Regulatory Impact Assessment (RIA) of implementing the (EU) Persistent Organic Pollutants Regulation in Turkey

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1. Overview of current situation with Persistent Organic Pollutants in Turkey

Persistent Organic Pollutants (POPs) cover a wide range of chemicals including pesticides, industrial chemicals and unintentionally produced pollutants causing substantial risk to environment and human health.

Stockholm Convention, ratified by Turkey in 2009 aims to protect environment and human health through controls on production, placement on the market and use of POPs substances, implementation of measures aimed to minimise with a view of eliminating releases of POPs into air, water and land as well as managing stockpiles and wastes.

On one hand, impacts associated with implementation of the By-Law on POPs will be driven by the past and current production, placement on the market and use of these substances, extent of releases to environment as well as accumulated quantities in stockpiles and wastes. On the other, regulatory framework already in place is expected to prevent or mitigate some of the releases.

1.1 Pesticides

Stockholm Convention includes the following pesticides: aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, pentachlorbenzene, mirex, toxaphene, lindane, α- hexachlorocyclohexane and β-hexachlorocyclohehane, chlordecone and endosulfan.

In the context of *production, placement on the market and use* of agricultural chemicals, pesticides concerned are either banned or have never been licensed in Turkey. In particular, following POPs have been banned in Turkey.

- Dieldrin – banned in 1971;
- α- hexachlorocyclohexane and β-hexachlorocyclohehane, DDT – restricted in 1978;
- Aldrin, chlordane, heptachlor, endrin – banned in 1979 due to their toxic effects on human health and environment;
- DDT, Lindane, α- hexachlorocyclohexane and β-hexachlorocyclohexane – banned in 1985;
- Toxaphane was banned in 1989;
- Endosulfan was banned in 2009 owing to harmful effects on humans, living organisms as well as toxic effects on environment;
- Mirex and PeCB have never been licensed in Turkey;
- Dicofol was banned in 2011[1]
- Chlordecone was never licenced in Turkey.

Any continuous use of these pesticides would constitute an illegal activity.

In the context of *stockpiles*:

- The last known stockpile of DDT (10,930 tonnes) was sent to the hazardous waste incinerator of IZAYDAS Inc. located in Kocaeli (NIP, 2015).
- There is also a major HCH stock (around 3,000 tons) in Kocaeli stored at a Merkim Industrial Products Inc. warehouses. This stock is scheduled to be disposed of by 2017 as part of an ongoing GEF funded project (NIP, 2015).

[1] Source: NIP(2015); consultation with the MoFAL

- The Ministry of Food, Agriculture and Livestock (MoFAL) suggests that given tight registration and strict follow-up procedures on licensed agricultural chemicals, no residual stock should be assumed since none is evident according to their records. (NIP, 2015; interviews April 2015).

In the case of **DDT**, the majority of the studies available suggest historic use for agricultural purposes as the key source of DDT in environment at present. However, some studies seem to suggest continuous inputs of DDT either as a result of illegal activities or more likely as a result of DDT presence as impurity in legitimately sold pesticides, such as dicofol[2].

Lindane has been used as a wide spectrum insecticide against animal eco-parasites, soil endemic insects, public health diseases, and predators. Globally, the production of lindane has decreased rapidly in the last few years and only few countries are still known to produce lindane. Lindane was produced in Turkey between years 1963 and 1985. Its production ceased by the time it was banned in 1985.

The intentional use of α- hexachlorocyclohexane (**Alpha-HCH**) and β-hexachlorocyclohehane (**Beta-HCH**) as an insecticide was phased out years ago. However, both Alpha-HCH and Beta-HCH are still produced as unintentional by-product of lindane (as ballast isomers during the production of Lindane). For each ton of lindane produced, around 6-10 tons of the other isomers including alpha- and beta-HCH are created. Large stockpiles of alpha- and beta-HCH are therefore present in the global environment[3]. Studies on the presence of lindane and HCHs suggest that detected contamination can be explained by the past usage in agriculture and their long term persistence in the environment.

Other banned POPs pesticides include heptachlor, aldrin, chlordane, endosulfan, dieldrin, endrin, toxaphane, mirex and chlordecone. Principal sources of these pesticides in the environment in Turkey include past agricultural uses, contribution from long-range transport and potentially continuous inputs (for instance, in form of impurities).

First introduced in 1945 to treat seeds, **Hexachlorobenzene** (HCB) kills fungi that affect food crops and it was widely used to control wheat bunt. HCB was also pesticide responsible for the episodic contamination in the 1950s resulting in numerous fatalities. HCB also exists as an impurity in several pesticide formulations. Like with the other POPs pesticides, historic applications as well as presence as impurity in currently legal pesticide formulations constitute the major sources of HCB in environment.

Pentachlorbenzene (PeCB) was used as a fungicide but it was never licensed as a pesticide in Turkey. However, PeCB can also be present as an impurity in pesticides such as quintozene due to potential use of PeCB as an intermediate. A study by Bailey et al.(2009) on the sources and prevalence of PeCB in the environment concluded that degradation of an agricultural fungicide, quintozene is one of the contributing sources of PeCB in Turkish environment.

Overall, having regard to the fact that all POPs pesticides listed are either banned or have never been licensed for use in Turkey key sources include past historic use, presence of some POPs pesticides as impurity in licensed products and long-range transport. There is no strong indication of continued illegal use of POPs pesticides in Turkey. Furthermore, known stockpiles of obsolete POPs pesticides have either been appropriately destroyed or will be destroyed within couple of years.

1.2 Industrial chemicals

A range of POPs substances listed on the Stockholm Convention are intentionally used industrial chemicals aiming to fulfil certain functions, such as flame-retardancy requirements.

Polychlorinated biphenyls (PCBs)

Polychlorinated biphenyls (PCBs) are used in industry as heat exchange fluids, in electric transformers and capacitors, in hydraulic systems and as additives in paint, carbonless copy paper, and plastics. Of the 209 individual congeners of PCBs, 13 exhibit a dioxin-like toxicity. Owing to their chemical stability and flame retardancy properties and high dielectric constant PCBs are mainly and widely used in electrical and electronic equipments as dielectric fluid in

[2] Also recently banned

[3] In studies, these chemicals – lindane, α- hexachlorocyclohexaneand β-hexachlorocyclohehane are typically analyzed together.

transformers and capacitors, additives in lubricants used in hydraulic machines, heat transfer fluid in industries and other applications. Moreover, they are also used in carbonless copy paper, insulating materials and plastics.

Other than direct production, PCBs may also be produced as a by-product in PVC manufacturing, pesticide production or waste incineration process.

Any industrial facility requiring high energy, such as iron-steel industry, power plants, factories, etc. use transformers and capacitors. Depending on the establishment year of such facilities, PCB containing equipment can still be in use, or under storage. Replacement of transformers would incur a large cost to a facilty, therefore, many transformers are still in use, which need proper cleaning (if cross contaminated) and/or disposal (especially if containing pure PCBs).

Improper disposal of PCB containing oils (Gedik and Yurdakul, 2014) when electrical equipment containing PCBs are to be recycled, can be a potential source of PCBs and other POPs. Burning of PCB containing oils in less than optimum conditions (such as in truck engines or for domestic heating purposes) would result in dioxin emissions which are highly toxic.

Odabasi et al (2009) show that electric arc furnaces are significant sources for fugitive POPs emissions with ambient air concentrations (62 +/- 35 for Sigma(41)PCBs) being significantly higher than those measured previously around the world and in the region. This further confirms that the steel plants with electric arc furnaces are "hot spots" for POPs.

PCBs were never produced in Turkey but customs records show a considerable amount imported both as dielectric fluids and inside electrical equipment such as transformers and capacitors. The use of PCBs was limited to specific applications only, such as transformers, condensers, and as hydraulic fluids, among others, until 1996. There is no official import/export record during the years 1969-1996. (Gedik and Imamoglu, 2010).

A current list of equipment containing PCBs is presented in the NIP (2014). However, it is not believed to be comprehensive as inventory studies are still ongoing in accordance with the requirements of the By-Law on Control of PCBs/PCTs. Furthermore, as a part of a UNEP/MAP project, detailed site investigations are done and many equipment either in use or out of order are identified that contain either pure PCBs or are cross-contaminated. New information concerning to the amounts of PCB containing oils in storage will be available as more field work is carried out and the online inventory available within the website of the MoEU is filled.

The current estimate, however, suggests a total of 1,080 tonnes of pure PCBs containing materials and equipment. The data were obtained from the surveys listing PCB-laden equipment with other equipment and site visits made in September 2013.

Perfluorooctane sulfonic acid (PFOS) and its salts and PFOSF

Perfluorooctane sulfonic acid (PFOS) is produced synthetically from perfluorooctane sulfonyl fluoride (PFOSF). PFOS can also be derived from its salts and PFOS containing polymers when dissolved. The term "PFOS-related substances" is used for all substances that contain one or more PFOS groups (defined as $C_8F_{17}SO_2$) and that can, or are assumed to, be degraded to PFOS in the environment. These PFOS-related substances are restricted through the listing of PFOSF, the basic material for their manufacture, and the listing of PFOS in Stockholm Convention.

PFOS and PFOS-related substances are known with their high surface activeness and they have been added to Stockholm Convention Annex B because they meet the POP criteria of the Convention. PFOS and PFOS-related substances have an extensive usage area which is limited by the Convention, permits to intended purposes and special exemptions.

PFOS is both intentionally produced and released as an unintended degradation product of related anthropogenic chemicals. The current intentional use of PFOS is widespread and includes: electric and electronic parts, firefighting foam, photo imaging, hydraulic fluids, hard metal (chromium) plating and textiles. PFOS is still produced in several countries but the most significant producer is China. In particular, China used PFOS in a large range of applications in 2008 including *textiles, fire fighting foams, pesticides, metal plating, semiconductors and cleaning products*. It is reported that 100 tones PFOS were used for textile treatment alone in China. However, this is not the case for Europe, where the only major current use of PFOS is in metal plating industry.

PFOS is neither produced in Turkey nor used as a process chemical. However there are ongoing uses of PFOS containing substances such as hydraulic fluids for aviation and aqueous fire fighting foams. In addition to this, historical uses of PFOS in different articles still have an effect on the local releases (STE Report on PFOS inventory, 2015).

The average amount of PFOS used in the country can be estimated as 850 tonnes if it is assumed that all the chemicals imported to the country under the 2923.90.00.90.19 HS Code. However, the exact amount of PFOS imported under the 2923.90.00.90.19 HS Code is not known.

The amount of PFOS retained in the country on the article basis for the years 2011 is estimated at 120,000 tonnes from the import and export data by using HS codes. (NIP, 2015).

Table 1.1 PFOS inventory (tonnes)

SECTOR	Production Amount	Import Amount	Export Amount	Amount Remaining in Country
Metal Plating	*	*	*	*
Fire Fighting Foams	*	*	*	*
Textile[1]	3,150,000	2,496,271	1,171,090	4,475,180
Apparel[1]	2,930,000	55,082	358,776	2,626,306
Synthetic Carpet[2]	748,800	20,000	504,127	264,673
Paper-Carton[3]	2,827,326	2,705,867	326,988	5,206,205
Aviation Hydraulic Fluids[4]	0	5,444	1,094	4,350

Metal processing, petrochemicals, automotive industry, home appliances, textile and leather sectors are the major contributor to manufacturing industry of the country. Semiconductor and photographic industry are not significant sources of production. As a matter of fact, the only significant ongoing release from the industry will be from hard metal plating (chrome plating) sector. From this process, emissions to water are still expected to be a significant contribution to PFOS release to environment. An overestimate calculation gives the *maximum release of* PFOS to environment due to metal plating sector as 0.7 tons/year to water media.

Articles with a short service life (i.e. paper products, some textiles) and articles which contain very low amounts of PFOS (i.e. rubber and plastic products) are not expected to have a significant contribution to total PFOS releases. Gold and copper mining industry, similar to chemically driven oil and gas industries also do not use PFOS related substances in their processes any more. As a matter of fact, contribution of electronics, semiconductors industries, and rubber and plastics products is negligible compared to other contributing sectors.

Situation regarding PFOS containing aqueous fire fighting foams (AFFF) and aviation hydraulic fluids needs further study in Turkey. These are expected to constitute two major contributions to ongoing release of PFOS to environment.

They are commonly stocked/used/operated in military bases, airports, oil and gas stations. According to sector information from the SIA, AFFFs are neither stocked nor there are PFOS containing AFFFs on the market. On the other hand, it is known that AFFF trade is not well monitored; there are unqualified products on the market. An estimate based on the amount of AFFFs used in the airports today results in 297 tons of PFOS release due to firefighting foams in airports since 1980. Yet again, aviation hydraulic fluids, containing PFOS are still being used in the market.

Ongoing use of PFOS containing substances in metal plating sector will mainly result in releases to water media, the case is similar for the PFOS containing AFFFs where the used up material ends up in sewer systems.

On the other hand, ongoing uses of PFOS containing articles (synthetic carpets, leather and apparel, textile goods, paper products and x-ray films) and any waste of these materials will end up as soil and water contamination sources either by means of a landfill (in the good case) or in a wild dumping site (the worst case). Wild dumpsites, in particular, constitute a major problem in Turkey resulting in soil and groundwater pollution.

Hexabromocyclododecane (HBCDD)

Hexabromocyclododecane (HBCDD) is the most recent addition to the POPs list of the Stockholm Convention. HBCDD is frequently used as a brominated flame retardant in materials for insulation (expandable and extruded polystyrene), in polymers of electric and electronic parts and as a textile coating agent.

HBCDD is known to be widely used in the manufacture of EPS and XPS across the Europe, and Turkey has three XPS production facilities. Information available suggests that HBCDD is not produced in Turkey (ref. STE report), however import records are somehow not straightforward because a defined harmonized system code cannot be attributed to HBCDD specifically. According to the import and export records of EPS and XPS, an estimate of the amount of HBCDD remaining in the country has been developed (ref: STE report). It is then used to develop a rough estimate of the waste material potentially containing HBCDD and the amount of HBCDD that can be released to the environment from these products.

It is estimated that 16,000 tonnes of HBCDD is present in insulation products in Turkey. Anticipated releases are 96 kg, 112 kg and 352 kg of HBCDD to air, water and to the land, respectively.

Furthermore, high impact polystyrene (HIPS) containing HBCDD is likely to be imported to Turkey in electrical and electronic equipment, but no data on this has been gathered (STE report, 2015).

Import of polymer dispersions for textiles containing HBCDD also cannot be excluded. Textile that is back-coated with a HBCDD containing layer is imported from China, the US and other countries in unknown quantities. In summary, import (and export) of HBCDD in articles is occurring but it could not be quantified (STE report, 2015). Turkey filed an exemption to the SC Secretariat regarding use of HBCDD in EPS and XPS production, until 2019.

Disposal of construction and demolition waste (C&DW) may constitute a potentially significant source of secondary HBCDD releases to environment.

Box 1 Disposal of construction and demolition waste in Turkey.

Management of construction and demolition wastes in Turkey is regulated by the "Regulation on Management of Excavation Soil, Construction and Demolition Wastes" published in Official Gazette 18.03.2004, numbered 25406.
The Regulation sets general guiding principles for managing C&DW in Turkey giving priority to waste minimization through selective demolition and segregation at source with subsequent recycling and reuse (e.g. as infrastructure material) instead of landfill disposal.

According to the regulation, C&DW up to 2 tonnes are managed by the owner who applies to municipality to arrange licensed/ authorized collection and transport. C&DW over 2 tonnes require coordination with the Municipality/Governorship.

In instances, when C&DW are found to be contaminated with hazardous wastes (such as asbestos, paint, fluorescent lamps, mercury, acid etc.) the entire volume of waste is treated as hazardous according to the Hazardous Wastes Management Regulation.

C&DW are usually recycled into the process, put into landfill or incinerated. Insulation boards form the majority of HBCDD containing waste. It is understood that most goes to landfill or incineration. There may be releases of HBCDD when buildings insulated with flame retarded materials are demolished. Having regard to anticipated lifetime of buildings, HBCDD emissions from this source can actually increase after 2025 onwards as increasing numbers of buildings containing HBCDD-treated materials become subject to refurbishment or demolition.

Disposal of construction wastes is much cheaper when the bulk waste is separated into components and eligible segregated waste components recycled. Typically PVC containing materials are separated and grinded for further smelting into raw plastic material. Insulation materials may be recycled and used for further asphalt raw material after their bituminous content is removed. They can be also used as a recycled fuel supply. Polystyrene foams are 100% recyclable back to new construction processes. If they cannot be recycled, incineration or energy recovery is always an option.

Total estimated annual quantity of C&DW in Turkey is around 40-50 million cubic meters. Average disposal costs are 5-15 TL per cubic meter. In Istanbul the costs are 20-30 TL per cubic meter. Disposal price on per tonne basis is about 2TL. Relative costs of disposal of hazardous wastes are about 880 TL per tonne.

There are 9 Type-I (Hazardous Waste) landfill licensed facilities in Turkey and 3 Type-II (Inert Waste) facilities.

Sources: Regulation on Management of Excavation Soil, Construction and Demolition Wastes; https://www.izmir.bel.tr

Brominated flame retardants BDEs (hepta, hexa, penta, tetrabromodiphenyl ether)

Tetrabromodiphenyl ether, pentabromodiphenyl ether (components of commercial pentabromodiphenyl ether, c-pentaBDE) hexabromodiphenyl ether and heptabromodiphenyl ether (components of commercial octanbromodiphenyl ether, c-octaBDE) have been included in the Stockholm Convention in 2009.

PBDEs were produced since 1970s; PBDEs represent one of the sub-groups of brominated flame retardants and possess similar characteristics to PCBs.

In general terms, **pBDEs** are widely used in items that are susceptible to catch or sustain fire such as plastic in electronic devices, polymers in automobile, certain synthetic textiles and polyurethane foam in certain applications.

pBDE is released into the environment during the manufacture of the commercial pBDE mixture, the manufacture of products, during their use and after they have been discarded as waste. While commercial mixture of octa-BDE is mainly used as a flame retardant in electrical and electronic equipment, commercial penta-BDE (pBDE) are mainly used as a flame retardant in polyurethane foams which have many applications in automotive sector, such as furniture, etc

PeBDE commercial product is a mixture of primarily tetra- through hexaBDE congeners (plus trace amounts of triBDE and 0-1% heptaBDE). The ratio of the pBDE-congeners in commercial PBDE mixtures is different in different regions of the world.

Turkey did not produce pBDEs, yet data obtained from the inventory study (STE report, 2015) suggests that there is a potential for a significant amount of pBDEs to have entered the waste stream in Turkey due to their use in transportation and electrical and electronic equipment, as well as household products. No exact information exists on the amount of pBDEs used in Turkey, but estimates suggest significant quantities of pBDEs in the transport sector.

Transport sector

Cars, buses, mini/midi buses, vans/trucks account for the major share of the transport sector containing the largest volume of POP-pBDEs in Turkey.

The amount of pBDE in the vehicles (used, imported, recycled from transport sector or disposed of in the past) by the year 2012 was 59 tonnes (consisting of 19 tonnes of tetraBDE, 33 tonnes of pentaBDE, 5 tonnes of hexaBDE and 0.3 tonnes of heptaBDE). Moreover, the amount of pPBDEs from imported vehicles to the country is estimated as 41 tonnes. The largest amount of pBDEs is detected to be originated from End-of-Life Vehicles and is estimated as 303 tonnes (containing approximately, 97 tonnes of tetraBDE, 170 tonnes of pentaBDE, 27 tonnes of hexaBDE and 1.5 ton of heptaBDE). Recycling of POP PBDEs from the transport sector is most likely to occur via recycling of polyurethane (PUR) foams. There is no specific recycling activity of POP-PBDE containing materials from the transport sector (plastics and PUR foram) in Turkey. The exact fate of this reclaimed foam is not known.

The total PBDE amount released from the transport sector is estimated at 200 tonnes and the total PBDE amount released from recycled PUR foams is estimated at 22 tonnes (STE report, 2015)

Electrical and Electronic Equipment

Electrical and electronic equipment is another important source of pBDEs (i.e. CRT monitors, recycled polymers, etc.).

In Turkey, the import of electrical and electronic equipment (EEE) from industrial countries increased during the last ten years. According to the STE Report on the inventory of pBDEs there were approximately 30 million TVs in Turkey in 2000. For the same year, 6.7 million appliances were entered to the market in Turkey and 4.3 million of them were imported. Import of WEEE or second hand electronics is banned by law in Turkey, however, licensed companies are permitted to import rubber, glass and plastic waste.

Turkey does not have any computer manufacturing facilities; however, assembling of computers which are imported as parts is present. Personal computers became widespread in Turkey after 1984. The current inventory covers CRT computers from 1984 to 2009 assuming that some of the PCs imported in a particular year will be stored for 1 year and will be used for another 4 years and will reach its end of life in 5 years after imported.

A total of 124 tonnes of c-OctaBDE, 54 tonnes of heptaBDE and 14 tonnes of hexaBDE waste was generated from waste CRT computers by the end of 2010 in Turkey (STE report, 2015)

A total of 267 tonnes of c-OctaBDE, 115 tonnes of heptaBDE and 29 tonnes of hexaBDE waste was generated from waste CRT TVs by the end of 2013 in Turkey.

Direct Import of Diphenyl Ether, Tetra- And Pentabromodiphenyl Ether

On the basis of data obtained from Customs Office of Turkey, 547 tonnes of diphenyl ether and 177 tonnes of penta/tetra bromo diphenyl ether were imported in the country, respectively between 1996 and 2013. However, there is no information statistics on the use of these chemicals in the country. (STE report, 2015)

Imported Acrylonitrile-Butadiene-Styrene

The main former use of c-OctaBDE was in acrylonitrile-butadiene-styrene (ABS) polymers, accounting for about 95% of c-OctaBDE supplied in the EU. The treated ABS was mainly used for housings/casings of electrical and electronic equipment (EEE), particularly for cathode ray tube (CRT) housings and office equipment such as copying machines and business printers. Assuming ABS imported to Turkey contains 15 wt% c-OctaBDE, POP PBDE in imported ABS to Turkey between 1970 – 2004, is about 997,684 tonnes equating to about 50kg of ABS per household or 13 kg per person (STE report, 2015).

Hexabromobiphenyl (HBB)

Hexabromobiphenyl is an industrial chemical that has been used as a flame retardant. It is no longer produced or used and many alternatives are available on the market.

Hexabromobiphenyl (HBB) is a member of polybrominated biphenyls (PBBs) which are generally referred as Brominated Flame Retardants (BFRs) and typically used in 3 groups of products. These are ABS thermoplasticizers normally used in house appliances, sealants and Polyurethane (PUR) foams used in automobile dashboards.

There is no information on the HBB sources in Turkey[4].

Short chain chlorinated paraffins

Polychlorinated alkanes ($C_xH_{(2x-y+2)}Cl_y$) are manufactured by chlorination of liquid n-alkanes or paraffin wax and contain from 30 to 70% chlorine. The products are often divided in three groups depending on chain length: short chain (C_{10} – C_{13}), medium (C_{14} – C_{17}) and long (C_{18} – C_{30}) chain lengths**.** The largest application of CPs is as a plasticizer. The chlorinated paraffins also impart a number of technical benefits, such as flame retardant properties and extreme pressure lubrication.

CPs may be released into the environment from improperly disposed metal-working fluids or polymers containing chlorinated paraffins. Loss of chlorinated paraffins by leaching from paints and coatings may also contribute to environmental contamination.

There is no information on the SCCPs sources in Turkey[5].

Polychlorinated naphthalenes (CNs)

Polychlorinated naphthalenes (CNs) are halogenated organic compounds. CNs had various uses similar to PCBs, which gradually replaced CNs in many applications. Characteristic functions of CN formulations were electric insulation, flame retardation and biocidal protection of goods. Until known global production virtually stopped in many countries, having drastically decreased by the late 1970s, some 150–400 kilotons had been produced worldwide.

While the commercial CN manufacture in the UNECE region has drastically declined since their large-volume production in the first half of the 20th century, the major remaining source of CNs is probably waste incineration. Releases from former uses of CNs or as impurities of technical PCB contained in landfills or old appliances are plausible but difficult to assess.

Currently there is no information whether PCNs were imported for use in Turkey, but very limited number of studies carried out in Aliaga, Izmir, indicate use of Halowaxes (technical mixtures of PCNs) in the industry because they are detected in ambient air, stack gas and soil.

[4] Source: NIP (2015)
[5] Source: NIP (2015)

PCNs and PCBs were used for similar purposes in the past and their concentrations were shown to correlate in Korea and Japan. Although not very strong, a similar correlation could be made for PCBs and PCNs in Izmir, Turkey. Here, PCB concentrations are much higher than PCNs, but correlation indicates common sources for these contaminants. Authors state that POPs have significant ongoing sources in Izmir area. Source of PCNs were identified as evaporative emissions from past use of different technical mixtures (Halowaxes) containing PCNs, as well as from combustion sources such as metal refining, iron-steel production and coal/wood combustion. PCNs may be emitted by different mechanisms from iron-steel plants with electric arc furnaces. PCNs may be present in the scrap (raw material) and are evaporated during production processes or they may be formed by de novo synthesis in thermal processes. Major source is considered to be waste incineration, which points to the Kocaeli hazardous waste incinerator for Turkey. Odabasi et al (2015) identify ongoing local sources especially scrap processing iron-steel plants and ship breaking yards in the Aliaga region, in Izmir.

In summary, combustion sources and emissions from sources related to historical use of technical mixtures, Halowaxes (Odabasi et al, 2012) constitute the major sources. There are three waste incinerators in Turkey (Izmit, Kocaeli and Aliaga, Izmir for hazardous waste incineration; and Kemerburgaz, Istanbul for medical waste incineration).

There is only one study available that specifically investigates PCN concentrations at suburban, two urban and one industrial site in Izmir (Odabasi et al, 2012). Investigation of possible sources indicated that combustion processes contribute significantly, together with emissions from sources related to historical use of technical mixtures.

No inventory data is available for CNs in Turkey[6].

Hexachlorobutadiene (HCBD)

Hexachlorobutadiene (HCBD) is a halogenated aliphatic hydrocarbon mainly generated as a by-product in the manufacturing of chlorinated hydrocarbons. HCBD has experienced a variety of uses, spanning from an intermediate in chemical production to transformer, hydraulic or heat transfer liquid to a viticulture pesticide. Its use and production have ceased in the UN-ECE countries but information about ongoing application outside the UN-ECE is not currently available.

The substance is still unintentionally released by industry particularly by waste management sector during incineration of waste. There are 3 waste incinerators in Turkey (Izmit, Kocaeli and Aliaga, Izmir for hazardous waste incineration; and Kemerburgaz, Istanbul for medical waste incineration) constituting potential sources[7].

HCB (Hexachlorobenzene) and PeCB (Pentachlorobenzene)

In addition to agricultural uses, HCB was also produced and used as industrial chemical. Likewise, PeCB was also intentionally used in PCB products, in dyestuff carriers, as flame retardant and as a chemical intermediate e.g. previously for the production of quintozene. PeCB might still be used as an intermediate and can be present as impurities in solvents.

No inventory data exist in Turkey for HCB and PeCB, however, a recent study by Bailey et al.(2009) on the sources and prevalence of PeCB in the environment concluded that there are no longer any large scale uses of PeCB with industrial releases noted to be less important (in comparison to combustion of solid wastes and biomass burning with degradation of an agricultural fungicide, quintozene).

1.3 Unintentionally released chemicals

A range of listed POPs substances are unintentionally emitted including dioxins/furans, PAHs, PCBs, HCB and PeCB. No inventory data exist on unintentional emissions of HCB, PeCB and PAH, but some discussion on key likely sources is presented in the sections below.

[6] Source: NIP (2015)
[7] Source: NIP (2015)

Dioxins, furans (PCDD/PCDF) and dioxin-like PCBs

PCDD/Fs are produced unintentionally due to incomplete combustion, during the manufacture of pesticides and other chlorinated substances. They are emitted mostly from the burning of hospital waste, municipal waste, and hazardous waste, and also from automobile emissions, peat, coal, and wood. Although there are many congeners, seven PCDDs are considered to be of concern. They have never been used as commercial products, nor were intentionally manufactured for any reason other than laboratory purposes.

Inventory estimate available on **PCDD/Fs** estimates total emissions at 1,315 g TEQ per year with emissions to residues accounting for 62% (813 g TEQ per year) and emissions to air for 23% (309 g TEQ per year). Remaining annual emissions are to products (103g TEQ per year or 8%), land (77 g TEQ per year or 6%) and water (12 g TEQ per year or 1%) (ref: NIP 2014).

In terms of sectoral contribution to emissions:

- In the context of residues, emissions from ferrous and non-ferrous metal production (70%) and disposal facilities (24%).Iron and steel production and copper production account for the highest contribution within the ferrous and non-ferrous metal production processes, while “disposal of domestic and mixed wastes” is responsible for the entire uPOP amount in the residues caused by the disposal facilities
- In the context of atmospheric emissions, same ferrous and non-ferrous metal production sector accounts for 51% of emissions while open burning processes (i.e. accidental fires at homes/factories) and heat and power generation account for 25% and 20% of emissions to air respectively.
- In the context of emissions to products production of chemicals and consumer goods account for 87% of emissions with textile and leather products being prominent source.
- While releases to land and water are relatively minor (accounting for 7% of total annual emissions), emissions from open burning processes are responsible for entirety of emissions to land, while production of chemicals and consumer goods and disposal account for 55% and 45% emissions to water respectively.

Despite significant decrease in PCDD/Fs emissions from metal industry, it is still the major contributor accounting singlehandedly for more than 55% of total annual emissions. Emissions from open burning processes that account for about 12% of annual emissions in 2012 have also decreased as a result of strict legislation and related controls. On the other hand the proportion of releases from heat and power generation, production of mineral products, production of chemicals and consumer goods and disposal facilities displayed increases, as part of the total emissions, in different percentages ranging from 6 % to 35 % in comparison to 2010 levels. The increase in the uPOP releases from heat and energy production is mainly related to the increase in the utilization of coal in recent years.

The results of the inventory are consistent with the studies available that identify combustion processes (combustion of fossil fuels and contaminated domestic wastes, motor vehicles, metal recovery/smelting process), iron and steel production, coal mining, cement production, textile manufacturing (dying), paper production and petrochemical industry among principal emission sources (Gunes et al., 2014; Ucar et al (2011).

Saral et al (2015) investigated PCDD/Fs in Istanbul atmosphere and demonstrated that medical waste incineration and gasification plants are shown to contribute to the emissions as well as the usage of various pesticides in the surrounding large forests and agricultural fields around one of the stations. Other significant contributors included dense vehicle traffic, and mixed groups of industrial facilities. Similarly, Gunes et al (2014) showed that contribution of industrial, residential and traffic sources result in the highest concentrations in Istanbul. Results reported are similar to those of Beijing, China. Combustion processes such as motor vehicles and residential heating equipment were thought to be the principal sources of emissions of PCDD/F compounds when both congener profiles and seasonal variations are considered in Istanbul (Gunes et al, 2014).

There is very limited information on unintentionally produced **PCBs**. Inventory data available in NIP (2015) suggests that metal production sector accounts for 98-99% of estimated total annual PCBs emissions. In addition to the iron and steel sector, highly chlorinated PCB congeners were observed in Izmir close to a chlor-alkali plant and petroleum refinery, suggesting their unintentional release.

Polyaromatic hydrocarbons (PAHs)

PAHs mainly originate from the incomplete combustion and pyrolysis of organic materials. They are formed due to natural sources such as forest fires and volcanic eruptions, and anthropogenic sources such as traffic emissions,

industrial activities, biomass burning and domestic heating. Although not listed under POPs by the Stockholm Convention, it is regulated under CRLTAP (Pribylova et al. 2012).

There are a vast number of PAH sources including combustion of fossil fuels, production/use of coke, asphalt, coal tars, catalytic cracking, iron/steel/aluminium production, combustion sources, cement production, petroleum refineries, forest fires, etc. These are valid sources for industries in Turkey, and hence there are many potential sources of PAHs.

Studies available suggest that industrial installations, particularly iron and steel sector, waste incineration as well as emissions from traffic and residential heating are major sources of PAH emissions in Turkey (Odabasi et al., 2009 and 2010; Gaga et al., 2012). It is particularly noteworthy that PAH emissions seem to increase approximately fourfold over the winter period (Gaga et al., 2012) associated with domestic heating.

In a recent study by Aydin et al. (2014), in Aliaga area, PAH sources were identified as biomass and coal combustion (40%), iron-steel production (27%), unburned crude oil (27%), and petroleum products (3%), and diesel and gasoline exhaust emissions (3%).

HCB (Hexachlorobenzene) and Pentachlorobenzene (PeCB)

In addition to agricultural and industrial uses, HCB and PeCB can also appear as unintentional by-products. In particular, HCB still appears as a by-product of the manufacture of certain industrial chemicals and combustion processes, while PeCB is also produced unintentionally during combustion, thermal and industrial processes.

In the case of PeCB, in particular, a study by Voigt et al (2013) suggests that the majority of PeCB enters the environment as a result of backyard trash burning and municipal waste incineration. There are no longer any large scale uses of PeCB and industrial releases are noted to be less important.

2. Problem definition

2.1 What is the policy context for POPs management in Turkey?

Turkey has a dynamic regulatory system aiming to protect environment and human health with a wide range of regulatory measures already put in place that address POPs.

Turkey has ratified **Stockholm Convention** in 2009. In particular, the Convention was adopted on 22 May 2001 and subsequently ratified in the Turkish Grand National Assembly by the means of the Law No.5871 on Ratification of Stockholm Convention on Persistent Organic Pollutants. The Law was adopted eight years after the signature of the Convention on April 14, 2009 and entered into force on October 14, 2009.

The Stockholm Convention is the most important regulatory instrument aiming to address these border-crossing chemicals by imposing a number of control actions aiming to prohibit production, placement on the market and use of the substances listed as well as minimise with a view of ultimate elimination of the releases of POPs.

The Convention is versatile and covers pesticides, industrial chemicals as well as unintentionally produced substances, e.g. as by-products.

In addition to Stockholm Convention, **Protocol on Persistent Organic Pollutants** (POPs) (POPs Protocol) under the Convention on Long-range Transboundary Air Pollution concerns POPs substances including pesticides, industrial chemicals and unintentionally released pollutants. The Protocol ultimately aims to eliminate any discharges, emissions and losses of POPs. Turkey is a signatory to the Protocol but has not yet ratified it. In practice, majority of the provisions under the Protocol overlap with these under the Convention. Key distinction concerns substances like PAH and SCCPs that are part of the Protocol but not Convention.

Following the adoption of the Convention ratification Law in May 2009, a range of subordinated legislation has been adopted focusing key outstanding POPs.

Pesticides

The original 12 substances under the Convention included nine ***pesticides*** that have been already banned in Turkey requiring no additional regulatory action addressing production, placement on the market and use of these pesticides.

Lindane, apha-, beta-HCHs, chlordecone, endosulfan and pentachlorbenzene were added in 2009 and 2011 after ratification of the Convention in Turkey.

In the context of pesticides, biocides and plant protection products (PPPs), key regulations include among others:

- **By-law on Control of Pesticides** (adopted and implemented by the Ministry of Food, Agriculture and Livestock/ Directorate General of Food and Control/ Department of Pesticides) that states that the production, import and sale of the pesticides whose certificates are invalidated must be ceased (Article 36). The prohibition and phasing out of the pesticides which have been listed on the Stockholm Convention as POP is implemented within the scope of this by-law.
- **By-law on the Certification of Pesticides** (adopted and implemented by the Ministry of Food, Agriculture and Livestock/ Directorate General of Food and Control/ Department of Pesticides) stipulate that the certificates of the pesticides which have been prohibited by the international organizations/institutions are cancelled by the MoFAL (Article 22) constituting the first step in prohibition process of the pesticides listed by the Convention as POP. Cancellation of certificates means that production, import and sale of the pesticides concerned become prohibited.
- **By-law on Sale and Storage of Pesticides** (adopted and implemented by the Ministry of Food, Agriculture and Livestock/ Directorate General of Food and Control/ Department of Pesticides) also prohibits the sale of POP pesticides (in accordance with the Article 15 provisions).
- **Law on Veterinary Services, Plant Health, Food and Feed** (adopted and implemented by the Ministry of Food, Agriculture and Livestock) sets forth the principles of production, import, use, packaging,

labelling, transport, storage, certified or non-certified sale, certification, control and supply of pesticides and provides the legal basis for the relevant by-laws.

- **By-law on Cosmetics (**implemented by the Ministry of Health/ Medicine and Medical Devices Institution) prohibits the use of α-HCH in cosmetic products (article 7) in accordance with 76/768/EEC Directive on Cosmetic Products and 96/335/EC Commission Decision of establishing an inventory and a common nomenclature of ingredients employed in cosmetic products.
- In addition, a range of horizontal legislation addresses the issue of pesticides including:
  - **By-law on Control of Soil Pollution and Sites Contaminated by Point Sources** (adopted and implemented by the Ministry of Environment and Urbanization/ Directorate General of Environmental Management/Department of Water and Soil Management) that determines the methods and principles of detection of the sites contaminated or potentially contaminated by POPs and stipulates the need for remediation and monitoring of these sites in line with the sustainable development goals. The By-Law also defines generic limit values for certain POPs in soil including aldrin, DDT, dieldrin, endosulfan, endrin, α-HCH, β-HCH, lindane, hexachlorobenzene, heptachlor, pentachlorobenzene and toxaphene).
  - **By-law on Control of Pollution Caused by Dangerous Substances in Aquatic Environment** (adopted and implemented by the Ministry of Environment and Urbanization/ Directorate General of Environmental Management/Department of Water and Soil Management) that regulates discharges to water and water quality standards for certain POPs including DDT, hexachlorocyclohexane, aldrin, dieldrin, endrin, hexachlorobenzene and endosulfan with the aim to control the discharges of these pollutants. The By-Law was adopted in accordance with 76/464/EEC Directive on Water Pollution by Discharges of Certain Dangerous Substances.

All pesticides listed in the Convention have either been banned or were never licensed in Turkey.

Industrial chemicals

In the context of ***industrial chemicals***, a wide range of substance specific and horizontal regulations exists in Turkey.

Listing of *polychlorinated biphenyls (PCBs)* on the Convention instigated adoption of several normative acts either dedicated exclusively to PCBs or including these substances within a scope of wider normative acts.

Key regulations addressing PCBs include among others:

- **By-law on the Control of Polychlorinated Biphenyls and Polychlorinated Terphenyls** (adopted and implemented by the Ministry of Environment and Urbanization/ Directorate General of Environmental Management/Department of Waste Management). This By-Law was adopted in accordance with Council Directive on the Disposal of Polychlorinated Biphenyls and Polychlorinated Terphenyls. (96/59/EC; 16.09.1996) that sets out requirements for disposal of polychlorinated biphenyls and polychlorinated terphenyls. In particular, the By-Law stipulates methods and principles of disposal of PCB containing equipments and prohibits production and import of PCBs.
- **By-law on Control of Waste Oils** (adopted and implemented by the Ministry of Environment and Urbanization/ Directorate General of Environmental Management/Department of Waste Management). This By-Law limits the PCB content of the waste oils, stipulates actions to prevent the incineration of PCB containing oils and ensures environmentally sound disposal of PCB containing waste oils. The By-Law was adopted in accordance with 2008/98/EC Waste Framework Directive and 75/439/EC Directive on Disposal of Waste Oils.
- In addition, a range of horizontal legislation addresses PCBs including:
  - By-law on Restriction of Manufacturing, Placing on the Market and Use of Certain Hazardous Substances, Preparations and Articles that prohibits placement on the market and use of PCB among other provisions. Furthermore, Notification on Auditing of Import of Chemicals that are Controlled for Environmental Protection by the Ministry of Economy/ Directorate General of Product Safety and Inspection prohibits the import of PCBs among other chemicals listed in Annex II of the notification.

- By-Law on Control of Waste Electrical and Electronic Equipments among other provisions determines the principles of disposal of waste electrical and electronic equipments containing PCBs.
- By-law on Control of Hazardous Wastes that aims to ensure environmentally sound management of hazardous wastes (including wastes contaminated with PCB) by minimizing at source and preventing the adverse effects on human health and environment of wastes.
- By-law on Landfill of Wastes that sets out the rules for the storage of wastes contaminated with PCBs (in accordance with 1999/31/EC Landfill of Waste Directive) and By-law on the Incineration of Wastes that sets out the principles of incineration of some wastes like PCBs.
- By-law on Control of Soil Pollution and Sites Contaminated by Point Sources that defines generic limit values for certain POPs in soil including for PCBs.
- Turkish Food Codex By-law on Contaminants that determines limit values for dioxin like PCBs in foodstuffs among other substances.

However, addition of *pBDEs*, *PFOS* and *HBCDD* to the Convention is not thoroughly reflected in the national Turkish legislation representing a significant regulatory gap. Key relevant regulations include:

- More generically, use of chemicals on their own, in preparations or in articles is governed under REACH. **Regulation on Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) (1907/2006 18.12.2006)** regulates the registration, restriction and certification of the chemicals. REACH regulation is transposed into a national By-law but not yet entered into force). The relevant subordinated legislation includes:
  - By-law on Inventory and Control of Chemicals requires gathering and presentation of data on production and import of chemicals, stipulates control of the associated risk caused by chemicals and sets out control of export and import of certain dangerous chemicals. Furthermore, **Environmental Law** sets out principles for the manufacturing, use, storage, transportation, import and export of hazardous chemicals assigning to the Ministry of Economy powers to prohibit or restrict import of certain chemicals, products and wastes upon consulting with the Ministry of Environment and Urbanization.
  - By-law on Classification, Packaging and Labelling of Dangerous Substances and Preparations regulates management and control of classification, packaging and labelling of hazardous substances on the market with the aim of ensuring the protection of environment and human health. Chemicals Advisory Board is established to follow up the implementation of the by-law.
  - By-law on Compilation and Distribution of Safety Data Sheets for Hazardous Substances and Preparations that sets out principles of compilation and distribution of material safety data sheets with the aim to protect the environment and human health.
  - By-law on Restriction of Manufacturing, Placing on the Market and Use of Certain Hazardous Substances, Preparations and Articles restricts and prohibits the production, use and placing on the market of PCBs. This By-Law does not explicitly prohibit production and industrial use of substances like PBDEs, hexachorobenzene (HCB) and hexabromocyclodecane (HBCDD).
- **By-Law on Control of Waste Electrical and Electronic Equipments** that among other provisions determines the principles of disposal of waste electrical and electronic equipments containing PBDEs and prohibits the production and import of electrical and electronic equipments containing PBDEs. This By-Law is adopted in accordance with 2002/95/EC Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipments and 2002/96/EC Directive on Waste Electrical and Electronic Equipments.
- **By-law on Control of Soil Pollution and Sites Contaminated by Point Sources** that among other provisions defines generic limit values for hexachlorobenzene and pentachlorobenzene in soil among other POPs.

Unintentionally produced chemicals

In the context of ***unintentionally released chemicals***, a range of relevant regulations already exists in Turkey, including:

- Regulations focusing on minimising emissions from industrial activities such as:
  - **By-law on Control of Air Pollution Arising from Industrial Facilities** (adopted and implemented by the Ministry of Environment and Urbanization/ Directorate General of Environmental Management/Department of Air Management and Climate Change in accordance with 2010/75/EU Integrated Pollution Prevention and Control Directive) that controls the emissions of POPs from industrial facilities including stipulating restrictions and setting limit values for emissions of PCDD/Fs and PCBs. Subordinated legislation on permitting and licensing sets out the system of regulating installations falling within the scope of the regulations and prescribing discharge and emission limits for different substances.
  - **By-law on the Prevention and Reduction of the Effects of Major Industrial Accidents** (implemented by the Ministry of Labour and Social Security/ Directorate General of Occupational Health and Safety and Ministry of Environment and Urbanization/ Directorate General of Environmental Impact Assessment, License and Inspection). The By-Law sets out methods and principles concerning the necessary measures to ensure the efficient and continual prevention of the major industrial accidents in the facilities in which PCDD/Fs can be formed as by-products of processes.
- Regulations focusing on minimising emissions from waste management and contaminated land
  - Umbrella waste legislation including **By-law on the General Principles of Waste Management** that determines the general principles of management of wastes from cradle to grave (in accordance with the 2008/98/EC Waste Framework Directive and **By-law on the Incineration of Wastes** that sets out the principles of incineration of some wastes like PCBs and other hazardous wastes.
  - **By-law on Control of Hazardous Wastes** (implemented by the Ministry of Environment and Urbanization/ Directorate General of Environmental Management/Department of Waste Management) aims to ensure environmentally sound management of hazardous wastes (including wastes contaminated with PCB, PCDD/Fs) by minimizing at source and preventing the adverse effects on human health and environment of wastes. **Environmental Law** provides the definition hazardous waste and sets principles for the management of hazardous wastes (including import of wastes) by referring to the related regulations.
  - **By-law on Control of Soil Pollution and Sites Contaminated by Point Sources** determines the methods and principles of detection of the sites contaminated or potentially contaminated by POPs, stipulates the need for remediation and monitoring of these sites in line with the sustainable development goals and defines generic limit values for certain POPs in soil including PCDD, PCBs, hexachlorobenzene and pentachlorobenzene among others.
- Regulations focusing on protecting consumers including **Turkish Food Codex By-law on Contaminants** that determines allowable limit values for PCDD/Fs and dioxin like PCBs in foodstuffs (in accordance with 1881/2006/EC Directive on Setting Maximum Levels for Certain Contaminants in Foodstuffs)

In more general terms, **By-Law on Surface Water Quality Management** (implemented by the Ministry of Forestry and Water Affairs/ Directorate General of Water Management/ Department of Water Quality Management) sets out environmental quality standards for some of the POP substances in water and requires carrying out monitoring of concerned POPs substances in water and sediment in accordance with 2000/60/EC Water Framework Directive and 2008/105/EC Environmental Quality Standards Directive.

2.2 What is the problem requiring action and what are the underlying drivers of the problem?

Despite extensive regulatory framework, some of the POPs substances listed in the Convention are found to be present in Turkish environment in some cases adversely affecting human health and environment.

In the case of **pesticides**, all listed substances have either been banned or have never been licensed for agricultural use in Turkey. Furthermore, according to MoFAL no stockpiles of obsolete POPs pesticides are anticipated to be found in addition to already known ones. While majority of studies on environmental and human exposure to POPs pesticides suggests no harmful concentrations, this is not the case, for instance, for HCHs. Furthermore, some of the studies suggest recent or continuous inputs of the banned pesticides either as a result of illegal application or most likely through impurities in legally sold products on the market. Presence of DDT as impurity in dicofol is one of such examples.

In the case of **industrial substances**, current regulatory framework does not cover substances like PBDEs, PFOS, HBCDD. The only heavily regulated industrial substance is PCBs. This constitutes a major regulatory gap resulting in continuous placement on the market, use and disposal of articles containing these substances leading to environmental and human exposure.

Finally, **unintentionally produced POP substances**, including dioxins, furans, PCBs, HCB, PeCB and PAH are subjected to highly fragmented or absent regulatory framework aiming to minimise with a view of eliminating environmental releases of these substances. This particularly affects non-industrial sectors (such as residential, transport).

In addition to fragmented regulatory system also suffering from significant gaps in terms of substances and/or sectors and uses, insufficient knowledge base is also detrimental to policy making. The issue concerns, in particular, the lack of comprehensive monitoring of the presence of these substances in the Turkish environment as well as incomplete or non-existent inventories of sources and emissions. Such lack of comprehensive, reliable information on sources, emissions, environmental and human exposure to the substances concerned poses significant challenges to the policy makers to introduce regulatory measures aiming to control and prohibit production, placement on the market and use of substances, minimise releases and appropriately manage stockpiles and wastes. This situation results in sub-optimal protection of human health and environment, particularly having regard to evidence of harmful exposure to some of the substances at present.

2.3 Who is affected by the problem identified, in what ways and to what extent?

Continuous use and unintentional releases of POPs substances could present significant risk to environment and human health due to inherent characteristics of these substances.

More specifically, some of the evidence available suggest environmental and/or human exposure to excessive concentrations of POPs in Turkey.

Pesticides

Despite the historic ban on virtually all POPs pesticides listed under the Stockholm Convention in Turkey, available evidence indicate excessive environmental concentrations and adverse human exposure in relation to some POPs pesticides and /or locations.

DDT

In the context of *environmental and human exposure*, **DDT** is the most well-known POP on the list and there is relatively a large body of knowledge on DDT levels in Turkish environment as well as on human exposure. Some countries are still allowing a restricted use of DDT for vector control purposes (i.e. avoid spreading of malaria with mosquitoes). Due to its semi-volatile characteristic, DDT can be present in atmosphere despite the historic ban in Turkey itself. Furthermore, DDT and its related products are very durable in nature and even after 10 - 15 years from the last application more than 50 % remains in the soil.

DDT can easily accumulate in the fat tissue of all living organisms; it was even detected in mother's milk. Although there is not enough evidence of DDT being carcinogenic, IARC classified it as a possible human carcinogen based on the results of the animal tests [NIP, 2015].

In the case of **environmental exposure**, the only continuous monitoring data available on DDT is from the rural background passive sampling station at Camkoru, Ankara. Results from December 2009 to May 2013 yield a median total DDT concentration (together with 4 metabolites) between BDL to 14 pg/m^3 with a median of 8 pg/m^3. DDE, a metabolite of DDT is dominant in the measurements, indicating no recent DDT input into the environment.

There is a vast number of published studies reporting the level of DDT and its metabolites in soil (e.g., Turgut et al., 2012), sediment (e.g. Okay et al. 2014, Ozkoc et al., 2007) and mussels (e.g. Okay et al., 2014, Kucuksezgin et al., 2013).

Furthermore, even when detected the levels appear to be below the established risk thresholds. For instance, Kocagoz et al (2014), in their biomonitoring study in Buyuk Menderes River, measured egg DDE concentrations and found these to be below the established threshold concentrations for the risk of hatch and reproductive success.

In a study by Ozkoc et al. (2007), sediment, mussel, and seawater samples collected from the Black sea coast of Turkey between 2001 and 2003 were shown to contain concentrations of DDT and its metabolites significantly greater than the detection limits.

Another study by Okay et al. (2014) investigated total DDT concentrations (the sum of 6 isomers of DDT) in the sediments of the study area on the Aegean coast with results ranging from not detectable to 16 ng g−1 dw. However, in the shipyard station, the measured concentration was 73 ng g−1 dw (from unspecified source).

A recent study on OCP levels in sediments of a national park in Aydin found DDT being one of the most prevalent pesticides in the 30-60-cm depth (69.5% of the samples). The pesticides detected (16 OCPs) could be a long-term contamination source that enters the food web used by the very species the park is trying to protect (STE report, 2015).

Typically, the results of these environmental studies show much greater prevalence of metabolites of DDT suggesting historic use.

However, several studies have showed significant contamination with DDT while suggesting continuous DDT inputs. Key relevant studies included:

- One recent toxicological study measured DDT and its metabolite levels in mussels from Gulluk and Gokova Bay with results indicating recent DDT usage in these areas (Kucuksezgin et al., 2013).
- A study by Isleyen (2013) who investigated DDT and its metabolite levels in agricultural fields near Sakarya, and found relatively high concentrations of DDT and its metabolites. Noteworthy was the fact, that the highest total DDT concentrations were observed where plants have been actively grown since 1987 while the opposite was true for fields where crops have not been grown since 1987. According to the authors it is not certain whether the application of DDT has indeed been terminated or whether observed concentrations are due to continuous illegal use.
- Studies have also shown that the wetlands in Turkey and related rivers and delta systems (Meric, Ergene, Sakarya River) are contaminated with DDT in high levels. More importantly, DDT levels in some wetlands are much higher than its metabolites (e.g. Meric Delta in sediment DDT: 2443.5 and DDE: 378.57 ppb) (Ayas, 2007). Furthermore, the observed DDT levels are higher in the wetlands located near the agricultural areas. The author suggests that although it is forbidden to use DDT since the 1980s, it might still be in use today due to weak law enforcement (Ayas, 2007). This study has shown that while identified DDT residue levels do not have acute toxic effects, long-term chronic effects (especially reproductive success) on the organisms in these wetlands are anticipated potentially resulting in extinction of endangered bird species in the long run (Ayas, 2007).
- OCP concentrations (including DDT) in various rivers of Turkey, such as Sakarya, Kizilirmak and Yesilirmak rivers, passing through agricultural and industrial regions seem to carry significant OCP loads into the Black Sea showing relatively higher concentrations of DDT and metabolites. Likewise, pesticide residues measured in freshwater bodies of Central Anatolia (Tuz Lake, Hirfanli Dam Lake, Esmekaya Lake, Tersakan Lake and Bolluk Lake) indicated that lakes located in the vicinity of large agricultural areas yield higher concentrations of pesticides attributed to potential continuous use of these chemicals (Turgut et al, 2013).

In the case of **human exposure**, there are also numerous toxicological studies on human adipose tissue (indicating progressively larger portion of metabolites and less DDT, hence demonstrating effectiveness of ban on DDT use, Cok et al. 1998), human milk in Kayseri (Ustunbas, 1994), Kahramanmaras (Erdogrul et al, 2004), Konya (Ozcan, 2011), in area residents of Taurus mountains (Voigt et al, 2013) and in agricultural workers in Antalya (Cok et al, 2011).

Among these, Ustunbas's (1994) study on mothers working in agriculture yielded DDT and metabolite levels above World Health Organization guideline values. Furthermore, Cok et al. (2011) give a summary on studies investigating OCP levels in human milk over a period of 30 years. From the first study in 1983, onwards, HCHs, HCB, Heptachlor epoxide and DDT & metabolite levels are reported. There seems to be a slowly decreasing trend in concentrations of OCPs, yet the Antalya human milk study yield recent DDT input. Although there is no particular comparison with worldwide human milk levels, they are typically lower than countries that produce POPs pesticides. A recent study by Ozcan's (2011) which analysed the infant exposure to DDTs showed that the estimated daily intakes of DDT were below the guideline values proposed by WHO indicating no concern for child health.

Daglioglu (2013) analysed levels of OCs in amniotic fluids from 200 pregnant women for OCPs. Only 5% of these women were found to be free of OCPs, while the rest had detectable level of OCPs in their amniotic fluid. However, metabolites of DDT were relatively more frequently observed, in line with environmental observations (Daglioglu, 2013).

There are also studies (Cok et al. 1998) on DDT levels in adipose tissue over 20 years timeline. The results (with the exception of Cok et al (2011)) show an increasing DDE/DDT ratio through time, thereby indicating no recent DDT exposure.

In addition to the studies of DDT content in human milk, there are also studies on DDT and its metabolite levels in **food stuffs**, such as butter (Aksoy et al, 2013), grape molasses in Kahramanmaras (Erdogrul, 2008) and mussels (Kucuksezgin et al., 2013). In all these studies the levels of DDT and its metabolites found showed no cause for concern. For instance, Aksoy et al (2008) analysed 9 organochlorine compounds (aldrin, hexachlorobenzene, DDT and metabolites, and alpha-, beta-, and gamma-HCH) in butter samples from the Eastern, Middle and Western Black Sea Regions of Turkey between 2009–2010 with DDT metabolites not being detected in the samples. Even in the case of study of mussels from Gulluk and Gokova Bay that potentially suggested a recent DDT usage in these areas, tolerable levels of POPs in seafood were not exceeded. In other words, comparing the levels measured against the guideline values proposed by a number of organizations (such as USFDA, FAO, etc.) showed that mussel consumption would not represent a risk for consumers (Kucuksezgin et al., 2013).

A recent study of 24 dicofol formulations in Turkey yielded o,p-DDE as the most frequent impurity in dicofol (average 169 mg kg−1 dicofol) (Turgut et al. 2009). Turgut et al. (2013) points especially to cotton production in Söke Plain, Turkey, where difocol-based pesticides are frequently being used. The claim seems also to be corroborated by the study by Cok et al. (2011) who present results from human milk studies over a 30 years period. In this study DDE/DDT ratio, which used to be around 4 to 9 in human milk DDT studies in the 80s and 90s, became 15 to 28 in more recent years followed by a decrease to 4.15 in 2008 in Antalya. This major difference in the ratio was explained by a recent DDT input into the environment either through illegal use or due to its presence as a significant impurity in dicofol. Universally, DDT production as a raw material for dicofol (2,2,2-trichloro-1,1-bis(4-chlorophenyl)ethanol) manufacturing constitute a new source with Turgut et al. (2013) referring to two facilities that produce DDT for dicofol manufacture in China. However, consultation with the MoFAL suggested that dicofol has been banned since 2011.

In summary, despite the relatively high frequency of observing DDT as with everywhere else around the world, concentrations of DDT typically shown to be decreasing with metabolite levels (DDE, etc.) increasing thereby indicating historic use. Yet some studies seem to indicate continuous inputs of DDT either as a result of illegal activities or more likely as a result of DDT presence as impurity, for instance in dicofol.

Lindane and HCHs

In the context of *environmental and human exposure*, there is relatively a large body of knowledge on HCHs in Turkish environment as well as on human exposure.

In terms of **environmental exposure**, lindane is toxic to animals and aquatic organisms. Similarly, α- HCH and β- HCH adversely affect wildlife while β- HCH is also highly persistent in water in colder regions and may bioaccumulate and biomagnify in biota and arctic food webs. It is also subject to long-range transport.

The only continuous monitoring data available on alpha-, beta-, gamma- and delta-HCH is from the rural background passive air sampling station at Camkoru, Ankara. Results from December 2009 to May 2013 yield a median total HCH

concentration (together with alpha-, beta- , gamma- and delta-HCH) between BDL to 64 pg/m^3 with a median of 22 pg/m^3. Lindane was detected in 65% of samples, alpha-HCH in 81% while other compounds in less than 20% samples. The ratio of α-/γ-HCH for environmental samples is used to give information regarding current usage of HCH-containing pesticides through comparing it with the ratio for technical HCH mixtures. Results obtained at Camkoru do not show a strong indication of recent technical HCH mixture usage. Values observed in this rural background sampling station were typically lower or around the same order of magnitude with those measured around the world.

Key relevant studies included:

- In a study by Ozkoc et al. (2007), sediment, mussel, and seawater samples collected from the Black sea coast of Turkey between 2001-2003 were shown to contain considerable levels of lindane in the sediment, mussel, or seawater samples prompting suggestion by the authors that banning the use of POPs pesticides did not necessarily had a significant influence on the observed environmental level as illegal use might still continue in some regions. Yet, in spite of high biota-sediment accumulation factors calculated in this study, levels of OCPs in edible biota were significantly below international legal limits recommended by Food and Agriculture Organization of the UN, hence, safe for human consumption.
- MEDPOL study (the monitoring of organic pollutants in sediment on the Mediterranean coasts of Turkey under the Program for the Assessment and Control of Pollution in the Mediterranean region as a part of the Mediterranean Action Plan of UNEP) during which sediments from many sites along the Mediterranean coast were analyzed for OCPs including HCHs. Relatively larger concentrations were observed close to populated cities like Antalya, Mersin, Iskenderun, but also Meric and Tasucu. Results seem to be consistent in terms of location and large consumption of agricultural chemicals. No major concern noted regarding these concentraitons.
- Kucuksezgin et al. (2013) found lindane concentrations in mussels to be not detectable along the Eastern Aegean coast (from Gulluk and Gokova Bay).
- Okay et al. (2014) investigated sediment and mussel OCP concentrations along marinas, ship building/breaking yards along the Canakkale strait and Aegean coast. They showed that total HCHs contribute only 0.03% to 6% of the total OCP concentrations in the polluted areas. Beta-HCH was the one with the highest concentration. Concentrations presented were similar to other locations around the world, though much higher concetrations were said to be present in the literature for Asian countries . Hence, no major concern noted regarding these values.
- A variety of data also exists regarding level of OCPs in sediments from lakes, estuaries, rivers and seas. A recent study on OCPs levels in sediments of a national park in Aydin shown it to be contaminated with 16 different organochlorine pesticides, with more pesticides detected in sediments than in water. Lindane isomers were present, but at < 30% of the sediment samples. (STE report, 2015)
- A study by Turgut et al. (2013) on OCP concentrations in various rivers of Turkey (Sakarya, Kizilirmak and Yesilirmak) and lakes of Central Anatolia (Tuz Lake, Hirfanli Dam Lake, Esmekaya Lake, Tersakan Lake and Bolluk Lake) showed relatively higher HCHs concentrations.

In terms of **human health**, lindane is persistent with high potential for bioconcentration. Humans can be exposed to lindane through digestion, inhalation and dermal contact resulting in adverse impacts on developmental and immune systems. Similarly, α- HCH and β- HCH are classified as potentially carcinogenic to humans and adversely affect human health in contaminated regions.

There are numerous studies on the human exposure to OCPs. A study by Cok et al. (2011) gives a summary on studies investigating OCP levels in human milk over a period of 30 years reporting on HCHs levels among other pesticides from 1983 onwards. Overall, a slowly decreasing trend in concentrations of OCPs can be observed. Although no specific comparison has been made with the levels of OCPs observed in human milk worldwide, these are typically lower than in countries that are still producing POPs pesticides.

Another study by Ozcan et al. (2011) in Konya aimed to analyse exposure of infants to OCPs including HCHs via mother's milk. The estimated daily intakes of these pollutants have been found to be below the guideline values proposed by the (WHO) and the Health Canada suggesting no concerns over the children health.

Another study carried out by Daglioglu (2013) measured levels of OCPs in amniotic fluids from 200 pregnant women residing in the Cukurova region which is one of the most important agricultural regions of Turkey accounting for 32% of Turkey's annual pesticide use. Only 5% of these women were found to be free of OCPs, while the rest had detectable

level of OCPs in their amniotic fluid. Among the HCHs, lindane was the most frequently observed, with 61% observation frequency, while alpha- and beta-HCH had much lower detection frequencies (9-10%) (Daglioglu et al. 2013). The levels observed in this study were orders of magnitude higher than those reported in the literature for Spain, Germany, Tanzania or USA, Total PCB level was only reported for India, which was higher but on the same order of magnitude with the results obtained in that study for Turkey.

Finally, Ustunbas's (1994) study on human milk in Kayseri from mothers working in agriculture showed OCP levels indicating that the amounts of total HCH were below the acceptable daily intake.

In addition to the studies that analysed indane and HCHs content in human milk, there are also studies on OCP levels in **food stuffs**, such as honey (Erdogrul, 2007), grape molasses in Kahramanmaras (Erdogrul, 2008) and butter (Aksoy et al., 2008). Levels were all found to be below acceptable levels. Although pesticide levels were generally low in honey samples, lindane was measurable in all samples.

However, Aksoy et al (2008) analysed 9 organochlorine compounds including alpha-, beta-, and gamma-HCH in butter samples from the Eastern, Middle and Western Black Sea Regions of Turkey between 2009 - 2010. Alpha-, and gamma-HCH were not detected in the samples but beta-HCH was detected in 3 of a total of 88 samples. In the first period, only one sample from the West Black Sea Region was beta-HCH positive (0.014 mg kg(-1)). The other beta-HCH positive samples collected in Middle and West Black Sea Regions in the second period had a concentration of 0.066 and 0.019 mg kg(-1), respectively. All concentrations of the detected compounds exceeded the legal limits of 0.003 mg kg(-1) for beta-HCH, as prescribed by the Turkish Food Codex, and therefore pose a potential health risk for consumers. The contamination detected was explained to be most likely due to the past usage of beta-HCH in agriculture and its long term persistence in the environment.

Other pesticides

Other banned POPs pesticides include heptachlor, aldrin, chlordane, endosulfan, dieldrin, endrin, toxaphane, mirex and chlordecone.

In the context of *environmental and human exposure*, despite the lack of continuous monitoring data available on these pesticides, there is relatively a large body of knowledge on OCPs (heptachlor, aldrin, chlordane, endosulfan, dieldrin, endrin) levels in Turkish environment as well as on human exposure.

Key relevant studies included:

- MEDPOL study during which sediments from many sites along the Mediterranean coast were analyzed for OCPs including heptachlor, aldrin, chlordane, endosulfan, dieldrin and endrin. Overall, relatively recent findings of these studies show the presence of OCPs in varying amounts in sediments of the Turkish coasts. Relatively larger concentrations were observed close to populated cities like Antalya, Mersin, Iskenderun, but also Meric and Tasucu. Results seem to be consistent in terms of location and large consumption of agricultural chemicals.
- In a study by Ozkoc et al. (2007), sediment, mussel, and seawater samples collected from the Black sea coast of Turkey between 2001-2003 were shown to contain considerable levels of aldrin, dieldrin, endrin, heptachlor epoxide and endosulfan sulphate in the sediment, mussel, or seawater samples prompting suggestion by the authors that banning the use of POPs pesticides did not necessarily had a significant influence on the observed environmental level as illegal use might still continue in some regions. Yet, in spite of high biota-sediment accumulation factors calculated in this study, levels of OCPs in edible biota were significantly below international legal limits recommended by Food and Agriculture Organization of the UN, hence, safe for human consumption.
- Ambient air OCP concentrations measured in 2003 in Izmir, Turkey were on the same order of magnitude as those measured in urban locations around the world (Sofuoglu et al., 2004). Lack of correlation with temperature, wind speed and direction for a number of pesticides (heptachlor, aldrin) were explained by their concentrations being affected by long-range transport while other OCPs were commented to have local sources. For example, endosulfan was stated to have ongoing local sources; a conclusion consistent with the fact that it was not yet banned at the time of the study.
- A variety of data also exists regarding level of OCPs in sediments from lakes, estuaries, rivers and seas. A recent study on OCPs levels in sediments of a national park in Aydin shown it to be contaminated with 16 different organochlorine pesticides, with more pesticides detected in sediments than in water. In addition

to DDT, the most prevalent pesticides in the 30-60-cm depth heptachlor (62.3%), a-endosulfan (55% of samples), and endrin (37%). These pesticides could be a long-term contamination source that enters the food web used by the very species the park is trying to protect. (STE report, 2015)

- Studies exist in the literature for determination of OCPs in agricultural and non-agricultural soils from Goksu Delta between 1991-1993 (Ayas, 1997) showing an order of magnitude difference between the two (agricultural being higher).
- Levels of OCPs in soil were also measured for Izmir, Taurus mountains and Soke, Aydin (STE-Kadir report). Atmospheric deposition of OCPs were shown in Taurus mountain soils while pesticide application onto agricultural sources noted for the others.
- Mirex was never registered in Turkey hence MoFAL states that it was not used. Even when that is the case, sediments from Marmara Sea and those near the shipbreaking yard was shown to contain mirex concentrations (Okay et al 2014). However, none were detected in local or transplanted mussels.
- In the study of Coelhan et al (2006), 15 of 22 toxaphene components were not detected in any of the edible fish samples and in general it was a minor component of samples collected from Marmara Sea, when compared to the other OCPs.
- Kocagoz et al (2014) investigated POPs in water birds by carrying out non-invasive versus invasive sampling. The results showed recent input of both aldrin and endosulfan. However, none of the values in biological samples were above the threshold value. Furthermore, the sampling took place in 2009 before endosulfan ban took effect.
- Measurements of OCP concentrations in various rivers (Sakarya, Kizilirmak and Yesilirmak) and lakes (Tuz Lake, Hirfanli Dam Lake, Esmekaya Lake, Tersakan Lake and Bolluk Lake) of Turkey showed relatively high concentrations of aldrin and heptachlor epoxide (Turgut et al, 2013).

No studies were found on environmental exposure for chlordecone.

There are numerous studies on the **human exposure** to OCPs. A study by Cok et al. (2011) gives a summary on studies investigating OCP levels in human milk over a period of 30 years reporting on heptachlor epoxide levels among other pesticides from 1983 onwards. Overall, a slowly decreasing trend in concentrations of OCPs can be observed. Although no specific comparison has been made with the levels of OCPs observed in human milk worldwide, these are typically lower than in countries that are still producing POPs pesticides.

Aytac et al (2010) conducted a study on human milk OCP levels in Adana – another agriculturally important city in Turkey. OCPs were found in 67% of human milk samples, suggesting that the population is affected by these chemicals.

Ustunbas's (1994) study on human milk in Kayseri from mothers working in agriculture show OCP levels indicate that the amounts of aldrin derivatives were below the acceptable daily intake.

Voigt et al. (2013) conducted a study on OCPs in human milk in Taurus mountains for residents at different altitude. Taurus Mountains were suggested for this study because of their potential to act as a sink for organic pollutants by cold condensation and can reflect the atmospheric pollution in Turkey as well as neighbouring countries, e.g. Arabia, Africa, and Russia. They argue that within the last few years, questions and concerns have also focused on the hypothesis that endocrine disrupting chemicals (EDC) may be involved in the dramatic rise in the incidence of metabolic disorders such as obesity and diabetes observed worldwide the last 40 years. They could find no correlation of human milk OCP levels with altitude in their study.

Iscan et al. (2002) conducted a study on the correlation of OCP concentrations versus human breast tumors, and found a partial association.

In addition to the studies that analysed pesticides content in human milk, there are also studies on OCP levels in **food stuffs**, such as honey (Erdogrul, 2007), grape molasses in Kahramanmaras (Erdogrul, 2008) and butter (Aksoy et al., 2008). Levels were all found to be below acceptable levels.

A recent study on environmental levels of OCPs carried out by Kucuksezgin et al. (2013) showed that transplanted mussels do not pose a lack of risk to human health as a result of measured levels of POPs.

Aksoy et al (2008) analysed 9 organochlorine compounds including aldrin among others in butter samples from the Eastern, Middle and Western Black Sea Regions of Turkey between 2009 – 2010 and did not detect aldrin in the samples.

However, according to the European Commission's Rapid Alert System for Food and Feed (RASFF) portal, roasted chickpeas from Turkey were noted to contain endosulfan (0,16 mg/kg - ppm) at the border to Italy.

Idiz et al. (2012) conducted a study on pesticide posioning cases, where 43 out of 54 deaths committed suicide with pesticides. Endosulfan was the third most commonly observed pesticide in these events. The fact that endosulfan comes out to be the only POPs is that it was banned only in 2009, as stated by the MoFAL (NIP, 2014). Daglioglu et al. (2011) conducted a similar study on poisoning cases between 2006 and 2008, and endosulfan was the most frequently analysed pesticide with 47% prevalence in autopsies with positive pesticide levels. This report showed that certain pesticides, endosulfan in particular, remains as common cause of poisonings in Cukurova region.

Hexachlorobenzene (HCB)

In the context of **environmental exposure**, the only continuous monitoring data available on HCB is from the rural background passive sampling station at Camkoru, Ankara. Results from December 2009 to May 2013 show that HCB was detected in 100% of samples collected, with a range of 18 to 82 pg/m^3 with a median of 54 pg/m^3. HCB is the only OCP (among DDT &metabolites, HCHs) to be detected 100% of the time.

HCB concentrations reported for different coastal sediments of the world vary between 0.2 and 39 ng g−1 dw while Okay et al (2014) report sediment HCB concentrations at a Mediterranean marina (42.6 ng g−1 dw) and at a shipyard in Tuzla (7.1 ng g−1 dw) which are higher than the global concentrations and also much higher than those on the eastern Aegean coast of Turkey (Küçüksezgin and Gönül, 2012) (nd–0.78 ng g−1 dw) and in the Istanbul Strait (nd–0.29 ng g−1 dw) (Okay et al., 2011).

In a study by Ozkoc et al. (2007), sediment, mussel, and seawater samples collected from the Black sea coast of Turkey between 2001-2003 were shown to contain considerable levels of HCB in the sediment, mussel, or seawater samples. Authors comment that banning of use of these OCPs did not necessarily have a big influence on the environmental levels, stating that there might still be illegal use in some regions. Yet, in spite of high biota-sediment accumulation factors calculated in this study, levels of OCPs in edible biota were significantly below international legal limits recommended by Food and Agriculture Organization of the UN, hence, safe for human consumption.

Also Kucuksezgin et al. (2013) could not detect HCB in mussel from Aegean coast in a sampling study conducted in 2011. Similarly, even though high concentrations of HCB were noted in sediments, none were detected in local or transplanted mussels in the same regions (Okay et al., 2014).

Aksoy et al (2008) analysed 9 organochlorine compounds including hexachlorobenzene in butter samples from the Eastern, Middle and Western Black Sea Regions of Turkey between 2009–2010 and did not detect HCB in the samples.

In the context of **human exposure**, hexachlorobenzene is the only POPs chemical that had an episodic contamination event in Turkey. Hexachlorobenzene is a chemical that has been associated with significant immediate and long term adverse health effects.

During a period when bread wheat was unavailable, HCB-treated seed wheat intended for agriculture was used for food. Between 1955 and 1959, 500 people were fatally poisoned by eating bread made with the contaminated seed. More than 4,000 people fell ill as a result of the exposure. Most of the sick were affected with a liver condition called porphyria cutanea tarda, which disturbs the metabolism of hemoglobin and results in skin lesions. The poisoning was often fatal for children. In some villages, almost all breastfeeding children under the age of two, whose mothers had eaten tainted bread, died. Locally, this condition was called "pembe yara" and probably resulted from high doses of HCB passed on through the breast milk. In one mother's breast milk during the incident, the HCB level was found to be 20 parts per million in lipid, approximately 2,000 times the average levels of contamination found in breast milk samples around the world. Follow-up studies 20 to 30 years after the poisoning found average HCB levels in breast milk were still more than seven times the average for unexposed women in that part of the world, and 150 times the level allowed in cow's milk (URL 1) (Cripps,1984). There were also spontaneous abortion and negative effects on offspring. Jarrell (2002) investigated whether there was an effect of the HCB contamination on the proportion of male births. The available national data demonstrated a significant reduction in the calculated proportion of males from 1935 to 1970 that stabilized from 1970 to 1990. These data indicate that HCB exposure that was sufficient to induce clinical porphyria

cutanea tarda may also have reduced the proportion of males in subjects over their reproductive life-span. However, no net trend could be observed (Jarrell, 2002).

In a study by Cok et al (1998) HCB levels in human adipose tissue were investigated and HCB detected in 84% of the analysed 56 samples in Manisa. This was interesting since HCB use in agriculture was banned in 1956. This is explained by some industrial activities using HCB and pesticides including HCB as impurities being used in large amounts.

In another study, Cok et al. (2011) give a summary on studies investigating OCP levels in human milk over a period of 30 yrs. From the first study in 1983, onwards HCB levels are reported among other pesticides. There seems to be a slowly decreasing trend in concentrations of OCPs and although there is no particular comparison with worldwide human milk levels, they are typically lower than countries that produce POPs pesticides.

Similarly, Erdogrul (2004) detected HCB in 98% of the human milk samples collected from Kahramanmaras while Daglioglu (2013) who studied levels of OCs in amniotic fluids from 200 pregnant women for OCPs, observed HCB in 14% cases.

HCB were also detected in fish species from a lake in Kahramanmaras (Erdogrul et al., 2005) but at much lower levels when compared to DDT.

Pentachlorobenzene (PeCB)

PeCB is persistent in the environment and bioaccumulative. The small spatial variability across the Northern Hemisphere indicates that pentachlorobenzene has a very long atmospheric residence time, which allows it to become widely distributed in the global hemisphere. There are monitoring data from remote areas, backed up by modelling results that suggest that pentachlorobenzene can be transported over great distances. Pentachlorobenzene is moderately toxic to humans, but is very toxic to aquatic organisms. Present concentrations in remote areas are well below estimated critical body burdens.

In the context of **environmental concentrations**, Okay et al (2014) conducted a study on Aegean sediments and PeCB were detected only in Tuzla shipyard area sediments, and none were detected in mussels. No other studies were found on environmental exposure to pentachlorbenzene in Turkey.

In the context of **human exposure**, Voigt et al (2013) investigated OCP levels, including PeCB in human breast milk. No significantly high concentrations were noted.

Despite the lack of comprehensive data, PeCB is not anticipated to be of significant concern due to the lack of ongoing sources. Long-range transport and past historical use might constitute the only concern.

Industrial chemicals

A range of listed POPs substances are intentionally used industrial chemicals aiming to fulfil certain functions, such as flame-retardancy requirements.

HCB and PeCB are discussed in the previous sections.

Polychlorinated biphenyls (PCBs)

Polychlorinated biphenyls (PCBs) are used in industry as heat exchange fluids, in electric transformers and capacitors, in hydralulic systems and as additives in paint, carbonless copy paper, and plastics. Of the 209 individual congeners of PCBs, 13 exhibit a dioxin-like toxicity. As chemical stability and flame retardancy properties and high dielectric constant are high PCBs are mainly and widely used in electrical and electronic equipments (as dielectric fluid in transformers and capacitors), additives in lubricants used in hydraulic machines, heat transfer fluid in industries and other applications. Moreover, they are also used in carbonless copy paper, insulating materials and plastics.

Improper disposal of PCB containing oils (Gedik and Yurdakul, 2014) when electrical equipment containing PCBs are to be recycled, can be a potential source of PCBs and other POPs. Burning of PCBs in less than optimum conditions such as in truck engines or for domestic heating purposes would result in dioxin emissions which are highly toxic.

Odabasi et al (2009) show that electric arc furnaces are significant sources for fugitive POPs emissions. Ambient air concentrations (62 +/- 35 for Sigma(41)PCBs) were significantly higher than those measured previously around the world and in the region, further confirming that the steel plants with electric arc furnaces are "hot spots" for POPs.

PCBs are highly dangerous in nature due to its stable structure and persistent properties and are subjected to long range transportation. Also, like other POPs compounds PCBs tend to accumulate in fatty tissues of organisms.

Other than direct production, PCBs may also be produced as a by-product in PVC manufacturing, pesticide production or waste incineration process. Moreover, when the optimum conditions for incineration are not reached, i.e. retarded combustion PCDDs and PCDFs are released.

In the context of ***environmental exposure,*** the only continuous monitoring data available is from the rural background passive sampling station at Camkoru, Ankara. Results from December 2009 to May 2013 yield a median total PCB concentration (as the sum of seven indicator PCBs) BDL to 34 pg/m^3 with a median of 5 pg/m^3. These concentrations are comparable or lower to worldwide monitoring station results.

Many studies exist in literature for the detection of PCB concentrations in soil in rural, industrial (Aliaga-Izmir, Golbasi-Ankara, Iskenderun-Hatay) areas (Gedik and Imamoglu, 2010). A significant contaminated site was identified by Yeniova (1998) inside a transformer maintenance and repair facility. Also sediment PCB levels were studied in Mersin, Bosphorus, Aliaga, Mediterranean Sea, Istanbul Strait, Ankara Creek (Gedik and Imamoglu,2010). Observed concentrations correlate with industrial activities. Significantly high concentrations of PCBs were detected in emissions of Aliaga electric-arc furnaces for steel-making (Odabasi, 2009). Sites contaminated with PCBs are expected where such equipment is used or around facilities using PCBs for their plasticizer or other properties, such as in carbonless copy paper.

In the recent biomonitoring study by Odabasi et al (2015), it is stated that although PCBs and PCNs are not produced and their use was banned more than three decades ago, their concentrations continued to rise due to the increasing number of ongoing local sources (especially scrap processing iron-steel plants and ship breaking yards).

In the context of *human exposure*, many studies also exist for the detection of PCBs in marine biota (fish, mussel, harbor porpoise, etc.) as well as human adipose tissue and human milk (Gedik and Imamoglu, 2010). All observed PCB concentrations in marine biota were below the level of guidance for US Food and Drug Administration, except for the levels detected in 1997 study of Tanabe for marine organisms in Black Sea. The date of that study coincided with the continued legal use of PCBs in Turkey at the time. PCB levels in fish on the other hand were noted to be comparable or lower than European countries, yet higher when compared to most Asian countries. Levels in mussels were below the EC regulation for dioxin-like PCBs in food stuffs, but on the same order of magnitude.

Regarding human adipose tissue PCB levels, although lower concentrations were observed when compared to those from other countries, a decreasing trend could not be observed (Gedik and Imamoglu, 2010).

Ozcan et al. (2011) yield an analysis of the infant exposure to PCBs via mother's milk in a study in Konya, Turkey. They estimated daily intakes of these pollutants were below the guideline proposed by the WHO and the Health Canada suggesting no concern for children health.

Population is affected to some degree by PCB pollution, tough it is less than that compared to countries that produced PCBs. Vicinity of any major industry containing PCB-transformers can act as a source, especially if their out-of-order equipment is not well stored.

Perfluorooctane sulfonic acid (PFOS) and its salts and PFOSF

PFOS and PFOS-related substances are known with their high surface activeness and they have been added to Stockholm Convention Annex B because they meet the POP criteria of the Convention. PFOS is both intentionally produced and an unintended degradation product of related anthropogenic chemicals. The current intentional use of PFOS related substances is widespread and includes: hard metal (chromium) plating, electric and electronic parts, firefighting foam, photo imaging, hydraulic fluids and textiles.

PFOS is neither produced in Turkey nor used directly as a process chemical. However there are ongoing uses of PFOS containing substances such as hydraulic fluids for aviation and aqueous fire fighting foams. In addition to this, historical uses of PFOS in different articles still have an effect on the local releases.

Significant industry based ongoing release is from hard metal plating (chrome plating) sector. Commercial uses as in aviation hydraulic fluids and aqueous fire fighting foams are two other major contributors to PFOS release but the

situation regarding PFOS containing aqueous fire fighting foams(AFFF) and aviation hydraulic fluids is unclear in Turkey.

In the context of **environmental exposure**, there are currently no studies in the literature on investigation of PFOS or PFOSF levels in the environment in Turkey.

In the context of **human exposure and/or toxicity studies**, there are no studies conducted in Turkey regarding PFOS levels in human milk, blood, etc. There are only a few studies investigating toxic effects of PFOS in laboratory environment. For example, Gunduz et al. (2013) investigated the embryotoxic effects of PFOS compounds in sea urchin and found that low doses caused malformations in the skeletal system while high concentrations inhibited the growth of embryos in early life stages. Hence, these chemicals were found harmful on the embryonic development of sea urchin both in the send of the whole embryo and on a cellular level. Authors conclude that PFOS and PSOF presents a major risk to the normal development of the sea urchin in the environment. These have ecological importance due to the hazard at a population level considering the cumulative effects of other environmental pollutants living organisms are exposed to in the environment.

Hexabromocyclododecane (HBCDD)

Hexabromocyclododecane (HBCDD) is frequently used as a brominated flame retardant. HBCDD appear as white, non-volatile and odourless solids, insoluble in water but soluble in organic solvents, is very persistent in the environment (i.e. more than 15-40 yrs of half life in sediments). Degradation in the environment seems to be insignificant, and levels are mostly increasing. HBCDD is lipophilic and bioaccumulative, the log K_{OW} of 5.6 for HBCDD is in the upper range for bioaccumulation, and it is comparable with that of DDT. Biomagnifies and concentrates in natural food chains.

There is no measurement or monitoring studies regarding HBCDD in Turkish environmental compartments. The only study was a short-term air/dust monitoring project carried out by Dr. Kurt-Karakus in 2012 in Istanbul. Obtained results from that study showed ambient air concentration of HBCDD in Istanbul ranged between 38-1200 pg/m3 whereas indoor air concentrations ranged between <MDL-400 pg/m3 in homes and <MDL-24000 pg/m3 in offices. Indoor dust concentrations ranged between <MDL-29000 ng/g in homes and <MDL to 94000 ng/g in offices (Kurt-Karakus, 2013). In general, levels in Istanbul are lower than HBCDD levels reported for UK classrooms (Harrad et al., 2010). Levels are generally similar to levels of HBCDD reported for UK offices and homes (Harrad et al., 2008) and Canadian homes (Wilford et al., 2005) and living rooms in US homes (Restrepo-Johnson and Kannan, 2009).

No data on environmental or human health exposure to HBCDD in Turkey is available.

Brominated flame retardants BDEs (hepta,hexa, penta, tetrabromodiphenyl ether)

PBDEs represent one of the sub-groups of brominated flame retardants and possess similar characteristics to PCBs. PeBDE is released into the environment during the manufacture of the commercial PeBDE mixture, the manufacture of products, during their use and after they have been discarded as waste. The releases are to air, water and soil. The major part of the releases ends up in soil. The distribution between the environmental compartments is: soil>>>water>air. The main part of PeBDE in the environment is bound to particles; only a small amount is transported in its gaseous phase or diluted in water.

When PBDEs are incinerated, they have a high risk in formation of polybrominated dibenzo-p-dioxins and dibenzofurans (PBDDs/Fs), having similar effects as PCDDs/Fs. PBDEs have persistent, bioaccumulative, toxic properties and they are ubiquitous in the environment with PBDEs concentrations in the environment showing a steep raise.

In the context of ***environmental exposure***, there is no monitoring data available for PBDEs in Turkey. They were not measured in the rural background passive sampling station at Camkoru, Ankara.

A recent study on biomonitoring of POPs that also included PBDEs indicated that background sampling locations yield much lower PBDE levels when compared to industrialised locations. In particular, the study showed that iron and steel, ship-breaking, petrochemical plants and the petroleum refinery to be the major sources in the region (Odabasi et al., 2015). The results are consistent with the outcomes of an earlier study that showed that electric arc furnaces are significant sources for fugitive POPs emissions, including PBDEs. Ambient air concentrations (1451 +/- 954 pg m(-3), for Sigma(7)PBDEs) were significantly higher than those measured previously around the world and in the region, further confirming that the steel plants with electric arc furnaces are "hot spots" for POPs (Odabasi et al., 2009). It should be noted, however, that low concentrations of PBDEs were detected in tree-ring samples even before

industrialisation period suggesting that PBDEs can form during combustion. However, much greater concentrations were observed in tree samples coming to recent years, showing the effect of industrialization in the Aliaga, Izmir area (Odabasi et al., 2015).

Cetin and Odabasi (2008) measured PBDEs in Izmir atmosphere associated with various industrial operations. At the industrial site, electric arc furnaces located in the steel plants are likely sources of PBDEs. At the steel plants, scrap steel components from cars are recycled in the electric arc furnaces, while a significant portion of the remaining plastic and foam is landfilled. PBDEs are likely emitted during the steel production process, probably during scrap charging (mostly in the particle-phase), scrap preheating, and at the beginning of the melting cycle (mostly in the gas-phase). Concentrations measured in the study were within the ranges of previously reported values. Another study in Dilovasi, Kocaeli, Turkey yielded soil PBDE concentrations to be significantly affected by industrial emissions (Cetin, 2014).

Total dissolved-phase PBDE concentrations (total-7PBDEs) observed in Izmir Bay were around the same order of magnitude with the ones measured at San Francisco Bay, USA and higher than those for Hong Kong (Cetin and Odabasi, 2007). In addition to gas exchange and particle deposition, other PBDE inputs into the Bay (i.e., wet deposition, runoff, and industrial discharges) were stated to contribute to the water column total PBDE inventory.

PBDEs were below detection limit in liquid samples from Kahramanmaras (Erdogrul, 2008).

Due to PeBDEs high persistency in air, the main route for long-range transport is through the atmosphere. In the context of ***human exposure***, the exposure to humans is through food, use of products and indoor air and dust.

For instance, Cetin and Odabasi (2011) state that indoor air is an important route of exposure to PBDEs as a result of several indoor sources of PBDEs (i.e., thermoplastics, electronic equipment housings etc.). In the indoor environment, PBDEs are less prone to atmospheric dilution and photolysis resulting in increased air concentrations. PBDEs are also used in several parts of cars but, PBDEs that are known to break down when exposed to the sun and UV light, may break down at much higher rates in solar-exposed cars than in other indoor environments.

Kurt-Karakus's 2013 study conducted in Istanbul to determine concentrations of PBDEs in indoor air and house dust was the first scientific study to assess the levels of these chemicals in indoor environments and also to understand the relative significance of human non-dietary exposure via dust ingestion for children and adults. Recent studies discovered that the main exposure route of PBDEs in the general population is house dust, not diet, because PBDEs are used as additives to retard fire and flames in a variety of commercial and household products. Median values of Σ_{12}PBDEs in house dust ranged between 1200-2500 ng/g whereas it was between <MDL to 2500 ng/g for office dust. The median PBDE concentrations in home dust in Thailand (Σ_{10} PBDE:10 ng/g, Muenhor, 2011) and Germany (Σ_7PBDE: 74 ng/g, Sjodin et al. 2008) were lower whereas samples from USA (Σ_{21}PBDE: 21000 ng/g, Battermann et al., 2009), UK (Σ13PBDE: 3500 ng/g, Harrad et al. 2008a) were higher compared to levels detected in dust from Turkish homes. Turkish office dust samples showed relatively lower median concentrations of ΣPBDEs compared to samples collected from China (Σ10PBDE: 30700 ng/g, Ma et al., 2009), USA (Σ21 PBDE: 8754 ng/g, Batterman et al., 2010) and UK (Σ13PBDE: 7400 ng/g, Harrad et al., 2008a). Findings of the study in Istanbul provided a snapshot of chemical contamination in indoor environments in Turkey and suggest that exposure to dust is a significant route of human non-dietary exposure to PBDEs. Moreover, the widespread distribution of these chemicals highlights the fact that humans are continuously exposed to low doses of these chemicals in the indoor environment.

The only indoor study depicts that house dust samples contain deca-BDE, which is used as an additive in textiles and consumer products like carpets and the samples are taken from the surface of the samples and other soft surfaces. Every house dust sampled in that study contain c-pentaBDE which is present in PUR foam as a flame retardant (STE Report, 2015).

PeBDE also transfers from mothers to embryos and lactating infants. Vulnerable groups can be pregnant women, embryos and infants. The first study on human milk PBDE levels were carried out by Erdogrul et al (2004) in Kahramanmaras. In this study, PBDEs were detected only in 3 out of 37 samples, with the highest value being 0.014 ng/g ww (0.40 ng/g lipid weight) and BDE 47 was the dominant congener. Ozcan et al (2011) investigated PBDE levels in human milk samples from Konya, Turkey and found an average of 67.34 ng/g lipid wt for five congener sum. No concern noted for milk consumption.

In addition to the studies that analysed exposure to pBDE through indoor air, water, soil and human milk, there are also studies on pBDE levels in **food stuffs**, such as butter, grape molasses and fish. For instance, Erdogrul (2005) investigated fish samples from a lake in Kahramanmaras, and show that the PBDEs (on wet weight basis) were lower than in similar species from European or American freshwater systems.

Ucar et al (2011) investigated butter samples from around Turkey for PBDEs and observed that BDE 209 was the most dominant congener. Other congener patterns were consistent with other international studies (indicating similarity of sources and degradation). In samples particularly from Mersin and Bursa, high levels of BDE 209 were detected, which is explained by contamination during production or processing. Authors state that butter BDE levels can not be checked for compliance since there are no EU or Turkish rules on maximum values.

PBDEs were below detection limit in grape molasses from Kahramanmaras (Erdogrul,2008).

Hexabromobiphenyl (HBB)

Hexabromobiphenyl, a member of polybrominated biphenyls (PBBs), is an industrial chemical that has been used as a flame retardant. It is no longer produced or used and many alternatives are available on the market.

There is no information on the HBB sources in Turkey. Similarly, no data on environmental or human health exposure to HBB is available.

Short chain chlorinated paraffins

Polychlorinated alkanes ($C_xH_{(2x-y+2)}Cl_y$), in the case of SCCPs alkanes with C_{10-13}. They are manufactured by chlorination of liquid n-alkanes or paraffin wax and contain from 30 to 70% chlorine. The products are often divided in three groups depending on chain length: short chain ($C_{10} – C_{13}$), medium ($C_{14} – C_{17}$) and long ($C_{18} – C_{30}$) chain lengths**.**

Short chain CPs with less than 50 % chlorine content seem to be degraded under aerobic conditions. CPs are bioaccumulated and both uptake and elimination are faster for the substances with low chlorine content.

The acute toxicity of CPs in mammals is low with reported oral LD_{50} values ranging from 4 - 50 g kg^{-1} bw, although in repeated dose experiments, effects on the liver have been seen at doses of 10 – 100 mg kg^{-1} $bw.day^{-1}$. Short-chain and mid-chain grades have been shown, in laboratory tests, to show toxic effects on fish and other forms of aquatic life.

There is no information on the SCCPs sources in Turkey. Similarly, no data on environmental or human health exposure to SCCPs is available.

Polychlorinated naphthalenes (CNs)

Polychlorinated naphthalenes (CNs) are halogenated organic compounds. CNs had various uses similar to PCBs, which gradually replaced CNs in many applications. Characteristic functions of CN formulations were electric insulation, flame retardation and biocidal protection of goods.

PCNs and PCBs were used for similar purposes in the past and their concentrations were shown to correlate in Korea and Japan. Although not very strong, a similar correlation could be made for PCBs and PCNs in Izmir, Turkey. Here, PCB concentrations are much higher than PCNs, but correlation indicates common sources for these contaminants. Source of PCNs were identified as evaporative emissions from past use of different technical mixtures (called Halowaxes) containing PCNs, as well as from combustion sources such as metal refining, iron-steel production and coal/wood combustion. PCNs may be emitted by different mechanisms from iron-steel plants with electric arc furnaces. PCNs may be present in the scrap (raw material) and are evaporated during production processes or they may be formed by de novo synthesis in thermal processes. Major source is considered to be waste incineration, which points to the Kocaeli hazardous waste incinerator for Turkey. Odabasi et al (2015) identify ongoing local sources especially scrap processing iron-steel plants and ship breaking yards in the Aliaga region, in Izmir.

In the context of ***environmental exposure***, recent studies on soil, ambient air, and stack-gas sampling have shown that Aliaga industrial region in Turkey is heavily polluted by polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs) as well as polychlorinated naphthalenes (PCNs) (Odabasi et al, 2009; Odabasi et al, 2012, Cetin and Odabasi, 2007; Bozlaker et al., 2008 JHM; Bozlaker et al, 2008b ENVPOL; Cetin et al, 2007; Kaya et al, 2012). In the most common biomonitoring study carried out by Odabasi et al (2015), among all POP groups, the highest concentrations were measured for PAHs followed by PCBs, PBDEs, and PCNs in the Aliaga industrial region. Although PCBs and PCNs are not produced and their use was banned more than three decades ago, their concentrations continued to rise due to the increasing number of ongoing local sources especially scrap processing iron-steel plants and ship breaking yards.

There is only one study available that specifically investigates PCN concentrations at suburban, two urban and one industrial sites in Izmir (Odabasi et al, 2012). Investigation of possible sources indicated that combustion processes contribute significantly, together with emissions from sources related to historical use of technical mixtures.

The Global Atmospheric Passive Sampling (GAPS) study assessed the global spatial distribution of PCNs together with other POPs (Lee et al, 2007). Results from more than 40 sites on seven continents indicated that PCBs are widespread, and highest levels were detected in urban/industrial locations consistent with other sampling studies. PCNs measured in the suburban site in Izmir study by Odabasi et al (2012) were within the values reported in the GAPS study. However, concentrations measured at the remaining three sites were similar to or higher compared to ones measured in urban/industrial locations of the GAPs study.

No information was found on ***human health exposure*** to PCNs.

Hexachlorobutadiene (HCBD)

Hexachlorobutadiene (HCBD) is a halogenated aliphatic hydrocarbon mainly generated as a by-product in the manufacturing of chlorinated hydrocarbons. Although there are limited data on its effects on humans, its adverse effects including nephrotoxicity in animals have been shown by previous studies.

In the context of **health exposure**, a study was conducted to evaluate the health impact of airborne pollutants on incinerator workers at IZAYDAS Incinerator, Turkey (Bakoglu et al, 2004). Ambient air samples were taken from two sampling points in the incinerator area and analyzed for particulate matter, heavy metals, volatile and semi-volatile organic compounds (VOCs and SVOCs) and dioxins. The concentrations of organic compounds measured at the sampling points were generally below the national and international occupational exposure limits. However, benzene, dibromochloropropane (DBCP) and hexachlorobutadiene (HCBD) concentrations in the ambient air of the plant were measured at levels higher than the occupational exposure limits.

The recommended exposure limit (NIOSH) for hexachlorobutadiene is 0.24 mg.m–3. An ambient air HCBD concentration of about 1 mg.m–3 (measured near the rotary kiln and storage areas) measured at a sampling location in IZAYDAS was commented to be resulting from both the volatilization of such compounds during the storage of the wastes of the tyre industry and the fugitive emissions from the rotary kiln during the incineration of these wastes. Authors state that since the wastes of the tyre industry have been incinerated at IZAYDAS in large quantities, HCBD and similar pollutants originating in these wastes should be followed up and assessed periodically by exposure and medical surveillance studies with regard to occupational health.

Moreover, as three large tyre factories have been in operation since the 1970s in Izmit (and located very close to each other), health risk assessments related to such chemicals should be conducted also for the people living in Izmit.

Unintentionally released chemicals

A range of listed POPs substances are unintentionally emitted including dioxins, furans, PAHs etc. Unintentional releases of HCB, PeCB, PCBs that are also produced and used intentionally have been discussed in previous Sections.

HCB and PeCB are discussed in the previous sections.

Dioxins, furans (PCDD/PCDF) and dioxin-like PCBs

Although there are many congeners, seven PCDDs are considered to be of concern. PCDDs/Fs releases are accompanied by releases of other unintentional POPs, which can be minimized or eliminated by the same measures that are used to address PCDDs/Fs releases. PCDD/Fs have been associated with a number of adverse effects in humans, including immune and enzyme disorders and chloracne, and they are classified as possible human carcinogens.

In the context of ***environmental exposure***, Saral et al (2015) investigated PCDD/Fs in Istanbul atmosphere. Medical waste incineration plant and gasification plant are shown to contribute as well as the usage of various pesticides in the surrounding large forests and agricultural fields around one of the stations. Dense vehicle traffic, and mixed groups of industrial facilities were also included as contributors. Fossil fuel consumption for residential and commercial heating purposes was contributing to a high correlation of total particulate matter and PCDD/F concentrations. This can have impact on respiratory exposure. Similarly, Gunes et al (2014) showed that contribution of industrial, residential and traffic sources result in the highest concentrations in Istanbul. Results were reported to be similar to those of Beijing, China. Combustion processes such as motor vehicles and residential heating equipment were thought to be the principal

sources of emissions of PCDD/F compounds when both congener profiles and seasonal variations are considered in Istanbul (Gunes et al, 2014).

Korucu and Karademir (2015) investigated PCDD/F levels of a hazardous waste incinerator after start-up conditions and commented that a short and clean start-up procedure is needed for hazardous waste incinerators in terms of a reasonable emission factor in the stack after start-up periods. Karademir et al's (2013) study results showed that PCDD/F concentrations could be elevated during the start-up periods up to levels 3-4 times higher than those observed in the normal operation.

Karademir et al (2013) investigated PCDD/F levels in surficial sediments of Izmir Bay and the central section of the bay was found to contain the highest concentrations. This was attributed to the former production of vinyl chloride monomer in the area, and one of the furans was attributed to the (previously unknown) use of a chlorophenol-based fungicide in the region. The OCDD dominated group was explained by the use of pentachlorophenol. The results indicate that historic industrial discharges are the main contributor to the PCDD/F pollution in the sediments.

Turgut et al (2012) investigated levels of the PCDD in forest soil from Taurus Mountains, and found that they varied from nearly 4 to 12 pg g(-1) dry weight (dw). PCDF concentrations ranged from 2 to 7 pg g(-1) dw.

Okay et al's 2009 study investigating PCDD/F levels in sediment and mussels of the Istanbul strait resulted in total WHO-TEQ values ranging between 0.01 and 17.8 pg g(-1) dm in sediments, and 0.98 and 1.01 pg g(-1) ww in mussels. None of the sediment and mussel samples analyzed exceeded the limits suggested in the sediment quality guideline and safe values set by the European Community for seafood intended for human consumption, respectively. Presence of PCDD/Fs were attributed to the former production of vinyl chloride monomer in the area and historic production of chlorophenol-based fungicide in the region (Okay et al, 2009).

In the context of **human exposure,** Ucar et al (2011) investigated butter samples from around Turkey for PCDD/Fs and found the levels in butter to be below EU and Turkish regulatory limits. However, for the four cities with elevated levels, intake amounts may reach tolerable daily intake levels with the contribution from other foodstuffs. This is also the case for people consuming more than the average amount of butter and other dairy products.

Concentrations of PCDD/Fs, dioxin-like polychlorinated biphenyls (dl-PCBs) and indicator PCBs (ind-PCBs) in eggs from cage hens without soil contact, pasteurized egg samples and imported egg yolk powder samples in Turkey were investigated by Olanca et al (2014). Although the exposure levels are below the TDI of 2 pg WHO-TEQ((1998)) kg bw(-1), the results were based only on consumption of egg. All results for PCDD/Fs, PCDD/Fs and dl-PCBs, and ind-PCBs are below the values imposed in Turkish Regulation for eggs and egg products, respectively. Authors state that in order to estimate total dietary intake for Turkish population, various food items should be investigated.

Karademir et al (2013) present an estimation of dietary exposure to PCDD/Fs by animal products in Kocaeli, a highly polluted area in Turkey, based on current food data consumption. The data relate to the PCDD/F levels in food groups of animal origin (milk, egg, meat, chicken, and fish), food consumption rates, and the fractions of locally grown foods in total consumption were statistically assessed. The results are within the range of 1–4 pg WHO-TEQ.kg−1bw.day −1, proposed as the tolerable daily intake by the World Health Organization. However, the maximum intakes are 2–2.5 times greater than the average, suggesting the presence of a health risk caused by the PCDD/F levels in the animal products, especially for the people living in the highly polluted areas in Kocaeli.

The results of their study showed that the PCDD/F levels are higher in local animal products than in non-local ones, indicating the presence of a PCDD/F pollution problem in the study area. The results are in agreement with Bakoglu et al. (2005), who found relatively high PCDD/F levels in air and soil samples taken from Kocaeli, the most industrialized region of Turkey.

Karademir et al's (2007) study for Kocaeli involving a health risk model showed that the exposure levels of PCDD/Fs were in the range of 3.7 - 13.1 pg I-TEQ.kg(-1) bw for adult receptors, which are higher than the recommended TDI value of 2 pg TEQ.kg(-1) bw. The PCDD/F intakes for rural receptors were estimated to be three times higher than those for urban and semi-urban receptors due mainly to the consumption of locally grown foods. The results are consistent with those from Aslan et al (2010)'s study in Kocaeli showed that the local animal products have higher PCDD/F concentrations than the non-local ones and the PCDD/F levels in some animal products were found to be higher than the national limit values.

Tanyildizi et al's (2010) study showed that the TEQ levels of PCDD/Fs are slightly higher in beef and chicken samples consumed in Turkey and long-term consumption of these foods may cause health risk for human and animals.

Kilic et al's (2011) study show that the major contributors to total exposure to PCDD/Fs were dairy products and fish. Despite the unexplained high contamination level in an individual egg sample from Kocaeli, average concentration levels in Turkey, even in industrialized regions, were low compared to reported concentrations in Western Europe.

Cakirogullari et al (2011) study yield concentrations of PCDDs-PCDFs and DL-PCBs in fish samples from Hirfanli Dam Like were below the EU regulation limits. Similarly, sea bass and sea bream concentrations of PCDD/Fs and DL-PCBs collected from various fish farms in Turkey were below the EU regulation (EC No. 1881/2006) limits. Samples of three mainly consumed three edible fish species, whiting, horse mackerel and anchovy, from the Black Sea were analyzed for PCDD/Fs, dioxin-like PCBs by Cakirogullari et al., (2010). Measured values were below the maximum residue levels indicated in the EU Regulation on maximum levels of dioxins for certain contaminants in foodstuffs.

Cok et al (2009) investigated *human milk* samples from 51 Turkish women living in the Ankara, Istanbul, Antalya, Kahramanmaras, and Afyon provinces for levels of PCDD/Fs. Of the five studied locations, the lowest levels of total-TEQs were found in Afyon and the highest in Antalya province. The reason for the latter, although not explained in that particular publication, was later deduced potentially to be due to burning of waste oils (potentially containing PCBs) to warm up greenhouses (Cok, personal communication). The mean levels of PCDD/Fs and PCBs in Turkish human milk are comparable to that found in other countries.

Polyaromatic hydrocarbons (PAHs)

PAHs mainly originate from the incomplete combustion and pyrolysis of organic materials. They are also formed due to natural sources such as forest fires and volcanic eruptions, and anthropogenic sources such as traffic emissions, industrial activities, biomass burning and domestic heating. PAHs are associated with adverse health effects and potential for long-range transport (Pribylova et al. 2012).

In the context of **environmental and human exposure**, the only continuous monitoring data available is from the rural background passive sampling station at Camkoru, Ankara. Results from December 2009 to May 2013 yield a total PAH concentration (as the sum of 16 PAHs) 8.42 to 66.50 ng/m^3 with a median of 28.33 ng/m^3. Naphthalene and phenanthrene were the dominant PAHs, followed by flourene and fluoranthene over the sampling period, as expected since more volatile PAH species were collected by PUF discs as shown in other studies. These concentrations are comparable to worldwide monitoring station results. The biomonitoring study conducted by Odabasi et al (2015) showed that POPs concentrations increased with the age of sampled trees, further emphasizing the substantial increase of POP emissions over time.

Odabasi et al (2009 and 2010) show that electric arc furnaces for steel-making (in Hatay-Iskenderun) are major source for POPs, and they reveal very high PAH concentrations in emissions from these sources. Soil POP concentrations (including PAHs) measured in the study were higher than those measured in rural/background sites, and they were within the ranges internationally reported for urban, especially for industrial sites.

Gaga et al. (2012) investigated atmospheric PAH concentrations in Kocaeli and state the effect of the emissions from residential heating on measured concentrations of PAHs. They specify specially great industrial plants and the only incinerator facility of Turkey are other important pollution sources around Kocaeli. Also, the winter period risk level (2.92 x 10(-3)) due to the respiratory exposure to PAHs was found to be almost 3 times higher than in the summer period. Rough calculations indicated about a 3 fold increase in calculated cancer risks in the heating period in Kocaeli considering only inhalation as a route of exposure. Kocaeli is a highly industrialised city of Turkey, and concentrations of PAHs should be reduced to protect human health. People should be encouraged to use cleaner fuels for heating purposes. New settlement areas and attraction centres far from industrial activities should be planned to reduce the number of people under risk.

Gaga et al.'s 2012 study in Eskisehir reveal toxic fractions of the measured PAHs to approximately fourfold increase over the winter period. Based on the previous studies carried out in Eskişehir and diagnostic ratios, fossil fuel combustion and traffic emissions might be important reasons of high PAH concentrations measured in Eskişehir. The Benzo[a]pyrene limit value was exceeded at all times in urban traffic location in both sampling periods. The percent of days in which BaP concentration exceeded the WHO limit value were 64 % and 72 % in summer and winter period, respectively, in the urban station. Gaga et al (2012) recommend that it is necessary to take certain actions for reducing atmospheric PAH concentrations in the study area such as increasing natural gas use and optimizing traffic flow.

Hanedar et al. (2008) investigated air samples during cold months, from September 2006 to March 2007 and toxicity equivalency factors for 16PAHs were measured. Likely sources were found to be traffic-related sources, with higher contribution from diesel than gasoline emission.

Okay et al. (2014) showed that the potential ecotoxicological risk of sediments (using effects range low and effects range median values) exceeded toxic levels at one of the largest marinas in Turkey at Marmara Sea, Tuzla shipyard area and at the Aliaga shipbreaking yard. The PAH concentration in shipyard sediments is noted to be the highest reported thus far in the literature.

In the context of **foodstuffs**, Kucuksezgin et al (2013) indicate low level of PAHs in mussels along the Aegean coast. Kucuksezgin et al. (2012) state pyrolitic origin PAHs to be also relatively high in Canakkale Strait. According to tolerable levels of POPs in seafood for different countries (USFDA, 2005; FAO, 2005; MARA, 2008; Canadian Food Inspection Agency, 2012) PAH (benzo(a)pyrene) (as well as DDTs and PCBs) concentrations in mussel were found to have no risk for consumers. The low contamination level in the coasts considering PAHs is considered to be a result of pyrolitic (combustion derived) inputs. Yildirim et al. (2010) investigated drinking water of Tunceli and found it fit for drinking regarding PAHs. Caylak et al. (2012) found no increased cancer risk due to PAHs in drinking water of Cankiri. Demir et al (2013) could not detect PAHs in drinking water of Tunceli.

According to the European Commission's RASFF portal, frozen marinated semi-dried gourmet tomato from Turkey was rejected at the border to Finland due to benzo(a)pyrene (3.7; 3.3 µg/kg - ppb) content. Also, canned tuna in olive oil from Turkey was also alerted at the border to Germany due to benzo(a)pyrene (20 µg/kg - ppb) content. Another one is sun dried tomatoes in olive oil containing benzo(a)pyrene (74 µg/kg - ppb) and polycyclic aromatic hydrocarbons (total 510 µg/kg - ppb) heading for Finland. Similarly, another one is noted for the same chemicals in oil heading for Norway.

2.4 Policy objectives

The overall objective of the proposed policy is to protect human health and environment from persistent organic pollutants.

3. Policy Options

3.1 Policy option 1 – Business as usual scenario

Policy Option 1 entails continuous implementation of the legislation already in force or adopted, including, in particular, regulations regarding pesticides, PCBs, Contaminated Land, IPPC, WEEE, product and food safety, REACH and WFD in Turkey.

No additional regulatory actions are taken to close identified regulatory gaps, such as regulations on pBDEs, PFOS, HBCDD etc.

3.2 Policy option 2 – By-Law on Persistent Organic Pollutants

Policy Option 2 entails implementation of the draft By-Law on POPs introducing a comprehensive regulatory framework for management of POPs in Turkey.

3.3 Policy Option 3 – By-Law on Persistent Organic Pollutants including requirements of POPs Protocol under CLRTAP

Policy Option 3 entails implementation of the draft By-Law on POPs including the elements associated exclusively with POPs Protocol under CLRTAP while it is awaiting ratification.

4. Analysis of impacts and comparison of policy options

4.1 Analysis of impacts of Policy Option 1 – Business-as-usual scenario

Costs

Economic costs (compliance costs to industry, consumers, public bodies)

Implementation of the Policy Option 1 reflects anticipated impacts of ongoing or planned implementation of IPPC, water and waste sector legislation as well as implementation of PCB and contaminated site legislation.

Pesticides

Pesticides production, placement on the market and use in Turkey is already comprehensively regulated. Current legislative framework in Turkey is regulating sources, pathways and impacts of pesticides. In particular:

- By-Laws on certification, control, sale and storage of pesticides are imposing controls on production, import and sale of prohibited pesticides.
- In addition, By-Laws on control of soil pollution, dangerous substances in aquatic environment, food safety and cosmetics regulations act as a safety net by setting limit values for certain POPs in soil, water, foodstuffs and prohibiting the use of POPs in cosmetics.

Control of production, placement on the market and use (including stockpiles)

There is no manufacturing of POPs pesticides in Turkey. All POPs pesticides are either prohibited or have never been licensed for use in Turkey, making enforcement of the current legislation in place the key focus of work of responsible authorities. There are two critical elements to such enforcement. First of all, MoFAL operates a licensing system for pesticides[8] that regulates placement on the market of new pesticides (containing existing, i.e. previously licensed or new active ingredients). Secondly, and more importantly, in the context of enforcing existing bans, all imports of pesticides to Turkey require pre-authorisation from the MoFAL for these to be brought into the country legally. The existing system provides double divident. On one hand, it allows MoFAL and other responsible authorities (i.e. Ministry of Customs) to execute an effective enforcement of existing bans. Secondly, it provides responsible authorities with accurate records on types and quantities of pesticides imported. At the end of each year, MoFAL is requiring all importers to submit annual reports on import versus sales data providing them with accurate information on sales and any remaining stocks of pesticides.

In the context of obsolete pesticides records available suggest that some disposal has taken place in the past (e.g. DDT). At present, there are two known stockpiles of POPs pesticides, including:

- HCH stock of about 3,000 tonnes that is scheduled to be disposed of in 2017 at the total costs of 18.35 million TL (one-off activity)
- In addition to POPs pesticides, MoFAL has engaged their provincial agricultural directorates in identification and collection of obsolete pesticides. Since summer 2014, provincial directorates have collected 30-35 tonnes of obsolete pesticides (none of these were POPs but included pesticides such as dicofol, cypermethrin etc.). MoFAL now holds detailed records on quantities, location, content and packaging of these pesticide stocks which also include obsolete pesticides returned to the provincial authorities by the members of public. MoFAL is responsible for collection and transport of collected stockpiles, while MoEU for arranging appropriate disposal. Current stocks are awaiting disposal with the budgeted costs of disposal at about 0.55 million TL (GEF funding).

[8] in accordance to the Control of Plant Protection products Regulation (Official Gazzette Date: 20.05.2011, number 27939) which is published according to the Law of Veterinary Services, Vegetation Health, Food and Bait, numbered 5966

Current regulatory system for pesticides is further supported by a wide range of awareness raising and training activities implemented by MoFAL, including among others:

- A certification programme for farmers on application of pesticides run by the MoFAL. The Ministry estimates that about 300,000 farmers have been trained since commencement of the programme with the costs being covered by the state budget. Participants are paying a nominal fee of 5-10 TL for obtaining the certificate. These trainings are organised and run by provincial directorates with each training taking 1 to 2 days. Trainings are carried out by provincial directorates' staff in their premises, effectively constituting a part of normal daily operation of provincial directorates.
- Publications by the MoFAL including on any forthcoming pesticides bans
- Regular meetings organized with the industry covering topics on pesticides, cancelled licenses, imports and sales updates
- Finally, when any issues are detected in particular regions, such as over-application of pesticides, further training and information dissemination among farmers is organised as mitigation actions.

Existing limit values and environmental quality standards for pesticides

In addition to measures aimed at enforcement of existing prohibitions on production, placement on the market and use of banned POPs pesticides, Turkey is also committed to implement legislation on control of soil and water pollution caused by POPs pesticides.

Furthermore, Turkish Food Codex By-Law on Contaminants[9] determines the allowable limit values for PCDD/Fs and dioxin like PCBs in foodstuffs.

Existing limit values and environmental quality standards for pesticides – surface water

First of all, in the context of protection of **aquatic environment**, Turkey has fully transposed Article 8 and Annex V of the Water Framework Directive (WFD) and 2013/39/EU Directive as regards priority substances in the field of water policy (EQSD) that also covers certain pollutants listed in the Directive 76/464/EEC on dangerous substances.

Implementation of WFD and EQSD will ensure a comprehensive and enhanced level of protection of aquatic environment in Turkey including from some of the POPs substances. The 2013/39/EU Directive is explicitly concerned with priority and priority hazardous substances that are behaving like ubiquitous PBTs.

Legislation in force requires Turkey to monitor and comply with the EQS set for some of the POPs substances in surface water and biota.

Table 4.1 POPs pesticides listed in the 2013/39/EU Directive and set EQS

Substance	Status	CAS number	AA-EQS (inland surface waters)	AA-EQS (other surface waters)	MAC-EQS (inland surface waters)	MAC-EQS (other surface waters)	EQS biota
Heptachlor	PHS	76-44-8/ 1024-57-3	$2x10^{-7}$	$1x10^{-8}$	$3x10^{-4}$	$3x10^{-5}$	$6,7x10^{-3}$
Endosulfan	PHS	115-29-7	0,005	0,0005	0,01	0,004	
Hexachlorobenzene (HCB)	PHS	118-74-1			0,05	0,05	10
Pentachlorobenzene	PHS	608-93-5	0,007	0,0007	Not applicable	Not applicable	

[9] Published by the Ministry of Food, Agriculture and Livestock/Directorate General of Food and Control, official gazette date 29.12.2011, numbered 28157. It is in direct correlation with the relevant EU Regulation of 1881/2006/EC "Directive on Setting Maximum Levels for Certain Contaminants in Foodstuffs"

Substance	Status	CAS number	AA-EQS (inland surface waters)	AA-EQS (other surface waters)	MAC-EQS (inland surface waters)	MAC-EQS (other surface waters)	EQS biota
DDT	Directive 76/464/EEC - other pollutant with EQS						
Para-para-DDT		50-29-3	0,01	0,01	Not applicable	Not applicable	
Aldrin	Directive 76/464/EEC - other pollutants with EQS Cyclodiene pesticides	309-00-2	Σ=0,01	Σ=0,005	Not applicable	Not applicable	
Dieldrin		60-57-1					
Endrin		72-20-8					
Dicofol	PHS	115-32-2	$1,3x10^{-3}$	$3,2x10^{-5}$	Not applicable	Not applicable	33

Notes: AA – annual average; MAC – maximum allowable concentration; units- microgram per litre (water) and microgram per kilogram of wet weight in biota

The legislation in place aiming to protect aquatic environment also reflects a commitment to identify and implement measures so the environmental quality standards set for pesticides are met in the surface waters of Turkey. According to the MoFWA, River Basin Management Plans aiming to ensure good status of water bodies across all river basin districts in Turkey are expected to be developed by 2020. Implementation of water sector legislation, and, in particular, commitment to ensure compliance with the set EQS constitute additional regulatory instrument to enact any necessary measures required to further protect aquatic environment from POPs pesticides.

Having regard to the absence of monitoring data on the presence of POPs pesticides in surface waters at present as well as the fact that Turkey just commenced development of its 4 pilot river basin management plans, no estimates are available regarding probable extent of EQS failures and whether or not, any additional mitigation actions will be required to meet pesticides EQS in surface water.

In instances, where wastewater treatment plants are found to be causing surface water bodies to fail environmental quality standards set, supplementary measures may be required. Potential costs to water industry are discussed in the separate section.

Existing limit values and environmental quality standards for pesticides – contaminated land

Turkey also has **soil protection** legislation in force. In particular, By-Law on Control of Soil Pollution and Sites Contaminated by Point Sources defines generic human exposure limits, including for aldrin, DDT, dieldrin, endosulfan, endrin, α-HCH, β-HCH, lindane, hexachlorobenzene, heptachlor, pentachlorobenzene and toxaphene .

In the context of known contaminated sites, the budgeted one-off costs of assessment, demolition and remediation of the Merkim site (where HCH stocks are currently being stored) are 2.5 million TL.

In general terms, risk based approach is applied in Turkey to contaminated land management. Contaminated sites inventory is anticipated to be developed in 2015 after Contaminated Land By-Law fully enters into force in June 2015.

At present, 4,500 potentially contaminated priority sites have been identified and will be assessed over the next 3 years. Such sites could include petrochemicals sites, large industrial facilities, old military bases (although special permissions would be required to access military sites). Depending on the results of assessment, remediation will be requested with owners of contaminated sites being expected to cover the costs of assessment and remediation if any is required. Not all these sites are anticipated to be tested for potential contamination with POPs pesticides. Even smaller number of sites would subsequently require remediation from pesticides presence. Predicting the likely number of sites contaminated with POPs pesticides requiring remediation is not feasible at this stage. Assuming that all 4,500 potentially contaminated sites in Turkey would be analysed for pesticides, total costs would reach 3.1 million TL per year.

Using the example of the Merkim site that require decontamination and remediation from HCH stockpiles storage, unit costs of remediation range from 1,000-2,000 TL per meter square. However, having regard to the information from MoFAL, no significant number of sites contaminated with these pesticides is anticipated.

Secondary (historic) releases from landfills and dumpsites constitute another potential source of POPs pesticides in environment and are discussed in the section below.

Industrial POPs

A wide range of industrial substances are falling within the scope of the By-Law including:

- Polychlorinated biphenyls (PCBs)
- PFOS
- HBCDD
- BDEs (hepta, hexa, penta, tetrabromodiphenyl ether and hexabromobifenil)
- Hexachlorobenzene (HCB)
- Pentachlorobenzene (PeCB)
- Short chain chlorinated paraffins (POPs Protocol and WFD)
- Hexacholorobutadiene (POPs Protocol and WFD)
- Polychlorinated Naphthalenes (POPs Protocol)

Polychlorinated biphenyls (PCBs)

PCBs have been used in electrical and hydraulic equipment such as transformers and capacitors. Historically, PCBs were used as a plasticizer for rubber and synthetic resins, carbonless copy paper, adhesives, paints, sealants, concrete additives, printing inks, pesticide extenders, industrial oils, flame retardants and to control dust on roads. Use in open applications was banned in 1976 (Directive 76/403/EEC), and subsequently in 1985 its use as a raw material or chemical intermediate was also prohibited (Directive 85/467/EEC). Unintentional formation of dioxin like PCBs during combustion processes is covered in the next sections.

Existing legislation in force already prohibits manufacturing, placement on the market and use of PCB containing equipment (with the exception of the equipment already in use). The most up to date version of the PCBs inventory in Turkey (NIP, 2015) suggests around 1.1 thousand tonnes of PCB containing equipment. Estimated costs of maintaining management and collection system, transportation and disposal of known and unknown stocks of PCB containing equipment are presented in the table below.

Table 4.2 Estimated costs of managing PCB containing equipment

	Costs
Transport and destruction of known PCB equipment	
Total known stock, tonnes	1080
Costs of disposal (planned), TL	15,000,000
Costs of disposal (remaining known stock), TL	17,400,000
Total costs of disposal of known stock, TL	32,400,000
Annual costs of collection and disposal system, TL	10,000,000
Total annual costs of disposal, TL	12,492,308
Transport and destruction of unknown PCB equipment	

	Costs
Total estimated unknown stock, tonnes	124,600
Annual costs, average, TL	55,637,258
Annual costs, low, TL	53,615,811
Annual costs, high, TL	57,658,704
TOTAL annual costs of transportation and disposal of known and unknown stock of PCB equipment	**68,129,565**

NB. Costs associated with potentially secondary releases from landfills and wastewater are considered in separate sections.

All costs associated with collection, disposal and replacement of PCB containing equipment will occur under the Policy Option 1.

Perfluorooctane sulfonic acid PFOS

Perfluorooctane sulfonic acid (PFOS) and its salts and PFOSF is a versatile industrial chemical with a wide range of applications. It is used in fire-fighting foams, textiles, paper, coatings, surfactants, aviation fluids and other articles. PFOS is also used in metal plating (chrome) as a mist suppressant.

Key issues in relation to PFOS manufacturing, placement on the market and use in Turkey include:

- Use in production of PFOS containing articles and preparations including chromium plating, coated paper, textile, leather and carpet industry. Use in semiconductor, electronics and photo imaging industry is considered to be minor (STE Report, 2015)
- Use of PFOS preparations in operation such as in fire fighting foams and aviation fluids
- Waste management of PFOS-containing articles and preparations including landfilling, incineration, UWWTPs discharges and uncontrolled landfills

Potential measures associated with UWWTP discharges and landfill leachates as well as remediation of uncontrolled dumpsites are addressed in separate sections.

Substitution of PFOS in different applications and further additional measures are considered under the Policy Option 2.

Hexabromocyclododecane (HBCDD)

Hexabromocyclododecane (HBCDD) is used as a flame retardant in a range of products including Expanded Polystyrene (EPS) and Extruded Polystyrene (XPS) as well as High Impact Polystyrene (HIPS) and polymer dispersion for textiles.

Summary of key uses of HBCDD in Turkey is presented in the table below.

Table 4.3 Key uses of HBCDD

Application	Main uses	In Turkey
HBCDD		Not produced. Global HBCDD production 23,000 tonnes in 2008 of which 80% used in construction
Expanded Polystyrene (EPS)	Main uses - insulation panels/boards in the construction sector. Minor uses are packaging material, automobile cushions for children, and props for exhibitions, filming or theatre productions ().	Domestic production 5 million m3. EPS density 24kg/m3. Polystyrene import 3.9 million m3/94.6 million kg (average 2009-2013). Assumed EPS amounts in imported/exported polystyrene products to/from Turkey 29% resulting in an estimated 1.1 million m3/27.4 million kg of import of EPS containing HBCDD. Polysterene export is 0.5 million m3/10.7million kg resulting in 0.1

Application	Main uses	In Turkey
		million m3/3.1 million kg. Total stock of HBCDD in EPS (1985-2013) is 3.8 thousand tonnes (STE Report, 2015).
Extruded Polystyrene (XPS)	Main uses- thermal insulation in buildings (residential, industrial and agricultural). Minor uses include civil engineering applications, cold stores and in vehicles.	Domestic production 1.5 million m3. Mean concentration in applications range from 0.8% to 2%. XPS density 30.6kg/m3. Polystyrene import 8.4 million m3/257 million kg (average 2009-2013). Assumed XPS amounts in imported/exported polystyrene products to/from Turkey 18% resulting in an estimated 1.5 million m3/ 46.4 million kg of import of XPS containing HBCDD. Polysterene export is 0.06 million m3/1.9million kg resulting in 0.001 million m3/0.4 million kg. Total stock of HBCDD in XPS (1985-2013) is 12.8 thousand tonnes (STE Report, 2015).
High Impact Polystyrene (HIPS)	Main uses - in video and audio equipment and distribution boxes for electrical lines in the construction sector.	Not included included in the inventory. Not produced in Turkey, potentially imported within articles (unknown quantities)
Polymer dispersion for textiles	Main uses - in textiles (to comply with flammability standards) including upholstered furniture and seating in transport (aeroplanes and train carriages), draperies, interior and automobile textiles.	Not included included in the inventory. Not produced in Turkey, potentially imported within articles (unknown quantities)

Sources: IOM, 2008; STE Report (2015)

Key issues in relation to HBCDD manufacturing, placement on the market and use in Turkey include substitution and safe end-of-life disposal of articles containing HBCDD.

Potential measures associated with UWWTP discharges and landfill leachate treatment s as well as remediation of uncontrolled dumpsites and contaminated sites are addressed in separate sections.

Substitution of HBCDD in different applications and further additional measures are considered under the Policy Option 2 (while highlighting the forthcoming role of REACH in authorising HBCDD uses).

Brominated flame retardants BDEs (hepta,hexa, penta, tetrabromodiphenyl ether and hexabromobifenil)

Brominated flame retardants are used in a range of products. Hepta, hexa, penta and tetrabromodiphenyl ether are used for the production of commercial pentaBDE and octaBDE. In turn, key uses of penta and octa BDEs are presented in the table below.

Table 4.4 Key uses of pentaBDE and octaBDE

Application	Main uses	In Turkey
PentaBDE	Major use in flexible polyurethane foam for furniture and upholstery (95% of use) Key applications - foam-based laminated automotive applications such as headrests; for domestic furniture, some of which includes cot mattresses; and in foam-based packaging. Use in domestic textiles is anticipated to be limited	Penta/tetra BDE 10 tonnes/per year (177 tonnes from 1996-2013) (NIP, 2015)
OctaBDE	Major uses in: acrylonitrile-butadiene-styrene (ABS) polymers (octaBDE content in the final product 12-18% by weight); high impact polystyrene (HIPS), polybutylene terephthalate (PBT), polyamide polymers, nylon, low density polyethylene polycarbonate, phenol-formaldehyde resins, unsaturated polyesters and in adhesives and coatings	Import of ABS about 55 thousand tonnes /year.
HBB	No longer produced or used flame retardant. Potentially relevant for waste management	

Sources: IOM, 2008; STE Report (2015)

Key issues in relation to BDEs manufacturing, placement on the market and use in Turkey include substitution and safe end-of-life disposal of articles containing BDEs.

Potential measures associated with UWWTP discharges and landfill leachate treatment s as well as remediation of uncontrolled dumpsites and contaminated sites are addressed in separate sections.

Substitution of BDEs in different applications and further additional measures are considered under the Policy Option 2 (while highlighting the role of WFD and EQSD and WEEE Directive). In particular, estimated annualised costs of implementation of the WEEE directive are about 148 million TL per year.

Short-chain chlorinated paraffins

Short-chain chlorinated paraffins are included in the WFD Priority Hazardous Substance list and are listed as a Substance of Very High Concern (SVHC) under REACH.

SCCPs are also listed in the Annex XVII of REACH that sets out restrictions on the manufacture, placing on the market and use of certain substances, preparations and articles. In the case of SCCPs these are prohibited from placement on the market for use as substances or as constituents of other substances or preparations in concentrations higher than 1% in metalworking and for fat liquoring of leather.

No information is available on the sources of emissions of SCCPs in Turkey (production, placement on the market and use of SCCPs, mixtures and articles containing SCCPs), extent of environmental and human health exposure.

Information from ECHA suggests that the majority of emissions of SCCPs occur during the service life of articles containing SCCPs (mostly to water and land) as opposed to from industrial processes which are an order of magnitude lower[10]. SCCPs are also released unintentionally through their presence in MCCPs.

SCCPs are used as flame retardants and plasticisers and key areas of applications include[11]:

- Rubber (in particular in conveyor belts for use in mines). SCCP is an additive flame retardant and on average used at an application rate between 1-10% by weight of rubber. However, in the case of high density conveyor belts content of 10% to 17% of SCCPs by weight has been measured. Conveyor belts at the end of their lifetime (10 years on average) can be powdered and recycled into belts, mats and building materials potentially constituting a secondary source of SCCPs releases (ECHA, 2009).
- sealants and adhesives mainly used in building and construction and in double and triple glazing. Typical concentrations are 5-14% by weight but 20% can be found in exceptional cases. SCCPs use in these applications in the EU is negligible or in the process of being phased out(ECHA, 2009) .
- paints and coatings mainly used as plasticizers. The main types of paints that are likely to contain chlorinated paraffins are those based on chlorinated rubber (typically used in marine and industrial applications) and vinyl copolymers (typically used for exterior masonry). The application rate of chlorinated paraffins in paints is between 1 and 10% by weight in paints based on resins such as chlorinated rubber, vinyl copolymers and acrylics, with 10% being considered typical for most paint types. SCCPs are also used in acrylic based coatings with a typical content of 5-20% by weight after application. There is no or little use of SCCPs in paints and coatings in the European Union (ECHA, 2009).
- textiles (flame retardant back coatings) with SCCPs used to manufacture flame-retarding, water repelling and rot-preventing textile finishes. The major historic use of such textiles is in military tenting. More recently SCCPs have been used in textiles as a flame retardant for the back coating of textiles most likely in applications such as for furniture upholstery, seating upholstery in transport, blinds and curtains as well as industrial protective clothing. SCCPs for backcoating of textiles generally have chlorine contents in the range of 56-60% by weight (ECHA, 2009)

[10] ECHA (2009). Data on manufacture, import, export, uses and releases of alkanes, C10-13, Chloro (SCCPS) as well as information on potential alternatives to its use.

[11] ECHA (2009). Data on manufacture, import, export, uses and releases of alkanes, C10-13, Chloro (SCCPS) as well as information on potential alternatives to its use.

In the case of all applications above SCCPs have potential to leach or volatise from the products over their lifetime.

In the context of disposal, used treated textiles, sealants and adhesives, paints and coatings are likely to be landfilled as part of domestic waste or as construction waste. Incineration would completely destroy the SCCPs while landfilling is not anticipated to result in significant leachate due to its very low mobility in soil and strong sorption to organic matter.

Potential measures include:

- additional wastewater treatment in rubber and textiles manufacturing. Estimated unit costs of installation of advanced wastewater treatment range from 0.5 million to 1.75 million TL per company (EC, 2009).
- thermal oxidation of emissions to air in rubber manufacturing
- substitution of SCCPs with alternatives including:
  - medium chain chlorinated paraffins MCCPs (rubber, paints and coatings, textiles, sealants and adhesives)
  - long chain chlorinated paraffins LCCPs (rubber, paints and coatings, sealants and adhesives
  - phthalates (paints and coatings, sealants and adhesives)
  - organophosphates (rubber)
  - deca-BDE (textiles)
  - terphenyls (sealants and adhesives)

Depending on the application and substitute substance or product, costs of substitution anticipated to range from 270 to 8,400 TL per tonne of SCCP. One off costs of R&D associated with substitution can reach 4 million TL per application (RPA, 2010; EA, 2011)[12].

Other industrial POPs – HCB, PeCB, Hexacholorobutadiene and Polychlorinated Naphthalenes

No inventory data are available on these substances in Turkey. In general terms, key sources include historic intentional use as industrial chemicals or pesticides (unintentional releases of some of these substances are covered in the next sections).

Measures considered in relation to other POPs (e.g. implementation of IPPC) as well as measures concerning, urban wastewater treatment plants and landfills will contribute to reduction of releases of these substances as well.

No additional measures are required to address the releases of these substances specifically.

Existing limit values and environmental quality standards for industrial POPs – surface water

In addition to legislation concerning industrial emissions, air pollution and REACH, legislation in place aiming to protect **aquatic environment** also concerns some industrial POPs substances. As mentioned above, Turkey has fully transposed Article 8 and Annex V of the Water Framework Directive, Directive 76/464/EEC on dangerous substances and 2013/39/EU Directive as regards priority substances in the field of water policy (EQSD).

Implementation of WFD and EQSD will offer enhanced level of protection of aquatic environment in Turkey through introduction of environmental quality standards for industrial POPs in surface waters and biota.

[12] RPA (2010). Evaluation of possible restrictions on short chain chlorinated paraffins (SCCPs), final report prepared for National Institute for Public Health and the Environment (RIVM), The Netherlands, Risk & Policy Analysts, July 2010. Environment Agency (2011). Abatement cost curves for chemicals of concern.

Table 4.5 Industrial POPs listed in the 2013/39/EU Directive and set EQS

Substance	Status	CAS number	AA-EQS (inland surface waters)	AA-EQS (other surface waters)	MAC-EQS (inland surface waters)	MAC-EQS (other surface waters)	EQS biota
Hexachlorobenzene (HCB)	PHS	118-74-1			0,05	0,05	10
Pentachlorobenzene	PHS	608-93-5	0,007	0,0007	Not applicable	Not applicable	
Hexachlorocyclohexane (technical)	PHS	608-73-1	0,02	0,002	0,04	0,02	
Perfluorinated Octanedulfonyl Fluoride (PFOS)	PHS	1763-23-1	$6,5x10^{-4}$	$1,3x10^{-4}$	36	7,2	9,1
BDEs (tetra-, penta-, hexa and heptabromodiphenylether	PHS	32534-81-9			0,14	0,14	0,0085
Hexachlorobutadiene	PHS	87-68-3			0,6	0,6	55
Hexabromocyclododecanes (HBCDD)	PHS		0,0016	0,0008	0,5	0,05	167
Chloralkanes, C_{10-13}	PHS	85535-84-8	0,4	0,4	1,4	1,4	

Note 1: AA – annual average; MAC – maximum allowable concentration; units- microgram per litre (water) and microgram per kilogram of wet weight in biota

The legislation in place aiming to protect aquatic environment also reflects a commitment to identify and implement measures so the environmental quality standards set for industrial POPs are met in the surface waters of Turkey. According to the MoFWA, River Basin Management Plans aiming to ensure good status of water bodies across all river basin districts in Turkey are expected to be developed by 2020. Implementation of water sector legislation, and, in particular, commitment to ensure compliance with the set EQS constitute additional regulatory instrument to enact any necessary measures required to further protect aquatic environment from industrial POPs.

Having regard to the absence of monitoring data on the presence of industrial POPs in surface waters at present as well as the fact that Turkey just commenced development of its 4 pilot river basin management plans, no estimates are available regarding probable extent of EQS failures and whether or not, any additional mitigation actions will be required to meet industrial POPs EQS in surface water.

In instances, where wastewater treatment plants are found to be causing surface water bodies to fail environmental quality standards set, supplementary measures may be required. Potential costs to water industry are discussed in the separate section.

Existing limit values and environmental quality standards for industrial POPs – contaminated land

Turkey also has **soil protection** legislation in force. In particular, By-Law on Control of Soil Pollution and Sites Contaminated by Point Sources defines generic human exposure limits, including for industrial POPs.

In general terms, risk based approach is applied in Turkey to contaminated land management. Contaminated sites inventory is anticipated to be developed in 2015 after Contaminated Land By-Law fully enters into force in June 2015.

At present, 4,500 potentially contaminated priority sites have been identified and will be assessed over the next 3 years. Such sites could include petrochemicals sites, large industrial facilities, old military bases (although special permissions would be required to access military sites). Not all these sites are anticipated to be tested for potential contamination with all POPs substances. However, assuming that all 4,500 potentially contaminated sites in Turkey would be analysed for industrial POPs, total costs are presented in the table below.

Table 4.6 Contaminated land assessment costs for industrial POPs

Substance	Costs (sampling and analysis), total	Costs (sampling and analysis), per year	Costs remediation
PCBs	8,032,500	2,677,500	Unknown, but unit costs range from about 500 TL to more than 2,000 TL per tonne of contaminated soil.
PFOS	3,389,559	1,129,853	Unknown but unit costs of incineration of solid wastes and contaminated soil range from about 900 to 1,500 TL per tonne
BDEs	3,654,265	1,218,088	
HBCDD	3,786,618	1,262,206	
SCCPs	6,698,382	2,232,794	
Hexachlorobenzene	Na	Na	
Pentachlorobenzene	Na	Na	
Hexachlorobutadiene	Na	Na	
Total	**25,561,324**	**8,520,441**	

Depending on the results of assessment, remediation will be requested with owners of contaminated sites being expected to cover the costs of assessment and remediation if any is required. A smaller number of sites would subsequently require remediation from industrial POPs presence. However, predicting the likely number of sites contaminated with industrial POPs requiring remediation is not feasible at this stage.

Secondary (historic) releases from landfills and dumpsites constitute another potential source of industrial POPs in environment and are discussed in the section below.

Unintentional POPs

The following unintentional POPs are falling within the scope of the By-Law:

- PCDD/PCDF and dioxin like PCBs
- PAH
- Hexachlorobenzene (HCB)
- Pentachlorobenzene (PeCB)

Dioxins, furans and dioxin like PCBs

Dioxins and furans are unintentionally formed and released from thermal processes involving organic matter and chlorine as a result of incomplete combustion or chemical reactions. Dioxins are also generated from natural sources such as forest fires and volcanoes.

Dioxins, furans and PCB-DL are emitted largely to air but also to wastewater from industrial processes. Releases can also occur from contaminated land.

Dioxins are already heavily regulated in existing legislation including IPPC that addresses PCDD/PCDF explicitly, waste incineration regulations that set limits for dioxin emissions at 0.1ng l-TEQ/m^3, WFD and EQSD Directives that set EQS for PCDD/PCDF and DL-PCBs. Furthermore, Regulation (EC) No 1881/2006 sets maximum levels for certain contaminants in foodstuffs, including dioxins and PCBs. For the muscle meat of fish and fishery products, the maximum value is 4.0 pg/g wet weight for dioxins only, and 8.0 pg/g wet weight for the sum of dioxins and PCBs. Furthermore, implementation of NECD and LCP Directive would also contribute to reduction in emissions.

Measures available to reduce the emissions include:

- Primary or process-integrated: these measures seek to avoid the formation of dioxins by inhibiting the key mechanisms for dioxin and furan formation. They include the prevention of precursors (e.g. chlorinated compounds) being present in the first place; the destruction or removal of precursors before they become available for dioxin formation; fuel switching; and the avoidance of conditions suitable for dioxin formation[13].
- Secondary or end-of-pipe: measures which remove dioxins from the waste combustion (flue) gases before discharge to atmosphere. They include: particulate matter arrestment plant such as electrostatic precipitators and fabric filters; acid gas scrubbers; and injection of lignite coke powder or other adsorbents upstream of particulate abatement units. Waste water treatment plants could also be included in this class, in relation to releases of dioxins in water to the environment[14]

More specifically, in the context of **industrial sectors** (that contribute about 65% of all uPOPs emissions), these are already subjected to IPPC, NECD and LCP Directives requirements. The legislation require installations to implement BAT for iron and steel, textiles, non-ferrous metal processes, refineries, surface treatment, LCPs, large volume organic chemicals, food production and waste treatment and waste incineration. Implementation of IPPC in metallurgy, textiles, cement, chemicals and power production sectors as well as in waste incineration installations will positively impact uPOPs emission reductions.

Table 4.7 Estimated costs of measures aiming to reduce uPOPs emissions

	Policy Option 1
Industrial sectors (metal production, power sector, cement manufacturing, chemicals industry)	6-12 billion TL per year (IPPC)

Implementation of IPPC at the annual estimated costs of 6 to 12 billion TL will result in significant ancillary reductions in dioxin, furan and DL-PCBs reductions.

Polyaromatic hydrocarbons (PAH)

Polyaromatic Hydrocarbons (PAHs) are released as unintentional by-products as a result of incomplete combustion of fuels. They are also released unintentionally in the manufacture of materials including aluminium and coke.

Furthermore, PAHs can be present incidentally in a variety of materials such as petrol, creosote, coal tar products, and pitch and tar used for roofing and road construction. The main relevant products of coal tar distillation are:

- creosote;
- carbon black feedstock (used in the production of tyres and some plastic materials);
- coal tar/carbon pitch used as a raw material in production process for aluminium (as a binding agent in formation of carbon anodes);
- for the production of steel in electric arc furnaces;
- in roofing materials, damp-proofing and waterproofing;
- road tar.

Natural sources also contribute to atmospheric PAH emissions for example as a result of volcanic eruptions and forest fires.

No information on PAHs emissions is available in Turkey (NIP, 2015), but key sources of emissions include industrial installations, residential heating, transport, agricultural burning and natural sources.

[13] Entec (2004) *Development of UK Cost Curves for Abatement of Dioxin Emissions to Air*
[14] Entec (2004) *Development of UK Cost Curves for Abatement of Dioxin Emissions to Air*

Data available on environmental and human exposure to PAH suggest that industrial facilities particularly iron and steel manufacturing and residential heating, are likely to be significant contributors.

Similarly to the dioxin, furan and DL-PCBs emissions, implementation of IPPC, waste and water sector legislation is anticipated to contribute significantly to reduction of PAH emissions from industrial, power production and waste incineration facilities. Costs of addressing PAH emissions under the Policy Option 1 are the same as above, i.e. implementation of IPPC at the annual estimated costs of 6 to 12 billion TL.

Other uPOPs – HCB and PeCB

No inventory data are available on these substances in Turkey. In general terms, unintentional emissions of HCB and PeCB are associated with combustion processes (e.g. in LCPs, waste incineration, metal, cement industries). Measures considered for other POPs including implementation of IPPC/IED, waste and water sectors legislation will contribute to the reduction of releases of these substances as well. No additional measures would be required.

Existing limit values and environmental quality standards for uPOPs – surface water

Legislation in place aiming to protect **aquatic environment** also concerns some uPOPs substances. As mentioned above, Turkey has fully transposed Article 8 and Annex V of the Water Framework Directive, Directive 76/464/EEC on dangerous substances and 2013/39/EU Directive as regards priority substances in the field of water policy (EQSD).

Implementation of WFD and EQSD will offer enhanced level of protection of aquatic environment in Turkey through introduction of environmental quality standards for industrial POPs in surface waters and biota.

Table 4.8 uPOPs listed in the 2013/39/EU Directive and set EQS

Substance	Status	CAS number	AA-EQS (inland surface waters)	AA-EQS (other surface waters)	MAC-EQS (inland surface waters)	MAC-EQS (other surface waters)	EQS biota
Hexachlorobenzene (HCB)	PHS	118-74-1			0,05	0,05	10
Pentachlorobenzene	PHS	608-93-5	0,007	0,0007	Not applicable	Not applicable	
Dioxins and dioxin-like compounds (PCDDs/ PCDFs/ dioxin like PCBs	PHS				Not applicable	Not applicable	PCDD+PCDF+ PCB-DL 0,0065 (TEQ)
PAH including	PHS	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	
Benzo(a) pyrene	PHS	50-32-8	$1,7x10^{-4}$	$1,7x10^{-4}$	0,27	0,027	5
Benzo(b)fluornathene	PHS	205-99-2	Note 2	Note 2	0,017	0,017	
Benzo(k)flouranthene	PHS	207-08-9	Note 2	Note 2	0,017	0,017	Note 2
Benzo (g,h,i)-perylene	PHS	191-24-2	Note 2	Note 2	$8,2x10^{-3}$	$8,2x10^{-4}$	Note 2
Ideno (1,2,3-cd)pyrene	PHS	193-39-5	Note 2	Note 2	Not applicable	Not applicable	Note 2

Substance	Status	CAS number	AA-EQS (inland surface waters)	AA-EQS (other surface waters)	MAC-EQS (inland surface waters)	MAC-EQS (other surface waters)	EQS biota
Anthracene	PHS	120-12-7	0,1	0,1	0,1	0,1	Note 2
Fluoranthene	PS	206-44-0	0,0063	0,0063	0,12	0,12	30
Naphtalene	PS	91-20-3	2	2	130	130	

Note 1: AA – annual average; MAC – maximum allowable concentration; units- microgram per litre (water) and microgram per kilogram of wet weight in biota
Note 2: for the group of PAH, the biota EQS and corresponding AA-EQS in water refer to the concentration of benzo(a)pyrene, on the toxicity of which they are based. Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only it needs to be monitored.
Source: 2013/39/EC Directive

The legislation in place aiming to protect aquatic environment also reflects a commitment to identify and implement measures so the environmental quality standards set for uPOPs are met in the surface waters of Turkey. According to the MoFWA, River Basin Management Plans aiming to ensure good status of water bodies across all river basin districts in Turkey are expected to be developed by 2020. Implementation of water sector legislation, and, in particular, commitment to ensure compliance with the set EQS constitute additional regulatory instrument to enact any necessary measures required to further protect aquatic environment from uPOPs.

Having regard to the absence of monitoring data on the presence of uPOPs in surface waters at present as well as the fact that Turkey just commenced development of its 4 pilot river basin management plans, no estimates are available regarding probable extent of EQS failures and whether or not, any additional mitigation actions will be required to meet uPOPs EQS in surface water.

In instances, where wastewater treatment plants are found to be causing surface water bodies to fail environmental quality standards set, supplementary measures may be required. Potential costs to water industry are discussed in the separate section.

Existing limit values and environmental quality standards for uPOPs – contaminated land

Turkey also has **soil protection** legislation in force. In particular, By-Law on Control of Soil Pollution and Sites Contaminated by Point Sources defines generic human exposure limits, including for uPOPs.

In general terms, risk based approach is applied in Turkey to contaminated land management. Contaminated sites inventory is anticipated to be developed in 2015 after Contaminated Land By-Law fully enters into force in June 2015.

At present, 4,500 potentially contaminated priority sites have been identified and will be assessed over the next 3 years. Such sites could include petrochemicals sites, large industrial facilities, old military bases (although special permissions would be required to access military sites). Not all these sites are anticipated to be tested for potential contamination with all POPs substances. However, assuming that all 4,500 potentially contaminated sites in Turkey would be analysed for uPOPs, total costs are presented in the table below.

Table 4.9 Contaminated land assessment costs for uPOPs

Substance	Costs (sampling and analysis), total	Costs (sampling and analysis), per year	Costs remediation
PCDD/PCDF/ DL-PCBs	33,750,000	11,250,000	Unknown, but unit costs range from about 500 TL to more than 2,000 TL per tonne of contaminated soil.
PAH	8,212,500	2,737,500	Unknown but unit costs of incineration of solid wastes and contaminated soil range from about 900 to 1,500 TL per tonne
Hexachlorobenzene	Na	Na	

Substance	Costs (sampling and analysis), total	Costs (sampling and analysis), per year	Costs remediation
Pentachlorobenzene	Na	Na	
Total	**41,962,500**	**13,987,500**	

Total estimated costs of testing prioritised contaminated sites for uPOPs are about 14 million TL per year.

Depending on the results of assessment, remediation will be requested with owners of contaminated sites being expected to cover the costs of assessment and remediation if any is required. A smaller number of sites would subsequently require remediation from uPOPs presence. However, predicting the likely number of sites contaminated with uPOPs such as dioxins or PAH requiring remediation is not feasible at this stage.

Secondary (historic) releases from landfills and dumpsites constitute another potential source of uPOPs in environment and are discussed in the section below.

Secondary releases – Water industry

Secondary releases of POPs from wastewater treatment plants may require additional measures to be implemented to ensure compliance with the EQS set for POPs substances in the surface water bodies. Sources of POPs in urban wastewater discharges are of diverse nature and could include effluent from manufacturing industries connected to public sewage and wastewater treatment plants (e.g. XPS/EPS, textile manufacturers etc.), domestic effluent containing POPs (e.g. from washing of fabrics) as well as storm water runoff containing POPs (e.g. PAH from road transport). Furthermore, some of the substances could also be present in the raw water abstracted (e.g. pesticides) and subsequently discharged from WWTPs.

Some studies also indicate that spreading of sewage sludge on agricultural lands could also constitute a secondary source of POPs releases to environment.

Depending on the extent of current failures of POPs EQS in surface water bodies of Turkey and sources of these failures, installation of additional treatment and/ or appropriate management of sewage sludge could be required.

Overall, installation of advanced wastewater treatment technologies, such as granular activated carbon (GAC) adsorption depending on the substance would result in removal efficiency from 85% to 99%.

As a first step, presence or absence of POPs in wastewater treatment plants effluent and sludge would need to be established. Two estimates of the number of UWWTPs were used to calculate sampling and analysis costs:

- Eurostat data for 2010 suggests that there are 1,017 UWWTPs in Turkey of which 964 have primary or secondary treatment
- River Basin Management Plans for 25 river basin districts in Turkey suggest a total of 301 UWWTPs of which 285 are estimated to have primary or secondary treatment[15]

Depending on the source used, costs of one-off wastewater discharge sampling and analysis for POPs at UWWTPs operating primary and secondary treatment are around 3 or 11 million TL (see Table below).

Table 4.10 Estimated costs of sampling and analysis of POPs in WWTPs effluent

	Eurostat based estimate	RBMPs based estimate
Number of WWTPs: Primary treatment	69	20
Number of WWTPs: Secondary treatment	895	265
Sampling, TL	2,970,000	879,000

[15] Using Eurostat reported shares in total number of WWTPs

	Eurostat based estimate	RBMPs based estimate
Analysis, TL		
Pesticides, low	819,000	243,000
Pesticides, high	1,540,000	457,000
PCBs	781,000	231,000
PFOS	283,000	83,900
BDEs	312,000	92,400
HBCDD	326,000	96,400
PCDD/PCDF/DL-PCBs	4,340,000	1,280,000
PAH	800,000	237,000
Sampling and analysis: total, low	**10,631,000**	**3,142,700**
Sampling and analysis: total, high	**11,352,000**	**3,356,700**

Predicting the need to install advanced wastewater treatment at UWWTPs in Turkey and anticipated extent of such measure is not feasible at this stage. In practice it will depend on the observed failures of POPs EQS in surface water bodies and contribution of UWWTPs discharges to these failures.

However, an upper bound of costs has been estimated in this study assuming that *all* primary and secondary UWWTPs in Turkey would require installation of advanced treatment (GAC).

Costs of treatment were estimated based on the unit costs of GAC reported in the ScorePP (2009). Feasibility of treatment options: Comparison of the approaches evaluated to maximise removal of Priority Pollutants study. The unit costs are expressed in current prices (TL).

Table 4.11 Unit costs of installing advanced treatment (GAC) at UWWTPs

Capital and annual costs of GAC	Unit costs, TL per cubic meter
GAC capex, low	0.01
GAC opex, low	0.02
GAC capex, average	0.47
GAC opex, average	1.18
GAC capex, high	0.94
GAC opex, high	2.32

Depending on the source used (Eurostat or RBMPs) to obtain the total number of UWWTPs in Turkey, the estimated costs range from 19 million to 8.6 billion TP per year. These costs are expressed as total annualised costs, using 4% discount rate and an estimated asset lifetime of 15 years to express one-off capital costs as equivalent annual costs (EAC).

Table 4.12 Estimated costs of installing advanced treatment (GAC) at all primary and secondary UWWTPs

	Eurostat based estimate	RBMPs based estimate

	Eurostat based estimate	RBMPs based estimate
Wastewater volume: Primary treatment, m3 per year	256,188,791	75,823,821
Wastewater volume: Secondary treatment, m3 per year	3,323,028,515	983,511,881
One-off costs, low, TL	21,100,000	6,230,000
One-off costs, average, TL	1,680,000,000	499,000,000
One-off costs, high, TL	3,370,000,000	997,000,000
EAC costs, low, TL	1,890,000	560,000
EAC costs, average, TL	151,000,000	44,800,000
EAC costs, high, TL	303,000,000	89,700,000
Annual costs, low, TL	63,200,000	18,700,000
Annual costs, average, TL	4,210,000,000	1,250,000,000
Annual costs, high, TL	8,320,000,000	2,460,000,000
Total annualised costs, low, TL	**65,100,000**	**19,300,000**
Total annualised costs, average, TL	**4,360,000,000**	**1,290,000,000**
Total annualised costs, high, TL	**8,620,000,000**	**2,550,000,000**

In practice, installation of advanced wastewater treatment at *all* UWWTPs across Turkey is likely to be unnecessary and disproportionately costly. However, in instances where such measure will be considered, it would provide multiple benefits in terms of reduction of multiple pollutants; hence costs of such measures cannot be attributed to a single POPs substance or other pollutant (e.g. nitrogen or phosphorus).

Secondary releases – Landfills

Secondary releases of POPs from landfills may require additional measures to be implemented to ensure compliance with the EQS set for POPs substances in the surface water bodies. Historic disposal of POPs substances, mixtures or articles containing POPs on landfills constitute primary potential source of POPs in landfill leachate.

Depending on the extent of current failures of POPs EQS in surface water bodies of Turkey and sources of these failures, installation of additional leachate treatment could be required.

Overall, installation of advanced wastewater treatment technologies, such as granular activated carbon (GAC) adsorption depending on the substance would result in removal efficiency from 85% to 99%.

As a first step, presence or absence of POPs in landfill leachate would need to be established. Costs of one-off leachate sampling and analysis for POPs are around 1 million TL (see Table below).

Table 4.13 Estimated costs of sampling and analysis of POPs in landfill leachate

	Cost estimates
Number of landfills affected	88
Sampling, TL	271,260
Analysis, TL	
Pesticides, low	74,800

	Cost estimates
Pesticides, high	141,000
PCBs	71,300
PFOS	25,900
BDEs	28,500
HBCDD	29,700
PCDD/PCDF/DL-PCBs	396,000
PAH	73,000
Sampling and analysis: total, low	970,460
Sampling and analysis: total, high	1,036,660

Predicting the need to install advanced wastewater treatment at landfills in Turkey and anticipated extent of such measure is not feasible at this stage. In practice it will depend on the observed failures of POPs EQS in surface water bodies and contribution of landfill leachate to these failures.

However, an upper bound of costs has been estimated in this study assuming that *all* landfills in Turkey would require installation of advanced treatment (GAC).

Costs of treatment were estimated based on the unit costs of GAC reported in European Commission (2009)[16] as well as costs of installing advanced treatment on some landfills in Turkey. All unit costs are expressed in current prices (TL).

Table 4.14 Unit costs of installing advanced treatment (GAC, ultrafiltration) at landfills

Elements of costs	Unit costs, TL
GAC capex, low	169,650
GAC capex, average	1,781,325
GAC capex, high	3,393,000
Opex, m3	1.71
Leachate volume average	52,048
Advanced treatment, costs per tonne of wastes, low	2,536
Advanced treatment, costs per tonne of wastes, high	11,000

Depending on the source of unit costs used, the estimated costs of advanced treatment of leachate range from 9 million to 98 million TL per year. These costs are expressed as total annualised costs, using 4% discount rate and an estimated asset lifetime of 15 years to express one-off capital costs as equivalent annual costs (EAC).

Table 4.15 Estimated costs of installing advanced treatment (GAC) at all landfills

	BREF based estimate	Case studies based estimate

[16] European Commission (2009): Draft reference document on best available techniques in the common waste water and waste gas treatment/management systems in the chemical sector, October 2009

	BREF based estimate	Case studies based estimate
One-off costs, low, TL	14,929,200	230,912,863
One-off costs, average, TL	156,756,600	616,207,469
One-off costs, high, TL	298,584,000	1,001,502,075
EAC costs, low, TL	1,342,749	20,768,557
EAC costs, average, TL	14,098,861	55,422,378
EAC costs, high, TL	26,854,974	90,076,199
Annual costs, TL	7,813,342	7,813,342
Total annualised costs, low, TL	**9,156,091**	**28,581,899**
Total annualised costs, average, TL	**21,912,203**	**63,235,720**
Total annualised costs, high, TL	**34,668,316**	**97,889,541**

In practice, installation of advanced wastewater treatment at *all* landfills across Turkey is likely to be unnecessary and disproportionately costly. However, in instances where such measure is considered, it would provide multiple benefits in terms of reduction of multiple pollutants; hence costs of such measures cannot be attributed to a single POPs substance or other pollutant (e.g. nitrogen or phosphorus).

Administrative costs to public authorities (all POPs)

Administrative costs – Monitoring system development

MoEU is planning to develop a monitoring information system, that is envisaged as a remote access electronic system allowing different Ministries and other stakeholders (such as Universities) to enter monitoring data for POPs. While academic institutions do not carry out periodic monitoring, their studies on POPs in biota and sediment are valuable for consideration. Such comprehensive monitoring data system will also allow for data gaps identification so further steps can be taken to close such knowledge gaps.

Cost estimate provided for developing such data sharing system is 2.7 million TL[17]. Once such system is developed, maintenance of it will require additional manpower estimated at 1 FTE or 70.3 thousand TL annually.

Administrative costs – Contaminated land

Some of the POPs substances are listed in the By-Law on Control of Soil Pollution and Sites Contaminated by Point Sources that sets out NOEC (no observed effect concentrations) for human exposure to different contaminants and pathways (i.e. inhalation, digestion, skin absorption). Costs of contaminated sites assessment are expected to be covered by site owners. Estimated assessment costs of POPs presence in contaminated sites are presented in substance specific sections.

[17] GEF project proposal budget of 1,000,000 USD

Monitoring costs to public authorities (all POPs)

Surface water monitoring

A number of significant activities are already planned and committed to in relation to monitoring of POPs in Turkish environment.

First of all, MoFWA is commencing monitoring programme that will measure 117 chemicals including POPs in surface waters under the Article 8 and Annex V of the WFD and 2013/39/EC requirements.

Monitoring will be carried out by State Hydraulic Works and will establish the extent of presence of POPs substances in surface waters across Turkey. Current draft programme for 12 catchments include 1052 points with the measurements taking place on average 4 times a year (12 times for priority substances). No cost estimates for the monitoring are available as the work is still to be tendered. However, total costs have been estimated based on anticipated number of monitoring points, list of substances to be measured, frequency and unit costs of sampling and analysis.

In total, there are 25 catchments in Turkey and MoFWA estimates a total of about 2,500 monitoring points with the measurements taking place 12 or 1 times a year depending on the substance. Costs of establishing and maintaining monitoring system for POPs in surface waters in Turkey are estimated and presented below.

Table 4.16 Annual monitoring costs of POPs in surface water and biota

	Low, TL per year	**High, TL per year**
Sampling costs, surface water	2,475,000	9,422,700
Sampling costs, biota	1,075,000	3,124,875
Total sampling	3,550,000	12,547,575
Analysis total (surface water), of which	40,428,529	47,718,529
Pesticides	7,470,000	14,400,000
Industrial POPs	25,668,529	25,668,529
Unintentionally released POPs	7,290,000	7,650,000
Analysis biota	1,125,000	8,012,500
Total sampling and analysis costs	**45,103,529**	**68,278,604**

Total estimated annual costs of sampling and analysis of surface water and biota are estimated between 45 million TL and 68 million TL per year depending on unit costs and sampling media assumptions.

Environmental costs

Introduction of advanced wastewater treatment at urban WWTPs and landfills where and if required as well as remediation of contaminated sites if POPs presence is detected could result in some adverse environmental impacts including carbon emissions, energy use as well as generation of waste (including wastewater sludge)

Social and distributional impacts

Implementation of water and waste sector legislation as well as ensuring compliance with the industrial pollution regulatory framework would entail significant costs.

In most instances, companies may be faced with substantial compliance costs (e.g. IPPC implementation). Similarly, waste generators and owners of contaminated sites may be faced with substantial assessment, disposal and remediation costs.

Some industries there may be able to pass-through the costs of compliance to customers resulting in increases in the prices of consumer goods and services. This is particularly relevant to utility companies, such as water, waste and energy service suppliers.

The impacts of higher prices of key goods and services, would particularly affect low income socio-economic groups (unless allowances for such groups are in place) and those without a job (e.g. unemployed, retired persons).

From an industrial perspective, any increase in utility prices would particularly affect intensive consuming sectors (e.g. higher water prices would affect agriculture, energy production and construction and higher electricity prices could affect energy intensive sectors like metal production).

Benefits

Environmental benefits

In general terms introduction of monitoring system for POPs under the WFD and EQSD Directive requirements will contribute significantly to improved level of knowledge regarding presence, concentrations and sources of POPs in Turkish environment enabling policy makers to focus on key existing and historic sources of POPs emissions to air, water and soil.

Pesticides

In the context of POPs pesticides, historic use, long-range transport, presence of some POPs as impurities in licensed pesticides and, potentially, illegal application constitute the main sources of POPs pesticides in Turkish environment.

Assessment of current levels of environmental exposure to POPs pesticides (while recognizing the lack of comprehensive monitoring system) concludes that:

- Majority of evidence available indicate historic use with some studies indicating recent inputs potentially originating from impurities, illegal application or non-agricultural sources
- However, even in instances when POP pesticides have been detected in relatively high concentrations, these still do not seem to pose risk to human consumption of edible biota
- The only recorded evidence of environmental concentrations of POPs causing significant environmental risk are studies on wetlands and related rivers and delta systems in Turkey (Meric, Ergene, Sakarya River) that were found to be contaminated with high levels of DDT. In this particular study, there was also evidence of recent DDT inputs. Measured DDT residue levels did not exhibit acute toxicity, but chronic exposure to measured levels would result in adverse environmental effects on the organisms in these wetlands (especially on reproductive success). In the long-term this could potentially result in extinction of endangered bird species (Ayas, 2007).

Implementation of existing bans on POPs pesticides will continue to ensure adequate levels of environmental protection. In the particular case of DDT, it is noted that dicofol, that was found to contain on average 17% of DDT per kilogram of dicofol, could constitute a significant remaining source of DDT inputs. Prohibition of production, placement on the market and use of dicofol in the recent years will contribute further to enhanced protection of Turkish environment. However, the issue of POPs pesticides being present as impurity would need to be addressed more generically under the Policy Option 2.

Industrial POPs

In the context of industrial chemicals, historic and ongoing use as well as disposal of articles containing POPs constitute the main sources of industrial POPs in Turkish environment.

While the full extent adverse effects of these substances in Turkish environment and their spatial distribution is not known some evidence is available regarding potential effects.

Implementation of the Policy Option 1 that will entail implementation of IPPC/IED directive, potentially tackling discharges from urban WWTPs, leachate from landfills and addressing contaminated site assessment and remediation, will result in a range of environmental improvements.

Installation of the advanced treatment at urban WWTPs and landfills as well as carrying out assessment and where required remediation of contaminated sites would contribute to reduction of emissions and environmental concentrations of PFOS, HBCDD, BDEs, SCCPs and other substances (HCB, PeCB, Hexacholorobutadiene and Polychlorinated Naphthalenes). Furthermore, implementation of waste sector legislation, including WEEE and end-of-life vehicles is anticipated to contribute to the reduction of BDEs emissions.

Environmental, human health and economic benefits associated with reductions in environmental concentrations of these industrial substances are considered under the Policy Options 2 and 3.

Implementation of the Policy Option 1 first of all will result in reduction of emissions and environmental concentrations of PCBs.

Transformers purchased before the ban of PCBs came into force are still in use in certain installations such as power plants and will need to be disposed of responsibly to avoid any potential adverse environmental impact.

Due to PCBs bioaccumulation properties, high concentrations of PCBs have been found particularly in top predators such as otters, seals and fish-eating birds (IPCS, 1992). A wide range of adverse environmental impacts include reproductive and development problems in fish, adverse impacts on birds including:

- thinning of seabird eggshells leading to reduced reproductive capacity;
- decrease in nesting productivity, increased mortality in second brood nestlings, and abnormalities in adult behaviour (decreased foraging trips) (Arenal *et al*, 2004, studying European starlings);
- Delayed growth and fledging, and lower thryroxine concentrations (Fernie *et al*, 2003, studying American kestrels);
- Significantly smaller song-control nuclei (Hoogesteijn et al, 2008, studying zebra finch) (Entec, 2011).

No comprehensive monitoring data is available on the presence of PCBs in Turkish environment. At present, there is only one monitoring station in a rural area. A recent biomonitoring study by Odabasi et al (2015) show a continued rise in PCB concentrations even though they were banned a long time ago. Prevention of ongoing local sources (especially scrap processing iron-steel plants and ship breaking facilities) and rehabilitation of the area would enable such reversal of the trend of POPs in living media.

Implementation of the legislation in force, such as PCB regulation will contribute to prevention of improper disposal of PCB containing oils. This would result in ensuring safe disposal of PCB containing equipment and will prevent potential landfill leachate. Furthermore, investigation and remediation of sites found to be contaminated with PCBs will result in general environmental benefits to air, water, soil and biota.

Unintentional POPs

The current extent of adverse effects of dioxins in Turkish environment and their spatial distribution is not known.

Implementation of IPPC/IED/LCP, waste incineration, contaminated land regulations as well as WFD and EQSD directives requirements in Turkey is anticipated to result in significant reduction in the estimated uPOPs emissions in Turkey. In particular, industrial, power and waste sectors account for about 87% of total estimated uPOPs emissions in Turkey.

Existing regulatory measures (IED/IPPC and By-Law on the Prevention and Reduction of the Effects of Major Industrial Accidents) enable control of PCDD/F emissions from large-scale combustion plants where PCDD/Fs can be formed as by-products of processes. Similarly, existing regulations also focus on minimizing emissions from waste management and contaminated lands. Studies available suggest that dioxin concentrations near waste incinerators can be elevated. In particular, Korucu and Kardemir (2015) as well as Kardemir et al (2013) commented that PCDD/F concentrations could be elevated (up to 3-4 times higher than regular operation periods) during start-up of the hazardous waste incinerator in Kocaeli.

Implementation of IPPC/ IED will also help reducing or controlling gaseous emissions from electric arc-furnaces, which are shown to be major POPs emitters, including PCBs. Implementation of IPPC/IED legislation will also have a positive impact on reduction on unintentional releases of HCB and PeCB. Facilities below a certain production volume are not covered by IPPC and major local sources specified in the literature may indeed be such facilities. Identification

and management of such sources based on the evidence obtained from WFD and EQSD monitoring programme implementation would also contribute to further reduction of environmental concentrations.

Furthermore, implementing measures aiming to ensure compliance with the set EQS for dioxins, furans and dioxin-like PCBs as well as PAH, HCB and PeCB under the WFD will also provide additional benefits resulting from reduction of emissions from wastewater treatment plants and landfills where and if appropriate.

Implementation of PCB regulation will also contribute to air quality improvement since burning PCB containing oils in truck engines, green houses or residences result in production of PCDD/Fs (Gedik and Yurdakul, 2014).

Overall, implementation of this policy option would provide a significant share of environmental benefits associated with reduction of uPOPs emissions in Turkey (the same is true for the costs).

In general terms, dioxins presence in environment can be associated with acute effects on freshwater invertebrates (EC, 1999), and on rainbow trout (Ritter et al, 1995). Chronic effects associated with dioxin exposure have been observed in freshwater algae, freshwater benthic invertebrates (Yockim et al, 1978) and rainbow trout. Having regard to the bioaccumulative nature of dioxins, reductions in dioxin concentrations would also provide a wider ecosystem benefits for fauna (e.g. predators on fish, such as mammals e.g. otters and fish eating birds).

Dioxins are particularly harmful in the early stages of development with potential adverse impacts ranging from reproductive to developmental effects (e.g. weakened immune responses). Reduction of ambient dioxin concentrations would allow ecosystems and species to recover.

Having regard to the long range transport potential, improvements would also extend across the border. In particular, reduction of PCDD/F and dioxin-like PCBs in air would have an international benefit that, in turn, contributing to lower deposition of dioxins on soils. Greater variety and numbers of flora and fauna could follow, under such positive conditions.

In the case of PAH, these can be very toxic to aquatic environment and be present at concentrations in aquatic systems such that animals can achieve tissue concentrations sufficient to cause photoactivated toxicity (EU RAR, 2008).

Some studies in Turkey indicate the potential ecotoxicological risk of sediments which exceed toxic levels at one of the major marinas in Turkey at Marmara Sea, Tuzla, as well as the Aliaga shipbreaking yard. The PAH concentrations reported in shipyard sediments were noted to be the highest reported (ever) in the international literature. Environmental benefit is expected, both in terms of the existing By-Law on Contaminated Sites, as well as minimization of the emission of ongoing sources of PAHs in the region.

Social and public health benefits

Pesticides

Preventable fatalities

The single episodic contamination event involving POPs was hexachlorobenzene poisoning in 1950's. Consumption of HCB-treated seed wheat intended for agriculture resulted in 500 fatalities and more than 4,000 people felling ill with a liver condition (porphyria cutanea tarda, which disturbs the metabolism of hemoglobin and results in skin lesions). There were also spontaneous abortion and negative effects on offspring. Regulatory system in place at present is built to prevent such incidents. The value of preventable fatalities associated with this contamination event alone would be 821 million TL. In addition, total number of QALY lost (years in a perfect health) associated with induced liver condition is estimated to be 102 thousand years in a perfect health lost equivalent to 6.5 billion TL.

Exposure to pesticides can be fatal to humans. A study into pesticide poisoning cases suggested that 43 out of 54 deaths were suicides with endosulfan being the third most commonly observed pesticide in a study conducted in Izmir between 2006 to 2009 (Idiz et al., 2012). Assuming that the remaining 11 fatalities were accidental exposure to POPs pesticides, estimated value of these preventable fatalities is 18.1 million TL.

In the case of POPs pesticides, predicting number of fatalities expected to be prevented between 2016-2028 s a result of effective implementation of existing prohibitions is not feasible.

Exposure of children through human milk

Evidence available on presence of POPs pesticides in human milk suggest that with the exception of:

- Elevated HCB levels in the area of contamination event which were found to be 7 times higher when comparing to unexposed population
- Elevated concentrations of DDT have been found in human milk in 1994, although more recent studies indicate no concern for children health despite a recent spike in Antalya.

While no studies seem to suggest risks to children through exposure to milk at present, the episodic contamination event with HCB resulted in deaths of all breastfeeding children under the age of two in some villages. Implementation of existing legislation on production, placement on the market and use of POPs pesticides is contributing to prevention of any such tragedies in the future.

Furthermore, the case of recent spike in DDT concentrations in human milk in Antalya (although not above the levels raising concerns) highlighted the need to address the issue of continuous inputs of POPs pesticides in Turkish environment (most likely as impurities).

Consumption of food stuffs

Assessment of current levels of human exposure to POPs pesticides (while recognizing the lack of comprehensive monitoring system) suggests that presence of POP pesticides in edible biota (fish, mussels etc.) do not seem to pose risk to human consumption.

Similarly, measured POPs pesticides levels in foodstuff such as butter, mussels or grape molasses pose no concern in the majority of cases with the exception of:

- Measured beta-HCH levels in butter that exceed the legal limit set in legislation indicating human health risk of consumption and
- Measured endosulfan levels in roasted chickpeas at the border with Italy (0,16 mg/kg).

In the context of foodstuff consumption the trade-off in essence is between human health and economic losses. In instances, where elevated levels of POPs pesticides are present but have not been measured and consumed would result in human health risks. In instances, where existing control and enforcement system tackling food safety is operating efficiently, human health is protected through detection and prevention of contaminated food consumption, but results in economic losses to food producer.

Effective implementation of POPs pesticides legislation and prevention of foodstuff contamination with these substances in the first place results in enhanced human health protection and avoided financial losses.

Carcinogenic impacts

There is limited evidence regarding carcinogenic properties of POPs pesticides. Some substances, like DDT, HCHs etc. are classified as potentially carcinogenic.

Partial association was found between exposure to OCPs and breast tumours indicating potential human health risk.

However, no records are available in Turkey on number of cancer cases linked to the exposure to POPs pesticide and POPs more generally. Subsequently, predicting reduction in number of cancer case and cancer-related fatalities in Turkey as a result of implementing fully existing legislation is not feasible.

It should be noted, however, that available valuation studies estimate value of preventable fatality from cancer from 2.4 million TL to 4.6 million TL depending on the source valuation study (and adjusted for income levels in Turkey).

Industrial POPs

In general terms, improved management of industrial POPs would result in reduced risks of occupational exposure. For instance, phasing out the use of PCB containing equipment would result in reduced risks of occupational exposure to PCBs at work place.

Assessment and remediation of sites found to be contaminated with industrial POPs would improve environmental quality in the vicinity resulting in improved living conditions for people residing in the area.

Human health benefits associated with reductions in environmental concentrations of industrial substances other than PCBs are considered under the Policy Options 2 and 3.

Preventable fatalities

No data is available regarding preventable fatalities associated with exposure to industrial POPs in Turkey.

Exposure of children through human milk

In the context of PCBs, literature studies indicate levels of PCBs in mother's milk to be below health guidelines, yet for most POPs, there is a significant detection frequency. Implementation of the PCB regulations in force will enable better control of releases, enabling a trend towards zero frequency of detection for POPs. This would in turn reduce exposure of young children to POPs.

Studies have shown elevated dioxin levels in mothers milk of Antalya, possibly pointing to improper disposal and burning of PCB containing oils (many greenhouses in the area) (Cok et al, ***). Implementing measures resulting in decreased environmental concentrations of PCBs would result in reduced risk of transfer of PCBs from mother to baby.

Consumption of food stuffs

In general terms, PCBs have been shown to be both acutely and chronically toxic to humans with accidental absorption of PCBs resulting in skin and eyes effects. Other adverse impacts include liver disorders, bronchitis, certain peripheral neuropathies and endocrine disruptions (UNEP, 2003).

Implementing measures resulting in decreased environmental concentrations of PCBs would result in reduced uptake of PCBs in drinking water and/or foodstuffs and, subsequently, reduced accumulation of PCBs in human tissues. A decreasing trend could not be observed for PCB levels in human adipose tissue (Gedik and Imamoglu, 2010).

Carcinogenic impacts

The International Agency for Research on Cancer (IARC), categorises PCBs as group 2B. This means that PCBs are considered to be "probably carcinogenic" to humans but that the evidence is "less well established". However the potential carcinogenic effects are predominantly assigned to the dioxin-like PCBs (EFSA, 2005). For non-dioxin-like PCBs alone, carcinogenicity has not been shown.

If remedial measures were to be undertaken at specific sites, populations in the local area may experience reductions in PCB concentrations. Over time, concentrations of PCBs in human tissues would decrease as intake through drinking water was reduced, and concentrations in locally-produced foods could have decreased concentrations of PCBs.

No data is available in Turkey linking PCB exposure to cancer cases. Subsequently, predicting reduction in number of cancer case and cancer-related fatalities in Turkey as a result of implementing fully existing legislation is not feasible.

It should be noted, however, that available valuation studies estimate value of preventable fatality from cancer from 2.4 million TL to 4.6 million TL depending on the source valuation study (and adjusted for income levels in Turkey).

Existing legislation in place will help reduce this risk, as implementation of PCBs regulation is anticipated to ensure enforcement of the prohibition of use and proper disposal of PCB containing equipment.

Unintentional POPs

Preventable fatalities

No data is available regarding preventable fatalities associated with exposure to uPOPs in Turkey (e.g. acute poisoning cases)

Exposure of children through human milk

Dioxins are known to cross the placenta to foetuses in the womb and can be passed to infants through breast milk. Reduction in emissions of dioxins would ultimately reduce exposure to infants.

Cok et al's (2009) study investigating the levels of PCDD/Fs and dioxin-like PCBs in human milk yield especially higher concentrations for Antalya, a region expected to yield much lower concentrations due to lack of major industry. However, most probably, the source of high PCDD/Fs and PCBs in human milk was attributable to a typical heating tradition of greenhouses – use of waste oils. Since there are numerous greenhouses in the region, and if PCB containing waste oils were to be used, this could explain the higher concentration of these toxic chemicals in human milk. Although waste oils and their regulation according to PCB content is under the By-Law on Control of PCB/PCTs, the enforcement of the By-Law on POPs is expected to have a positive impact. In turn, exposure of infants to POPs is expected to be reduced.

Consumption of food stuffs

In general terms, dioxin concentrates in the fatty tissues of beef and dairy cattle, poultry, pork or seafood[18]. More than 90% of human exposure is through food, mainly meat and dairy products, fish and shellfish[19]. A study by the European Commission (1999) estimated that total dietary exposure to dioxins for average consumers varies from 69 pg I-TEQ/day in the Netherlands to 210 pg I-TEQ/day in Spain, equal to 0.93-3.0pg I-TEQ/kg body weight/day. The Tolerable Daily Intake (TDI) recommended by the WHO is 1-4 pg I-TEQ/kg bw/day, which includes exposure to DL-PCBs[20]. In Turkey, Kademir et al's (2013) study shows increased health risk for people living in Kocaeli due to consumption of local animal products containing relatively higher PCDD/F and dioxin like PCBs when compared to those produced in other parts of Turkey. Kardemir et al's (2007) study show PCDD/F intakes for rural receptors were estimated to be three times higher than those for urban and semi-urban receptors due mainly to the consumption of locally grown foods. Reductions in dioxins in foodstuffs should reduce human exposure.

Carcinogenic impacts

TCDD is carcinogenic to humans, and other dioxins are classed as possibly carcinogenic (IARC, 1997). Similarly, some PAHs are classified as carcinogenic with benzo(a)pyrene being considered as the most strongly carcinogenic of all the PAHs. Consumption of fish is particularly relevant dietary exposure pathway in the context of PAH and dioxins.

Reductions in ambient concentrations of dioxins and PAH would result in health benefits associated with lower cancer rates.

No data is available in Turkey linking dioxin exposure to cancer cases. Subsequently, predicting reduction in number of cancer case and cancer-related fatalities in Turkey as a result of implementing fully existing legislation is not feasible.

It should be noted, however, that available valuation studies estimate value of preventable fatality from cancer from 2.4 million TL to 4.6 million TL depending on the source valuation study (and adjusted for income levels in Turkey).

Existing legislation in place will help reduce this risk, as implementation of IPPC/IED/ LCP and NECD directives are anticipated to contribute to reduction of dioxins, furans and dioxin like PCBs. The same abatement measures are expected to contribute to the reduction of PAH, HCB and PeCB emissions.

Economic benefits

In general terms, implementation of contaminated land and PCBs regulations in Turkey will create a demand for contaminated land assessment, remediation and waste management services resulting in positive impacts on turnover and employment in these sectors.

[18] European Commission (2001) Fact Sheet on dioxin in feed and food. Available at: ec.europa.eu/dgs/health_consumer/library/press/press170_en.pdf

[19] WHO Factsheet on Dioxins. Available at: http://www.who.int/mediacentre/factsheets/fs225/en/

[20] European Commission (1999) Compilation of EU Dioxin Exposure and Health Data

Pesticides

Implementation of existing legal framework governing POPs pesticides would lead to an improved food safety, improved image of Turkish food sector and reduced risk of financial losses particularly associated with detection of elevated POPs pesticides levels in exported products.

Industrial POPs

Proper waste management for PCB containing equipment would result in a number of benefits including increase in efficiency of production. Typically, maintenance for PCB containing equipment is not carried out by regular industry personnel as Turkish Electricity Production/Distribution company did not give permission for dismantling of PCB containing transformers for repair or maintenance purposes. Instead, when equipment required maintenance or repair, it was sent to a central repair and maintenance facility in Ankara. So, when PCB containing equipment is replaced and is no longer used, equipment can be maintained at the facility and could be put back in operation in a relatively much shorter time.

Unintentional POPs

Implementation of existing legal framework directly and indirectly affecting uPOPs would lead to an improved food safety, improved image of Turkish food sector and reduced risk of financial losses particularly associated with detection of elevated levels of uPOPs in exported products.

There are allowable limit values for PCDD/Fs and dioxin like PCBs in food stuffs. Hence, it is expected that as better enforcement of the existing regulations take place, benefits on exported food stuffs will be evident. This may not currently be a major issue, as Ucar et al's (2011) study or Olanca et al's (2014) study did not yield concentrations of these chemicals higher than total daily intake values. Yet, Aslan et al's (2010) study reveal that levels in locally grown foods around the Kocaeli hazardous waste incinerator have statistically higher concentrations when compared to those imported from other regions.

There are also records about certain food stuffs (sun-dried tomatoes, tuna in olive oil, sun dried tomatoes, etc.) being rejected at the border of EU countries due to high benzo(a)pyrene content. Enforcement of the existing legislation will help reducing such incidences, with the aim of totally eliminating any such instances.

4.2 Analysis of impacts of Policy Option 2– By-Law on POPs

Implementation of the Policy Option 2 covers the impacts of the proposed By-Law on POPs while excluding substances that are exclusively related to POPs Protocol such as SCCPs, PAH, Hexachlorobutadiene and Polychlorinated Naphthalenes. However, having regard to the fact that majority of these substances are covered under REACH and/ or WFD and EQSD Directives most of the impacts are captured under the Policy Option 1.

Costs

Economic costs (compliance costs to industry, consumers, public bodies)

Pesticides

Control of production, placement on the market and use (including stockpiles)

All POPs pesticides are either prohibited or have never been licensed for use in Turkey. Implementation of existing legislation in force is anticipated to ensure an effective enforcement.

Assessment of the current situation has indicated recent inputs of POPs pesticides in the environment, most likely resulting from impurities. Following the ban of dicofol in the recent years, the situation is anticipated to further improve.

However, By-Law on POPs is introducing explicit requirements to consider POPs characteristics within existing authorisation schemes for chemicals and pesticides. In particular, *Article 5 of the By-Law sets our requirements regarding control of production, placing on the market and use of POPs*.

Systems of certification and licensing of pesticides and of pre-authorisation of pesticide imports are already in place and operational.

The Regulation on Control of Plant Protection products (Official Gazzette Date: 20.05.2011, number 27939) envisage two alternative procedures for pesticide licensing - by trial (new substances) or by example (existing substances, i.e. active ingredients licensed before).

In the case of new substances (active ingredients) detailed information is requested including information on physico-chemical, toxicologic, eco-toxicologic properties, bio-effectiveness and residual properties.

The Licensing Committee of the MoFAL takes place once every month (12 times a year). It is composed of 20-25 experts (including staff of the MoFAL, experts from academia and other stakeholders). As a general rule, for a pesticide to be authorised in Turkey, it should already be authorised in EU and/or in G8 countries.

According to the MoFAL, about 300 licences are issued each year (including licence renewals, applications for new products that are based on previously licensed active ingredients etc.). The licensing process typically takes 2 years to complete and each licence is valid for 10 years.

Currently there are more than 340 licensed active ingredients on the Turkish market (corresponding to a higher number of marketable products).

Although information on physico-chemical, toxicologic, eco-toxicologic properties, bio-effectiveness and residual properties is already being reviewed as part of the current licensing system, MoFAL estimates that in order to comply with the Article 5 requirements, additional manpower will be needed. In particular, estimated costs of annual compliance with the Article 5 requirements would be 5%-10% FTE per year equivalent to 5.7 thousand TL to review published materials, information on products, information on potential future ban of a product due to its POPs characteristics (MoFAL, 2015).

Assessment of current situation has revealed that recent inputs of some POPs pesticides, such as DDT, HCB and PeCB etc. might be a result of the presence of these substances as impurities in licensed products. On one hand *Article 6(1) of the By-Law* exempts substances occurring as an unintentional trace contaminant in substances, preparations or articles. According the MoEU there is no intention to determine thresholds for such trace amounts or impurities. Considering the study by Turgut et al. (2009) that suggested o,p-DDE as the most frequent impurity in dicofol (average 169 mg kg−1 dicofol) prevention of further inputs of POPs pesticides as impurities would benefit environment and human health. There are instances of setting such threshold values for product purity in European Union, including, for instance:

- Content of Hexachlorbenzene within chlorothalonil (CAS 1897-45-6) of not more than 0,01g/kg (Directive 2005/53/EC)
- Content of DDT and DDT related compounds within dicofol of not more than 1 g/kg
- Content of HCB and PeCB of not more than 1g/kg and 10g/kg respectively within quintozene (Directive 79/117/EEC, amended by 90/533/EC Directive)

A proper control on maximum allowable content of POPs pesticides within plant protection products would strengthen the current legislative framework. This aspect could also be considered as part of the licensing process, in particular, through reviewing relevant EU legislation.

Article 7 and Article 9 of the By-Law address the issue of stockpiles and wastes. According to the MoFAL, there is no system of continuous and targeted search and collection of obsolete pesticides from farmers. However, the MoFAL believes that given their licensing and auditing system for pesticides, all obsolete POPs pesticides stocks have been traced and either dealt with (i.e. DDT) or scheduled for disposal (i.e. HCH). In the context of unknown, potential stocks of obsolete POPs pesticides stocks being present at individual farms, MoFAL has suggested that it is very unlikely for individual users (farmers) to have stocks of obsolete POPs pesticides. There are cheaper and more effective alternatives on the market. Besides, having regards to the bans being implemented up to 45 years ago, any (remaining) stocks would be unusable. Finally, the ad-hoc obsolete pesticides (all, not just POPs) initiative organised by provincial directorates of MoFAL has resulted in collection of 30-35 tonnes (in comparison to the known HCH stock of about 3,000 tonnes). Overall, no additional costs (over and above Policy Option 1) are anticipated in relation to dealing with obsolete POPs pesticides stocks in Turkey. However, in the unlikely event of locating further, yet unknown stockpiles of obsolete

POPs pesticides, the unit costs of packaging, transport and disposal of these would be in the range from 2.5-18 thsd. TL per tonne[21]

Industrial POPs

A wide range of industrial substances are falling within the scope of the By-Law including:

- Polychlorinated biphenyls (PCBs)
- PFOS
- HBCDD
- BDEs (hepta,hexa, penta, tetrabromodiphenyl ether and hexabromobifenil)
- Hexachlorobenzene (HCB)
- Pentachlorbenzene (PeCB)
- Short chain chlorinated paraffins (POPs Protocol and WFD)
- Hexacholorobutadiene (POPs Protocol and WFD)
- Polychlorinated Naphthalenes (POPs Protocol)

Polychlorinated biphenyls (PCBs)

No additional costs are expected under the Policy Option 2 over and above those detailed under the Policy Option 1.

Perfluorooctane sulfonic acid PFOS

Perfluorooctane sulfonic acid (PFOS) and its salts and PFOSF is a versatile industrial chemical with a wide range of applications. Key issues in relation to PFOS manufacturing, placement on the market and use in Turkey include use of PFOS in manufacturing industries as well as waste management issues.

Range of measures considered included:

- Control of manufacturing and placement on the market of PFOS, substances and articles containing PFOS
- Substitution of PFOS in fire fighting foams
- Substitution of PFOS in hydraulic aviation fluids (none currently available)
- Substitution of PFOS in photolithography and semiconductors (none currently available)
- Substitution of PFOS in photography (coatings) (none currently available for surfactant, electrostatic charge control, friction control and adhesion control but anticipated to decrease due to increases in digital photography)
- Metal plating: abatement measures to reduce emissions, cessation of PFOS use and installation of (additional) extraction ventilation or greater tank enclosure or use of alternatives (mist-suppressants/ technologies)
- Control of disposal of articles and household products in use (particularly of upholstery, carpets)

Estimated annual costs of measures are summarised in the table below.

Table 4.17 Estimated costs of PFOS related measures

Measures	Costs

[21] The estimate is based on the past disposal experiences and budgeted costs under GEF POPs project

Measures	Costs
Substitution and replacement of fire-fighting foams (one-off)	0.15 million TL
Metal plating:	
- Increased ventilation	Hard metal plating - larger closed tanks, or increased ventilation combined with extraction of chromium(VI) are alternatives. Relative gain of not using PFOS may offset the costs of alternatives with net costs being zero or small. One-off costs of installing ventilation system are estimated at 38.8 million TL. Total annualised costs of installing ventilation are between 3.5 million TL.
- Advanced wastewater treatment	One-off costs of installing GAC treatment at all surface treatment of metals installations in Turkey range from 29 -576 million TL. Total annualised costs of installing advanced WWT are between 39 and 88 million TL per year.
Managing stockpiles	Unknown, but assuming that MoSTI reporting system is used for holders of such stockpiles to report, estimated one-off costs are 0.24 million TL (based on 120,000 reporting manufacturing companies)
Costs of establishing disposal system for PFOS containing fire-fighting foams and aviation fluids (managed as hazardous wastes)	Na

Assuming that uses where no feasible alternatives are available continue, the majority of the estimated costs are attributed to measures in metal plating sector. Costs of executing control of manufacturing and placement on the market of PFOS, substances and articles containing PFOS among other POPs are discussed in a separate section.

Hexabromocyclododecane (HBCDD)

Hexabromocyclododecane (HBCDD) is used as a flame retardant in a range of products including Expanded Polystyrene (EPS) and Extruded Polystyrene (XPS) as well as High Impact Polystyrene (HIPS) and polymer dispersion for textiles. HBCDD is an industrial substance that is intentionally used in manufacturing of different articles in order to obtain a certain functionality (flame retardancy).

Summary of key measures considered for HBCDD in Turkey is presented in the table below.

Table 4.18 Key measures to control uses and releases of HBCDD

Application	Key measures
HBCDD	Control of production and placement on the market of HBCDD (import and placement on the market)
Expanded Polystyrene (EPS) and Extruded Polystyrene (XPS)	Use of alternative flame retardants for EPS and XPS insulation products: under development (e.g. Emerald Innovation 3000). Much higher levels of non-halogen flame retardant (EPS and XPS contain 0.7 % and 2.5 % HBCDD respectively) would be necessary, and these would change the polymer quality significantly (IOM 2008)
	Use of alternative products than EPS, XPS as insulation in buildings: polyurethane rigid foam (PUR with added flame retardants), or mineral-based products (inherently non-flammable), or phenolic foam/resins. Mineral wools are already used in 30 % in the European building insulation market (ECHA, 2009). Phenolic foam is a very efficient insulation product with moisture resistance and low density, but is not widely used, due to its high costs (IOM 2008). UBA (2000) compared relative costs of material per unit area insulated to a specific insulation performance: EPS = 1, mineral wool = 1.3, PUR = 2.8 and XPS = 3
High Impact Polystyrene (HIPS)	Alternative flame-retardants in HIPS (for electronics and TV sets): other brominated flame retardants (restricted also) Alternative flame-retardants in HIPS (for electronics and TV sets): copolymer of HIPS and polyphenylene oxide, e.g. with triphenyl phosphate. KemI (2008, from Danish EPA, 2006) estimate such a change would cost between 4-5 Euro per TV set due to increase in raw material price
Polymer dispersion for textiles	Alternative flame retardants in textile applications: reactive phosphorus constituents, ammonium polyphosphates, diammonium phosphase, intumescent systems

Application	Key measures
Disposal of articles containing HBCDD	Control of disposal of products in use (particularly of C&DW). System in place for WEEE, RoHS but not other types of products. Potentially introducing separation and collection system for C&DW followed by appropriate disposal (incineration)

Sources: IOM, 2008; STE Report (2015)

Estimated annual costs of measures are summarised in the table below.

Table 4.19 Estimated costs of HBCDD related measures

Measures	Costs
Industrial WWTPs (XPS manufacturers)	Total annualised costs of installing advanced wastewater treatment at XPS manufacturing sites are estimated from 9.6 to 13.9 million TL
Substitution of HBCDD in XPS	Total annual costs of replacement of HBCDD in XPS are estimated to range from 44 million to 58 million TL per year (manufacturing and import)
Substitution of HBCDD in EPS	Total annual costs of replacement of HBCDD in EPS are estimated to range from 90 million to 145 million TL per year (manufacturing and import)
Costs of establishing disposal system for HBCDD containing wastes	Costs of establishing separation system for HBCDD from CDW (alternative to establishing landfill leachate treatment). Estimated costs of separating and incinerating total current stock of HBCDD in construction are 754 million TL per year of which annual costs of waste separation are estimated at 701 million TL per year.

Estimated costs of substitution of HBCDD in EPS and XPS are significant potentially reaching about 200 million TL per year. It should also be noted that the estimated annual costs of separating and disposing safely of HBCDD containing components within C&DW in Turkey could reach more than 750 million TL per year.

Brominated flame retardants BDEs (hepta,hexa, penta, tetrabromodiphenyl ether and hexabromobifenil)

PentaBDE and octaBDE are used as flame retardants in a range of products. Key measures considered for BDEs in Turkey include:

- Control of production and placement on the market of BDEs (import and placement on the market)
- Substitution of BDEs with alternatives
- Control of disposal of products in use containing BDEs such as electronic articles, end-of-life vehicles, textiles etc.

Estimated annual costs of measures are summarised in the table below.

Table 4.20 Estimated costs of BDEs measures

Measures	Costs
Substitution of BDEs in ABS	Turkey is importing 55 tonnes of ABS a year on average with an estimated 8 tonnes per year potentially containing octa-BDE. Alternatives for octaBDE in ABS are available at approximately the same price resulting in net zero costs of substitution
Costs of establishing disposal system for CRT computers and TVs	Estimated annualised costs of safe disposal of existing stock of CRT computers and TVs (containing octa, hepta, hexaBDE) range from 11 to 15 million TL per year. No additional annual costs are anticipated to address forthcoming waste streams as EEE placed on the market after 2005 should not contain BDEs. It should be noted that these costs could fall under the WEEE directive implementation

Measures	Costs
Costs of establishing disposal system for ELVs containing BDEs	Costs of safe disposal of BDEs containing ELVs and resulting PUR foam (through incineration) (alternative to leachate treatment) range from 6.6 to 16.8 million TL per year.

Estimated costs of tackling BDE containing wastes (electronic equipment, ELVs) are estimated to range from 18 million to 32 million TL per year.

Short-chain chlorinated paraffins

Short-chain chlorinated paraffins are not listed in the Stockholm Convention. No additional costs are anticipated under the Policy Option 2 over and above those detailed under the Policy Option 1.

Other industrial POPs – HCB, PeCB, Hexacholorobutadiene and Polychlorinated Naphthalenes

No additional costs are anticipated under the Policy Option 2 over and above those detailed under the Policy Option 1. No additional measures are required to address the releases of these substances specifically.

Unintentional POPs

Unintentional POPs falling within the scope of the By-Law include dioxins, furans, dioxin-like PCBs, HCB and PeCB.

Dioxins, furans and dioxin like PCBs

Industrial sectors contributing to uPOPs emissions in Turkey are already subject to IPPC and other legislation that will contribute significantly to the reduction of PCDD/PCDF/DL-PCBs emissions.

However, a range of additional measures might be employed to ensure further, beyond Policy Option 1 reductions in emissions including installation of additional abatement measures.

Furthermore, open burning processes contribute significant share of PCDD/PCDF/DL-PCBs emissions. Available range of potential measures includes:

- Maintenance of good combustion conditions (open agricultural waste burning)
- Education campaigns; installation of smoke alarms, fire blankets, fire extinguishers (accidental and natural fires)
- Best practice techniques for hearths (clearing away ask to improve air flow, using dry fuels, ensuring vents are clear); fuel switching from solid fuel or oil to natural gas/LPG; Increased uptake of energy efficiency measures (e.g. home insulation which reduces the need for coal combustion at public power plants) (domestic fuel burning)

Estimated costs of additional abatement measures in metal production, textiles, power production and waste management sectors as well as in tackling open burning are presented in the table below.

Table 4.21 Estimated costs of measures aiming to reduce uPOPs emissions

	Policy Option 1
Industrial sectors (textiles)	Captured under IPPC. In case additional advanced wastewater treatment will be required at all 103 installations within textiles sector, estimated total annualised costs range from 1.7 million to 225 million TL per year
Industrial sectors (metal production)	Captured under IPPC. In case introduction of additional carbon injection within metal production sector, estimated total annualised costs are 98 million TL per year
Power production	Captured under IPPC/LCPs. SIA suggests no additional costs.

	Policy Option 1
	In case introduction of carbon injection at coal fired stations, estimated total annualised costs range from 162 million to 217 million TL per year
Waste management (incineration)	Captured under IPPC/ LCPs. All waste incinerating facilities in Turkey comply with dioxin ELV. In case additional/different air pollution abatement technologies (FGD, bag filters, activated carbon injection) are required at two waste incinerators, estimated total annualised costs range from 0.1 million to 3.4 million TL per year
Open burning processes	Total annual costs of measures are estimated at 1 billion TL per year of which 810 million TL per year are attributed to domestic heating measures and 197 million TL per year to prevention of accidental fires.

Implementation of additional measures in industrial, power and waste management sectors would result in estimated 262 million to 543 million TL per year. In comparison to the Policy Option 1 costs of 6 billion to 12 billion TL per year, these cost represent a relatively minor fraction. Furthermore, additional reduction in industrial emissions over and above Policy Option 1 measures might not be required in practice.

Tackling diffuse sources of PCDD/PCDF/DL-PCBs emissions on the other hand, would result in substantial additional costs (estimated at 1 billion TL per year).

Polyaromatic hydrocarbons (PAH)

PAH are not falling within the scope of the Policy Option 2. No additional costs are anticipated under the Policy Option 2 in relation to PAH over and above those detailed under the Policy Option 1. It is, however, noted that implementation of further measures to address other uPOPs such as dioxins, furans and dioxin-like PCBs would contribute to PAH emissions reduction as well.

Other industrial POPs – HCB and PeCB

No additional costs are anticipated under the Policy Option 2 over and above those detailed under the Policy Option 1. No additional measures are required to address the releases of these substances specifically.

Secondary releases – Landfills and dumpsites

Historic dumpsites may constitute a potential source of POPs releases as these may host disposed POPs substances, mixtures or articles containing POPs.

Depending on the extent of dumpsites contributing to continuous POPs releases into Turkish environment, additional measures, such as remediation of dumpsites, may be required.

In Turkey, the estimated number of dumpsites range from about 1,850 to 3,660[22]. Unit costs of remediation of dumpsites were obtained from Cyprus NIP (2013). These range from 0.5 to 3 million TL per uncontrolled landfill site with an average costs of 1.7 million TL. Annual remediation costs range from 65 to 718 million TL depending on the assumed number of remediated sites and unit costs.

Table 4.22 Annual costs of remediation of uncontrolled landfill sites

	Low number of sites, TL per year	High number of sites, TL per year
Costs of remediation, low	129,176,471	65,011,765
Costs of remediation, average	423,411,765	213,094,118

[22] Source: River Basin management plans 2013 and an estimate assuming 1 dumpsite per municipality

	Low number of sites, TL per year	High number of sites, TL per year
Costs of remediation, high	717,647,059	361,176,471

In practice, remediation of all dumpsites across Turkey is likely to be unnecessary and disproportionately costly. However, in instances where such measure is considered, it would provide multiple benefits in terms of reduction of multiple pollutants; hence costs of such measures cannot be attributed to a single POPs substance or other pollutant.

Compliance costs to public authorities (all POPs)

Implementation of the By-Law will entail a range of compliance related costs to public authorities such as executing control of placement on the market. Key articles associated with compliance costs to public authorities include Article 5 (control of manufacturing, placement on the market and use), Article 7 (stockpiles) and Article 9 (waste management).

Total annual estimated compliance costs to public authorities to comply with the imposed tasks are presented in the table below.

Table 4.23 Annual estimated compliance costs to public authorities

Ministries	Annual costs, TL
Article 5	12,617,134
Article 7	338,000
Article 9	2,179,424
Total	15,134,558
Ministry of Food, Agriculture and Livestock	5,678
Ministry of Science, Industry and Technology	2,877,056
Ministry of Environment and Urbanization	2,517,424
Ministry of Environment and Urbanization/ Ministry of Customs	9,734,400
Total	15,134,558

Overall, annual compliance costs to public authorities are estimated to be about 15 million TL per year.

Administrative costs to industries (all POPs)

Implementation of the By-Law will entail companies to provide information to public authorities including on stockpiles, articles in use, wastes generated. Industries are also expected to participate in development and review of the NIP and Article 18 Committee's activities.

Total annual estimated administrative costs to industries (to all sectors) to comply with the imposed administrative burden are presented in the table below.

Table 4.24 Annual estimated administrative costs to industries

Articles of the By-Law	Annual costs, TL
Article 5	2,180
Article 6	871,844

Articles of the By-Law	Annual costs, TL
Article 7	116,195
Article 8	309,853
Article 10	1,744
Article 14	154,927
Article 18	1,860
Total	1,458,601

Overall, annual administrative costs to industrial sectors are estimated to be about 1.5 million TL.

Administrative costs to public authorities (all POPs)

By-Law on Persistent Organic Pollutants contains a wide range of provisions and obligations imposed on public sector bodies including Ministry of Environment and Urbanization and other relevant institutions. These provisions cover data gathering, reporting, authorisation, exemption granting, monitoring, enforcement and other actions.

Key relevant institutions affected by different provisions of the By-Law include (along with their subordinated and regional organisations):

- Ministry of Environment and Urbanization
- Ministry of Food, Agriculture and Livestock
- Ministry of Science, Industry and Technology
- Ministry of Energy and Natural Resources
- Ministry of Health
- Ministry of Customs and Trade
- Ministry of Economy
- Ministry of Forestry and Water Affairs
- Ministry of Labour and Social Security

Implementation of the By-Law is anticipated to impact these institutions to different extent depending on the nature of requirement, i.e. specific activities needed to be performed, required frequency and, to an extent, on whether relevant institutions already are carrying out stipulated activities.

Key elements of the By-Law that are expected to affect public authorities, such as MoEU and relevant institutions to a varying degree include:

- Control of production, placing on the market and use of POPs through considering characteristics of persistent organic pollutants within the assessment and authorisation schemes for chemicals and pesticides (Article 5) (covered under compliance costs of relevant substances)
- Notification of the MoEU regarding i) substances occurring as a constituent of articles produced before or on the date of entry into force of this By-law until six months after the date of its entry into force; and ii) substance occurring as a constituent of articles already in use before or on the date of entry into force of this By-law. Such instances constitute exemptions from control measures (relevant only if Appendix explicitly allows for such exemption) and MoEU is tasked with notifying the Secretariat upon receiving notifications from relevant institutions. Furthermore, By-Law allows temporary exemptions of production and use of substance as a closed-system site-limited intermediate based on stipulated criteria for the assessment of closed systems and imposes a range of inspection, maintenance and notification duties on the MoEU (Article 6)

- Notification of stockpiles (greater than 50 kg) consisting of or containing any substance listed in Annex I or Annex II, and the use of which is permitted to be made to the Ministry in which the stockpile is established. A duty to monitor the use and management of notified stockpiles is then imposed on the MoEU (Article 7)
- Development and maintenance of release inventories of Annex III substances into air, water and land by MoEU and RI as well as development and sharing action plan on measures to identify, characterise and minimise with a view to eliminating where feasible as soon as possible the total releases of these substances. MoEU when evaluating proposals to construct new facilities or significantly to modify existing facilities using processes that release chemicals listed in Annex III, is also tasked to give priority consideration to alternative processes, techniques or practices that have similar usefulness but which avoid the formation and release of substances listed in Annex III (Article 8)
- Application of derogations to POPs wastes in accordance with concentration limits set in the By-Law adopted through the Committee (Art 18). Before such time, MoEU and relevant institutions may adopt or apply concentration limits or specific technical requirements in respect of waste. MoEU may also, where appropriate, adopt additional measures relating to the wastes through the Art 18 Committee process (Article 9)
- Periodic review and update of the National Implementation Plan including information exchange with relevant institutions and obtaining their approval (Article 10)
- Establishment of appropriate monitoring systems for Annex III substances (Article 11)
- Implementing information exchange activities including with the EU and third countries, carrying out trainings and public awareness campaigns (Article 12)
- Cooperation in providing technical assistance to developing countries and economies in transition regarding POPs (Article 13)
- Carrying out extensive reporting duties including on i) application of the By-Law and any infringements or penalties; ii) production and placement on the market of Annex I and Annex II substances; iii) stockpiles, release inventories and monitoring (RI to MoEU every 3 years) with MoEU tasked to compile the data provided and to report to the Secretariat of the Convention at stated intervals (Article 14)
- Establishment and operation of Chemicals and Waste Advisory Committee responsible for harmonization of national policies, provision of a platform for information exchange, monitoring and evaluation of implementation of the By-Law (Article 18).

Summary of additional impacts under the By-Law

Table 4.25 Summary of additional impacts under the By-Law

	Additional impacts anticipated under the By-Law (over and above Policy Option 1)								
Requirements	**MoEU**	**MoFAL**	**MoFWA**	**MoC**	**MoH**	**MoSTI**	**MoLSS**	**MoENR**	**MoE**
Art 5: Control of production, placement on the market and use (compliance costs)	Yes	Yes	No	Yes	No	No	No	Yes	No response
Art 6: Exemptions from control measures (relevant only if Appendix explicitly allows for such exemption)	Yes	No	No	Yes	No	No	No	No	No response
Art 7 Stockpiles	Yes	No	No	No	No	No	No	No	No response

Art 8 Release reduction, minimisation and elimination	Yes	No	No	No	No	No	No	No	No response
Art 9 Waste management: application of concentration limits for POPs in wastes for derogations	Yes	No	Yes	No	Yes	No	No	Yes	No response
Art 10 Implementation plan	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No response
Art 11 Establishment of monitoring system for Annex III substances	Yes	No	No	No	No	No	No	No	No response
Art 12 Information exchange	Yes	No	No	Yes	No	No	No	No	No response
Art 13 Cooperation in providing technical assistance to developing countries and economies in transition regarding POPs	No	No	No	No	No	No	No	No	No response
Art 14 Reporting	Yes	No	No	Yes	No	Yes	Yes	Yes	No response
Art 18 Chemicals and Waste Advisory Committee	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No response

Ministry of Environment and Urbanisation

Ministry of Environment and Urbanization is the authority responsible for implementation of the By-Law on POPs. The Ministry and its different departments will be tasked with a range of compliance related activities (such as enforcing control of production, placement on the market and use of POPs including authorisation schemes of chemicals and permitting, dealing with stockpiles and wastes). Furthermore, the MoEU will incur a wide range of administrative tasks, such as data gathering, preparing inventories and reporting. Finally, appropriate monitoring system will need to be set up.

In relative terms, compliance related costs by far outweigh administrative costs associated with implementation of the By-Law.

More specifically:

- In relation to existing authorisation schemes for chemicals and pesticides, the only one that MoEU will be involved with is REACH (with costs allocated to implementation of REACH). However, permitting and licensing department will have to consider POPs related aspects within their permitting and inspection process resulting in additional costs.
- One of the main aspects of the By-Law on POPs is the requirement to control production, placement on the market and use of POPs as substances, in formulations or as constituents of articles. Having regard to the fact that none of POPs pesticides or industrial substances are produced domestically, controlling import and/or placement on the market would constitute one of the main aspects of implementation. This element of the By-Law is expected to be associated with significant costs to public authorities and potentially industries, particularly in the context of industrial POPs and import of these as part of the articles

- Managing stockpiles, wastes and contaminated land constitutes the second part of comprehensive approach to POPs management as most of the current POPs stocks in Turkey have been imported to Turkey within articles, such as cars, electronic equipment, textiles etc. Recently adopted regulations on contaminated land, although associated with substantial cost to public authorities and owners of the sites, are being implemented as part of the Policy Option 1 or Business-as-usual scenario. POPs substances are already incorporated in the Annex I on risk assessment of sites in relation to human health exposure. At present, 4,000 potentially contaminated priority sites have been identified and will be assessed over the next 3 years. Such sites could include petrochemicals sites, large industrial facilities, old military basis (although special permissions would be required to access military sites). Following the entry into force of the CL Regulation (June 2015), all site owners will be required to fill in a form in line with their NACE codes. MoEU will compile and assess the forms provided and in instances when the sites appear suspicious will commission tests to determine the extent and nature of contamination. The assessment will take place in 3 steps: a) listing suspicious sites for investigation; and following assessment b) either confirming the sites as contaminated (or not) or c) keeping these as potentially contaminated. Depending on the results of assessment, remediation will be requested. At present there are 13 licensed investigation and remediation companies in Turkey. Owners of contaminated sites will be expected to cover the costs of assessment and remediation if any is required. Once a month a committee composed of MoEU, staff from Provincial Directorates and experts will meet to consider all contaminated land sites in the region. When determining contamination, new POPs are not on the list of chemicals considered when assessing contaminated land sites. The upcoming GEF project (June 2015) will have a component dedicated to integration of the contaminated land system with POPs By-Law to ensure that contaminated land sites are also filtered depending on the presence of POPs. There will be no additional administrative costs in terms of establishing the system and ensuring coherence between contaminated land and POPs initiatives as it will be tackled under the GEF project. However, as far as impacts on industries are concerned, costs of POPs tests are expensive.
- In the context of waste management, once a waste is determined to be hazardous it has to be disposed off appropriately and in accordance with the legislation. Waste analysis (determination of hazardous characteristics) is currently performed by the Tubitak Marmara Research Centre laboratory as it is able to carry out analysis and toxicity on fish. In the future, the Laboratory of the MoEU will be performing waste analysis as well. The system is operated in accordance with the polluter pays principle, with waste holders covering the costs of tests. Depending on the results and if wastes are classified as hazardous, waste owners are also responsible for covering the costs of treatment and disposal. In the case a hazardous waste being also contaminated with a POP, it would not impose significant additional burden, as it would be tackled appropriately in any case. However, if a household type wastes happen to be contaminated with POPs it would constitute a challenge. There are already PBDE limits for WEEE and systems in place to tackle PCBs (costs to be covered by waste owners). For other wastes potentially containing POPs a new system would need to be developed for collection, treatment and disposal (unless the concentration limits set are below typically anticipated content of POPs concerned in final articles). Waste bringing centres that are piloted at present, could play a role in assisting collection of the articles under consideration.

Requirements	**MoEU**
Art 6: Exemptions from control measures (relevant only if Appendix explicitly allows for such exemption)	Art 6(1). The MoEU is not expecting to develop LVs for unintentional trace amounts, i.e. impurities. Art 6(2). Overall, the provision is not affecting uPOPs. Similarly due to historic ban on pesticides, these POPs are unlikely to be affected either. The focus of this article will be on industrial substances such as PFOS, PBDEs, HBCDD, PCBs etc. The MoEU/ Chem D envisages the use of official requests to other Ministries and subsequent use of existing electronic format under SC for reporting. As MoEU does not hold information themselves, this provision will mainly entail collection and submission of the data received. The estimated manpower costs are about 10 manpower days to prepare. There is also a database, i.e. inventory of wastes held by the MoEU/ Waste Man Dep but it is not yet fully operational. The request for data will likely affect MoC for imported goods, formulations and chemicals. As far as domestic production is concerned, the Ministry of Industry is envisaging collection of production data by NACE codes in the future. Art 6(3)&Art 6(4) Authorisation of closed system intermediates will take place under REACH Art 18(4) (i.e. Policy Option 1). No additional administrative burden is expected. In the context of products containing POPs that are in use, inventory will need to be prepared along with maintenance and inspection provisions. Information is available on PCBs suggesting that 1,050 tonnes in use and as wastes. In the context of GEF project, 350 tonnes of PCBs will be disposed off. As part of UNEP project, 500 tonnes of PCBs

	tackled with liquids drained from transformers and sent for domestic disposal with solid metal parts sent to France. Total costs of this project is about 1.2 million USD. No data exists (in addition to the inventories prepared under NIP) regarding quantities of other POPs (PFOS, PBDEs) contained in articles.
Art 7 Stockpiles: Notification of stockpiles (greater than 50 kg) consisting of or containing any substance listed in Annex I or Annex II	Chem Dep: No MoEU /Chem D is anticipating to receive this information from other Ministries (stemming from their own inspection activities) and own Provincial directorates (on stocks). Monitoring of notified stockpiles will be a duty of Waste Management Department Other Dep: this will involve Waste Management Department in accordance with hazardous waste management.
Art 8 Release reduction, minimisation and elimination (inventories, action plan and permitting)	Chem Dep: No Art 8(1). Development of inventories will be an integral part of NIP update. No additional administrative burden is expected. Art 8(3). Permitting of new and existing facilities is a responsibility of EIA Directorate / Licensing and Authorisation department. Other Dep: Yes Turkey is a signatory to the EMEP Protocol and POPs Protocol (not yet ratified) under the UN Convention on Long-range Transboundary Air Pollution. Currently, air emissions inventory exists covering pollutants like NOx, PM10, SO2 etc (developed as part of a project). There are plans to expand the system by adding new pollutants, such as heavy metals (in a short-term). A technical assistance project will establish electronic inventory system using UNEP toolkit and compiling production data and emissions factors to calculate air emissions. The budget is 4.5 million TL (but it also include development of air quality models, not just an inventory). There is, however, no budget allocated to include POPs or heavy metals. Inclusion of Annex III POPs within air emissions inventory will require additional budget. The costs of developing original inventory were about 750,000 Euro (including other minor components). This budget seems to be a reasonable approximation of costs of developing POPs emission inventory (PCBs, PeCB, HCB, dioxins/durans, PAH).
Art 9 Waste management: application of concentration limits for POPs in wastes for derogations (in accordance with the limits set in the By-Law adopted through the Committee (Art 18).	Chem Dep: No At present PCB Reg is the only legal act that is waste/ POPs specific. Current classification system is distinguishing hazardous wastes, but not POPs wastes. In the future, further subordinated legislation might be required to tackle POPs waste issue. A duty of Waste Management Department. Other Dep: Yes In terms of administrative burden, Waste Department does not expect to develop and set own concentration limits. The work would be limited to uptake of the existing limits in the EU. Landfills: POPs are not monitored in the landfill leachate. Unless relevant legislation requires such monitoring and sets ELVs no specific requirements are set. Current discharge criteria are available. In the context of CL, the need to assess 4,000 sites within 3 years will require additional capacity. Currently there are 13 licensed companies equating to ~300 sites per company or 100 per company per year. Capacity of these companies will need to increase and/or more licences issued. Furthermore, assessment would also involve staff from provinces. Assuming 4h per site this would require 2.5 FTEs per year for 3 years.
Art 10 Implementation plan- periodic review and update, including information exchange with relevant institutions and obtaining approval	Yes. Chem Dep: Estimated frequency of NIP update is once every 3 years. Overall, introduction of new substance or changes to ELVs would necessitate NIP update within 2 years. The MoEU/Chem D estimated the following manpower requirements for updating the NIP (including inventories): 25 manpower days to update NIP (internally) 6 months expert hire to update inventories, NIP etc. Other Dep: if update will involve using available information – 7 manpower days between the three Departments. If data requests will be needed, more time will be required (~20-25 manpower days)
Art 11 Establishment of monitoring system for Annex III substances	Chem Dep: Yes There are few elements associated with monitoring: Development of monitoring information system. At present this is envisaged as a remote access electronic system allowing different Ministries and other stakeholders (such as Universities) to enter monitoring data for POPs). For instance, while academic institutions do not carry out periodic monitoring, their studies on POPs in biota and sediment are valuable for consideration. Such comprehensive monitoring data system will also allow for data gaps identification allowing for steps to be taken to close such knowledge gaps. Estimated costs of developing such data sharing system is 1,000,000 USD (GEF project proposal). Once such system is developed, maintenance of it will require additional manpower estimated to be within Laboratory staff (1 FTE). Monitoring costs including: Air quality department monitoring of Annex III substances. At present Turkey is not a party to the POPs Protocol but it is party to and report to EPER. Waste department monitoring of wastes and stockpiles against the set LVs. Other Dep: Yes Air monitoring: there are 200 fixed monitoring stations across the country with results being available online. Each province has at least 1 station. Marmara Research Centre has 39 fixed stations (included within 200 above) but it also measures additional parameters. It carries out passive sampling and possibly covers POPs. The Centre carries out calibration and maintenance of its equipment. Other stations are centrally maintained. In the future there are plans to increase 1 Clean Air centre to 8 with the network extended to 300 stations. Air quality monitoring infrastructure exists, but adding new substances will result in additional costs

	(see above)
Art 12 Information exchange within the Community and with third countries on POPs Information exchange - public information provision and awareness raising campaigns, trainings Information exchange –protection of confidential information	Yes. Chem Dep: Art 12(1). Provided estimate was 50,000TL every 2 years to organise a regional information sharing event. Art 12(2). At present there are no specific training/ awareness raising campaigns regarding POPs. It is not expected to result in additional administrative burden. Art 12(3). The provision will not affect the MoEU/ Chem D, i.e. it is not expected to result in additional administrative burden Air quality: cooperation and information exchange typically takes place in a form of bi-lateral projects (cooperation is decided by the Minister/governmental development strategies), different project activities and experience exchange with other countries. In terms of public awareness raising, air quality monitoring results are published in a Bulletin, shared online. There is also an Air quality project in a tendering stage (Improving air quality in metropolitan areas) and it has a public consultation component. Waste management: in the context of PCB wastes in particular activities included booklets, regional meetings, website on PCBs, trainings (government and private sector) Contaminated land: activities typically include trainings (including on remediation technologies), information exchange and sharing on innovative technologies. There is no separate project on soil issues, but CL Regulations have been developed through a project in 2010 (3.5 million TL budget).
Art 13 Cooperation in providing technical assistance to developing countries and economies in transition regarding POPs	No The provision will not affect the MoEU, i.e. it is not expected to result in any additional burden
Art 14 Reporting: on i) application of the By-Law and any infringements or penalties (RI to MoEU every 3 years); ii) production and placement on the market of Annex I and Annex II substances (RI to MoEU every year); iii) stockpiles, release inventories and monitoring (RI to MoEU every 3 years). MoEU to compile the data provided and report to the Secretariat of the Convention	Yes. Chem Dep: the estimated manpower costs are 3 FTE annually to deal with all additional administrative requirements (2016-2028). Average costs are 4,500 TL per month.
Art 18 Chemicals and Waste Advisory Committee -harmonization of national policies, provision of a platform for information exchange, monitoring and evaluation of implementation of the By-Law	Yes. Chem Dep: captured above Other Dep: estimated typically 2-4 days per year (total).

MoEU Permitting and Licences Department is responsible for permitting, licensing and inspections as well as authorisation of hazardous wastes for export.

Permitting:

- The process is implemented in accordance with Regulations on Permitting and Licensing. Once a facility falls within the scope of the Regulations it applies for a licence. Initially a temporary licence is given for 1 year based on a basic information regarding process, production etc. Subsequently the facility needs to get a licence (valid for 5 years) and comply with emissions and discharge standards. Permits cover 4 topics- wastewater, air, deep sea discharge and noise. Licences cover 21 topics (25 in total). There are currently about 10,000 permits and licences issued for manufacturing facilities, recycling facilities, incineration plants, LCPs etc. There is a database of licences but it cannot be queried (i.e. used for generating statistics by sector etc.). An estimate provided suggests that about 10-15% of installations are believed to be licensed. Implementation of current consent conditions is problematic, but adding new POPs substances would become even more challenging.
- Manpower involved in licensing is as follows: 40 staff members (centrally responsible for Annex I installations); 300 staff members in provincial directorates (within 1,200 estimate below).
- IPPC has not yet been implemented with anticipated timeline being 2020 for new facilities. Instant implementation would costs about 30 million TL.

- Substances prescribed are listed in the Industrial source regulations (updated recently, November 2014).

Inspections:

- The process includes visiting facilities and checking for authorisation, checking process, appropriateness of discharge/ disposal processes etc.
- There are on average 40,000 inspections per year (35,000-45,000)
- Centrally, about 300 inspections takes place (most problematic sites), the rest is administered by Provincial Directorates.
- Inspections usually take place once in 2 years.
- Following the shift from combined to IPPC licensing, staff training will be required (about 30 people centrally and 1,200 across the whole country)

Hazardous wastes:

- Key responsibilities include export of hazardous wastes including PCBs and in line with ROHS. Any changes to waste ELVs would require changes to other legislation and procedures (e.g. waste classification etc.). The scope of responsibilities exclude domestic waste management and import/ export of products and articles.
- UNEP project on PCB equipment (mostly transformers) has included collection, treatment by licensed companies and export after receiving consent.
- Export of hazardous wastes takes place in accordance with the Basel Convention provisions.
- Import of wastes is strictly prohibited with the exception of inert wastes (such as glass, scrap metal etc. imported for recycling).
- There are 4 Product safety regulations published by the Ministry of Economy including import of wastes, scrap metal, coal and solid fuel and product based batteries and accumulators.
- Other two relevant product safety regulations (not related to this department but, related to MoFAL and Air Quality Management Department of MoEU) are Safety Regulation regarding materials which deplete ozone layer, and Safety regulation regarding inspection of product safety.

Ministry of Food, Agriculture and Livestock (MoFAL)

Ministry of Food and Agriculture suggests that having regard to the fact that all POPs pesticides are either have been banned or never licensed in Turkey the Ministry would not be affected substantially in terms of additional burden. They do not expect to develop inventories or establish environmental monitoring system for POPs pesticides (although the work carried out by Ministry of Forestry and Water Affairs on monitoring of POPs pesticides in surface water is noted). Key activities, in addition to taking preventative steps in carrying out future assessments and licensing of pesticides (covered in the section above), include participation in coordination activities through the Art 18 Committee.

Requirements	**MoFAL**
Art 6: Exemptions from control measures (relevant only if Appendix explicitly allows for such exemption)	No The provision will not affect the MoFAL and it is not expected to result in any additional burden
Art 7 Stockpiles: Notification of stockpiles (greater than 50 kg) consisting of or containing any substance listed in Annex I or Annex II	No The provision will not affect the MoFAL and it is not expected to result in any additional burden
Art 8 Release reduction, minimisation and elimination (inventories, action plan and permitting)	No The provision will not affect the MoFAL and it is not expected to result in any additional burden Annex III substances include PeCB and HCB which were either never licensed in Turkey (for

	agricultural use) or have been banned in the past (in 1950's). There is no current agricultural use for PeCB and HCB, so no releases of these substances from agricultural sources are anticipated that would need to be addressed.
Art 9 Waste management: application of concentration limits for POPs in wastes for derogations (in accordance with the limits set in the By-Law adopted through the Committee (Art 18).	No. The provision will not affect the MoFAL and it is not expected to result in any additional burden
Art 10 Implementation plan- periodic review and update, including information exchange with relevant institutions and obtaining approval	No The provision will not affect the MoFAL and it is not expected to result in any additional burden MoFAL suggested that updating of the NIP will not cause additional burden to them as POPs pesticides have been banned already. Any approval would be a quick formality not entailing additional administrative burden.
Art 11 Establishment of monitoring system for Annex III substances	No The provision will not affect the MoFAL and it is not expected to result in any additional burden There is no monitoring system of POPs pesticides in operation. In the context of PeCB and HCB these POPs have either never been licensed for agricultural use or banned a long time ago. Any studies on environmental concentrations and human exposure to other POPs pesticides (e.g. OCPs) have been taking place on an ad-hoc basis, as part of scientific research projects. One project, in cooperation with the Ministry of Forestry and Water has analysed POPs pesticides in water across more than 20 provinces. In addition, results of individual studies, measuring HCB or PeCB are available, but these are not part of a monitoring system. MoFAL does not expect to develop environmental monitoring system for these two substances.
Art 12 Information exchange within the Community and with third countries on POPs Information exchange - public information provision and awareness raising campaigns, trainings Information exchange –protection of confidential information	No. Article 12(1) – information exchange with EU and third countries (captured under the Art 18 assessment). Article 12(2) – participation in awareness raising and training activities. MoFAL is running a certification programmes for farmers to apply pesticides. These trainings are organised and run by provincial directorates for agriculture. Each training is taking 1-2 days and is carried out by the staff of provincial directorates and using their premises. There is no separate budget for the trainings and it constitutes a part of normal daily operation of provincial directorates. If needed, POPs related issues can be incorporated in the trainings and would not require any additional budget. 12(3) Licensing dossiers are confidential due to commercial data included. MoFAL is publishing information on active substances rather than on products themselves. Compliance with this provision will not constitute an additional burden.
Art 13 Cooperation in providing technical assistance to developing countries and economies in transition regarding POPs	No The provision is not expected to result in any additional burden to MoFAL No such technical assistance projects have taken place within the department to date. Any technical assistance projects require political approval by the Minister. Once such approval is granted, budget will be allocated. The exact extent of such future projects cannot be predicted at present. But in terms of POPs related projects the provision is not expected to affect the MoFAL significantly, i.e. it is not expected to result in significant additional administrative burden.
Art 14 Reporting: on i) application of the By-Law and any infringements or penalties (RI to MoEU every 3 years); ii) production and placement on the market of Annex I and Annex II substances (RI to MoEU every year); iii) stockpiles, release inventories and monitoring (RI to MoEU every 3 years). MoEU to compile the data provided and report to the Secretariat of the Convention	No The provision will not affect the MoFAL and it is not expected to result in any additional burden. There are no POPs pesticides produced, placed on the market or used in Turkey. Reporting on stockpiles, monitoring and emission inventories have been addressed aboved and is not expected to result in additional administrative burden. At present, all imports of pesticides are requiring pre-authorisation from the MoFAL. At the end of each year, MoFAL is requiring to submit importers annual reports on import versus sales data.

Art 18 Chemicals and Waste Advisory Committee -harmonization of national policies, provision of a platform for information exchange, monitoring and evaluation of implementation of the By-Law	Yes. MoFAL estimates 2 people to be allocated to the activity twice a year (4 manpower days plus travel expenses).

Ministry of Forestry and Water Affairs

Ministry of Forestry and Water Affairs would not be affected substantially in terms of additional administrative or monitoring burden over and above the requirements under the current legislation.

The single and most extensive task that MoFWA is involved in currently is developing monitoring system for pollutants in surface waters of Turkey including POPs. This work, however, takes place in accordance with the transposed Article 8 and Annex V of the WFD and 2013/39/EC Directive requirements as opposed to being driven by the proposed By-Law on POPs. The same normative acts also envisage development of River Basin Management Plans with the aim to ensure achievement of good chemical status in all surface water bodies in Turkey. Additional measures aiming to reduce emissions of Priority / Priority Hazardous Substances and specific pollutants (many of which are POPs) to surface waters can be included in Programmes of Measures under RBMPs and further support reduction of emissions and releases of POPs.

Key activities in the context of the By-Law on POPs will include participation in updating NIP, ensuring coordination on monitoring programmes and setting limit values for POPs concentrations in wastes as well as participation in coordination activities through the Article18 Committee.

Requirements	**MoFWA**
Art 6: Exemptions from control measures (relevant only if Appendix explicitly allows for such exemption)	No The provision will not affect the MoFWA, i.e. it is not expected to result in any additional burden
Art 7 Stockpiles: Notification of stockpiles (greater than 50 kg) consisting of or containing any substance listed in Annex I or Annex II	No The provision will not affect the MoFWA, i.e. it is not expected to result in any additional burden
Art 8 Release reduction, minimisation and elimination (inventories, action plan and permitting)	No The provision will not affect the MoFWA, i.e. it is not expected to result in any additional burden
Art 9 Waste management: application of concentration limits for POPs in wastes for derogations (in accordance with the limits set in the By-Law adopted through the Committee (Art 18).	Yes. In the future, waste concentration limits for POPs will need to be set in a manner ensuring consistency with the set EQS in relation to these substances. Cooperation with the MoEU will be needed to achieve this (in order to ensure that the waste concentration limits are not set at such a level that would jeopardize achievement of the EQS in WBs). The estimated manpower requirements are provided using the EQS development project as reference. Work on the EQS has required 5 people working 30% of their standard load for a year to develop system and EQS. This equates to about 1.5 FTE for one year to develop the standards.
Art 10 Implementation plan- periodic review and update, including information exchange with relevant institutions and obtaining approval	Yes. Manpower requirements for the MoFWA will depend on anticipated extent of update. The estimates provided were: 1 week for the update and 1 day for the sign-off for each round of NIP update.
Art 11 Establishment of monitoring system for Annex III substances	No The provision will not affect the MoFWA and it is not expected to result in any additional burden. MoFWA will monitor 117 chemicals including POPs in surface water in accordance with the transposed Article 8/ Annex V of the WFD. State Hydraulic Works will be responsible for monitoring activities covering PS/PHS and certain pollutants under the WFD and 2013/39/EC Directive with costs attributable to Policy Option 1 as opposed to new By-Law on POPs
Art 12 Information exchange within the Community and with third countries on	No.

POPs Information exchange - public information provision and awareness raising campaigns, trainings Information exchange –protection of confidential information	Art 12(1). Current activities in terms of cooperation and information sharing include participation in CIRCA (WFD) estimated at about 2 times per year per staff member. There is also an EU project on capacity building in monitoring that also included some measurements in sediment and biota. Art 12(2). At present there are no specific training/ awareness raising campaigns regarding POPs. In the future, RBMPs will require extensive public consultation on RBMPs and significant water management issues (including management of Priority/Priority Hazardous Substances). But these activities will be taken place under the WFD and not in relation to the By-Law on POPs specifically. There might also be a need to carry out trainings of institutions on monitoring / sampling. Art 12(3). The provision will not affect the MoFWA, i.e. it is not expected to result in any additional burden
Art 13 Cooperation in providing technical assistance to developing countries and economies in transition regarding POPs	No The provision will not affect the MoFWA, i.e. it is not expected to result in any additional burden. There are few bi-lateral projects, with countries such as Uruguay, Afghanistan etc. regarding exchange of information. Any such cooperation is driven and determined by political will. Once the Minister approves such activities, appropriate budget allocated. In order for this to happen, the Ministry of Development would need to have included such activities in the list of priority areas. The exact extent of such future projects cannot be predicted at present. But in terms of POPs related projects the provision is not expected to affect the MoFWA significantly, i.e. it is not expected to result in significant additional administrative burden.
Art 14 Reporting: on i) application of the By-Law and any infringements or penalties (RI to MoEU every 3 years); ii) production and placement on the market of Annex I and Annex II substances (RI to MoEU every year); iii) stockpiles, release inventories and monitoring (RI to MoEU every 3 years). MoEU to compile the data provided and report to the Secretariat of the Convention	No The provision will not affect the MoFWA, i.e. passing on this information to the MoEU is not expected to result in additional administrative burden. MoFWA does not hold information on production, placement on the market and use of POPs chemicals or on stockpiles of the chemicals. However, monitoring summaries will be provided by the State Hydraulic Works to the MoFWA regularly once they commence monitoring of surface water bodies. The summaries will be sent to the MoFWA. These summaries are expected to include the results and description of potential sources, directing follow up and checking by the MoEU.
Art 18 Chemicals and Waste Advisory Committee -harmonization of national policies, provision of a platform for information exchange, monitoring and evaluation of implementation of the By-Law	Yes. The estimated manpower costs of participating are 1-2 staff members participating for 1 day each (equivalent to 1-2 manpower days per year).

Ministry of Customs and Trade

Ministry of Customs and Trade suggests that in terms of administrative and information provision burden it would not be affected substantially.

In terms of administrative tasks, key activities include development of risk based approach to customs control, participation and approval of NIP, reporting on imports of products at risk of containing POPs and participation in coordination activities through the Committee.

However, in terms of ensuring compliance with the provisions of the By-Law, it will play a significant role. While MoCaT does not operate any chemicals or pesticides authorisation schemes, due to the nature of its core responsibilities, it controls imports of substances, preparations and articles.

Article 5 of the By-Law states that production, placement on the market and use of POPs substances listed is prohibited (unless one of the exemptions from the Article 6 applies). MoCaT is responsible for customs control and holds information on chemicals, formulations and articles crossing border as per declaration form provided; it does not, however, check for the presence of certain chemicals as constituents of imported articles. MoC is carrying out sampling and testing to confirm GTIP number but not POPs content. MoC does not have manpower to stop and test all shipments containing goods potentially at risk of containing POPs.

In the past, any ban of certain chemicals was first reflected in the product safety legislation administered by the Ministry of Economy. Once, relevant GTIP numbers are identified, MoC becomes responsible for implementation. However, in the case of pesticides, pre-authorisation for import needs to be first obtained from the MoFAL. MoFAL, for instance, is responsible for testing and assessing import requests for pesticides and food.

One potential approach to implementing the ban and providing information on products containing POPs, would be for the MoEU to list potentially affected GTIP numbers (i.e. to identify all products that might contain POPs). Once the list of potentially risky products is composed and a container carrying any of these products reaches the border, pre-authorisation for import would need to be obtained from the MoEU. MoEU would consider declaration form, order any necessary tests (with the costs to be recovered from the importer) and depending on the results pre-authorise entry or not. In such a case, additional workload for MoC would be negligible. Still, such approach would be prohibitively manpower intensive and extremely costly to importers. A risk management approach can be develepod instead reflecting the types of the articles (GTIP numbers), manufacturing country and anticipated likelihood of POPs presence (as it will be impractical to test every single shipment with given articles at the border).

Information sharing protocol might be extended to allow MoEU access to their database to aid with implementation as 4,000 staff at the customs will not be sufficient to absorb additional duties and associated workload. Furthermore, in legal terms customs officers cannot be tasked with additional duties stemming from the legislation of other Ministries. They are only liable to comply with the requirements and scope of their duties as set out in the Law by MoC.

Predicting additional manpower required is not feasible as the list of GTIP numbers (and hence, articles) is not known, import quantities of these articles are not available. Furthermore, the number of tests and checks will depend on the how these articles are distributed in terms of number of containers and numbers of samples requested by the officers. For instance, in the case of a packaged container, 3 samples would be taken per 10,000 packaging.

In the context of tests, costs of these are typically recovered from importers. There is, however, a threshold as MoC can only recover base prices (185 TL per 1 sample and 600 TL per 3 samples). Besides, the imposed maximum number of samples for the purpose of cost recovery is still 3. In other words, if 50 samples are taken and analysed, the importer will only be billed back for 600 TL. Other challenges include the issue of LOD and potential lack of accredited laboratories as well as delays. For a comparison, the longest waiting time for GTIP tests are 2-3 days (usual waiting time is 2 hours), while POPs tests will require 10 days as a minimum causing significant delays. Despite the experience of some of the EU countries with rapid testing equipment for the use at customs, development of appropriate risk management approach is of utmost importance.

For the purpose of this assessment, the provided example of about 120 staff members responsible for waste products approval at the MoC (specialty customs, for export) is used.

Requirements	**MoCAT**
Art 6: Exemptions from control measures (relevant only if Appendix explicitly allows for such exemption)	Yes. MoC is responsible for customs control and holds information on chemicals, formulations and articles crossing border as per declaration form provided. The lowest data resolution is GTIP number (combined nomenclature code for goods). In the case of chemicals or mixtures imports declaration does not require to provide CAS numbers. There is a voluntary field that is typically filled in about 10% of cases. At the same time a single GTIP number can correspond to hundreds of CAS numbers. Any data provided based on GTIP (assuming that potentially relevant GTIP numbers in the context of POPs are identified) will constitute an overestimate due to inclusion of other substances under the same code. Expanding or changing customs declaration forms does not constitute a viable option either. In the case of articles, customs does not check for the presence of certain chemicals as constituents of imported articles. MoC is carrying out sampling and testing to confirm GTIP number but not POPs content. In terms of the data provision, MoC would be able to provide information on the quantity/ value of goods by GTIP number / country that are deemed potentially at risk of containing POPs. This would represent a maximum pool of articles imported that might contain POPs. There is no way of providing information on POPs content within imported articles at present.
Art 7 Stockpiles: Notification of stockpiles (greater than 50 kg) consisting of or containing any substance listed in Annex I or Annex II	No The provision will not affect the MoC, i.e. it is not expected to result in any additional administrative burden
Art 8 Release reduction, minimisation and elimination (inventories, action plan and permitting)	No The provision will not affect the MC, i.e. it is not expected to result in any additional burden

Art 9 Waste management: application of concentration limits for POPs in wastes for derogations (in accordance with the limits set in the By-Law adopted through the Committee (Art 18).	No The provision will not affect the MoC, i.e. it is not expected to result in any additional administrative burden
Art 10 Implementation plan- periodic review and update, including information exchange with relevant institutions and obtaining approval	Yes. The estimated manpower requirements are as follows: Approval – 1 manpower hour Minor change -1 day Significant changes – 10 days (2 staff members for a week)
Art 11 Establishment of monitoring system for Annex III substances	No The provision will not affect the MoC, i.e. it is not expected to result in any additional administrative burden
Art 12 Information exchange within the Community and with third countries on POPs Information exchange - public information provision and awareness raising campaigns, trainings Information exchange –protection of confidential information	Yes Article 12(1) – The provision will not affect the MoC, i.e. it is not expected to result in any additional administrative burden. Article 12(2) – MoC is holding regular staff trainings. Such trainings take place once every 6 months and could incorporate 1-2h dedicated to POPs. For the purpose of the assessment time required to develop such training is assumed to be 1 manpower day per year 12(3) In the context of information sharing, cooperation between MoC and MoEU could include Risk management department and be based on the Information protocol that is currently under development.
Art 13 Cooperation in providing technical assistance to developing countries and economies in transition regarding POPs	No The provision will not affect the MoC, i.e. it is not expected to result in any additional administrative burden
Art 14 Reporting: on i) application of the By-Law and any infringements or penalties (RI to MoEU every 3 years); ii) production and placement on the market of Annex I and Annex II substances (RI to MoEU every year); iii) stockpiles, release inventories and monitoring (RI to MoEU every 3 years). MoEU to compile the data provided and report to the Secretariat of the Convention	Yes MoC would only contribute to the Art 14(2) data on placing on the market. Developing the list of GTIP numbers of articles potentially at risk would take about 12 manpower days.
Art 18 Chemicals and Waste Advisory Committee -harmonization of national policies, provision of a platform for information exchange, monitoring and evaluation of implementation of the By-Law	Yes. The provision will not affect the MoC significantly. The estimated manpower requirements suggest 3 manpower days per attendance (2 preparation and 1 attendance). Assuming bi-annual meetings the estimated manpower requirements are 6 manpower days a year.

Ministry of Health

Ministry of Health would not be affected substantially in terms of additional administrative or monitoring burden over and above the requirements under the current legislation.

Key activities in the context of the By-Law on POPs will include participation in updating NIP, ensuring coordination on setting limit values for POPs concentrations in wastes as well as participation in coordination activities through the Article18 Committee.

Requirements	**MoH**
Art 6: Exemptions from control measures (relevant only if Appendix explicitly allows for such exemption)	No. The provision will not affect the MoH, i.e. it is not expected to result in any additional administrative burden
Art 7 Stockpiles: Notification of stockpiles (greater than 50 kg)	No The provision will not affect the MoH, i.e. it is not expected to result in any additional administrative burden

consisting of or containing any substance listed in Annex I or Annex II	Overall, the MoH does not have a responsibility to search for stockpiles. But if a chemical stockpile is reported to the MoH by a member of public, they are able to pass the information on (from a database) to the MoEU. In addition, Poison Centre calls are recorded as well.
Art 8 Release reduction, minimisation and elimination (inventories, action plan and permitting)	No The provision will not affect the MoH, i.e. it is not expected to result in any additional burden. Until 2003, MoH was responsible for emission licensing. Since then, the responsibility has shifted to the MoEU. MoH does not have or hold uPOPs inventory data.
Art 9 Waste management: application of concentration limits for POPs in wastes for derogations (in accordance with the limits set in the By-Law adopted through the Committee (Art 18).	Yes. MoH can provide support in executing the task as opposed to being responsible for detecting limit values. Manpower requirements are estimated under the Article 18.
Art 10 Implementation plan- periodic review and update, including information exchange with relevant institutions and obtaining approval	Yes. The estimated manpower requirements are as follows: Approval – 2 manpower days Minor change -3-4 days Significant changes – 10-15 days
Art 11 Establishment of monitoring system for Annex III substances	No The provision will not affect the MoH, i.e. it is not expected to result in any additional administrative burden In particular, MoH does not operate any environmental monitoring programmes. It can, however, support MoEU where possible. Once MoH learns about a substance that may be of human health concern, it informs MoEU and advises on the need to carry out monitoring. For instance, one of such advices was to measure benzo(a)pyrene or the need to measure PAH levels emitted by the recycled rubber clad playgrounds. MoH is acquiring information on chemicals of concern from the EU alert system. There are also no consistent and periodic human exposure studies to chemicals of concern. Typically, any human/ environmental exposure studies are carried out in cooperation with universities and commence with a provincial directorate of Health raising concerns about specific issue/ chemical. A study is then carried out in cooperation with appropriate research institution with capabilities to carry out such studies. Results of such pilot/ individual studies are then extrapolated to other regions as necessary. There is one ongoing 2 year study on hazardous chemicals (some of which are POPs but largely focusing on heavy metals). The locations studied include heavily industrialised and polluted Koacelli and a reference location. The results of the study are not available for dissemination/ sharing.
Art 12 Information exchange within the Community and with third countries on POPs Information exchange - public information provision and awareness raising campaigns, trainings Information exchange –protection of confidential information	No Article 12(1) – information exchange with EU and third countries. The MoH suggests that if such information exchange is ever taking place regarding POPs it will involve very high ranking officials. No additional administrative burden estimates are provided, but likely to be none or negligible (over and above typical daily operations). Article 12(2) – it is not expected to result in any additional administrative burden. 12(3) Licensing of biocidal products is in accordance with existing confidentiality protocols. Compliance with this provision will not constitute an additional administrative burden.
Art 13 Cooperation in providing technical assistance to developing countries and economies in transition regarding POPs	No In terms of POPs related projects the provision is not expected to affect the MoH significantly, i.e. it is not expected to result in any significant additional administrative burden. MoH carries out a range of bi-lateral projects with countries like Iran, Afghanistan, Somali, Pakistan etc. However none of these projects were on POPs. The exact extent of such future projects cannot be predicted at present.
Art 14 Reporting: on i) application of the By-Law and any infringements or penalties (RI to MoEU every 3 years); ii) production and placement on the market of Annex I and Annex II substances (RI to MoEU every year); iii) stockpiles, release inventories and monitoring (RI to MoEU every 3 years). MoEU to compile the data provided and report to the Secretariat of the Convention	No The provision will not affect the MoH, i.e. it is not expected to result in any additional administrative burden over and above passing on the data on notified chemicals stockpiles.
Art 18 Chemicals and Waste Advisory Committee -harmonization of national policies, provision of a platform for information exchange, monitoring and evaluation of implementation of the By-	Yes. The provision will not affect the MoH significantly. The estimated manpower requirements suggest 2 manpower days per year.

Law	

Ministry of Science, Industry and Technology

Ministry of Science, Industry and Technology would not be affected substantially in terms of additional administrative or monitoring burden over and above the requirements under the current legislation.

Given the scope of its core responsibilities, the Ministry is not anticipated to be involved in monitoring, stockpile and waste management activities, or, for that matter, control of production, placement on the market and use of POPs or articles containing POPs. The Ministry only involved in REACH Annex XVII workstreams.

However, the Ministry can act as a source of detailed information on annual production volumes by sectors and product codes. While limitations, current challenges with data accuracy are noted, as well as the fact that the lowest data resolution is PRODTR codes that do not allow distinguishing between articles containing POPs from POPs-free articles, the reporting system provides good basis for developing inventories or estimating total stocks of domestically manufactured products that could potentially contain POPs.

Key activities in the context of the By-Law on POPs will include participation in updating NIP, reporting, focusing, in particular on manufacturing sectors and participation in coordination activities through the Article18 Committee.

Requirements	**MoSTI**
Art 6: Exemptions from control measures (relevant only if Appendix explicitly allows for such exemption)	MoSTI holds information reported on production volumes (by PRODTR codes but not by products containing POPs). MoSTI has cooperated in the past with MoEU to assist in developing activity based inventories. MoSTI holds a **database** with reported production volumes by NACE/ PRODTR codes. The data is filled online by companies. There are about 120,000 registered companies on the system. In total, according to Turkish Statistics in 2012 there were 337,000 manufacturing companies. However, in terms of capacity, registered companies account for about 80% of total production capacity of the country. After a company is registered on the system, the MoSTI approves it followed by reporting. A number of challenges exist: data accuracy is questionable. The majority of industries are concentrated in couple of regions. For instance, Istanbul alone accounts for ~20% (25,000 companies reporting). Given the number of staff, inspections carried out to check the declarations are not sufficient. For instance, Istanbul region has 12 people, while required manpower would be about 50. At the design level, if data were more reliable, this would form good basis for developing emissions inventory. Production data reported for the same sectors/ products often appear in different units. For instance, the same product can be reported in tonnes, pairs, km etc. Data extraction, therefore, requires manual processing to convert the data available to consistent units. As an example, preparing of production data for chemicals sector took about 12 manpower days. The system of registration and authorisation can be improved. MoSTI develop: sectoral strategies (textile, chemical, automotive, machinery, metal, electric and electronic, mineral products).
Art 7 Stockpiles: Notification of stockpiles (greater than 50 kg) consisting of or containing any substance listed in Annex I or Annex II	There are no records of chemicals manufactured by CAS#, for instance. The MoSTI holds information reported on production volumes (by PRODTR codes but not on POPs chemicals stockpiles). The lowest level of data resolution is PRODTR code (for chemical industries outputs as well). If relevant product codes are provided, data on total production volumes can be provided.
Art 8 Release reduction, minimisation and elimination (inventories, action plan and permitting)	No The provision will not affect the MoSTI, i.e. it is not expected to result in any additional burden.
Art 9 Waste management: application of concentration limits for POPs in wastes for derogations (in accordance with the limits set in the By-Law adopted through the Committee (Art 18).	No. The provision will not affect the MoSTI, i.e. it is not expected to result in any additional administrative burden
Art 10 Implementation plan- periodic review and update, including information exchange with relevant institutions and obtaining approval	Yes. Likely activities would include: responding to data requests, participation in trainings. Impacts captured under reporting below.
Art 11 Establishment of monitoring system for Annex III substances	No The provision will not affect the MoSTI, i.e. it is not expected to result in any additional administrative burden
Art 12 Information exchange within the	No

Community and with third countries on POPs Information exchange - public information provision and awareness raising campaigns, trainings Information exchange –protection of confidential information	Art 12(1). MoSTI is a member of Prohibition of Chemical Weapons (OPCW); LAHEY Art 12(2) Face-to-face trainings on industry reporting (120k companies) would not be feasible. There was a project on developing on online/ remote training tool, but MoSTI saw no improvement in quality of reporting afterwards Art 12(3) Confidentiality of data is set out under the Statistics Law. As a rule of thumb, data from less than 3 companies cannot be published. Company specific data cannot be shared publicly. However MoSTI can be authorized to provide such information under specified circumstances.
Art 13 Cooperation in providing technical assistance to developing countries and economies in transition regarding POPs	No The provision will not affect the MoSTI, i.e. it is not expected to result in any additional administrative burden
Art 14 Reporting: on i) application of the By-Law and any infringements or penalties (RI to MoEU every 3 years); ii) production and placement on the market of Annex I and Annex II substances (RI to MoEU every year); iii) stockpiles, release inventories and monitoring (RI to MoEU every 3 years). MoEU to compile the data provided and report to the Secretariat of the Convention	Yes Capacity includes 8 people across different departments plus 3-4 from the IT department totalling to 11 staff members (for the purpose of the assessment 5% of their time is assumed). There is a pilot project aimed to develop an integrated database on economic activities including data like production value, costs etc. It is run in cooperation with MoE, MoLSS, MoF and Statistics. The database is open to public access, although some parts of it are closed. If MoEU is requesting data and referring to the Enterprise system access can be arranged. However, in instances when MoSTI does not have information, for instance on the extent of use of certain chemical substances in production of textile clothing, MoSTI would need to consult companies potentially affected (for the purpose of the assessment, same amount of time required to extract sectoral data is used as a proxy).
Art 18 Chemicals and Waste Advisory Committee -harmonization of national policies, provision of a platform for information exchange, monitoring and evaluation of implementation of the By-Law	Yes. The estimated requirements are 2-3 people from different departments twice a year involved. It will also be important to include other stakeholders and industry representatives such as Turkish Union of Chambers and Commodity Exchange who holds valuable experience in sectors.

Ministry of Labour and Social Security (MoLSS)

Overall the Ministry is an important stakeholder but is unlikely to be affected by the provisions of the By-Law. They are primarily concerned with occupational exposure and industrial/ workplace incidents involving chemicals. Overall, the data compiled include instances of occupational illnesses, number of workers affected and statistics on cancer cases (most frequently associated with VOC).

To date their records show no incidents of occupational exposure involving POPs (checked by CAS#). However, the systems of records might not reflect the complete picture due to underreporting of accidents, issues with illegal workers and insufficient capacity of inspectorate.

Information on linking workers exposure to cancer is also compiled using bottom up approach, i.e. data is based on health claims against employers. However, linking conclusively cancer cases to occupational exposure might be challenging sometimes exacerbated by the fact that workers would be employed in multiple work places simultaneously.

Overall, most problematic sectors include mining, construction and metal. In order for MoLSS to start considering specific POPs, occupational health legislation would need to be updated accordingly to include these substances.

Two main regulations related to responsibilities of MoLSS, occupational health and safety are: “Legislation on import of materials that effect occupational health and safety” and “Regulation on Health and Safety Precautions for works with Chemical Materials”

For the purpose of the assessment, it was assumed that MoLSS would participate in updating and approving NIP (2 manpower days once every 3 years), providing information on any notified cases of exposure to POPs or POPs stockpiles if any (1 manpower day once every 3 years) and participating in coordination activities through the Article18 Committee (2 manpower days per year).

Ministry of Energy and Natural Resources

Overall the Ministry is an important stakeholder but is unlikely to be siginificantly affected by the provisions of the By-Law.

In the context of POPs substances, the Ministry is largely concerned about PCB-containing equipment. The issue, however, is fully covered by the existing legislation in place and proposed By-Law would not impose additional requirements regarding PCBs.

On the other hand, Annex III emissions might also be of concern to the MoENR and energy sector in general (particularly, PCDD/PCDF and PCB-DL emissions from combustion). The sector, however, is already regulated under LCP Directive and IPPC that would result in reduction of these POPs emissions as a co-benefit.

The Ministry suggested that while there is an ongoing project regarding disposal of PCB containing capacitators and they might participate in the Article 18 committee, the Ministry does not hold any stockpiles, does not have any monitoring or inventory data.

However, for the purpose of the assessment, it was assumed that MoENR would at least participate in updating and approving NIP (2 manpower days once every 3 years), reporting on articles in use containing POPs (1 manpower day per year), on stockpiles and inventory data if any (2 manpower days once every 3 years) and participating in coordination activities through the Article18 Committee (2 manpower days per year particularly in relation to PCB containing equipment and waste).

Ministry of Economy

Ministry of Economy did not provide response regarding anticipated impacts of proposed By-Law on their operations. For the purpose of this assessment, responses from the Ministry of Customs have been used as a proxy.

Administrative costs to public authorities - summary (all POPs)

Implementation of the By-Law will entail companies to provide information to public authorities including on stockpiles, articles in use, wastes generated. Industries are also expected to participate in development and review of the NIP and Article 18 Committee's activities.

Total annual estimated administrative costs to industries (to all sectors) to comply with the imposed administrative burden are presented in the table below.

Table 4.26 Annual estimated administrative costs to public authorities

Ministries	**Annual costs, TL**
Ministry of Customs and Trade	4,641
Ministry of Economy	4,125
Ministry of Energy and Natural Resources	1,262
Ministry of Food, Agriculture and Livestock	5,565
Ministry of Forestry and Water Affairs	8,133
Ministry of Health	21,370
Ministry of Labor and Social Security	874
Ministry of Science,Industry and Technology	52,513
Ministry of Environment and Urbanization	569,475
Total	667,958

Overall, annual administrative costs to public authorities are estimated to be about 0.7 million TL per year.

Monitoring costs to public authorities (all POPs)

Soil monitoring

Implementation of the By-Law would entail establishing a monitoring system for the Annex III substances, including dioxins, furans, dioxin like PCBs, HCB and PeCB.

Soil monitoring would entail monitoring of agricultural land, forests and protected areas. The estimated range of potential monitoring points is summarised in the table below.

Table 4.27 Number of soil monitoring points

	All sites	Selected sites (used for POPs monitoring)	Number of samples per site per year
Agricultural land	1991	321	4
Protected areas	34	4	4
Forests	481	481	1-5

Estimated costs of sampling and analysis are presented in the table below.

Table 4.28 Annual monitoring costs of POPs in soils

	Sampling, TL per year	Analysis, TL per year
Agricultural land, all points	3,424,480	36,023,409
Agricultural land, selected points	552,336	1,452,557
Protected areas, all points	57,752	607,516
Protected areas, selected points	7,219	18,985
Forests, low number of horizons present	206,734	2,174,714
Forests, high number of horizons present	1,033,670	10,873,571
All soil monitoring, all points	**4,515,903**	**47,504,496**
All soil monitoring, selected points/horizons	**766,289**	**3,646,256**

Total estimated annual costs of sampling and analysis of soils are estimated between 4.4 million TL and 52 million TL per year depending on number of sampling points chosen.

Air monitoring

Implementation of the By-Law would entail establishing a monitoring system for the Annex III substances in the air, including dioxins, furans, dioxin like PCBs, HCB and PeCB.

Air monitoring would entail passive and active monitoring. The estimated range of potential monitoring points and frequency is summarised in the table below.

Table 4.29 Number of air monitoring points

Design	Active sampling	Frequency	Passive sampling	Frequency
Proposed monitoring design paper, min	22	52	80	4-12
Proposed monitoring design paper, max	36	52	120	4-12
Using existing air quality monitoring network, min	200	52	200	4-12
Using existing air quality monitoring network, max	300	52	300	4-12

Estimated costs of sampling and analysis are presented in the table below.

Table 4.30 Annual monitoring costs of POPs in air

	Proposed monitoring design paper	**Using existing air quality monitoring network**
Minimum number of sites – annualised equipment costs	300,000	2,682,000
Maximum number of sites – annualised equipment costs	490,000	4,024,000
Minimum number of sites – annual costs, low frequency	14,677,088	112,283,733
Maximum number of sites – annual costs, low frequency	23,579,584	168,425,600
Minimum number of sites – annual costs, high frequency	21,093,301	128,324,267
Maximum number of sites – annual costs, high frequency	33,203,904	192,486,400
Minimum number of sites – total annual costs, low frequency	**14,977,088**	**114,965,733**
Maximum number of sites – total annual costs, low frequency	**24,069,584**	**172,449,600**
Minimum number of sites – total annual costs, high frequency	**21,393,301**	**131,006,267**
Maximum number of sites – total annual costs, high frequency	**33,693,904**	**196,510,400**

Note: one-off equipment costs are annualised using 4% discount rate and 7 years equipment lifetime

Total estimated annual costs of air sampling and analysis of are estimated between 15 million TL and 197 million TL per year depending on assumed design of the monitoring network, number of sampling points chosen and assumed frequency of sampling.

Environmental costs

Policy Option 2 will entail implementation of further emissions abatement measures (e.g. in metal plating, construction materials manufacturing etc.) but more importantly substitution of POPs chemicals with alternatives. Consideration of environmental performance of alternatives (substances or materials) is critical in order to avoid substituting POPs substances with chemicals displaying similar adverse environmental impacts.

Social and distributional impacts

Implementation of further emissions abatement measures (e.g. in metal plating, construction materials manufacturing etc.) but more importantly substitution of POPs chemicals with alternatives would entail significant costs.

In most instances, companies may be faced with substantial compliance costs and while some industries may be able to pass-through the costs of compliance to customers (resulting in increases in the prices of consumer goods and services), others may be adversely affected and suffer profitability losses.

The impacts of higher prices of key goods and services, would particularly affect low income socio-economic groups (unless allowances for such groups are in place) and those without a job (e.g. unemployed, retired persons).

Benefits

Environmental benefits

In general terms introduction of monitoring system for POPs will contribute significantly to improved level of knowledge regarding presence, concentrations and sources of POPs in Turkish environment enabling policy makers to focus on key existing and historic sources of POPs emissions to air, water and soil.

In particular, monitoring and inventory related activities will enable valuable data gathering for better, informed decision making, with less uncertainty, for the policy makers. These activities will also allow closing the gap in the knowledge for some POPs in Turkish environment enabling a robust decision making process.

Pesticides

Pesticides were banned many years ago and although there are instances where relatively higher concentrations are observed in soil or food stuff, since these chemicals are no longer produced or licensed, these concentrations are expected to decrease with time. However, due to being in the POP list, these pesticides are persistent and are accumulated in soil and sediments, becoming secondary sources of pollution in certain locations. Therefore, people and environment will be exposed to these chemicals for many more years. In that sense, effective tackling of any potential stockpiles and leachate from landfills and contaminated sites would be beneficial and will reduce the time of exposure to these chemicals.

Implementation of the By-Law in the context of the pesticides will ensure a further protection and pro-active consideration of POPs characteristics of pesticides coming into the market in the future. It will also strengthen the regulatory basis for any action required to address obsolete stockpiles, wastes and contaminated land.

Industrial POPs

Implementation of further emissions abatement measures (e.g. in metal plating, construction materials manufacturing etc.), substitution of POPs chemicals with alternatives as well as establishing appropriate waste collection and disposal system for wastes contaminated with POPs will further contribute to reduction of environmental concentrations of PFOS, BDEs, HBCDD and other substances. Furthermore, remediation of uncontrolled waste landfills (dumpsites) could also contribute to further improvement in environmental levels of industrial POPs.

Any improvements achieved in terms of reduction in industrial POPs emissions would have international implications due to persistent nature and long-range transport abilities of these substances.

Perfluorooctane sulfonic acid PFOS

At present, there is no control on use or disposal of PFOS and related products. It is noted, however, that EQS are set for PFOS in surface water bodies under the WFD and EQSD. PFOS designation as a Priority Hazardous Substance (PHS) imposes a requirement to phase out discharges, emissions and losses within a set time period.

There are no studies available on observed environmental levels of PFOS or related compounds in Turkey. Therefore, it is difficult to quantitatively characterise current situation and subsequently, anticipated benefits associated with improvement of environmental levels. However, considering that these are persistent substances that have much more aqueous solubilities when compared to other POPs, benefit would be towards protection of water resources.

In general terms, PFOS is toxic to a range of aquatic organisms. It has potential induce adverse effects on the endocrine system of animals, including rats and fish. However, endocrine effects appear to occur at concentrations higher than those causing effects on growth, reproduction and mortality in standard toxicity tests (EA, 2008).

Despite the absence of recorded use data, it is known that PFOS is used in metal processing (chrome plating) sector as well as in hydraulic fluids for aviation, etc. There is a potential for these uses to contaminate surface or groundwater sources affecting communities using these water sources for potable, recreational or agricultural uses. Due to their persistence, these pollutants would then have a health impact through drinking contaminated water or agricultural

products (e.g. Entec (2011) report on PFOS discusses that in Germany, PFOS contaminated groundwater used to irrigate vegetables resulted in contamination of the vegetables with PFOS).

Hexabromocyclododecane (HBCDD)

At present, HBCCD is falling within the scope of the REACH and WFD. HBCDD designation as a Priority Hazardous Substance (PHS) under the WFD imposes a requirement to phase out discharges, emissions and losses within a set time period.

HBCDD is also falling under REACH, but as Turkey has filed an exemption to continue using HBCDD in XPS and EPS production until 2019, no decrease in environmental concentrations of HBCDD is anticipated in the short term. Producers of XPS and EPS using HBCDD are expected to ensure abatement measures are in place to prevent releases to environment to the extent possible.

There are no studies available on the observed environmental levels of HBCDD in Turkey. Therefore, it is difficult to quantitatively characterise current situation and subsequently, anticipated benefits associated with reduced environmental concentrations of HBCDD.

In general terms, exposure to HBCDD can result in a range of acute and chronic effects. Potential adverse impacts include on the thyroid system in mammals (EU-RAR, 2008) and in fish (effects on hatching, growth and fry survival in rainbow trout).

Brominated flame retardants BDEs (hepta,hexa, penta, tetrabromodiphenyl ether and hexabromobifenil)

At present, BDEs are falling within the scope of the WEEE and WFD. In particular, WEEE regulation stipulates provisions for disposal of waste electronic equipment containing PBDEs. This would result in reduction of poor waste disposal practices regarding WEEEs.

Furthermore, BDEs are also subject to EQSD directive that set EQS for BDEs in surface waters in Turkey.

Only limited studies are available on observed environmental levels of BDEs in Turkey. Therefore, it is difficult to quantitatively characterise current situation and subsequently, anticipated benefits associated with reduced environmental concentrations of BDEs.

In general terms, the main environmental compartment to which additional protection (i.e. reduction in risk) would be afforded is to predators via secondary poisoning. BDEs have been found in high concentrations in some top predators, for example in the egg shells of peregrine falcons in Sweden (Johansson *et al*, 2009) and in seals in Canada (Kelly *et al*, 2008). RPA (2002) also identified a risk of secondary poisoning via earthworms, where earthworms would be exposed to BDEs in soil representing a risk to predators feeding on terrestrial prey.

No particular environmental benefit is expected regarding HBB, other than those valid for all POPs in general.

Other industrial POPs – HCB, PeCB, Hexacholorobutadiene and Polychlorinated Naphthalenes

Enforcement of the contaminated site legislation would enable any sites contaminated with PeCB or HCB to be identified and remediated, if necessary.

HCB is the only chemical that was detected with 100% frequency in Ankara monitoring study (results of for December 2009 - May 2013). It is also detected in sediments and mussels, some of which are higher than global concentrations. Banning of HCB is said to not have such a dramatic effect in terms of decrease of concentrations in the environment, but unintentional release and potential presence as impurity in other formulations have an effect on that. Remediation of sites contaminated with HCB when identified, would enable a faster decrease in observed concentrations.

Studies available on PeCB suggest no significantly high levels nor high detection frequency for PeCB in the Turkish environment at present. Remediation of contaminated sites when and where required, would enable a faster decrease in observed environmental concentrations.

Unintentional POPs

Implementation of the Policy Option 2 (By-Law on POPs excluding provisions of POPs Protocol) would contribute to the same environmental benefits as described under the Policy Option 1.

In comparison to the Policy Option 1, implementation of By-Law would also entail a more pro-active tackling on uPOPs emissions from diffuse sources, i.e. open burning including residential heating, burning of wastes, as well as natural and accidental fires. This source is estimated to contribute about 12% of uPOPs emissions in Turkey.

Enforcement of the POPs By-Law will enable control measures to be put on residual diffuse sources of PCDD/Fs and dioxin like PCBs, such that, common practices of using inappropriate fuels in residences or greenhouses, or emissions from widely practiced open burning, as well as transportation sources. Although, on a singular basis, emissions from these sources are minor, their cumulative effect can be significant. This is evident in Saral et al. (2014) and Gunes et al's (2014) study, where combustion from motor vehicles and residential heating equipment were found to be the principal sources of emissions of PCDD/F compounds in Istanbul.

In the context of HCB and PeCB, Voigt et al (2013) suggests that the majority of PeCB enters the environment as a result of backyard trash burning and municipal waste incineration. As regards to enforcement of the POPs By-Law, such sources are to be minimized, enabling a reduction in the ambient concentrations.

Similarly, in the context of PAH, residential heating and traffic sources of PAH are also present in urban areas, as pointed out by Gaga et al (2012) and Aydin et al (2014).

Social and public health benefits

Pesticides

Having regard to the historic ban of the POPs pesticides in Turkey, implementation of the By-Law will ensure a further protection and pro-active consideration of POPs characteristics of pesticides coming into the market in the future. It will also strengthen the regulatory basis for any action required to address obsolete stockpiles, wastes and contaminated land.

Industrial POPs

Perfluorooctane sulfonic acid PFOS

PFOS is persistent, bioaccumulative and toxic in mammals. Range of potential adverse impacts includes harmful changes in the liver and other organs, developmental problems (e.g. delays in growth and maturation). Exposure to PFOS over a long period of time also caused cancer in laboratory animals (EA, 2010) so possible carcinogenic effects on humans cannot be dismissed. Consumption of fish products is of relevance to human health. Given bioaccumulative properties of PFOS, reduction in environmental concentrations of PFOS in biota entering the food chain would also result in subsequent human health benefit.

Hexabromocyclododecane (HBCDD)

Social and public health benefits associated with adoption of the POPs By-Law are not expected to occur in the short term, due to the filing of an exemption until 2019. Exposure levels, as indicated in the STE report, are around the same order of magnitude with results presented in UK studies.

In general terms, HBCDD is possibly toxic to reproduction suggesting possible risk of impaired fertility; possible risk of harm to the unborn child, and, potential to cause harm to breastfed babies (CHL, 2009). However, consistent consumption of fish containing concentrations of HBCDD of at least 6100 µg/kg would be required to cause concerns. Furthermore, it seems that no adverse effects on human health resulting from environmental exposure to HBCDD are actually known to have been observed historically (Aylward and Hays, 2011).

Brominated flame retardants BDEs (hepta,hexa, penta, tetrabromodiphenyl ether and hexabromobifenil)

In general terms, BDEs can cause toxic effects in wildlife and mammals with pregnant women, embryos and infants constituting vulnerable groups as the substances can transfer from mothers to embryos and lactating infants. Food and water consumption, use of articles containing BDEs and inhalation (exposure to indoor air and dust) constitute the main human exposure routes.

Indoor air is typically significantly affected by PBDEs (i.e. exposure to dust leading to exposure to low doses), which is also indicated to some degree for Turkey (STE Report, 2015). PBDEs were detected in human milk, albeit with much

lower frequency of detection and concentration, when compared to pesticides, for example. Food stuffs were shown to contain PBDEs in varying degrees.

Reduction in BDEs concentrations in biota and indoor air stemming from the progressive cessation of use in articles would contribute to reduction of risk to human health.

Implementation of the WEEE directive that sets the BDE limits in electronic goods and stipulates appropriate collection and disposal system for WEEE is expected to contribute significantly to reduction of the BDEs in Turkish environment. Furthermore, measures aimed at tackling end-of-life vehicles will also contribute to the reduction in future exposure.

No particular social and health benefit is expected regarding HBB, other than those valid for all POPs in general.

Other industrial POPs – HCB, PeCB, Hexacholorobutadiene and Polychlorinated Naphthalenes

Although HCB is detected in the environment, biota (e.g. fish from Kahramanmaras (Erdogrul et al., 2005) or mussel from Black sea (Ozkoc et al., 2007), or e.g. butter (Aksoy et al., 2008), the levels noted were low enough to be considered safe for human consumption. So, the only benefit would be to encounter consistently lower concentrations and smaller cumulative effect on people in regards to the body burden of HCB.

Unintentional POPs

Implementation of the Policy Option 2 (By-Law on POPs excluding provisions of POPs Protocol) would contribute to the same human health benefits as described under the Policy Option 1.

In comparison to the Policy Option 1, implementation of By-Law would also entail a more pro-active tackling on uPOPs emissions from diffuse sources, i.e. open burning including residential heating, burning of wastes, as well as natural and accidental fires resulting in a comparatively more enhanced levels of benefits.

In particular, in the context of PAH, domestic winter heating can be a major source of atmospheric PAH concentrations, as pointed out by Gaga et al (2012). The authors state that the emissions can be fourfold over the winter period. Gaga et al (2012) present that, the winter period risk level, due to respiratory exposure to PAHs was found to be almost three times higher than in the summer period for Kocaeli, a highly industrialised city of Turkey.

Similar results are found for Eskisehir. Benzo(a)pyrene is considered to be the most toxic of the PAHs. The limit for this PAH was exceeded at all times in an urban traffic location in Eskisehir in both sampling times. Fossil fuel combustion and traffic emissions are depicted as the sources. This is a very significant result indicating the magnitude of the problem regarding PAHs in urban areas. Such results depict an increased cancer risk due to exposure to PAHs.

While PAH are not strictly falling under the scope of the Policy Option 2, measures aimed to reduce dioxin, furan and dioxin-like PCBs from open burning sources and from introduction of more advanced treatment technologies at some industrial sectors, would also result in simultaneous PAH emission reduction. Hence, potential health benefit is expected from the enforcement of the POPs By-Law provisions for PAH as well.

Economic benefits

Pesticides

In addition to potential health concerns, presence of the trace amounts of pesticides in foodstuffs when detected often result in financial losses. Assessment of current situation has highlighted a number of incidents, when agricultural export products have been stopped at the EU borders due to elevated pesticide content.

While predicting likely number of detections of trace amounts of pesticides in exported food until 2028 is not feasible, importance of agricultural exports for Turkey provide an indication of how significant the sector is for Turkish economy. In addition to financial losses due to rejected exported goods, such occurrences also negatively affect image and reputation of Turkish agricultural sector.

In summary, Turkey is the major net exporter of fruit and vegetables to the European Union and ranking among the top 10 exporters of several agricultural products, including hazelnuts, cherries, and apricots[23] worldwide. In 2005, exports of agricultural products accounted for about 9 % of total export. In 2010 Turkey exported agricultural products with a value of 2.9 billion Euro[24]. The majority of the Turkish food and beverage sector is formed of privately owned SMEs suggesting high degree of exposure and potentially significant impact of any financial losses [SIA Report, 2014].

While anticipated benefit to Turkish food and drink sector as a result of enhanced POPs pesticides control cannot reasonably be estimated in monetary terms, implementation of By-Law on POPs is expected to contribute to reduced risk of financial losses to market players due to detected elevated levels of pesticides.

Industrial POPs

Development and use of alternatives to industrial POPs where such substitution is technically, functionally and commercially feasible would result in an increased turnover and employment in competing sectors. In particular, producers of alternatives would benefit from an increased demand and potentially increased market share.

Unintentional POPs

Implementation of the Policy Option 2 (By-Law on POPs excluding provisions of POPs Protocol) would contribute to the same human health benefits as described under the Policy Option 1.

In comparison to the Policy Option 1, implementation of By-Law would also entail a more pro-active tackling on uPOPs emissions from diffuse sources, i.e. open burning including residential heating, burning of wastes, as well as natural and accidental fires resulting in a comparatively more enhanced levels of benefits.

4.3 Analysis of impacts of Policy Option 3– By-Law on POPs including POPs Protocol under CLRTP

Implementation of the Policy Option 3 covers the impacts of the proposed By-Law on POPs including substances that are exclusively listed in POPs Protocol such as SCCPs, PAH, Hexachlorobutadiene and Polychlorinated Naphthalenes. However, having regard to the fact that majority of these substances are covered under REACH and/ or WFD and EQSD Directives most of the impacts are captured under the Policy Option 1 and/or Policy Option 2.

Costs

Economic costs (compliance costs to industry, consumers, public bodies)

Pesticides

The costs of addressing any residual POPs pesticides issues will be the same as under the Policy Option 2. No additional costs over and above Policy Option 2 costs are anticipated under the Policy Option 3.

Industrial POPs

A wide range of industrial substances are falling within the scope of the By-Law. Under the Policy Option 3, inclusion of substances also covered by the POPs Protocol is considered including:

- Short chain chlorinated paraffins (POPs Protocol and WFD)
- Hexacholorobutadiene (POPs Protocol and WFD)
- Polychlorinated Naphthalenes (POPs Protocol)

[23] The World Bank (2007): Integrating Environment into Agriculture and Forestry Progress and Prospects in Eastern Europe and Central Asia

[24] European Commission (2009): Turkey country profile, Agriculture and Enlargement

Polychlorinated biphenyls (PCBs)

No additional costs are expected under the Policy Option 3 over and above those detailed under the Policy Options 1 and 2.

Perfluorooctane sulfonic acid (PFOS)

No additional costs are expected under the Policy Option 3 over and above those detailed under the Policy Options 1 and 2.

Hexabromocyclododecane (HBCDD)

No additional costs are expected under the Policy Option 3 over and above those detailed under the Policy Options 1 and 2.

Brominated flame retardants BDEs (hepta,hexa, penta, tetrabromodiphenyl ether and hexabromobifenil)

No additional costs are expected under the Policy Option 3 over and above those detailed under the Policy Options 1 and 2.

Short-chain chlorinated paraffins

Short-chain chlorinated paraffins are not listed in the Stockholm Convention and would be tackled under the Policy Options 1 and 3 (that covers POPs Protocol). However, having regard to the activities anticipated under REACH and WFD/EQSD, no additional costs are anticipated under the Policy Option 3 over and above those detailed under the Policy Option 1.

Other industrial POPs – HCB, PeCB, Hexacholorobutadiene and Polychlorinated Naphthalenes

No additional costs are anticipated under the Policy Option 3 over and above those detailed under the Policy Options 1 and 2.

No additional measures are required to address the releases of hexachlorobutadiene (HCBD) and polychlorinated naphthalenes specifically.

Unintentional POPs

The following unintentional POPs are falling within the scope of this Policy Option:

- PCDD/PCDF and dioxin like PCBs
- PAH
- Hexachlorobenzene (HCB)
- Pentachlorobenzene (PeCB)

Dioxins, furans and dioxin like PCBs

No additional costs are anticipated under the Policy Option 3 over and above those detailed under the Policy Options 1 and 2. No additional measures are required to address the releases of these substances specifically.

Polyaromatic hydrocarbons (PAH)

Industrial sectors contributing to uPOPs emissions in Turkey are already subject to IPPC and other legislation that will contribute significantly to the reduction of PAH emissions.

However, a range of additional measures might be employed to ensure further, beyond Policy Option 1 reductions in emissions including installation of additional abatement measures.

Furthermore, open burning processes are likely to be significant contributor to PAH emissions. The same measures considered for PCDD/PCDF/DL-PCBs emissions reduction will contribute to the reduction of PAH emissions.

Implementation of additional measures in industrial, power and waste management sectors would result in estimated 260 million to 380 million TL per year (textiles sector excluded). In comparison to the Policy Option 1 costs of 6 billion to 12 billion TL per year, these costs represent a relatively minor fraction. Furthermore, additional reduction in industrial emissions over and above Policy Option 1 measures might not be required in practice.

Tackling diffuse sources of PAH emissions on the other hand, would result in substantial additional costs (estimated at 1 billion TL per year).

No additional costs are anticipated under the Policy Option 3 over and above those detailed under the Policy Options 1 and 2. No additional measures are required to address the releases of these substances specifically.

Other uPOPs – HCB and PeCB

No additional costs are anticipated under the Policy Option 3 over and above those detailed under the Policy Options1 and 2. No additional measures are required to address the releases of these substances specifically.

Monitoring costs to public authorities (all POPs)

Soil monitoring

Implementation of the By-Law would entail establishing a monitoring system for the Annex III substances. In the context of the Policy Option 3 PAH will also be included.

Soil monitoring would entail monitoring of agricultural land, forests and protected areas. The estimated range of potential monitoring points is summarised in the table below.

Table 4.31 Number of soil monitoring points

	All sites	Selected sites (used for POPs monitoring)	Number of samples per site per year
Agricultural land	1991	321	4
Protected areas	34	4	4
Forests	481	481	1-5

Estimated costs of sampling and analysis are presented in the table below.

Table 4.32 Annual monitoring costs of POPs in soils

	Sampling, TL per year	Analysis, TL per year
Agricultural land, all points	3,424,480	6,610,043
Agricultural land, selected points	552,336	266,534
Protected areas, all points	57,752	111,475
Protected areas, selected points	7,219	3,484
Forests, low number of horizons present	206,734	399,045
Forests, high number of horizons present	1,033,670	1,995,224
All soil monitoring, all points	**4,515,903**	8,716,743

	Sampling, TL per year	Analysis, TL per year
All soil monitoring, selected points/horizons	**766,289**	669,062

Total estimated annual costs of sampling and analysis of soils for PAH are estimated between 0.7 million TL and 8.7 million TL per year depending on number of sampling points chosen.

It should be noted that the sampling costs will be the same as under the Policy Option 2 and do not need to be duplicated.

Air monitoring

Implementation of the By-Law would entail establishing a monitoring system for the Annex III substances in the air. In the context of the Policy Option 3 PAH will also be included.

Air monitoring would entail passive and active monitoring. The estimated range of potential monitoring points and frequency is summarised in the table below (this is the same as under the Policy Option 2).

Table 4.33 Number of air monitoring points

Design	Active sampling	Frequency	Passive sampling	Frequency
Proposed monitoring design paper, min	22	52	80	4-12
Proposed monitoring design paper, max	36	52	120	4-12
Using existing air quality monitoring network, min	200	52	200	4-12
Using existing air quality monitoring network, max	300	52	300	4-12

Estimated costs of sampling and analysis are presented in the table below.

Table 4.34 Annual monitoring costs of PAH in air

	Proposed monitoring design paper	Using existing air quality monitoring network
Minimum number of sites – annualised equipment costs	300,000	2,682,000
Maximum number of sites – annualised equipment costs	490,000	4,024,000
Minimum number of sites – annual costs, low frequency	1,466,928	11,222,400
Maximum number of sites – annual costs, low frequency	2,356,704	16,833,600
Minimum number of sites – annual costs, high frequency	2,108,208	12,825,600
Maximum number of sites – annual costs, high frequency	3,318,624	19,238,400
Minimum number of sites – total annual costs, low frequency	**1,766,928**	**13,904,400**
Maximum number of sites – total annual costs, low frequency	**2,846,704**	**20,857,600**
Minimum number of sites – total annual costs, high frequency	**2,408,208**	**15,507,600**
Maximum number of sites – total annual costs, high frequency	**3,808,624**	**23,262,400**

Note: one-off equipment costs are annualised using 4% discount rate and 7 years equipment lifetime

Total estimated annual costs of PAH air sampling and analysis of are estimated between 1.8 million TL and 21 million TL per year depending on assumed design of the monitoring network, number of sampling points chosen and assumed frequency of sampling.

Environmental costs

No additional costs over and above those associated with the implementation of Policy Options 1 and 2 are anticipated under the Policy Option 3. In the case of SCCPs, consideration of environmental performance of alternatives (substances or materials) is critical in order to avoid substituting POPs substances with chemicals displaying equally adverse environmental impacts.

Social and distributional impacts

No additional benefits over and above those associated with the implementation of Policy Options 1 and 2 are anticipated under the Policy Option 3. In the case of SCCPs, substitution may result in higher prices of different articles. This, in turn, could adversely affect low income socio-economic groups (unless allowances for such groups are in place) and those without a job (e.g. unemployed, retired persons).

Benefits

Environmental benefits

Pesticides

No additional benefits over and above those associated with the implementation of Policy Options 1 and 2 are anticipated under the Policy Option 3.

Industrial POPs

No additional benefits over and above those associated with the implementation of Policy Options 1 and 2 are anticipated under the Policy Option 3. This is particularly the case for SCCPs and hexachlorobutadiene.

In the case of polychlorinated naphthalenes, studies in Izmir suggested the presence of evaporative sources of CNs as well as sources originating from scrap metal processing or iron-steel plants having electric-arc furnaces. Relatively high concentrations of CNs were measured in some areas. Although small in number, there are a few studies that indicate technical mixtures containing CNs, Halowaxes, were used in Turkey. Implementation of the Policy Option 3 would introduce a regulatory framework for CNs in Turkey (which is absent at present) and will control prohibition of manufacturing, placement on the market and use as well as management of any stockpiles, wastes and contaminated sites. Waste disposal stage of product lifecycle is particularly relevant as scrap metal may contain CNs (as per study of Odabasi et al 2015) resulting in subsequent secondary release of CNs during combustion processes. Introduction of regulatory control on wastes potentially containing POPs and requesting its safe disposal would contribute to reduction of CNs concentrations in the Turkish environment.

Unintentional POPs

Implementation of the Policy Option 3 (By-Law on POPs including provisions of POPs Protocol) would contribute to the same environmental benefits as described under the Policy Option 2.

In comparison to the Policy Option 2, this option explicitly covers PAH.

While PAH are not strictly falling under the scope of the Policy Option 2, measures aimed to reduce dioxin, furan and dioxin-like PCBs from open burning sources and from introduction of more advanced treatment technologies at some industrial sectors, would also result in simultaneous PAH emission reduction. Hence, enforcement of the POPs By-Law provisions would result in reduction of PAH emissions as well.

Social and public health benefits

Pesticides

No additional benefits over and above those associated with the implementation of Policy Options 1 and 2 are anticipated under the Policy Option 3.

Industrial POPs

No additional benefits over and above those associated with the implementation of Policy Options 1 and 2 are anticipated under the Policy Option 3. This is particularly the case for SCCPs.

In the case of hexachlorobutadiene, two studies conducted around the only hazardous waste incinerator of Turkey measured HCBD concentrations in ambient air of the plant at levels higher than the occupational exposure limits. Sources are deduced to be due to volatilization of such compounds during storage of wastes waiting to be incinerated and fugitive emissions from the rotary kiln. Enforcement of the existing waste incineration legislation in Turkey will enable reducing occupational exposure limits.

In the case of polychlorinated naphthalenes, studies in Izmir suggested the presence of evaporative sources of CNs as well as sources originating from scrap metal processing or iron-steel plants having electric-arc furnaces. Relatively high concentrations of CNs were measured in some areas. Workers in these facilities as well as neighbourhood residents are exposed to relatively much higher concentrations of CNs. Enforcement of existing industrial and air pollution as well waste sector legislation would enable reduction measures to be put into place contributing to the reduced health risks.

Unintentional POPs

Implementation of the Policy Option 3 (By-Law on POPs including provisions of POPs Protocol) would contribute to the same health benefits as described under the Policy Option 2.

In comparison to the Policy Option 2, this option explicitly covers PAH.

While PAH are not strictly falling under the scope of the Policy Option 2, measures aimed to reduce dioxin, furan and dioxin-like PCBs from open burning sources and from introduction of more advanced treatment technologies at some industrial sectors, would also result in simultaneous PAH emission reduction. Hence, enforcement of the POPs By-Law provisions would result in reduction of PAH as well.

However, if transport emissions in urban areas are tackled even more stringently, additional health benefits associated with PAH might be anticipated.

Economic benefits

Pesticides

No additional benefits over and above those associated with the implementation of Policy Options 1 and 2 are anticipated under the Policy Option 3.

Industrial POPs

No additional benefits over and above those associated with the implementation of Policy Options 1 and 2 are anticipated under the Policy Option 3. In the case of SCCPs, substitution may result in development and use of alternatives where such substitution is technically, functionally and commercially feasible. This, in turn, would benefit producers of alternatives through an increased demand and potentially increased market share.

Unintentional POPs

Implementation of the Policy Option 3 (By-Law on POPs including provisions of POPs Protocol) would contribute to the same human health benefits as described under the Policy Option 2.

In comparison to the Policy Option 2, this option explicitly covers PAH.

While PAH are not strictly falling under the scope of the Policy Option 2, measures aimed to reduce dioxin, furan and dioxin-like PCBs from open burning sources and from introduction of more advanced treatment technologies at some industrial sectors, would also result in simultaneous PAH emission reduction. Hence, enforcement of the POPs By-Law provisions would result in reduction of PAH as well.

5. Comparison of policy options and conclusions

In summary:

- Policy Option 1 entails continuous implementation of the legislation already in force or planned, including, in particular, regulations regarding pesticides, PCBs, Contaminated Land, IPPC, WEEE, product and food safety, REACH and WFD in Turkey.
- Policy Option 2 entails implementation of the draft By-Law on POPs introducing a comprehensive regulatory framework for management of POPs in Turkey while excluding substances listed in the POPs Protocol only (SCCPs, PAH, HCBD and PCNs)
- Policy Option 3 entails implementation of the draft By-Law on POPs including the elements associated exclusively with POPs Protocol under CLRTAP while it is awaiting ratification.

Summary of administrative and monitoring costs (over and above Policy Option 1) are presented in the table below.

Table 5.1 Administrative and monitoring costs Policy Option 1 – Policy Option 3 (anualised costs in million TL)

	Policy Option 1	Policy Option 2	Policy Option 3
Monitoring (system development)	0.3	0	0
Monitoring (water)	45-68	0	0
Monitoring (air)	0	15-197	17-218
Monitoring (soil)	0	4-52	5-61
Administrative (public)	0	0.7	0.7
Administrative (private)	0	1.5	1.5
Total costs	45-68	21-252	25-281

Implementation of Policy Options 2 and 3 is relatively more costly. However, significant flexibility exists in selection of most suitable design in terms of number of points, list of substances and frequency. Monitoring system needs to be optimised according to the needs of policy makers. Having regard to the lack of monitoring data, obtaining further evidence on the presence of POPs in the environment of Turkey is critical to robus decision making regarding the need for additional controls.

Summary of estimated costs by policy option (over and above Policy Option 1) is presented in the tables below.

Table 5.2 Policy Option 1 – summary of annualised costs (million TL)

	Pesticides	uPOPs	PAH	PCBs	PFOS	HBCDD	BDEs	SCCPs
Manufacturing	0	0	0	0	0	Captured by REACH/WFD	0	0
Use (substitution)	0	0	0	0	0	Captured by REACH/WFD	Captured by WEEE[3]	Unknown, unit costs 270-8,400 TL per tonne
Releases	0	6,000-12,000	Captured by uPOPs	Captured by uPOPs	0	Captured by REACH/WFD	0	Unknown. Unit costs 0.5-1.8 TL per company

	Pesticides	uPOPs	PAH	PCBs	PFOS	HBCDD	BDEs	SCCPs
Diffuse sources	0	0	0	0	0	0	0	0
Stockpiles	1.7[1]	0	0	66-70	0	Captured by REACH/WFD	0	0
Waste collection and disposal	0	0	0	0		0	148 (WEEE)	0
Contaminated land (assessment)	3.1	11.3	2.7	2.7	1.1	1.3	1.2	2.2
Contaminated land (remediation/ identified)	0.2	0	0	0	0	0	0	0
Contaminated land (remediation)	Unknown unit costs of disposal 2,500-18,000 TL	Unknown unit costs of disposal 1,250 TL	Unknown	Unknown unit costs of disposal 500-2,000 TL	Unknown unit costs of disposal 900-1,500 TL	Unknown unit costs of disposal 900-1,500 TL	Unknown unit costs of disposal 900-1,500 TL	Unknown unit costs of disposal 900-1,500 TL
Wastewater treatment (assessment)	0.2-1.5	1.3-4.3	0.2-0.8	0.2-0.8	0.1-0.3	0.1-0.3	0.1-0.3	0.2-0.6
Wastewater treatment (assessment)	**19-8,620 (GAC at *all* UWWTPs)**							
Landfill leachate (assessment)	0.07-0.14	0.4	0.07	0.07	0.03	0.03	0.03	0.06
Landfill leachate (treatment)	**9-98 (GAC at *all* landfills)**							
Compliance costs (public authorities)	**0**							
Total	**6,200-21,000**							

Note: one-off costs are annualised using 4% discount rate and 15 years appraisal lifetime; Note 2: unit costs per tonne; Note 3: some uses

Implementation of the Policy Option 1 including compliance with the requirements of IPPC, WEEE, WFD and EQSD could potentially range from 6.2 to 21 billion TL. In practice, no universal installation of advanced treatment at landfills and urban WWTPs will be required. First, assessment of landfill and UWWTP leachated for POPs would be required (estimated 3 to 10 million TL).

It is, however, clear that estimated costs of implementation of the IPPC alone would constitute a single largest cost item (assuming that no universal installation of GAC at all UWWTPs in Turkey at the high unit costs would be required in practice).

Implementation of the option is anticipated to result in significant benefits associated with uPOPs reduction. However, additional regulatory measures are likely to be required to address use of industrial POPs.

Table 5.3 Policy Option 2 – summary of annualised costs (million TL)

	Pesticides	**uPOPs**	**PAH**	**PCBs**	**PFOS**	**HBCDD**	**BDEs**	**SCCPs**
Manufacturing	0	0	0	0	0	0	0	0
Use (substitution)	0.01	0	0	0	0.15	134-203 (XPS/EPS)	Unknown	0
Releases	0	260-318	0	0	3.5 (ventilation) OR 39-88 (GAC)	10-14 (GAC)	0	0
Diffuse sources	0	1,000	0	0	0	0	0	0
Stockpiles	0	0	0	0		0.24		0
Waste collection and disposal	0	0	0	0	Unknown	701-754 (C&DW)	18-32 (ELV, CRT)	0
Contaminated land (assessment)	0	0	0	0	0	0	0	0
Contaminated land (remediation/ identified)	0	0	0	0	0	0	0	0
Contaminated land (remediation)	0	0	0	0	0	0	0	0
Wastewater treatment (assessment)	**0**	0	**0**	**0**	**0**	**0**	**0**	**0**
Wastewater treatment (assessment)	**0**	0	**0**	**0**	**0**	**0**	**0**	**0**
Landfill leachate (assessment)	**0**	0	**0**	**0**	**0**	**0**	**0**	**0**
Landfill leachate (treatment)	**0**	0	**0**	**0**	**0**	**0**	**0**	**0**
Uncontrolled landfill remediation	**65-718 (remediation of dumspites)**							
Compliance costs (public authorities)	**15 (control on manufacturing, placement on the market and use)**							
	2,210-3,140							

Note: one-off costs are annualised using 4% discount rate and 15 years appraisal lifetime

Cost of implementation of the Policy Option 2 could potentially range from 2.2 to 3.1 billion TL per year of which 1 billion is attributed to dealing with uPOPs emissions from the open burning. Remediating all uncontrolled landfill sites as well as developing appropriate waste collection and disposal systems for C&DW as well as domestic articles would result in further 0.8 to 1.5 billion TL per year. Substiting industrial POPs in a range of applications could also cost up to 200 million TL per year.

In practice, site specific analysis and assessment will be needed to establish the need to remediate any uncontrolled dumpsites. Similarly, costs of installing advanced leachate collection and treatment system constite an alternative to developing new, dedicated waste collection system. Finally, Article 8 requires to implement measures aiming to minimise to a feasible extent releases of the Annex III substances to environment. Excessive potential costs of tackling open burning and domestic heating provide ground for policy makers to consider the trade-offs carefully.

Table 5.4 Policy Option 3 – summary of annualised costs (million TL)

	Pesticides	uPOPs	PAH	PCBs	PFOS	HBCDD	BDEs	SCCPs
Manufacturing	0	0	0	0	0	0	0	0
Use (substitution)	0.01	0	0	0	0.15	134-203 (XPS/EPS)	Unknown	Unknown, unit costs 270-8,400 TL per tonne
Releases	0	260-318	Captured by uPOPs	0	3.5 (ventilation) OR 39-88 (GAC)	10-14 (GAC)		Unknown. Unit costs 0.5-1.8 TL per company
Diffuse sources	0	1,000	Captured by uPOPs	0	0	0	0	0
Stockpiles	0	0	0	0		0.24		
Waste collection and disposal	0	0	0	0	Unknown	701-754 (C&DW)	18-32 (ELV, CRT)	0
Contaminated land (assessment)	0	0	0	0	0	0	0	0
Contaminated land (remediation/ identified)	0	0	0	0	0	0	0	0
Contaminated land (remediation)	0	0	0	0	0	0	0	0
Wastewater treatment (assessment)	**0**	0	**0**	**0**	**0**	**0**	**0**	**0**
Wastewater treatment (assessment)	**0**	0	**0**	**0**	**0**	**0**	**0**	**0**
Landfill leachate (assessment)	**0**	0	**0**	**0**	**0**	**0**	**0**	**0**
Landfill leachate (treatment)	**0**	0	**0**	**0**	**0**	**0**	**0**	**0**
Uncontrolled landfill remediation	**65-718 (remediation of dumspites)**							
Compliance costs (public authorities)	**15 (control on manufacturing, placement on the market and use)**							
Total	**2,210-3,140**							

Note: one-off costs are annualised using 4% discount rate and 15 years appraisal lifetime

Cost of implementation of the Policy Option 3 could potentially range from 2.2 to 3.1 billion TL per year. In essence the costs of Policy Option 3 appear to be the same as those associated with the Policy Option 2.

The key difference between these two alternatives entails inclusion or exclusion of four substances within its scope. The substances include PAH, SCCPs, PCNs and HCBD. Most critically measures aimed to tackle dioxin, furan and dioxin-like PCBs will simultaneously address emissions of PAH. The only major additional area for policy action include reduction of PAH emissions from transport sector.

In the case of SCCPs, no additional costs could be estimated due to lack of inventory data. It is also noted that PCNs and HBCD are largely associated with historic use and are likely to be addressed indirectly as a co-benefit under the Policy Option 1.

This Policy option, however, entail relatively higher monitoring costs associated with measuring PAH in soils and air.

Overall, inclusion of the POPs Protocol substancs within the scope of the By-Law is not anticipated to result in significantly higher costs (mostly due to indirect contribution of uPOPs measures towards reduction of PAH emissions).

Appendix A
Compliance impacts

Assessment of compliance impacts on public authorities and on industry

Article of the By-Law	Title	Requirements driving scope or extent of impacts (excluding administrative impacts on public authorities)	Drives/ determines anticipated compliance costs	Drives/ determines anticipated compliance benefits
Art 1	Aim	The purpose of this bylaw is to protect human health and the environment from persistent organic pollutants		Yes. Enhanced protection of human health and environment. These are the stated benefits of implementation of this By-Law.
Art 2	Scope	This By-law shall apply to persistent organic substances which may affect human health and environment. Article stipulates: * by prohibiting production, placing on the market and use of substances, * by phasing out as soon as possible, or restricting the production, placing on the market and use of substances. * by minimising, with a view to eliminating where feasible as soon as possible, releases of such substances * by establishing provisions regarding waste consisting of, containing or contaminated by any of these substances	Yes (Compliance) costs will be driven by the scope of the By-Law in terms of substances covered; nature of required actions – prohibition, restriction, minimisation etc.; and current situation with regard to production, placement on the market, use, releases and contamination of wastes	Extent of these benefits will depend on: a) scope of the By-Law in terms of the substances covered; b) current situation with regard to production, placement on the market, use of these POPs substances or POPs containing articles as well as current releases and contamination of wastes and c) nature of requirements and subsequent impact (i.e. mechanisms of actions – prohibition, restriction, minimisation of releases etc.)
Art 4	Definitions	This article sets out a range of definitions of the terms used in the By-Law.	Yes, indirectly (clarifies the exact scope of the By-Law, i.e. definition of articles, wastes, recovery techniques etc.)	Yes, indirectly (clarifies the exact scope of the By-Law i.e. definition of articles, wastes, recovery techniques etc.)
Art 5	Control of production, placing on the market and use	Art 5(1) The production, placing on the market and use of substances listed in Annex I, whether on their own, in preparations or as constituents of articles, shall be prohibited.	Yes. One of the main articles driving compliance costs including costs to industries associated with prohibition or restriction. Potential adverse impacts on producers and suppliers of the prohibited/ restricted substances. Depending on industries ability to pass on the costs to consumers – adverse impacts on consumers.	Yes. One of the main articles driving compliance related benefits. Environmental and human health benefits associated with prohibited / restricted use (and subsequently emissions and releases). Economic benefits to producers of alternatives; sectors currently incurring costs due to presence of POPs (e.g. food processing industry; shellfisheries etc.)
Art 5	Control of production, placing on the market and use	Art 5(2) The production, placing on the market and use of substances listed in Annex II, whether on their own, in preparations or as constituents of articles, shall be restricted in accordance with the conditions set out in that Annex II.		

Art 6	Exemptions from control measures (relevant only if Appendix explicitly allows for such exemption)	Art6(1) Article 5 shall not apply in the case of: a) A substance used for laboratory-scale research or as a reference standard b) A substance occuring as uninintentional trace contaminant in substances, preparations or articles	Yes. Use derogation Environmental costs (potential) associated with continious use of prohibited/ restricted substances. In the case of laboratory use, environmental and human health risks are expected to be minimal and adequately controlled. In the case of trace contamination – environmental and human health risks will depend on the extent of POPs substances being present as trace contaminants in substances, preparations or articles (e.g. DDT in dicofol presence)	Yes. Use derogation Benefits of continious use of the substances for research. Avoided costs to industry that would be associated with a complete ban (applicable to trace contamination as well)
		Art6(2) Article 5 shall not apply in respect of substances occurring as a constituent of articles produced before or on the date of entry into force of this By-law until six months after the date of its entry into force. Article 5 shall not apply in the case of a substance occurring as a constituent of articles already in use before or on the date of entry into force of this By-law. However, upon becoming aware of articles referred in the first and second subparagraph, Relevant Institution shall inform the Ministry accordingly. Whenever the Ministry is so informed or otherwise learns of such articles, it shall, where appropriate, notify the Secretariat accordingly without further delay.	Yes. Time derogation. Environmental costs associated with the use and disposal of articles containing POPs (6 months after entry into force – production; anticipated lifetime of articles that will be already in use). Administrative costs are covered separately.	Yes. Time derogation. Benefits to producers and consumers in terms of avoided sunk costs (if all articles were prohibited) and avoided costs of alternatives that do not contain POPs. Administrative impacts are covered separately.

		Art6(3) – "The Ministry wishing to permit, until the deadline specified in the relevant Annex, the production and use of that substance as a closed-system site-limited intermediate shall notify accordingly the Secretariat of the Convention"	Yes. Time derogation (for specific applications) Environmental costs associated with the production and use of substances in a closed-system site-limited internediate. Having regard to the closed system production/ use environmental and human health risks associated with such derogation are anticipated to be negligible. Administrative costs of carrying out the assessments, inspections and monitoring are covered separately. These costs, in essence, represent internalised environmental damage. In other words, if assessment, monitoring and enforcement are properly implemented additional risks associated with continious use would be negligible.	Yes. Time derogation (for specific applications) Benefits to industry from exemption (i.e. reduced or brought forward costs for operators of closed systems using POPs as intermediates. Administrative costs are covered separately.
Art 7	Stockpiles	Art 7(1) "The holder of a stockpile, which consists of or contains any substance listed in Annex I or Annex II, for which no use is permitted, shall manage that stockpile as waste and in accordance with Article 9.	Yes. One of the main articles driving compliance costs.	Yes. One of the main articles driving compliance benefits
Art 8	Release reduction, minimisation and elimination	Art8(2) "Ministry shall communicate its action plan on measures to identify, characterise and minimise with a view to eliminating where feasible as soon as possible the total releases developed in accordance with its obligations under the Convention to other Relevant Institution as part of its national implementation plan".	Yes. Costs to industries to minimise releases of Annex III substances. Assessment to be based on NIP and SIA. Administrative costs of developing the action plan and reporting are covered separately.	Yes Environmental and human health benefits associated with reduction of releases. Potentially, economic benefits associated with increased productivity; sales etc. Administrative benefits of developing the action plan and reporting are covered separately.
Art 9	Waste management	Art9 (1) Producers and holders of waste shall undertake all reasonable efforts to avoid, where feasible, contamination of this waste with substances listed in Annex IV.	Yes (Compliance) costs will be driven by the scope of the By-Law in terms of substances covered; nature of required actions, i.e. interpretation of "reasonable effort to avoid....contamination"; and current situation with regard to generation and treatment of wastes. Costs to industries (holders of the wastes) associated with the actions required to avoid contamination.	Yes Environmental and human health benefits associated with reduced/ prevented emissions of POPs. Economic benefits in terms of potential savings when considering alternative treatment costs of wastes that end up being contaminated.

Art 9	Waste management	Art9(2) Notwithstanding By-law on control of polychlorinated biphenyls and polychlorinated terphenyls published in the Official Journal dated 27/12/2007 numbered 26739, waste consisting of, containing or contaminated by any substance listed in Annex IV shall be disposed of or recovered, without undue delay and in accordance with Annex V, part 1 in such a way as to ensure that the persistent organic pollutant content is destroyed or irreversibly transformed so that the remaining waste and releases do not exhibit the characteristics of persistent organic pollutants. In carrying out such a disposal or recovery, any substance listed in Annex IV may be isolated from the waste, provided that this substance is subsequently disposed of in accordance with the first subparagraph.	Yes (Compliance) costs will be driven by the scope of the By-Law in terms of substances covered; allowed disposal and recovery practices, current situation with regard to generation and treatment of such wastes and relative costs of these options.. Costs to industries (holders of the wastes) associated with the actions required to dispose/ recover contaminated wastes could be passed on or recovered from holders / generators of the wastes.	Yes Environmental and human health benefits associated with reduced/ prevented emissions of POPs and prevented recovery, recycling, reclamation or re-use of relevant POPs substances.
Art 9	Waste management	Art9(3) Disposal or recovery operations that may lead to recovery, recycling, reclamation or re-use of the substances listed in Annex IV shall be prohibited.		
Art 9	Waste management	Art9(4) stipulate derogations based on concentration limits for POPs in wastes (4) By way of derogation from paragraph 2: a) waste containing or contaminated by any substance listed in Annex IV may be otherwise disposed of or recovered in accordance with the legislation, provided that the content of the listed substances in the waste is below the concentration limits to be specified in Annex IV. Those measures, designed to amend non-essential elements of this By-law, shall be adopted through the Committee referred to in Article 18. b) Ministry, in exceptional cases, allow wastes listed in Annex V, part 2 containing or contaminated by any substance listed in Annex IV up to concentration limits to be specified in Annex V, part 2, to be otherwise dealt with in accordance with a method listed in Annex V, part 2 provided that: 1) the holder concerned has demonstrated to the satisfaction of the Ministry concerned that decontamination of the waste in relation to substances listed in Annex IV was not appropriate, and that destruction or irreversible transformation of the persistent organic pollutant content, performed in accordance with best environmental practice or best available techniques, does not represent the environmentally preferable option and the competent authority has subsequently authorised the alternative operation; 2) this operation is in accordance with the legislation of the Ministry and Relevant Institutions and the conditions laid down in relevant additional measures referred to in paragraph 6.	Yes, scope derogation. Environmental and human health costs associated with disposal of wastes contaminated with POPs below the set concentration limits. Administrative impacts associated with this article (Art18 Committee process, derogation authorisation etc.) are covered separately under administrative impacts	Yes, scope derogation. Benefits to waste holders from reduced or avoided costs (due to lower/ derogated requirements). Administrative impacts associated with this article (Art18 Committee process, derogation authorisation etc.) is covered under administrative impacts
Art 20	Entry into force	Art20(1) This By-Law shall enter into force 1 year later on the date of its publication	Yes. The Article determines the start date of appraisal period and costs	Yes. The Article determines the start date of appraisal period and benefits

Appendix B
Administrative impacts

Assessment of administrative burden on public authorities and on industry

Article of the By-Law	Title	Requirements associated with administrative burden on public bodies	To be covered through interviews/ questionnaires? Yes/ No	Which Ministry?	Type of obligation	Type of action	Underlying administrative requirements on industry?	Anticipated benefits
Art 1	Aim	None	Na	Na	Na	Na	Na	Na
Art 2	Scope	None	Na	Na	Na	Na	Na	Na
Art 3	Legal basis	None	Na	Na	Na	Na	Na	Na
Art 4	Definitions	Yes, indirectly[25].	Yes, indirectly. Article 18 lists a range of institutions: MoEU Ministry of Health Ministry of Food, Agriculture and Livestock Ministry of Energy and Natural Resources Ministry of Science, Industry and Technology Ministry of Customs and Trade Ministry of Economy Ministry of Forests and Water Affairs Ministry of Labor and Social Security	MoEU MoH MoFAL Ministry of Energy and Natural Resources Ministry of Science, Industry and Technology Ministry of Customs and Trade Ministry of Economy Ministry of Forests and Water Affair Ministry of Labor and Social Security	Na	Na	Na	Na
Art 5	Control of production,	Yes	Yes.	MoEU	Authorisation	Specific actions will depend on	Yes, potentially.	Yes.

[25] Defined public institutions affected by provisions of the By-Law. The current version of the By-Law seems to be excluding the list of relevant institutions from the Art 4.

	placing on the market and use	Art5(3) stipulates that "The Ministry and Relevant Institution shall, within the assessment and authorisation schemes for chemicals and pesticides under their relevant legislation, take into consideration Convention and *take appropriate measures to control existing* chemicals and pesticides and *prevent the production, placing on the market and use of chemicals and pesticides*, which exhibit characteristics of persistent organic pollutants"	Additional administrative burden will depend on: - Number of such assessment and authorisation schemes - Their current operation and to what extent POP characteristics are already being considered as part of authorisation process - In the case of this being an additional requirement over and above baseline what actions these institutions would need to take in order to "take into account", "take appropriate measures to control....and prevent" - Administrative cost can be assessed based on assumptions regarding: 1. Number of institutions affected 2. Manpower required to comply with the Art5 requirements per authorisation and associated unit costs 3. Number of authorisations per year	MoH MoFAL Ministry of Energy and Natural Resources Ministry of Science, Industry and Technology Ministry of Customs and Trade Ministry of Economy Ministry of Forests and Water Affair Ministry of Labor and Social Security	Registration Certification	interpretation of to "take into account", "take appropriate measures to control....and prevent" while carrying out assessment and authorisation schemes for chemicals and controlling existing chemicals but expected to include: familiarising with information, data assessment and retrieving	Depending on the need for industries to provide data on POPs characteristics as part of their submissions for authorisation.	Requirements of this Article would ideally prevent production, placement on the market and use of checmicals and pesticides exhibiting POPs characteristics
Art 6	Exemptions from control measures (relevant only if Appendix explicitly allows for such exemption)	Art6(2) Article 5 shall not apply in respect of substances occurring as a constituent of articles produced before or on the date of entry into force of this By-law until six months after the date of its entry into force. Article 5 shall not apply in the case of a substance occurring as a constituent of articles already in use before or on the date of entry into force of this By-law. However, upon becoming aware of articles referred in the first and second subparagraph, Relevant Institution shall inform the Ministry accordingly. Whenever the Ministry is so informed or otherwise learns of such articles, it shall, where	Yes. Information obligation is imposed on relevant institutions to inform MoEU. No details regarding reporting format, anticipated frequency, etc The Article does not seem to impose a duty on relevant institutions to actively collect such information. Rather it refers to instances where it is "becoming aware" or is "informed". Predicting number of such articles and reporting instances is not feasible. However, given that the relevant institutions seem to be tasked with passing the information reveived on to MoEU, it would not constitute significant additional burden. Additional administrative burden will depend on: - Number of notifications per year by Relevant institutions to the MoEU - Unit costs (manpower) per such notification - Understanding on the likely pathways for relevant institutions to become aware or to be informed.	MoEU MoH MoFAL Ministry of Energy and Natural Resources Ministry of Science, Industry and Technology Ministry of Customs and Trade Ministry of Economy Ministry of Forests and Water Affair Ministry of Labor and Social Security	Notification	Data processing and sharing Reporting	Yes, potentially. Depending on the duties imposed to report such occassions to relevant institutions in the first place.	Better information on the presence of POPs as constituents within articles currently in use or recently produced and placed on the market.

		appropriate, notify the Secretariat accordingly without further delay.						
		Art6(3) – "The Ministry wishing to permit, until the deadline specified in the relevant Annex, the production and use of that substance as a closed-system site-limited intermediate shall notify accordingly the Secretariat of the Convention"	Yes. Notification requirement. Costs will depend on: - anticipated frequency and format of such notifications - manpower costs of notifications. In relative terms carrying out assessment and inspections would require more effort than notification of the Secretariat itself	MoEU	Permitting and notification	Permitting Inspecting and checking Information provision	Yes, potentially. Depending on involvement of industries in the application for restricted use	Benefits to industry from exemption (i.e. reduced or brought forward costs)
		Art6(4) – stipulates criteria for the assessment of closed systems during the handling of chemical agents. More importantly inspection and maintenance (checks) are required as well.	Yes. Costs of assessment, inspection and maintenance. Potentially the costs are recovered by industrial installations themselves. Costs will depend on: - number of installations affected - manpower costs of such assessment and checks.	MoEU	Permitting and inspection	Inspection and checking	Yes, potentially. Depending on involvement of industries in the assessment of closed systems	Enforcement benefits
Art 7	Stockpiles	Art 7(2) "The holder of a stockpile greater than 50 kg, consisting of or containing any substance listed in Annex I or Annex II, and the use of which is permitted shall provide the Ministry in which the stockpile is established with information concerning the nature and size of that stockpile. Such information shall be provided within 12 months of the entry into force of this By-law and of amendments to Annexes I or II and annually thereafter until the deadline specified in Annex I or II for restricted	Yes. Additional requirement to notify relevant Ministries about stockpiles. Administrative costs will depend on: - the number of such stockpiles - frequency and format of notification - unit cost of processing notifications (to be multiplied by number of stockpiles and frequency per year)	MoEU plus Relevant Institutions	Notification	Retrieving information Storing data Reporting	Yes, holders of stockpiles are obliged to notify the Ministry in which stockpile is established with information concerning the nature and size of that stockpile (within 12 months and then annually till restricted use deadline is expired.	Improved information on existing stockpiles

		use"						
	Stockpiles	Art7(3) "Ministry shall monitor the use and management of notified stockpiles"	Yes. Additional requirement to monitor notified stockpiles. Administrative costs will depend on: - the number of such stockpiles - frequency and format of monitoring - unit cost of monitoring (to be multiplied by number of stockpiles and frequency per year)	MoEU	Inspection	Inspecting and checking	Yes, potentially. Holders of stockpiles to cooperate with monitoring activities	Enforcement of proper management of POPs stockpiles
Art 8	Release reduction, minimisation and elimination	Art8(1) Within two years of the date of entry into force of this By-law, the Ministry and Relevant Institutions shall draw up and maintain release inventories for the substances listed in Annex III into air, water and land in accordance with their obligations under the Convention and within the scope of their duties	Yes. Additional costs of developing and maintaining inventories for Annex III substances. Costs will depend on: - List of substances and anticipated format of inventories - One –off costs of developing the inventories required - Annual (O&M) costs of inventories - Split of responsibilities between different institutions	MoEU MoH MoFAL Ministry of Energy and Natural Resources Ministry of Science, Industry and Technology Ministry of Customs and Trade Ministry of Economy Ministry of Forests and Water Affair Ministry of Labor and Social Security	Submission of reports	Producing new data Reporting	Yes, potentially. Depending on downstream requirements for industries to provide information for inventories	Benefits of better information on Annex III releases to Turkish environment
	Release reduction, minimisation and elimination	Art8(2) "Ministry shall communicate its action plan on measures to identify, characterise and minimise with a view to eliminating where feasible as soon as possible the total releases developed in accordance with its obligations under the Convention to other Relevant Institution as part of its national implementation	Yes. Information dissemination requirement. In practice probably limited to publishing NIP. Costs will depend on the format of communication (e.g. publishing, active dissemination via seminars etc.). Costs will also depend on the expected actions from the Relevant institutions, i.e. familiarisng themselves with the NIP.	MoEU MoH MoFAL Ministry of Energy and Natural Resources Ministry of Science, Industry and Technology Ministry of Customs and Trade	Reporting	Retrieving and adjusting data Holding meetings Reporting	Yes, potentially. Depending on downstream requirements for industries to contribute to development of the action plan	Benefits of better information and enforceable action plan.

		plan".	Costs assumed to be addressed under Article 10 (NIP).	Ministry of Economy Ministry of Forests and Water Affair Ministry of Labor and Social Security				
	Release reduction, minimisation and elimination	Art8(3) "Ministry shall, when evaluating proposals to construct new facilities or significantly to modify existing facilities using processes that release chemicals listed in Annex III, without prejudice to Draft IPPC By-law, give priority consideration to alternative processes, techniques or practices that have similar usefulness but which avoid the formation and release of substances listed in Annex III".	Yes. Costs will depend on whether such consideration is taking place already. Potential costs depend on: - Current evaluation systems - Number of such applications per year - Unit cost for the Ministry to evaluate such proposals Costs on public bodies will also depend on whether the costs are incorporated in the permitting fees and recovered from the applicants.	MoEU	Permitting	Data assessment Holding meetings	Yes, potentially. Depending on downstream requirements for industries to contribute to consideration process.	Benefits to environment from reduced Annnex III emissions
Art 9	Waste management	Art9(4) stipulate derogations based on concentration limits for POPs in wastes (4) By way of derogation from paragraph 2: a) waste containing or contaminated by any substance listed in Annex IV may be otherwise disposed of or recovered in accordance with the legislation, provided that the content of the listed substances in the waste is below the concentration limits to be specified in Annex IV. Those measures, designed to amend non-essential elements of this By-law, shall be adopted through the Committee referred to in Article 18.	Yes. Potentially, cost of establishing concentration limits in wastes and operation of the Committee under the Article 18. Costs of assessing and granting such exemptions that will depend on: - Number of anticipated exemptions per year - Manpower required for assessment per each case and unit costs	MoEU plus relevant institutions	Permitting and derogations	Data assessment. Holding meetings Inspections and checking	Yes, potentially. Depending on downstream requirements for industries to report on POPs concentrations in wastes	Benefits to waste holders from reduced or avoided costs

		b) Ministry, in exceptional cases, allow wastes listed in Annex V, part 2 containing or contaminated by any substance listed in Annex IV up to concentration limits to be specified in Annex V, part 2, to be otherwise dealt with in accordance with a method listed in Annex V, part 2 provided that: 1) the holder concerned has demonstrated to the satisfaction of the Ministry concerned that decontamination of the waste in relation to substances listed in Annex IV was not appropriate, and that destruction or irreversible transformation of the persistent organic pollutant content, performed in accordance with best environmental practice or best available techniques, does not represent the environmentally preferable option and the competent authority has subsequently authorised the alternative operation; 2) this operation is in accordance with the legislation of the Ministry and Relevant Institutions and the conditions laid down in relevant additional measures referred to in paragraph 6.						
Art9	Waste management	Art9 (5) Concentration limits in Annex V, part 2 shall be established by the Ministry for the purposes of paragraph 4(b) of this Article. Those measures, designed to amend non-essential elements of this By-law, shall be adopted in	Yes. Potentially, cost of establishing concentration limits in wastes and operation of the Committee under the Article 18. Costs of assessing and granting such	MoEU plus relevant institutions			Yes. Information provision obligation on the holders of wastes	

		accordance with the regulatory procedure with scrutiny referred to in Article 18. Until such time as these concentration limits are established: a) the Ministry and Relevant Institutions may adopt or apply concentration limits or specific technical requirements in respect of waste being dealt with under paragraph 4(b); b) where waste is being dealt with under paragraph 4(b), the holders concerned shall provide information on the persistent organic pollutant content of the waste to the Ministry.	exemptions that will depend on: - Number of anticipated exemptions per year - Manpower required for assessment per each case and unit costs					
Art9	Waste management	Art9 (6) The Ministry may, where appropriate, and taking into consideration technical developments and relevant international guidelines and decisions and any authorizations granted by a Ministry and Relevant Institutions in accordance with paragraph 4 and Annex V, adopt additional measures relating tothe implementation of this Article. Such measures shall be decided in accordance with the procedure laid down in Article 18	Yes. Potentially, cost of consideration of technical developments and operation of the Committee under the Article 18. Costs of such activities will depend on format, extent and frequency of such "consideration" and associated manpower requirements. For the purpose of RIA, costs could be captured under Art 18 – committee	MoEU plus relevant institutions				
Art 10	Implementation plans	(1) The Ministry shall review and update the National implementation plan, as appropriate.	Yes. Costs of review and updating of NIP. Costs will depend on: - Anticipated frequency of review - Unit costs of such activity (including potential outsourcing)	MoEU	Submission of report	Retreiving, adjusting and producing data Holding meetings	Potentially. Participation in NIP revision as stakeholders	Ensuring that policy makers are acting based on the most up to date information regarding POPs

	Implementation plans	(2) The Ministry exchanges information with other institutions during revision and update of the NIP.	Yes. Information exchange. Costs will depend on: - Format, content and frequency of such information exchange - Manpower requirements and costs	MoEU plus relevant institutions	Submission of report	Familiarising with data and draft NIP Holding meetings Preparing response	Potentially. Participation in NIP revision as stakeholders	Ensuring timely involvement and "ownership" of updated NIP by all RIs
	Implementation plans	(3) The ministry sends the NIP to related institutions for approval	Yes. Information provision. Costs will depend on: - Frequency of submission for approval - Manpower requirements and costs associated with approval - List of relevant institutions	MoEU plus relevant institutions	Submission of report	Copying and submitting the report Familiarising with report Holding meetings Preparing response/ approval	Potentially. Participation in NIP revision as stakeholders	Ensuring feeling of ownership from all parties involved and commitment to implementation
Art 11	Monitoring	Art11(1) The Ministry and the Relevant Institution shall establish, in close cooperation, appropriate programmes and mechanisms, consistent with the state of the art, for the regular provision of comparable monitoring data on the presence of dioxins, furans and PCBs as identified in Annex III in the environment.	Yes. Costs of establishing monitoring system for Annex III substances. Costs will depend on: - List of substances - Monitoring network design (number of points, frequency) - Unit cost of sampling and analysis including reporting	MoEU and Relevant Institutions	Monitoring	Producing new data Filling and submitting the information	No	Generation of new data on the presence of Annex III substances in environment would result in a better information and knowledge available to policy makers and, subsequently, better decision making
Art 12	Information exchange	Art12(1) The Ministry and the Relevant Institution shall facilitate and undertake the exchange within the Community and with third countries of information relevant to the reduction, minimisation or elimination, where feasible, of the production, use and release of persistent organic pollutants and to alternatives to those substances, specifying the risks and the economic and social costs related to such	Yes. Costs of information exchange. Costs will depend on the format, content and frequency of such exchange.	MoEU plus Relevant Institutions	Information sharing	Training Holding meetings Publishing information	No	Improved knowledge base

		alternatives						
	Information exchange	Art 12(2) The Ministry and Relevant Institution, as appropriate, shall promote and facilitate with regard to persistent organic pollutants: a) awareness programmes, including relating to their health and environmental effects and their alternatives and on the reduction or elimination of their production, use and release, especially for: b) the provision of public information; c) training, including workers, scientists, educators and technical and managerial personnel.	Yes. Costs of promotion and facilitation. Costs will depend on anticipated format, content and frequency of such activities (i.e. awareness programmes; public awareness raising; dedicated training events).	MoEU plus Relevant institutions	Information sharing	Training Holding meetings Publishing information	Potentially, as recipents or contributors.	Improved POPs awareness among general public, industries and institutions (inter alia facilitating implementation of NIP)
	Information exchange	Art 12(3) Without prejudice to Right to Information Law published in the Official Journal dated 09/10/2003 and numbered 4982 on public access to information, information on health and safety of humans and the environment shall not be regarded as confidential. The Ministry and Relevant Institution that exchange other information with other institutions shall protect any confidential information as mutually agreed	Yes. Costs of safeguarding confidential information. Costs will depend on the policies, implementation approaches. Costs will include: - Costs of developing confidentiality policies and agreements (including developing confidentiality criteria) - Annual implementation costs	MoEU plus Relevant institutions	Information sharing	Training Holding meetings Publishing information	Yes, indirectly by stipulating that information provided should be treated as confidential	Protection of confidential information ensured.
Art 13	Technical assistance	Art13(1) In accordance with Articles 12 and 13 of the Regulation, the Ministry and the Relevant Institution shall cooperate in providing appropriate and timely technical and financial assistance to developing	Yes. Technical and financial assistance to developing countries. Costs will depend on anticipated format and scale of such assistance.	MoEU plus Relevant institutions	Information sharing	Training Holding meetings Designing infotmation materials etc.	No	Implementation of this article would provide external benefits to third countries (developing and countries in transition) with

		countries and countries with economies in transition to assist them, upon request and within available resources and taking into account their particular needs, to develop and strengthen their capacity to fully implement their obligations under the Regulation. Such support may also be channeled through non-governmental organisations						regard to POP management
Art 14	Reporting	Art14(1) Relevant Institution shall every three years forward to the Ministry information on the application of this By-law, including information on infringements and penalties.	Yes. Costs of reporting that will depend on: - Number of institutions affected - Frequency of reporting (once in 3 years) - Content and format of reporting affecting the unit costs of each submission. Costs to relevant institution will depend on whether reporting could be done using information available to these institutions or would entail generation of new data.	MoEU MoH MoFAL Ministry of Energy and Natural Resources Ministry of Science, Industry and Technology Ministry of Customs and Trade Ministry of Economy Ministry of Forests and Water Affair Ministry of Labor and Social Security	İnformation provision	Data gathering, generation, reporting	Yes, indirectly if Relevant institutions will need to acquire data for reporting from industry	Better information
	Reporting	Art14(2) Relevant Institution shall provide the Ministry every year with statistical data on total production and placing on the market of any substance listed in Annex I or II.	Yes. Costs of reporting that will depend on: - Number of institutions affected - Frequency of reporting (annual) - List of substances (Annex I and Annex II) - Content and format of reporting - Availability of the data to the relevant institutions or the need to generate new information	MoEU MoH MoFAL Ministry of Energy and Natural Resources Ministry of Science, Industry and Technology Ministry of Customs and Trade Ministry of Economy Ministry of Forests and	İnformation provision	Data gathering, generation, reporting	Yes, indirectly if Relevant institutions will need to acquire data for reporting from industry	Better information on POPs substances

				Water Affair Ministry of Labor and Social Security				
	Reporting	Art14(3) Within three years of the date of entry into force of this By-law and every three years thereafter, Relevant Institution shall provide the Ministry with: a) summary information compiled from the notifications, concerning stockpiles, received pursuant to Article 7(2); b) summary information compiled from the release inventories drawn up pursuant to Article 8(1); c) summary information on the presence of substabces as identified in Annex III in the environment, as compiled pursuant to Article 11.	Yes. Costs of reporting that will depend on: - Number of institutions affected - Frequency of reporting (once in 3 years) - List of substances (Annex III) - Number of stockpiles - Information of inventories - Content and format of reporting - Availability of the data to the relevant institutions or the need to generate new information	MoEU MoH MoFAL Ministry of Energy and Natural Resources Ministry of Science, Industry and Technology Ministry of Customs and Trade Ministry of Economy Ministry of Forests and Water Affair Ministry of Labor and Social Security	İnformation provision	Data gathering, generation, reporting	Yes, indirectly if Relevant institutions will need to acquire data for reporting from industry	Better information
	Reporting	Art14(4) As regards the data and information to be provided by Relevant Institution pursuant to paragraphs 1, 2 and 3, the Ministry shall take necessary measures to compile data provided	Yes. Costs of compilation and storage of data provided by Relevant institutions. Costs will depend on the format, content and update frequency of reported data	MoEU	Data management	Data gathering, review, storage	No, covered above	Better information
	Reporting	Art14(5) Regarding the substances listed in the Regulation, the Ministry shall, at intervals to be determined by the Conference of the Parties of the Convention, compile a report on the basis of the information provided by the Relevant Institutions in accordance with paragraph 2 and communicate it to the Secretariat of the Convention.	Yes. MoEU to report to the Secretariat. Costs will depend on the: - Frequency - Content - Unit costs of generating such report	MoEU	Reporting	Data review, assessment Holding meetings Reporting	No, covered above	Better information

Art 15	Pentalties	(1) Controls and sanctions in relation to this Regulation shall be performed by relevant institutions in accordance with their legislation	No Article does not seem to impose reporting/ information exchange requirements	na	na	na	na	na
Art 16	Amendment of Annexes	Art16(1) Whenever a substance is listed in the Convention or the Protocol, the Ministry shall, where appropriate, amend Annexes I, II and III accordingly in line with the legislation. Provision not included in current draft by-Law	Na Assumed to be covered by the Committee work	na	na	na	na	na
Art 17	Relevant Institutions' Point of Contact	Art17(1) Each Relevant Institution is responsible for the execution of this By-Law within the scope of their duties and existing legislation: MoEU MoH MoFAL Ministry of Energy and Natural Resources Ministry of Science, Industry and Technology Ministry of Customs and Trade Ministry of Economy Ministry of Forests and Water Affair Ministry of Labor and Social Security	Yes, indirectly Defines the list of potentially affected institutions	MoEU MoH MoFAL Ministry of Energy and Natural Resources Ministry of Science, Industry and Technology Ministry of Customs and Trade Ministry of Economy Ministry of Forests and Water Affair Ministry of Labor and Social Security	na	na	na	na
Art 18	Chemicals and Waste Advisory Committee	Art18(1) The Ministry shall establish a new Commission to harmonise national policies, provide information exchange between related	Yes. Establishment of new Committee Costs will depend on:	MoEU plus relevant institutions	Information sharing and cooperation	Familiarising with new information Holding meetings	Yes, indirectly if industry members are included	Improved inter-institutional cooperation and information

		institutions Art18(2) The commission comprises of authorized representatives from related institutions and invited speficially for the topic Art18(3) This commission is assembled by the invitation of the Ministry and proposal of related institutions Main duties and responsibilities of the commission: a) Providing information exchange between ministry and related institutions b) Monitors, evaluates and gives suggestions about the implementation of the by-law c) Develops suggestions to improve applicability of the implementation of by-law and to improve cooperation d) Shares opinion about the policies and strategies of Turkey at national scale and international relations within the scope of this regulation	- Format of operation and frequency of Committee meetings - Number of participants and estimated time requirements per year per participant - Manpower costs per hour			Information sharing		exchange Improved knowledge base
Art 19	Inspection	Art19(1) Inspections related with provisions of this By-law are administered by Relevant Institutions according to their	Na Assumed to be covered by the current legal requirements	na	na	na	na	na

		legislation Provision not included in current draft by-Law						
Art 20	Entry into force	None	na	na	na	na	na	na
Art21	Execution	Art21(1) The provisions of this By-law are administered by the Minister of Environment and Urbanization	Yes, indirectly Defines overall responsibility for the execution of the By-Law	MoEU	na	na	na	na

Appendix C
Questionnaire to Ministry of Environment and Urbanisation

Section 1: Article 5 Control of production, placing on the market and use

Art5(3) stipulates that "The Ministry and Relevant Institution shall, within the assessment and authorisation schemes for chemicals and pesticides under their relevant legislation, take into consideration Convention and take appropriate measures to control existing chemicals and pesticides and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants"

1. Do you have current assessment and authorisation schemes for chemicals and pesticides under your relevant legislation? Yes/No
2. If Yes, please provide details on these schemes detailing its scope, assessment frequency and average number of assessments and authorisations per year.
3. Do you currently take into account requirements of Stockholm Convention regarding POPs and take measures to control existing chemicals and pesticides and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants?
4. If yes, please provide details on how this is done and what effort does it require currently (e.g. manpower requirements etc.)
5. If no (or not fully), what additional actions would you need to execute in order to comply with the provisions of the article and, in particular, to take into account and take appropriate measures to control and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants? What would be associated manpower requirements of these actions? (in annual terms or on per assessment and authorisation basis)?

Section 2: Article 6 Exemptions from control measures (relevant only if Appendix explicitly allows for such exemption)

Article 6(2) requires MoEU to notify the Secretariat about the articles containing POPs already in use before or on the date of entry into force of By-Law and about articles containing POPs produced before or on the date of entry into force of this By-law until six months after the date of its entry into force.

1. In your view, how would you be obtaining this information?
2. What would be the likely format and frequency of such notification to the Secretariat? [NB. It is noted that the requirement is time limited and would probably apply for the first year only]
3. What would be anticipated manpower requirements for you per year to notify the Secretariat?

Article 6(3) requires MoEU to notify the Secretariat about the instances of permitted production and use of relevant POP substances as a closed-system site limited intermediate.

1. In your view, how would you be obtaining this information?
2. What would be the likely format and frequency of such notification to the Secretariat?
3. What would be anticipated manpower requirements for you per year to notify the Secretariat? [NB. It is noted that in relative terms carrying out assessment and inspections would require more effort than notification of the Secretariat itself]

Article 6(4) stipulates criteria for the assessment of closed systems during the handling of chemical agents as well as inspection and checks requirements.

1. In your opinion, what would be the process for assessment and granting exemptions to the closed systems?
2. What would be likely number of installations affected and manpower requirements to carry out such assessment and follow-up inspections per application?

Section 3: Article 7 Stockpiles

Article 7 requires holders of stockpiles (permitted use of POPs) to notify the Ministry in which stockpile is established about the nature and the size of stockpile. The Ministry is then required to monitor the use and management of notified stockpiles.

1. In your view, what would be the likely format and frequency of such monitoring?
2. What would be anticipated monitoring costs while having regard to the likely number of stockpiles, monitoring frequency and format and unit costs per year?

Section 4: Article 8 Release reduction, minimization and elimination

Article 8(1) requires preparation and maintenance of Annex III release inventories.

1. In your opinion, what would be anticipated format and content of inventories?
2. What would be one-off costs of developing the inventories required?
3. What would be annual costs of maintaining the inventories?
4. What contribution and/or data would you expect from other Relevant Institutions?

Article 8(3) requires the Ministry to give priority consideration to alternative processes, techniques or practices that have similar usefulness but which avoid the formation and release of substances listed in Annex III while evaluating proposals to construct new facilities or significantly to modify existing facilities using processes that release chemicals listed in Annex III.

1. Please provide details on whether current application assessment processes already take into account anticipated impacts on releases of Annex III substances?
2. If so, would you anticipate any additional effort (i.e. in terms of manpower costs) to incorporate the requirement in the current assessment and permitting process?
3. If no such consideration is taking place at the moment, what would be the likely number of applications per year?
4. What additional effort in terms of manpower costs would be required to incorporate consideration of alternative techniques or practices as part of permitting system?
5. Would you anticipate for this additional effort to be covered through increased permit application fees to the industries?

Section 5: Article 9 Waste management

Article 9(4) stipulate derogations based on concentration limits for POPs in wastes and implementation of this article would require carrying out assessments on whether derogations should be granted.

1. In your opinion, how proposed derogation system for POPs containing wastes would work in practice?
2. What would be anticipated number of derogations per year?
3. What would be additional manpower requirements to asses each derogation application?
4. Would you anticipate these costs to be recovered from the applicants?

Article 9(5) requires the Ministry to establish concentration limits to be adopted under the Article 18 process. Implementation of this article would require setting up concentration limits in wastes and operation of the Committee established under Article 18.

1. In your opinion, what would be the costs of establishing concentration limits for wastes?

Article 9(6) stipulates provisions regarding adoption of any additional measures relating to implementation of the Article 9 while taking into consideration technical developments, guidelines etc. Any additional measures will need to be decided in accordance of the Article 18 process. Costs are considered to be covered under Article 18 assessment below.

Section 6: Article10 Implementation Plan

Article 10 stipulates the following:

(1) The Ministry shall review and update the National implementation plan, as appropriate.

(2) The Ministry shall exchange information with other institutions during revision and update of the NIP.

(3) The ministry shall send the NIP to related institutions for approval

2. According to your opinion, what would be anticipated frequency of review and updating of the NIP?
3. What are anticipated costs of NIP review and update (including own manpower and, potentially, outsourcing costs)[26]?
4. Article 10 includes provisions regarding information exchange with other relevant institutions during the review and update of NIP and obtaining their approval.
    - What would be the most likely format and frequency of such information exchange and associated internal manpower requirements and other costs (such as meeting room costs etc.)?
    - What would be internal manpower requirements and other costs to obtain approval from other Relevant Institutions?

Section 7: Article 11 Monitoring

The Article 11 requires MoEU to establish appropriate monitoring systems on the presence of Annex III substances in the environment (PCB, PAH, HCB and PCDD/PCDF, Pentaklorobenzen).

1. In your opinion, what would be anticipated costs of establishing such monitoring system (one-off and annual O&M costs)?

In the absence of such estimates, could you please:

2. Confirm the list of POP substances to be monitored
3. Provide information on potential design of monitoring system in terms of number of sampling points and sampling frequency per substance per year?
4. Unit costs of sampling, analysis and reporting per substance?

Section 8: Article 12 Information exchange

Article 12(1) requires MoEU and Relevant Institutions to facilitate and undertake the exchange within the Community and third countries of information relevant to the reduction, minimisation, elimination, production, use and release of POPs.

1. In your view, what could be likely format, content and frequency of such information exchange? Would these activities be covered under Article 18 Committee?

[26] Also covering developing of specific action plans (i.e. Article 8(2) - action plan on measures to identify, characterise and minimise with a view to eliminating where feasible as soon as possible the total releases etc.)

2. If not, what would be associated manpower and other costs per year for ensuring information exchange?

Article 12(2) requires MoEU and RI to promote and facilitate awareness programmes, provision of public information and dedicated training on POPs.

1. In your view, what would be likely format and frequency of such information sharing activities?
2. What would be anticipated annual costs/ budget for information sharing? In the absence of dedicated information dissemination and training budget, what would be estimated manpower requirements per year to comply with the provisions of this Article?

Article 12(3) sets out that while performing information sharing and exchange the MoEU and RI shall protect confidential data.

In your view, what would be anticipated approach to safeguarding confidential information (dedicated policies, data sharing protocols etc.)?

What would be anticipated costs of developing such confidentiality policies and implementing these on continuous basis?

Section 9: Article 13 Technical assistance

Article 13 requires the Ministry to cooperate in providing technical and financial assistance to developing countries and countries with economies in transition.

1. What is your view regarding potential format and scale of such assistance?
2. What would be anticipated annual costs/ budget for providing such technical assistance per year?
3. In the absence of dedicated technical assistance budget, what would be estimated manpower requirements per year to comply with the provisions of this Article?

Section 10: Article 14 Reporting

Article 14(1) requires Relevant Institutions to submit information to the MoEU regarding the application of the By-Law including on any infringements and penalties (once every 3 years).

Article 14(2) requires Relevant Institutions to provide the MoEU with total production and placing in the market quantity data for substances listed in the Annex I or Annex II (once a year).

Article 14(3) requires Relevant Institutions to submit information to the MoEU (once every 3 years):

- Summary information on notified stockpiles
- Summary information on release inventories (Annex III substances)
- Summary information on Annex III substance monitoring

Article 14(4) requires MoEU to compile and store the data received

1. What would be anticipated manpower requirements to review and store reported data?
2. Would you anticipate any additional data storage costs of the reported data?

Article 14(5) requires MoEU to report the information received to the Secretariat

1. What would be anticipated frequency, content and format of the reporting?
2. In your opinion, what would be likely manpower requirements to generate such report?

Section 11: Article 18 Chemicals and Waste Advisory Committee

The Article requires the Ministry to establish a new Committee to harmonise national policies, provide information exchange between related institutions that is composed of representatives from relevant institutions and those invited by the Ministry depending on specific topic.

Duties of the Committee also cover some of the activities referred to in other articles (e.g. information exchange responsibilities (Article 12), setting up concentration limits etc.).

1. In you view, what would be the most likely design of such Committee in terms of format of operation, frequency of the meetings, number of participants and anticipated time inputs per year per Committee member?
2. What would be associated annual costs of running and operating the Committee (for the MoEU) including background support?

Appendix D
Questionnaire to Relevant Institutions

Section 1: Article 5 Control of production, placing on the market and use

Art5(3) stipulates that "The Ministry and Relevant Institution shall, within the assessment and authorisation schemes for chemicals and pesticides under their relevant legislation, take into consideration Convention and take appropriate measures to control existing chemicals and pesticides and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants"

1. Do you have current assessment and authorisation schemes for chemicals and pesticides under your relevant legislation? Yes/No
2. If Yes, please provide details on these schemes detailing its scope, assessment frequency and average number of assessments and authorisations per year.
3. Do you currently take into account requirements of Stockholm Convention regarding POPs and take measures to control existing chemicals and pesticides and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants?
4. If yes, please provide details on how this is done and what effort does it require currently (e.g. manpower requirements etc.)
5. If no (or not fully), what additional actions would you need to execute in order to comply with the provisions of the article and, in particular, to take into account and take appropriate measures to control and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants? What would be associated manpower requirements of these actions? (in annual terms or on per assessment and authorisation basis)?

Section 2: Article 6 Exemptions from control measures (relevant only if Appendix explicitly allows for such exemption)

Article 6(2) requires Relevant Institutions to notify the MoEU about the articles containing POPs already in use before or on the date of entry into force of By-Law and about articles containing POPs produced before or on the date of entry into force of this By-law until six months after the date of its entry into force.

1. In your view, what would be the likely approach, format and frequency of such notifications to your institution?
2. What would be anticipated manpower requirements per year to collate, process, store and pass on this information to the MoEU? [NB. It is noted that the requirement is time limited and would probably apply for the first year only].

Section 3: Article 7 Stockpiles

Article 7 requires holders of stockpiles (permitted use of POPs) to notify the Ministry in which stockpile is established about the nature and the size of stockpile. The Relevant Institutions is then required to pass on this information to the MoEU so it can fulfil set monitoring requirements on the notified stockpiles.

1. In your view, would your institution be affected by the provisions of this Article? Would you expect holders of stockpiles to notify you as you represent the Ministry under which stockpile is established?
2. If so, what would be anticipated costs per year to receive, process and store the information?

Article 14 requires to provide a summary information compiled from the notifications, concerning stockpiles, received pursuant to Article 7(2) to the MoEU.

1. In your view, what would be the format of such information provision (e.g. a letter, e-mail, formal report etc.) and anticipated manpower cost per year?

Section 4: Article 8 Release reduction, minimization and elimination

Article 8(1) requires preparation and maintenance of Annex III release inventories.

1. In your opinion, would you be requested to draw up or contribute to development of inventories for the Annex III substance releases?
2. If so, what would be anticipated format and content of inventories?
3. What would be one-off costs of developing the inventories required?
4. What would be annual costs of maintaining the inventories?

Section 5: Article 9 Waste management

Article 9(5) requires the Ministry to establish concentration limits to be adopted under the Article 18 process. Implementation of this article would require setting up concentration limits in wastes and operation of the Committee established under Article 18.

Until such time as these concentration limits are established the Ministry and Relevant Institutions may adopt or apply concentration limits or specific technical requirements in respect of waste being dealt with under paragraph 4(b) Art9 (5) under the Article 18 process.

Costs are considered to be covered under Article 18 assessment below.

Section 6: Article10 Implementation Plan

Article 10 stipulates the following:

(1) The Ministry shall review and update the National implementation plan, as appropriate.

(2) The Ministry shall exchange information with other institutions during revision and update of the NIP.

(3) The ministry shall send the NIP to related institutions for approval

Article 10 includes provisions regarding information exchange with other relevant institutions during the review and update of NIP and obtaining of approval.

1. What would be your internal manpower requirements and other costs (such as meeting room costs etc.) associated with such information exchange (per a round of NIP review)?
2. What would be internal manpower requirements and other costs to obtain your approval?

Section 7: Article 11 Monitoring

The Article 11 requires MoEU in cooperation with Relevant Institutions to establish appropriate monitoring systems on the presence of Annex III substances in the environment (PCB, PAH, HCB and PCDD/PCDF, Pentaklorobenzen).

1. Are you envisaging taking part of such monitoring system?
2. If so, what would be anticipated costs of establishing such monitoring system (one-off and annual O&M costs) for your organisation?
3. In the absence of such estimates, could you please:
   - Confirm the list of POP substances to be monitored
   - Provide information on potential design of monitoring system in terms of number of sampling points and sampling frequency per substance per year?

- Unit costs of sampling, analysis and reporting per substance?

Section 8: Article 12 Information exchange

Article 12(1) requires MoEU and Relevant Institutions to facilitate and undertake the exchange within the Community and third countries of information relevant to the reduction, minimisation, elimination, production, use and release of POPs.

1. Do you anticipate to participate in such information exchange activities? If so, what could be likely format, content and frequency of such information exchange?
2. What would be associated manpower and other costs per year for ensuring information exchange?

Article 12(2) requires MoEU and Relevant Institutions to promote and facilitate awareness programmes, provision of public information and dedicated training on POPs.

1. Do you anticipate to participate in such awareness programmes, training and public information provision activities? If so, what would be likely format and frequency of such activities?
2. What would be anticipated annual costs/ budget for awareness programmes, provision of public information and dedicated training on POPs? In the absence of dedicated information dissemination and training budget, what would be estimated manpower requirements per year to comply with the provisions of this Article?

Article 12(3) sets out that while performing information sharing and exchange the MoEU and Relevant Institutions shall protect confidential data.

1. In your view, what would be anticipated approach to safeguarding confidential information (dedicated policies, data sharing protocols etc.)?
2. What would be anticipated costs of developing such confidentiality policies and implementing these on continuous basis to your organisation?

Section 9: Article 13 Technical assistance

Article 13 requires the Ministry to cooperate **with Relevant Institutions** in providing technical and financial assistance to developing countries and countries with economies in transition as part of the Regulation implementation process.

1. Would you expect to be involved in provision of such technical assistance?
2. If so, what is your view regarding potential format and scale of such assistance?
3. What are anticipated annual costs/ budget for technical assistance?
4. In the absence of dedicated technical assistance budget, what would be estimated manpower requirements per year to comply with the provisions of this Article?

Section 10: Article 14 Reporting

Article 14(1) requires Relevant Institutions to submit information to the MoEU regarding the application of the By-Law including on any infringements and penalties (once every 3 years).

Article 14(2) requires Relevant Institutions to provide the MoEU with total production and placing in the market quantity data for substances listed in the Annex I or Annex II (once a year).

Article 14(3) requires Relevant Institutions to submit information to the MoEU (once every 3 years):

- Summary information on notified stockpiles
- Summary information on release inventories (Annex III substances)
- Summary information on Annex III substance monitoring

1. What would be anticipated annual manpower requirements for your institution to generate and compile reports under Article 14(1), 14(2) and 14(3) provisions? [NB. It is noted that anticipated costs of reporting will depend on whether such data is already available or easily obtainable or would require establishment of additional data gathering mechanisms, monitoring activities etc.]

Section 11: Article 18 Chemicals and Waste Advisory Committee

The Article requires the Ministry to establish a new Committee to harmonise national policies, provide information exchange between related institutions that is composed of representatives from relevant institutions and those invited by the Ministry depending on specific topic.

Duties of the Committee also cover some of the activities referred to in other articles (e.g. information exchange responsibilities (Article 12), setting up concentration limits etc.).

1. In you view, would you expect to participate in the Committee and if so, what would be annual manpower requirements associated with preparation and participation in the Committee meetings?

Appendix E
Results of the interviews and written responses

REGULATORY IMPACT ASSESSMENT: administrative impacts - Meeting with the Ministry of Food, Agriculture and Livestock (MoFAL)

Project title:	**Technical Assistance for Implementation of Persistent Organic Pollutants (POPs) Regulation** **TR2010/0327.03-01/001**
Time:	13th of April, 2015 Time: 10:00 am – 12:00 pm.
Place:	MoFAL

List of participants

Name of the participant	Institution	Position
Ms. Ilona Kirhensteine	AMEC, NIRAS Consortium	Deputy Team Leader
Ms. Sinem Erdogdu	RAST Engineering, NIRAS Consortium	Short Term RIA Expert
Hasan Yılmaz Dursun	MoFAL Department of Plant Protection Product	Branch Manager
Abdullah Gölpınar	Department of Plant Protection Products	0312 258 7570 0507 873 65 58

MINUTES

RIA working meeting started at 10:00 am and was dedicated to obtaining responses to the questionnaire disseminated earlier by the Ministry of Environment and Urbanisation. The questionnaire was focused on eliciting views of different Ministries on potential administrative burden associated with the draft By-Law.

The summary of the responses provided is presented in the table.

Questions	Responses
Section 1: Article 5 Control of production, placing on the market and use Art5(3) stipulates that "The Ministry and Relevant Institution shall, within the assessment and authorisation schemes for chemicals and pesticides under their relevant legislation, take into consideration Convention and take appropriate measures to control existing chemicals and pesticides and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants" Do you have current assessment and authorisation schemes for chemicals and pesticides under your relevant legislation? Yes/No If Yes, please provide details on these schemes detailing its scope, assessment frequency and average number of assessments and authorisations per year. Do you currently take into account requirements of Stockholm	MoFAL operates a licensing system for pesticides in accordance to the Control of Plant Protection products Regulation (Official Gazzette Date: 20.05.2011, number 27939) which is published according to the Law of Veterinary Services, Vegetation Health, Food and Bait, numbered 5966. The Regulations envisage two alternative procedures - by trial (new substances) or by example (existing substances, i.e. active ingredients licensed before). In the case of new substances (active ingredients) detailed information is requested including detailed information on physico-chemical, toxicologic/ecotoxicologic properties, bioeffectiveness, residual properties. The Licensing Committee of the MoFAL takes place once every month (12 times a year). It is composed of 20-25 experts (including staff of the MoFAL, experts from academia). As a general rule, for a pesticide to be authorised in Turkey, it should be already authorised in EU/ G8 countries. There are usually about 300 licences issued each year (but some

Questions	Responses
Convention regarding POPs and take measures to control existing chemicals and pesticides and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants? If yes, please provide details on how this is done and what effort does it require currently (e.g. manpower requirements etc.) If no (or not fully), what additional actions would you need to execute in order to comply with the provisions of the article and, in particular, to take into account and take appropriate measures to control and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants? What would be associated manpower requirements of these actions? (in annual terms or on per assessment and authorisation basis)?	are renewals while others are for different products but same active ingredients). The licensing process typically takes 2 years and each licence is valid for 10 years. Currently there are 343 licensed active ingredients in the Turkish market (corresponding to a higher number of products). Current application of PPP is estimated to be between 50-70 tonnes a year. All POPs pesticides are either banned or have never been licensed. Dicofol was also banned in 2011. Consideration of POPs characteristics is partially a part of the process but estimated additional burden to consider POPs characteristics specifically will require 1-2 people spending about 3-5% each max (5-10% FTE per year). Time will be needed to consider published materials, information on products, information on potential future ban of a product due to its POPs characteristics.
Section 2: Article 6 Exemptions from control measures (relevant only if Appendix explicitly allows for such exemption) Article 6(2) requires Relevant Institutions to notify the MoEU about the articles containing POPs already in use before or on the date of entry into force of By-Law and about articles containing POPs produced before or on the date of entry into force of this By-law until six months after the date of its entry into force. In your view, what would be the likely approach, format and frequency of such notifications to your institution? What would be anticipated manpower requirements per year to collate, process, store and pass on this information to the MoEU? [NB. It is noted that the requirement is time limited and would probably apply for the first year only].	The provision will not affect the MoFAL, i.e. it is not expected to result in any additional burden
Section 3: Article 7 Stockpiles Article 7 requires holders of stockpiles (permitted use of POPs) to notify the Ministry in which stockpile is established about the nature and the size of stockpile. The Relevant Institutions is then required to pass on this information to the MoEU so it can fulfil set monitoring requirements on the notified stockpiles. In your view, would your institution be affected by the provisions of this Article? Would you expect holders of stockpiles to notify you as you represent the Ministry under which stockpile is established? If so, what would be anticipated costs per year to receive, process and store the information? Article 14 requires to provide a summary information compiled from the notifications, concerning stockpiles, received pursuant to Article 7(2) to the MoEU. In your view, what would be the format of such information provision (e.g. a letter, e-mail, formal report etc.) and anticipated manpower cost per year?	The provision will not affect the MoFAL, i.e. it is not expected to result in any additional burden
Section 4: Article 8 Release reduction, minimization and elimination Article 8(1) requires preparation and maintenance of Annex III release inventories. In your opinion, would you be requested to draw up or contribute to development of inventories for the Annex III substance releases? If so, what would be anticipated format and content of inventories? What would be one-off costs of developing the inventories required? What would be annual costs of maintaining the inventories?	The provision will not affect the MoFAL, i.e. it is not expected to result in any additional burden. Annex III substances include PeCB and HCB which were either never licensed in Turkey (for agricultural use) or have been banned in the past. There is no current agricultural use for PeCB and HCB, so no releases of these substances from agricultural sources are anticipated.
Section 5: Article 9 Waste management	In the context of obsolete pesticides:

Questions	Responses
Article 9(5) requires the Ministry to establish concentration limits to be adopted under the Article 18 process. Implementation of this article would require setting up concentration limits in wastes and operation of the Committee established under Article 18. Until such time as these concentration limits are established the Ministry and Relevant Institutions may adopt or apply concentration limits or specific technical requirements in respect of waste being dealt with under paragraph 4(b) Art9 (5) under the Article 18 process. Costs are considered to be covered under Article 18 assessment below.	HCH stock of 2,300 is scheduled to be disposed of in 2017 (through GEF funding) In 2010, 16 tonnes of DDT have been disposed of (at the total cost of 40,000TL) In addition to POPs pesticides, MoFAL has engaged with their provincial agricultural directorates to identify and collect obsolete pesticides. Since summer 2014, MoFAL has received responses from 9-11 provincial directorates that indicated that they have collected 30-35 tonnes of obsolete pesticides (none of these POPs, such as dicofol, cypermethrin etc.). MoFAL now holds detailed records on quantities, location, content and packaging of these pesticide stocks which also include obsolete pesticides returned to the provincial authorities by the members of public. There is GEF funding available for disposal of these stocks estimated at 150,000 USD (of which 120,000 USD are for disposal and 30,000USD for training). MoFAl is responsible for collection and transport, while MoEU for arranging appropriate disposal. Current stocks are awaiting disposal. MoFAL indicated that the issue seems to become urgent, as obsolete pesticides collected in several locations are now becoming a source of complaints (e.g. due to smell) and MoFAL is waiting for the MoEU assistance with disposal as per original agreement with GEF project. In the context of unknown, potential stocks of obsolete pesticides: the initiative described above is not part of an ongoing activities by the provincial directorates. In other words, there is no system of continuous and targeted search and collection of obsolete pesticides from farmers. As far as a possibility of obsolete POPs pesticides stocks being present at individual farms, MoFAL has suggested that it is very unlikely for individual users (farmers) to have stocks of obsolete POPs pesticides. At present, there are cheaper and more effective alternatives on the market. Besides, having regard to the bans being implemented up to 45 years ago, any (remaining) stocks would be unusable.
Section 6: Article10 Implementation Plan Article 10 stipulates the following: (1) The Ministry shall review and update the National implementation plan, as appropriate. (2) The Ministry shall exchange information with other institutions during revision and update of the NIP. (3) The ministry shall send the NIP to related institutions for approval Article 10 includes provisions regarding information exchange with other relevant institutions during the review and update of NIP and obtaining of approval. What would be your internal manpower requirements and other costs (such as meeting room costs etc.) associated with such information exchange (per a round of NIP review)? What would be internal manpower requirements and other costs to obtain your approval?	The provision will not affect the MoFAL, i.e. it is not expected to result in any additional burden. MoFAL suggested that updating of the NIP will not cause additional burden to them as POPs pesticides have been banned already. Any approval would be a quick formality not entailing additional administrative burden.
Section 7: Article 11 Monitoring The Article 11 requires MoEU in cooperation with Relevant Institutions to establish appropriate monitoring systems on the presence of Annex III substances in the environment (PCB, PAH, HCB and PCDD/PCDF, Pentaklorobenzen). Are you envisaging taking part of such monitoring system? If so, what would be anticipated costs of establishing such monitoring system (one-off and annual O&M costs) for your organisation? In the absence of such estimates, could you please: Confirm the list of POP substances to be monitored Provide information on potential design of monitoring system in terms of number of sampling points and sampling frequency per	The provision will not affect the MoFAL, i.e. it is not expected to result in any additional burden. There is no monitoring system of POPs pesticides in operation. In the context of PeCB and HCB these POPs have either never been licenced for agricultural use or banned a long time ago. Any studies on environmental concentrations and human exposure to other POPs pesticides (e.g. OCPs) have been taking place on an ad-hoc basis, as part of scientific research projects. One project, in cooperation with the Ministry of Forestry and Water has analysed POPs pesticides in water across more than 20 provinces within the scope of “BIKOP“ project.

Questions	Responses
substance per year? Unit costs of sampling, analysis and reporting per substance?	
Section 8: Article 12 Information exchange Article 12(1) requires MoEU and Relevant Institutions to facilitate and undertake the exchange within the Community and third countries of information relevant to the reduction, minimisation, elimination, production, use and release of POPs. Do you anticipate to participate in such information exchange activities? If so, what could be likely format, content and frequency of such information exchange? What would be associated manpower and other costs per year for ensuring information exchange? Article 12(2) requires MoEU and Relevant Institutions to promote and facilitate awareness programmes, provision of public information and dedicated training on POPs. Do you anticipate to participate in such awareness programmes, training and public information provision activities? If so, what would be likely format and frequency of such activities? What would be anticipated annual costs/ budget for awareness programmes, provision of public information and dedicated training on POPs? In the absence of dedicated information dissemination and training budget, what would be estimated manpower requirements per year to comply with the provisions of this Article? Article 12(3) sets out that while performing information sharing and exchange the MoEU and Relevant Institutions shall protect confidential data. In your view, what would be anticipated approach to safeguarding confidential information (dedicated policies, data sharing protocols etc.)? What would be anticipated costs of developing such confidentiality policies and implementing these on continuous basis to your organisation?	Article 12(1) – information exchange with EU and third countries. The MoFAL estimates 2 people allocated to the activity twice a year (4 mandays). In addition, costs of about 1,000-1,200 TL per person per meeting would be expected (4,000-4,800TL in total per year). Article 12(2) – participation in awareness raising and training activities. MoFAL is running a certification programmes for farmers to apply pesticides. Until today 300,000 farmers have been trained with the costs being covered by state budget. Participants are paying a nominal fee of 5-10 TL for certificate. These trainings are organised and run by provincial directorates for agriculture. Each training is taking 1-2 days and is carried out by the staff of provincial directorates and using their premises. There is no separate budget for the trainings and it constitutes a part of normal daily operation of provincial directorates. If needed, POPs related issues can be incorporated in the trainings (e.g. dealing with obsolete stockpiles etc.) and would not require any additional budget (as these trainings will be able to include POPs related issues if required (such as dealing with stockpiles). Publications by the MoFAL have a separate budget. At present MoFAL is publishing information on forthcoming bans. There are also regular meetings organised with the industry on pesticides, cancelled licenses, imports and sales updates.. Finally, in any issues are detected in particular regions, such as overapplication of pesticides, further training, information dissemination among farmers are organised as mitigation actions. 12(3) Licensing dossiers are confidential due to commercial data included. MoFAL is publishing information on active substances rather than on products themselves. Compliance with this provision will not constitute an additional burden.
Section 9: Article 13 Technical assistance Article 13 requires the Ministry to cooperate with Relevant Institutions in providing technical and financial assistance to developing countries and countries with economies in transition as part of the Regulation implementation process. Would you expect to be involved in provision of such technical assistance? If so, what is your view regarding potential format and scale of such assistance? What are anticipated annual costs/ budget for technical assistance? In the absence of dedicated technical assistance budget, what would be estimated manpower requirements per year to comply with the provisions of this Article?	Turkey is important producer and exporter of agricultural products. Any technical assistance projects require political approval by the Minister. Once such approval is granted, budget will be allocated. No such technical assistance projects have taken place within the department to date. The exact extent of such future projects can not be predicted at present. But in terms of POPs related projects the provision is not expected to affect the MoFAL significantly, i.e. it is not expected to result in significant additional administrative burden.
Section 10: Article 14 Reporting Article 14(1) requires Relevant Institutions to submit information to the MoEU regarding the application of the By-Law including on any infringements and penalties (once every 3 years). Article 14(2) requires Relevant Institutions to provide the MoEU with total production and placing in the market quantity data for substances listed in the Annex I or Annex II (once a year). Article 14(3) requires Relevant Institutions to submit information to the MoEU (once every 3 years): Summary information on notified stockpiles Summary information on release inventories (Annex III substances) Summary information on Annex III substance monitoring What would be anticipated annual manpower requirements for your institution to generate and compile reports under Article 14(1), 14(2) and 14(3) provisions? [NB. It is noted that anticipated costs of	The provision will not affect the MoFAL, i.e. it is not expected to result in any additional burden. There are no POPs pesticides produced, placed on the market or used. Reporting on stockpiles, monitoring and emission inventories have been addressed above and is not expected to result in additional administrative burden. At present, all imports of pesticides are requiring pre-authorisation from the MoFAL. At the end of each year, MoFAL is requiring to submit importers annual reports on import versus sales data.

Questions	Responses
reporting will depend on whether such data is already available or easily obtainable or would require establishment of additional data gathering mechanisms, monitoring activities etc.]	
Chemicals and Waste Advisory Committee The Article requires the Ministry to establish a new Committee to harmonise national policies, provide information exchange between related institutions that is composed of representatives from relevant institutions and those invited by the Ministry depending on specific topic. Duties of the Committee also cover some of the activities referred to in other articles (e.g. information exchange responsibilities (Article 12), setting up concentration limits etc.). In you view, would you expect to participate in the Committee and if so, what would be annual manpower requirements associated with preparation and participation in the Committee meetings?	The provision will not affect the MoFAL, i.e. it is not expected to result in any additional burden. The issue is covered above (2 members of staff being involved twice a year)

REGULATORY IMPACT ASSESSMENT: administrative impacts - Meeting with the Ministry of Forestry and Water Affairs (MoFWA)

Project title:	**Technical Assistance for Implementation of Persistent Organic Pollutants (POPs) Regulation** **TR2010/0327.03-01/001**
Time:	13th of April, 2015 Time: 14:00 am – 16:00 pm.
Place:	MoFWA

List of participants

Name of the participant	Institution	Position
Ms. Ilona Kirhensteine	AMEC, NIRAS Consortium	Deputy Team Leader
Ms. Sinem Erdogdu	RAST Engineering, NIRAS Consortium	Short Term RIA Expert
Ms. Nermin Anul	MoFWA, Department of Monitoring and Water Information System	Department Head nanul@ormansu.gov.tr

MINUTES

RIA working meeting started at 14:00 am and was dedicated to obtaining responses to the questionnaire disseminated earlier by the Ministry of Environment and Urbanisation. The questionnaire was focused on eliciting views of different Ministries on potential administrative burden associated with the draft By-Law.

The summary of the responses provided is presented in the table.

Questions	Responses
Section 1: Article 5 Control of production, placing on the market and use	The provision will not affect the MoFWA, i.e. it is not expected to result in any additional burden.
Art5(3) stipulates that "The Ministry and Relevant Institution shall,	MoFWA does not operate any authorisation schemes for chemicals

Questions	Responses
within the assessment and authorisation schemes for chemicals and pesticides under their relevant legislation, take into consideration Convention and take appropriate measures to control existing chemicals and pesticides and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants" Do you have current assessment and authorisation schemes for chemicals and pesticides under your relevant legislation? Yes/No If Yes, please provide details on these schemes detailing its scope, assessment frequency and average number of assessments and authorisations per year. Do you currently take into account requirements of Stockholm Convention regarding POPs and take measures to control existing chemicals and pesticides and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants? If yes, please provide details on how this is done and what effort does it require currently (e.g. manpower requirements etc.) If no (or not fully), what additional actions would you need to execute in order to comply with the provisions of the article and, in particular, to take into account and take appropriate measures to control and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants? What would be associated manpower requirements of these actions? (in annual terms or on per assessment and authorisation basis)?	or pesticides and it is only involved in developing EQS (in compliance with the 2013/39/EC Directive). Development of EQS has been assisted by a project (BIKOP)
Section 2: Article 6 Exemptions from control measures (relevant only if Appendix explicitly allows for such exemption) Article 6(2) requires Relevant Institutions to notify the MoEU about the articles containing POPs already in use before or on the date of entry into force of By-Law and about articles containing POPs produced before or on the date of entry into force of this By-law until six months after the date of its entry into force. In your view, what would be the likely approach, format and frequency of such notifications to your institution? What would be anticipated manpower requirements per year to collate, process, store and pass on this information to the MoEU? [NB. It is noted that the requirement is time limited and would probably apply for the first year only].	The provision will not affect the MoFWA, i.e. it is not expected to result in any additional burden
Section 3: Article 7 Stockpiles Article 7 requires holders of stockpiles (permitted use of POPs) to notify the Ministry in which stockpile is established about the nature and the size of stockpile. The Relevant Institutions is then required to pass on this information to the MoEU so it can fulfil set monitoring requirements on the notified stockpiles. In your view, would your institution be affected by the provisions of this Article? Would you expect holders of stockpiles to notify you as you represent the Ministry under which stockpile is established? If so, what would be anticipated costs per year to receive, process and store the information? Article 14 requires to provide a summary information compiled from the notifications, concerning stockpiles, received pursuant to Article 7(2) to the MoEU. In your view, what would be the format of such information provision (e.g. a letter, e-mail, formal report etc.) and anticipated manpower cost per year?	The provision will not affect the MoFWA, i.e. it is not expected to result in any additional burden
Section 4: Article 8 Release reduction, minimization and elimination	The provision will not affect the MoFWA, i.e. it is not expected to

Questions	Responses
Article 8(1) requires preparation and maintenance of Annex III release inventories. In your opinion, would you be requested to draw up or contribute to development of inventories for the Annex III substance releases? If so, what would be anticipated format and content of inventories? What would be one-off costs of developing the inventories required? What would be annual costs of maintaining the inventories?	result in any additional burden
Section 5: Article 9 Waste management Article 9(5) requires the Ministry to establish concentration limits to be adopted under the Article 18 process. Implementation of this article would require setting up concentration limits in wastes and operation of the Committee established under Article 18. Until such time as these concentration limits are established the Ministry and Relevant Institutions may adopt or apply concentration limits or specific technical requirements in respect of waste being dealt with under paragraph 4(b) Art9 (5) under the Article 18 process. Costs are considered to be covered under Article 18 assessment below.	In the future, waste concentration limits for POPs will need to be set in a manner ensuring consistency with the set EQS in relation to these substances. Cooperation with the MoEU will be needed to achieve this (in order to ensure that the waste concentration limits are not set at such a level that would jeopardize achievement of the EQS in WBs). The estimated manpower requirements are provided using the EQS development project as reference. Work on the EQS has required 5 people working 30% of their standard load for a year to develop system and EQS. This equates to about 1.5 FTE for one year to develop the standards.
Section 6: Article10 Implementation Plan Article 10 stipulates the following: (1) The Ministry shall review and update the National implementation plan, as appropriate. (2) The Ministry shall exchange information with other institutions during revision and update of the NIP. (3) The ministry shall send the NIP to related institutions for approval Article 10 includes provisions regarding information exchange with other relevant institutions during the review and update of NIP and obtaining of approval. What would be your internal manpower requirements and other costs (such as meeting room costs etc.) associated with such information exchange (per a round of NIP review)? What would be internal manpower requirements and other costs to obtain your approval?	Manpower requirements for the MoFWA will depend on anticipated extent of update. The estimates provided were: 1 week for the update and 1 day for the sign-off for each round of NIP update.
Section 7: Article 11 Monitoring The Article 11 requires MoEU in cooperation with Relevant Institutions to establish appropriate monitoring systems on the presence of Annex III substances in the environment (PCB, PAH, HCB and PCDD/PCDF, Pentaklorobenzen). Are you envisaging taking part of such monitoring system? If so, what would be anticipated costs of establishing such monitoring system (one-off and annual O&M costs) for your organisation? In the absence of such estimates, could you please: Confirm the list of POP substances to be monitored Provide information on potential design of monitoring system in terms of number of sampling points and sampling frequency per substance per year? Unit costs of sampling, analysis and reporting per substance?	MoFWA will monitor 117 chemicals including POPs in surface water. State Hydraulic Works will be responsible for monitoring activities. Current draft programme for 12 catchments include 1052 points with the measurements taking place on average 4 times a year. There are no yet estimates of costs for the monitoring as the work will be tendered. In total, there are 25 catchments. The estimate for the country as a whole is about 2500 monitoring points with the measurements taking place on average 4 times a year in accordance with the list of POPs chemicals provided. Aldrin Dieldrin Endrin Heptachlor Hexachlorobenzene (HCB) Pentachlorobenzene Polychlorinated Biphenyl (PCB) Endosulfan DDT

Questions	Responses
	Perfluorinated Octanedulfonyl Fluoride (PFOS) PCDD PCDF Lindane (Gamma-Hexachlorocyclohexane) Alfa Hexachlorocyclohexane Beta Hexachlorocyclohexane At present, WFD is fully transposed for Art8/Annex V (monitoring). Some monitoring activities have started in 2012, but there was no monitoring for POPs before in surface water. In the absence of monitoring system for POPs in water, some individual studies are available. The results suggest that while for some POPs measurements the results are below the LOD, others have been detected in the water. For instance, endosulfan (recently banned) has been most frequently observed.
Section 8: Article 12 Information exchange Article 12(1) requires MoEU and Relevant Institutions to facilitate and undertake the exchange within the Community and third countries of information relevant to the reduction, minimisation, elimination, production, use and release of POPs. Do you anticipate to participate in such information exchange activities? If so, what could be likely format, content and frequency of such information exchange? What would be associated manpower and other costs per year for ensuring information exchange? Article 12(2) requires MoEU and Relevant Institutions to promote and facilitate awareness programmes, provision of public information and dedicated training on POPs. Do you anticipate to participate in such awareness programmes, training and public information provision activities? If so, what would be likely format and frequency of such activities? What would be anticipated annual costs/ budget for awareness programmes, provision of public information and dedicated training on POPs? In the absence of dedicated information dissemination and training budget, what would be estimated manpower requirements per year to comply with the provisions of this Article? Article 12(3) sets out that while performing information sharing and exchange the MoEU and Relevant Institutions shall protect confidential data. In your view, what would be anticipated approach to safeguarding confidential information (dedicated policies, data sharing protocols etc.)? What would be anticipated costs of developing such confidentiality policies and implementing these on continuous basis to your organisation?	Art 12(1). Current activities in terms of cooperation and information sharing include participation in CIRCA (WFD) estimated at about 2 times per year per staff member. There is also an EU project on capacity building in monitoring that also included some measurements in sediment and biota. Art 12(2). At present there are no specific training/ awareness raising campaigns regarding POPs. In the future, RBMPs will require extensive public consultation on RBMPs and significant water management issues (including management of Priority/Priority Hazardous Substances). But these activities will be taken place under the WFD and not in relation to the By-Law on POPs specifically. There might also be a need to carry out trainings of institutions on monitoring / sampling. Art 12(3). The provision will not affect the MoFWA, i.e. it is not expected to result in any additional burden
Section 9: Article 13 Technical assistance Article 13 requires the Ministry to cooperate with Relevant Institutions in providing technical and financial assistance to developing countries and countries with economies in transition as part of the Regulation implementation process. Would you expect to be involved in provision of such technical assistance? If so, what is your view regarding potential format and scale of such assistance? What are anticipated annual costs/ budget for technical assistance? In the absence of dedicated technical assistance budget, what would be estimated manpower requirements per year to comply with the provisions of this Article?	The provision will not affect the MoFWA, i.e. it is not expected to result in any additional burden There are few bi-lateral projects, with countries such as Uruguay, Afghanistan etc. regarding exchange of information. Any such cooperation is driven and determined by political will. Once the Minister approves such activities, appropriate budget allocated. In order for this to happen, the Ministry of Development would need to have included such activities in the list of priority areas. The exact extent of such future projects cannot be predicted at present. But in terms of POPs related projects the provision is not expected to affect the MoFWA significantly, i.e. it is not expected to result in significant additional administrative burden.
Section 10: Article 14 Reporting Article 14(1) requires Relevant Institutions to submit information to the MoEU regarding the application of the By-Law including on any	MoFWA does not hold information on production, placement on the market and use of POPs chemicals or on stockpiles of the chemicals.

Questions	Responses
infringements and penalties (once every 3 years). Article 14(2) requires Relevant Institutions to provide the MoEU with total production and placing in the market quantity data for substances listed in the Annex I or Annex II (once a year). Article 14(3) requires Relevant Institutions to submit information to the MoEU (once every 3 years): Summary information on notified stockpiles Summary information on release inventories (Annex III substances) Summary information on Annex III substance monitoring What would be anticipated annual manpower requirements for your institution to generate and compile reports under Article 14(1), 14(2) and 14(3) provisions? [NB. It is noted that anticipated costs of reporting will depend on whether such data is already available or easily obtainable or would require establishment of additional data gathering mechanisms, monitoring activities etc.]	However, monitoring summaries will be provided by the State Hydraulic Works to the MoFWA regularly once they commence monitoring of surface water bodies. The summaries will be send to the MoFWA. These summaries are expected to include the results and description of potential sources, directing follow up and checking by the MoEU. The provision will not affect the MoFWA, i.e. passing on this information to the MoEU is not expected to result in additional administrative burden.
Chemicals and Waste Advisory Committee The Article requires the Ministry to establish a new Committee to harmonise national policies, provide information exchange between related institutions that is composed of representatives from relevant institutions and those invited by the Ministry depending on specific topic. Duties of the Committee also cover some of the activities referred to in other articles (e.g. information exchange responsibilities (Article 12), setting up concentration limits etc.). In you view, would you expect to participate in the Committee and if so, what would be annual manpower requirements associated with preparation and participation in the Committee meetings?	The estimated manpower costs of participating are 1-2 staff members participating for 1 day each (equivalent to 1-2 manpower days per year). Manpower costs provided are on average 4,000 TL brutto per month (assuming 40 h week) with a range between 2,500-4,000 TL

Other:

Anticipated timeline for implementing EQS is within about 1 year. At present the Art 8 and Annex V requirements of the WFD are fully transposed in the Turkish legislation with MoFWA being responsible for monitoring only. Furthermore, the requirement to reach good status across water bodies, develop RBMPs with PoM including tackling PS/ PHS issues in accordance with the 2013/39/EC Directive are incorporated in the Turkish legislation. This implies that even without the By-Law on POPs, MoFWA will be aiming to ensuring compliance with EQSD including with the EQS set for POPs. Water Law is drafted and awaiting signature by the Prime Minister at present.

There are 4 pilot RBMP projects under development but none has yet been prepared for Turkey. Overall political ambition is to develop these by 2020 at the latest.

REGULATORY IMPACT ASSESSMENT: administrative impacts - Meeting with the Ministry of Health (MoH)

Project title:	**Technical Assistance for Implementation of Persistent Organic Pollutants (POPs) Regulation** **TR2010/0327.03-01/001**
Time:	15th of April, 2015 Time: 14:00 am – 16:00 pm.
Place:	MoH

List of participants

Name of the participant	Institution	Position
Ms. Ilona Kirhensteine	AMEC, NIRAS Consortium	Deputy Team Leader

Name of the participant	Institution	Position
Ms. Sinem Erdogdu	RAST Engineering, NIRAS Consortium	Short Term RIA Expert
Mr. Selim Atak	Ministry of Health	Environmental Engineer
Mr. Ramazan Akpınar	Ministry of Health	Biologist
Mr. Hacı Deniz	Ministry of Health	Environmental Engineer
Ms. Canan Bayar	Ministry of Health	Biologist
Mr. Yüksel Söyleriz	Ministry of Health	Chemical Engineer (MSc.)
Mr. Ahmet Ceran	Ministry of Health	Department Director

MINUTES

RIA working meeting started at 14:00 pm and was dedicated to obtaining responses to the questionnaire disseminated earlier by the Ministry of Environment and Urbanisation. The questionnaire was focused on eliciting views of different Ministries on potential administrative burden associated with the draft By-Law.

The summary of the responses provided is presented in the table.

Questions	Responses
Section 1: Article 5 Control of production, placing on the market and use Art5(3) stipulates that "The Ministry and Relevant Institution shall, within the assessment and authorisation schemes for chemicals and pesticides under their relevant legislation, take into consideration Convention and take appropriate measures to control existing chemicals and pesticides and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants" Do you have current assessment and authorisation schemes for chemicals and pesticides under your relevant legislation? Yes/No If Yes, please provide details on these schemes detailing its scope, assessment frequency and average number of assessments and authorisations per year. Do you currently take into account requirements of Stockholm Convention regarding POPs and take measures to control existing chemicals and pesticides and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants? If yes, please provide details on how this is done and what effort does it require currently (e.g. manpower requirements etc.) If no (or not fully), what additional actions would you need to execute in order to comply with the provisions of the article and, in particular, to take into account and take appropriate measures to control and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants? What would be associated manpower requirements of these actions? (in annual terms or on per assessment and authorisation basis)?	MoH operates a licensing system for biocidal products in accordance with the 98/8/EC Directive (528 Regulations, 2012). Public Health Institution, department of biocidal products is responsible for authorising biocidal products in accordance with BPD/BPR. The system is affecting all traders placing biocidal products on the market; envisages recall of banned products; and is based on consideration of published scientific evidence on active ingredients. As a rule of thumb, if an active ingredient is permitted within the EU, it also becomes authorised in Turkey. If not, the ingredient is banned. In the case of mixtures, it is the responsibility of the MoEU to regulate these. In the past, MoH held responsibility under product safety that has then been shifted to the MoC who is now tasked with testing products such as toys, candles etc. Other products, such as food, pesticides etc. are subject to MoFAL control. Some others, are subject to control of Ministry of Economy (clothings, shoes etc.). MoEU has control over setting limitations of chemicals in domestic products. Overall, the MoH can only test products/ goods that are subject to biocidal exposure, such as textiles.
Section 2: Article 6 Exemptions from control measures (relevant only if Appendix explicitly allows for such exemption) Article 6(2) requires Relevant Institutions to notify the MoEU about the articles containing POPs already in use before or on the date of entry into force of By-Law and about articles containing POPs produced before or on the date of entry into force of this By-law until six months after the date of its entry into force. In your view, what would be the likely approach, format and	The provision will not affect the MoH, i.e. it is not expected to result in any additional burden

Questions	Responses
frequency of such notifications to your institution? What would be anticipated manpower requirements per year to collate, process, store and pass on this information to the MoEU? [NB. It is noted that the requirement is time limited and would probably apply for the first year only].	
Section 3: Article 7 Stockpiles Article 7 requires holders of stockpiles (permitted use of POPs) to notify the Ministry in which stockpile is established about the nature and the size of stockpile. The Relevant Institutions is then required to pass on this information to the MoEU so it can fulfil set monitoring requirements on the notified stockpiles. In your view, would your institution be affected by the provisions of this Article? Would you expect holders of stockpiles to notify you as you represent the Ministry under which stockpile is established? If so, what would be anticipated costs per year to receive, process and store the information? Article 14 requires to provide a summary information compiled from the notifications, concerning stockpiles, received pursuant to Article 7(2) to the MoEU. In your view, what would be the format of such information provision (e.g. a letter, e-mail, formal report etc.) and anticipated manpower cost per year?	The provision will not affect the MoH, i.e. it is not expected to result in any additional burden. Overall, the MoH does not have a responsibility to search for stockpiles. But if a chemical stockpile is reported to the MoH by a member of public, they are able to pass the information on (from a database) to the MoEU. In addition, Poison Centre calls are recorded as well.
Section 4: Article 8 Release reduction, minimization and elimination Article 8(1) requires preparation and maintenance of Annex III release inventories. In your opinion, would you be requested to draw up or contribute to development of inventories for the Annex III substance releases? If so, what would be anticipated format and content of inventories? What would be one-off costs of developing the inventories required? What would be annual costs of maintaining the inventories?	The provision will not affect the MoH, i.e. it is not expected to result in any additional burden. Until 2003, MoH was responsible for emission licensing. Since then, the responsibility has shifted to the MoEU. MoH does not have or hold uPOPs inventory data.
Section 5: Article 9 Waste management Article 9(5) requires the Ministry to establish concentration limits to be adopted under the Article 18 process. Implementation of this article would require setting up concentration limits in wastes and operation of the Committee established under Article 18. Until such time as these concentration limits are established the Ministry and Relevant Institutions may adopt or apply concentration limits or specific technical requirements in respect of waste being dealt with under paragraph 4(b) Art9 (5) under the Article 18 process. Costs are considered to be covered under Article 18 assessment below.	MoH can provide support in executing the task as opposed to being responsible for detecting LVs. Manpower requirements are estimated under the Art 18
Section 6: Article10 Implementation Plan Article 10 stipulates the following: (1) The Ministry shall review and update the National implementation plan, as appropriate. (2) The Ministry shall exchange information with other institutions during revision and update of the NIP. (3) The ministry shall send the NIP to related institutions for approval Article 10 includes provisions regarding information exchange with	The estimated manpower requirements are as follows: Approval – 2 manpower days Minor change -3-4 days Significant changes – 10-15 days Manpower costs are 5,500TL per month per person

Questions	Responses
other relevant institutions during the review and update of NIP and obtaining of approval. What would be your internal manpower requirements and other costs (such as meeting room costs etc.) associated with such information exchange (per a round of NIP review)? What would be internal manpower requirements and other costs to obtain your approval?	
Section 7: Article 11 Monitoring The Article 11 requires MoEU in cooperation with Relevant Institutions to establish appropriate monitoring systems on the presence of Annex III substances in the environment (PCB, PAH, HCB and PCDD/PCDF, Pentaklorobenzen). Are you envisaging taking part of such monitoring system? If so, what would be anticipated costs of establishing such monitoring system (one-off and annual O&M costs) for your organisation? In the absence of such estimates, could you please: Confirm the list of POP substances to be monitored Provide information on potential design of monitoring system in terms of number of sampling points and sampling frequency per substance per year? Unit costs of sampling, analysis and reporting per substance?	The provision will not affect the MoH, i.e. it is not expected to result in any additional burden. In particular, MoH does not operate any environmental monitoring programmes. It can, however, support MoEU where possible. Once MoH learns about a substance that may be of human health concern, it informs MoEU and advises on the need to carry out monitoring. For instance, one of such advices was to measure benzo(a)pyrene or the need to measure PAH levels emitted by the recycled rubber clad playgrounds. MoH is acquiring information on chemicals of concern from the EU alert system. There are also no consistent and periodic human exposure studies to chemicals of concern. Typically, any human/ environmental exposure studies are carried out in cooperation with universities and commence with a provincial directorate of Health raising concerns about specific issue/ chemical. A study is then carried out in cooperation with appropriate research institution with capabilities to carry out such studies. Results of such pilot/ individual studies are then extrapolated to other regions as necessary. There is one ongoing 2 year study on hazardous chemicals (some of which are POPs but largely focusing on heavy metals). The locations studied include heavily industrialised and polluted Koacelli and a reference location. The results of the study are not available for dissemination/ sharing.
Section 8: Article 12 Information exchange Article 12(1) requires MoEU and Relevant Institutions to facilitate and undertake the exchange within the Community and third countries of information relevant to the reduction, minimisation, elimination, production, use and release of POPs. Do you anticipate to participate in such information exchange activities? If so, what could be likely format, content and frequency of such information exchange? What would be associated manpower and other costs per year for ensuring information exchange? Article 12(2) requires MoEU and Relevant Institutions to promote and facilitate awareness programmes, provision of public information and dedicated training on POPs. Do you anticipate to participate in such awareness programmes, training and public information provision activities? If so, what would be likely format and frequency of such activities? What would be anticipated annual costs/ budget for awareness programmes, provision of public information and dedicated training on POPs? In the absence of dedicated information dissemination and training budget, what would be estimated manpower requirements per year to comply with the provisions of this Article? Article 12(3) sets out that while performing information sharing and exchange the MoEU and Relevant Institutions shall protect confidential data. In your view, what would be anticipated approach to safeguarding confidential information (dedicated policies, data sharing protocols etc.)? What would be anticipated costs of developing such confidentiality policies and implementing these on continuous basis to your organisation?	Article 12(1) – information exchange with EU and third countries. The MoH suggests that if such information exchange is ever taking place regarding POPs it will involve very high ranking officials. No additional administrative burden estimates are provided, but likely to be none or negligible (over and above typical daily operations). Article 12(2) – it is not expected to result in any additional administrative burden. 12(3) Licensing of biocidal products is in accordance with existing confidentiality protocols. Compliance with this provision will not constitute an additional administrative burden.

Questions	Responses
Section 9: Article 13 Technical assistance Article 13 requires the Ministry to cooperate with Relevant Institutions in providing technical and financial assistance to developing countries and countries with economies in transition as part of the Regulation implementation process. Would you expect to be involved in provision of such technical assistance? If so, what is your view regarding potential format and scale of such assistance? What are anticipated annual costs/ budget for technical assistance? In the absence of dedicated technical assistance budget, what would be estimated manpower requirements per year to comply with the provisions of this Article?	MoH carries out a range of bi-lateral projects with countries like Iran, Afganisthan, Somali, Pakistan etc. However none of these projects were on POPs. The exact extent of such future projects can not be predicted at present. But in terms of POPs related projects the provision is not expected to affect the MoH significantly, i.e. it is not expected to result in significant additional administrative burden.
Section 10: Article 14 Reporting Article 14(1) requires Relevant Institutions to submit information to the MoEU regarding the application of the By-Law including on any infringements and penalties (once every 3 years). Article 14(2) requires Relevant Institutions to provide the MoEU with total production and placing in the market quantity data for substances listed in the Annex I or Annex II (once a year). Article 14(3) requires Relevant Institutions to submit information to the MoEU (once every 3 years): Summary information on notified stockpiles Summary information on release inventories (Annex III substances) Summary information on Annex III substance monitoring What would be anticipated annual manpower requirements for your institution to generate and compile reports under Article 14(1), 14(2) and 14(3) provisions? [NB. It is noted that anticipated costs of reporting will depend on whether such data is already available or easily obtainable or would require establishment of additional data gathering mechanisms, monitoring activities etc.]	The provision will not affect the MoH, i.e. it is not expected to result in any additional administrative burden over and above passing on the data on notified chemicals stockpiles.
Chemicals and Waste Advisory Committee The Article requires the Ministry to establish a new Committee to harmonise national policies, provide information exchange between related institutions that is composed of representatives from relevant institutions and those invited by the Ministry depending on specific topic. Duties of the Committee also cover some of the activities referred to in other articles (e.g. information exchange responsibilities (Article 12), setting up concentration limits etc.). In you view, would you expect to participate in the Committee and if so, what would be annual manpower requirements associated with preparation and participation in the Committee meetings?	The provision will not affect the MoH significantly. The estimated manpower requirements suggest 2 manpower days per year at the cost of 5,500 TL per month.

REGULATORY IMPACT ASSESSMENT: administrative impacts - Meeting with the Ministry of Labour and Social Security (MoLSS)

Project title:	**Technical Assistance for Implementation of Persistent Organic Pollutants (POPs) Regulation** **TR2010/0327.03-01/001**
Time:	17th of April, 2015 Time: 08:30 am – 09:30am
Place:	MoLSS

List of participants

Name of the participant	Institution	Position
Ms. Ilona Kirhensteine	AMEC, NIRAS Consortium	Deputy Team Leader
Ms. Sinem Erdogdu	RAST Engineering, NIRAS Consortium	Short Term RIA Expert
Gizem Naz DÖLEK	Ministry of Labour and Social Security	

MINUTES

RIA working meeting started at 08:30 am and was dedicated to obtaining responses to the questionnaire disseminated earlier by the Ministry of Environment and Urbanisation. The questionnaire was focused on eliciting views of different Ministries on potential administrative burden associated with the draft By-Law.

Key points included:

- Overall the Ministry is an important stakeholder but is unlikely to be affected by the provisions of the By-Law.
- They are primarily concerned with occupational exposure and industrial/ workplace incidents involving chemicals. Overall, the data compiled include instances of occupational illnesses, number of workers affected and statistics on cancer cases (most frequently associated with VOC etc.). To date their records show no incidents of occupational exposure involving POPs (checked by CAS#). However, the systems of records might not reflect the complete picture due to underreporting of accidents, issues with illegal workers and insufficient capacity of inspectorate.
- Information on linking workers exposure to cancer is also compiled using bottom up approach. Instead of considering national health outcomes records and attributing some of these to occupational exposure (top down), the data is based on health claims against employers. However, conclusively linking cancer cases to occupational exposure might be challenging when workers were working in multiple work places simultaneously.
- Most problematic sectors include mining, construction and metal (NB. occupational incidents also include accidents and not just exposure to chemicals). Currently, about 300 staff members are trained in construction/ asbestos issues.
- In order for MoLSS to consider specific POPs, occupational health legislation would need to be updated accordingly to include these substances.
- Two base regulations related to responsibilities and applications of MoLSS, occupational health and safety are: Legislation on import of materials that effect occupational health and safety" and "Regulation on Health and Safety Precautions for works with Chemical Materials"

RIA meeting ended at 09:30 am.

REGULATORY IMPACT ASSESSMENT: administrative impacts - Meeting with the Ministry of Customs (MoC)

Project title:	**Technical Assistance for Implementation of Persistent Organic Pollutants (POPs) Regulation** **TR2010/0327.03-01/001**
Time:	14th of April, 2015 Time: 14:00 am – 17:00 pm.
Place:	MoC

List of participants

Name of the participant	Institution	Position
Ms. Ilona Kirhensteine	AMEC, NIRAS Consortium	Deputy Team Leader
Ms. Sinem Erdogdu	RAST Engineering, NIRAS Consortium	Short Term RIA Expert
Ms. Özge Yıldırım	Ministry of Customs and Trade, Laboratory	

MINUTES

RIA working meeting started at 14:00 pm and was dedicated to obtaining responses to the questionnaire disseminated earlier by the Ministry of Environment and Urbanisation. The questionnaire was focused on eliciting views of different Ministries on potential administrative burden associated with the draft By-Law.

The summary of the responses provided is presented in the table..

Questions	Responses
Section 1: Article 5 Control of production, placing on the market and use Art5(3) stipulates that "The Ministry and Relevant Institution shall, within the assessment and authorisation schemes for chemicals and pesticides under their relevant legislation, take into consideration Convention and take appropriate measures to control existing chemicals and pesticides and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants" Do you have current assessment and authorisation schemes for chemicals and pesticides under your relevant legislation? Yes/No If Yes, please provide details on these schemes detailing its scope, assessment frequency and average number of assessments and authorisations per year. Do you currently take into account requirements of Stockholm Convention regarding POPs and take measures to control existing chemicals and pesticides and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants? If yes, please provide details on how this is done and what effort does it require currently (e.g. manpower requirements etc.) If no (or not fully), what additional actions would you need to execute in order to comply with the provisions of the article and, in particular, to take into account and take appropriate measures to control and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants? What would be associated manpower requirements of these actions? (in annual terms or on per assessment and authorisation basis)?	The provision will not affect the MoC, i.e. it is not expected to result in any additional administrative burden as MoC does not operate any authorisation schemes for chemicals or pesticides.
Section 2: Article 6 Exemptions from control measures (relevant only if Appendix explicitly allows for such exemption) Article 6(2) requires Relevant Institutions to notify the MoEU about the articles containing POPs already in use before or on the date of entry into force of By-Law and about articles containing POPs	MoC is responsible for customs control and holds information on chemicals, formulations and articles crossing border as per declaration form provided. The lowest data resolution is GTIP number (combined nomenclature code for goods). In the case of chemicals or mixtures imports declaration does not

Questions	Responses
produced before or on the date of entry into force of this By-law until six months after the date of its entry into force. In your view, what would be the likely approach, format and frequency of such notifications to your institution? What would be anticipated manpower requirements per year to collate, process, store and pass on this information to the MoEU? [NB. It is noted that the requirement is time limited and would probably apply for the first year only].	request to provide CAS numbers. There is a voluntary field that is consistently/ typically filled in (accounting for about 10% of cases overall). At the same time a single GTIP number can correspond to hundreds of CAS numbers. Any data provided based on GTIP (assuming that potentially relevant GTIP numbers in the context of POPs are identified) will constitute an overestimate due to inclusion of other substances under the same code. Expanding or changing customs declaration forms does not constitute a viable option either. Customs does not check for the presence of certain chemicals as constituents of imported articles. In the past, any ban of certain chemicals was first reflected in the product safety legislation administered by the MoEconomy. Once, relevant GTIP numbers are identified, MoC becomes responsible for implementation. However, in the case of pesticides, pre-authorisation for import needs to be first obtained from the MoFAL. MoFAL, for instance, are testing/ assessing import requests for pesticides and food. One potential approach to implementing the ban and providing information on products containing POPs, would be for the MoEU to list potentially affected GTIP numbers (i.e. to identify all products that might contain POPs). Once the list of potentially risky products is composed and a container containing any of these products reaches the border, pre-authorisation for import would need to be obtained from the MoEU. MoEU would consider declaration form, order any necessary tests (with the costs to be recovered from the importer) and depending on the results pre-authorises entry or not. MoC is carrying out sampling and testing to confirm GTIP number but not POPs content. MoC does not have manpower to stop and test all shipments containing goods potentially at risk of containing POPs. Ideally, MoEU would carry out pre-authorisation and once imported articles enter customs, importers should demonstrate the obtained pre-authorisation. In such a case, additional workload for MoC would be negligible. In terms of the data provision, MoC would be able to provide information on the quantity/ value of goods by GTIP number / country that are deemed potentially at risk of containing POPs. This would represent a maximum pool of articles imported that might contain POPs. There is no way of providing information on POPs content within imported articles at present.
Section 3: Article 7 Stockpiles Article 7 requires holders of stockpiles (permitted use of POPs) to notify the Ministry in which stockpile is established about the nature and the size of stockpile. The Relevant Institutions is then required to pass on this information to the MoEU so it can fulfil set monitoring requirements on the notified stockpiles. In your view, would your institution be affected by the provisions of this Article? Would you expect holders of stockpiles to notify you as you represent the Ministry under which stockpile is established? If so, what would be anticipated costs per year to receive, process and store the information? Article 14 requires to provide a summary information compiled from the notifications, concerning stockpiles, received pursuant to Article 7(2) to the MoEU. In your view, what would be the format of such information provision (e.g. a letter, e-mail, formal report etc.) and anticipated manpower cost per year?	The provision will not affect the MoC, i.e. it is not expected to result in any additional administrative burden
Section 4: Article 8 Release reduction, minimization and elimination	The provision will not affect the MoC, i.e. it is not expected to result in any additional administrative burden

Questions	Responses
Article 8(1) requires preparation and maintenance of Annex III release inventories. In your opinion, would you be requested to draw up or contribute to development of inventories for the Annex III substance releases? If so, what would be anticipated format and content of inventories? What would be one-off costs of developing the inventories required? What would be annual costs of maintaining the inventories?	
Section 5: Article 9 Waste management Article 9(5) requires the Ministry to establish concentration limits to be adopted under the Article 18 process. Implementation of this article would require setting up concentration limits in wastes and operation of the Committee established under Article 18. Until such time as these concentration limits are established the Ministry and Relevant Institutions may adopt or apply concentration limits or specific technical requirements in respect of waste being dealt with under paragraph 4(b) Art9 (5) under the Article 18 process. Costs are considered to be covered under Article 18 assessment below.	The provision will not affect the MoC, i.e. it is not expected to result in any additional administrative burden
Section 6: Article10 Implementation Plan Article 10 stipulates the following: (1) The Ministry shall review and update the National implementation plan, as appropriate. (2) The Ministry shall exchange information with other institutions during revision and update of the NIP. (3) The ministry shall send the NIP to related institutions for approval Article 10 includes provisions regarding information exchange with other relevant institutions during the review and update of NIP and obtaining of approval. What would be your internal manpower requirements and other costs (such as meeting room costs etc.) associated with such information exchange (per a round of NIP review)? What would be internal manpower requirements and other costs to obtain your approval?	The estimated manpower requirements are as follows: Approval – 1 manpower hour Minor change -1 day Significant changes – 10 days (2 staff members for a week) Manpower costs are 4,500-6,000TL per month per person
Section 7: Article 11 Monitoring The Article 11 requires MoEU in cooperation with Relevant Institutions to establish appropriate monitoring systems on the presence of Annex III substances in the environment (PCB, PAH, HCB and PCDD/PCDF, Pentaklorobenzen). Are you envisaging taking part of such monitoring system? If so, what would be anticipated costs of establishing such monitoring system (one-off and annual O&M costs) for your organisation? In the absence of such estimates, could you please: Confirm the list of POP substances to be monitored Provide information on potential design of monitoring system in terms of number of sampling points and sampling frequency per substance per year? Unit costs of sampling, analysis and reporting per substance?	The provision will not affect the MoC, i.e. it is not expected to result in any additional administrative burden
Section 8: Article 12 Information exchange Article 12(1) requires MoEU and Relevant Institutions to facilitate and undertake the exchange within the Community and third countries of information relevant to the reduction, minimisation,	Article 12(1) – The provision will not affect the MoC, i.e. it is not expected to result in any additional administrative burden. Article 12(2) – MoC is holding regular staff trainings. Such trainings take place once every 6 months and could incorporate 1-

Questions	Responses
elimination, production, use and release of POPs. Do you anticipate to participate in such information exchange activities? If so, what could be likely format, content and frequency of such information exchange? What would be associated manpower and other costs per year for ensuring information exchange? Article 12(2) requires MoEU and Relevant Institutions to promote and facilitate awareness programmes, provision of public information and dedicated training on POPs. Do you anticipate to participate in such awareness programmes, training and public information provision activities? If so, what would be likely format and frequency of such activities? What would be anticipated annual costs/ budget for awareness programmes, provision of public information and dedicated training on POPs? In the absence of dedicated information dissemination and training budget, what would be estimated manpower requirements per year to comply with the provisions of this Article? Article 12(3) sets out that while performing information sharing and exchange the MoEU and Relevant Institutions shall protect confidential data. In your view, what would be anticipated approach to safeguarding confidential information (dedicated policies, data sharing protocols etc.)? What would be anticipated costs of developing such confidentiality policies and implementing these on continuous basis to your organisation?	2h dedicated to POPs. 12(3) In the context of information sharing, cooperation between MoC and MoEU could include Risk management department and be based on the Information protocol under development currently. Developing the list of GTIP numbers of articles potentially at risk would take about 12 manpower days.
Section 9: Article 13 Technical assistance Article 13 requires the Ministry to cooperate with Relevant Institutions in providing technical and financial assistance to developing countries and countries with economies in transition as part of the Regulation implementation process. Would you expect to be involved in provision of such technical assistance? If so, what is your view regarding potential format and scale of such assistance? What are anticipated annual costs/ budget for technical assistance? In the absence of dedicated technical assistance budget, what would be estimated manpower requirements per year to comply with the provisions of this Article?	The provision will not affect the MoC, i.e. it is not expected to result in any additional administrative burden
Section 10: Article 14 Reporting Article 14(1) requires Relevant Institutions to submit information to the MoEU regarding the application of the By-Law including on any infringements and penalties (once every 3 years). Article 14(2) requires Relevant Institutions to provide the MoEU with total production and placing in the market quantity data for substances listed in the Annex I or Annex II (once a year). Article 14(3) requires Relevant Institutions to submit information to the MoEU (once every 3 years): Summary information on notified stockpiles Summary information on release inventories (Annex III substances) Summary information on Annex III substance monitoring What would be anticipated annual manpower requirements for your institution to generate and compile reports under Article 14(1), 14(2) and 14(3) provisions? [NB. It is noted that anticipated costs of reporting will depend on whether such data is already available or easily obtainable or would require establishment of additional data gathering mechanisms, monitoring activities etc.]	The impact of this provision on the MoC is covered above. MoC would only contribute to the Art 14(2) data on placing on the market
Chemicals and Waste Advisory Committee The Article requires the Ministry to establish a new Committee to harmonise national policies, provide information exchange between	The provision will not affect the MoC significantly. The estimated manpower requirements suggest 3 manpower days per attendance (2 preparation and 1 attendance). Assuming bi-annual meetings the estimated manpower requirements are 6 manpower days a year at

Questions	Responses
related institutions that is composed of representatives from relevant institutions and those invited by the Ministry depending on specific topic. Duties of the Committee also cover some of the activities referred to in other articles (e.g. information exchange responsibilities (Article 12), setting up concentration limits etc.). In you view, would you expect to participate in the Committee and if so, what would be annual manpower requirements associated with preparation and participation in the Committee meetings?	the cost of 4,500-6,000 TL per month.

Other issues

Approach to implementation of the Art 5 ban on placement on the market of chemicals (including as constituents of articles).

In practice enforcing the ban will be challenging and extremely manpower intensive. Identification of GTIP numbers associated with articles potentially at risk would constitute a starting point. Further, a risk management approach will need to be developed reflecting the types of the articles, manufacturing country and anticipated present of POPs (as it will be impractical to test every single shipment with given articles at the border). Information sharing protocol might be extended to allow MoEU access to their database to aid with implementation as 4,000 staff at the customs will not be sufficient to absorb additional duties and associated workload. Furthermore, in legal terms customs officers cannot be tasked with additional duties stemming from the legislation of other Ministries. They are only liable to comply with the requirements and scope of their duties as set out in the Law by MoC.

If a pre-authorisation form from the MoEU is attached to the declaration, customs officers would not entail additional burden.

As an example, about 120 staff members (spread out across 6 entities) are responsible for waste products approval at the MoC (specialty customs, for export).

Predicting additional manpower required is not feasible as the list of GTIP numbers (and hence, articles) is not known, import quantities of these articles are not available. Furthermore, the number of tests and checks will depend on the how these articles are distributed in terms of number of containers and numbers of samples requested by the officers. For instance, in the case of a packaged container, 3 samples would be taken per 10,000 packaging.

In the context of tests, costs of these are typically recovered from importers. There is, however, a threshold as MoC can only recover base prices (185 TL per 1 sample and 600 TL per 3 samples). Besides, the imposed maximum number of samples for the purpose of cost recovery is still 3. In other words, if 50 samples are taken and analysed, the importer will only be billed back for 600 TL. Other challenges include the issue of LOD and potential lack of accredited laboratories as well as delays. For a comparison, the longest waiting time for GTIP tests are 2-3 days (usual waiting time is 2 hours), while POPs tests will require 10 days as a minimum causing significant delays. Development of appropriate risk management approach is of utmost importance.

REGULATORY IMPACT ASSESSMENT: administrative impacts - Meeting with the Ministry of Environment and Urbanization (MoEU)

Project title:	**Technical Assistance for Implementation of Persistent Organic Pollutants (POPs) Regulation** **TR2010/0327.03-01/001**
Time:	15th of April, 2015 Time: 10:00 am – 12:00 pm
Place:	MoEU

List of participants

Name of the participant	Institution	Position
Ms. Ilona Kirhensteine	AMEC, NIRAS Consortium	Deputy Team Leader
Ms. Sinem Erdogdu	RAST Engineering, NIRAS Consortium	Short Term RIA Expert
Bursev Doğan Artukoğlu		
Ahmet Daşkın		
Mahmut Osmanbaşoğlu		
Ertan Öztürk		

MINUTES

RIA working meeting started at 14:00 pm and was dedicated to obtaining responses to the questionnaire disseminated earlier by the Ministry of Environment and Urbanisation. The questionnaire was focused on eliciting views of different Ministries on potential administrative burden associated with the draft By-Law.

The summary of the responses provided is presented in the table.

Questions	Responses
Section 1: Article 5 Control of production, placing on the market and use Art5(3) stipulates that "The Ministry and Relevant Institution shall, within the assessment and authorisation schemes for chemicals and pesticides under their relevant legislation, take into consideration Convention and take appropriate measures to control existing chemicals and pesticides and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants" Do you have current assessment and authorisation schemes for chemicals and pesticides under your relevant legislation? Yes/No If Yes, please provide details on these schemes detailing its scope, assessment frequency and average number of assessments and authorisations per year. Do you currently take into account requirements of Stockholm Convention regarding POPs and take measures to control existing chemicals and pesticides and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants? If yes, please provide details on how this is done and what effort does it require currently (e.g. manpower requirements etc.) If no (or not fully), what additional actions would you need to execute in order to comply with the provisions of the article and, in particular, to take into account and take appropriate measures to control and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants? What would be associated manpower requirements of these actions? (in annual terms or on per assessment and authorisation basis)?	The provision will not affect the MoEU, i.e. it is not expected to result in any additional administrative burden (over and above REACH authorisation). MoEU/Chem Dep stated that at present there are no operational authorisation schemes that they are involved with. In the future, REACH authorisations will become their responsibility; however manpower requirements will be linked to implementation of REACH Reg rather than By-Law on POPs. SIA/RIA for REACH contain manpower estimates to be used for Policy Option 1 development.
Section 2: Article 6 Exemptions from control measures (relevant only if Appendix explicitly allows for such exemption) Article 6(2) requires Relevant Institutions to notify the MoEU about the articles containing POPs already in use before or on the date of entry into force of By-Law and about articles containing POPs	Art 6(1). The MoEU is not expecting to develop LVs for unintentional trace amounts, i.e. impurities. Art 6(2). Overall, the provision is not affecting uPOPs. Similarly due to historic ban on pesticides, these POPs are unlikely to be affected either. The focus of this article will be on industrial

Questions	Responses
produced before or on the date of entry into force of this By-law until six months after the date of its entry into force. In your view, what would be the likely approach, format and frequency of such notifications to your institution? What would be anticipated manpower requirements per year to collate, process, store and pass on this information to the MoEU? [NB. It is noted that the requirement is time limited and would probably apply for the first year only].	substances such as PFOS, PBDEs, HBCDD, PCBs etc. The MoEU/ Chem D envisages the use of official requests to other Ministries and subsequent use of existing electronic format under SC for reporting. As MoEU does not hold information themselves, this provision will mainly entail collection and submission of the data received. The estimated manpower costs are about 10 manpower days to prepare. There is also a database, i.e. inventory of wastes held by the MoEU/ Waste Man Dep but it is not yet fully operational. The request for data will likely affect MoC for imported goods, formulations and chemicals. As far as domestic production is concerned, the Ministry of Industry is envisaging collection of production data by NACE codes in the future. Art 6(3)&Art 6(4) Authorisation of closed system intermediates will take place under REACH Art 18(4) (i.e. Policy Option 1). No additional administrative burden is expected.
Section 3: Article 7 Stockpiles Article 7 requires holders of stockpiles (permitted use of POPs) to notify the Ministry in which stockpile is established about the nature and the size of stockpile. The Relevant Institutions is then required to pass on this information to the MoEU so it can fulfil set monitoring requirements on the notified stockpiles. In your view, would your institution be affected by the provisions of this Article? Would you expect holders of stockpiles to notify you as you represent the Ministry under which stockpile is established? If so, what would be anticipated costs per year to receive, process and store the information? Article 14 requires to provide a summary information compiled from the notifications, concerning stockpiles, received pursuant to Article 7(2) to the MoEU. In your view, what would be the format of such information provision (e.g. a letter, e-mail, formal report etc.) and anticipated manpower cost per year?	MoEU /Chem D is anticipating to receive this information from other Ministries (stemming from their own inspection activities) and own Provincial directorates (on stocks). Monitoring of notified stockpiles will be a duty of *Waste Management Department*
Section 4: Article 8 Release reduction, minimization and elimination Article 8(1) requires preparation and maintenance of Annex III release inventories. In your opinion, would you be requested to draw up or contribute to development of inventories for the Annex III substance releases? If so, what would be anticipated format and content of inventories? What would be one-off costs of developing the inventories required? What would be annual costs of maintaining the inventories?	Art 8(1). Development of inventories will be an integral part of NIP update. No additional administrative burden is expected. Art 8(3). Permitting of new and existing facilities is a responsibility of *EIA Directorate / Licensing and Authorisation department*.
Section 5: Article 9 Waste management Article 9(5) requires the Ministry to establish concentration limits to be adopted under the Article 18 process. Implementation of this article would require setting up concentration limits in wastes and operation of the Committee established under Article 18. Until such time as these concentration limits are established the Ministry and Relevant Institutions may adopt or apply concentration limits or specific technical requirements in respect of waste being dealt with under paragraph 4(b) Art9 (5) under the Article 18 process. Costs are considered to be covered under Article 18 assessment below.	A duty of *Waste Management Department*. At present PCB Reg is the only legal act that is waste/ POPs specific. Current classification system is distinguishing hazardous wastes, but not POPs wastes. In the future, further subordinated legislation might be required to tackle POPs waste issue.

Questions	Responses
Section 6: Article10 Implementation Plan Article 10 stipulates the following: (1) The Ministry shall review and update the National implementation plan, as appropriate. (2) The Ministry shall exchange information with other institutions during revision and update of the NIP. (3) The ministry shall send the NIP to related institutions for approval Article 10 includes provisions regarding information exchange with other relevant institutions during the review and update of NIP and obtaining of approval. What would be your internal manpower requirements and other costs (such as meeting room costs etc.) associated with such information exchange (per a round of NIP review)? What would be internal manpower requirements and other costs to obtain your approval?	Estimated frequency of NIP update is once every 3 years. Overall, introduction of new substance or changes to ELVs would necessitate NIP update within 2 years. The MoEU/Chem D estimated the following manpower requirements for updating the NIP (including inventories): 25 manpower days to update NIP (internally) 6 months expert hire to update inventories, NIP etc.
Section 7: Article 11 Monitoring The Article 11 requires MoEU in cooperation with Relevant Institutions to establish appropriate monitoring systems on the presence of Annex III substances in the environment (PCB, PAH, HCB and PCDD/PCDF, Pentaklorobenzen). Are you envisaging taking part of such monitoring system? If so, what would be anticipated costs of establishing such monitoring system (one-off and annual O&M costs) for your organisation? In the absence of such estimates, could you please: Confirm the list of POP substances to be monitored Provide information on potential design of monitoring system in terms of number of sampling points and sampling frequency per substance per year? Unit costs of sampling, analysis and reporting per substance?	There are few elements associated with monitoring: Development of monitoring information system. At present this is envisaged as a remote access electronic system allowing different Ministries and other stakeholders (such as Universities) to enter monitoring data for POPs). For instance, while academic institutions do not carry out periodic monitoring, their studies on POPs in biota and sediment are valuable for consideration. Such comprehensive monitoring data system will also allow for data gaps identification allowing for steps to be taken to close such knowledge gaps. Estimated costs of developing such data sharing system is 1,000,000 USD (GEF project proposal). Once such system is developed, maintenance of it will require additional manpower estimated to be within Laboratory staff (1 FTE). Monitoring costs including: *Air quality department* monitoring of Annex III substances. At present Turkey is not a party to the POPs Protocol but it is party to and report to EPER. Waste dep monitoring of wastes and stockpiles against the set LVs.
Section 8: Article 12 Information exchange Article 12(1) requires MoEU and Relevant Institutions to facilitate and undertake the exchange within the Community and third countries of information relevant to the reduction, minimisation, elimination, production, use and release of POPs. Do you anticipate to participate in such information exchange activities? If so, what could be likely format, content and frequency of such information exchange? What would be associated manpower and other costs per year for ensuring information exchange? Article 12(2) requires MoEU and Relevant Institutions to promote and facilitate awareness programmes, provision of public information and dedicated training on POPs. Do you anticipate to participate in such awareness programmes, training and public information provision activities? If so, what would be likely format and frequency of such activities? What would be anticipated annual costs/ budget for awareness programmes, provision of public information and dedicated training on POPs? In the absence of dedicated information dissemination and training budget, what would be estimated manpower requirements per year to comply with the provisions of this Article? Article 12(3) sets out that while performing information sharing and exchange the MoEU and Relevant Institutions shall protect confidential data. In your view, what would be anticipated approach to safeguarding confidential information (dedicated policies, data sharing protocols etc.)? What would be anticipated costs of developing such confidentiality policies and implementing these on continuous basis to your	Information exchange and technical assistance articles might be merged. Art 12(1). Provided estimate was 50,000TL every 2 years to organise a regional information sharing event. Art 12(2). At present there are no specific training/ awareness raising campaigns regarding POPs. It is not expected to result in additional administrative burden. Art 12(3). The provision will not affect the MoEU/ Chem D, i.e. it is not expected to result in additional administrative burden

Questions	Responses
organisation?	
Section 9: Article 13 Technical assistance Article 13 requires the Ministry to cooperate with Relevant Institutions in providing technical and financial assistance to developing countries and countries with economies in transition as part of the Regulation implementation process. Would you expect to be involved in provision of such technical assistance? If so, what is your view regarding potential format and scale of such assistance? What are anticipated annual costs/ budget for technical assistance? In the absence of dedicated technical assistance budget, what would be estimated manpower requirements per year to comply with the provisions of this Article?	The provision will not affect the MoEU, i.e. it is not expected to result in any additional burden
Section 10: Article 14 Reporting Article 14(1) requires Relevant Institutions to submit information to the MoEU regarding the application of the By-Law including on any infringements and penalties (once every 3 years). Article 14(2) requires Relevant Institutions to provide the MoEU with total production and placing in the market quantity data for substances listed in the Annex I or Annex II (once a year). Article 14(3) requires Relevant Institutions to submit information to the MoEU (once every 3 years): Summary information on notified stockpiles Summary information on release inventories (Annex III substances) Summary information on Annex III substance monitoring What would be anticipated annual manpower requirements for your institution to generate and compile reports under Article 14(1), 14(2) and 14(3) provisions? [NB. It is noted that anticipated costs of reporting will depend on whether such data is already available or easily obtainable or would require establishment of additional data gathering mechanisms, monitoring activities etc.]	The estimated manpower costs are 3 FTE annually to deal with all additional administrative requirements (2016-2028). Average costs are 4,500 TL per month.
Chemicals and Waste Advisory Committee The Article requires the Ministry to establish a new Committee to harmonise national policies, provide information exchange between related institutions that is composed of representatives from relevant institutions and those invited by the Ministry depending on specific topic. Duties of the Committee also cover some of the activities referred to in other articles (e.g. information exchange responsibilities (Article 12), setting up concentration limits etc.). In you view, would you expect to participate in the Committee and if so, what would be annual manpower requirements associated with preparation and participation in the Committee meetings?	Additional manpower requirements are captured above.

REGULATORY IMPACT ASSESSMENT: administrative impacts - Meeting with the Ministry of Environment and Urbanization (MoEU)

Project title:	**Technical Assistance for Implementation of Persistent Organic Pollutants (POPs) Regulation** **TR2010/0327.03-01/001**
Time:	16th of April, 2015 Time: 10:00 am – 12:00 pm
Place:	MoEU

List of participants

Name of the participant	Institution	Position
Ms. Ilona Kirhensteine	AMEC, NIRAS Consortium	Deputy Team Leader
Ms. Sinem Erdogdu	RAST Engineering, NIRAS Consortium	Short Term RIA Expert
Bursev Doğan Artukoğlu	MoEU, Chemicals Man. Department	
Ahmet Daşkın	MoEU, Chemicals Man. Department	
Mahmut Osmanbaşoğlu	MoEU, Chemicals Man. Department	
Ertan Öztürk	MoEU, Chemicals Man. Department	
Sinem Atgın	MoEU, Waste Man. Department	
Nazan Özyürek	MoEU, Air Pollution Man. Department	
Kenan Kama	MoEU, Water and Soil Pol. Department	
Gökhan Öktem	MoEU, Water and Soil Pol. Department	
İrde Gürtepe	MoEU, Air Pollution Man. Department	

MINUTES

RIA working meeting started at 10:00 am and was dedicated to obtaining responses to the questionnaire disseminated earlier by the Ministry of Environment and Urbanisation. The questionnaire was focused on eliciting views of different Ministries on potential administrative burden associated with the draft By-Law.

The summary of the responses provided is presented in the table.

Questions	Responses
Section 1: Article 5 Control of production, placing on the market and use Art5(3) stipulates that "The Ministry and Relevant Institution shall, within the assessment and authorisation schemes for chemicals and pesticides under their relevant legislation, take into consideration Convention and take appropriate measures to control existing chemicals and pesticides and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants" Do you have current assessment and authorisation schemes for chemicals and pesticides under your relevant legislation? Yes/No If Yes, please provide details on these schemes detailing its scope, assessment frequency and average number of assessments and authorisations per year. Do you currently take into account requirements of Stockholm Convention regarding POPs and take measures to control existing chemicals and pesticides and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants? If yes, please provide details on how this is done and what effort does it require currently (e.g. manpower requirements etc.) If no (or not fully), what additional actions would you need to execute in order to comply with the provisions of the article and, in particular, to take into account and take appropriate measures to control and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants? What would be associated manpower requirements of these actions? (in annual terms or on per assessment	The Departments of air quality, soil and waste do not hold or participate in any chemicals or pesticides authorisation schemes. However, a number of relevant regulatory activities are taking place: Setting ELVs for air quality in the context of industrial pollution (IPPC Directive) Managing hazardous wastes Managing contaminated land (including limit setting for pollutants). In the context of waste management, once a waste is determined to be hazardous it has to be disposed off appropriately and in accordance with the legislation. Waste analysis (determination of hazardous characteristics) is currently performed by the Tubitak Marmara Research Centre laboratory as it is able to carry out eluate analysis and toxicity on fish. In the future, the Laboratory of the MoEU will be performing waste analysis as well. The system is operated in accordance with the polluter pays principle, with waste holders covering the costs of tests. Depending on the results and if wastes are classified as hazardous, waste owners are also responsible for covering the costs of treatment and disposal. In the context of contaminated land, risk based approach is applied. Contaminated sites inventory is anticipated to be developed in couple of months time with Contaminated Land regulations coming into force in June 2015. At present, 4,000 potentially contaminated priority sites have been identified and will be assessed over the next 3 years. Such sites could include petrochemicals sites, large industrial facilities, old military basis (although special permissions would be required to access military sites). Depending on the results of assessment,

Questions	Responses
and authorisation basis)?	remediation will be requested. At present there are 13 licensed investigation and remediation companies in Turkey. Similarly to the waste management, owners of contaminated sites will be expected to cover the costs of assessment and remediation if any is required. Following the entry into force of the CL Regulation (June 2015), all site owners will be required to fill in a form in line with their NACE codes. MoEU will compile and assess the forms provided and in instances when the sites appear suspicious will commission tests to determine the extent and nature of contamination. The assessment will take place in 3 steps: a) listing suspicious sites for investigation; and following assessment b) either confirming the sites as contaminated (or not) or c) keeping these as potentially contaminated. Once a month a committee composed of MoEU, staff from Provincial Directorates and experts will meet to consider all CL sites in the region. When determining contamination, new POPs are not on the list of chemicals considered when assessing CL sites. The upcoming GEF project (June 2015) will have a component dedicated to integration of the CL system with POPs By-Law to ensure that CL sites are also filtered depending on the presence of POPs. There will be no additional administrative costs in terms of establishing the system and ensuring coherence between CL and POPs initiatives as it will be tackled under the GEF project. In terms of the actual compliance, tests will be expensive. Private companies are already impacted by high costs of CL assessment. If POPs are added this will result in significant additional costs to them. NB. Base prices for laboratory tests are available.
Section 2: Article 6 Exemptions from control measures (relevant only if Appendix explicitly allows for such exemption) Article 6(2) requires Relevant Institutions to notify the MoEU about the articles containing POPs already in use before or on the date of entry into force of By-Law and about articles containing POPs produced before or on the date of entry into force of this By-law until six months after the date of its entry into force. In your view, what would be the likely approach, format and frequency of such notifications to your institution? What would be anticipated manpower requirements per year to collate, process, store and pass on this information to the MoEU? [NB. It is noted that the requirement is time limited and would probably apply for the first year only].	In the context of products containing POPs that are in use, inventory will need to be prepared along with maintenance and inspection provisions. Information is available on PCBs suggesting that 1,050 tonnes in use and as wastes. In the context of GEF project, 350 tonnes of PCBs will be disposed off. As part of UNEP project, 500 tonnes of PCBs tackled with liquids drained from transformers and sent for domestic disposal with solid metal parts sent to France. Total costs of this project is about 1.2 million USD. No data exists (in addition to the inventories prepared under NIP) regarding quantities of other POPs (PFOS, PBDEs) contained in articles.
Section 3: Article 7 Stockpiles Article 7 requires holders of stockpiles (permitted use of POPs) to notify the Ministry in which stockpile is established about the nature and the size of stockpile. The Relevant Institutions is then required to pass on this information to the MoEU so it can fulfil set monitoring requirements on the notified stockpiles. In your view, would your institution be affected by the provisions of this Article? Would you expect holders of stockpiles to notify you as you represent the Ministry under which stockpile is established? If so, what would be anticipated costs per year to receive, process and store the information? Article 14 requires to provide a summary information compiled from the notifications, concerning stockpiles, received pursuant to Article 7(2) to the MoEU. In your view, what would be the format of such information provision (e.g. a letter, e-mail, formal report etc.) and anticipated manpower cost per year?	This will involve Waste Management Department in accordance with hazardous waste management.

Questions	Responses
Section 4: Article 8 Release reduction, minimization and elimination Article 8(1) requires preparation and maintenance of Annex III release inventories. In your opinion, would you be requested to draw up or contribute to development of inventories for the Annex III substance releases? If so, what would be anticipated format and content of inventories? What would be one-off costs of developing the inventories required? What would be annual costs of maintaining the inventories?	Turkey is a signatory to the EMEP Protocol and POPs Protocol (not yet ratified) under the UN Convention on Long-range Transboundary Air Pollution. Currently, air emissions inventory exists covering pollutants like NOx, PM10, SO_2 etc (developed as part of a project). There are plans to expand the system by adding new pollutants, such as heavy metals (in a short-term). A technical assistance project will establish electronic inventory system using UNEP toolkit and compiling production data and emissions factors to calculate air emissions. The budget is 4.5 million TL (but it also include development of air quality models, not just an inventory). There is, however, no budget allocated to include POPs or heavy metals. Inclusion of Annex III POPs within air emissions inventory will require additional budget. The costs of developing original inventory were about 750,000 Euro (including other minor components). This budget seems to be a reasonable approximation of costs of developing POPs emission inventory (PCBs, PeCB, HCB, dioxins/durans, PAH). It is noted that By-Law cannot enforce POPs Protocol. If it is not ratified, the By-Law will exclude POPs associated with Protocol only. In practice, this would mean exclusion of PAH and SCCPs from the scope of the By-Law. If POPs Protocol is ratified in the future, By-Law will be amended to include these substances. It was, however, noted that POPs Protocol covers dioxins/ furans, PAH and HCB. PeCB is not included. IPPC: permitting system is under development (there is a RIA for IPPC). In the future, Turkey will be compliant with the IPPC permitting system. Currently, a combined permitting system in place (requiring permits and licences). It covers air emissions and water discharges and is based on EIA. No prescription of specific processes takes place currently (BAT/BEP). The licence is valid for 5 years. Following an EIA a construction permit is issued based on the proposed technology, anticipated compliance with ELVs etc. After construction phase, a permit or licence is issued. IPPC will require obtaining a permit before construction. It is anticipated that IPPC will be implemented and will include consideration of BAT/BEP. As part of this process, consideration of the impact on Annex III substances would also take place without additional burden.
Section 5: Article 9 Waste management Article 9(5) requires the Ministry to establish concentration limits to be adopted under the Article 18 process. Implementation of this article would require setting up concentration limits in wastes and operation of the Committee established under Article 18. Until such time as these concentration limits are established the Ministry and Relevant Institutions may adopt or apply concentration limits or specific technical requirements in respect of waste being dealt with under paragraph 4(b) Art9 (5) under the Article 18 process. Costs are considered to be covered under Article 18 assessment below.	In terms of administrative burden, Waste Department does not expect to develop and set own concentration limits. The work would be limited to uptake of the existing limits in the EU. In the context of compliance this might be a significant issue. Currently with the exception of PCBs containing wastes, WEEE, the rest is classified either as hazardous or not. In the case a hazardous waste being also contaminated with a POP, it would not impose significant additional burden, as it would be tackled appropriately in any case. However, if a household type wastes happen to be contaminated with POPs it would constitute a challenge. In particularly given the nature of such articles – textiles. There are already PBDE limits for WEEE and systems in place to tackle PCBs (costs to be covered by waste owners). For other wastes potentially containing POPs a new system would need to be developed for collection, treatment and disposal (unless the concentration limits set are below typically anticipated content of POPs concerned in final articles). Waste bringing centres that are piloted at present, could play a role in assisting collection of the articles under consideration. Landfills: POPs are not monitored in the landfill leachate. Unless relevant legislation requires such monitoring and sets ELVs no specific requirements are set. Current discharge criteria are available. In the context of CL, the need to assess 4,000 sites within 3 years will require additional capacity. Currently there are 13 licenced

Questions	Responses
	companies equating to ~300 sites per company or 100 per company per year. Capacity of these companies will need to increase and/or more licences issued. Furthermore, assessment would also involve staff from provinces. Assuming 4h per site this would require 2.5 FTEs per year for 3 years.
Section 6: Article10 Implementation Plan Article 10 stipulates the following: (1) The Ministry shall review and update the National implementation plan, as appropriate. (2) The Ministry shall exchange information with other institutions during revision and update of the NIP. (3) The ministry shall send the NIP to related institutions for approval Article 10 includes provisions regarding information exchange with other relevant institutions during the review and update of NIP and obtaining of approval. What would be your internal manpower requirements and other costs (such as meeting room costs etc.) associated with such information exchange (per a round of NIP review)? What would be internal manpower requirements and other costs to obtain your approval?	If update will involve using available information – 7 manpower days between the three Departments. If data requests will be needed, more time will be required (~20-25 mandays)
Section 7: Article 11 Monitoring The Article 11 requires MoEU in cooperation with Relevant Institutions to establish appropriate monitoring systems on the presence of Annex III substances in the environment (PCB, PAH, HCB and PCDD/PCDF, Pentaklorobenzen). Are you envisaging taking part of such monitoring system? If so, what would be anticipated costs of establishing such monitoring system (one-off and annual O&M costs) for your organisation? In the absence of such estimates, could you please: Confirm the list of POP substances to be monitored Provide information on potential design of monitoring system in terms of number of sampling points and sampling frequency per substance per year? Unit costs of sampling, analysis and reporting per substance?	Air monitoring: there are 200 fixed monitoring stations across the country with results being available online. Each province has at least 1 station. Marmara Research Centre has 39 fixed stations (included within 200 above) but it also measures additional parameters. It carries out passive sampling and possibly covers POPs. The Centre carries out calibration and maintenance of its equipment. Other stations are centrally maintained. In the future there are plans to increase 1 Clean Air centre to 8 with the network extended to 300 stations. Air quality monitoring infrastructure exists, but adding new substances will result in additional costs.
Section 8: Article 12 Information exchange Article 12(1) requires MoEU and Relevant Institutions to facilitate and undertake the exchange within the Community and third countries of information relevant to the reduction, minimisation, elimination, production, use and release of POPs. Do you anticipate to participate in such information exchange activities? If so, what could be likely format, content and frequency of such information exchange? What would be associated manpower and other costs per year for ensuring information exchange? Article 12(2) requires MoEU and Relevant Institutions to promote and facilitate awareness programmes, provision of public information and dedicated training on POPs. Do you anticipate to participate in such awareness programmes, training and public information provision activities? If so, what would be likely format and frequency of such activities? What would be anticipated annual costs/ budget for awareness programmes, provision of public information and dedicated training on POPs? In the absence of dedicated information dissemination and training budget, what would be estimated manpower requirements per year to comply with the provisions of this Article? Article 12(3) sets out that while performing information sharing and exchange the MoEU and Relevant Institutions shall protect	Air quality: cooperation and information exchange typically takes place in a form of bi-lateral projects (cooperation is decided by the Minister/governmental development strategies), different project activities and experience exchange with other countries. In terms of public awareness raising, air quality monitoring results are published in a Bulletin, shared online. There is also an Air quality project in a tendering stage (Improving air quality in metropolitan areas) and it has a public consultation component. Waste management: in the context of PCB wastes in particular activities included booklets, regional meetings, website on PCBs, trainings (government and private sector) Contaminated land: activities typically include trainings (including on remediation technologies), information exchange and sharing on innovative technologies. There is no separate project on soil issues, but CL Regulations have been developed through a project in 2010 (3.5 million TL budget).

Questions	Responses
confidential data. In your view, what would be anticipated approach to safeguarding confidential information (dedicated policies, data sharing protocols etc.)? What would be anticipated costs of developing such confidentiality policies and implementing these on continuous basis to your organisation?	
Section 9: Article 13 Technical assistance Article 13 requires the Ministry to cooperate with Relevant Institutions in providing technical and financial assistance to developing countries and countries with economies in transition as part of the Regulation implementation process. Would you expect to be involved in provision of such technical assistance? If so, what is your view regarding potential format and scale of such assistance? What are anticipated annual costs/ budget for technical assistance? In the absence of dedicated technical assistance budget, what would be estimated manpower requirements per year to comply with the provisions of this Article?	The provision is not expected to result in any additional burden
Section 10: Article 14 Reporting Article 14(1) requires Relevant Institutions to submit information to the MoEU regarding the application of the By-Law including on any infringements and penalties (once every 3 years). Article 14(2) requires Relevant Institutions to provide the MoEU with total production and placing in the market quantity data for substances listed in the Annex I or Annex II (once a year). Article 14(3) requires Relevant Institutions to submit information to the MoEU (once every 3 years): Summary information on notified stockpiles Summary information on release inventories (Annex III substances) Summary information on Annex III substance monitoring What would be anticipated annual manpower requirements for your institution to generate and compile reports under Article 14(1), 14(2) and 14(3) provisions? [NB. It is noted that anticipated costs of reporting will depend on whether such data is already available or easily obtainable or would require establishment of additional data gathering mechanisms, monitoring activities etc.]	Wastes: once a year all companies including waste management companies submit report about production and disposal of hazardous wastes.
Chemicals and Waste Advisory Committee The Article requires the Ministry to establish a new Committee to harmonise national policies, provide information exchange between related institutions that is composed of representatives from relevant institutions and those invited by the Ministry depending on specific topic. Duties of the Committee also cover some of the activities referred to in other articles (e.g. information exchange responsibilities (Article 12), setting up concentration limits etc.). In you view, would you expect to participate in the Committee and if so, what would be annual manpower requirements associated with preparation and participation in the Committee meetings?	Estimated typically 2-4 days per year (total).

REGULATORY IMPACT ASSESSMENT: administrative impacts - Meeting with the Ministry of Environment and Urbanization (MoEU)

Project title:	**Technical Assistance for Implementation of Persistent Organic Pollutants (POPs) Regulation** **TR2010/0327.03-01/001**
Time:	16th of April, 2015

	Time: 2pm – 5 pm
Place:	MoEU – Permitting and Licensing Department

List of participants

Name of the participant	Institution	Position
Ms. Ilona Kirhensteine	AMEC, NIRAS Consortium	Deputy Team Leader
Ms. Sinem Erdogdu	RAST Engineering, NIRAS Consortium	Short Term RIA Expert
Ms. Halime Sezer	MoEU, Permitting Department	Expert
Mr. İbrahim Özdemir	MoEU, Inspection Department	Department Manager
Mr. Ufuk Türkmen	MoEU, Permitting Department	Department Manager

MINUTES

RIA working meeting started at 2pm and was dedicated to obtaining responses to the questionnaire disseminated earlier by the Ministry of Environment and Urbanisation. The questionnaire was focused on eliciting views of different Ministries on potential administrative burden associated with the draft By-Law.

Permitting:

- The process is implemented in accordance with Regulations on Permitting and Licensing. Once a facility falls within the scope of the Regulations it applies for a licence. Initially a temporary licence is given for 1 year based on a basic information regarding process, production etc. Subsequently the facility needs to get a licence (valid for 5 years) and comply with emissions and discharge standards. Permits cover 4 topics- wastewater, air, deep sea discharge and noise. Licences cover 21 topics (25 in total). There are currently about 10,000 permits and licences issued for manufacturing facilities, recycling facilities, incineration plants, LCPs etc. There is a database of licences but it cannot be queried (i.e. used for generating statistics by sector etc.). An estimate provided suggests that about 10-15% of installations are believed to be licensed. Implementation of current consent conditions is problematic, but adding new POPs substances would become even more challenging.
- Manpower involved in licensing is as follows: 40 staff members (centrally responsible for Annex I installations); 300 staff members in provincial directorates (within 1,200 estimate below).
- IPPC has not yet been implemented with anticipated timeline being 2020 for new facilities. Instant implementation would costs about 30 million TL.
- Substances prescribed are listed in the Industrial source regulations (updated recently, November 2014).

Hazardous wastes:

- Key responsibilities include export of hazardous wastes including PCBs and in line with ROHS. Any changes to waste ELVs would require changes to other legislation and procedures (e.g. waste classification etc.). The scope of responsibilities exclude domestic waste management and import/ export of products and articles.
- UNEP project on PCB equipment (mostly transformers) has included collection, treatment by licensed companies and export after receiving consent.
- Export of hazardous wastes takes place in accordance with the Basel Convention provisions.

- Import of wastes is strictly prohibited with the exception of inert wastes (such as glass, scrap metal etc. imported for recycling).
- There are 4 Product safety regulations published by the Ministry of Economy including import of wastes, scrap metal, coal and solid fuel and product based batteries and accumulators.
- Other two relevant product safety regulations (not related to this department but, related to MoFAL and Air Quality Management Department of MoEU) are Safety Regulation regarding materials which deplete ozone layer, and Safety regulation regarding inspection of product safety.

Inspections:

- The process includes visiting facilities and checking for authorisation, checking process, appropriateness of discharge/ disposal processes etc.
- There are on average 40,000 inspections per year (35,000-45,000)
- Centrally, about 300 inspections takes place (most problematic sites), the rest is administered by Provincial Directorates.
- Inspections usually take place once in 2 years.
- Following the shift from combined to IPPC licensing, staff training will be required (about 30 people centrally and 1,200 across the whole country)

RIA meeting ended at 5 pm.

REGULATORY IMPACT ASSESSMENT: administrative impacts - Meeting with the Ministry of Science, Technology and Industry (MoSTI)

Project title:	**Technical Assistance for Implementation of Persistent Organic Pollutants (POPs) Regulation** **TR2010/0327.03-01/001**
Time:	17th of April, 2015 Time: 14:00 pm – 16:00 pm
Place:	MoSTI

List of participants

Name of the participant	Institution	Position
Ms. Ilona Kirhensteine	AMEC, NIRAS Consortium	Deputy Team Leader
Ms. Sinem Erdogdu	RAST Engineering, NIRAS Consortium	Short Term RIA Expert
Orhan ÇETİNKAYA	Ministry of Industry and Trade	Head of Department

MINUTES

RIA working meeting started at 2 pm and was dedicated to obtaining responses to the questionnaire disseminated earlier by the Ministry of Environment and Urbanisation. The questionnaire was focused on eliciting views of different Ministries on potential administrative burden associated with the draft By-Law.

Before 2011 there was a Ministry of Industry and Trade. After 2011, trade related responsibilities were transferred to MoC while MoSTI became responsible for trade issues.

The MoSTI has five areas of responsibility:

- Determination of sectoral and industry strategies

- Support to research
- Support to manufacturing industries in terms of innovations (using 3Y approach- domestic, innovative, green). In order to obtain support, industries have to apply for grants that are given by the MoSTI

The MoSTI has to comply with the decisions/ priorities set by the MoDevelopment.

Grants are distinguished between:

- General
- Regional
- Strategic (e.g. petrochemical)
- Large scale (>50 million USD)

MoSTI develop: sectoral strategies (textile, chemical, automotive, machinery, metal, electric and electronic, mineral products). The sectoral strategies contain aims and actions and are updated every 4 years. Sectoral reports are prepared annually.

Industrial strategy is a horizontal strategy for all manufacturing industries addressing major bottlenecks (access to finance, illegal production etc.) and setting out proposed solutions.

The summary of the responses provided is presented in the table.

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Questions	**Responses**
Section 1: Article 5 Control of production, placing on the market and use Art5(3) stipulates that "The Ministry and Relevant Institution shall, within the assessment and authorisation schemes for chemicals and pesticides under their relevant legislation, take into consideration Convention and take appropriate measures to control existing chemicals and pesticides and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants" Do you have current assessment and authorisation schemes for chemicals and pesticides under your relevant legislation? Yes/No If Yes, please provide details on these schemes detailing its scope, assessment frequency and average number of assessments and authorisations per year. Do you currently take into account requirements of Stockholm Convention regarding POPs and take measures to control existing chemicals and pesticides and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants? If yes, please provide details on how this is done and what effort does it require currently (e.g. manpower requirements etc.) If no (or not fully), what additional actions would you need to execute in order to comply with the provisions of the article and, in particular, to take into account and take appropriate measures to control and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants? What would be associated manpower requirements of these actions? (in annual terms or on per assessment and authorisation basis)?	The provision will not affect the MoSTI, i.e. it is not expected to result in any additional administrative burden The MoSTI is involved in REACH Annex XVII actitvities.
Section 2: Article 6 Exemptions from control measures (relevant only if Appendix explicitly allows for such exemption) Article 6(2) requires Relevant Institutions to notify the MoEU about the articles containing POPs already in use before or on the date of entry into force of By-Law and about articles containing POPs	MoSTI holds information reported on production volumes (by PRODTR codes but not by products containing POPs).

Questions	Responses
produced before or on the date of entry into force of this By-law until six months after the date of its entry into force. In your view, what would be the likely approach, format and frequency of such notifications to your institution? What would be anticipated manpower requirements per year to collate, process, store and pass on this information to the MoEU? [NB. It is noted that the requirement is time limited and would probably apply for the first year only].	
Section 3: Article 7 Stockpiles Article 7 requires holders of stockpiles (permitted use of POPs) to notify the Ministry in which stockpile is established about the nature and the size of stockpile. The Relevant Institutions is then required to pass on this information to the MoEU so it can fulfil set monitoring requirements on the notified stockpiles. In your view, would your institution be affected by the provisions of this Article? Would you expect holders of stockpiles to notify you as you represent the Ministry under which stockpile is established? If so, what would be anticipated costs per year to receive, process and store the information? Article 14 requires to provide a summary information compiled from the notifications, concerning stockpiles, received pursuant to Article 7(2) to the MoEU. In your view, what would be the format of such information provision (e.g. a letter, e-mail, formal report etc.) and anticipated manpower cost per year?	There are no records of chemicals manufactured by CAS#, for instance. The MoSTI holds information reported on production volumes (by PRODTR codes but not on POPs chemicals stockpiles). The lowest level of data resolution is PRODTR code (for chemical industries outputs as well). If relevant product codes are provided, data on total production volumes can be provided.
Section 4: Article 8 Release reduction, minimization and elimination Article 8(1) requires preparation and maintenance of Annex III release inventories. In your opinion, would you be requested to draw up or contribute to development of inventories for the Annex III substance releases? If so, what would be anticipated format and content of inventories? What would be one-off costs of developing the inventories required? What would be annual costs of maintaining the inventories?	MoSTI has cooperated in the past with MoEU to assist in developing activity based inventories. MoSTI holds a **database** with reported production volumes by NACE/ PRODTR codes. The data is filled online by companies. There are about 120,000 registered companies on the system. In total, according to Turkish Statistics in 2012 there were 337,000 manufacturing companies. However, in terms of capacity, registered companies account for about 80% of total production capacity of the country. After a company is registered on the system, the MoSTI approves it followed by reporting. A number of challenges exist: data accuracy is questionnable. The majority of industries are concentrated in couple of regions. For instance, Istanbul alone accounts for ~20% (25,000 companies reporting). Given the number of staff, inspections carried out to check the declarations are not sufficient. For instance, Istanbul region has 12 people, while required manpower would be about 50. At the design level, if data were more reliable, this would form good basis for developing emissions inventory. Production data reported for the same sectors/ products often appear in different units. For instance, the same product can be reported in tonnes, pairs, km etc. Data extraction, therefore, requires manual processing to convert the data available to consistent units. As an example, preparing of production data for chemicals sector took about 12 manpower days. The system of registration and authorisation can be improved.
Section 5: Article 9 Waste management Article 9(5) requires the Ministry to establish concentration limits to be adopted under the Article 18 process. Implementation of this article would require setting up concentration limits in wastes and operation of the Committee established under Article 18. Until such time as these concentration limits are established the	The provision will not affect the MoSTI, i.e. it is not expected to result in any additional administrative burden

Questions	Responses
Ministry and Relevant Institutions may adopt or apply concentration limits or specific technical requirements in respect of waste being dealt with under paragraph 4(b) Art9 (5) under the Article 18 process. Costs are considered to be covered under Article 18 assessment below.	
Section 6: Article10 Implementation Plan Article 10 stipulates the following: (1) The Ministry shall review and update the National implementation plan, as appropriate. (2) The Ministry shall exchange information with other institutions during revision and update of the NIP. (3) The ministry shall send the NIP to related institutions for approval Article 10 includes provisions regarding information exchange with other relevant institutions during the review and update of NIP and obtaining of approval. What would be your internal manpower requirements and other costs (such as meeting room costs etc.) associated with such information exchange (per a round of NIP review)? What would be internal manpower requirements and other costs to obtain your approval?	Likely activities would include: responding to data requests, participation in trainings. On one hand additional compliance burdens might affect industries adversely (Annex XVII under REACH), on the other hand there is a commitment to carry out manufacturing in environmentally sound manner.
Section 7: Article 11 Monitoring The Article 11 requires MoEU in cooperation with Relevant Institutions to establish appropriate monitoring systems on the presence of Annex III substances in the environment (PCB, PAH, HCB and PCDD/PCDF, Pentaklorobenzen). Are you envisaging taking part of such monitoring system? If so, what would be anticipated costs of establishing such monitoring system (one-off and annual O&M costs) for your organisation? In the absence of such estimates, could you please: Confirm the list of POP substances to be monitored Provide information on potential design of monitoring system in terms of number of sampling points and sampling frequency per substance per year? Unit costs of sampling, analysis and reporting per substance?	The provision will not affect the MoSTI, i.e. it is not expected to result in any additional administrative burden
Section 8: Article 12 Information exchange Article 12(1) requires MoEU and Relevant Institutions to facilitate and undertake the exchange within the Community and third countries of information relevant to the reduction, minimisation, elimination, production, use and release of POPs. Do you anticipate to participate in such information exchange activities? If so, what could be likely format, content and frequency of such information exchange? What would be associated manpower and other costs per year for ensuring information exchange? Article 12(2) requires MoEU and Relevant Institutions to promote and facilitate awareness programmes, provision of public information and dedicated training on POPs. Do you anticipate to participate in such awareness programmes, training and public information provision activities? If so, what would be likely format and frequency of such activities? What would be anticipated annual costs/ budget for awareness programmes, provision of public information and dedicated training on POPs? In the absence of dedicated information dissemination and training budget, what would be estimated manpower requirements per year to comply with the provisions of this Article?	Art 12(1). MoSTI is a member of Prohibition of Chemical Weapons (OPCW); LAHEY Art 12(2) Face-to-face trainings on industry reporting (120k companies) would not be feasible. There was a project on developing on online/ remote training tool, but MoSTI saw no improvement in quality of reporting afterwards Art 12(3) Confidentiality of data is set out under the Statistics Law. As a rule of thumb, data from less than 3 companies cannot be published. Company specific data cannot be shared publicly. However MoSTI can be authorized to provide such information under specified circumstances.

Questions	Responses
Article 12(3) sets out that while performing information sharing and exchange the MoEU and Relevant Institutions shall protect confidential data. In your view, what would be anticipated approach to safeguarding confidential information (dedicated policies, data sharing protocols etc.)? What would be anticipated costs of developing such confidentiality policies and implementing these on continuous basis to your organisation?	
Section 9: Article 13 Technical assistance Article 13 requires the Ministry to cooperate with Relevant Institutions in providing technical and financial assistance to developing countries and countries with economies in transition as part of the Regulation implementation process. Would you expect to be involved in provision of such technical assistance? If so, what is your view regarding potential format and scale of such assistance? What are anticipated annual costs/ budget for technical assistance? In the absence of dedicated technical assistance budget, what would be estimated manpower requirements per year to comply with the provisions of this Article?	The provision will not affect the MoSTI, i.e. it is not expected to result in any additional administrative burden
Section 10: Article 14 Reporting Article 14(1) requires Relevant Institutions to submit information to the MoEU regarding the application of the By-Law including on any infringements and penalties (once every 3 years). Article 14(2) requires Relevant Institutions to provide the MoEU with total production and placing in the market quantity data for substances listed in the Annex I or Annex II (once a year). Article 14(3) requires Relevant Institutions to submit information to the MoEU (once every 3 years): Summary information on notified stockpiles Summary information on release inventories (Annex III substances) Summary information on Annex III substance monitoring What would be anticipated annual manpower requirements for your institution to generate and compile reports under Article 14(1), 14(2) and 14(3) provisions? [NB. It is noted that anticipated costs of reporting will depend on whether such data is already available or easily obtainable or would require establishment of additional data gathering mechanisms, monitoring activities etc.]	Capacity includes 8 people across different departments plus 3-4 from the IT department totalling to 11 staff members. There is a pilot project aimed to develop an integrated database on economic activities including data like production value, costs etc. It is run in cooperation with MoE, MoL, MoF and Statistics. The database is open to public access, although some parts of it are closed. If MoEU is requesting data and referring to the Enterprise system access can be arranged. However, in instances when MoSTI does not have information, for instance on the extent of use of certain chemical substances in production of textile clothing, MoSTI would need to consult companies potentially affected.
Chemicals and Waste Advisory Committee The Article requires the Ministry to establish a new Committee to harmonise national policies, provide information exchange between related institutions that is composed of representatives from relevant institutions and those invited by the Ministry depending on specific topic. Duties of the Committee also cover some of the activities referred to in other articles (e.g. information exchange responsibilities (Article 12), setting up concentration limits etc.). In you view, would you expect to participate in the Committee and if so, what would be annual manpower requirements associated with preparation and participation in the Committee meetings?	The estimated requirements are 2-3 people from different departments twice a year involved. It will also be important to include other stakeholders and industry representatives such as Turkish Union of Chambers and Commodity Exchange who holds valuable experience in sectors.

REGULATORY IMPACT ASSESSMENT: administrative impacts – response from the Ministry of Energy and Natural Resources (MoENR)

Project title:	**Technical Assistance for Implementation of Persistent Organic Pollutants (POPs) Regulation** **TR2010/0327.03-01/001**

Time:	Na
Place:	MoENR

List of participants

Name of the participant	Institution	Position
Ms. Ilona Kirhensteine	AMEC, NIRAS Consortium	Deputy Team Leader
Ms. Sinem Erdogdu	RAST Engineering, NIRAS Consortium	Short Term RIA Expert

MINUTES

RIA working meeting started at 2 pm and was dedicated to obtaining responses to the questionnaire disseminated earlier by the Ministry of Environment and Urbanisation. The questionnaire was focused on eliciting views of different Ministries on potential administrative burden associated with the draft By-Law.

The summary of the responses provided is presented in the table.

Questions	Responses
Section 1: Article 5 Control of production, placing on the market and use Art5(3) stipulates that "The Ministry and Relevant Institution shall, within the assessment and authorisation schemes for chemicals and pesticides under their relevant legislation, take into consideration Convention and take appropriate measures to control existing chemicals and pesticides and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants" Do you have current assessment and authorisation schemes for chemicals and pesticides under your relevant legislation? Yes/No If Yes, please provide details on these schemes detailing its scope, assessment frequency and average number of assessments and authorisations per year. Do you currently take into account requirements of Stockholm Convention regarding POPs and take measures to control existing chemicals and pesticides and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants? If yes, please provide details on how this is done and what effort does it require currently (e.g. manpower requirements etc.) If no (or not fully), what additional actions would you need to execute in order to comply with the provisions of the article and, in particular, to take into account and take appropriate measures to control and prevent the production, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants? What would be associated manpower requirements of these actions? (in annual terms or on per assessment and authorisation basis)?	No – Yes There is a project, regarding the disposal of PCB containing capacitors, before the determined date. -
Section 2: Article 6 Exemptions from control measures (relevant only if Appendix explicitly allows for such exemption) Article 6(2) requires Relevant Institutions to notify the MoEU about the articles containing POPs already in use before or on the date of entry into force of By-Law and about articles containing POPs produced before or on the date of entry into force of this By-law until six months after the date of its entry into force.	At the time being, there is no responsibility to inform MoEU.

Questions	Responses
In your view, what would be the likely approach, format and frequency of such notifications to your institution? What would be anticipated manpower requirements per year to collate, process, store and pass on this information to the MoEU? [NB. It is noted that the requirement is time limited and would probably apply for the first year only].	
Section 3: Article 7 Stockpiles Article 7 requires holders of stockpiles (permitted use of POPs) to notify the Ministry in which stockpile is established about the nature and the size of stockpile. The Relevant Institutions is then required to pass on this information to the MoEU so it can fulfil set monitoring requirements on the notified stockpiles. In your view, would your institution be affected by the provisions of this Article? Would you expect holders of stockpiles to notify you as you represent the Ministry under which stockpile is established? If so, what would be anticipated costs per year to receive, process and store the information? Article 14 requires to provide a summary information compiled from the notifications, concerning stockpiles, received pursuant to Article 7(2) to the MoEU. In your view, what would be the format of such information provision (e.g. a letter, e-mail, formal report etc.) and anticipated manpower cost per year?	There are not any stockpiles of POPs, under the possession of the ministry of energy.
Section 4: Article 8 Release reduction, minimization and elimination Article 8(1) requires preparation and maintenance of Annex III release inventories. In your opinion, would you be requested to draw up or contribute to development of inventories for the Annex III substance releases? If so, what would be anticipated format and content of inventories? What would be one-off costs of developing the inventories required? What would be annual costs of maintaining the inventories?	Annex III – substances are not relevant to MoEnergy
Section 5: Article 9 Waste management Article 9(5) requires the Ministry to establish concentration limits to be adopted under the Article 18 process. Implementation of this article would require setting up concentration limits in wastes and operation of the Committee established under Article 18. Until such time as these concentration limits are established the Ministry and Relevant Institutions may adopt or apply concentration limits or specific technical requirements in respect of waste being dealt with under paragraph 4(b) Art9 (5) under the Article 18 process. Costs are considered to be covered under Article 18 assessment below.	Costs are covered and explained under article 18
Section 6: Article10 Implementation Plan Article 10 stipulates the following: (1) The Ministry shall review and update the National implementation plan, as appropriate. (2) The Ministry shall exchange information with other institutions during revision and update of the NIP. (3) The ministry shall send the NIP to related institutions for approval	No response

Questions	Responses
Article 10 includes provisions regarding information exchange with other relevant institutions during the review and update of NIP and obtaining of approval. What would be your internal manpower requirements and other costs (such as meeting room costs etc.) associated with such information exchange (per a round of NIP review)? What would be internal manpower requirements and other costs to obtain your approval?	
Section 7: Article 11 Monitoring The Article 11 requires MoEU in cooperation with Relevant Institutions to establish appropriate monitoring systems on the presence of Annex III substances in the environment (PCB, PAH, HCB and PCDD/PCDF, Pentaklorobenzen). Are you envisaging taking part of such monitoring system? If so, what would be anticipated costs of establishing such monitoring system (one-off and annual O&M costs) for your organisation? In the absence of such estimates, could you please: Confirm the list of POP substances to be monitored Provide information on potential design of monitoring system in terms of number of sampling points and sampling frequency per substance per year? Unit costs of sampling, analysis and reporting per substance?	No
Section 8: Article 12 Information exchange Article 12(1) requires MoEU and Relevant Institutions to facilitate and undertake the exchange within the Community and third countries of information relevant to the reduction, minimisation, elimination, production, use and release of POPs. Do you anticipate to participate in such information exchange activities? If so, what could be likely format, content and frequency of such information exchange? What would be associated manpower and other costs per year for ensuring information exchange? Article 12(2) requires MoEU and Relevant Institutions to promote and facilitate awareness programmes, provision of public information and dedicated training on POPs. Do you anticipate to participate in such awareness programmes, training and public information provision activities? If so, what would be likely format and frequency of such activities? What would be anticipated annual costs/ budget for awareness programmes, provision of public information and dedicated training on POPs? In the absence of dedicated information dissemination and training budget, what would be estimated manpower requirements per year to comply with the provisions of this Article? Article 12(3) sets out that while performing information sharing and exchange the MoEU and Relevant Institutions shall protect confidential data. In your view, what would be anticipated approach to safeguarding confidential information (dedicated policies, data sharing protocols etc.)? What would be anticipated costs of developing such confidentiality policies and implementing these on continuous basis to your organisation?	No
Section 9: Article 13 Technical assistance Article 13 requires the Ministry to cooperate with Relevant Institutions in providing technical and financial assistance to developing countries and countries with economies in transition as part of the Regulation implementation process. Would you expect to be involved in provision of such technical	

Questions	Responses
assistance? If so, what is your view regarding potential format and scale of such assistance? What are anticipated annual costs/ budget for technical assistance? In the absence of dedicated technical assistance budget, what would be estimated manpower requirements per year to comply with the provisions of this Article?	
Section 10: Article 14 Reporting Article 14(1) requires Relevant Institutions to submit information to the MoEU regarding the application of the By-Law including on any infringements and penalties (once every 3 years). Article 14(2) requires Relevant Institutions to provide the MoEU with total production and placing in the market quantity data for substances listed in the Annex I or Annex II (once a year). Article 14(3) requires Relevant Institutions to submit information to the MoEU (once every 3 years): Summary information on notified stockpiles Summary information on release inventories (Annex III substances) Summary information on Annex III substance monitoring What would be anticipated annual manpower requirements for your institution to generate and compile reports under Article 14(1), 14(2) and 14(3) provisions? [NB. It is noted that anticipated costs of reporting will depend on whether such data is already available or easily obtainable or would require establishment of additional data gathering mechanisms, monitoring activities etc.]	
Chemicals and Waste Advisory Committee The Article requires the Ministry to establish a new Committee to harmonise national policies, provide information exchange between related institutions that is composed of representatives from relevant institutions and those invited by the Ministry depending on specific topic. Duties of the Committee also cover some of the activities referred to in other articles (e.g. information exchange responsibilities (Article 12), setting up concentration limits etc.). In you view, would you expect to participate in the Committee and if so, what would be annual manpower requirements associated with preparation and participation in the Committee meetings?	We might participate in the committee