

A SIMPLE APPROACH TO EVALUATE THE EFFECTIVENESS OF STOCKHOLM CONVENTION

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Introduction

The Stockholm Convention (SC) was adopted in 2001 to protect human health and the environment from chemicals grouped as Persistent Organic Pollutants (POPs) that remain in the environment for a long period of time and become widely distributed both in environmental media and in living organisms. The government agencies have responsibility to fulfill obligations of the agreement. There are different ways for evaluating the improvements made by the countries e.g. national monitoring plans^{1,2}. The relevant article of the convention suggests long term monitoring programs (human/environment) to evaluate the effectiveness of the convention. Considering the development level of a country, these situations may take a long period. On the other hand, we propose that an effective evaluation can also be possible via literature search, considering the studies forming a basis to the Convention. Thus, in this study, the effects of the Convention were evaluated using the scientific literature, and studies concerning POPs. For this purpose, bibliometric analysis and content analysis tools were used.

Bibliometric analysis, firstly introduced by Pritchard, includes a series of quantitative procedures to generalize the patterns and dynamics in scientific publications³. Also it is used to decide what research should be made and supported by government, to decide national research needs. On the other hand, content analysis is a commonly used bibliometric method and used to evaluate the characteristics of publications, research trends and hotspots. Bibliometric analysis has been applied in various areas such as evaluation of researches on estuary pollution⁴, solid waste⁵, and renewable energies⁶. In this study, it is used to quantify and to evaluate the publications on POPs exclusively in Turkey. However, this approach needs to be applied in other countries in order to confirm the evaluation of the effectiveness of SC.

Materials and methods

The data used in this study were based on the Science Citation Index (SCI) database published by Thomson Reuters Web of Science (WOS) which is an important and frequently used source for a broad review of scientific accomplishment in all research fields. The search is limited to chemicals listed in SC addressing Turkey. The search was done in May 2014; the publications between 1980 and December 2013 were evaluated. After the literature search, 324 publications are listed and 310 of them are filtered by publication type of "article" considering that the data revealed in "articles" should lead more reliable and detailed results, hence data in 310 articles were used for further purposes. The study was conducted in two stages. Firstly, they were quantitatively evaluated by bibliometric analysis, and then research trends were analyzed by simple content analysis. SPSS Statistics Base v21 was used for analysis. Mainly, 11 research topics (Table 1) were used to classify publications and evaluate the relationship with articles of SC.

Results and discussion

Bibliometric analysis

In the current analysis, document type, language of publication, publication year, distribution of publications in journals, institutional distribution and international collaborations, keyword analysis, and citation analysis were evaluated. However, only the most relevant results with SC were selected to present in this study. The findings (Figure 1) showed a significant increase in the number of publications after the adoption of SC.

Table 1. Research topics used to evaluate publications

Topic No	Subject of the publication	Related SC Article No
1	Management options to reduce/eliminate releases	3, 4, 5, 6
2	Physical and Chemical Properties/Listing of chemicals in Annexes	8
3	Method development on POP analysis/treatment	8
4	Public Information, awareness and education	10
5	Receptor Modeling/Source/Release	11-1a
6	Presence/Levels and trends in humans and environment	11-1b
7	Fate/Transport/Transformation	11-1c
8	Effects on human and environment/Toxicity/Health effects	11-1d
9	Socio-economic and cultural impacts	11-1e
10	Reduction/Elimination/Treatment and/or technologies	11-1f
11	Harmonized methodologies for making inventories of generating sources and analytical techniques for the measurement of releases	11-1g

As it is seen from Figure 1, approximately 50% of the publications were after 2010 as SC was officially approved by the Turkish Parliament and legally came into force in 2009 (Official Gazzette Date-Number: 14/04/2009-27200). Therefore, it can be concluded that SC has a positive effect on the number of conducted studies and publications. In addition, another positive effect of SC has been observed on international collaborations between Turkish and other scientists from various countries, and yet 22.9% of the publications were carried out with a partner abroad.

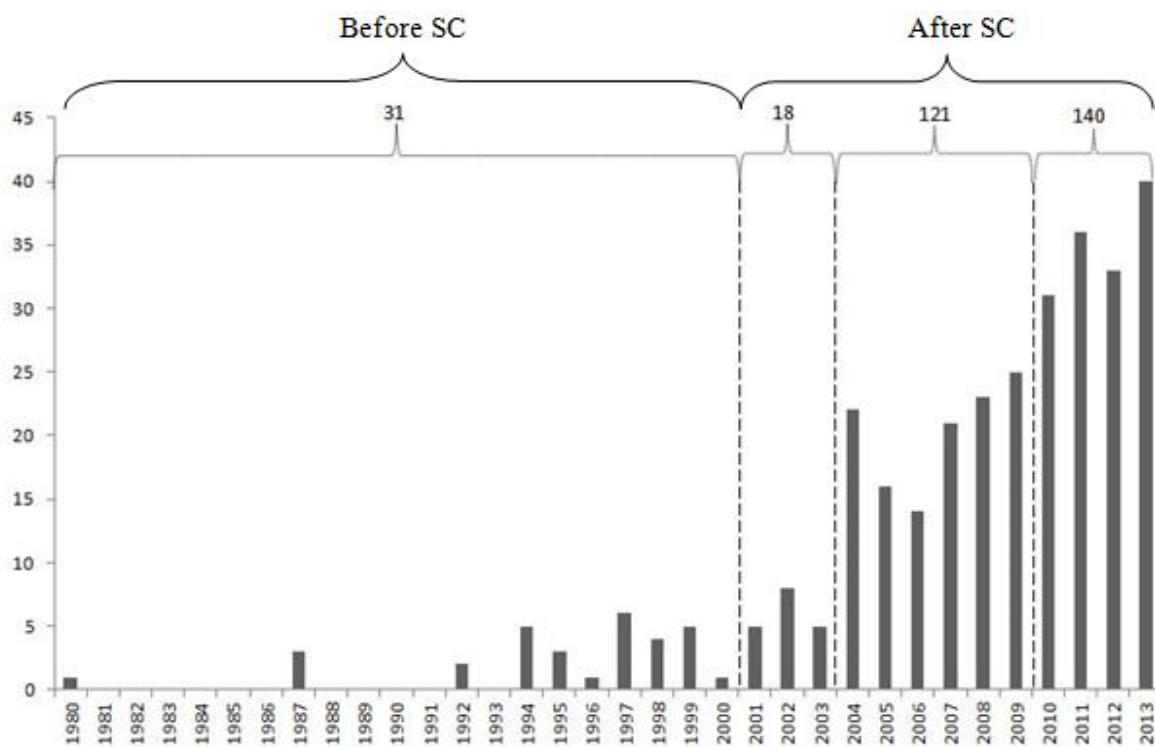


Figure 1. Characteristics of publications outputs

Trend analysis

Trend analysis was carried out under the titles listed in Table 1. The publications were evaluated by content and were grouped under one or more topics. Results of POPs groups versus published data (Figure 2) showed that the largest number of documents were related to organochlorine pesticides (43.9%) followed by polychlorinated biphenyls (37.4%). On the other hand, it was found out that there are limited publications including recent chemicals listed in SC, in Turkey.

As it is depicted in Figure 3, the most active research topic was "Presence/Levels and trends in humans and environment (corresponding to SC Article 11)". Moreover, after the Convention, number of studies centered on measurements of the POPs levels in both human and environmental compartments has increased. Although major advances have been made in recent years on POPs research in Turkey, more emphasis and efforts should be made on investigations related to management, treatment and reduction of POPs. Besides, studies should be conducted to evaluate public awareness, socio-economic and cultural effects of SC.

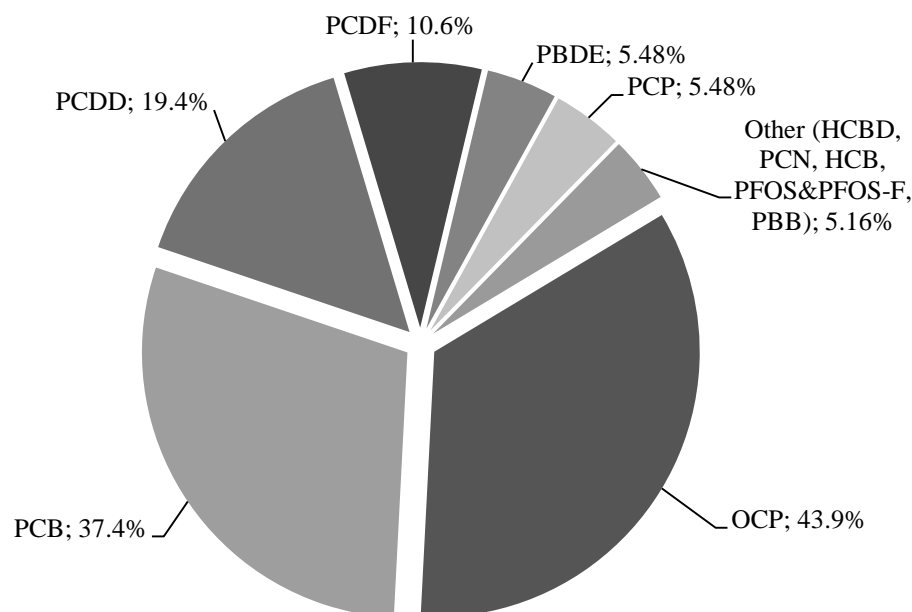


Figure 2. Characteristics of publications by POPs groups (OCP; Organochlorine pesticide, PCB; Polychlorinated biphenyls, PCDD; Polychlorinated dibenzo-p-dioxins, PCDF; Polychlorinated dibenzofurans, PBDE; Polybrominated diphenyl ethers, PCP; Pentachlorophenol, HCB; Hexachlorobutadiene, PCN; Polychlorinated naphthalenes, HCB; Hexachlorobenzene, PFOS and PFOS-F; Perfluorooctane sulfonic acid, its salts and Perfluorooctane sulfonyl fluoride, PBB; Polybrominated biphenyls)

Results of the study show that several studies – although still in limited numbers compared to North America or to Europe - on initial 12 POPs listed in SC have been conducted in Turkey, there is lack of information/data regarding the new POPs that are recently added to SC. Overall results of the study suggest that such an analysis can be extremely useful to determine the research trends/needs in countries which are just initiating POPs studies and also results from the current study can be used as a guide for policy makers to identify the missing parts/data for a comprehensive policy update and National Implementation Action Plan.

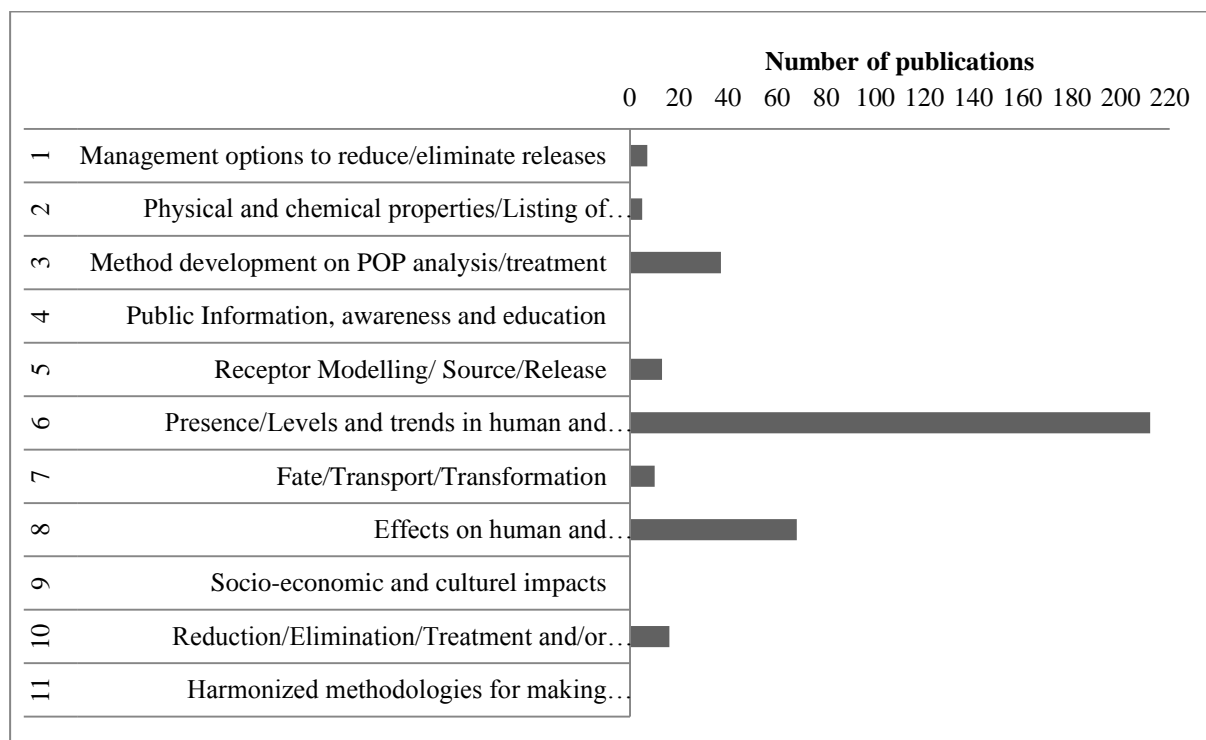


Figure 3. Characteristics of publications by research topics related to SC articles

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