FROM NIPs TO IMPLEMENTATION: LESSONS LEARNED REPORT

December 2018

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List of acronyms and abbreviations

3F	Fluorine-free firefighting foams
AFFF	Aqueous film forming foams
AMAP	Arctic Monitoring and Assessment Programme
BAT	Best Available Techniques
BCRC	Basel Convention regional centres
BEP	Best Environmental Practices
BFRs	Brominated flame retardants
BRS	Basel, Rotterdam and Stockholm Conventions
CARPHA	The Caribbean Public Health Agency
CETESB	Environmental Company of the State of São Paulo
CFCs	Chlorofluorocarbons
COP	Conference of the Parties
CRC	Chemical Review Committee
CRT	Cathode ray tube
CSIC	Superior Council of Scientific Research
CSOs	Civil Society Organisations
CVUA	State Institute for Chemical and Veterinary Analysis
DDT	dichlorodiphenyltrichloroethane
DecaBDE	Decabromdiphenyl ether
DEHP	Diethylhexyl phthalate
EEA	European Environment Agency
EBP	Ethane 1,2 bis(pentabromophneyl) (decabromodiphenyl ethane)
ECOWAS	Economic Community of West African States
EDCs	Endocrine disrupting chemicals
EECCA	Eastern Europe, the Caucasus and Central Asia
EEE	Electrical and electronic equipment
EHP	Environmental Health Perspectives
EMEP	European Monitoring and Evaluation Programme
EPR	Extended Producer Responsibility
ESM	Environmentally sound management
EU	European Union
E-waste	Electronic waste
FAO	Food and Agriculture Organization
FECO	Foreign Economic Cooperation Office
FSP	Full size project
GAPS	Global Atmospheric Passive Air Sampling Programme
GASG	Global Automotive Stakeholder Group
GADSL	Global Automotive Declarable Substance List
GC-ECD	Gas Chromatography – Electron Capture Detector
GDP	Gross domestic product
GEF	Global Environment Facility
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
GIZ	Gesellschaft für Internationale Zusammenarbeit
GMP	Global Monitoring Plan
GRULAC	Group of Latin America and the Caribbean
GSPI	Green Science Policy Institute
HBB	Hexabromobiphenyl

HBCD	Hexabromocyclododecane
HCB	Hexachlorobenzene
HCH	Hexachlorocyclohexane
HCBD	Hexachlorobutadiene
HS	Harmonized System
IADN	Integrated Atmospheric Deposition Network
IHPA	International HCH and Pesticides Association
IOMC	Inter Organization Programme for the Sound Management of Chemicals
IPCP	International Panel on Chemical Pollution
IPEN	International POPs Elimination Network
IPM	Integrated Pest Management
IQ	Intelligence quotient
KIC	Knowledge and Innovation Community
MEAs	Multilateral Environmental Agreements
MFA	Material flow analysis
MOOC	Massive open online course
MONET CEECs	Monitoring Network in Central and Eastern European Countries
MRSL	Manufacturing Restricted Substances List
NAP	National Action Plan
NATO	North Atlantic Treaty Organization
NGOs	Non-Governmental Organizations
NIP	National Implementation Plan
OCPs	Organochlorine pesticides
ODS	Ozone depleting substances
OECD	Organisation for Economic Co-operation and Development
OEWG	Open-ended Working Group
OSCE	Organization for Security and Co-operation in Europe
PBBs	Polybrominated biphenyls
PBDEs	Polybrominated diphenyl ethers
PBDD	Polybrominated dibenzo-p-dioxin
PBDF	Polybrominated dibenzofuran
PCBs	Polychlorinated biphenyls
PCDDs	Polychlorinated dibenzo-p-dioxins
PCDD/Fs	Polychlorinated dioxins and furans
PCDFs	Polychlorinated dibenzofurans
PCNs	Polychlorinated naphthalenes
PCP	Pentachlorophenol
PeCBz	Pentachlorobenzene
PEN	PCB Elimination Network
PFASs	Per- and polyfluoroalkyl substances
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonic acid
POPRC	Persistent Organic Pollutants Review Committee
POPs	Persistent Organic Pollutants
RECETOX	Research Centre for Toxic Compounds in the Environment
SAICM	Strategic Approach to International Chemicals Management
SC	Stockholm Convention
SCCPs	Short-chain chlorinated paraffins
SCRCs	Stockholm Convention regional and sub-regional centres

SDGs	Sustainable Development Goals
SDPI	Sustainable Development Policy Institute
SEA	Socio-Economic Assessment
SEAM	Secretariat of the Environment of the Republic of Paraguay
SFA	Substance flow analysis
SMART	Specific, Measurable, Achievable, Relevant, Time-bound
SPREP	South Pacific Regional Environment Programme
t	Tonnes; metric tons
TA	Technical assistance
TBBPA	Tetrabromobisphenol A
TEQ	Toxic equivalency
ToR	Term of Reference
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
UNITAR	United Nations Institute for Training and Research
UPOPs	Unintentionally Produced POPs
US	United States
USEPA	United States Environment Protection Agency
VECAP	Voluntary Emissions Control Action Programme
WEEE	Waste electrical and electronic equipment
WWF	World Wildlife Fund
ZDHC	Zero Discharge of Hazardous Chemicals

List of figures

List of tables

List of boxes with case studies

Executive summary

The United Nations (UN) Environment's Chemicals and Health Branch has implemented the full size Global Environmental Facility (GEF) project entitled "Global project on the updating of National Implementation Plans for POPs" and the medium size GEF project entitled "Global project on the updating of National Implementation Plans for POPs – add on to umbrella FSP project". The objective of the two projects is to assist countries in reviewing and updating their National Implementation Plans (NIPs) to comply with reporting obligations (Article 15), and in updating their NIPs (Article 7) under the Stockholm Convention. These two projects have assisted 34 Stockholm Convention Parties from all UN regions in updating or developing their NIPs.

This report compiles the valuable information provided via a questionnaire by a majority of the countries who have participated in these projects, as well as by other invited countries with relevant expertise in developing, updating or revising NIPs, and by other GEF implementing agencies and non-governmental organizations (NGOs). The aim of this report is to help the global community shape future activities to implement the Stockholm Convention most effectively.

The report includes a wide range of good practice case studies for NIP development, update and implementation, as well as lessons learned regarding:

- Sustainable capacity, political and stakeholder engagement (Chapter 3);
- Technical elements and capacity (Chapter 4);
- Funding of NIP development, implementation and compliance with the Stockholm Convention (Chapter 5); and
- The process for further NIP updates (Chapter 6).

The countries that responded to the questionnaire identified several remaining challenges (Chapter 8) regarding:

- Sustainability in capacity development and in securing the created capacity;
- Influencing policymaking to address POPs-related issues and ensure the sound management of chemicals and related wastes;
- Technical capacity; and
- Funding of NIP development, implementation and compliance with the Stockholm Convention.

Challenges regarding sustainability in capacity development and in securing the created capacity
All Parties underlined existing challenges regarding building and retaining a capable team, both for policymaking and for inter-ministerial coordination and technical issues. In many countries, the staff in ministries changes frequently, and part of the capacity built during the first NIP implementation has been lost. Developing countries have an added challenge due to the low wages for employees of many of the environmental ministries, often insufficient to meet the minimum living standard for a family. Staff often leave the ministry if offered a better paying job, which contributes to the brain-drain and loss of built capacity.

Challenges in influencing policymaking to address POPs-related issues and ensure the sound management of chemicals and related waste

According to the Parties, the biggest obstacles to influencing policymakers are the: (i) limited technical and financial capacity to generate national evidence-based information regarding the environmental and health hazards associated with POPs; (ii) limited technical and financial capacity to implement a policy if approved; (iii) policymakers' limited understanding of the issues associated with POPs; (iv) poor cooperation and coordination among relevant stakeholders; (v) frequent staff changes at the line ministries, including the focal points under the Multilateral Environmental Agreements (MEAs); and (vi) governmental reforms and slow economic development.

Governments also face several obstacles when engaging with industry and the civil society, including: (i) insufficient human and financial resources for outreach to a large number of stakeholders; (ii) industry's distrust of government actions on POPs and chemicals management in general; (iii) limited or no disclosure about industrial operations, which impedes proactive action on potential pollution affecting society; (iv) limited or no financial resources allocated by industry for environmental protection; and (v) poor understanding of the impacts of POPs and other chemicals on human health and the environment.

Many other challenges at the national level lead to less informed decision-making and policies, such as the: (i) lack of coordination between the line ministries and the national research programmes on policy-related priorities and needs; (ii) lack of connection between scientific or technical experts and policy- or decision-makers; (iii) lack of or insufficient capacity to understand and assess the national implications of scientific and technical information to support policymaking regarding the Conventions; (iv) lack of technical and financial capacity to conduct targeted research relevant to the Stockholm Convention; and (v) lack of cooperation and networking with the regional and global POPs research community.

Challenges regarding technical capacity

The report identifies a range of challenges regarding technical capacity: (i) difficulties in identifying POPs present in products and articles; (ii) lack of chemical-specific Harmonized System (HS) codes; (iii) lack of capacity and resources to monitor compliance at border entry points and to identify and test chemicals, mixtures and products; (iv) lack of training for custom officers and, in some cases, not enough human resources for effective customs control and no capacity building opportunities; and (v) lack or limited coordination among the different key government actors.

Some Parties are still having difficulties controlling the POPs in use throughout their life cycle, the main issues being the: (i) lack of capacity for chemical detection and analysis, including lack of equipment and training opportunities; (ii) limited bilateral and multilateral cooperation; (iii) poor implementation and effectiveness of the legal framework; (iv) lack of research on new POPs at the national level; (v) lack of incentives for manufacturers, importers and others working along the life cycle of POPs to prevent environmental releases; (vi) lack of trained personnel; (vii) lack of laws and regulations regarding registration of industrial chemicals; (viii) lack of a registration system for industrial chemicals; (ix) lack of incentives for importers and manufacturers to shift to alternatives; and (x) improper handling, storage and disposal of chemical substances.

Other countries specifically answered that they lack the capacity for controlling and monitoring the products available on the market that may contain POPs. Some countries mentioned institutional problems such as a lack of coordination among ministries on the life cycle management of POPs. Several countries also reported lacking a funding mechanism for end-of-life management. Only 23% of the surveyed countries reported destroying POPs domestically, whereas the remainder (77%) lack the technical capacity needed.

Also, most countries reported that they have not yet started managing contaminated sites, due to challenges such as: (i) limited or no capacity to assess and secure contaminated sites; (ii) lack of databases or other such systems for inventorying contaminated sites in most developing countries; (iii) lack of analytical capacity in developing countries for assessing sites contaminated with (new) POPs; (iv) weak or lacking regulatory frameworks for defining contaminated sites (e.g. limits for POPs in soil or groundwater); and (v) limited availability of best practice case studies of contaminated sites.

The process of reviewing and updating the NIPs can be challenging for Parties that lack adequate resources and technical capacity. Parties have expressed the need for assistance, particularly with addressing newly listed POPs that are widely used for industrial purposes and contained in products and articles.

Challenges regarding funding of NIP development, implementation and compliance with the Stockholm Convention

The Parties mentioned a range of obstacles to receiving funding or general support: (i) insufficient money, in general, in the environment sector; (ii) limited national financial resources for the diversity of international agreements ratified or accepted (i.e. agreements related to chemicals or waste management, climate change, biodiversity, etc.) with implementation requirements; (iii) tight budgets focused on other priorities; (iv) limited lobbying of financial decision-makers; (v) lack of staff; (vi) limited visibility of the chemical and waste agenda, which prevents it from reaching all levels of government and accessing national funding, since it is a cross-cutting issue; (vii) very limited resources and other more pressing needs (food, water, peace) in developing countries, meaning that not much support can be given to the Stockholm Convention, since chemicals and waste are often not seen as priorities; (viii) some countries preferring to address chemicals and waste management holistically rather than dealing with individual chemicals; and (viii) war and unstable security conditions preventing Stockholm Convention activities from being carried out.

The majority of countries (62%) have harmonised their national priorities with those of the donor, particularly with those of GEF. Still, the following obstacles to harmonization were mentioned: (i) lack of a suitable regulatory framework and enforcement; (ii) lack of a unified approach to controlling and managing chemicals within the country and lack of an independent integrated system, guidelines, transparent laws and enforcement of the laws and regulations; (iii) lack of coordination; (iv) lack of financing; (v) perception that financing POPs-related work would take part of the current budget away from other important issues; (vi) lack of robust data and inventories; (vii) lack of coordination with other priorities such as climate change, biodiversity, SDGs, etc.; (viii) lack of an integrated chemicals management system (for all chemicals, including POPs); and (ix) war and unstable security conditions.

1 Introduction

The United Nations Environment's (UNEP) Chemicals and Health Branch has implemented the full size Global Environmental Facility (GEF) project entitled "Global project on the updating of National Implementation Plans for POPs"[1] and the medium size GEF project entitled "Global project on the updating of National Implementation Plans for POPs – add on to umbrella FSP project".[2] The objective of the two projects is to assist countries in reviewing and updating their National Implementation Plans (NIPs) to comply with reporting obligations (Article 15) and in updating their NIPs (Article 7) under the Stockholm Convention. These two projects have assisted 34 Stockholm Convention Parties[3] from all UN regions in updating or developing their NIPs.

These projects also include a regional and global support component that provides access to technical expertise and tools to facilitate updating the NIPs. The support component is intended to enhance communication and information exchange among Parties to compare and harmonize data and identify lessons learned and good practices for developing, updating or revising the NIPs.

This report compiles the valuable information provided by a majority of the countries who participated in these projects, as well as by other invited countries with relevant expertise in developing, updating or revising NIPs. Information provided by other GEF implementing agencies and non-governmental organizations (NGOs) was also considered.

Besides the introductory and methodology sections, the report is structured into four main chapters with substantive information on the lessons learned and good practices from developing, updating or revising NIPs at the national level, as follows:

- Lessons learned relating to sustainable capacity, political and stakeholder engagement;
- Lessons learned relating to the technical elements and capacity;
- Lessons learned relating to funding of NIP development, implementation and compliance with the Stockholm Convention;
- Lessons learned relating to the process for further NIP updates.

Additionally, Chapter 7 compiles the lessons learned identified by the UNIDO Office for Independent Evaluation within the document entitled "Cluster Evaluation of UNIDO projects. Enabling Activities to review and update the National Implementation Plans for the Stockholm Convention on POPs". This report aims to reflect and disseminate those experiences, good practices and lessons learned that will help the global community shape future activities to implement the Stockholm Convention most effectively.

[1] GEF Project ID: 5307

[2] GEF Project ID: 5525

[3] Benin, Burundi, Cameroon, Djbouti, Egypt, Equatorial Guinea, Ghana, Gambia, Libyan Arab Jamahiriya, Madagascar, Malawi, Afghanistan, Georgia, Kyrgyz Republic, Lebanon, Malaysia, Albania, Croatia, Montenegro, Argentina, Chile, Paraguay, Uruguay, Kiribati, Samoa, Solomon Islands, Tuvalu, Cook Islands, Marshall Islands, Nauru, Palau, Papua New Guinea, Pakistan, Sierra Leone, Tonga and Yemen

Moreover, this report will serve as a resource for the countries updating their NIPs and for the on-going GEF-6 medium size project entitled "Integrated SC toolkit to improve the transmission of information under Articles 07 and 15".[4]

2 Objective and methodology

2.1 Objective

The overall objective of this report is to compile lessons learned and good practices within the NIP development, update and implementation processes at the national level, with the aim of helping the global community shape future activities to implement the Stockholm Convention most effectively.

2.2 Methodology

2.2.1 Approach

The report was developed in four steps:

1. Outline preparation;
2. Information collection;
3. Information compilation and evaluation;
4. Review and consultations.

2.2.1.1 Report outline preparation

In establishing the report outline, relevant aspects on developing, updating or revising the NIPs at the national level were considered and project countries were consulted. These aspects include lessons learned and good practices regarding ensuring sustainable technical capacities and political and stakeholder engagement at the national level, as well as regarding funding the NIP implementation and complying with the Convention requirements.

2.2.1.2 Information collection

A questionnaire was developed in order to identify and collect the lessons learned and good practices within the NIP development, update and implementation process at the national level. The questionnaire, in both Word and Google Forms formats, was addressed to Stockholm Convention National Focal Points, NIP development or update coordinators, some GEF Implementing Agencies, Stockholm Convention regional centres and NGOs.

Following the report outline, the questionnaire had four main sections, as follows:

- Section 1. Sustainable capacity, political and stakeholder engagement;
- Section 2. Technical elements and capacity;
- Section 3. Funding for NIP implementation and compliance with the Convention;
- Section 4. Future NIP update progress.

[4] GEF Project ID: 9884

The questionnaire was circulated to projects countries[3] and to some other countries[5] experienced in the NIP development, update and implementation processes at national level. To gather the perspectives of those supporting Stockholm Convention Parties with their NIP development, update and implementation, the questionnaire was also circulated to two GEF implementing agencies,[6] to project-related regional centres,[7] and to the International POPs Elimination Network (IPEN), which represents approx. 500 NGOs working on POPs. Additionally, Chapter 7 includes information from the document entitled "Cluster Evaluation of UNIDO projects - Enabling Activities to review and update the National Implementation Plans for the Stockholm Convention on POPs" developed by the UNIDO Office for Independent Evaluation in 2015.

2.2.1.3 Information compilation and evaluation

The questionnaire replies (21 total) were compiled and distributed according to the report outline topics. The information provided was evaluated and summarized to reflect the main lessons learned and good practices from the NIP development, update and implementation processes at the national level. Good practice case studies were also compiled and included. The remaining challenges for Parties and other Stockholm Convention stakeholders were compiled and included in a separate section. The report also compiles the relevant conclusions, recommendations and lessons learned included in the document entitled "Cluster Evaluation of UNIDO projects - Enabling Activities to review and update the National Implementation Plans for the Stockholm Convention on POPs"[8] developed by the UNIDO Office for Independent Evaluation in 2015.

2.2.1.4 Review and consultations

The report was circulated to the project countries and face-to-face debates over the report's good practices, lessons learned and remaining challenges took place at the Global Workshop "From NIPs to Implementation" of the UN Environment, GEF Projects "Global project on the updating of National Implementation Plans for POPs" and "Global project on the updating of National Implementation Plans for POPs – add on to umbrella FSP project", held on 23-24 October 2018, in Montevideo, Uruguay. The report was revised based on comments and the workshop outcomes.

2.2.2 Challenges and limitations

A major limitation was the moderate response rate (approx. 60%) from the countries asked to complete the questionnaire. Participating countries provided few examples of lessons learned and good practices, with limited worldwide coverage.

[5] Honduras, Kenya, Republic of Moldova, Vietnam, Zimbabwe.

[6] United Nations Industrial Development Organization and United Nations Development Programme.

[7] Basel Convention Regional Centre for the South American Region in Argentina and Uruguay.

[8] https://www.unido.org/sites/default/files/2015-04/FINAL_report_NIPS_CLUSTER_EVAL_20150409_0.pdf

3 Lessons learned relating to sustainable capacity, political and stakeholder engagement

3.1 Building the capacity needed to address POPs-related issues and comply with the Stockholm Convention

3.1.1 Introduction

Adequate capacity is crucial for effectively implementing the Stockholm Convention at the national level. In accordance with Article 12 of the Stockholm Convention, the developed country Parties shall cooperate to provide technical assistance to developing country Parties and Parties with economies in transition, to assist them, considering their particular needs, in building and strengthening their capacity to implement their obligations under this Convention.

Also, the developed country Parties shall make appropriate arrangements to provide technical assistance and promote the transfer of technology to developing country Parties and Parties with economies in transition relating to the implementation of this Convention. These arrangements shall include regional and sub-regional centres for capacity-building and transfer of technology to assist developing country Parties and Parties with economies in transition to fulfil their obligations under this Convention.

The Stockholm Convention has established a network of 16 regional and sub-regional centres (SCRCs) to provide technical assistance and to promote the transfer of technology to developing country Parties and Parties with economies in transition relating to the implementation of their obligations under the Convention. These autonomous institutions operate under the authority of the Conference of the Parties (COP), the decision-making organ of the Convention composed of all the countries Party to the Convention. The Regional centres were established within institutions with relevant expertise and ability to provide technical assistance and assist the eligible countries with their capacity-building (Stockholm Convention website, 2018).

3.1.2 Assessing the capacity needs and ways to address them

3.1.2.1 Ways to assess the capacity needs

At the **global level**, the Technical Assistance programme of the Secretariat is developed biannually based on, among others, the needs of developing country Parties or Parties with economies in transition for implementing the Stockholm Convention (Stockholm Convention website, 2018). To identify such needs, the Secretariat uses a variety of information sources. The main sources of information are: direct requests for assistance from Parties, NIPs, national reports and specific surveys carried out every two years (Stockholm Convention website, 2018).
The information collected regarding Parties' needs to implement the Convention is centralized in a database. The database allows for data analysis by region and theme. The needs are clustered into different areas such as technical, legal, coordination and cooperation, and information exchange. The database also allows for comparing the identified needs with the technical assistance activities already provided to each Party, to monitor the progress and impact of the Technical Assistance programme (Stockholm Convention website, 2018).

At the **national level**, the needs identified through NIP development, revision or update constitute an important part of the assessment required for developing country Parties and Parties with economies in transition to implement the Convention. Moreover, developing the National Profile to Assess the Chemicals Management Infrastructure helps identify and assess the needs of the country in terms of technical capacity building and financial assistance from the international and donor communities. Capacity needs are also identified when preparing the national report on the status of implementation of the Stockholm Convention (Article 15).

3.1.2.2 Tools and modalities to address the capacity needs

3.1.2.2.1 Available resource materials for capacity building

Parties are encouraged to use the various guidance documents[9] developed by the Stockholm Convention Secretariat to support Parties in developing, reviewing, updating and implementing their NIPs (Stockholm Convention website, 2018). These documents range from general guidance on how to develop, review or update a NIP to more focused assistance such as on how to build inventories for certain POPs (Secretariat of the Stockholm Convention 2015a,b; 2017a,b,c,d) or how to use best available techniques or best environmental practices (BAT/BEP) during the implementation phase of the NIP (Stockholm Convention website, 2018; Secretariat of the Stockholm Convention 2017e,f,g).

3.1.2.2.2 Workshops, webinars and online support

Pursuant to its mandate set out in Article 20 of the Convention, and in accordance with decision SC-5/20 on technical assistance, the Secretariat periodically carries out a variety of capacity-building activities to assist Parties in developing and updating their NIPs, as well as in implementing the NIPs at the national level (Stockholm Convention website, 2018). The capacity building activities consist of workshops, webinars and online trainings based on existing guidance and on guidance being developed or reviewed by the Secretariat, as requested by the COP to assist Parties in updating or implementing their NIPs for new POPs.

The webinars are live training events, open to the public through the web. Attendance increased by 94% from 2015 to 2016, with over 3,132 participants from May 2015 to March 2017. During the webinars, participants can interact with experts to gain experience in the implementation of the Stockholm Convention. The webinars include case studies and training modules delivered by the Secretariat during in-person training courses, thus providing access to this information to a larger number of stakeholders. Each webinar is run twice a week to cover different time zones. Webinars are offered in English and in other UN official languages. Webinar presentations are recorded and available for download, including a transcript of the question and answer sessions.[10] The webinar library[10] provides recorded training modules and information sessions on several thematic areas such as: NIP development and updating, new POPs listed under the Convention, new guidance adopted by the COP, briefings on the meetings of the COP and the Persistent Organic Pollutants Review Committee (POPRC) under the Convention, etc. (Stockholm Convention website, 2018).

[9] http://chm.pops.int/Implementation/NationalImplementationPlans/Guidance/tabid/2882/Default.aspx
[10] http://chm.pops.int/Implementation/TechnicalAssistance/WebinarsLibrary/tabid/4218/Default.aspx

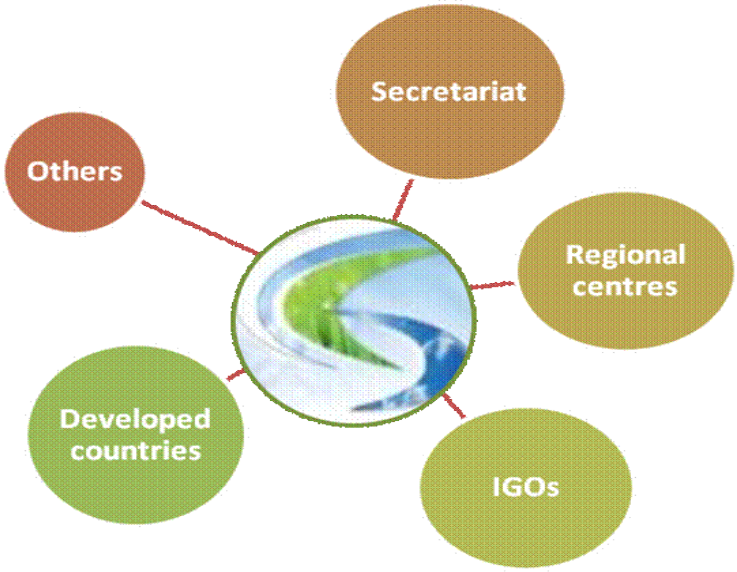
The E-waste Challenge massive open online course (MOOC),[11] an online university course for Master's and PhD students, was developed by the Basel, Rotterdam and Stockholm Convention (BRS) Secretariat in partnership with the University of Leuven (Belgium), the Climate Knowledge and Innovation Community (KIC), the RawMaterials KIC, and the World Resources Forum. The course is hosted on the Innovation primer, the online platform of the Climate-KIC. The Climate and RawMaterials KICs are public-private partnerships of the European Union (EU)'s Institute of Innovation and Technology. The E-waste Challenge MOOC has been available online since its launch in April 2016. The MOOC will be translated in other UN languages and disseminated worldwide (Stockholm Convention website, 2018).

Online training modules[12] provide interactive training opportunities of variable duration, from one to ten hours, over some days. The online training modules cover a range of topics related to the three Conventions such as environmentally sound management (ESM) of e-waste, NIP development and updating, and national legislation for the BRS conventions. Online training modules add to the e-learning courses already available to the Parties. Both the online modules and the e-learning courses are self-paced. The courses are designed for Basel competent authorities, Rotterdam designated national authorities, and Stockholm Convention focal points and points of contact (Stockholm Convention website, 2018).

Capacity building for inventory development was in a few cases supported by an online workshop. For instance, a two-day workshop for listed polybrominated diphenyl ethers (PBDEs), polybrominated biphenyls (PBBs), and perfluorooctane sulfonic acid (PFOS) and related substances was held in Zimbabwe online via skype.

3.1.3 Main actors in building capacity

Globally, there are various sources of technical assistance for capacity building, as reflected in Figure 1 below.



[11] http://www.basel.int/Implementation/TechnicalAssistance/MOOC/tabid/4966/Default.aspx
[12] http://www.brsmeas.org/Implementation/TechnicalAssistance/

Figure 1: Sources of technical assistance for capacity building
(Source: Stockholm Convention website, 2018)

The **Secretariat of the Stockholm Convention**, pursuant to paragraphs 2 (b) and (c) of Article 20 of the Convention, should assist the Parties, particularly developing country Parties and Parties with economies in transition, on request, with building capacity in the implementation of the Convention, and ensure coordination with the Secretariats of other relevant international bodies (Stockholm Convention website, 2018).

The Stockholm Convention benefits from a network of **16 Regional and Sub-regional Centres** for Capacity Building and Technology Transfer (SCRCs). They provide capacity-building and promote the transfer of technology to assist developing country Parties and Parties with economies in transition to fulfil their obligations under the Stockholm Convention. The SCRCs are autonomous institutions, which operate under the authority of the COP (Stockholm Convention website, 2018). An example of a best practice case study of an SCRC or Basel Convention regional centre (BCRC) supporting Parties in updating their NIP is the update of eight NIPs for Caribbean countries executed by the BCRC-Caribbean in cooperation with The Caribbean Public Health Agency (CARPHA) (See Box 1).

In coordination with focal points in recipient developing and economy in transition countries, the **bilateral development agencies of the developed countries** are expected to be actively involved in providing technical assistance for capacity building to recipient countries (Stockholm Convention website, 2018). A good practice case study is the Gesellschaft für Internationale Zusammenarbeit (GIZ) support of the SCRC in Algeria. As part of a capacity building project, the Parties assigned to the Centre region were offered regional workshops on inventory development for industrial POPs, management of POPs, destruction of POPs stockpiles and action plan development (see Box 2).

Intergovernmental organizations have an active role in delivering technical assistance for capacity building to the Parties. This can happen as part of their mandate as implementing agencies of the GEF, through their individual assistance programmes, or in partnership with others (for example, through the Inter Organization Programme for the Sound Management of Chemicals – IOMC). Intergovernmental organizations and regional development banks may interact directly with the Secretariat, with regional and sub-regional centres, including through their regional offices, and with the Stockholm Convention national focal points (Stockholm Convention website, 2018).

Non-governmental organizations and the civil society are key players in the implementation of the Convention and are also potential sources of technical assistance for capacity building (see Box 3). Thus, they can play a direct role in the execution of projects. Their potential to mobilize funding and raise awareness is an important asset at the regional and national levels (Stockholm Convention website, 2018).

Box 1: Good practice case study of regional centres supporting NIP development and update

Within a GEF project on POPs management in the Caribbean implemented by UNIDO and executed by the Basel Convention Regional Centre (BCRC)-Caribbean, NIPs were updated for

eight Caribbean countries (Antigua and Barbuda, Barbados, Belize, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, and Trinidad and Tobago). BCRC-Caribbean contracted with the Caribbean Public Health Agency (CARPHA) for the NIP updates. The project strengthened the capacities of the eight Caribbean countries to update their NIPs to comply with and implement the Convention by identifying and allocating needed human, institutional and infrastructural resources. With the support of international and national consultants, CARPHA coordinated the NIP update for each country and facilitated their inventory and action plan development and NIP writing. Several regional workshops, with option of online access, trained the local institutions and other stakeholders in inventory and action plan development. Specific guidance documents for inventory development and for priority setting and risk assessment were developed, tailored to the Caribbean. Most NIPs were updated within two years. This included the development of inventories, update of the NIPs and, in another project component, an assessment of the regulatory frameworks. An international consultant was included on the team to build capacity in the two regional centres regarding NIP development and the individual POPs groups.

During the project it became obvious that the entire region lacks the capacity to destroy waste, and so wastes were mainly dumped. Additionally, PFOS and other per- and polyfluoroalkyl substances (PFASs) were identified as a major risk for groundwater used as drinking water on some of the islands.

The project demonstrated the strength of working with regional centres and, in particular, of establishing cooperation between regional institutions with expertise in waste management and chemicals (BCRC) and in health and chemicals (CARPHA).

Box 2: Good practice case study of bilateral funding for a regional project facilitated by a Stockholm Convention Regional Centre

As part of a regional project in North Africa, GIZ helped build capacity at the Stockholm Convention Regional Centre in Algeria and in other countries in the region to inventory new industrial POPs and manage POPs. Regional workshops held in Algeria and Morocco were attended by Stockholm Convention focal points or selected experts from each country and facilitated by experienced international consultants and the ministries. The project assessed the destruction capacity for POPs and the options available in the region, including cement kilns. Also, the project assessed the laws and regulations governing POPs and chemicals management in the countries in the region.

The project also supported Algeria in finalizing its NIP and in further developing analytical capacity for POPs monitoring, thus contributing to building the capacity of the national laboratory, police, military and customs (Ministry of Environment and Renewable Energy, 2018). One recommendation based on the project results was to strengthen the ability of police and customs and acquire monitoring tools to better fight the illegal traffic of hazardous wastes. The project also identified a need to have more information available in French.

The project showcased the strength of contributing bilateral funding to activities that support regional centres and capacity building. The project also demonstrated the importance of cooperation among the countries in the region regarding POPs management and destruction, and of further exploring the capacity of cement kilns to destroy POPs stockpiles.

Box 3: Good practice case study of civil society organization (CSO)/NGO work – The International POPs Elimination Network (IPEN)

IPEN is a network with more than 500 public interest NGOs working in more than 100 countries mainly on topics related to the Stockholm, Basel, Rotterdam and Minamata Conventions. Members participate in the BRS COPs, regional meetings, Basel Convention Open-ended Working Group (OEWG), Stockholm Convention POPs Review Committee, and Rotterdam Convention Chemical Review Committee, among others. To educate its NGO members, policymakers and the public, IPEN develops and disseminates globally resource materials on the chemicals and waste conventions and Strategic Approach to International Chemicals Management (SAICM) issues, such as:

- Films (https://ipen.org/articles/big-picture-video, https://ipen.org/chemical-victims, https://ipen.org/articles/little-things-matter-video)
- Reports (https://ipen.org/resources)
- Monitoring studies, including POPs monitoring in the environment, recycled products and food (see Box 6 and Box 7).

IPEN is also working on:

- SAICM global issues of concern (https://ipen.org/policy/chemical-safety-saicm)
- Elimination of lead paint (https://ipen.org/projects/eliminating-lead-paint)
- Mercury (https://ipen.org/tags/mercury)
- Ocean pollution (https://ipen.org/tags/marine-pollution).

Playing a leading role in scientific research and in the discovery and analysis of cutting-edge technologies, **research institutions and universities** can offer valuable information on alternative strategies and remediation programmes for POPs. These entities are resources for training exercises and workshops to educate policymakers, government regulators and technicians, users and exposed consumers (Stockholm Convention website, 2018).

3.1.4 Sustainability in capacity development and in securing the created capacity

The questionnaire sent to the Parties asked GEF implementing agencies and NGOs about their ability to build and secure capacity for Stockholm Convention implementation, and about any challenges and good practices identified in the process. The majority of respondents (73%) stated that they were able to build the capacity needed to address POPs-related issues and comply with the Stockholm Convention. Still, all Parties underlined existing challenges regarding building and retaining a capable team for policymaking, coordinating among ministries and addressing technical issues. These challenges include:

- Frequent changing of the Stockholm Convention National Focal Point, the person who ensures continuity in coordinating Stockholm Convention activities at the national level;
- Frequent loss of trained personnel and lack of funding to train new personnel;
- Frequent re-organization of the inter-ministerial coordination committee due to changes in government structure and understaffed public institutions;
- The policymakers' reluctance to integrate actions addressing POPs into their daily work, since their interests and priorities sometimes differ from the Stockholm Convention objectives;
- Lack of funding for technical activities, leading to the breakdown of the technical team;

- Uncooperative team members;
- Inability of some team members to cope with all Stockholm Convention activities since they are overburdened with other environmental protection activities;
- Lack of funding for further technical knowledge building required for Stockholm Convention technical information developments;
- Infrequent communication among team members and irregular team meetings.

A slight majority of respondents (53%) consider their work sustainable, while the rest do not. This may be explained by differences in Stockholm Convention implementation levels and by the Parties' abilities to attract funding for capacity building to make the implementation work sustainable.

The Parties identified the followings aspects as most relevant to capacity building for Stockholm Convention implementation:

- Assessing the capacity building needs and updating the assessment periodically as to keep it up to date with the SC developments (e.g. new POPs listing);
- Developing a long-term strategy for capacity building and gaining support from the highest level of the government and the international community;
- Streamlining the capacity building activities across all parts of government and promoting synergistic capacity building programmes;
- Setting up networks of local, regional, national and international partners and creating capacity building tools (e.g. training trainers and teams of national experts; training with examples and real-case scenarios; developing rich documentation, training materials and kits to allow "the trained experts" to practice "the theories learned"; diversifying the training topics; holding sub-regional or regional meetings to exchange information, documentation and experiences; using local and international consultants);
- Maintaining continuous communication with the line ministries involved in the Stockholm Convention implementation, to engage them in the capacity building activities and to raise awareness about the importance of POPs management and their responsibilities in this process.

The good practices employed by Parties to the Stockholm Convention in building and sustaining capacity vary across countries and regions, but can have general applicability as the examples below illustrate:

- At the organizational level:
    - Developing and maintaining an inter-ministerial coordination mechanism for chemicals-related issues;
    - Setting up and maintaining a permanent steering committee for chemicals-related projects;
    - Setting up and maintaining a permanent technical team for chemicals-related issues;
    - Ensuring the stability of the Stockholm Convention National Focal Point, who coordinates all the implementation activities, including capacity building;
    - Ensuring proper coordination through the inter-ministerial mechanism for streamlining the existing capacity building activities, identifying additional capacity

building needs and prioritizing the capacity building activities based on needs assessment;
    - Ensuring the national capacity builders have access to the latest information available at the regional and international level (e.g. ensuring participation in regional and international meetings and trainings in the field of chemicals management);
    - Providing competitive salaries and benefits to prevent migration of created capacity to other fields or the private sector;
    - Developing, maintaining and permanently updating an expert roster; when necessary, building it using the existent national capacities;
    - Creating networks of chemicals management practitioners;
    - Organizing regular meetings and ensuring continuous communication in the field of chemicals management.
- At the knowledge building level:
    - Organizing national and local expert missions, training of trainers, thematic trainings and workshops involving national and international experts, and utilizing industry representatives as resources for knowledge transfer;
    - Constantly updating the knowledge base to keep up with new developments under the Stockholm Convention;
    - Using the most up to date resource documents, guidance, guidelines, toolkits, etc. for knowledge transfer;
    - Developing, maintaining and updating a national knowledge management system.

Regarding how to advance the national work in support of the Stockholm Convention implementation, the following experiences were compiled from the replies received:

- Integrating the Stockholm Convention objectives and requirements within national policies, programs, plans and highest priorities and mainstreaming them;
- Developing and regularly updating the necessary legal and regulatory framework;
- Providing targeted trainings for knowledge transfer at the local and national level;
- Setting up a coordination mechanism to follow up on Stockholm Convention implementation, monitoring and reporting;
- Identifying technical and financial needs and potential external donors;
- Raising awareness about the negative effects of POPs to involve all responsible stakeholders in their management;
- Enhancing cooperation with the existent Stockholm and Basel Conventions Regional Centres, GEF Implementing Agencies and international consultants.

The **GEF implementing agencies** were able to assist the Parties in building their capabilities to address POPs-related issues and comply with the Stockholm Convention, but faced some problems with the policymaking team and inter-ministerial coordination. Therefore, in their opinion, enhancing the inter-ministerial coordination is critical to building capacity, since addressing the chemicals currently listed under the Convention requires multi-disciplinary and multi-stakeholder approaches. They identified equipping the technical teams in the ministries with the right skills as the most important good practice employed by the countries they assisted. In their experience, their work with Parties on chemicals management is sustainable.

A major challenge in many countries is that staff in ministries changes frequently, and part of the capacity built during the first NIP implementation has been lost. Sustained capacity is highly beneficial for NIP implementation, and in particular for the NIP update process. It can even save money due to a smoother further capacity building process (see case studies Box 4 and Box 5). Properly trained staff can build capacity in other countries (e.g. South-South capacity building, see Box 4 and Box 5).

Another major challenge is the low salary for employees of many of the environmental ministries in developing countries. The salary is often insufficient to meet the minimum living standard for a family. Staff must frequently get a second job or provide consulting services to earn additional money. Staff often leave the ministry if offered a better paying job, which contributes to the brain-drain and loss of built capacity.

Box 4: Good practice case study of sustained capacity and South-South consulting on NIP update

An East African NIP coordinator responsible for the development of the initial NIP was also tasked with updating the NIP for chemicals listed in 2009, 2011 and 2013. By securing capacity, the teams responsible for the initial NIP were able to update the NIP for initial POPs on their own.
A two-day online workshop led by an international consultant educated the teams working on PFOS and the newly listed industrial brominated POPs about these POPs groups. Preliminary inventories were developed for these new industrial POPs and the updated NIP was submitted in a reasonable time.
The NIP coordinator was able to support, as a consultant, another African country in developing their NIP for the initial POPs.

Box 5: Good practice case study of sustained capacity for PCB inventory development and management

After graduating in 2002 from the Politehnica University Timisoara, Romania with a degree in chemistry, Mr. B. was employed as an assistant within the Ministry of Ecology, Natural Resources and Construction in the Republic of Moldova. Under the guidance of another colleague, he was involved in drafting the first NIP for the Stockholm Convention on POPs. Within the NIP project, experienced international consultants helped build capacity for polychlorinated biphenyls (PCBs), pesticides and unintentional POPs. Mr. B. was involved in all activities, including inventory development; was exposed to the practical assessment, sampling and equipment management work carried out by the consultants; and learned how to perform life cycle management. This international transfer of knowledge, combined with participation in a number of international meetings, workshops and practical trainings, contributed to personal development and capacity building in the field of POPs management. As a result, the country has managed to attract assistance from a number of international donors such as the GEF, World Bank, Organization for Security and Co-operation in Europe (OSCE), Czech Development Agency, North Atlantic Treaty Organization (NATO), Food and Agriculture Organization (FAO), as well as from local donors, to ensure sustainable POPs management. Finally, the country was able to implement a number of projects to address the stocks of POPs pesticides (Paun et al. 2014), develop a detailed inventory of PCB stocks, and manage and export a significant amount of PCBs for destruction.

Mr. B. provided guidance and participated in finding, sampling and labelling the transformers and capacitors in his country, with assistance from international consultants experienced in the field of PCBs. In 2011, he won the PCB Elimination Network (PEN) award in the field of PCB inventory development, given the results achieved by the country. This led him to consult internationally on PCBs and POP inventory development. In collaboration with another international consultant, he supported other Eastern Europe, the Caucasus and Central Asia (EECCA) countries in developing their PCB inventories (Kazakhstan, Belarus and Ukraine). He now works as an international consultant on PCB inventory development and management also in other regions (e.g. Egypt, Uzbekistan and Pakistan).

The International POPs Elimination Network (IPEN), comprised of over 500 organizations, filled the questionnaire on behalf of NGOs (Civil Society Organisations (CSOs))[13] (See Box 3). According to IPEN, public interest NGOs consider their work with Parties on chemicals to be important for national implementation. Engagement between government personnel responsible for chemical safety and public interest NGOs can support government efforts to make chemicals and wastes national priorities. Also, building capacity within public interest NGOs regarding chemicals and waste issues can help harness public support for the full implementation of the chemicals and waste conventions and bring these issues to the attention of other ministries.

IPEN and its member NGOs have worked to build capacity within Parties, but they have also identified problems faced by Parties in building and retaining a capable team. They observed that it is often difficult to coordinate and share responsibilities among different agencies that are under different ministries or government sectors. Implementing the Stockholm Convention is sometimes considered to be additional work, rather than part of the daily agenda or a priority for the ministry.

Public interest NGOs/CSOs[13] can support the process of NIP update and implementation by gathering information and raising awareness about contaminated sites or waste management issues. IPEN also has a range of good practice monitoring studies, such as monitoring for POPs in eggs around pollution sources (Box 6; DiGangi & Petrlik 2005; Petrlik 2015; Petrlik et al. 2017a,b) and in fly ash (Petrlik and Bell 2017), and screening for lead in paint (Box 3; Box 7; Strakova et al. 2018; ChemWatch 2011). The NGOs mentioned the following good practices employed in building and sustaining the capacity of the Parties:

- Engaging local CSOs and local authorities;
- Holding round-tables and workshops based on new data and reports;
- Involving national CSOs in monitoring projects and developing national or international reports based on the results of such projects;
- Skill-sharing with local CSOs and with local and national authorities;
- Continuing to cooperate and exchange information even after a joint project was finished.

[13] Public interest NGOs (CSOs) are non-profit groups that support the public interest in protecting human health and the environment by addressing for instance policies and problems related to chemicals and wastes. They function as a public advocate for vulnerable groups such as the poor, women, children, workers, and others whose voices are often unheard.

IPEN members consider their work on chemicals with Parties to be partially sustainable, depending on the attitude of the national authorities. They believe that engaging public interest NGOs[13] is crucial to ensuring sustainable capacity within the Parties and keeping chemicals and waste as top national priorities. If public interest NGOs[13] have enough capacity to work on these issues, then national authorities will almost certainly be forced to pay attention to them. Pressure from the international community also helps with keeping chemicals, particularly POPs, and waste as high national priorities. Support for the academic sector, such as research grants, would help keep capacity within the countries. For instance, regional cooperative projects that engage CSOs and focus on addressing POPs-related issues would help sustain the capacity of Parties.

In many countries, public interest NGOs[13] have advanced the national work in support of the Stockholm Convention by providing the first data sets on levels of certain POPs within the country. NGOs frequently cooperate with high profile academics and laboratories in developed countries, and are able to collect data and samples even in parts of the world normally excluded from large monitoring studies, such as developing countries, economies in transition and small island states. Data collected by NGOs helped maps sites contaminated by POPs, e.g. by monitoring for POPs in eggs (see Box 6), or became the basis for actions addressing the spreading of POPs pollution, e.g. in recycled products (see Box 7). They also helped some Parties improve their dioxin inventories. An IPEN member helped significantly improve Chapter 7 of the United Nations Environment Programme (UNEP) toolkit on the release of unintentionally produced POPs (UPOPs) from chemicals,[14] and developed a strategy to find new sources of polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs) and other UPOPs[15] to better address them in the Action Plans for reducing Dioxins and UPOPs.

Box 6: Good practice case studies of monitoring for POPs in chicken eggs

IPEN in cooperation with participating organizations from 17 countries performed a global study of PCDDs, PCDFs, PCBs, and hexachlorobenzene (HCB) in home-raised chicken eggs near potential sources of unintentional POPs (DiGangi & Petrlik 2005). The study focused mainly on developing countries and countries with economies in transition, since POPs data in these locations are often lacking. The study revealed that almost all eggs sampled around potential point sources (non-BAT waste incinerators, metal smelters, chloralkali plants, power plants) considerably exceeded regulatory limits. For example, samples collected near the metallurgical facility in Egypt, the thermal power plant in Bulgaria, and the chloralkali facilities in Russia yielded dioxin levels ranging from 44 – 126 pg/g toxic equivalency (TEQ) of fat, therefore 15 to 40 times above EU regulatory limits.

A second global study in the same 17 countries measured the content of eleven PBDE congeners, hexabromocyclododecane (HBCD), lindane and beta-hexachlorocyclohexane (HCH) in home-grown chicken eggs near potential POPs sources named in the Stockholm Convention (Blake 2005). The results showed PBDE and HBCD levels higher than those found in previous food studies, but comparable to eggs of wild bird populations. The highest levels of lindane were found near an organochlorine pesticide factory.

[14] http://toolkit.pops.int/Publish/Main/II_07_Chemicals.html

[15] http://toolkit.pops.int/Publish/Annexes/A_02_Annex02.html

Another global study of dichlorodiphenyltrichloroethane (DDT) in home-raised chicken eggs in 18 countries near potential POPs sources found levels ranging from background to over 7,000 ng/g fat – 14 times higher than the EU maximum residue limit (IPEN 2009). Additional studies followed with specific monitoring in China (Petrlik 2015), Kazakhstan (Petrlik et al. 2016) and Thailand (Mach et al. 2017). The studies were also extended to newly listed POPs like PBDEs, HBCD, brominated dioxins and novel flame retardants. The study results were shared with the research community at a global POPs conference, to establish further collaborations for state-of-the-art assessment and monitoring (Petrlik et al. 2017b; 2018; Teebthaisong et al. 2018; Weber et al. 2015b).

Box 7: Good practice case study of a CSO monitoring POPs in recycled products

IPEN has conducted or initiated a range of studies to monitor POPs in products, including:

- PBDEs in toys from recycled plastic (Strakova et al. 2018)
- Dioxins in plastic toys (Petrlik et al. 2018c)
- PBDEs in rebound carpet padding from recycled polyurethane (DiGangi et al. 2011)
- Lead in toys and paints in developing countries (https://ipen.org/projects/eliminating-lead-paint ChemicalWatch 2011)

The studies highlight the problem of uncontrolled recycling of POPs-containing waste, such as plastics and polyurethane foam, and the need to better control the recycling streams and phase out POPs in articles and products.

3.2 Influencing policymaking to address POPs-related issues and ensure the sound management of chemicals and related waste

3.2.1 Main actors influencing policymakers

3.2.1.1 Scientific advisory groups addressing POPs or other chemicals and related wastes

At the **global level**, the work of BRS subsidiary bodies, expert groups and others is important for informed decision-making to reach the objectives of the Conventions. The subsidiary bodies include the following:

- The Persistent Organic Pollutants Review Committee (POPRC) - the Stockholm Convention subsidiary body established for reviewing chemicals proposed for listing in Annex A, Annex B, or Annex C and making proposals to the COP (the governing body of the Convention) for listing new chemicals;
- The Chemical Review Committee (CRC) - a subsidiary body of the Rotterdam Convention established to review chemicals and pesticide formulations according to the criteria set out by the Convention, and make recommendations to the COP for listing chemicals in Annex III;
- The Open-ended Working Group (OEWG) - one of the subsidiary bodies of the Basel Convention mandated to consider and advise the COP on policy, technical, scientific, legal, institutional, administrative, financial, budgetary issues and other aspects of the implementation of the Convention.

The work of these subsidiary bodies, achieved through the expertise of its members nominated by Parties to the three Conventions, has the power to influence the COP to make informed decisions. Still, this influence is sometimes challenged and diminished due to insufficient scientific evidence needed for policymakers to reach an agreement.

At the **national level**, issues related to chemicals, including POPs, are considered and addressed by the national research institutes, which are usually subordinated or under the coordination of the environment ministries or research and development ministries. Still, many existing challenges at the national level can lead to less informed decision-making and policies. These challenges include:

- Lack of coordination between the line ministries and the national research programmes on policy-related priorities and needs;
- Lack of connection between scientific or technical experts and policy- or decision-makers;
- Lack of or insufficient capacity to understand and assess the national implications of scientific and technical information to support policymaking regarding the Conventions;
- Lack of technical and financial capacity to conduct targeted research relevant to the Stockholm Convention.

3.2.1.2 Government ministries, bodies and agencies

Government ministries can initiate their own policies for implementing of the Stockholm Convention. They can exercise their influence to get laws approved by the Parliament, and express their opinions on laws initiated by the Parliament. In both cases, appropriate technical expertise and skills to convey the message to policymakers are crucial.

3.2.1.3 Public interest NGOs[13] and civil society

It is well known and documented that public interest NGOs[13] are important actors in helping to implement the environmental policy agenda, including the Stockholm Convention, at the national level. However, their effectiveness often depends on both their own capacity and the mechanism of public consultations, a fundamental component of government-NGO cooperation. IPEN supports approx. 500 NGOs in 100 countries with appropriate resource materials (see Box 3, Box 6 and Box 7). IPEN also gives these NGOs a voice at meetings of the COP, Stockholm Convention POPRC and Basel Convention OEWG.

3.2.1.4 Science community

The science community also provides a basis for decision-making on complex issues such as the impact of chemicals on health and the environment, and whether a chemical meets the POPs criteria set by Annex D of the Convention. The POPRC is the scientific body that assesses the POP properties of chemicals suggested for listing under the Stockholm Convention and evaluates other complex scientific issues such as the adverse health impacts resulting from interactions of POPs (POPRC 2012). These assessments are based on peer reviewed studies and other available scientific reports.

The science community has contributed to the effectiveness evaluation by the Global Monitoring Plan (GMP[16]) for POPs. The GMP was established to identify trends, assess risks and set priorities related to POPs. It provides a framework for the collection of comparable monitoring data on the levels of POPs in humans and in the environment worldwide. Research groups from different universities also support building the analytical capacity coordinated by UNEP in developing countries.

Furthermore, thousands of researchers worldwide are assessing the fate and impacts of POPs in the environment, wildlife and humans. The vast majority of the study results are published in scientific journals. This information however often does not reach policymakers and decision-makers. Another problem emphasized by a review of the challenge of integrating science and policy is that some of the information produced by scientists may not be considered relevant or useful by decision-makers (McNie 2007).

Some science organisation such as the International Panel on Chemical Pollution (IPCP, Box 8) and the Green Science Policy Institute (GSPI, Box 9) are aiming to bridge the science-policy divide (Reid 2004). One approach to overcome this divide and reach policymakers and other stakeholders is to develop scientists' consensus statements that summarize the scientific findings on contemporary problems (see the good practice case study in Box 9). The Madrid Statement, which documents the scientific consensus regarding the persistence and potential for harm of per- and polyfluoroalkyl substances (PFASs), was published together with a reply from the FluoroCouncil, the industry association representing the manufacturers of organofluorine compounds (Bowman 2015a). The authors of the Madrid statement replied in the following issue (Cousins et al. 2015), followed by a further reply from the Executive Director of the FluoroCouncil (Bowman 2015b). This facilitated a dialogue between the science community arguing for restricting the use of PFASs and the industry association arguing for the need for PFASs in certain applications. This case of public argument exchange can be considered a best practice case study of dialogue between these important stakeholders, which can educate policymakers about the viewpoint of concerned scientists and industry as a basis for their decision-making.

Box 8: Good practice case study of a science NGO established to bridge the gap between science, policy and the public on chemicals management issues

The International Panel on Chemical Pollution (IPCP)[17] was established in 2008 due to an increasing awareness of the chemical cocktail humans and the environment are exposed to, and due to the identification of a critical gap in the communication between science, policy and the public. The IPCP aims to provide leadership in identifying priority topics of concern and bridging the gap between science, policy and the public.
The IPCP is an international network of researchers who want to contribute to solving the major problems associated with chemical pollution that require effective international cooperation. The IPCP wants to provide a global network of scientists within the field of environmental chemistry. Emerging issues are addressed in working groups, where a topic can be thoroughly reviewed. Membership in the IPCP network is open to academic scientists from all over the world. In addition,

[16] https://www.unenvironment.org/explore-topics/chemicals-waste/what-we-do/persistent-organic-pollutants/global-monitoring-plan
[17] www.IPCP.ch

stakeholders such as policymakers, NGOs and industry are invited to share their opinions and are informed about study outputs.

The IPCP aims to develop a scientifically sound and balanced view of the major issues associated with chemical pollution and evaluate different options for chemicals management. Through its scientific expertise, the IPCP supports the political processes at the national and international level. The main goals of the IPCP are:

- To initiate, prepare and disseminate condensed state-of-the-science documentation on all aspects of environmentally relevant chemicals;
- To act internationally and in countries that need improved knowledge regarding chemicals, to help them manage issues related to chemicals;
- To offer its scientific expertise to international organizations, national governments and other parties for discussion and review of the scientific basis for regional or global management of chemicals.

The IPCP held side events at the 6th COP on challenges with POPs analysis[18], the needs for the Global Monitoring Program, and challenges faced by developing countries. The IPCP also supported the development of the Stockholm Convention monitoring guidance on POPs in products (Secretariat of the SC 2017h) and of the Zürich Statement on Future Actions on Per- and Polyfluoroalkyl Substances (PFASs) (Richer et al. 2018). The Zürich Statement, developed by a group of academic and government scientists in conjunction with regulators from agencies across the globe, contains a set of needs, goals, and actions to help assess and manage the diverse and widely used group of PFASs. The Statement stresses that, while well-known legacy PFASs such as PFOA and PFOS have been investigated extensively and regulated over the past two decades in response to their identified hazardous properties, very little information exists regarding the current uses and potential hazards of many other PFASs. Furthermore, the chair of the IPCP assessed the POPs properties of 93,144 chemicals and identified 574 chemicals that exceed the POPs Annex D thresholds and 193 that are high-potential POPs; (Scheringer et al. 2012). Thus, the IPCP is contributing globally to science information on POPs and POPs-like chemicals and supporting the science-policy dialogue.

Box 9: Good practice case study of science statements on POPs-containing chemical groups facilitating science-policy dialogue, raising awareness and making recommendations for stakeholders

The Green Science Policy Institute (GSPI) has developed, in cooperation with experts, several scientific statements on problematic chemicals and group of chemicals to inform policymakers and other stakeholders. GSPI staff present the science statements at global POPs conferences, allowing for commenting and sign-ons. Each statements have been signed by more than 200 scientists from a few dozen countries. The scientific statements published to date include:

1) The Madrid Statement,[19] which documents the scientific consensus regarding the persistence and potential for harm of per- and polyfluoroalkyl substances (PFASs), and lays out a roadmap to gather needed information and prevent further harm. It was published as open access in Environmental Health Perspectives (EHP) (Blum et al. 2015).

[18] https://www.ipcp.ch/activities/challenges-pops-monitoring

[19] http://greensciencepolicy.org/madrid-statement/

2) The San Antonio Statement,[20] which documents the scientific consensus about the health, environmental and fire safety concerns associated with the use of halogenated flame retardants. This statement was a joint project of the IPCP, IPEN and GSPI, and was published in EHP (DiGangi et al. 2010) together with a related review article (Shaw et al. 2010).
3) The Florence Statement on Triclosan and Triclocarban,[21] which shares current scientific research on two widely used antimicrobial chemicals to motivate broader consideration of the long-term impacts of antimicrobial use (Halden et al. 2018). The statement was accompanied by a short film, to facilitating raising public awareness.[22]
Such science statements can support the science-policy interface during NIP development and implementation.

3.2.1.5 Private sector and industrial NGOs

The private sector, as a Stockholm Convention implementation stakeholder, influences the policymaking process. This influence is usually exercised through the representatives of specific industry associations, using the channels provided by the governments. Most governments are committed to interacting with the private sector and provide opportunities for the private sector to get involved during the decision-making process. While it is important to include industry knowledge in the process of gathering information for decision-making, care needs to be taken that industry interests aiming to optimize profit do not negatively influence policymaking (Michaels 2008; Oreskes and Conway 2011).

There are a range of good practice case studies of industry controlling POPs (see e.g. Box 10 and Box 11). However, manufacturers and others in industry rarely address the end-of-life phase, particularly in developing countries (Shaw et al. 2011; Blum et al. 2014; Babayemi et al. 2016, 2018).

Box 10: Good practice case study of industry controlling hazardous chemicals, including POPs, in products

The Zero Discharge of Hazardous Chemicals (ZDHC) Roadmap to Zero Programme[23] aims to take a holistic approach to tackling the issue of hazardous chemicals in the global textile, leather and footwear value chain. The goal is to eliminate the use of priority hazardous chemicals by focussing on the following areas: Manufacturing Restricted Substances List (MRSL) & Conformity Guidance, Wastewater Quality, Audit Protocol, Research, Data and Disclosure, and Training. The ZDHC MRSL[24] includes all industrial POPs, but goes considerably beyond. For example, in addition to pentachlorophenol (PCP), the MRSL includes limits for all chlorophenols (ZDHC 2015). Also, all chlorobenzenes are listed in the MRSL, in addition to hexachlorobenzene (HCB) and pentachlorobenzene (PeCBz) (ZDHC 2015). The ZDHC published a Guidance Sheet on short-chain chlorinated paraffins (SCCPs) that limits their concentration to <50 ppm (0.005%) in all chemical formulations used (ZDHC 2016). ZDHC members have also banned the intentional use

[20] http://greensciencepolicy.org/san-antonio-statement/
[21] http://greensciencepolicy.org/florence-statement/
[22] https://www.youtube.com/watch?v=slXHCzbSTPY
[23] https://www.roadmaptozero.com
[24] https://www.roadmaptozero.com/fileadmin/pdf/MRSL_v1_1.pdf

of durable water-, oil- and stain-repellent and soil release finishes (fluorinated polymers) based on long-chain technology (ZDHC 2015).
There are several other initiatives for controlling POPs and other hazardous chemicals in products, such as from the car manufacturers[25] and the electronics industry[26]. BOMcheck is a declaration tool that covers restricted and declarable substances relevant to electrical and electronic equipment. It comprises a "restricted and declarable substances list" and a data entry template linked to an online database. The Global Automotive Declarable Substance List (GADSL)[27] is the result of the efforts of a global team from the automotive, automotive parts supplier (tier supplier) and chemical and plastics industries who have organized the Global Automotive Stakeholders Group (GASG). GASG's purpose is to facilitate communication and exchange of information regarding the use of certain substances in automotive products throughout the supply chain (GASG 2016).
Such global industry activities can greatly support NIP implementation.

Box 11: Good practice case study of industry controlling POPs or POP-like chemicals

The Voluntary Emissions Control Action Programme (VECAP) is a product stewardship scheme for the responsible management of chemicals throughout the value chain, run under the principles of Responsible Care® (VECAP 2016). VECAP considers the brominated flame retardants decabromodiphenyl ether (DecaBDE), tetrabromobisphenol A (TBBPA), HBCD and Ethane 1,2 bis(pentabromophneyl) (EBP).
According to an industry report (VECAP 2016), the VECAP programme had a significant impact in helping producers and downstream users manage chemicals responsibly and in an environmentally sound manner. In 2015, the programme took an additional step forward and decided to extend its application to all powder brominated flame retardants produced by VECAP member companies (VECAP 2016). According to the industry, the programme ensures the environmentally responsible management of chemicals across the value chain, by reducing the potential for chemical emissions during production and manufacturing.
The bromine industry voluntarily developed VECAP to take responsibility for the management of flame retardants at the production and manufacturing stage. VECAP is a globally recognised product stewardship scheme, with users in Europe and worldwide embracing the core values of the programme. Individual International Bromine Council (BSEF) members have promoted and implemented VECAP in Europe, North America, Mexico, China, Japan, Singapore, Thailand, Indonesia, South Korea and Taiwan. Users in these countries show their commitment to the scheme by participating in the programme.
VECAP is founded on the commitment of the brominated flame-retardant industry to sustainably manage solid polymers throughout the value chain. The programme has been tailored to provide support and guidelines to participating companies on how to control and reduce potential emissions of chemicals into the environment during production. The simple-to-implement best practices help producers and downstream users control, reduce and continuously improve their potential emissions of flame retardants to the environment (VECAP 2016).
While VECAP has considerably reduced emissions from producers and downstream users, it has not addressed the management of brominated flame retardant (BFR)-containing products at end-

[25] https://www.gadsl.org/
[26] http://www.bomcheck.net/
[27] https://www.gadsl.org/

of-life, nor the recycling of hazardous BFRs into sensitive products such as toys and food contact materials (Chen et al. 2009, Ionas et al. 2014, 2016; Puype et al. 2015; Samsonek and Puype 2013). To improve this situation, VECAP stated at the global POPs conference in 2014 that it will also consider responsible disposal. Their paper states that "Testimony to the success of the scheme is the responsible disposal of the full volume of Tetrabromobisphenol-A (TBBPA), Decabromodiphenyl ether (DecaBDE) and HBCD, showing the industry commitment throughout the supply chain, from the production to the disposal phase" (Goossens et al. 2014) and "in parallel, there will be a determined effort by the VECAP team to establish how to include the end-of-life process of flame retardant containing products in the scope of future VECAP surveys" (Goossens et al. 2014).

3.2.1.6 Media

Different media outlets have been used to raise awareness regarding POPs or NIP activities. Governmental institutions and NGOs often disseminate information on websites or in the media, such as in newspaper articles or TV news (see e.g. Box 20). Sometimes the media report on POPs-related topics on their own, publishing detailed investigative reports to educate and raise awareness among their readers. Two good examples are The Intercept series on PFOS, PFOA and other PFASs (Box 12) and the investigative series from the Chicago Tribune regarding industry lobbying for the use of persistent and toxic flame retardants in furniture and textiles, which has led to human exposure (Box 13). Films are another good media for disseminating information. Some directors have created entire movies or short films on POPs, often promoted by NGOs (see Box 14).

Box 12: Good practice case study of media documenting problems with PFOS/PFOA production and use

In a series in The Intercept,[28] Sharon Lerner documents industry's decades-long cover-up of the severe health harms associated with PFOA and PFOS, two POPs also known as C8. To date, the series has 20 articles covering key challenges and actions taken regarding PFASs. This includes, for instance, reporting on a class action lawsuit against 3M, DuPont and Chemours, filed on behalf of everyone in the United States who has been exposed to PFASs (Lerner 2018a), and on internal documents showing that 3M knew about the dangers of PFOA and PFOS decades ago (Lerner 2018b). By revealing the approaches taken by some industries, the information documented in The Intercept series is relevant to and can support NIP implementation.

Box 13: Good practice case study of media documenting industry lobbying leading to the use of POPs

The Chicago Tribune published a series[29] explaining why the average American baby is born with the highest recorded levels of flame retardants (e.g. PBDEs) in the world (Chicago Tribune 2012). PBDE levels in United States (US) human milk were on average 10 to 100 times higher than for European citizens (UNEP 2013).
The Chicago Tribune unveiled a decades-long campaign of deception that has loaded the furniture and electronics in American homes with large amounts of toxic flame retardants linked to cancer,

[28] https://theintercept.com/series/the-teflon-toxin/

[29] http://media.apps.chicagotribune.com/flames/index.html

neurological deficits, developmental problems and impaired fertility (Chicago Tribune 2012). The series documents in detail the lobbying work, including false testimonies that babies burned to death in fires caused by candles burning pillows (Chicago Tribune 2012).
The Tribune's review of thousands of government, scientific and internal industry documents revealed that the tactics were spearheaded by the Tobacco industry, which wanted to shift focus away from cigarettes as the cause of fire deaths, and continued by the chemical companies, which worked to preserve a lucrative market for their products (Chicago Tribune 2012). These powerful industries distorted science in ways that overstated the benefits of the flame retardant chemicals, created a phony consumer watchdog group that stoked the public's fear of fire, and helped organize and steer an association of top fire officials that spent more than a decade campaigning for their cause (Chicago Tribune 2012).
By revealing the approaches taken by some industries, the information documented in The Chicago Tribune series is relevant to and can support NIP implementation. The series won three media awards and was a Pulitzer Prize Finalist in Investigative Reporting in 2013.[30]

Box 14: Good practice case study of films raising awareness and informing the public about POPs and related chemicals

Films are one of the best and easiest tools for raising awareness, reaching the broader society. They can also be easily integrated into teaching materials in school.
Several whole movies address POPs. Examples include:

- Silent Snow[31], in which a young Inuit travels the world to track the sources of POPs pollution impacting their food and human milk;
- Submission (Undercastelsen) [32], on POPs and chemical mixture present in the blood of the population and their associated effects;
- Toxic Hot Seat[33], on halogenated flame retardants;
- The Devil We Know[34], on PFOA, in combination with a 7-day program called the "Chemical Detox Challenge", designed to help consumers make simple safer choices.

Furthermore, there is a wide range of educational short films, such as:

- IPEN films on introduction to POPs[35], victims of POPs and chemical exposure[36], and the effect of chemicals at low doses[37];
- The Story of Stuff films, including on the impact of POPs[38], the challenge of e-waste[39], and chemicals in cosmetics[40], which can contain PFOA and other PFASs (Danish EPA 2018).

[30] https://www.pulitzer.org/finalists/patricia-callahan-sam-roe-and-michael-hawthorne
[31] http://www.silentsnow.org/
[32] http://www.wecf.eu/english/articles/2010/08/Documentary.php
[33] https://www.hbo.com/documentaries/toxic-hot-seat/ and https://www.youtube.com/watch?v=2wsl71wE2cU
[34] https://thedevilweknow.com; https://www.youtube.com/watch?v=Zjs3hsIFCHw
[35] https://ipen.org/articles/big-picture-video
[36] https://ipen.org/chemical-victims
[37] https://ipen.org/articles/little-things-matter-video
[38] https://storyofstuff.org/movies/story-of-stuff/
[39] https://storyofstuff.org/movies/story-of-electronics/
[40] https://storyofstuff.org/movies/story-of-cosmetics/

There are also good films on POPs contaminated sites[41], such as on HCB waste management[42] and an HCH production site[43].

3.2.2 Identifying and quantifying the impact and communicating it to policymakers

The report on the Costs of Inaction on the Sound Management of Chemicals shows that these costs – borne by all segments of society, including business, due to the production, use, and disposal of harmful chemicals – are too high (UNEP 2013a). The United Nations Secretary-General's High-Level Panel on Global Sustainability (2012) highlighted that only if both the cost of action and the cost of inaction become transparent, the political process will be able to summon the arguments and political will necessary to act for a sustainable future (UNEP 2013a). A key driver for mainstreaming the sound management of chemicals into national development policies and plans is collecting data and information on the costs of inaction and the benefits of action on the three pillars of sustainable development: environmental sustainability, economic sustainability and socio-political sustainability. The data revealed that the costs of inaction on chemicals would affect a significant portion of the gross domestic product (GDP), especially in developing countries and countries with economies in transition (UNEP 2013a).

At the **global level**, the impact of POPs is quantified by the POPRC and communicated to the COP through the procedure laid down in Article 8 of the Stockholm Convention. POPRC uses two main instruments to quantify the impact of POPs, namely the risk profile and risk management evaluation. Based on the risk profile and risk management evaluation, the POPRC recommends whether the chemical should be considered by the COP for listing in Annexes A, B or C.

At the **national level**, especially in developing countries and countries with economies in transition, the impact of POPs is mainly quantified through the NIP development and update. During the NIP development and update, Parties conduct preliminary or in-depth inventories, thus generating data and information needed to estimate or semi-quantify the impacts of POPs on human health and the environment. The quantified impacts are communicated at experts' meetings, stakeholders NIP validation workshops, etc. However, a comprehensive cost assessment including costs associated with health impacts such as endocrine effects are normally not conducted in developing countries. Only a few examples are available for industrial countries including Europe (Trasande et al. 2015) and the United States (Attina et al. 2016) (Box 15). Of course, there are also exceptions when the impact is quantified through research and monitoring projects or programmes, socio-economic assessments, etc.

One of the most common challenges is communicating complex issues regarding POPs to policymakers, who sometimes lack basic scientific literacy. Therefore, the scientists researching POPs should improve their communication skills to better connect with policymakers, deliver the key messages of their research using targeted format and language, and influence the development of evidence-based policies. One approach that has proven successful and has led policymakers to act,

[41] http://contaminatedfuture.org/
[42] http://contaminatedfuture.org/poland/
[43] https://vimeo.com/150652497

both at the legislative level and during NIP implementation, is the development of cost of inaction calculations (UNEP 2013a), such as quantifying the risk to human food supplies and health, and socio-economic assessments. Such assessments have raised political awareness by highlighting the economic benefits of integrating chemicals management into national development policies and plans. The main challenge to this approach is the insufficient capacity at the national level to conduct such complex assessments. Therefore, further capacity building activities should be dedicated to this topic.

Box 15: Health cost estimates for endocrine disrupting chemicals (including POPs) in Europe (Trasande et al. 2015) and the United States (Attina et al. 2016).

Research groups in Europe and the United States have calculated the costs associated with the health impact of endocrine disrupting chemicals (EDCs). The costs of diseases from EDCs are much higher in the US than in Europe ($340 billion [2.33% of GDP] vs $217 billion [1.28%]). The difference is driven mainly by intelligence quotient (IQ) points loss and intellectual disability due to polybrominated diphenyl ethers (11 million IQ points lost and 43 000 cases costing $266 billion in the US vs 873 000 IQ points lost and 3290 cases costing $12.6 billion in the EU) (Attina et al. 2016). The study also found that DDT still had a significant impact in the US (Attina et al. 2016). A higher share of autism in children positively correlated with higher levels of DDT in mothers (Brown et al. 2018).
POPs were associated with a minor overall share of EDC effects in the EU. Accounting for probability of causation, in the EU, organophosphate pesticides were considered the largest contributor to costs associated with EDC exposure ($121 billion) (Trasande et al. 2015).
EDC exposure contributes to disease and dysfunction, with annual costs taking up more than 2% of the US GDP. Differences between the US and the EU suggest the need for improved screening for chemical disruption to endocrine systems and proactive prevention.

3.2.3 Developing science–based policies for POPs or other chemicals and related wastes

At the **global level**, the Basel, Rotterdam and Stockholm conventions (BRS) are science-based, legally binding global treaties aimed at protecting human health and the environment from hazardous chemicals and wastes. Policy decisions taken by their governing bodies, the Conferences of the Parties (COP), are underpinned by various scientific assessments (Stockholm Convention website, 2018).

At the 2015 meetings, the BRS COP had as a motto “From science to action”, recognizing the importance of the science-policy interface to the effectiveness of the conventions and the need for greater access to scientific understanding in developing countries for informed decision-making on the implementation of the conventions. The COP also emphasized the need for scientific underpinning for decision-making and policymaking in the sound management of chemicals and wastes at the national and regional levels (Stockholm Convention website, 2018).

At the 2017 and 2019 meetings, the BRS COP took note of the “Draft road map on from science to action” (UNEP 2019) prepared by the Secretariat for further engaging Parties and other stakeholders in an informed dialogue for enhanced science-based action in the implementation of the conventions. The BRS COP emphasized that, through their subsidiary bodies, expert groups and other mechanisms

and partnerships, they have put in place the necessary processes to ensure science-based work and decision-making under the BRS conventions. They also emphasized the importance of, and the need to enhance the interaction between scientists, policymakers and other actors in the policy process to promote the exchange, development and joint construction of knowledge, with the aim of achieving more informed decision-making for reaching the objectives of the conventions (Stockholm Convention website, 2018).

Parties and other stakeholders are encouraged to initiate action to promote science-based decision-making and implement the conventions at the national level (Stockholm Convention website, 2018). The Secretariat was asked, subject to resource availability, to collaborate with the regional centres to build capacity and provide training to support Parties in science-based decision-making and implementation of the BRS conventions (Stockholm Convention website, 2018). The Secretariat was also asked to cooperate and coordinate with UN Environment and other relevant organizations, scientific bodies and stakeholders towards strengthening the science-policy interface (Stockholm Convention website, 2018).

At the national level, the development of science–based policies for POPs or other chemicals and related wastes is based on different research studies and assessments conducted by ministries or agencies staff, or externalized to research institutes or consultancies. Still, in many developing countries evidence-based chemicals and waste policies remain impractical due to several challenges, such as a lack of technical and financial resources to generate data and information, insufficient coordination between policymakers and research institutions regarding the most relevant research topics to pursue, and few, if any, chemicals and waste research topics included in the national research programmes and, therefore, no prioritization for funding.

3.2.4 Influencing policymaking at the national level

This section compiles the questionnaire replies submitted by Parties regarding lessons learned and good practices on influencing policymakers at the national level to advance the implementation of the Stockholm Convention. The majority of Parties mentioned that the conclusions from the NIP and other implementation projects were used to influence policymaking and regulatory actions across government, such that:

- Ministries were informed about measures they need to take for NIP implementation or POPs management;
- POPs-related issues were integrated into other policies and strategies;
- A legislative framework for the management of chemicals, including POPs, was developed or updated;
- Memoranda of understanding between environment and customs authorities were signed;
- Actions to clean up POPs in different sectors, such as the electric power, agriculture and food sectors, were taken;
- A system, new guidelines and framework to control POPs pesticides in any amounts were initiated;
- All authorities responsible for taking action for POPs reduction or elimination were mobilized;

- Awareness on POPs-related issues was raised through different channels, e.g. public campaigns, radio-television outreach etc.;
- Proper institutional systems and infrastructure for POPs management were established.

Moreover, the Parties provided examples of how the POPs work has influenced government initiatives, including:

- Developing further projects on chemicals management;
- Developing a general legislative and regulatory framework for chemicals management;
- Developing government initiatives to look for alternative energy sources, such as renewable energy for household cooking to reduce the heavy reliance on wood and biomass burning for fuel;
- Using PCB-free transformers and capacitors;
- Registering and using POPs-free pesticides;
- Initiating and implementing new laws and regulations on hazardous and electronic wastes;
- Revising several policies and regulatory frameworks to include POPs management;
- Establishing mechanisms for continuous cooperation and coordination for the implementation of the Stockholm Convention and information exchange;
- Promoting the issues regarding the safety of POPs and other chemicals into the national discussion of sustainable development goals and broader development initiatives.

The Parties provided the following lessons learned and good practices for how to mainstream POPs into chemicals and waste management:

- Linking the POPs-related issues with other major environment issues at the national level, like climate change and sustainable development;
- Incorporating the NIP action plan into the agendas of line ministries and national agencies;
- Identifying institutional focal points and preparing work plans and budgets;
- Using the platforms of chemical information exchange networks;
- Ensuring that the relevant stakeholders are aware of their role, the benefits of mainstreaming and the cost of inaction;
- Having an integrated chemicals and waste management policy and legislation that includes POPs management.

According to the information provided by the Parties, policymakers are most influenced by the following initiatives and approaches:

- Holding regular consultations with the practitioners;
- Involving of decision-makers early in the policymaking process;
- Mapping the external funding opportunities available for policy implementation;
- Providing adequate and reliable information for informed decision-making;
- Quantifying the human health and environmental impact of a chemical or chemical group;
- Collecting and presenting international experiences on the matter to be regulated by a proposed policy;
- Preparing a cost-benefit analysis on the matter to be regulated by a proposed policy.

According to the Parties, the biggest obstacles to influencing policymakers are the:

- Limited technical and financial capacity to generate national evidence-based information regarding the environmental and health hazards associated with POPs;
- Limited technical and financial capacity to implement a policy if approved;
- Policymakers' limited understanding of the issues associated with POPs;
- Poor cooperation and coordination among relevant stakeholders;
- Frequent staff changes at the line ministries, including the focal points under the Multilateral Environmental Agreements (MEAs);
- Governmental reforms and slow economic development.

All the Parties who replied to the questionnaire mentioned that the priorities and goals related to chemicals management were established in a participatory and consultative approach via stakeholders meetings, workshops etc., based on different national assessments and findings (inventories, studies, etc.). The Parties considered several criteria when establishing their priorities and goals related to chemicals management, namely the:

- Magnitude of the problem;
- Correlation with the existent national policies;
- International obligations in terms of implementation;
- Availability of national and international partners for financing;
- Impacts of the substances on human health, the environment and the economy;
- Volume of use, trade relevance, toxicity (hazard) and socio-economic importance of the substance;
- Severity of human health and environmental impacts, if no intervention is put in place;
- Ease of implementing the interventions;
- Negative externalities generated by the chemical substances.

From the perspective of **GEF implementing agencies** the NIP conclusions have been especially successful in ensuring that more coordinated and realistic action plans are prioritized. They mentioned as an example of how the work on POPs has influenced government initiatives that some of the countries they have assisted included considerations regarding the sustainability of many actions in their institutional budgets. In their view, well-coordinated inter-ministerial efforts ensure the success of Parties in mainstreaming POPs into chemicals and waste management. The agencies believe that policymaking results from specific needs and issues, thus if agencies can support awareness of such needs, policymaking comes easier. In their experience, policymaking is usually not an issue, but implementing the policies is. Understanding the issues relevant to the Stockholm Convention obligations proved to be the most successful approach to influencing the policymaking.

The **non-governmental organizations** highlighted some cases where addressing severe contamination with POPs (e.g. obsolete pesticides stockpiles, continuous spraying with DDT or other organochlorine pesticides (OCPs)) became part of the political agenda for governments, so it required initiatives across ministerial sectors. In their opinion, the Parties succeeded in mainstreaming POPs into chemicals and waste management by demonstrating how POPs can affect the everyday life of people in their country and presenting such cases to the mass-media. It is thus possible to bring POPs to the awareness of many stakeholders, including the public and policymakers.

A main obstacle encountered by NGOs when attempting to influence policymaking within individual Parties was that policymakers in developing countries think they must follow the same technical solutions used in developed countries, although easier options may be available, particularly in waste management.

Monitoring POPs in humans (Box16), the environment (e.g. GMP for air and water) and the technosphere (Box 17; Box 32) provides important information about the situation in the country and is a key way through which public interest NGOs can help raise awareness among the public and policymakers about the need for full implementation of the Stockholm Convention.

Box 16: Good practice case study of raising awareness by biomonitoring for POPs and pseudo-POPs in the blood of EU Ministers (WWF 2004)

The World Wildlife Fund (WWF) took blood samples from 14 Health and Environmental Ministers from 13 EU countries who volunteered to be tested for 103 hazardous man-made chemicals (WWF 2004), including:

- 12 organochlorine pesticides (e.g. DDT, chlordane, lindane, HCB);
- 40 PCB congeners;
- 32 brominated flame retardants (30 PBDEs, HBCD and TBBPA);
- 7 perfluorinated chemicals (including PFOA and PFOS);
- 8 phthalates;
- 2 synthetic musks;
- 2 antibacterials (triclosan and its metabolite, methyl triclosan).

The total number of chemicals found in the blood of the Ministers was 55, that is 53% of the 103 chemicals tested. The maximum number of chemicals found in any minister was 43, the average (and median) was 37, and the minimum was 33. The highest concentration found in blood serum was 3300 pg/g for the DDT metabolite, p,p'-DDE. The highest concentration of any chemical found in whole blood was 160 ng/g for diethylhexyl phthalate (DEHP).

Through this activity, WWF's DETOX campaign brought POPs and other chemicals present in humans to the awareness of the European Parliament, the health and environmental ministries of EU states, and the wider public.

Box 17: Good practice case studies on monitoring for POPs in products and articles (Secretariat of the Stockholm Convention, 2017h)

In recent years it has become more and more obvious that the exposure to hazardous chemicals is often related to consumer products (Fantke et al. 2018). Since the listing of PFOS, PBDEs, HBCD, and SCCPs, this is increasingly true also for POPs assessed by a range of good practice case studies (e.g. Gallistl et al. 2018; Imm et al. 2009; Stapleton et al. 2008, 2011; Trudel et al. 2008; Yuan et al. 2017). The science community is monitoring for POPs in products, including recycled products. Several best practice case studies for key articles and products possibly containing POPs (HBCD, PFOS, PBDEs, polychlorinated napthalenes (PCNs), PCP, unintentional POPs) are briefly described and referenced in Annex 3 of the "*Guidance on Sampling, Screening and Analysis of Persistent Organic Pollutants in Products and Articles. Relevant to the substances listed in Annexes A, B and C to the Stockholm Convention on Persistent Organic Pollutants in 2009, 2011, 2013 and 2015*" (Secretariat of the Stockholm Convention 2017h). These case studies can serve as a reference

for selecting suitable approaches and methodologies (sample selection, screening and analysis). The studies provide available information on POPs in articles, products and recycled materials, and can help identify data gaps (Secretariat of the Stockholm Convention 2017h).

3.3 Promoting chemicals management issues within national policies and synergies among multilateral agreements on chemicals and wastes

At the **global level**, the Conferences of the Parties of the Basel, Rotterdam and Stockholm conventions have taken a series of decisions to enhance cooperation and coordination among the three conventions. This so-called "synergies process" aims to strengthen the implementation of the three conventions at the national, regional and global levels by providing coherent policy guidance, enhancing efficiency in providing support to Parties to the conventions, reducing their administrative burden and maximizing the effectiveness and efficiency of resource use at all levels, while maintaining the legal autonomy of these three multilateral environmental agreements. This unique approach is a successful example for other parts of the global environmental agenda and demonstrates how to enhance international environmental governance through coordination and cooperation (Stockholm Convention Secretariat website, 2018).

In addition to initiating administrative and operational reforms within the secretariats of the three conventions, this process is changing the way in which the conventions are implemented at the national and regional levels. Parties to the conventions and entities supporting countries in the implementation of the conventions, such as regional centres, intergovernmental organizations and NGOs, also undertake efforts to increase coherence in the implementation of the conventions (Stockholm Convention Secretariat website, 2018).

At the **national level**, 95% of the Parties who responded to the questionnaire mentioned that the Stockholm Convention work is linked to the work of other multinational agreements: the Basel and Rotterdam Conventions, Minamata Convention, Montreal Protocol and Strategic Approach to International Chemicals Management (SAICM). In their experience, this synergistic implementation is driven mainly by human and financial resource limitations that make it difficult to comply with single MEAs. The holistic approach proved to be the most cost-effective and technically feasible.

The Parties mentioned the following examples of promoting collaboration or synergies:

- Having one ministry, preferably the ministry of the environment, manage the implementation of all MEAs;
- Setting up institutional arrangements for the coordination of synergistic activities;
- Developing and implementing multifocal projects;
- Conducting synergistic activities for data and information collection for MEAs reporting.

In accordance with the provisions of Article 7 paragraph 3 of the Stockholm Convention, the Parties shall endeavour to integrate NIPs for POPs in their sustainable development strategies, where appropriate. 90% of the respondent Parties mentioned they were able to promote POPs and chemical safety issues within their SAICM national plan (see Box 18), discussions of Sustainable Development Goals (SDGs) and National Sustainable Development Strategies, national development plans, and

other growth and development strategies. 90% of the respondent Parties also stated that NIP update activities are linked to national sustainable consumption concepts and the SDGs, as well as with other environmental health aspects. This requires developing an appropriate national policy (Box 19).

Regarding the linking of the Stockholm Convention work to national waste management plan and to national plan on management of contaminated sites, only 47% of the respondent Parties reported that matters regarding POPs waste and contaminated sites have been included in their larger framework of waste and contaminated sites management. The rest of the Parties are still struggling to develop waste management and contaminated sites management strategies and plans.

The **GEF Implementing Agencies** responding to the questionnaire mentioned that they identified, at the level of the Parties they have assisted, linkages between the work under the Stockholm Convention and the work on other multinational agreements such as the Basel and Rotterdam Conventions, the Montreal Protocol and SAICM. They also found that the Parties were able to promote POPs and chemical safety issues within national discussions of SDGs and wider development initiatives, as well as within environmental health policies, but no link has yet been made with the sustainable production and consumption policies. For example, they found that national working groups have been established in some countries to coordinate the implementation of MEAs.

Public interest NGO also mentioned that most of the Parties they have assisted have linked their work under the Stockholm Convention with their work on other multinational agreements such as the Basel and Rotterdam Conventions, the Montreal Protocol and SAICM. They noticed that several countries have one department responsible for all the conventions on chemicals. Less common is the connection or synergy between the conventions on chemicals and the Basel Convention, which is mostly the responsibility of other departments or institutions that address waste issues. Most of developing countries still lack a management plan for contaminated sites, and their waste management is rudimentary due to a lack of funds and technical capacity. Some (new) EU member states have connected the management of contaminated sites and their Stockholm Convention-related work, but connections between waste management and Stockholm Convention work are very rare.

The NGOs also identified that, in some cases, Parties have promoted POPs and chemical safety issues within the national discussion of SDGs and wider development initiatives. In general, the Parties they have assisted have also integrated POPs into environmental health, but the extent of this work varied from country to country.

Box 18: Good practice case study of linking Stockholm Convention NIP and SAICM National Action Plan (NAP) and SDGs

Suriname developed a first NIP in 2010 and a National Action Plan (NAP) for the Strategic Approach to International Chemicals Management (SAICM) in 2014 (Convay 2014). The SAICM NAP was evaluated within the Stockholm Convention NIP update process (2017/2018) and its links to the Stockholm Convention action plan were elaborated and integrated into the updated NIP. The SAICM issues of concern (e.g. PFASs and highly hazardous pesticides) were linked in the action plan of the Stockholm NIP, where appropriate. Furthermore, the links between all the developed NIP priorities and the SDGs were evaluated and listed so they can be considered in the implementation (The Government of Suriname 2018).

Box 19: Good practice case study of developing national policies and regulations

Cameroon has developed legislation and regulations consistent with its obligations under the Stockholm Convention. First, they developed and updated a national chemicals management profile, which helps to understand the regulatory framework and identify unclear responsibilities, gaps and overlaps. Second, they hired a consulting lawyer who worked with the technical experts to review the legal framework.

POPs-specific legislation, incorporating the requirements of the Stockholm Convention, is a useful complement to legislation applicable to other sectors. It helps meet all the obligations under the Convention and amend the existing regulatory framework to cover the entire life cycle of chemicals.

Cameroon noted that cost analysis provides a solid foundation for establishing good legislation.

Annex 1 of this report compiles the recommendations from the "UNEP Guidance: On the development of legal and institutional infrastructures and measures for recovering costs of national administration for sound management of chemicals" (UNEP 2015).

3.4 Engaging with stakeholders outside government (industry, science and education, civil society, media) to address POPs-related issues

All **Parties** who responded to the questionnaire reported that they were able to engage with stakeholders outside government, such as industry and industry associations, chambers of commerce, academia, research institutions, non-governmental organizations and the civil society, and bring the need to address POPs-related issues to their awareness. 90% of the surveyed Parties were also approached by stakeholder groups about POPs-related issues of concern to them. The respondents gave the following examples of good practices on engaging with stakeholders outside the government sector:

- Ensuring a proper government structure (National Focal Point and permanent technical team) to continue engaging stakeholders outside the government;
- Ensuring a multi-stakeholder participative approach and having a strategy for information exchange;
- Developing awareness-raising materials targeted at each stakeholder category;
- Developing and conducting adequate community outreach programmes and sensitization sessions;
- Engaging with stakeholders while involving them in the Stockholm Convention implementation projects.

90% of the respondent Parties reported that the NIP results have changed their stakeholders' attitudes and ways of working. They mentioned the following examples:

- Academic institutions included POPs-related issues as part of their extracurricular activities and within student projects (see for instance the good practice case study in Box 25);
- The industry sector involved in POPs management projects such as projects regarding PCB management and disposal began adopting alternatives to industrial POPs like HBCD; adjusted their operation to lower their emissions, including those of POPs; implemented various BAP/BEP technologies and advanced environmental standards; improved its monitoring

capacities, according to international practices; developed its own waste disposal strategies such as for the disposal of PCB equipment;

- Public interest NGOs became more active in implementing the conventions on chemicals and developed a range of materials for raising public awareness (see for instance Boxes 3, 6, 7 and 14) in UN languages and some other national languages, or helped with monitoring for POPs, identifying contaminated sites, and addressing waste management issues;
- Workers dealing with chemicals management started using the personal protective equipment and learned the basic rules for when being in potential hazardous working environment;
- The stakeholders involved generally started to consider gender aspects within the NIP inventories, action plans and training workshops;
- Farmers shifted from food and agriculture methods with pesticides towards more organic ones to avoid food contamination with POPs;
- Industry increased its level of collaboration and cooperation with government and stopped or reconsidered the import or use of some POPs and POPs-containing articles and products;
- The general understanding of POPs and their impacts on human health and the environment increased;
- National research institutes started updating their research strategies and laboratory equipment to analyse new POPs.

The following were identified as prerequisites for attitude changing:

- Understanding the issues due to the chemical in the country, how they might affect society, and what obligations the country has agreed to at the global level;
- Providing training and technical assistance for capacity building;
- Providing information, raising awareness and organizing trainings on POPs-related issues;
- Sensitizing on the issues of POPs and their potential impacts on public health and the environment;
- Providing technical assistance for shifting to alternatives and ensuring that the alternatives are safer for public health and the environment;
- Offering financial incentives to support the transition to new or updated less polluting technologies and alternative substances;
- Providing information on the costs of implementing measures to reduce or eliminate POPs.

Despite the high level of engagement, governments face several obstacles when engaging with industry and the civil society, namely:

- Insufficient human and financial resources for outreach to a large number of stakeholders;
- Industry's distrust of government actions on POPs and chemicals management in general;
- Limited or no disclosure about industrial operations, which impedes proactive action on potential pollution affecting society;
- Limited or no financial resources allocated by industry for environmental protection;
- Poor understanding of the impacts of POPs and other chemicals on human health and the environment.

One country mentioned that they are aiming for an improved dialogue with the industry in future NIP updates (see Chapter 6.2.3 on the approach for future NIP updates).

The **GEF implementing agencies** found that the governments of the Parties they have supported were able to engage with potential stakeholders, key actors and important organisations (for example, in industry, education and civil society) and bring the need to address POPs-related issues to their awareness. They also observed that the stakeholder groups approached governments about POPs-related issues of concern to them. As a good practice for successfully engaging with stakeholders outside the government, they mentioned continuously involving the stakeholders on POPs and chemicals management issues. In their opinion, the NIP results and any implementation projects that they have supported afterwards have changed attitudes and ways of working among industry and the civil society. The best examples of influencing the behaviour of industry and civil society, in their opinion, are the increased awareness of POPs-related issues and increased resources allocated for POPs management.

For **public interest NGOs**, supporting the elements of the Convention related to public participation is major concern, so involving the public and dialogue with other stakeholders is an important part of many projects. Round tables and joint workshops with many participants are often used as a tool to engage with relevant stakeholders on POPs and chemicals management issues. This helps raise awareness and generate information about good practices. IPEN Participating Organizations also have direct dialogue with governments at BRS COPs, regional meetings and expert group meetings (see e.g. Box 3). In addition, other CSOs such as the International HCH and Pesticide Association (IHPA) invite environmental ministries to their forums (See Box 22).

The countries did not specifically address the media in their questionnaire responses. However, the media play a key role in communication and information dissemination from government to other stakeholders, including the public (see e.g. Box 20). Websites and other tools, including films and video games, have been developed to reach and educate the younger generation (see Box 21 and Box 14). Public interest NGOs also use the media to disseminate their studies and activities. Professional investigative journalists can reveal facts behind market development or chemical use that are not normally assessed by researchers. Investigative journalists can also give an overview of the challenges associated with certain POPs groups, with a wider reach (Box 12; Box 13).

Box 20: Good practice case study: communicating POPs information to the public in Pakistan

The Ministry of Climate Change in Pakistan communicated activities on NIP update in major national newspapers (e.g. The Express Tribune, 2016; The Nation, 2017; The News, 2017). In cooperation with a member of the Sustainable Development Policy Institute (SDPI), POPs-related issues and workshop outcomes were communicated on the radio following the NIP update inception and inventory workshop.
The United Nations Development Programme (UNDP), in cooperation with the government, has developed a webpage and information platform for POPs in Pakistan, including updates on ongoing POPs projects and background information (http://popspakistan.com/).

Box 21: Good practice case study: communicating POPs information to the public and stakeholders in China

Celebrating 10 years of successful POPs project implementation in China and abroad, UNDP China with its government counterparts, the Foreign Economic Cooperation Office (FECO) and the Ministry of Environmental Protection, rolled out an international campaign against the 23 POPs,

with awareness-raising tools including a video game "POPs hunter" and a song for action against POPs.
A website on contemporary and background information on the fight against POPs is included on the webpage of the "Office of the National Coordination Group for Stockholm Convention Implementation" established and operated since 2004.[44]

3.5 Engaging stakeholders in NIP development and implementation

Article 10 of the Stockholm Convention on public awareness, information and education, requires Parties to promote and facilitate awareness among policy and decision-makers with regard to POPs. Parties should ensure that all available information on POPs is accessible to the public and kept up to date. In pursuance of this Article, Parties should ensure that appropriate education programmes are put in place for groups such as women, children and the least educated, as well as for workers, scientists, educators, and technical and managerial personnel.

The successful implementation of the Stockholm Convention on POPs in a country can only be achieved when the relevant stakeholders (policymakers, industry, science community, civil society and general population) are aware of the nature of POPs and other hazardous chemicals, and of their effects on human health and the environment. It is therefore important to promote continuous awareness-raising, and provide information and training programmes on POPs and the life cycle of hazardous chemicals (SAICM synergy). Information needs to be tailored to specific stakeholder groups, including policy and decision-makers, industry and the general public. The individual stakeholders should be appropriately trained and informed to play their respective roles. The awareness-raising activities should be linked to other programs raising awareness on chemical safety, public health, green economic development, and sustainable consumption and production - all aimed at sustainable development.

All **Parties** who responded to the questionnaire expressed the high relevance and importance of awareness raising to the overall NIP development and implementation. In their view, this is key to understanding the Stockholm Convention obligations. The campaigns and strategies employed for awareness raising and dissemination, which engage governmental stakeholders including other ministries, consisted of:

- Developing comprehensive training packages and delivering the trainings;
- Broadcasting by the media (radio, television, print media, internet, etc.);
- Organizing specific meetings and workshops, door to door meetings, round tables;
- Including POPs-related issues within school and university curriculum (see Box 25);
- Organizing POPs and chemicals discussion forums;
- Running campaigns on specific POPs;
- Conducting educational presentations at elementary and secondary schools;
- Organizing trainings at potentially hazardous work environments.

All respondent Parties identified the role of NGOs on NIP development and implementation as very important, but at the same time 50% of them mentioned that the NGOs working nationally were not

[44] http://www.china-pops.org/

active enough. The main NGO roles mentioned were providing data and information on POPs and chemicals in general, and raising awareness at the level of government, industry and civil society. Good practice case studies of awareness raising on POPs by NGOs include work on food (Box 6), human biomonitoring (Box 16), pollution from pesticide stockpiles (Box 22), mismanagement of incineration fly ash in developing countries (Box 23) and contamination of children toys with POP-BFRs (PBDEs; HBCD) (Box 7). More recently, IPEN also raised awareness regarding some of the alternatives to POPs (fluorine-free alternatives to PFOS-containing firefighting foam) (Box 24).

No standard methods for measuring the impact of awareness raising campaigns on POPs and chemicals in general could be identified. These varied from country to country, as follows:

- Assessing informally how those who received training or awareness-raising products are using their new knowledge;
- Inviting the same stakeholders to help with the implementation of projects on other chemicals and checking if they still retain and use the knowledge from past awareness-raising campaigns;
- Counting the number of debates on POPs-related issues on radio and TV and the number of initiatives (actions against POPs) taken by stakeholders;
- Observing any changes in behaviour or attitude towards issues related to POPs, or any changes in the number of queries from the public or other stakeholders;
- Conducting surveys, monitoring behaviour change and the level of interest and awareness.

Including POPs and other hazardous chemicals as a topic in the education curriculum for children and students is a promising approach for raising awareness. Modules on POPs are currently being developed for high schools and universities, for instance in Sri Lanka (Box 25).

Box 22: Good practice case study of raising awareness about POPs pollution among authorities

The two major working areas of the International HCH and Pesticide Association (IHPA) are: (1) assessing and supporting the management of the world's single largest POPs stockpile: the 4 to 7 million tonnes of hexachlorocyclohexane (HCH) waste dumped globally from lindane production (Vijgen et al. 2011), and (2) supporting the management of the ~240,000 tonnes of obsolete pesticides in Eastern Europe, the Caucasus and Central Asia (EECCA), which are stored without adequate safety controls and pose a huge risk to the environment and to human health (Vijgen et al. 2013). The IHPA has developed various tools that support its work, such as:

- The IHPA webpage and newsletter, which inform on the threats of pesticides, the challenges of managing them, and the progress made with managing pesticide stockpiles;
- The joint GIZ-PAN-IHPA exhibition, which raised awareness about the challenge of pesticide stockpiles;
- Film documentation; and
- The 12 International HCH and Pesticides Fora, which are available open access[45] and include international declarations on the management of stockpiles and wastes.

The IHPA takes an integrative approach, bringing together all relevant stakeholders and promoting international cooperation and the exchange of knowledge and experiences (Vijgen et al. 2013).

[45] http://www.ihpa.info/hch-forum/

This includes informing governments (e.g. the EU parliament[46]) about related key problems to seek common solutions.

Box 23: Good practice case study of raising stakeholders' awareness about the risk of managing waste incinerator residues (Petrlik & Bell 2017; Petrlik et al. 2018a)

Waste incineration can be a good practice for destroying POPs waste (Mark et al. 2015). However, even BAT/BEP incinerators generate toxic fly ash containing polychlorinated dioxins and furans (PCDD/Fs), other unintentional POPs and heavy metals. Unless properly managed and safely disposed of, fly ash and other hazardous wastes generated by incinerators contaminate the areas where they are dumped or reused (Petrlik & Bell 2017). The International POPs Elimination Network (IPEN) has documented the pollution resulting from the frequent bad management of fly ash from waste incinerators as a way to raise awareness among policymakers about the high risk of waste incineration and the importance of avoiding or minimizing this practice wherever possible, implementing instead the waste hierarchy model with an emphasis on better management measures. The study can be used to educate authorities on the importance of controlling ash and other toxic incinerator waste (e.g. salt from wet scrubber). The study was presented in 2018 at the global POPs conference in Poland in the European Environment Agency (EEA)'s Non-Toxic Environment session, thus bringing the challenges of fly ash management also to the attention of the POPs research community (Petrlik et al. 2018a).

Box 24: Good practice case study of raising awareness about the available fluorine-free alternatives to firefighting foams containing PFOS or PFOA

The International POPs Elimination Network (IPEN) established an expert panel with specialized knowledge on alternatives to PFOS-, PFOA-, and other PFAS-containing firefighting foams, including knowledge and expertise on fluorine-free firefighting foams (3F) and the challenges and costs of assessing and managing the legacy of PFOS/PFOA-containing firefighting foam use and the contaminated sites. IPEN documented for the POPRC that 3F foams are a viable substitute for fluorinated foams (Allcorn et al. 2018).

Based on the evidence presented in this paper concerning the availability, effectiveness and certifications of 3F foams, the expert panel and IPEN affirmed that no exemptions for continued production and use of PFOA, PFOS and their precursors in AFFF should be recommended and no exemption should permit the continued use of existing AFFF stockpiles.

Members of the expert panel and IPEN presented the study at the Fourteenth Meeting of the POPRC in September 2018 in Rome and in May 2019 at COP9 in Geneva, to inform decisions on exemptions for PFOA. The aim was for the evidence presented in the paper to contribute toward decisions that will prevent further harm to the global environment and human health from the dispersive contamination associated with continued production and use of AFFF in firefighting.

Box 25: Good practice case study of developing POPs educational materials for curricula in Sri Lanka

The environmental ministry of Sri Lanka issued a tender for a compilation of informational materials on POPs pertinent to high school and university. Professors from Sri Lanka experienced in chemical and environmental education, who were involved as national consultants in POPs

[46] http://www.ihpa.info/actions/eu/

inventory development and NIP update, were selected for the task. Together with students and the support of an international consultant, they developed a set of educational materials on legacy POPs still relevant for the country and on newly listed industrial POPs, tailored to the national circumstances and needs.

4 Lessons learned relating to technical elements and capacity

4.1 Using the national, regional and international technical capacity to develop NIP inventories and action plans

According to Article 7 and following the adoption from 2009 to 2019 of amendments listing eighteen additional POPs in Annexes A, B and C of the Convention, the Parties are obliged to review and update their NIPs and submit them to the COP within two years of the date on which the amendments enter into force. The process of reviewing and updating the NIPs can be challenging for Parties that lack adequate resources and technical capacity. Given this complex situation, Parties have expressed the need for assistance, particularly with addressing newly listed POPs that are widely used for industrial purposes and are contained in products and articles.

Article 14 of the Stockholm Convention states that the GEF shall be the principal entity entrusted with the operations of the financial mechanism. Different institutions act as GEF Agencies and manage projects on the ground, facilitating collaboration. They support eligible governments and NGOs in developing, implementing and executing their projects. Often, the Agencies work together on GEF projects, pooling expertise. Not only does this allow for a more holistic approach to programming, it also reinforces the individual Agency's efforts to mainstream or incorporate global environmental concerns into its internal policies, programs and projects.

The network of the regional and sub-regional Stockholm Convention Centres also plays a key part in providing technical assistance and promoting technology transfer to developing country Parties and Parties with economies in transition, helping them implement their obligations under the Convention. The Regional Centres were established within institutions that possess relevant expertise and the capacity to provide technical assistance and facilitate capacity building for eligible countries.

The Secretariat and the different regional Centres have carried out many activities for capacity building and technical support during the last 10 years, including training workshops not only on NIP review and update, but also on guidelines for updating NIPs and revising PCDD/F inventories, among others. Examples include the global activity carried out by the Stockholm Convention Regional Centre for the Asia and Pacific Region in China. Another example is the Stockholm Convention Regional Centre for English-speaking countries in Africa (SCRC South Africa), Pretoria, and CETESB (Environmental Company of the State of São Paulo), who hosts the Stockholm Convention Regional Centre in Sao Paulo, Brazil (SCRC Brazil), supporting inventory development and priority setting as part of the process of developing, reviewing and updating NIPs. Other centres involved in these activities include the Stockholm Convention Regional Centre in Montevideo, Uruguay, and the Regional Activity Centre for Cleaner Production workshop for the Mediterranean (outside CEE) and French-speaking African regions.

Many Parties focused on capacity building, using the pool of national and international experts engaged in the NIP implementation, and leveraged the synergies and information exchanged among the main stakeholders involved in NIP review and update. 91% of the questionnaire respondents pointed out that it was possible to rely on technical expertise available in the country for the implementation of some of the NIP action plans. As shown in the Figure 2 below, the majority (95%) of respondents indicated they have been able to rely on the technical expertise of staff in different

ministries, and 91% worked with independent consultants. 86% also mentioned relying on the technical expertise of the ministry staff working on chemicals and waste. Slightly more than half of the respondents (58%) regarded the employees in local industries as experts with the necessary technical expertise for NIP implementation.

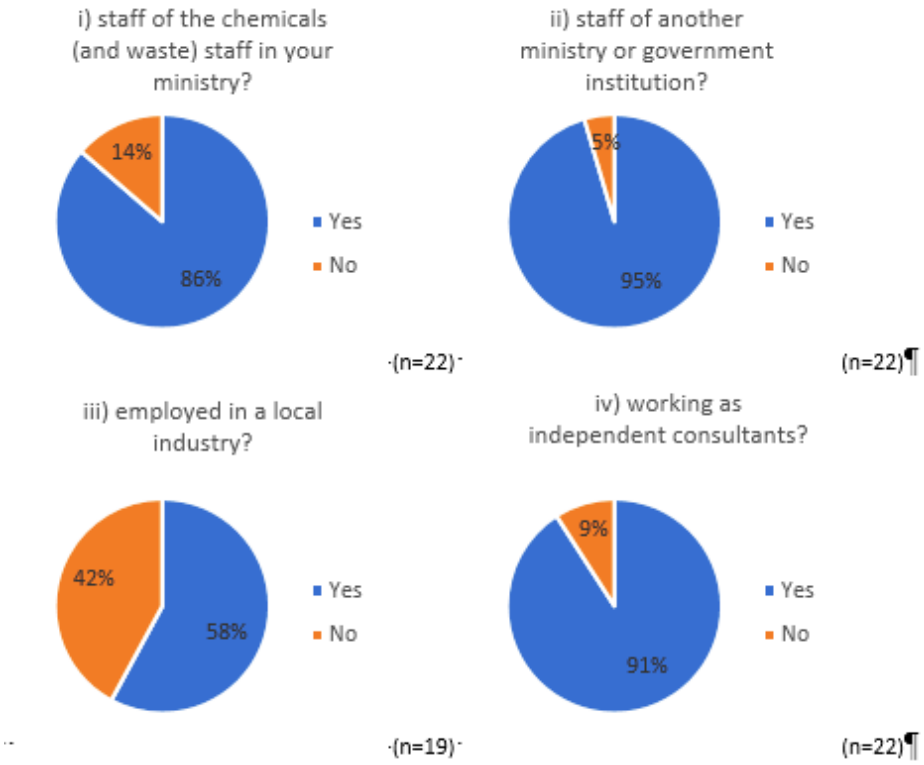


Figure 2: Distribution of national capacities involved in the implementation of the NIP.

The information gathered indicates that the contribution of external technical support to carrying out the NIP inventory and developing action plans is important. The technical support provided by the Regional Centres was mentioned by almost 55% of the respondents, but the support received from international consultants stands out, being mentioned in 81% of the responses received (Figure 3). This includes two replies regarding support received through the South Pacific Regional Environment Programme (SPREP). Although 55% of respondents considered the role of the Regional Centres as important, one answer suggested that Basel and Stockholm Conventions Regional Centres should enhance the trainings offered to countries regarding POPs.

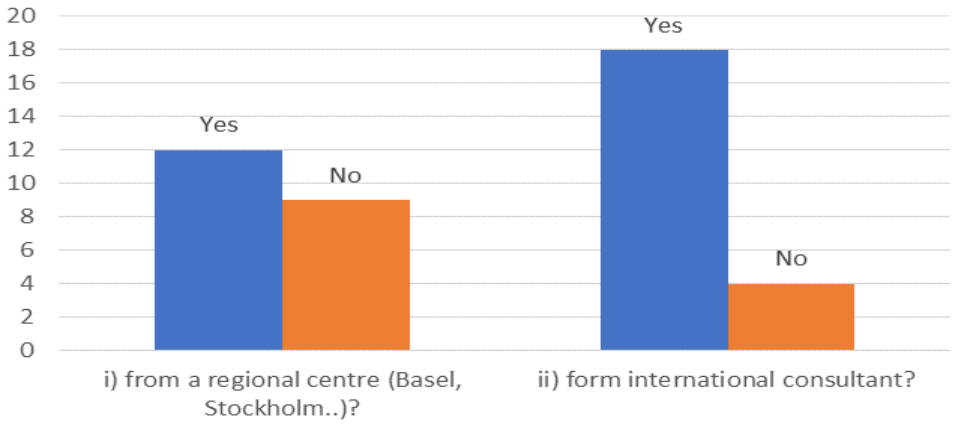


Figure 3: Number of responses identifying the most relevant external technical support

The regular meetings of the professionals under the SAICM working group were also highlighted in the questionnaire responses. Two respondents commented that not all action plans were being implemented yet because the NIP update had just been completed. Civil society groups have been active in the implementation phase.

An example of this aforementioned technical cooperation, at the regional level, is the Review and Updating of the National Plan of Implementation of the Stockholm Convention on POPs in Paraguay, funded by the GEF and implemented by the UN Environment and the Secretariat of the Environment of the Republic of Paraguay (SEAM), in collaboration with the Basel Convention Regional Centre (BCRC) for South America hosted in Argentina. This cooperation was essential to achieving the desired results and strengthening local capacities, since the participating technicians had the experience of reviewing and updating the NIP for Argentina. This successful capacity building is a model to be highlighted.

From the analysis conducted, it can be concluded that the majority of the Parties have reliable technical capacity for the implementation of the NIP action plans. This technical capacity includes both national expertise and international cooperation, mainly with international consultants and the different Regional Centres (see e.g. Box 1). Given their technical capacity and specific expertise, regional centres might facilitate complex tasks such as the substitution of industrial POPs with green or sustainable alternatives (see Box 26). However, several countries requires greater external collaboration, including strengthening their capacity and training of the different government actors (ministries, etc.), to achieve the necessary goals. A few respondents also mentioned the role played by civil society organizations in the implementation of the action plans.

Box 26: Good practice case study of substituting POPs with green alternatives, with support from a regional centre

As part of a regional project within the EU SwitchMed initiative for sustainable consumption and production in the Mediterranean Region[47], the Stockholm Convention Regional Centre in

[47] https://www.switchmed.eu/

Barcelona[48] developed a publication entitled "20 case studies on how to prevent the use of toxic chemicals frequently found in the Mediterranean Region" (SCPRAC 2018). The publication contains case studies on substituting industrial fluorinated, brominated and chlorinated POPs with sustainable alternatives. It also includes case studies on substitution of SAICM chemicals of concern and emerging policy issues such as lead in paints and the substitution of endocrine disrupting chemicals. Therefore, the publication can facilitate the implementation of both the Stockholm Convention and SAICM.
The Stockholm and Basel Regional Convention Centre, with financial support from GIZ and technical support from an international consultant and several scientists, developed the publication "POPs in Articles and Phase-Out Opportunities" (BCRC/SCRC Asia and the Pacific 2014), to support the substitution of POPs during NIP implementation. In addition to compiling alternatives for the listed POPs, the publication includes information on the assessment of alternatives. In the first phase of the project, the Centre assessed the production, use and supply chain of PBDEs and PFOS and their presence in China (Stockholm Convention Regional Centre for Asia and the Pacific 2011[49]).

4.2 Using the technical expertise in monitoring and analysing POPs and other chemicals

Multilateral environmental agreements, such as the Stockholm Convention, were enacted to identify POPs and establish the conditions to control their release, production and use. Monitoring is a particularly important element of the Stockholm Convention. The Convention encourages Parties to contribute to its global monitoring activities in order to collect comparable data and determine how effectively it is being implemented.

UNEP and GEF created a capacity-building initiative to support the Global Monitoring Plan (GMP) for POPs. The collection of high-quality, comparable POPs-monitoring data from all regions is critical for identifying time trends and regional or global environmental transport. The GMP was established in 2007, three years after the Convention entered into force, as a way for Parties to comply with Article 16 of the Convention. Article 16 requires periodic review of the effectiveness of the Convention, which involves obtaining environmental monitoring data for the 23 substances listed in its annexes.

Several capacity-building projects and strategic partnerships have also been set up to close data gaps and improve global coverage under the GMP. For example, there are several strategic and cooperation partners for air monitoring: the Global Atmospheric Passive Sampling Programme (GAPS), the Arctic Monitoring and Assessment Programme (AMAP), the East Asia Air Monitoring Program, the European Monitoring and Evaluation Programme (EMEP), the Integrated Atmospheric Deposition Network (IADN), and the Research Centre for Toxic Compounds in the Environment (RECETOX).

Furthermore, monitoring might be useful for developing inventories of the listed POPs. The Stockholm Convention POPs inventory guidance documents include a tiered approach such that all

[48] http://www.cprac.org/
[49] https://www.global-chemicals-waste-platform.net/fileadmin/files/doc/Report_of_New_POPs_in_article-SCRCAP-final.pdf

Parties to the Convention can develop national inventories with their available resources. Only Tier III inventory approaches might need monitoring and analysis. Tier I and Tier II methodologies exclude sampling and analysis.

Some monitoring and analysis guidance were developed by UNEP and the SC Secretariat, such as the Guidance on the GMP for POPs, which focuses on the matrices for effectiveness evaluation of the Convention (air, water, human milk and blood). The Guidance on Sampling, Screening and Analysis of Persistent Organic Pollutants in Products and Articles complements the guidance on the GMP and provides support and advice for monitoring POPs in products listed between 2009 and 2015, including unintentional POPs in products.

Of the 22 questionnaire respondents, 91% answered the part about availability of analytical capacity on POPs. 95% of them answered that they have analytical capacity to evaluate pesticides, 55% have analytical capacity to evaluate some industrial chemicals, in particular PCBs, and 30% have capacity for analysing unintentional POPs. These data indicate that the weaknesses, in terms of analytical capabilities, are mainly regarding the determination of non-intentional POPs, followed by industrial chemicals. On the other hand, the majority of respondents have already developed the capacity to monitor and analyse for basic POPs pesticides.

All respondents answered the question about analytical capacity needs (Figure 4). The majority (90%) highlighted a need to develop analytical capacity for industrial chemicals and for the unintentional production of POPs. Despite a capacity for monitoring pesticides, 55% of the responses received indicate a need for strengthening existing capacities for monitoring and analysing pesticides since today more than 1000 active incrediants are on the market with the challenge of illegal pesticides.[50]

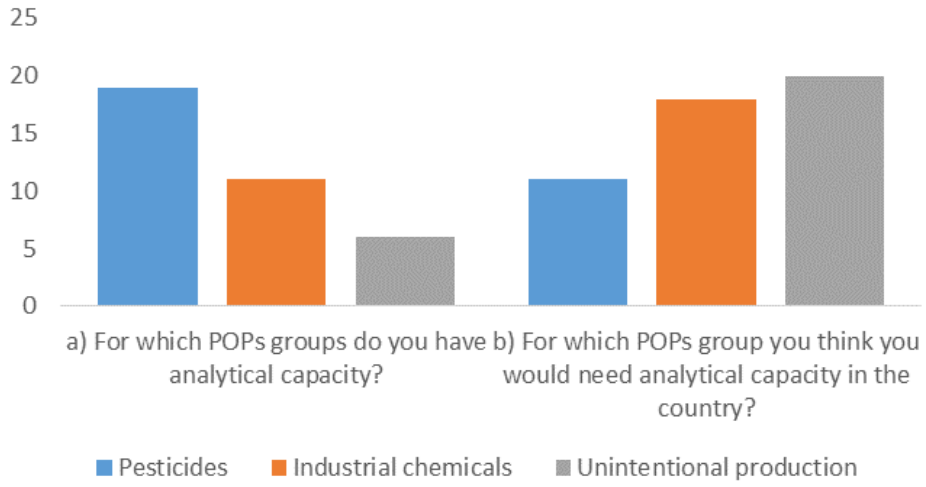


Figure 4: POPs analytical capacity

91% of respondents answered the question about the engagement of the country with global or regional initiatives to support the Stockholm Convention, for example, by having a laboratory participating in the GMP. 50% of those who answered indicated that their country was engaged with

[50] Miszczyk M, Płonka M, et al. (2018) Official control of plant protection products in Poland: detection of illegal products. Environmental Science and Pollution Research. 25, 31906-31916

global or regional initiatives to support the Stockholm Convention, while 50% have no initiatives in place. Some respondents provided examples of initiatives in which they have participated. For instance, some institutions that have participated in GMP have trained scientists involved in POPs analysis. They assist regulatory institutions with data analysis for informed decision-making and assist in other national economic activities.

Regarding developing expertise, advancing national studies and improving the understanding of national issues of concern, 50% of the respondents highlighted the following issues:

- Participating in inter-calibration studies - Bi-annual Global Inter-laboratory coordinated by UNEP's Chemicals and Waste Branch;
- Participating in GEF projects - Assessment of POPs UNEP/GEF Project "Assessment of Existing Capacity and Capacity Buildings Needs to Analyze POPs in Developing Countries";
- Cooperating as part of the passive air monitoring campaign of the Monitoring Network in Central and Eastern European Countries (MONET_CEECs) program, since 2007;
- Training and knowledge sharing with laboratories involved in POPs analysis; developing analytical capacity, but in few matrices;
- Coordinating the GMP and publishing reports on the Convention website;
- Establishing partnerships between the Ministry and institutions (such as Care International) to help with currents projects; working with universities.

Despite strengthening the analytical capacities through participation in the various projects and programs mentioned above, important weaknesses still remain. Only a few countries still lack capacity for addressing the basic POPs.[51] However, several Parties lack the laboratory capacities needed to participate in the GMP. Most developing countries lack laboratory capacity for the new industrial POPs. A major challenge is to capacitate national experts in POPs analysis and build laboratory capacity nationally, to apply and further develop their expertise. A good practice case study of capacity building for POPs research and analysis at the Ehime University in Vietnam is presented in Box 27.

Box 27: Good practice case study of capacity building for POPs monitoring in East Asian and South American countries

For more than a decade, Ehime University had a capacity-building program for researchers monitoring POPs in East Asian countries. This generated several POPs monitoring studies in the region, such as the POPs mussel watch (Ramu et al. 2007) and POPs monitoring around landfills (Kunisue et al. 2004; Minh et al. 2003). Several of the trainees became leading environmental scientists in their home countries. For instance, two Vietnamese analytical chemists completed their PhD and post doc studies at Ehime University and returned to Vietnam.[52] One of them became the head of the national laboratory of Vietnam and has developed a comprehensive POPs analysis including state of the art PCDD/F measurements with a high-resolution mass spectrometer.[53] He and his laboratory are responsible for monitoring the PCDD/F legacy of the Vietnam war, with US

[51] It needs to be emphasized that in the inter-laboratory assessments many laboratories had challenges delivering reasonable results for basic POPs pesticide analysis.

[52] A basis for POPs monitoring was established by building the capacity of a Vietnamese scientist in Switzerland in the 1980s (https://www.researchgate.net/profile/Pham_Viet).

[53] https://www.researchgate.net/profile/Nguyen_Minh39

funding. They also support assessment projects at contaminated sites (Van Tuang et al. 2015; Hue et al. 2018). He recently also established analytical capabilities for PFOS and other PFASs at the national laboratory.

The second Vietnamese scientist trained at Ehime University got a position at Hanoi University where he has been driving POPs research and has established monitoring programs for key emerging pollutants in Vietnam.[54] This new capacity has enabled a comprehensive assessment of POPs contamination in Vietnam (Minh et al. 2016). In addition, the researchers have established monitoring of novel contaminants such as pharmaceuticals, biocides, plastic additive and other endocrine disruptors (Tri et al. 2016).

A third Vietnamese researcher is still at Ehime University,[55] supporting collaborative POPs research between Vietnam and Japan (Tue et al. 2010, 2014) and participating in regional pollutant monitoring studies conducted by the Ehime network (Kim et al. 2014).

Another successful experience is related to the GEF GMP projects in the Group of Latin America and the Caribbean (GRULAC), especially in collaboration with CETESB (Environmental Company of the State of São Paulo) in Brazil, which also function as Stockholm Convention regional centre.

During the GMP I, Supporting the Implementation of the Global Monitoring Plan of POPs in Latin America and Caribbean States (LAC) GFL / PMS: 3778, two laboratories in Brazil participated: CETESB and FIOCRUZ (Oswaldo Cruz Foundation), under the Ministry of Health, in Rio de Janeiro.

CETESB had a HRGC-HRMS equipment for PCDD/F analysis, however they had not started to work with or setting it up. They installed it and received training through the project led by the Spanish reference laboratory CSIC (Superior Council of Scientific Research). Nowadays they analyse dioxins in different environmental matrices with high quality performance demonstrated by their participation in the interlaboratory "Bi-ennial Global Interlaboratory Assessment on Persistent Organic Pollutants, 3rd Round".

Within the GMP II, Continuing Regional Support for the POPs Global Monitoring Plan under the Stockholm Convention in the Latin American and Caribbean Region, GRULAC participants received training in active air sampling and analysis of PBDE and PFOS, thus developing expertise in analysing new POPs.

Of the different monitoring activities, the monitoring of contaminated sites is of greatest concern to the questionnaire respondents. 70% of them identified it as high relevance, 12% as medium relevance and 18% as low relevance (Figure 5). Similarly, 67% of respondents identified human biomonitoring as of high relevance. However, 28% classified it as of low relevance and only 5% as medium relevance. Third most relevant is environmental monitoring, including of biota. 61% of the responses identified it as of high relevance, 22% as medium relevance, and 17 % as low relevance. Fourth, but still important, is the monitoring of articles, products and waste, considered by 50% of respondents as of high relevant, by 38% as medium relevance, and by over 10% as low relevance (Figure 5).

[54] https://www.researchgate.net/profile/Tu_Minh2

[55] https://www.researchgate.net/profile/Nguyen_Tue

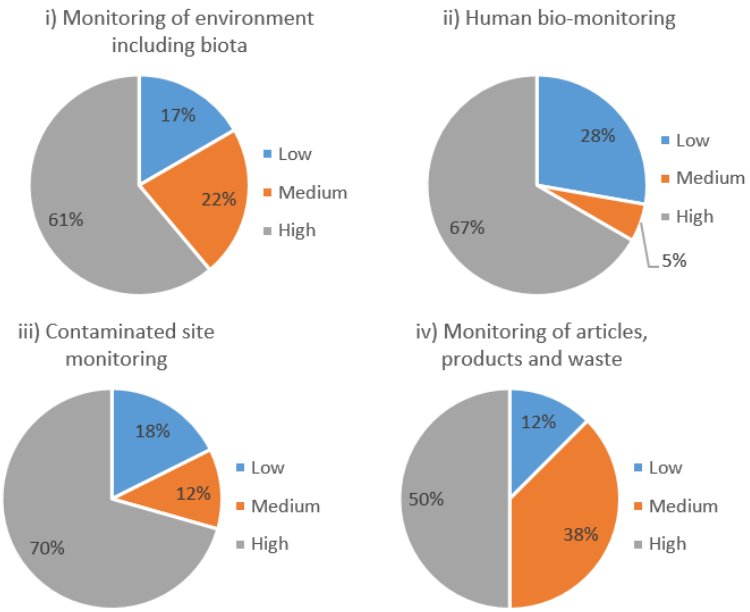


Figure 5**:** Relevance of monitoring activities according to questionnaire respondents

A majority of questionnaire respondents identified the national monitoring capacity and projects as a helpful monitoring approach, followed by bilateral cooperation with an international experienced laboratory, then by global coordinated studies, and finally by the regional monitoring capacity and regional projects (Figure 6).

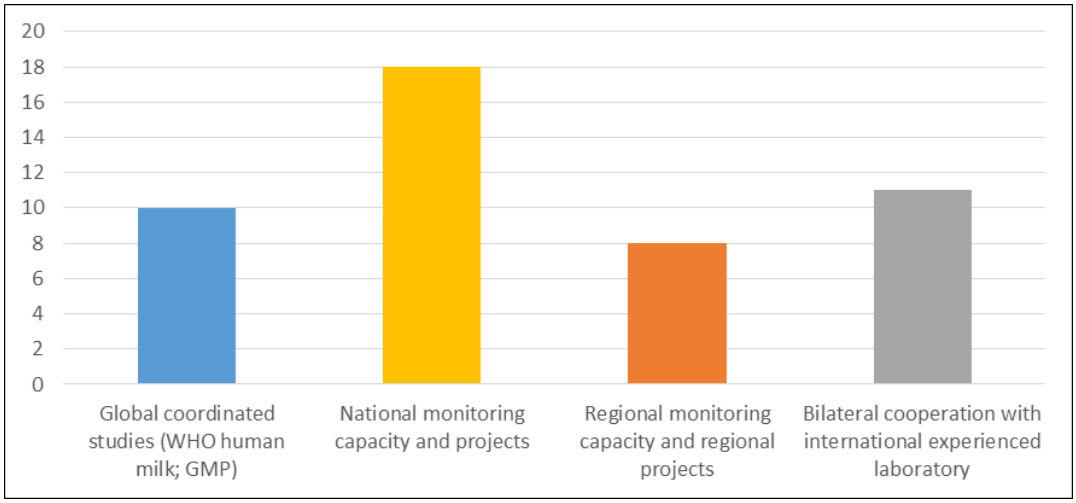


Figure 6: Most helpful monitoring approach according to questionnaire respondents

Respondents highlighted the need to enhance the analytical capacity for monitoring or detecting POPs, not only in laboratories but also at ports. They identified the following needs: better equipment; training for technical personnel; acquisition of standards, chemicals and various inputs needed for analytical determinations; and an improved monitoring network. Such capacity building and network development have been facilitated in East Asia by the Ehime University and the United Nations University, in the GRULAC region by CETESB, and in EECCA and African region by RECETOX (see Box 27, 28 and 29).

Respondents considered regional cooperation to strengthen monitoring capacities and participation in regional projects as very useful. However, some mentioned challenges in terms of coordination because of language barriers or institutional arrangements carried out at the national level. One

respondent identified the incorporation of the Economic Community of West African States (ECOWAS) as important for the sustainability of the different cooperation agreements. A useful approach is North-South cooperation for complex monitoring tasks.

Box 28: Good practice case study of capacity building associated with the WHO survey of POPs in human milk

The human milk survey was one of the activities under the Global Monitoring Plan (GMP) for evaluating the effectiveness (Article 16) of the Stockholm Convention on POPs. The Secretariat of the Stockholm Convention in cooperation with WHO organized the human milk survey and revised the WHO guidelines for developing a national protocol that describes the basic study design for monitoring human exposure. In most cases, only pooled human milk samples are analysed for their average POPs content by the State Institute for Chemical and Veterinary Analysis (CVUA) Freiburg WHO/UNEP-Reference Laboratory for "Stockholm Convention POPs in human milk samples".

Ghana participated in the Stockholm Convention/WHO human milk study in 2008/2009. The sampling campaign in Ghana covered the north, central and south regions, including rural and urban participants from each region. In total, 92 individual samples were collected during the 2008/2009 sampling campaign. Furthermore, approximately 30 samples were collected in 2004. A pooled sample from 2008/2009 was sent to the WHO laboratory. Additionally, two PhD students analysed POPs content of individual samples at Ehime University in Japan in cooperation with the Shimadzu Techno cooperation. This also helped build the capacity of researchers in Ghana and generated detailed data of POPs in human milk in Ghana (Adu-Kumi et al. 2010; Asante et al. 2011). The study revealed that the PCB levels in human milk exceeded the reference dose (Asante et al. 2011). The study measured for the first-time brominated flame retardants in human milk in Ghana and Africa, revealing that PBDEs were present in all samples and their levels were increasing over time (Asante et al. 2011).

Box 29: Good practice case study of capacity building for POPs monitoring by the United Nations University and RECETOX

From its modest beginnings in 1996, the United Nations University's POPs monitoring project has contributed for more than 20 years data and capacity building in East Asian countries. The project included international symposiums and conferences, as well as specialized training seminars held each year. Numerous environmental researchers have been trained in the latest scientific techniques, and an extensive network has been built, connecting academia, the private sector and government across the region and internationally. POPs monitoring capacity has been built in 10 Asian countries (Iino et al. 2008; United Nations University 2012, 2016). Activities include:

- Environmental monitoring and governance - EDC pollution in the East Asian coastal hydrosphere;
- A cooperative international research project on marine and coastal environments;
- Asia-Pacific cooperation on research and conservation of mangroves and developing laboratory capacity.

Ehime University similarly contributes to capacity building for POPs monitoring in the region (Box 27).

Another good practice case study is the capacity building and monitoring activities of RECETOX, which hosts the Regional POPs Centre for Central and Eastern Europe for the Stockholm Convention and supports the GMP. The good practices of RECETOX have already been covered in the "Success stories of Stockholm Convention 2001-2011" (UNEP 2012).

Box 30: Good practice case study of monitoring for POP-PBDEs in plastics and the technosphere

Within a small grant project of the Secretariat of the Stockholm Convention for initial assessment of new industrial POPs, POP-PBDEs and other brominated flame retardants were monitored in e-waste plastic in Nigeria as part of a PhD project facilitated by the Regional Basel Convention Centre in Nigeria (Sindiku et al. 2015a). The project was financed by the Norwegian government.
The project used a combination of XRF screening, Gas Chromatography – Electron Capture Detector (GC-ECD) analysis, and GC-MS analysis for selected samples. An impact factor was determined based on the XRF screening of 382 cathode ray tube (CRT) casings and PBDE/BFR analysis of 220 samples containing bromine. The average PBDE content in TV and computer CRTs was in the same order of magnitude as that of CRTs in Europe, with somewhat higher PBDE-levels in TV CRTs due to the presence of TVs from the 1980s and 1990s. Additionally, 60 CRTs were analysed for polybrominated dibenzo-p-dioxins and dibenzofurans (PBDD/Fs) (Sindiku et al. 2015b). PBDD/Fs, consisting mainly of PBDFs, were detected in BFR-containing plastic with a median concentration of 18,000 ng/g (mean of 41,000 ng/g), with highest levels in samples containing PBDEs. Based on the monitoring data, it was estimated that the 237,000 t of CRT casings stockpiled in Nigeria contain between 2 and 8 t of PBDD/Fs (Sindiku et al. 2015b). The presence of PBDD/Fs in toys produced from recycled plastic was recently highlighted in an IPEN study (Petrlik et al. 2018c).
This monitoring study in combination with the Nigerian e-waste inventory and a material and substance flow analysis (see Box 32) served as a case study for the Stockholm Convention inventory for PBDEs in electrical and electronic equipment (EEE) and related waste (WEEE). Furthermore, related to the project, first drafts of guidance on monitoring POPs in articles and monitoring products of newly listed POPs were developed (Secretariat of the Stockholm Convention 2017h).

4.3 Using the technical capacity to manage POPs

The Stockholm Convention prohibits or restricts the production and use of POPs and regulates the export and import of intentionally produced POPs listed in its Annexes A and B. The Convention also contains specific mandates for certain POPs when produced or used in specific applications, including exemptions or acceptable purposes. The Parties to the Convention have the obligation to ensure that any import or export of the chemicals listed in the annexes mentioned above complies with the strict requirements.

4.3.1 Controlling POPs manufacturing and use in manufacturing

The questionnaire responses regarding POPs manufacturing control and POPs use in production processes varied widely. More than 50% of the respondents indicated they do not have POPs production in their countries. 40% have restricted or banned the production, use and import of POPs, especially pesticides. One response indicated that this ban includes DecaBDE and SCCPs. Two responses mentioned the use of alternative chemicals in manufacturing instead of POPs. 20% of

respondents answered that they lack experience with controlling the production of POPs, or lack access to information regarding the production of the new POPs.

Controlling the use of POPs in manufacturing seems to be more difficult than controlling the production of the chemicals themselves. In general, developing countries have very limited experience in controlling the use of POPs in production processes. Almost 30% of the respondents clearly indicated they have no experience with controlling the use of POPs in manufacturing (some also have no national production).

Industrial countries, however, have developed experience controlling POPs in production and use. An example is the Voluntary Emissions Control Action Programme (VECAP) program (see Box 11; VECAP 2016). Another example is USEPA's 2010/2015 PFOA Stewardship Program, through which eight major companies controlled their PFOA releases by 2010 and phased out its use by 2015 (USEPA 2006). Since the program was not global and only voluntary, other companies have continued to produce and use PFOA (also known as C8). Because these PFOA-based products had superior technical performance, the companies that changed to C6-PFAS chemistry lost market shares. Therefore, legally binding and global approaches are needed to successfully control and phase out hazardous chemicals that are high-performing or cheap (Fantke et al. 2015). Industrial countries also have experience producing certain chemicals or mixtures known to contain unintentional POPs such as PCDD/Fs, PCBs or HCB with low levels of such contaminants by optimizing their procedure or further refining the chemical products (Box 31; Government of Japan 2006, 2007).

Developing countries lack knowledge especially regarding controlling the manufacturing and use of the new POPs, because these chemicals have only recently been inventoried. It is thus important to continue advancing the knowledge regarding these POPs, to ensure that none are locally produced, formulated, or used in manufacturing. According to the questionnaire responses, many proposals and activities in this regard have been considered in NIP action plans, but have yet to be implemented.

Box 31: Good practice case study of controlling the presence and release of unintentional POPs impurities in chemicals

The government of Japan has informed the Conference of the Parties to the Stockholm Convention that high hexachlorobenzene (HCB) levels are sometimes present in tetrachlorophthalic anhydride, and has suggested BAT levels for HCB in tetrachlorophthalic anhydride and related pigments (Government of Japan 2006, 2007). The study described procedures for producing the chemicals or cleaning up the products to achieve low levels of HCB and other unintentional POPs. Furthermore, Japan is monitoring pigments for PCB contamination and has restricted the use of pigments containing PCBs above 50 mg/kg.

Table 1**:** Pigments known to contain HCB and possibly other unintentional POPs

Pigment	***CAS Registry Number***
Pigment Yellow 110	5590-18-1
Pigment Yellow 138	30125-47-4

Pigment Green 7[56]	1328-45-6 and 1328-53-6
Pigment Green 36	14302-13-7
Solvent Red 135	20749-68-2 and 71902-17-5
Tetrachlorophthalic anhydride	117-08-8

Additionally, the ZDHC published a Guidance Sheet stating that the limit of SCCPs in all chemical formulations used for the textile industry should be <50 ppm (0.005%) (ZDHC 2016).

4.3.2 Controlling POPs in imports and exports

In imports and exports, DDT and the 14 POPs banned or restricted between 2009 and 2015 have to be considered as chemical substances per se and as components of mixtures or of products and articles.

More than half of the respondents (57%) lack the experience or capacity (especially regarding identification or analytical determination) needed for the control of POPs in imports and exports, including for the purpose of environmentally sound disposal. The rest of the respondents (43%) mentioned they are developing or have developed national policies or laws. Some of them refer to POPs import restrictions, others prohibit the import of POPs, including for disposal, and export POPs follows the Basel Convention provisions. The implementation of PCB management projects has generated capacities for the control of equipment contaminated with PCBs at customs (identification and recognition of contaminated equipment, sample collection and analysis, identification of hotspots and contaminated sites). These new capacities are an asset for the Parties.

A minority of respondents pointed out the work done with the Customs Agencies for the control of POPs in imports and exports, establishing customs codes and guidelines for disposal through the ministries of environment. This interinstitutional coordination approach is an important strategy for controlling imports and exports of POPs. The Parties identified the coordination with customs authorities as key for controlling imports and exports of POPs.

Many other challenges have been identified in the analysed documentation. The questionnaire respondents highlighted difficulties in identifying POPs present in products and articles, in particular due to the absence of the manufacturers' declaration of composition. A case study of the challenges of controlling imports of PFOS in products and articles was published by the Turkish NIP update project (Korucu et al. 2015). Customs authorities with access to laboratories mainly analyse samples to verify the customs tariff based on the Harmonized System (HS) code chosen by the person who declares the good. As the HS code is often not chemical-specific, the normal customs analysis in these cases reveals only the chemical class but not the chemical identity.

Lack of capacity and resources to monitor compliance at border entry points and to identify and test chemicals, mixtures and products, and lack of training for custom authorities on POPs texts and

[56] Due to its stability, Pigment Green 7 is used in inks, coatings, and many plastics. In application, it is transparent. The pigment is insoluble and has no tendency to migrate in the material. It is a standard pigment used in printing ink and packaging industry. It is also allowed in cosmetics except those used around the eyes and is used in some tattoos.

codification for POPs were identified by 57% of the responses as the main challenges. In particular, assigning a specific HS code for each POP would enable monitoring at the custom level. Moreover, respondents highlighted the lack of training for custom officers and, in some cases, not enough human resources for effective customs control and no capacity building opportunities. One respondent stated that the POPs NIP is neither implemented nor considered for the control of imports or exports.

As mentioned previously, the new industrial POPs have been recently inventoried, and steps are being taken to ensure that they are not imported or exported, without specific exemptions or acceptable purposes.

Government authorities can better enforce national legal frameworks pertaining to the import, transit, and export of hazardous chemicals and wastes if law enforcement officers are aware of their role in enforcing the international multilateral environmental agreements. The moment chemicals and wastes cross borders provides a unique opportunity to verify that transboundary movement follows the applicable rules. Customs authorities are among the best suited to perform monitoring and control. An effective control mechanism requires a strong coordination effort involving all relevant stakeholders, a clear understanding of which POPs can be traded internationally, and the ability to enforce relevant regulations.

4.3.3 Controlling the POPs in use throughout their life cycle

Several POPs remain in use in current production with listed exemptions (HBCD, PFOS, Endosulfan, and recently DecaBDE, PFOA and SCCP). Some of these POPs are still found in products from former production (e.g. PBDEs, PCBs, HBCD, PFOA, PFOS, and SCCPs). Life cycle management, including end-of-life, is well established for pesticides, according to 63% of the respondent countries. However, 27% of respondents indicate that they cannot control the use or other aspects of the life cycle of pesticides. Thus, further actions need to be implemented to improve the control of pesticides throughout their life cycle at the global level (Figure 7). The control of empty pesticide containers is also difficult in developing countries, which lack the capacity to destroy or manage pesticide containers at their end-of-life. For instance, a study in Bolivia revealed that 93% of empty containers were disposed of in vulnerable places (Huici et al. 2017).

As in other aspects discussed in this report, the life cycle management of industrial POPs presents the greatest weaknesses and challenges. Only 18% of the countries declare that they can control and manage them throughout their life cycle. Such challenges are documented for instance for POP-BFR-containing polymers from e-waste in Nigeria and other African countries, which is subject to open burning or dumping. An initial material and substance flow analysis for e-waste and end-of-life vehicle management provides an overview of the situation (Box 32; Babayemi et al. 2015, 2018; Secretariat of the Basel Convention 2011).

The VECAP program has addressed the release of POP-BFRs and other BFRs used in their production and supply chain (see Box 11; VECAP 2016). A first commitment to improve the end-of-life management of these chemicals was made within the VECAP program (Goossens et al. 2014).

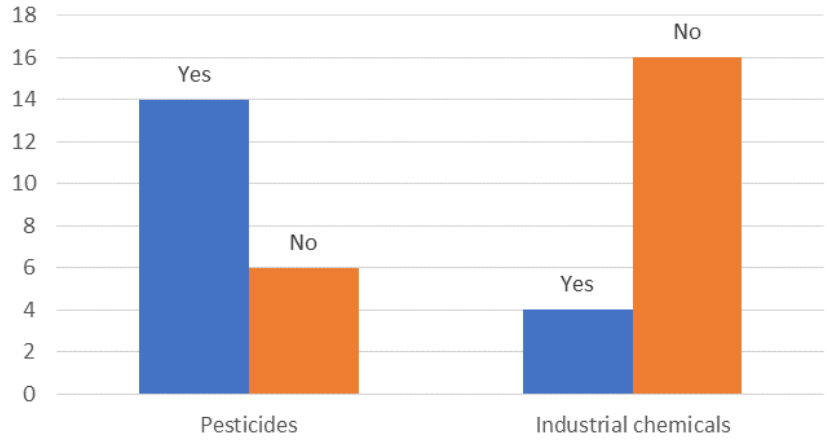


Figure 7**:** Controlling POPs in use throughout their life cycle

According to the respondents, the main conditions that determine the control of POPs throughout their life cycle include:

- Knowledge of the harmful effects of pesticides;
- Engagement with industry and other important stakeholders;
- Establishing an Environmental Management Plan to control POPs;
- Sampling, analysis, monitoring, handling, packaging, labelling, transport health and safety, emergency response, and public participation;
- Regulations for the production, import, merchantability, and use of POPs and items containing POPs; and
- Availability of laboratories with developed POPs analysis capabilities.

The questionnaire asked the countries that have difficulties controlling POPs throughout their life cycle to record their challenges and suggestions for improvement. 68% of questionnaire respondents answered this question, highlighting the following issues:

- Lack of capacity for chemical detection and analysis, including lack of equipment and training opportunities;
- Limited bilateral and multilateral cooperation;
- Poor implementation and effectiveness of the legal framework;
- Lack of research on new POPs at the national level;
- Lack of incentives for manufacturers, importers and others working along the life cycle of POPs to prevent environmental releases;
- Lack of trained personnel;
- Lack of laws and regulations regarding registration of industrial chemicals;
- Lack of a registration system for industrial chemicals;
- Lack of incentives for importers and manufacturers to shift to alternatives;
- Improper handling, storage and disposal of chemical substances; and
- Research at the national level on the new POPs needing to be established or improved.

Other countries specifically answered that they lack the capacity for controlling and monitoring the products available on the market that may contain POPs. Some countries mentioned institutional problems such as a lack of coordination among ministries on the life cycle management of POPs.

Box 32: Good practice case study of assessing the fate of POPs in products through a material/substance flow analysis

One of the bases for the life cycle assessment and management of hazardous materials and wastes is the detailed understanding of their material and substance flow, as well as their final fate and the option for resource recovery. Within a small grant project of the Secretariat of the Stockholm Convention, financed by the Norwegian government and conducted by the Regional Basel Convention Centre in Nigeria for initial assessment of new industrial POPs, POP-PBDEs and other brominated flame retardants were monitored in e-waste plastic in Nigeria (Sindiku et al. 2014; Box 30). Additionally, material and substance flow analysis (MFA/SFA) were performed.

The MFA was conducted for plastic in electrical and electronic equipment (EEE) and related waste (WEEE), and the SFA was conducted for PBDEs (Babayemi et al. 2015). The plastic fractions of EEE and WEEE imported between 2000 and 2010 into Nigeria contained 1,270 t of POP-PBDEs, with approximately 370 t PBDEs still in use and approximately 900 t at the end-of-life phase. All three major end-of-life treatments (open burning, dumping and recycling) result in environmental pollution and risk of exposure to harmful chemicals. The implementation of the Stockholm Convention represents an opportunity to improve the management of EEE and WEEE in Nigeria and other developing countries.

In a second stage of the project, the PBDEs in polymers in vehicles were also inventoried in Nigeria. A material and substance flow analysis revealed similar challenges for polymers of end-of-life vehicles as for WEEE plastic (Babayemi et al. 2018).

4.3.4 Managing POPs releases and wastes, including implementing BAT/BEP

67% of questionnaire respondents said that local companies have gained competence and experience by participating in the NIP implementation, while 24% responded that companies have gained some experience. Only 9% of respondents did not perceive improvements in competence or experience. However, some countries mentioned that only a few groups received training and developed their capacities obtained from previous projects, and that more work and capacity building is needed for local companies to become competent in chemical and hazardous waste management.

The most relevant example, mentioned by the great majority of the countries, referred to the electrical sector having eliminated PCBs. Government institutions received training and equipment to manage PCB-containing equipment (transformers and capacitors). None of the countries mentioned the assessment of PCBs in open application. The life cycle of PCBs in closed and open applications and the resulting contamination of the environment, including of human food and animal feed, have been recently reviewed. In particular, open applications are still major sources of PCB contamination in the industrial countries included in the assessment (Weber et al. 2018a; Figure 8). This assessment can serve as an example for controlling the life cycle of other industrial POPs, especially those with similar use patterns, such as PCNs and SCCPs.

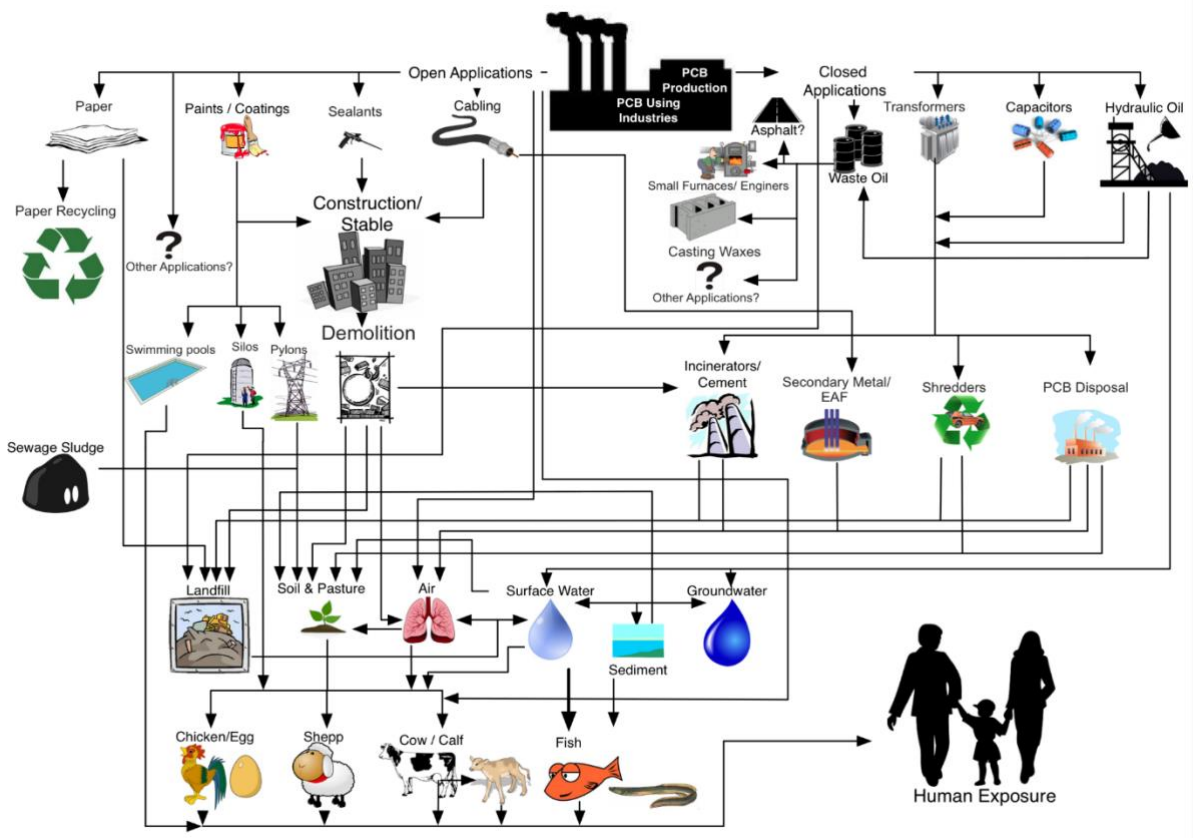


Figure 8**:** Life cycle of PCBs and related releases to the environment that expose food-producing animals (Weber et al. 2018a,b).

Regarding the packaging or transportation of hazardous waste, 75% of respondents perceive that local companies have gained relevant experience, while 25% do not. One country mentioned that none of the local companies has acquired the necessary internationally recognized certificates in order to conduct such work. This country lacks reference laboratories to conduct proper sampling and analysis of POPs, particularly of industrial chemicals.

The expertise provided by international consultants has been critical to managing POPs releases and wastes, including implementing BAT/BEP. 43% of the respondents have had to rely entirely on international consultants for this work, and another 43% have relied on them in part. Only 14% of respondents have not relied on international consultants at all.

95% of the countries who participated in the questionnaire commented on how implementing projects for the management of POPs waste has increased their technical capacity. The replies include:

- Forming and training an inter-ministerial coordination group as the main body reviewing and providing recommendations on issues regarding POPs and other chemicals;
- Managing hospital waste;
- Managing capacitors and transformers containing or contaminated by PCBs, including developing technologies for PCB decontamination;
- Electrical utilities and pesticide sellers gaining technical capacity for POPs waste management;
- Implementing government clean and green initiatives for reducing the burning of green waste;

- Developing a cement industry (with advice from an international consultant) for the disposal of old or obsolete pesticides as co-processing, which has helped dispose of 470 t of POPs and PCBs;
- Conducting projects to secure repackaging of POPs waste in UN packaging, transfer to centralized storage, and transportation to authorized EU countries for final treatment and incineration;
- Analysing and sharing data on the environmental and human health impact of POPs;
- Training consulting offices to obtain license for the transportation of POPs; and
- Avoiding the open burning of waste.

In most (65%) of the countries, professional bodies (such as the local chapter of a professional engineering body) or industrial groups (such as the Chamber of Commerce or an association of manufacturers) contribute technical knowledge and experience towards the implementation of conventions. This synergy is important to highlight, although 35% of the countries lack such support. The respondents provided the following examples of technical support received:

- Ministry of Commerce, Trade, and Industries (MoCTI) is part of an inter-ministerial coordination group that provides support and advice for projects on chemicals;
- Customs system, commercial system;
- The Association of Chemists and the Confederation of Chamber of Commerce and Industry have been instrumental in contributing their expertise and technical knowledge in the implementation of the convention and for the general sound management of chemicals;
- Chamber of Commerce & Industry;
- Business associations provide input for drafting the regulatory process;
- Several chambers actively participated in the development of the revised or updated NIP, such as the Chamber of Chemical Industries, Chamber of Textile Industry, and Chamber of Leather Tanning Industry;
- Association of Manufacturers;
- Electrical sector;
- The steel industry provides technical information on technology and emission reduction;
- National Committee for the Management of Chemicals and Hazardous Waste; and
- The safety of POPs and other chemicals continues to be promoted in national discussions of the sustainable development goals and broader development initiatives.

In spite of the aforementioned cooperation, some respondents reported a lack of knowledge in the different sectors regarding industrial POPs, as well as a lack of initiatives to address this. Before these groups are ready to engage, their needs must be attended to. These needs have been summarized as information, capacity building, resources, training, continual engagement, regulation, and guidelines.

43% of the respondents claimed to have developed an intermediate storage or pre-treatment facility, but the majority (57%) have not yet. The situation is quite different among countries, as illustrated by the following examples:

- One of the countries mentioned that a centre for logistics of hazardous wastes is being set up, to facilitate the operations related to packaging, temporary storage, and some treatment of

hazardous waste within the country. In addition, another centre will be set up to facilitate the export of POPs waste for disposal abroad when not possible to treat it domestically.

- One country mentioned there will be five storage facilities for PCBs treatment.
- Some of the countries that have developed storage or pre-treatment facilities have also built intermediate storage facilities for PCBs and POP-pesticide waste, but not treatment facilities.
- A new law and new regulations on hazardous waste and electronic waste are expected to control and manage all hazardous wastes, including POPs, in one of the countries.

The lack of capacity for developing and implementing policies or BAT/BEP projects reported by 41% of respondents is worrisome. Nevertheless, BAT/BEP have had important applications in municipal waste management, the destruction and elimination of POPs, the metallurgical industry, the management of PCBs and the smoking of food. The countries mentioned the following examples:

- A current project for protecting human health and the environment from unintentional releases of POPs originating from the incineration and open burning of healthcare and electronic waste;
- BAT/BEP demonstrations for the industrial and medical sector, which showed the possibility for POPs reduction with environmental and economic benefits;
- A manual for the Environmentally Sound Management of electrical equipment with PCBs; and
- A project including the development of guidelines on BAT/BEP for the mining sector.

4.3.5 Using technical capacity and financial mechanisms to destroy POPs

Only 23% of the surveyed countries reported destroying POPs domestically. The remainder (77%) lack the technical capacity to destroy POPs (Figure 9), which means that POPs wastes need to be exported for disposal, following the Basel Convention procedures. This export comes with many difficulties and high costs.

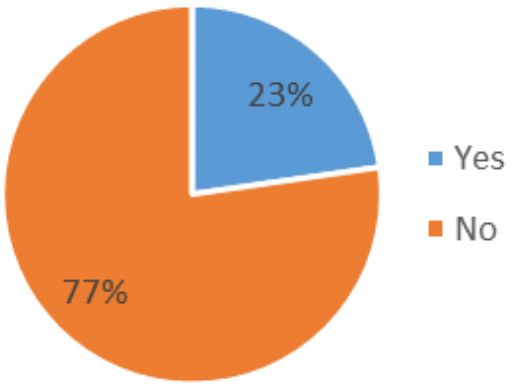


Figure 9**:** POPs destroyed within the country

Regardless of the situation, it is important to develop a rigorous project framework with clear responsibilities and plans (see Box 33). In some cases, waste from different POPs might be managed within the same project. For instance, POPs and ozone depleting substances (ODS) such as chlorofluorocarbons (CFCs) can be managed within the same project (see Box 34).

When asked about their experiences and lessons learned regarding POPs waste management, the respondents' answers included:

- Lack of POPs destruction capacity in the country;
- Difficulties in POPs waste management in the cement industry due to social impacts;
- Need to develop several de-chlorination processes to decontaminate transformers and incinerate some pesticides.

The GEF/UNIDO FSP on destruction of POPs pesticide stockpiles in China demonstrated that the destruction of large POPs stockpiles is feasible using cement kilns after developing the appropriate regulatory framework, guidelines, and human capacity, including for monitoring (Box 37).

Another element to consider is the financing mechanism for the management of POPs at the end of their life cycle. The different mechanisms implemented include funding from:

- GEF;
- International projects;
- Domestic private sector and international organizations;
- FAO (for pesticides); and
- National government.

Bilateral funding is especially successful if former projects were implemented smoothly (see Box 35).

Several countries declared to have no funding mechanism for end-of-life management. For those who do, the mechanisms include:

- Multilateral and bilateral funded projects;
- Co-financing by different stakeholders (see Box 35), including the private sector;
- Financing through UNDP or GEF;
- Own national funding (see Box 36 and Box 37);
- Industry engagement;
- Awareness regarding the cost for end-of-life management when purchasing;
- Manufacturers taking back waste that cannot be handled;
- Establishing intermediate storage and pre-treatment facilities financed by producers and users;
- Placing financial responsibility on polluters, producers, and consumers.

Box 33: Good practice case study of managing obsolete pesticide and preventing the build-up of new pesticide stocks (Paun et al. 2014)

In a stepwise approach, the pesticide waste management project in Romania removed all obsolete pesticides, including POPs, and established a stepwise system to ensure that no new pesticide waste will reoccur (Paun et al. 2014):

Step 1 – update of inventory. Initially, the project was going to eliminate 1409 t of obsolete pesticides listed in the national inventory of the NIP. A detailed inventory of POPs and other pesticides at 227 locations provided updated information, identifying an additional 1107 t of obsolete pesticides that needed to be disposed of.

Step 2 – remediation of the pesticide stockpiles. The EU PHARE Project, supervised by a professional project team, collected 2516 t of obsolete pesticides at 227 locations, becoming one

of the largest pesticide cleanup projects in Europe. Following environmentally sound management (ESM), the pesticides were transported to Germany for destruction by high temperature incineration.

Step 3 – prevention of the build-up of new pesticide stocks. Besides stockpile disposal, another important outcome of the project was the development of a National Strategy and Action Plan for preventing the creation of future pesticide waste stocks. This included 5 steps:

1. Further development of the legal framework in terms of the government's role in the sustainable use of pesticides and in hazardous waste management;
2. Establishment of a national stakeholders' platform and ensuring maximum participation;
3. Awareness raising campaigns and training for farmers;
4. Empty Container Management System;
5. Follow-up activities for good agricultural practices among Romanian farmers.

The conclusions and lessons learned from the project can be summarised as follows:

- A comprehensive strategy and action plan at the national level is key to an efficient implementation of relevant policies and appropriate funding resources.
- The cooperation and communication among relevant stakeholders (ministries, agencies, producers, retailers, private owners, control bodies) involved in pesticide management is key to success.
- Well-trained and committed personnel meeting project deadlines is key to project success.
- A comprehensive assessment and detailed inventory are essential to controlling pesticide stocks.
- Streamlining existing policies in the field of pesticides and POPs management and developing legislation is essential for ensuring the effective NIP implementation.
- Awareness-raising activities are crucial for the cleanup activities and for preventing the re-occurrence of obsolete pesticides. They can drive these change processes.
- During the cleanup activities, it is important to get the local authorities' commitment and participation in facilitating work execution.
- It is important to establish cooperation with the donors at an early stage, and to ensure transparency and good planning of finances and procurement.
- Establishing and maintaining an experienced project management team ensures the sustainability and effectiveness of the project and Convention implementation.
- Selecting and contracting qualified consultants, both local and international, facilitated the successful implementation of planned activities and knowledge transfer to personnel.
- Compliance of and contribution from the government and the partners who have agreed to support the projects are non-negotiable for the successful implementation of activities.
- It is necessary to establish an empty-container management system as part of the "life-cycle concept" to minimize the risks to both humans and the environment.
- The cleanup activities are only sustainable if they are combined with a strategy for preventing the reoccurrence of obsolete pesticides.
- Organic farming reduces the pesticide exposure of humans and the environment and guarantees that farms do not generate pesticide stocks. This approach also protects the soil and increases carbon storage.

The POPs pesticide management project was described in detail elsewhere (Paun et al. 2014).

Box 34: Good practice case study of concomitant management of PCB, pesticide and CFC wastes in Ghana

A GEF/UNITAR/UNDP/EPA-Ghana Project on Capacity Building for the Elimination of PCBs in Ghana succeeded in building on the preliminary inventory conducted as part of the first Ghana NIP to identify the major PCB stockpiles and managed the waste in an environmentally sound manner. A technically sound central storage site was constructed and operated as part of the project. In total, approximately 40 t of PCB wastes were gathered in the temporary storage site including transformers, capacitors and drums of PCB-containing waste oil from the mining sector. The PCB waste was shipped to Europe following ESM and the Basel Convention procedures. The vehicles used during the transportation of PCBs waste were in compliance with national and international standards for transportation of dangerous goods. The interim storage site was decommissioned following the shipment of PCBs waste.

Within the PCB elimination project, 110.2 t of obsolete pesticide stockpiles that had been safeguarded and stored in a temporal storage site were also exported and destroyed. Furthermore, the first ozone depleting substances (ODS), chlorofluorocarbons (CFCs) were shipped for destruction. This promotes synergies between the Stockholm and Basel Conventions and the Montreal Protocol.

Box 35: Good practice case study of generating follow-up projects based on built capacity

In the Republic of Moldova, the 3C principles of continuance, complementarity and coordination informed the technical solution for POPs management. Furthermore, stakeholder engagement and capacity building were key approaches for POPs inventory development and POPs management (see Box 5 on capacity building; Paun et al. 2014). The POPs stockpiles (obsolete pesticides and some PCBs) were repackaged and transported for final disposal abroad following a similar approach as in Romania (Box 33; Paun et al. 2014). The outcome was considered by the GEF country portfolio evaluation team as good, building relevant capacities among all the stakeholders involved during the first decade of addressing POPs in the country (2002-2012; for building the capacity of national experts see Box 5).

Results from these GEF POPs initiatives (POPs Stockpiles Management and Destruction Project) allowed the country to attract the interest of other donors in this field, such as the Canadian development cooperation, IPEN projects, NATO Peace program funds, and FAO/EU project. For example, the inventory of obsolete pesticide stockpiles was used to evaluate financial costs for subsequent projects. The NIP approved at the end of the enabling activity was considered a good basis for applying for an FSP. The experience gained in developing the FSP made it was easier to prepare two subsequent projects, funded by UNEP and the Canadian International Development Agency, respectively.

Box 36: Good practice case study of POPs waste disposal in Ukraine using national financial resources

Like other EECCA countries, Ukraine had large POPs stockpiles, including large volumes of POPs pesticides. From 2011 to 2014 Ukraine exported large volumes of POPs waste and other hazardous wastes to the EU for disposal (Table 2). The exports consisted mainly of HCB waste (24907.7 t) from the production of organochlorine solvents (Lysychenko e al. 2015) and obsolete pesticides (24290 t). Ukraine also exported some PCB wastes (107,9 t) and waste containing mononitrochlorobenzene (3184.4 t) and beryl (272.6 t, 111 containers). The disposal was financed by the Ukrainian state budget according to the National Action Plan (Design № 589-p from 25.07.2012 of the Cabinet of Ministry of Ukraine), without international funding.

Table 2: Volume of POPs waste and other hazardous waste exported

Type of POPs/hazardous waste exported	Export in 2011	Export in 2012	Export in 2013	Export in 2014
HCB waste	9486.4	3429.6	11,991.7	
Obsolete pesticides	10454.6	13062.5	500.7	272.3
PCB waste		101.3		6.56
Mononitrochlorobenzene waste	2351.4	391.9	441.1	
Beryl-containing waste		272.6		

Box 37: Good practice case study of POPs pesticide destruction and fly ash management in China

China possessed a large POPs pesticide stockpile and contaminated soils from pesticide production. Within a GEF/UNIDO full size project (FSP), all POPs pesticide stockpiles of China were destroyed and all POPs pesticides contaminated soils were cleaned. Furthermore, the project treated 80,000 t fly ash. This included destroying the main load of dioxins using two innovative technologies.

The project completed the following key tasks for NIP implementation:

- Strengthening the legal and regulatory framework for the environmentally sound management (ESM) and disposal of POPs wastes and building the capacity of national and provincial authorities;
- Performing ESM for all identified POPs pesticides and their wastes, including the disposal of 6,350 t of POPs pesticide waste and cleanup of 42000 t of POPs pesticides in a manner consistent with international environmental protection requirements;
- Demonstrating a BAT/BEP disposal technology for incineration fly ash by cement kiln co-processing and high temperature sintering, thus destroying 80,000 t of incineration fly ash and preventing the release of 106.9 g-TEQ of PCDD/Fs;
- Monitoring the destruction and removal efficiency of POPs wastes;
- Evaluating the destruction of dioxins and their release vectors (air, water, land and residues);
- Assessing the fate of heavy metals in the cement kiln treatment process;
- Performing qualitative environmental risk assessments of identified sites contaminated by pesticide POPs.

Technical guidance and support from national and international experts in the field of POPs waste and contaminated site management have laid the foundation for the success of the project. The

project received large national co-financing, including industry investment in the development of new technologies.
Also during this project, non-combustion technologies were assessed. It was decided to conduct basic research to better assess the degradation products of fluorinated and brominated industrial POPs, explore treatment options, and develop a mechanochemical pilot plant. These activities resulted in the publication of 20 peer-reviewed scientific articles, including a literature review (Cagnetta et al. 2018). The UN evaluator rated the project as "highly satisfactory".

4.4 Developing and using the technical capacity to assess, manage and remediate POPs contaminated sites

The text of the Stockholm Convention makes it clear that one of the objectives is to address POPs contaminated sites. Article 6 of the Stockholm Convention provides an opportunity for Parties to develop strategies to address POPs contaminated sites. The Stockholm Convention also includes provisions under Article 6 to reduce or eliminate emissions from POPs stockpiles, wastes and contaminated sites (see Box 38).

Box 38: Article 6 of the Stockholm Convention, including requirement to address contaminated sites

Article 6: Measures to reduce or eliminate releases from stockpiles and wastes

1. In order to ensure that stockpiles consisting of or containing chemicals listed either in Annex A or Annex B and wastes, including products and articles upon becoming wastes, consisting of, containing or contaminated with a chemical listed in Annex A, B or C, are managed in a manner protective of human health and the environment, each Party shall:

(e) Endeavour to develop appropriate strategies for identifying sites contaminated by chemicals listed in Annex A, B or C; if remediation of those sites is undertaken it shall be performed in an environmentally sound manner.

4.4.1 Experience with building capacity for contaminated site assessment

All questionnaire respondents answered the question about built capacity to address POPs contaminated sites. 55% of respondents claimed no built capacity regarding contaminated site assessment, while 45% claimed that some capacity has been built (Figure 10). However, one of the countries that answered that capacity regarding contaminated sites has been built mentioned the smoking of fish as good practice case study for contaminated sites. This answer indicates that the Party did not understand the concept of contaminated sites and that the proportion of 45% of countries having built some capacity working on contaminated sites is an overestimation. Overall, more than 50% of responding countries lack the capacity to assess contaminated sites.

One issue raised was the lack of monitoring capacity. While in some countries there were initiatives to map potential POPs-contaminated sites, more advanced laboratory testing is needed to determine if the preselected areas are contaminated with POPs or not. One country mentioned having collected soil samples from contaminated sites for POPs monitoring, but did not mention whether the samples were analysed. One good practice case study from Kyrgyzstan on systematic monitoring of POPs

pesticides in soils and placenta with GC-ECD demonstrated that POPs pesticide contaminated sites can be assessed with relatively simple analytical equipment (see Box 40; Toichuev et al. 2017a,b).

The respondents mentioned projects regarding PCB- and pesticide-contaminated sites (see the case studies in Box 39 and Box 33). However, none of the countries mentioned activities regarding newly listed industrial pollutants like PFOS and related substances, or brominated flame retardant like PBDEs. PFOS-contaminated sites are currently being assessed in industrial countries and have been found to result in significant drinking water contamination (see the case study in Box 42). Some countries responded that they have not started managing contaminated sites. The challenge of managing contaminated sites is documented, for example, for Kyrgyzstan (Box 40; Toichuev et al. 2017a).

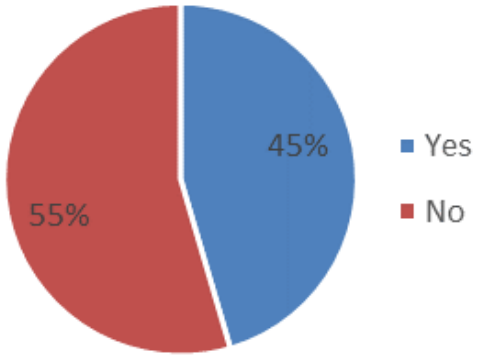


Figure 10: Capacity built in assessing POPs contaminated sites

The majority of the countries (55%) have dealt with POPs contaminated sites mainly within Stockholm Convention activities, as opposed to within a broader aspect of general contaminated site inventory and management. This indicates that the majority of developing countries lack a broader, holistic approach to contaminated sites that could integrate POPs contaminated sites. This perception was substantiated by comments like "Ideally, it should be addressed within the broader aspect of general contaminated site management with careful attention to POPs".

Only 36% of the countries responded that they address the issue of POPs contaminated sites within the broader aspect of general contaminated site inventory and management. Therefore, more than 1/3 of the countries seem to coordinate to some extent the management of sites contaminated with various pollutants. However, according to consultants supporting NIP development and update, only a few developing countries have a database of contaminated sites. The exceptions are for instance the few countries where larger UN contaminated site assessment activities have taken place (see e.g. Box 39).

Some respondents noted that many potentially contaminated sites were identified during NIP development and update, but no analysis has been carried out to verify the contamination. This is also due to the lack of analytical capacity (see Chapter 4.2). Some countries have integrated the activities at contaminated site into their NIP action plan and anticipate requiring assistance with upcoming projects. Two countries have benefited from a UNIDO regional project on contaminated sites in West Africa. Capacity was built for a number of institutions (including the Environmental Protection

Agency and the Atomic Energy Commission in Ghana) regarding preliminary identification of POPs contaminated sites, particularly of PCB-contaminated sites.

4.4.2 Good practice case studies on contaminated sites

In answer to the question on good practice case studies and lessons learned regarding contaminated sites, 46% selected "no good practices studies and lessons learned, not sure or not documented". Of the 21 countries, only Ghana, the Republic of Moldova, and Vietnam responded that they have documented good practice case studies (see Box 39). The Republic of Moldova was part of the regional GEF project on Capacity Building on Obsolete Pesticides in EECCA Countries (GEF ID 3212), which is described in detail in a good practice case study developed under a GIZ project (Paun et al. 2014). This project provided further support for developing an inventory of sites polluted with the initially listed POPs. A few other countries answered that they might have information on good practices, without providing any details.

For the good practice case study of contaminated site assessment for POPs pesticides please see Boxes 39 and 40. Good practice case studies for PCB and PCDD/F contaminated sites are available from industrial countries, e.g. Box 41. None of the respondents had good practice case studies for the new industrial chemicals. One reason is the lack of analytical capacity. Some good practice case studies for PFOS contaminated sites have been developed in industrial countries (e.g. Hu et al. 2016 Box 42, Oliaei et al. 2013).

Box 39: Good practice case study of POPs pesticide-contaminated site monitoring in Vietnam

Within the NIP implementation in Vietnam a national and international expert team conducted a comprehensive assessment of POPs pesticides contaminated sites. More than 1000 sites were found to be potentially contaminated and were assessed and prioritized. Within the project, Guidelines for Sustainable Management were developed for the different phases of assessing and remediating POPs pesticides contaminated sites (UNDP/TAUW 2014 a,b,c,d,e):

- PHASE 1: Preliminary Site Assessment;
- PHASE 2: Site Assessment;
- PHASE 3: Site Remediation Assessment;
- PHASE 4: The Site Remediation Management; and
- PHASE 5: Site Monitoring and Aftercare.

Thus, these guidelines address the full cycle of site assessment and remediation.

Box 40: Good practice case study of pesticide-contaminated site monitoring, securing, and exposure assessment in Kyrgyzstan (Toichuev et al. 2017a,b)

In 2010, several cattle died and high pesticide levels were found in the blood, breast milk, and placenta of the population living around a major pesticide dump site in Kyrgyzstan (Toichuev et al. 2017a,b). In the first phase of a UN project, a historic assessment of the pesticide dumping at the sites was conducted. In the second phase, organochlorine pesticides were measured in soil collected from the pesticide disposal sites, the former pesticides storehouses, the agro-air strips, and the cotton-growing fields. This assessment provided a first overview of the types and sources of pollution, the scale of the problem, and the information gaps. A reasonable risk assessment could then be performed with the limited analytical capacity available. The study contributed to the NIP of Kyrgyzstan (Toichuev et al. 2017a).

Within the UN project, practical risk reduction measures have been implemented at the two major pesticide disposal sites, with support from a Dutch environmental engineering company, an international NGO (Green Cross Switzerland), and local authorities. Local populations living near the sites of the former pesticide storehouses and agro-airstrips were advised not to cultivate vegetables and melons or to raise cattle in these areas. Instead, it is recommended to grow technical crops or plant trees.

For a risk and exposure assessment, the Kyrgyzstan National Academy of Science analysed more than 500 placenta samples for their organochlorine pesticides (OCPs) content, including 241 placentas from cotton-growing regions impacted by POPs pesticides, 121 placentas from an urban area (the city of Osh), and 146 placentas from unpolluted mountain regions. The researchers recorded manifestations of disease in the mothers during pregnancy and parturition and in their newborns during the first 6 days of life (Toichuev et al. 2017b). The incidence of health problems in four subgroups of this data set, with increasing levels of total OCPs, was compared with the incidence of health problems in the group of 268 placentas with OCP levels below the detection limit. The relative risk of health problems in both the mothers and their newborns increased significantly with increasing levels of total OCPs ($p < 0.0001$). Health complications with increased incidence in OCP-exposed newborns included low birth weight, congenital malformations, infections, and stillbirths, and in OCP-exposed mothers they included preterm delivery, (pre)eclampsia/gestosis, and higher frequency of hospitalizations after delivery (due to infections). Women living near former pesticide storehouses and agro-airstrips were most impacted and should be considered as being at risk, needing urgent reduction in exposure.

Furthermore, one research group studied the microbial structural complexes of the pesticide-contaminated soils in these dumping zones, to identify microorganisms with cytochrome P450 genes capable for pesticide degradation. Active bacterial strains from the Pseudomonas fluorescens and Bacillus polymyxa population were selected for further assessment because they demonstrated high rates of Aldrin degradation (Doolotkeldieva et al. 2017).

Box 41: Good practice case study of assessing PCDD/F and PCB contamination of environmental media and food

While in the past, PCDD/F and PCB contamination exceeding limits in food from animal origin (eggs, meat or milk) was mainly detected in industrial products, in the last decade, free range chicken, sheep and beef were more frequently found to exceed EU limit values for PCDD/Fs or dioxin-like(dl)-PCBs, often in the absence of known contamination source. The German Environment Agency initiated a project to elucidate the entry of PCBs and PCDD/Fs in food related to environmental contamination (Weber et al. 2015a; 2018a,b). The study revealed that food products from farm animals sensitive to dioxin or PCB exposure, such as suckling calves and laying hens housed outdoor, can exceed EU maximum levels at soil concentrations that have previously been considered safe. Maximum permitted levels can already be exceeded in beef/veal when soil is contaminated with around 5 ng PCB-TEQ/kg dry matter (dm) (Weber et al. 2015a; 2018a,b). For eggs/broiler, this can occur at a concentration of PCDD/Fs in soil below 5 ng PCDD/F–PCB-TEQ/kg dm. The study showed that the soil–chicken egg exposure pathway is probably the most sensitive route for human exposure to both dl-PCBs and PCDD/Fs from soil and needs to be considered when establishing soil guidelines (Weber et al. 2018a,b). The study also found that calves from suckler cow herds are most prone to the impacts of dl-PCB contamination due to transfer via milk. PCB (and PCDD/F) intake for free-range cattle stems from feed and soil. A

compilation of sources of PCDD/Fs and PCBs environmental contamination impacting food safety demonstrated that PCBs in open application are still impacting feed and food. The assessment of the life cycle of PCBs and their impact on feed and food, including exposure from contaminated soils, highlighted the need for detailed assessments and prevention of soil contamination for other POPs as well. Additionally, the project compiled PCDD/F and PCB source patterns for the German Dioxin/POPs database (Weber et al. 2015a).

Box 42: Good practice case study of monitoring PFOS/PFOA-contaminated groundwater and drinking water

PFOS and PFOA have been found in groundwater and drinking water at many sites globally (Lerner 2016). For instance, the working group for contaminated sites of the German Federal States developed a monitoring guidance document for PFOS and PFOA and tested the guidance in selected regions (Held 2015). Since 2011, several Parties to the Convention have been developing PFOS inventories, but groundwater and drinking water are rarely assessed due to a lack of analytical capacity.

The most comprehensive ground- and drinking water monitoring was conducted by the US Environmental Protection Agency (US EPA), which monitored 36,000 water samples between 2013 and 2015 for PFOS and PFOA contamination within a national drinking water survey program (Hu et al. 2016). The study revealed that the drinking water supplies for 6 million US residents exceed US EPA's lifetime health advisory for PFOS and PFOA (70 ng/L) (Hu et al. 2016). The number of industrial sites that manufacture or use these compounds, the number of military fire training areas, and the number of wastewater treatment plants were all significant predictors of PFAS detection frequencies and concentrations in public water supplies (Hu et al. 2016). The number of civilian airports with personnel trained in the use of aqueous film-forming foams were also significantly associated with the detection of PFASs (Hu et al. 2016).

Box 43: Guidance documents and resource materials for assessing POPs contaminated sites

Selected guidance documents have been developed for POPs contaminated sites:

- Inventory guidance documents with chapters on contaminated site inventories (Secretariat of the Stockholm Convention 2015a,b, 2017a,b,c,d);
- UNEP "Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs under Article 5 of the Stockholm Convention on Persistent Organic Pollutants" (UNEP 2013b);
- UNIDO (2010) Persistent Organic Pollutants: Contaminated Site Investigation and Management Toolkit[57];
- UNDP and TAUW (2014a,b,c) Volume 1-3 EMP Guidelines for Sustainable Management of POP pesticides contaminated sites. Building capacity to eliminate POP Pesticides in Viet Nam.
- Soil and groundwater contamination with PFCs/PFASs at suspect sites and after firefighting foam use. Working Tool for increasing coverage, site-specific historical. Sensing and orientation study (Project Stage 1) (Held 2015).

[57] http://chm.pops.int/Portals/0/download.aspx?d=UNIDO-POPS-TOOLK-ContaminatedSiteIM.En.pdf

5 Lessons learned relating to funding of NIP development, implementation and compliance with the Stockholm Convention

5.1 Using national funding for NIP development and implementation

5.1.1 Introduction

Funding, including from national sources (from the governmental budget or other stakeholders), is crucial for the implementation of the Stockholm Convention. Article 13 of the Stockholm Convention states that "(e)ach Party undertakes to provide, within its capabilities, financial support and incentives in respect of those national activities that are intended to achieve the objective of this Convention in accordance with its national plans, priorities and programmes" (Stockholm Convention website 2018).

Paragraph 2 of Article 13 of the Convention states that "developed country Parties shall provide new and additional financial resources to enable developing country Parties and Parties with economies in transition to meet the agreed full incremental costs of implementing measures which fulfil their obligations under the Convention. The implementation of these commitments shall take into account the need for adequacy, predictability, the timely flow of funds and the importance of burden sharing among the contributing Parties" (Stockholm Convention website 2018).

Paragraph 3 of Article 13 of the Convention states that "Developed country Parties, and other Parties in accordance with their capabilities and in accordance with their national plans, priorities and programmes, may also provide and developing country Parties and Parties with economies in transition avail themselves of financial resources to assist in their implementation of this Convention through other bilateral, regional and multilateral sources or channels". (Stockholm Convention website 2018).

Paragraph 6 of Article 13 defines a "mechanism for the provision of adequate and sustainable financial resources to developing country Parties and Parties with economies in transition on a grant or concessional basis to assist in their implementation of the Convention" (Stockholm Convention website 2018).

5.1.2 Financing the NIP development and implementation of NIP action plans

5.1.2.1 Funding from international sources

All countries that responded to the survey have benefitted from GEF and donor cash financing at least for developing their NIPs. 95% of the countries received donor support through international agencies. Only 9% of the responding countries received direct donor support.

All countries highlighted the importance of international funding. GEF funding for action plan implementation was emphasized by 71% of the countries, and the GEF overall NIP support by 100% of respondents. One country also mentioned support from the World Bank for implementation projects.

Some countries reported that individual activities such as PCB management have been funded but the vast majority of the NIP action plans lack funding. Several other Parties reported that the implementation of the NIP actions plans is addressed through various financial sources. In addition to GEF funding, bilateral funding from the EU, international institutions, technical partners and private donations were used for projects and NIP implementation. A few countries (10%) mentioned that projects were financed through the SAICM Quick Start Programme and could be linked to NIP implementation and wider chemicals management.

According to IPEN, most developing countries were seeking international financial support and only basic measures were covered by domestic sources such as the national state budget.

5.1.2.2 National contribution to NIP implementation

Regarding national contributions, UNIDO emphasized that budgetary allocations in ministerial activities are particularly relevant. IPEN mentioned that basic measures such as re-packing of obsolete pesticides were covered by national budgets. Private donors were also mentioned.

All Parties emphasized the importance of in-kind contributions for projects and implementation. One Party defined potential sources for implementing NIP action plans and integrating the financial issues into national programs and strategies while seeking financial support from international and national sources. Some countries mentioned that financing is assigned mainly by projects. One Party mentioned that the local contributions to NIP implementation activities included not only funding from the national budget but also NGO activities, which are good in-kind contributions. Support from the Basel and Stockholm Conventions Regional Centres for NIP implementation was also mentioned. Several parties reported that they are still seeking funds for implementing NIP action plans. For a few countries developing their first NIP, financing the implementation was not yet an issue.

5.1.3 Percentage of the national budget for chemicals management

Developing appropriate financing and taxation for chemicals and waste management requires a good understanding of the associated costs. Sustainable financing is a major obstacle to improving solid waste management (World Bank 2014). New industrial POPs impact large volumes of waste such as e-waste and related plastic, polymers in the transport sector, polymers in construction, textiles, carpets or wood (Secretariat of the Stockholm Convention 2015a,b,c; 2017a,b). Financing for addressing POPs-impacted waste is thus linked to municipal waste management and the overall financing of waste management. Therefore, this survey requested information on the national budgets for chemicals and waste management.

Most countries (81%) answered that they could not quantify the costs of waste and POPs management. Several countries noted that the budget allocated for this is minimal. UNIDO also reported that, in their experience, there is typically a lack of information regarding costs and national budgets for chemicals and waste management. IPEN mentioned that CSOs do not have access to this kind of information. It would take complicated cost calculations even in cases where enough information is available and evaluated.

One Party stated that there are no budget allocations for chemicals management and that the EPA supports the sound management of chemicals through its internally generated funds. Waste management is the responsibility of the metropolitan, municipal and district assemblies. Other Parties provided similar answers regarding the distribution of tasks between the national and provincial government. Some Parties reported that they have requested funding for chemicals management in the current national budget.

Four countries have managed to or have tried to quantify to some extent their waste management expenditures. One country stated that waste management is not differentiated in the governmental budget but is less than 0.5%. Another Party estimated that the budget for chemicals and waste is less than 0.001% of the governmental budget. Another Party reported that they could not estimate the costs of waste and POPs management but had data for the health sector, where 0.5% of the health budget is spent on waste management and a fraction of that is used for minimizing emissions of unintentional POPs.

Only one Party reported details about their waste volume, costs and budgets for waste management and POPs management. The total amount of waste generated was approx. 90,760,000 t/year, of which 0.5% (or about 450,000 t) was classified as hazardous waste, excluding non-hazardous industrial and healthcare wastes and sludge. The Party reported spending approx. $250,000,000/year for waste management and disposal, and highlighted that this amount only addressed two thirds of the total solid waste produced in the country. According to the Party, its waste management budget is approximately $100,000,000 less than needed to cover the total volume of waste produced annually. The money spent represented approx. 0.2% of the State Budget. For POPs, this Party allocated $15,500,000, in addition to $8,100,000 received from GEF to manage and safely dispose of approx. 1,000 t of obsolete pesticides, including POPs pesticides, and 1,000 t of PCB-contaminated transformer oils. Therefore, managing the basic POPs was estimated to account for approx. 10% of the yearly waste management budget and 0.02% of the governmental budget for that year.

5.1.4 Incremental costs for the implementation of the Convention to better target financial and technical assistance

Most Parties (71%) were unable to determine their incremental cost. UNIDO also reported that, in their experience, countries cannot determine their incremental costs, mainly due to lack of information.

The countries mentioned the following challenges to incremental cost estimation:

- Lack of national experts able to determine the incremental costs;
- Lack of opportunities for training in the determination of incremental costs;
- Lack of basic data and lacking or weak national system for controlling and monitoring the presence of POPs in goods and articles at ports and production sites and their fate in dumpsites;
- Lack of examples for estimating incremental costs;
- Lack of precise costing of the implementation of the Convention;
- Lack of serious budgeting at the national level;

- Frequent listing of POPs under the Convention and the need for implementation. This leads to frequent cost increases and changes, making it difficult to follow up. This includes costs for new regulations and law enforcement in addition to the costs of analytical facilities and operators;
- Inability to finalize the first NIP due to unstable political situation or war.

IPEN emphasized the missing information regarding the scale of the problem (contamination, pollution). The unequal amount of information about POPs pollution or contamination is apparent when viewing reports by UN regions.

5.1.5 Reaching out to GEF Focal Points with important project ideas and proposals for Convention implementation

Overall, respondents provided positive feedback regarding discussing project ideas with GEF Focal Points. One Party, which recently finished the first NIP, has had limited communication with the GEF Focal Point, but mentioned that they seem supportive to ad-hoc request such as when any guidance is needed. One Party mentioned requirements that the project ideas and proposals to be discussed with the GEF Focal Point must be clearly written and focused on: i) a problem related to the convention and national priorities; ii) relevant objectives and outputs; and iii) sustainable activities. Another Party emphasized that regular contacts between the GEF Focal Points and the Convention National Focal Points, NIP coordinators, and national experts is needed to ensure the flow of clear information, knowledge, and guidance. One Party mentioned a need for harmonizing national targets with those of GEF and the Convention and closely cooperating with international organizations.
One Party answered that the GEF Focal Point was part of the task force when developing the NIP.

It was also mentioned that executing projects with GEF support has been a good experience. In particular, countries that gained several GEF projects were very satisfied. Only one Small Island State mentioned that they had no experience with the GEF Focal Point.[58] Another Party answered that training is needed in order to develop projects.

5.1.6 Co-financing NIP development, update and implementation projects

Most countries emphasized that the major contributions were in-kind. Some Parties added further information regarding the in-kind contribution, e.g. that it includes support for officers partially dedicated to NIP implementation or the contribution of facilities.

Approximately half of the countries (48%) considered themselves successful in gaining financial support from the government directly linked to the Stockholm Convention implementation. Some Parties reported that the implemented projects were covered by national funding with the necessary national proportion of contributions in cash and in-kind requested by GEF. One country, which is in the process of EU integration, has budgetary allocations mainly for related key activities. On the other hand, there is no further support from GEF given the country's upcoming EU status. Another country

[58] At least the person(s)/focal point answering the questionnaire

has recently included the POPs NIP in the national budget, but doesn't yet have experience with implementing the NIP with national funding.

In UNIDO's experience, Parties are usually successful in gaining financial support from the government. In IPEN's experience, Parties have gained some governmental support but in many cases, this is insufficient and could be considered a lack of budget.

The following have helped countries successfully secure funding for the Stockholm Convention implementation:

- The Stockholm Convention being an obligation that the Parties have signed and ratified. According to UNIDO, this is a major driver for support;
- Defining the budget within the national plans, such as the national plan for remediation of sites contaminated by pesticides or other pollutants, including dioxins;
- Linking the actions needed to be implemented under the Stockholm Convention with other related actions already budgeted for;
- Strengthening the legal framework;
- Linking the Stockholm Convention implementation activities to a project or activity triggered by national or county regulation (not necessarily linked to Stockholm requirements);
- Creating a specific institution dedicated to chemicals management (Chemicals Office), which will also serve as a unit for the implementation of the Stockholm Convention. For this purpose and the implementation of measures indicated in the NIP, the ministry is in continuous contact and negotiation with the ministry responsible for finance;
- Aligning NIP activities with government objectives, for example actions for raising awareness regarding the pesticides used and alternatives;
- Involving the private sector, industry and companies for co-financing. For example, in a PCB-elimination project government could convince the companies in the energy sector and industry to cover part of the project cost within their budgeted activities;
- The availability of GEF approved project funds that could attract other funding for addressing common aims with the co-funding institution;
- Developing national strategic and regulatory documents that set the actions to be addressed under the Stockholm Convention;
- Effective lobbying of financial decision-makers;
- Sensitizing high-profile personnel of government and national stakeholder institutions to the Stockholm Convention implementation;
- Mainstreaming the sound management of chemicals and waste into activities of relevant stakeholder institutions. Institutions are encouraged to budget for chemicals and waste activities;
- Strengthening laboratory capacities and research and providing data in support for action;
- The Environmental Ministry collaborating with other Ministries on common aims. For instance, the Agriculture Ministry and related institutions co-financed the POPs pesticide management project since they could clearly see benefits from its activities.

The Parties mentioned a range of obstacles to receiving funding or general support:

- Insufficient money, in general, in the environment sector;

- Limited national financial resources for the diversity of international agreements ratified or accepted (i.e. agreements related to chemicals or waste management, climate change, biodiversity, etc.) with implementation requirements;
- Tight budgets focused on other priorities;
- Limited lobbying of financial decision-makers;
- Lack of staff; few officers dedicated to chemicals and waste issues;
- Limited visibility of the chemical and waste agenda, which prevents it from reaching all levels of government and accessing national funding, since it is a cross-cutting issue;
- Very limited resources and other more pressing needs in developing countries, meaning that not much support can be given to the Stockholm Convention, since chemicals and waste are often not seen as priorities;
- Some countries preferring to address chemicals and waste management holistically rather than dealing with individual chemicals;
- War and unstable security conditions preventing Stockholm Convention activities from being carried out.

IPEN highlighted that industry often fails to take responsibility for addressing pollution caused by its operations and externalizes the associated costs onto governments and the public. Also, industry rarely takes responsibility for the end-of-life of their products (extended producer responsibility) as evidenced by the pollution associated with the treatment of e-waste and end-of-life vehicles, or the global plastic pollution (Basel Action Network 2002, 2016, 2018; Greenpeace 2018; Takahashi et al. 2016). IPEN also emphasized that industry does not contribute adequately to the budget for government actions to reduce POPs pollution. In some cases, CSOs have witnessed industry trying to hide data revealing pollution (Forter 2010, Lerner 2018; Neslen 2017).

5.1.7 Experience with using socio-economic assessment or cost benefit analyses as arguments

The majority of the responding Parties (71%) had little or no experience applying socio-economic or cost-benefit analysis to POPs-related issues. Also, according to UNIDO, most countries have limited experience with these assessment tools. Parties identified a need for training on such tools and how to use them for convincing decision-makers. One Party mentioned that these are useful tools but that data collection is not easy, due to a lack of information required for this type of assessment. Another Party reported that this type of assessment and analysis was used for other types of projects, unrelated to POPs.

Of the responding Parties that have some experience with these tools, one highlighted that the results of a socio-economic assessment have been added to a report submitted to the government when proposing programs and projects for funding. Another Party said that it is necessary to define and explain the measures in the NIP action plan in order to win financial support, and socio-economic assessment and cost benefit analyses can contribute to the reasoning.

Another Party stated that socio-economic assessment or cost benefit analyses have not yet lead to financial support, but have helped improve the legislative/regulatory framework. Another Party similarly reported carrying out a cost benefit analysis, however stakeholder contribution did not

increase because chemicals (including POPs) are not considered a priority and haven't been allocated a budget. Thus, the Parties' experiences using these tools to show the impact of POPs are very limited.

5.1.8 Linking implementation plans to other initiatives

The majority (52%) of Parties have identified other means to undertake the implementation plans, by linking to other initiatives across government, industry or society.[59] Examples include:

- Linking with cleaner production projects on controlling big pollution sources;
- Changing pesticide practices through education;
- Linking with waste management-related approaches and projects;
- Implementing integrated waste management systems;
- Implementing strategies for the sustainable use of pesticides to avoid the reoccurrence of pesticide stocks;
- Promoting and subsidizing the switch to organic farming;
- Promoting biological agriculture; for instance, one partner to the NIP implementation in one country has invested in organic cotton production;
- Setting up a control system and new guidelines and frameworks to prevent any amounts of pesticides from entering the market unless they comply with the national regulations;
- Developing municipal ordinances for waste burning, for cement kilns processing of containers of used pesticides, for burning hospital mattresses, and for raising awareness regarding the collection of WEEE;
- Using DDT alternatives in indoor sprays for malaria vector control;
- Reducing UPOPs emissions through strict national standards and enforcing continuous monitoring of industrial emissions;
- Implementing strategies to reduce open waste burning, and enforcing environmental compliance at industrial establishments, especially regarding POPs;
- Establishing close collaboration with the Ministry of Health regarding the use of DDT, with the Ministry of Agriculture regarding the use of pesticides, and with municipalities regarding waste management;
- Reducing open waste burning through community actions.

5.1.9 Experience with linking POPs management to financing for projects on climate change, biodiversity and SDGs

57% of the countries that responded to the questionnaire have not yet considered the links between POPs and SDGs or climate change. UNIDO also found that these topics are not very well linked within NIP development and implementation. Only a few Parties (14%) mentioned that they have linked the NIP to the SDGs.

One Party highlighted that POPs management, climate change and biodiversity are an integral part of its Sustainable Development Goals, and is investigating the possibility of developing multilateral

[59] The examples given include: reducing DDT use for malaria control by improving housing; changing pesticide practices through farmer education; reducing open waste burning through community actions.

projects. Another Party has formulated objectives and activities for addressing POPs based on existing national strategies, plans, programs and financing for climate change, biodiversity and SDGs. However, the legislative link has only recently been established in the NIP update and it will take time for its implementation and assessment. One Party gave an example of the connection between work on POPs and on climate change: the implementation of the energy efficiency strategy and action plans with allocated financing is contributing to achieving the climate change goals and reducing unintentional POPs emissions.

A few other countries have emphasized that the links to SDGs, climate change and biodiversity are relevant and should or will be better explored in the future. However, the details are yet unknown to them. One Party complained about the lack of support for establishing the relationship to climate change. Another Party highlighted that the overall chemical pollution will likely hinder the country's potential to achieve the SDGs.

One of the Parties mentioned that people are now linking waste management to climate change, but that this also needs further clarification and elaboration. Another Party benefited from an EU-UNDP Project entitled "Low Emission Capacity Building Programme", which allowed it to develop a project on biogas recovery from a dumpsite. The implementation of this project may indirectly reduce POPs emissions.

Better links between POPs and SDGs, climate change and biodiversity are needed. The links between POPs and climate change were elaborated in a report from the Secretariat (AMAP & UNEP 2013) and in a study of POPs in landfills (Weber et al. 2011). Recent studies of landfills, for instance in the UK, have found that more than 1000 landfills are at sea level and at risk of collapsing into the sea over time (O'Shea et al. 2018). The links between SDGs and POPs were elaborated by UNDP (UNDP 2015). Additionally, Suriname's updated NIP discusses their priorities for POPs management and the link to the individual SDGs (see Box 18).

5.1.10 Harmonizing the country's priorities regarding POPs with donor's priorities for funding

The majority of countries (62%) have harmonised their national priorities with those of the donor, particularly with those of GEF. These countries refer to the priorities and target areas of possible donors and harmonize them with their national targets, as reflected in their NIPs. Their national priorities regarding POPs consider the GEF funding strategies for chemicals, and projects are designed to address government priorities and link to the donors' priorities. These priorities are integrated into the action plan of the updated NIP.

One Party mentioned that they have harmonized their work on chemicals and wastes with the relevant EU financial mechanisms for waste management. However, 24% of responding Parties have not harmonized the priorities listed in their NIP with those of donors, and 14% did not answered this question. The major reason reported for the lack of harmonization is that the priorities of the donors have not been evaluated, but the countries said they plan to do so in the future. One country mentioned that this is particularly true for the newly listed POPs.

5.1.11 Success factors and obstacles to financing and implementation

The following were seen by Parties as factors leading to successful financing and implementation:

- Support from top Ministry management;
- Good inter-ministerial coordination (also highlighted by UNIDO);
- Involvement of all relevant players;
- Thorough development of projects.

IPEN emphasized that the polluter pays principle can contribute to successful financing. They gave as examples the practical cases of the "superfunds" and financial support from extended producer responsibility (e.g. for e-waste and end-of-life vehicles).

The following obstacles were mentioned:

- Lack of a suitable regulatory framework and enforcement;
- Lack of a unified approach to controlling and managing chemicals within the country and lack of an independent integrated system, guidelines, transparent laws and enforcement of the laws and regulations;
- Lack of coordination;
- Lack of financing;
- Perception that financing POPs-related work would take part of the current budget away from other important issues;
- Lack of robust data and inventories;
- Lack of coordination with other priorities such as climate change, biodiversity, SDGs, etc.;
- Lack of an integrated chemicals management system (for all chemicals, including POPs);
- War and unstable security conditions.

Furthermore, a few Parties reported that they have just developed the NIP and began working on POPs, so they cannot yet evaluate the success of the implementation.

5.1.12 Ensuring the sustainability of NIP implementation projects

The respondent Parties have taken the following approaches to ensure the sustainability of NIP implementation projects:

- Developing and strengthening policies (also highlighted as key by UNIDO);
- Adopting a comprehensive regulatory framework on POPs management and control;
- Adopting regulations and implementing BAT/BEP in the relevant industrial sectors;
- Introducing POPs action plan activities into national strategies and budgets;
- Capitalising on the projects results by mainstreaming the project activities into other activities related to environmental protection, sustainability and climate change;
- Widening the tasks and activities of the Stockholm Convention inter-ministerial coordination group to continue to work on the wider issues of chemicals and waste management;
- Developing an institutional arrangement to address chemicals and waste issues more efficiently;

- Developing a project coordination office within the Environmental Ministry or the institution responsible for developing and formulating new project proposals, and considering the option of national or regional projects;
- Building capacity for national institutions and experts;
- Transferring knowledge and know-how to all possible stakeholders and engaged parties under the guidance of the national focal point and competent authority;
- Selecting key staff working on waste management and chemicals management to further capacitate them in the related POPs field;
- Requiring that project beneficiaries contribute to the implementation of the project. For instance, when promoting BAT/BEP to reduce POPs emissions related to open burning of waste, beneficiary municipalities must provide an appropriate framework for the project. Industries benefitting from the BAT/BEP project should contribute with cash and in-kind;
- Compiling concrete project results, lessons learned and experiences gained by the project team and disseminating them to the widest possible audience;
- Developing sustainable follow-up projects building on successfully implemented projects;
- Integrating the substitution of hazardous chemicals into the action plan and linking to the related activity in the action plan for sustainable consumption and production (and to SDG12);
- Better controlling the import and export of products and waste, including POPs and other hazardous chemicals;
- Building stepwise capacity for countries developing their first NIP and utilizing the built capacity for governmental work on chemicals management, for implementation activities, and for future NIP updates and reporting (e.g. Article 15 reporting), thus ensuring continuity, further capacity enhancement, project development, and timely and strategic NIP update;
- Getting an overall view of POPs-related issues in the country in order to determine priorities according to each period with newly added POPs. Then, projects will be proposed to ensure sustainability;
- When implementing a project, determining and planning future needed activities, and building projects on one another where feasible (see the good practice case study in Box 44);
- Harmonizing national targets with those of the Convention and GEF;
- Closely cooperating with international organizations (with budgets defined and included in the national plans);
- Ensuring transparency and effective coordination.

Box 44: Good practice case study of projects building on one another considering national and regional activities

1) The strategy: "A project is building on another project"

When the Burundi team was implementing the Project entitled "Enabling Activities to Facilitate Action on the Implementation of the Stockholm Convention on POPs" (financed by GEF to prepare the initial Burundi NIP: 2004-2006), the team discovered a lack of data in the National Chemicals Management Profile. The "Lack of data in Burundi chemicals management Profile" became the basis for another project entitled "Updating the National Chemicals Management Profile and Developing a National Chemical Database in Burundi" (QSPT/SAICM: 2008-2009).

A third project was subsequently generated from the two projects mentioned above, entitled "Institutional Capacity Building for Implementation of the Stockholm Convention on POPs and

Awareness Raising on POPs-related Issues" (QSPTF/SAICM: 2010-2012). Then these three projects led to another one, "Strengthening Capacities for National SAICM Implementation and Supporting GHS Capacity Building in the Republic of Burundi" (QSPTF/SAICM: ongoing since 2015).

2) Internal financial efforts to ensure the sustainability of some regional actions

The sub-regional project entitled "Capacity Strengthening and Technical Assistance for the Implementation of Stockholm Convention NIPs in African Least Developed Countries (LDCs) of the COMESA Sub-region" (GEF:2011-2017) initiated "Awareness raising on POPs-related issues" actions. Since 2011, the Republic of Burundi has been dedicating $5000 in its annual budget to ensure the sustainability of these actions undertaken by the sub-regional project.

5.2 Compliance with the Convention with respect to NIP implementation

5.2.1 Introduction

At the global level, according to Article 17 of the Convention, the Conference of the Parties (COP) shall "develop and approve procedures and institutional mechanisms for determining non-compliance with the provisions of this Convention and for the treatment of Parties found to be in non-compliance" (Stockholm Convention website 2018). "To prepare draft procedures on non-compliance for its consideration, the Conference of Parties established an ad hoc open-ended working group on non-compliance that met in April 2006 and April 2007. Further work on the issue was undertaken by the Conference of the Parties at its third, fourth, fifth, sixth, seventh and eighth meetings. At its eighth meeting, (…) the Conference of the Parties decided to defer further consideration of the matter of compliance to its ninth meeting" (Stockholm Convention website 2018). Therefore, there is yet no agreed upon framework and compliance monitoring protocol.

On the other hand, Parties have internal procedures to monitor and evaluate the implementation of the NIP and related activities. In this chapter, the term "compliance" refers to this internal assessment, since this is currently an important addition to the NIP submission and Article 15 reporting. Since in most developing countries and countries with economies in transition the resources allocated to such evaluation and monitoring activities are limited, these activities are often carried out once a few years, when the NIP document is updated.

5.2.2 Experience with ensuring transparency, effective coordination, and assignment of responsibilities

At the national level, the set up for evaluating the NIP implementation varies from country to country. Some of the Stockholm Convention Parties use the National Coordinating Committee, formed at the time of NIP development to monitor and evaluate the progress on NIP implementation, while other Parties have created special units or committees within ministries and agencies to deal with this, or have allocated such responsibilities to existing structures.

The respondent Parties mentioned the following experiences and approaches:

- One Party reported that they have three strategies for ensuring transparency, effective coordination, and assignment of responsibilities among government agencies, industry, NGOs, and other stakeholders more broadly during the NIP implementation:
    - Organizing meetings. The meetings will provide opportunities for stakeholders' representatives to update one another and exchange information and experiences regarding the NIP implementation.
    - Keeping "the Permanent Steering Committee" operational. Through the committee meetings, the stakeholders' representatives will be informed about and updated on the progress of the NIP implementation.
    - Keeping "the Permanent Technical team" operational. Through the team meetings, the stakeholders' representatives will be informed about and updated on the progress of the NIP implementation.
- All relevant stakeholders have been engaged since the beginning, ensuring their participation in the process. The NIP document is shared for discussion, comments, and opinions.
- A national chemical working group was established, consisting of seventeen ministries and agencies, with a Term of Reference (ToR) to support the government in developing the POPs inventory and action plans and help implement the plans in their respective organisations.
- The BCRC has kept all parties informed of the development, execution and results of the implementation project at all times.
- The Ministry in charge of the environment has a lot of experience coordinating multiple stakeholders. For example, for the NIP update the Ministry set up a committee formed of representatives from government agencies, industry, NGOs and other stakeholders, and involved its members at each step of the process.
- One Party has organized consultative meetings with relevant stakeholders and assigned responsibilities to stakeholders based on their areas of competence. They developed a memorandum of agreement and contract agreements for all concerned parties. The NIP coordinator followed up on progress made on the different task and tried to resolve any challenges encountered. When financial transfers were delayed (which happened frequently) or could not be accessed due to technical errors, the NIP coordinator tried to contact all those involved to resolve the problems amicably.
- The NIP planning and preparation involved active stakeholder participation to ensure ownership and buy-in on project implementation. Specific roles were assigned to all relevant stakeholders.
- The NIP development and implementation work was coordinated by the national coordination committee and the budget execution by the implementing agencies of the United Nations.
- Several Parties observed that some enterprises regard POPs-related issues as confidential and there is a general lack of transparency of research data due to concerns that the data might be put to negative uses.
- Another Party ensured the transparency of the NIP update (inventory, assessment, and action plan) through the continuous dissemination of clear data and information sharing with all related stakeholders.
- During the action plan development, one Party organized a round of workshops with all the stakeholders to develop and agree upon the priorities, criteria, and activities needed and the distribution of responsibility for each institution (thus appointing the lead implementer for each activity).

- The relevant entities and institutions are all members of the National Coordinating Committee for the NIP implementation. They therefore participate in all decisions.
- There has been positive response from all stakeholders during the implementation of other projects and the same is expected for the implementation of the NIP. As long as there is trust, the coordination and delivery of assigned responsibilities are easy.
- For one Party, all stakeholders except for the NGOs were involved during the NIP implementation.
- Another Party established a Taskforce to address and coordinate all matters related to solid waste, including POPs and other chemicals.
- The National Coordination Committee played an important role for implementing the NIP.
- A governmental decision to approve the NIP sets in motion the national mechanism to implement SC requirements. The Steering Committee, established under the previously-implemented GEF projects on OPs and composed of representatives of various institutions, businesses and local authorities, is also instrumental.
- One Party emphasized the importance of having clearly defined roles and responsibilities for stakeholders in plans and programs, developing and maintaining close cooperation among stakeholders, integrating POPs-related issues into environmental protection activities such as training, workshops, news, etc., and supporting industries in doing POPs-related work such as waste management and emission reduction.
- Another Party emphasized the importance of establishing a mechanism for continuous cooperation and coordination, exchanging information, working as a harmonious team, and ensuring the participation of key stakeholders, actors and organizations outside the government.
- Promote the safe use and substitution of POPs and other chemicals within national discussions of sustainable development goals and broader development initiatives.
- One Party emphasized that more integration efforts are needed in order to unify regulation and to bring government agencies, industries, trade chambers, NGOs and other stakeholders together while developing and enforcing legislation to manage chemicals in the country.
- In addition to the governmental structures dealing with NIP evaluation and monitoring, the industry plays a key role when it comes to ensuring compliance with the Convention. For the governmental structures to be able to evaluate the progress achieved, the relevant industry sectors should comply with their responsibilities to meet the Convention objectives and report data and information to the pertinent authorities.

5.2.3 Measuring the NIP implementation

The respondent Parties have used the following approaches to measure compliance:

- Reporting annually to the government on the status of NIP implementation, as required per the government decision;
- Reporting annually on the implementation of the national strategy for chemicals management and the measures taken;
- Including a reporting regime in the NIPs to get information on NIP implementation from ministries, local authorities and other stakeholders, and using other sources of information such as provincial environmental status reports and industry reports;
- Appointing specific organisations responsible for the NIP implementation to report after a specified period of time;

- Comparing the activities planned in the NIP with those that have been implemented;
- Following up on the activities conducted, and evaluating the conducted and completed activities;
- Evaluating the national goals using fixed SMART[60] indicators;
- Assessing the indicators proposed in the action plans;
- Assessing the impacts of banning and reducing the use of POPs and POPs-containing products.
- Using monitoring activities to measure compliance with the NIP implementation.
- Evaluating for example the number of legislations in place and the activities carried out for capacity building and awareness raising.
- Assessing the number of industries using alternatives to POPs and the reduction in the amount of imported goods containing POPs;
- Monitoring the volume of disposed POPs.

5.2.4 Follow up measures

The Parties mentioned a range of follow-up measures and strategies:

- Collecting relevant data, updating inventories, developing inventories for newly listed POPs, and updating the NIP;
- Updating the NIP and integrating the newly listed POPs;
- Conducting inter-ministerial meetings;
- Organizing meetings, assessments by the Steering Committee, and reporting from the Technical Teams.
- Assigning responsibility for follow up to the National Focal Point of the Stockholm Convention, with support from the permanent convention committee;
- Conducting stakeholder consultations and reporting, and following-up with the relevant authorities and other stakeholders, in coordination with the lead implementer of each activity in the action plan;
- Following up through the respective committees developed within the National Commission for ESM of chemical products;
- Monitoring and evaluating monitoring reports from stakeholders;
- Performing material and substance flow analysis for relevant chemicals, covering their entire life cycle;
- Developing further technical assistance (TA) projects based on reports submitted to the government, such as a project on additional OPs removal from the country that was launched using GEF funds and has been further coordinated and financed by bilateral donors.

One party emphasized that, due to resource limitations, follow-up activities are sometimes ineffective.

[60] SMART: Specific, Measurable, Achievable, Relevant, Time-bound (https://en.wikipedia.org/wiki/SMART_criteria)

5.2.5 Mechanisms in place to measure implementation and compliance

In general, regulations have already been set up and are enforced, particularly for the initial POPs (pesticides and PCBs). A list of prohibited chemicals including most of the POPs is being used, for instance at ports. Similar actions are being established for the new POPs. Compliance is mainly ensured by following the reporting requirements of Article 15. However, only 29% of the responding countries have completed their third reporting. Progress on implementation is ensured through the required NIP updates. The work with donors to implement the NIP also contributes to evaluating the project implementation. Without the support of donors there is limited implementation and compliance.

Additionally, the Parties mentioned the following mechanisms and approaches for measuring implementation and compliance:

- One Party is assessing the NIP implementation matrix.
- One Party mentioned that, to ensure its implementation, the updated NIP document will be approved by a council of ministers.
- Some Parties mentioned the role of the coordination committee and coordination mechanism. For some Parties this committee is specific for POPs, for others it addresses more the general ESM of chemicals and products.
- One Party mentioned that they have two mechanisms that have been functioning since 2004: the Permanent Steering Committee and the Permanent Technical Team.
- Some Parties mentioned monitoring and evaluation systems.
- One Party said that any activity plan approved by the government is subject to annual or semester-based reporting. However, progress depends on the availability of national and international funds and on government priorities.
- A Party stressed the importance of recruiting staff for chemicals management. Their ToR includes addressing relevant chemical issues including compliance with chemical-related MEAs.
- Another Party stated that implementation and compliance are ensured through diligent and effective follow-up.

The Parties did not specify to what extent the individual above-mentioned approaches and activities are functioning. Some Parties admitted that mechanisms are not functioning and need to be improved:

- One Party stated that the committee implementing the Stockholm Convention is not functioning correctly and they are making an effort to improve it.
- One Party reported that it is in the process of implementing a reliable mechanism to measure compliance.
- One Party highlighted that their main challenge for implementation and compliance is the newly listed industrial POPs (PFOS, PBDEs, HBCD, SCCPs, etc.), since POPs and other chemicals in products are hard to identify by only examining labels and their attached documents at ports. In all cases, the documents that accompany shipments are very poor indicators of the actual contents. The HS code usually refers to mixtures or groups of chemicals (Koruku et al. 2015). This makes it difficult to control the use of these products and manage stockpiles. Detailed labels that record all chemicals present are needed to combat

fraud, illegal import and transportation, and misuse of POPs and POPs-containing articles and goods.

- Another Party reported that the NIP has not been implemented yet due to lack of staff and funding.

6 Lessons learned relating to the process for further NIP updates

6.1 Identification of the need to review and update the NIP

6.1.1 Background

A number of factors can lead to a need to review and update the NIP. Each Party should regularly assess whether it is affected by any external or internal factors (UNEP 2017). The external and internal factors for reviewing and updating the NIP are listed in Table 3.

The NIP update guidance says that, as part of the NIP review and update, Parties should also evaluate the efficacy of the adopted action plans, strategies, and measures included in their first or last updated NIPs. For example, Article 5 of the Convention ("Measures to reduce or eliminate releases from unintentional production") specifically calls for a review, every five years, of related strategies and their success in meeting the Convention obligations.

Table 3: List of external and internal factors triggering the review and update of the NIP (UNEP 2017)

External factors	**Internal factors**
a) Changes in obligations arising from amendments to the Convention or its annexes, including the addition of chemicals to Annexes A, B or C; b) Decisions of the Conference of the Parties that may affect how Parties implement Convention obligations, including adoption of guidance or guidelines; c) Changes in the availability of technical or financial assistance; and **d)** Changes in access to infrastructure external to the Party (e.g. disposal facilities).	a) Reporting under Article 15 of the Convention indicating that the Party's implementation plan is not adequate; b) A change in national priorities; c) A significant change in national circumstances (e.g. infrastructure or institutional arrangements); d) Inventories of persistent organic pollutants, after improvement or updating, indicating a change in the scope of the problem to be addressed.

6.1.2 Factors determining the need to review and update the national implementation plan

The following factors were considered most relevant for determining the need to review and update national implementation plans pursuant to Article 7 (see Table 1). All respondent countries mentioned that the "*changes in obligations arising from amendments to the Convention or its annexes, including the addition of chemicals to Annexes A, B or C*" were a trigger for NIP update. UNIDO, an agency that has guided 60 countries in the NIP update, and IPEN also highlighted this as major reason for the NIP update.

66% of the countries also considered the "*decisions of the Conference of the Parties that may affect how Parties implement Convention obligations, including adoption of guidance or guidelines*" as a driver for NIP update. The majority of countries (57%) also found that the "*inventories of persistent organic pollutants, after improvement or updating, indicating a change in the scope of the problem*

to be addressed" were a driver for NIP update. Furthermore, IPEN and the majority of respondent countries (52%) found that *"changes in the availability of technical or financial assistance"* are a relevant driver. Other drivers for NIP update were considered less relevant, including "*reporting under Article 15 of the Convention indicating that the Party's implementation plan is not adequate*" (48%); "*a change in national priorities*" (38%); "*a significant change in national circumstances*" (33%); and "*changes in access to infrastructure external to the Party (e.g. disposal facilities)*" (29%), whereas IPEN also considered the latter to be relevant.

This shows that all external and internal triggers listed in the NIP update guidance are, to some extent, relevant to initiating or motivating the NIP review and update. The survey results also showed that, while changes in obligations due to the addition of new POPs are the main trigger, other triggers also motivate the NIP update.
The Parties also commented on how, in some cases, the alternatives suggested or available soon become designated as POPs themselves and need to be addressed. For the countries that, at their Stockholm Convention ratification/accession declared that each Convention amendment needs to be ratified or accepted in order to come into force, the NIP update process is greatly delayed due to delays in passing the amendments through the national procedural steps (within the Parliament).

6.2 Coordination mechanism and process organization

6.2.1 Introduction

The successful development, review, or updating of a NIP requires that an effective coordination and project planning and management structure is in place (UNEP 2017). Success is likely to depend on both an effective executing body responsible for the development, review and updating of the NIP, as well as on a means to engage with a wider group of stakeholders.

National coordination mechanisms for chemicals management may already exist and could be adapted and used for NIP development. Making use of mechanisms and structures already established for developing the initial NIP should facilitate and accelerate the NIP reviewing and updating.

6.2.2 Use of existing coordination mechanisms for NIP review and update

All countries that replied to the questionnaire are planning to use or are already using the existing coordination mechanisms, such as the national coordination committees, for issues related to the Convention. They are making the necessary adjustments to address the factors triggering their NIP review and update. None of the Parties suggested an alternative to a coordination mechanism.

Some Parties reported that the coordination committee takes a more holistic approach addressing chemicals and wastes. One Party emphasized that the coordination committee works towards the sound management of all chemicals. Some countries have both a coordination committee and a technical team, and will maintain both. One Party reported that they are using the already existing National Waste Management Advisory group as their National Coordination Committee. Another Party emphasized that no formal coordination mechanism has been established, but that it has a working group consisting of all relevant institutions. Another Party mentioned that they have a

continuing coordination group for pesticides and are building on it. Some countries mentioned that the established coordination group will be further used for chemicals management initiatives or related issues. UNIDO and IPEN also confirmed that, in their experience, coordination committees are normally in place for the NIP update.

6.2.3 Approaches considered for future NIP update progress

The respondents made a range of suggestions and commitments regarding approaches for future NIP updates, including:

- Using a similar approach, bearing in mind effective coordination and good division of responsibilities among all members of the working group;
- Conducting more consultations at the sub-national level when reviewing progress and updating the NIP;
- Applying a more participatory approach;
- Involving all the key stakeholders through the Permanent Steering Committee and a Permanent Technical Team;
- Engaging industries and relevant departments;
- Empowering the team attending all relevant convention-related meetings, international workshops and trainings, and facilitating the flow of information and spontaneous preparations for actions even before a new chemical is included on convention lists;
- Maintaining the task teams and coordination committee to ensure institutional memory and enhance inventory activities;
- Assisting in the process, particularly in addressing newly-listed POPs that are widely used for industrial purposes and contained in products and articles;
- Mainstreaming chemicals management and related project activities;
- Enforcing the role of the national steering committee and enhancing their technical capacity;
- Strengthening the knowledge management mechanism, to improve the transmission of information under Articles 7 and 15, along with other mechanisms suggested in a UN project;
- Setting up institutional arrangements to address chemicals and waste issues more efficiently, and approving the National Environmental Plan for Sustainable Development to include and foster more actions associated with chemicals and waste;
- Using the guidance under the Convention and the national status on POPs as a basis for determining future NIP updates;
- Following up diligently and effectively on all external and internal triggers for NIP review and update (Table 3).

7 Lessons learned as identified by the Cluster Evaluation of UNIDO Enabling Activities projects

In 2015, the UNIDO Office for Independent Evaluation developed the document entitled "Cluster Evaluation of UNIDO Projects. Enabling Activities to Review and Update the National Implementation Plans for the Stockholm Convention on POPs". The following lessons learned and recommendations are highly relevant to this report:

- The projects have identified the relevant objectives of the GEF5 focal areas, meaning that the national priorities have been correlated with donors' priorities;
- The stakeholders' involvement and awareness raising generated by the NIPs has been considered one of the main achievements of the project;
- There is a need to ensure the integration of socio-economic and gender issues in the review and update of their NIPs, in accordance with the guidance documents produced by the BRS Secretariat;
- Capacity building should be promoted, using the pool of national and international experts that have been engaged in the project implementation, including the national focal points of the chemicals conventions, and encouraging synergies and information exchange among the main stakeholders involved in the NIP review and update;
- Assigning one person the task of collecting and compiling all the deliverables produced under the NIP review and update projects, using a standardised management information and monitoring tool, prevents the loss of information;
- The POPs inventories should be more focused on the traceability and management of POPs;
- Establish and implement the training effectiveness evaluation (pre and post-training tests);
- Certify successful trainees;
- Involve universities or consolidated training institutions in the training activities;
- Periodically repeat the training on POPs, including after the completion of NIP review and update projects;
- Establish national and international web-training portals on POPs.

8 Remaining challenges regarding NIP development, update and implementation

8.1 Sustainability in capacity development and in securing the created capacity

Challenges still faced in building and retaining a capable team, both for policymaking and inter-ministerial coordination issues and technical issues, were underlined by all Parties. In summary, these challenges relate to:

- Frequent changing of the Stockholm Convention National Focal Point, the person who ensures continuity in coordinating Stockholm Convention activities at the national level;
- Frequent loss of trained personnel and lack of funding to train new personnel;
- Frequent re-organization of the inter-ministerial coordination committee due to changes in government structure and understaffed public institutions;
- The policymakers' reluctance to integrate actions addressing POPs into their daily work, since their interests and priorities sometimes differ from the Stockholm Convention objectives;
- Lack of funding for technical activities, leading to the breakdown of the technical team;
- Uncooperative team members;
- Inability of some team members to cope with all Stockholm Convention activities since they are overburdened with other environmental protection activities;
- Lack of funding for further technical knowledge building required for Stockholm Convention technical information developments;
- Infrequent communication among team members and irregular team meetings.

A major challenge in many countries is that staff in ministries changes frequently, and part of the capacity built during the first NIP implementation has been lost. Sustained capacity is highly beneficial for NIP implementation, and in particular for the NIP update process. It can even save money due to a smoother further capacity building process (see case studies Box 4 and Box 5). Properly trained staff can build capacity in other countries (e.g. South-South capacity building, see Box 4 and Box 5).

Another major challenge is the low wages for employees of many of the environmental ministries in developing countries. The salary is often insufficient to meet the minimum living standard for a family. Staff must frequently get a second job or provide consulting services to earn additional money. Staff often leave the ministry if offered a better paying job, which contributes to the brain-drain and loss of built capacity.

8.2 Influencing policymaking to address POPs-related issues and ensure the sound management of chemicals and related waste

8.2.1 Influencing by research institution

At the **national level**, issues related to chemicals, including POPs, are considered and addressed by the national research institutes, which are usually subordinated or under the coordination of the

environment ministries or research and development ministries. Still, many existing challenges at the national level can lead to less informed decision-making and policies. These challenges include:

- Lack of coordination between the line ministries and the national research programmes on policy-related priorities and needs;
- Lack of connection between scientific or technical experts and policy- or decision-makers;
- Lack of or insufficient capacity to understand and assess the national implications of scientific and technical information to support policymaking regarding the Conventions;
- Lack of technical and financial capacity to conduct targeted research relevant to the Stockholm Convention;
- Lack of regional and global cooperation and networking with the POPs research community.[61]

8.2.2 Identifying and quantifying the impact and communicating it to policymakers

The most common challenge to identifying and quantifying the impact and communicating it to policymakers is that policymakers often lack basic scientific literacy and do not understand the quantification results. Therefore, the scientists researching POPs should improve their communication skills to better connect with policymakers, deliver the key messages of their research, and influence the development of evidence-based policies.

Despite existing challenges, one approach that has proven successful and has led policymakers to act, both at the legislative level and during NIP implementation, is the development of cost of inaction calculations (UNEP 2013a) and socio-economic assessments. Such assessments have raised political awareness by highlighting the economic benefits of integrating chemicals management into national development policies and plans. The main challenge to this approach is the insufficient capacity at the national level to conduct such complex assessments. Therefore, further capacity building activities should be dedicated to this topic.

8.2.3 Developing science-based policies

At the national level, the development of science–based policies for POPs or other chemicals and related wastes is based on different research studies and assessments conducted by ministries or agencies staff, or externalized to research institutes or consultancies. Still, in many countries evidence-based chemicals and waste policies remain impractical due to several challenges, such as a lack of technical and financial resources to generate data and information, insufficient coordination between policymakers and research institutions regarding the most relevant research topics to pursue, and few, if any, chemicals and waste research topics included in the national research programmes and, therefore, no prioritization for funding.

8.2.4 Influencing the policymakers

According to the Parties, the biggest obstacles to influencing policymakers are the:

[61] Examples of global POPs research and waste management support include www.dioxin20XX.org, www.ipcp.ch and www.iswa.org.

- Limited technical and financial capacity to generate national evidence-based information regarding the environmental and health hazards associated with POPs;
- Limited technical and financial capacity to implement a policy if approved;
- Policymakers' limited understanding of the issues associated with POPs;
- Poor cooperation and coordination among relevant stakeholders;
- Frequent staff changes at the line ministries, including the focal points under the Multilateral Environmental Agreements (MEAs);
- Frequent governmental reforms and slow economic development.

The main obstacle encountered by NGOs when attempting to influence policymaking within individual Parties was that policymakers in developing countries think they must follow the same technical solutions used in developed countries, although easier options may be available, particularly in waste management.

8.2.5 Engaging with stakeholders outside the government

Despite the high level of engagement, governments face several obstacles when engaging with industry and the civil society, namely:

- Insufficient human and financial resources for outreach to a large number of stakeholders;
- Industry's distrust of government actions on POPs and chemicals management in general;
- Limited or no disclosure about industrial operations, which impedes proactive action on potential pollution affecting society;
- Limited or no financial resources allocated by industry for environmental protection;
- Poor understanding of the impacts of POPs and other chemicals on human health and the environment.

8.3 Technical elements and capacity

8.3.1 Using the national, regional and international technical capacity to develop NIP inventories and action plans

The process of reviewing and updating the NIPs can be challenging for Parties that lack adequate resources and technical capacity. Given this complex situation, Parties have expressed the need for assistance, particularly with addressing newly listed POPs that are widely used for industrial purposes and are contained in products and articles. There is also a need for civil society groups to be active in the NIP implementation phase. Additionally, although some training activities have been developed, the questionnaire identified a need for the Basel and Stockholm Conventions Regional Centres to enhance their training of regional countries regarding POPs (see good practice case studies in Box 1 and Box 2).

8.3.2 Using the technical expertise in monitoring and analysing POPs and other chemicals

Despite strengthening the analytical capacities through participation in the various projects and programs mentioned in Chapter 4.2, important weaknesses still remain. Several countries have the laboratory capacity for POPs pesticides and PCBs needed to participate in the GMP. However, most developing countries lack the laboratory capacity needed for most industrial POPs (e.g. PFOS/PFOA,

PBDEs, HBCD). A major challenge is to capacitate national experts in the analysis of various POPs and building laboratory capacity nationally, to apply and further develop their expertise (see the good practice case studies in Boxes 17, 27, 28, 29 and 30).

The quality assurance and quality control for the monitoring procedure and analytical results are important aspects that require improvement. Developing guidance for monitoring, especially for industrial chemicals, should also be considered.

8.3.3 Controlling POPs in imports and exports

The questionnaire respondents mentioned a range of challenges for import and export:

- Difficulties in identifying POPs present in products and articles, in particular due to the absence of manufacturers declaration of composition and labelling;
- Frequent lack of chemical-specific HS codes, which means that the normal customs analysis reveals only the chemical class but not the chemical identity;
- The fact that customs authorities with access to laboratories mainly analyse samples taken to verify the customs tariff based on the Harmonized System (HS) code chosen by the person who declares the good;
- Lack of capacity and resources to monitor compliance at border entry points, to identify and test chemicals, mixtures and products, and lack of training for custom authorities on POPs texts and codification for POPs, which were identified by 57% of the responses as the main challenges (in particular, the integration of the specificities of POPs into the HS code for POPs classification is relevant);
- Modifying the Tariff Code to minimize the risk of using an incorrect tariff code;
- Lack of training for custom officers and, in some cases, not enough human resources for effective customs control and no capacity building opportunities;
- Insufficient coordination among the key government actors.

8.3.4 Controlling the POPs in use throughout their life cycle

As in other aspects discussed in this report, the life cycle management of industrial POPs presents the greatest weaknesses and challenges. Only 18% of the countries declared that they can control and manage POPs throughout their life cycle. Such challenges are documented for instance for POP-BFR-containing polymers from e-waste in Nigeria and other African countries, which is subject to open burning or dumping (Babayemi et al. 2015; Secretariat of the Basel Convention 2011).

Some Parties are still having difficulties controlling the POPs in use throughout their life cycle, the main issues being the:

- Lack of capacity for chemical detection and analysis, including lack of equipment and training opportunities;
- Limited bilateral and multilateral cooperation;
- Poor implementation and effectiveness of the legal framework;
- Lack of research on new POPs at the national level;
- Lack of incentives for manufacturers, importers and others working along the life cycle of POPs to prevent environmental releases;

- Lack of trained personnel;
- Lack of laws and regulations regarding registration of industrial chemicals;
- Lack of a registration system for industrial chemicals;
- Lack of incentives for importers and manufacturers to shift to alternatives;
- Improper handling, storage and disposal of chemical substances; and
- Research at the national level on the new POPs needing to be established or improved.

Other countries specifically answered that they lack the capacity for controlling and monitoring the products available on the market that may contain POPs. Some countries mentioned institutional problems such as a lack of coordination among ministries on the life cycle management of POPs. Some countries also identified a lack of knowledge in various sectors regarding industrial POPs, and a lack of initiatives to acquire that knowledge. The life cycle of pesticides is better controlled, but the final disposal of pesticide stocks, waste or used containers is often problematic, as it is for other POPs.

Some countries reported that they have not started managing contaminated sites. The challenge of managing contaminated sites is documented, for example, for Kyrgyzstan, including a simple approach to mitigating risk (Box 40; Toichuev et al. 2017a).

8.3.5 Managing POPs releases and wastes, including implementing BAT/BEP

Some of the questionnaire respondents mentioned a lack of knowledge of the different sectors regarding industrial POPs, as well as a lack of initiatives for the sector to deepen in this subject. Before these groups are ready to engage, their needs must be attended to. These needs have been summarized as information, capacity building, resources, training, continual engagement, regulation, and guidelines.

8.3.6 Using the technical capacity and financial mechanisms to destroy POPs

Only 23% of the surveyed countries reported destroying POPs domestically. The remainder (77%) lack the technical capacity to destroy POPs. Several countries also reported lacking a funding mechanism for end-of-life management.

8.3.7 Experience with building capacity for contaminated site assessment

The key challenges in respect to contaminated sites are the:

- Limited or no capacity to assess and secure contaminated sites;
- Lack of databases or other such systems for inventorying contaminated sites in most developing countries;
- Lack of analytical capacity in developing countries for assessing sites contaminated with (new) POPs;
- Weak or lacking regulatory frameworks for defining contaminated sites (e.g. limits for POPs in soil or groundwater);
- Limited availability of best practice case studies of contaminated sites.

A recurring issue is the lack of monitoring capacity. Some countries have initiatives to map the sites potentially contaminated with POPs, but require analytical testing to determine if the sites preselected for mapping are indeed contaminated with POPs and if so, to what extent.

8.4 Funding of NIP development, implementation and compliance with the Stockholm Convention

8.4.1 Budget and funding for the management of POPs and other chemicals and related wastes

Most countries (81%) mentioned that they could not quantify the costs of waste and POPs management. Several countries noted that the budget allocated for this is minimal. Developing appropriate financing and taxation for chemicals and waste management requires a good understanding of the associated costs. Lack of sustainable financing is a major obstacle to improving solid waste management (World Bank 2014).

New industrial POPs impact large volumes of waste, such as e-waste and related plastics, polymers in the transport sector, polymers in construction, textiles, carpets and wood (Secretariat of the Stockholm Convention 2015a,b,c; 2017a,b). Financing for addressing POPs-impacted waste is thus linked to municipal waste management and the overall financing of waste management.

8.4.2 Incremental costs for the implementation of the Convention to better target financial and technical assistance

Most Parties (71%) were unable to determine their incremental cost. UNIDO also reported that, in their experience, countries cannot determine their incremental costs, mainly due to lack of information.

The countries mentioned the following challenges to incremental cost estimation:

- Lack of national experts able to determine the incremental costs;
- Lack of opportunities for training in the determination of incremental costs;
- Lack of basic data and lacking or weak national system for controlling and monitoring the presence of POPs in goods and articles at ports and production sites and their fate in dumpsites;
- Lack of examples for estimating incremental costs;
- Lack of precise costing of the implementation of the Convention;
- Lack of serious budgeting at the national level;
- Frequent listing of POPs under the Convention and the need for implementation. This leads to frequent cost increases and changes, making it difficult to follow up. This includes costs for new regulations and law enforcement in addition to the costs of analytical facilities and operators;
- Inability to finalize the first NIP due to unstable political situation or war.

8.4.3 Co-financing NIP development, update and implementation projects

The Parties mentioned a range of obstacles to receiving funding or general support:

- Insufficient money, in general, in the environment sector;
- Limited national financial resources for the diversity of international agreements ratified or accepted (i.e. agreements related to chemicals or waste management, climate change, biodiversity, etc.) with implementation requirements;
- Tight budgets focused on other priorities;
- Limited lobbying of financial decision-makers;
- Lack of staff; few officers dedicated to chemicals and waste issues;
- Limited visibility of the chemical and waste agenda, which prevents it from reaching all levels of government and accessing national funding, since it is a cross-cutting issue;
- Very limited resources and other more pressing needs in developing countries, meaning that not much support can be given to the Stockholm Convention, since chemicals and waste are often not seen as priorities;
- Some countries preferring to address chemicals and waste management holistically rather than dealing with individual chemicals;
- War and unstable security conditions preventing Stockholm Convention activities from being carried out.

8.4.4 Experience with using socio-economic assessment or cost benefit analyses as arguments

The majority of the responding Parties (71%) had little or no experience applying socio-economic or cost-benefit analysis to POPs-related issues. Also, according to UNIDO, most countries have limited experience with these assessment tools. Parties identified a need for training on such tools and how to use them for convincing decision-makers. One Party mentioned that these are useful tools but that data collection is not easy, due to a lack of information required for this type of assessment.

8.4.5 Experience with linking POPs management to financing for projects on climate change, biodiversity and SDGs

57% of the countries that responded to the questionnaire have not yet considered the links between POPs and the Sustainable Development Goals (SDGs) or climate change. UNIDO also found that these topics are not very well linked within NIP development and implementation. Only a few Parties (14%) mentioned that they have linked the NIP to the SDGs. A few other countries have emphasized that the links to SDGs, climate change and biodiversity are relevant and should or will be better explored in the future. However, the details are yet unknown to the Parties. One of the Parties mentioned that people are now linking waste management to climate change, but that this also needs further clarification and elaboration.

8.4.6 Harmonizing the country's priorities regarding POPs with the possible donor's priorities for funding

The majority of countries (62%) have harmonised their national priorities with those of the donor, particularly with those of GEF. Still, the following obstacles to harmonization were mentioned:

- Lack of a suitable regulatory framework and enforcement;
- Lack of a unified approach to controlling and managing chemicals within the country and lack of an independent integrated system, guidelines, transparent laws and enforcement of the laws and regulations;
- Lack of coordination;
- Lack of financing;
- Perception that financing POPs-related work would take part of the current budget away from other important issues;
- Lack of robust data and inventories;
- Lack of coordination with other priorities such as climate change, biodiversity, SDGs, etc.;
- Lack of an integrated chemicals management system (for all chemicals, including POPs);
- War and unstable security conditions.

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Annex

Annex 1 Recommendation of the UNEP Guidance on developing legal and institutional infrastructures

Table A1: Recommendations from the "UNEP guidance: On the development of legal and institutional infrastructures and measures for recovering costs of national administration for sound management of chemicals" (UNEP 2015)

RECOMMENDATIONS (when establishing legal and institutional infrastructures and financing through cost recovery mechanisms for Sound Management of Chemicals)	
Legal and institutional infrastructure	**Cost recovery**
1. Legislation should be adapted to the national legal framework and be in accordance with the international commitments of the country	1. Policy conditions do not need to be perfect but policy goals need to be coherent with the economic, environmental and societal goals
2. Improving inter-sectoral communication exchange is critical for efficient use of existing information	2. Demonstrating net benefits to key stakeholders of strengthening the legal and institutional infrastructures governing the placement of chemicals on the market
3. Legislation governing the placement of chemical on the market should be comprehensive, coherent and transparent	3. Minimizing costs of legal and institutional infrastructure upfront
4. Clear delineation of obligations and responsibilities of key stakeholders affected by chemical management	4. Reducing costs and building credibility with the industry by establishing a truly leveled playing field
5. Best use of resources and strong coordination are key for efficient organization of national administration	5. Clarifying what is being paid for by closely linking cost recovery with spending or service delivery
6. Regional cooperation can provide an effective and cost-efficient mean for strengthening chemical management	6. Identifying and engaging with a broad range of stakeholders is one way of ensuring that important design issues are covered and political acceptability for the measures achieved.