SAICM/IP.4/7

Distr.: General
21 February 2020

English only

Fourth meeting of the intersessional process considering the Strategic Approach and the sound management of chemicals and waste beyond 2020

Bucharest, Romania, 23-27 March 2020

Item 3 (d) of the provisional agenda[1]

Development of recommendations for consideration by the fifth session of the International Conference on Chemicals Management: Financial considerations

Review of cost recovery mechanisms and other economic instruments for financing of the sound management of chemicals and waste

Note by the secretariat

1. The secretariat has the honour to submit to the fourth meeting of the intersessional process the final review of cost recovery mechanisms and other economic instruments for financing of the sound management of chemicals and waste, prepared as per the request of the third meeting of the Open-ended Working Group held in Montevideo, Uruguay.

2. The first draft of the review was presented to the third meeting of the intersessional process in Bangkok, Thailand, from 1 to 4 October 2019.

3. The review considers input received from stakeholders at the third meeting of the intersessional process and input received in the subsequent comment round. The document has not been formally edited by the secretariat.

4. Participants may wish to review the document and consider it in the discussions under the relevant agenda item on financial considerations.

[1] SAICM/IP.4/1

Annex

Review of cost recovery mechanisms and other economic policy instruments for financing of the sound management of chemicals and waste

20 February 2020

Contents

Abbreviations

CAP	Common Agricultural Policy
CBD	Convention on Biological Diversity
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act (Superfund)
CESR	Center for Economic and Social Rights
COP	Conference of Parties
CREPD	Research and Education Center for Development
CSR	Corporate social responsibility
ECHA	European Chemicals Agency
EPR	Extended Producer Responsibility
EU	European Union
GCO	Global Chemicals Outlook
GEF	Global Environment Facility
GPA	Global Plan of Action
ICCA	International Council on Chemical Associations
ICCM	International Conference on Chemicals Management
IMF	International Monetary Fund
IOMC	Inter-Organization Programme for the Sound Management of Chemicals
IPEN	International POPs Elimination Network
KemI	Kemikalieinspktionen (Swedish Chemicals Agency)
LIRA guidance	Guidance on the Development of Legal and Institutional Infrastructures and Measures for Recovering Costs of National Administration for Sound Management of Chemicals
NGO	Non-governmental organization
OECD	Organization for Economic Co-operation and Development
OEWG	Open-ended Working Group
OOG	Overall orientation and guidance
OPS	Overarching policy strategy
POP	Persistent Organic Pollutant
PRTR	Pollutant Release and Transfer Register
REACH	Registration, Evaluation, Authorization and Restriction of Chemicals
SAICM	Strategic Approach to International Chemicals Management
TURA	Massachusetts Toxic Use Reduction Act
UN	United Nations
UNEA	United Nations Environment Assembly
UNEP	United Nations Environment Programme
UNITAID	International Drug Purchase Facility

1. Introduction

The overall objective of this review is to provide examples of successful mechanisms for cost recovery and implementation of the Polluter Pays Principle for the financing of risk management and risk reduction activities for the sound management of chemicals and waste at the national level. This review has been prepared in response to the call from the third meeting of Open-ended Working Group of the International Conference on Chemicals Management (OEWG-3) held in April 2019 in Montevideo, Uruguay. An interim report was presented to the third meeting of the Intersessional Process considering the Strategic Approach and the sound management of chemicals and waste beyond 2020 held in October 2019 in Bangkok, Thailand. This is the final review, to be presented for consideration at the fourth meeting of the Intersessional Process in Bucharest, Romania, from 23 to 27 March 2020. The review aims to contribute to financial considerations of the Strategic Approach and the sound management of chemicals and waste beyond 2020.

The review explores the use of economic policy instruments in the context of implementation of the industry involvement component of the integrated approach to financing the sound management of chemicals and waste. Focus is centered on two main categories of economic instruments: 1) **cost recovery measures** intended to cover costs for staffing and operating national administrations for chemicals control, and 2) **fiscal measures,** which consist of fiscal policies, such as taxes, that could be used for operating national administrations and that could also change the relative price of a given activity or input, either encouraging or discouraging its use. Command and control measures and voluntary corporate social responsibility (CSR) measures are excluded from the review, even though they play an important role in engaging industry.

This review is structured in three main sections. Activities at the national level constitute the main focus, with dedicated sections on both cost recovery measures and fiscal measures. Thereafter, activities at the international level are discussed, in situations where they guide work at the national level. The review incorporates examples from the national level. In general, a time lag is apparent between high-income countries and middle- and low-income countries with respect to implementation of economic instruments, with high income countries having the greatest number of policies in place. This review attempts to highlight examples from low- and middle-income country to the fullest extent possible, while also bearing in mind that the OEWG-3 requested a review of successful mechanisms for cost recovery. On the effectiveness of fiscal measures, the review found limited research. A concluding section summarizes main points of the review and raises issues for future consideration.

This review is based on a number of sources: input received from stakeholders, a literature review and 12 semi-structured interviews with key stakeholders from governments, UN bodies, academia, the private sector and non-governmental organizations (NGOs). The Secretariat requested input from stakeholders during two phases. First, following the request of the OEWG-3, responses were received from two countries (Iraq and Madagascar), the United Nations Rapporteur on human rights and hazardous substances and wastes, the Research and Education Center for Development (CREPD), the International POPs Elimination Network (IPEN), the Pesticide Action Network and a joint submission from 11 other NGOs. Second, after the first draft report was presented at the third meeting of the intersessional process in Bucharest, the EU, US, Nigeria and IPEN provided input in response to an invitation sent by the Secretariat to all stakeholders.

2. Background

The Polluter Pays Principle is outlined in Principle 16 of the 1992 Rio Declaration on Environment and Development as follows: "National authorities should endeavor to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment" (UN, 1992). In the Malmö Ministerial Declaration of 2000, environment ministers reasserted the continuing importance of the Polluter Pays Principle by stating that: "A greater commitment by the private sector should be pursued to engender a new culture of environmental accountability through the application of the Polluter Pays Principle, environmental performance indicators and reporting, and the establishment of a precautionary approach in investment and technology decisions" (UNEP, 2000).

Many international agreements have internalized the Polluter Pays Principle, some of which are listed in Annex 1. Furthermore, the Polluter Pays Principle has been endorsed in numerous national legal systems (Khan, 2015). For instance, in 2014, China introduced the Polluter Pays Principle in the Environmental Protection Law that was later modified by the Environmental Protection Tax Law that took effect in January 2018 (Zahar, 2018; Li & Masui, 2019). The Polluter Pays Principle is also enshrined in Article 191 of the Treaty on the European Union (EU) and is reflected in the EU Water Framework Directive (2000/60/EC) and Directive on Industrial Emissions (2010/75/EU). In Madagascar, the Polluter Pays Principle is mentioned in the MECIE on the Compatibility of Investments in the Environment Decree.

The often-cited benefit of internalizing the Polluter Pays Principle is efficiency gains achieved when industry minimizes costs and reduces pollution and other environmental impacts, including through development of new technologies, when they are bound to internalize negative externalities (Khan, 2015). Considering equity issues is pivotal for ensuring the fair distribution of costs, i.e., placing the burden on the industry responsible for the pollution rather than the consumer (Khan, 2015).

Since the inception of the Strategic Approach to International Chemicals Management (SAICM) in 2006, industry involvement as part of national or sub-national resource mobilization has been a central feature in its work, as summarized in Annex 2. The overarching policy strategy (OPS) of SAICM states in paragraph 19 that financial arrangements for SAICM include, among other things, "assessing and where necessary adopting appropriate policies at the national and sub-national levels, which could include economic instruments, that can help to cover the cost of sound chemicals management" and "where appropriate, assessing and adopting at the national and sub-national levels economic instruments intended to internalize the external costs of chemicals…" (SAICM, 2006a). Furthermore, the Global Plan of Action (GPA) of SAICM includes the development and application of economic instruments as an activity (no. 193) (SAICM, 2006b).

In 2013, the Governing Council of the United Nations Environment Programme (UNEP) adopted an integrated approach to financing the sound management of chemicals and waste.[2] It is composed of three complementary and interlinked components: 1) mainstreaming the sound management of chemicals and waste into development planning, 2) industry involvement and 3) dedicated external financing. The Governing Council invited "Governments to implement actions to further encourage industry involvement in the integrated approach, including the development of legislation on the responsibilities of industry and national administration, the provision of incentives for sound chemicals and wastes management, and promotion of measures by industry to internalize costs as per the polluter pays principle".[3]

In 2015, the Fourth session of the International Conference on Chemicals Management (ICCM-4) welcomed the integrated approach and highlighted its applicability to SAICM.[4] ICCM-4 also endorsed the overall orientation and guidance (OOG), which specifies "industry participation and defined responsibility across the life cycle, including cost recovery policies and systems as well as the incorporation of sound chemicals management into corporate policies and practices" as one of 11 basic elements that are considered critical at the national and regional levels for the attainment of sound chemicals and waste management (SAICM, 2015).[5]

Although economic instruments have been part of the SAICM agenda for over a decade, their role in the context of the sound management of chemicals and waste are still poorly understood and implemented. The independent evaluation of SAICM highlights that securing sufficient funds has been challenging and that future success will require secure and sustainable funding, inter alia, through introduction of appropriate economic instruments based on the principle of polluter pays (SAICM, 2019a). Furthermore, the second edition of the Global Chemicals Outlook (GCO-II) highlights that "gaps remain in regard to increasing industry contributions to match responsibility and the required level of support" and recommends "promot[ing] extended producer responsibility and internalization of costs by industry" (UNEP, 2019a). The preceding edition of the outlook (GCO-I) already noted that "the vast majority of human health costs linked to chemicals production, consumption, and disposal are not borne by chemicals producers, or shared down the value-chain" and emphasized that "uncompensated harm to human health and the environment are market failures that need correction" (UNEP, 2013a).

The high economic and societal price tag of market failures in the chemicals and waste sector has been well documented in many studies. Some examples of economic calculations of negative externalities are listed below:

- USD 90 billion for health-related costs for smallholders from pesticide use in Sub-Saharan Africa in 2005-2020 (UNEP, 2013a)
- EUR 157 billion median annual health costs for diseases associated with endocrine disrupting chemicals in the EU (Trasande et al., 2015)
- USD 977 billon annual costs related to childhood exposure to lead in low- and middle-income countries (Attina & Trasande, 2013)
- USD 236 billion annual costs for pollution associated with the production and use of volatile organic compounds (UNEP, 2013b)

The societal problems arising from this market failure manifest in various ways. For example, pediatricians have noted a "silent pandemic" of disease and disability associated with exposure to

[2] UNEP/GC/27/12

[3] UNEP/GC/27/12 (para 5)

[4] ICCM4 Resolution IV/1 (intro)

[5] ICCM4 Resolution IV/1 (para 1)

toxics and pollution during childhood, many of which do not surface for years or decades (Grandjean & Landrigan, 2014). Given that the size of the global chemicals industry (excluding pharmaceuticals) is approximately USD 5 trillion, and that chemicals production is expected to double in size by 2030, many actors have voiced the need for more action to internalize the costs to the environment and human health and the environment throughout the entire value chain (UNEP, 2019a).

A recent evaluation of the implementation of the integrated approach to financing the sound management of chemicals and waste highlights challenges in particular for assessing the level of industry involvement, as it remains largely unknown (UNEP, 2019b). The evaluation notes that "…deliberate instrumental use of the integrated approach by national governments at scale to trigger new financial and in-kind participation of industry and other partners is not strongly evidenced" (UNEP, 2019b). This lack of evidence is partly the result of the lack of data collection on implementation at these levels (UNEP, 2019b). To this end, the evaluation calls for a more strategic and pragmatic approach to enhance industry involvement, including accompanying it with outcome and impact monitoring. The evaluation was welcomed by the fourth session of the United Nations Environment Assembly (UNEA), in March 2019 in Nairobi, Kenya.[6] At OEWG-3, stakeholders requested that its conclusions and recommendations be considered during the preparation of this report.

At a higher political level, the UNEA-4 Ministerial Declaration from March 2019 is of relevance, as it expresses deep concern that recent global assessments find that "our planet is increasingly polluted, affected by the adverse effects of climate change, quickly losing its biodiversity, and experiencing widespread environmental degradation" (UNEP, 2019c). The Declaration commits to a variety of measures including to "address the damage to our ecosystems caused by the unsustainable use and disposal of plastic products, including by significantly reducing the manufacturing and use of single-use plastic products by 2030" and to "promote sustainable and innovative financing opportunities and mechanisms to unlock new capital for sustainable investment and upscaling of sustainable business models…" (UNEP, 2019c).

[6] UNEP/EA.4/Res. 8 (para 8)

3. Cost recovery measures

3.1 Overview of cost recovery measures

The integrated approach to financing the sound management of chemicals and waste highlights that the development of "cost recovery measures at the national level to fund the administrative process of providing and maintaining systems for governing the marketing of chemicals at the national level, in order to shift the administrative and operational costs of activities from government budgets to producers and importers that benefit from those activities" is needed to make effective the component of industry involvement (UNEP, 2013c). The development of national legislation—which outlines the responsibilities of industry and national administration—is key, as stipulated in UNEP's Governing Council decision 27/12. Conditions for placing chemicals on the market and the institutional arrangements for decision-making, implementation, fees and enforcement should also be defined in legislation (UNEP, 2019c).

In essence, fees are earmarked for the provision of specific services, whereas taxes are not. Cost recovery fees are aimed at regulated industries and designed to cover the expenses arising from carrying out administrative procedures at the national level for ensuring chemical safety. Such fees can cover costs for inspections and for providing and maintaining registration, licensing and authorization systems. However, the application of cost recovery fees can vary greatly. Another example is the fee a company may pay for the evaluation of an application requesting the authorization of a pesticide. The use of cost recovery fees is recommended together with other financing options, including allocations from the state budget (UNEP, 2019c). The review of legislation governing the placement of chemicals on the market and the development of associated cost-recovery fees needs to be carried out in a way that it does not conflict with the country's obligations with regard to international trade agreements (UNEP, 2015).

Benefits

The Guidance on the Development of Legal and Institutional Infrastructures and Measures for Recovering Costs of National Administration for Sound Management of Chemicals (Lira guidance) highlights that the implementation of cost recovery measures offers governments—even low-income countries—the opportunity to mobilize new, predictable and steady sources of financing to cover costs of national administration for chemicals control (UNEP, 2015). Chemicals control can bring society and industry various benefits, as it makes production and supply chains cleaner and safer and reduces the risk of costly accidents (UNEP, 2019d). It also provides incentives to develop safer chemicals as well as safer and more resource-efficient production methods (UNEP, 2019d). A clear and predictive regulatory framework for chemicals management is an asset for businesses in any location and has not been shown to result in the relocation of businesses (Persson et al., 2013)

Challenges

In principle, cost recovery fees should help make the work of national chemicals agencies predominantly self-sustaining and self-financing by enabling the mobilization of predictable, reliable and secure financing. However, achieving and maintaining a high cost recovery rate is often challenging. In particular, weak legal systems in many developing countries and shifting political priorities can hinder establishing and managing necessary mechanisms for national chemicals control, including through the use of cost

recovery fees. In addition, the transnational nature of the chemicals industry and its markets can make purely national approaches to cost-recovery challenging, even for large, high-income countries.

Good practices are emerging in many countries, but many low- and middle-income countries can find the burden of establishing a national approach overwhelming due to limited support and capacity. Further, some low- or middle-income countries may be reluctant to establish such national cost internalization instruments because of fear that this would result in a loss of investment and trade opportunities relative to their neighbors.

Substantial costs incurred by governments for sound chemicals management results from chemicals that are either not produced in that country or not directly imported. Instead, the chemical may be found in imported products and released to the environment when the product is used or after it is discarded as waste. Such chemicals may be of substantial volume, and measures to ensure they do not harm health and the environment can be costly. A national cost recovery system to address this would likely not be sufficient to recover these costs.

Risk assessment can complicate the operations of national chemicals agencies and can be excluded in the primary phase in setting up such agencies in low-and middle-income countries. In this context, the Massachusetts Toxic Use Reduction Act (TURA), which combines voluntary and binding measures, provides an effective bottom-up approach that these countries could adopt.

3.2 Classification

Fees are designed to cover costs of general or specific public administrative services, whereas taxes refer to a payment required by law from persons, groups or companies in order to provide the state and municipalities with revenue (UNEP, 2019e). A classification of the various types of cost recovery fees is summarized in Table 1.

Table 1. Types of cost recovery fees for carrying out administrative functions for chemicals safety (UNEP, 2019e; KemI, 2018).

Type of fee	Who pays?	What is covered?
Annual fees	Companies placing chemicals on the market in a country, both chemical producers and importers	Maintaining registers, performing inspections, granting exemptions, providing a helpdesk and issuing licenses
Fees / service	Companies charged for each service provided (as alternative to annual fees)	Could include e.g. inspections of companies and assessments of applications from companies
Authorization fees	Companies requesting authorization for the use of chemicals with hazardous properties	Processing of the application requesting authorization
Inspection fees	Companies that place chemicals on the domestic market	Market surveillance of chemicals on the domestic market, including testing and verifying products
Import fees	Importers requesting licenses to import and sell chemicals on the domestic market	The costs of processing the licensing

3.2.1 Annual fees

When an annual fee measure is applied, all companies placing chemicals on the market in a country—both chemical producers and importers—pay an annual fee. To implement such schemes, the country must first issue legislation which defines the fees. Annual fees can consist of flat-rate fees or fees that are differentiated based on the number of products, volume, toxicity class or a combination of these. Annual fees can be used to support related government responsibilities, such as maintaining registries and performing inspections of producers and importers of chemicals (KemI, 2018).

3.2.2 Fees per service

As an alternative to annual fees, cost recovery can also be implemented by charging companies per service provided. This would require that the cost of a specific service be easily defined. Like annual fees, fees for services can include a degree of differentiation, either by the company size or by the complexity of the service provided (UNEP, 2019c). The following are examples of types of fees per service.

Authorization fees are typically applied to chemicals of high concern. Most countries have authorization systems for pesticides, and many of these have introduced some level of fees to cover the cost of authorization (UNEP, 2019e). Once a substance has been defined as a substance that requires authorization, companies or groups of companies must apply for such authorization (KemI, 2018). The procedures for assessing the substances before the authorization are costly, and fees have to be set to cover the workload of the authority (KemI, 2018).

Inspection fees enable inspection of companies that place chemicals on the domestic market. Two main models include market surveillance (covered in this subsection) and border control (addressed in the following subsection). Inspection involves checking the quality of the information provided by a producer or importer, including laboratory analyses. It is important that inspection fees cover access to qualified laboratories for conducting inspections of chemicals placed on the markets, including the use of certified laboratories from the private sector (KemI, 2018).

Fees for import licenses. Many countries have systems in place where import licenses provide the right to import and place chemicals on the domestic market. Countries often charge a fee for such licensing. In such cases, the fees for each delivery are paid at the border. Importers are either charged per ton or charged an administrative fee each time they import (UNEP, 2019e). Fees for import licenses normally cover the cost for processing licenses but not for chemicals management activities in the countries (KemI, 2018).

3.3 Examples of cost recovery systems

Financial considerations of the OPS outline the need to assess and, where necessary, adopt appropriate policies at the national and sub-national levels that can help to cover the cost of sound chemicals management (SAICM, 2006a). Defining the role and responsibilities of the industry and the wider business community in legislation is key, as responsibilities entail activities to be funded that enable cost internalization. This involves, first and foremost, ensuring that national administration capacity for chemicals control, including enforcement of the requirements legally placed on industry. Cost recovery systems have been developed both at the national and subnational level, but the EU has also taken a regional approach to their application. However, there has not been a global overview of the use of cost recovery mechanisms. In the absence of such a global overview, this subsection provides case-studies of cost recovery mechanisms used at different levels.

3.3.1 National level

To date, many high-income countries have developed mechanisms to cover the costs of national agencies responsible for chemicals control. Cost recovery systems are also emerging in low- and middle-income countries, such as Costa Rica, Serbia, Kenya and Vietnam, but there is scarcity of information regarding the application of fees (Chemical Watch, 2019; UNEP, 2019e). Examples from Sweden and Costa Rica aim to illustrate cost recovery systems at the national level.

EXAMPLE 1: Use of cost recovery fees in Sweden

The Swedish Chemicals Agency (KemI) was established in 1986. The agency is an example of a separate agency under the Ministry of Environment that has its own secretariats for finance and accounts, human resources and communications (UNEP, 2019e). The annual chemicals fee they charge is linked to the amount of chemicals produced or imported and the number of chemicals products reported to the Swedish Products Register (KemI, 2018). In the case of requests for the authorization of pesticides, both an application fee and an annual fee related to the value of the volume sold are applied (KemI, 2018). These fees generate revenues that are allocated through the state budget to the agency. In 2017, the chemicals cost recovery fees financed 50 % of the agency's administrative costs (KemI, 2018). Initially, 80 % of the operations were covered by cost recovery fees, but over the years additional functions have been introduced (such as international cooperation) that have increased the share taken from the state budget. KemI employs on total 290 staff members (KemI, 2020).

EXAMPLE 2: Use of cost recovery fees in Costa Rica

In 2006, the Technical Coordination Secretariat for Chemicals Management was established through Executive Decree no. 33104 as a coordination mechanism for the sound management of chemicals in Costa Rica to support the national competent authorities. The Decree serves as the legal basis for coordination among relevant ministries and stakeholders for establishing effective protocols for different situations involving chemicals management. An online platform called REGÍSTRELO has been introduced to streamline the registration of "products of sanitary interest".[7] Its implementation has significantly facilitated the registration tasks of the competent authority, as well as those of the regulated entity. The registration fee applied for "products of sanitary interest" is an example of a cost recovery fee per service, which has been calculated to recover associated institutional costs. This includes the cost of designing and maintaining the registration system's online platform, the cost of hosting company files/registries on the platform's server, the institutional internet costs for maintaining the registration platform and bank charges for receiving and administering payments by companies that wish to register (UNEP, 2019e).

3.3.2 Subnational level

The OPS of SAICM places importance on advancing the use of cost recovery measures at the sub-national level. In some countries (e.g. US and Canada), cost recovery systems have been developed at the sub-national level (Massey, 2011).

EXAMPLE 3: Massachusetts Toxics Use Reduction Act (TURA)

The Massachusetts Toxics Use Reduction Act (TURA) was enacted in 1989 and provides a useful model for combining mandatory and voluntary components for cost recovery. It has served as a model for other states in the US and internationally in efforts to reform chemicals policies at the sub-national level (Massey, 2011). A core obligation includes an annual fee that businesses pay, which enables three implementing agencies to provide required services, including training, grant programs, research and technical assistance. The fee varies according to the number of full-time employees and the number of hazardous chemicals used. As of April 2019, the TURA list includes 1,533 hazardous chemicals (TURA, 2019). Additionally, TURA includes two obligations for companies that use large amounts of toxic chemicals: reporting on chemical use annually and preparation of toxics use reduction plans biennially.

Promising features of TURA include performance outcomes, using mandatory planning mechanisms, and supporting innovation through technical assistance and peer mentoring (O'Rourke & Lee, 2004). Over the period 2000 to 2010, companies were observed to reduce toxic chemical use by 22% and on-site releases of toxics to the environment by 65% (MassDEP, 2012). On-site technical assistance visits to companies have been observed to reduce the use of toxic chemicals by an average of 9% as compared to before such visits (Reibstein, 2008). However, companies are required to only prepare, not to implement biennial plans, and the state has only a limited ability to encourage their implementation (Wilson, 2006). In addition, TURA does not require companies to evaluate the toxicity of, or disclose information about, chemicals in their products (Wilson, 2006).

[7] www.registrelo. go.cr

3.3.3 Regional level

The European regulation on Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) applies a unique regional approach to the application of cost recovery. Also, other economic and political integration organizations advance regional cooperation on chemicals and waste management in many regions (UNEP, 2019a).

EXAMPLE 4: REACH regulation in the EU

REACH contributes to fulfilling the Polluter Pays Principle mainly by internalizing risk management through the obligation for companies to prove that their substances are safe by carrying out pre-market safety and toxicity testing of substances introduced to the markets. This applies to both existing and new substances, which, because it does not favor the use of existing substances that lack safety and toxicity testing, creates a level playing field and stimulates innovation. Since REACH came into force, 17,000 substances have been registered and, therefore, assessed by industry (European Commission, 2018a).

Furthermore, the Polluter Pays Principle comes into play by using fees to recover the operational costs of running the European Chemicals Agency (ECHA), which manages the implementation of REACH. The estimated scale of potential benefits for human health and the environment remains in the order of EUR 100 billion over 25–30 years (European Commission, 2018b). The second 5-year review of REACH shows that it has significantly contributed to directing the EU's work towards meeting the SAICM's overall objective for the achievement of the sound management of chemicals throughout their lifecycle by 2020 (European Commission, 2018b). REACH has also influenced legislation in other countries (e.g. Korea and China), although significant differences still exist (European Commission, 2018b).

ECHA was founded in 2007 as the central entity responsible for administration of the EU's REACH Regulation. ECHA, which employs approximately 600 staff members, relies on a variety of fees that have helped cover 70% of the operational costs of the agency from 2006–2020 (European Commission, 2018b). However, after 2020, the income from cost recovery fees is expected to drop significantly (particularly from registration), necessitating consideration of other sources of income (European Commission, 2018b).

REACH specifies that substances of very high concern can only be used after being granted authorization. Companies can apply for authorization of these substances. The fee for an application for authorization is EUR 54,000 for large enterprises and EUR 5,400 for micro enterprises (Official Journal of the EU, 2018). Other fees are also progressive to ensure that small enterprises are not overburdened and the capacity to innovate and stimulate job creation remains.

4. Fiscal measures

4.1 Overview

Since the early 1970s, the role and use of fiscal measures has been growing, as evidenced by the considerable increase in the number of applications for pollution control and natural resource management and the diversification of those instruments already being applied (OECD, 2017). The most notable proliferation in the use of fiscal measures occurred after the launch of the Brundtland report, which recommended their use to help integrate environmental considerations into other policy areas (World Commission, 1987).

The use of fiscal measures for chemicals is a relatively recent evolution in the environmental policy field. These have been modelled after pollution charges that have been used successfully to reduce emissions of, inter alia, sulphur dioxide and nitrogen oxides (OECD, 2017). Fiscal measures are suitable to consider for moderately hazardous substances where a total phase-out is not considered necessary and usually take the form of a new policy, regulation, or economic or social programme. Before considering the introduction of an economic instrument as a tool to reduce risks from a substance, the administrative costs—both for the authorities and for the industry—should be considered.

Benefits

Fiscal measures aim to internalize environmental externalities so that the true environmental and societal costs of products and services are accurately reflected (Metcalf, 2019). This can generate significant revenues for operating national administration: in 2018, fiscal revenue generated from environmentally related taxation constituted around 2 % of GDP and around 5 % of total tax revenues in countries in the Organization for Economic Co-operation and Development (OECD), deriving mainly from taxation of energy products, motor vehicles and transports (Slunge & Alpizar, 2019).

In practice, fiscal measures are policy measures that direct behavior, leading to the gradual reduction of negative externalities, benefitting both human health and the environment. Taxes and charges that create incentives for substitution can also be used as an intermediary step to facilitate implementation of tougher use-restrictions, with potential progression to prohibitions (Slunge & Alpizar, 2019).

Fiscal policies have been hailed for their ability to incentivize producers to improve environmental performance in contrast to traditional command-and-control policies (Andersen, 1995). Thus, by increasing the cost of specific chemicals use, taxes and charges can stimulate innovation as well as the search for new alternatives in order to avoid the relatively more expensive controlled-usage costs (Slunge & Alpizar, 2019).

Challenges

The use of fiscal measures requires careful preparation, piloting and making any necessary post-launch adjustments, which require expertise and can easily burden administration. To this end, they are not suitable for broader use in the early stages of establishing and operating a national chemicals authority. Nevertheless, reforming the subsidy structure (e.g. removing environmentally harmful subsides) entails a promising starting point for many low- and middle-income countries (Slunge & Alpizar, 2019).

The use of fiscal measures can provide additional revenues in the short-term and, to some extent, serve to internalize externalities in line with the Polluter Pays Principle. However, since their intention is to predominantly change behavior and, in this way, reduce the use of hazardous chemicals, they do not provide a consistent revenue stream over time. Thus, fiscal measures are best suited towards achieving environmental policy targets and their role in cost internalization could remain rather limited at the national level. Following the same logic, fiscal measures should not be used as cost recovery measures where steady and predictable funding is required to ensure the efficient and balanced operation of national chemical authorities.

The use of fiscal measures can encounter political challenges and the question of equity should be factored fully into their design. The recent "yellow vest" protests in France resulting from the significant increase in fuel prices due to a fiscal measure designed to curtail carbon dioxide emissions is a stark reminder that social issues deserve attention. To this end, when designing fiscal measures, it is important to avoid transferring the cost of internalization to consumers if industry is the target.

Data on the effectiveness of economic instruments is scarce. This may be due to the fact that fiscal measures on chemicals are still relatively new and research is not yet available. Nevertheless, it is generally noted that more economic policy researchers need to engage in such studies. In particular, more research is required to identify best practices that could be scaled.

4.2 Classification

The OECD monitors the use of market-based measures and maintains the OECD Policy Instruments for the Environment database ("Pine database"), which contains 3,400 policy instruments categorized under 12 environmental domains. Chemicals and waste do not have an independent domain, but they are covered under several other domains, in particular "water pollution", "land contamination" and "ozone layer protection" (OECD, 2019). The OECD classification is described in Table 2, with indication of the category's applicability to chemicals and waste. This review broadly follows the OECD classification, while suggest some tailoring specific to chemicals and waste.

Table 2. OECD classification of environmental policy instruments and their applicability to chemicals and waste (OECD, 2016a; Slunge & Alpizar, 2019).

Category	OECD Definition	Applicability to chemicals and waste
Taxes	Compulsory, unrequited payment to government levied on tax base with a proven, specific negative impact on the environment	Yes, e.g. pesticides, inorganic fertilizers and chlorinated solvents
Fees	Compulsory requited payments to the government that are levied in proportion to the services provided	Yes, e.g. hazardous waste, pesticide or chemical containers, tires, batteries
Tradable permits	Market-based instruments that provide allowance or permission to engage in an activity	Yes, e.g. lead in petrol, ozone depleting substances
Deposit-refund	Combination of a product charge (the deposit) and a subsidy for recycling or proper disposal (the refund), generally with the objective of discouraging illegal or improper disposal	Yes, but could focus on Extended Producer Responsibility (EPR) schemes (e.g. on waste electrical and electronic equipment). Deposit-refund schemes (e.g. containers made for pesticides) is a subcategory of EPR
Subsidies	A subsidy is environmentally motivated if it reduces directly or indirectly the use of something that has a proven, specific negative impact on the environment	Yes, distinction could be made in two sub-categories: subsidy use (e.g. for organic farming and lead paint removal) and removal of subsides (e.g. for the use of fertilizers and pesticides)

The Pine database covers environmental policy instruments from 107 countries. An analysis of measures in the Pine database identified 113 applications in 35 countries relevant to chemicals and waste: 45 taxes, 50 fees, 15 deposit-refund systems and 3 tradable permit systems (Slunge & Alpizar, 2019). This constitutes only 3.3 % of all the applications listed in the Pine database, indicating that the use of market-based instruments for chemicals management is relatively limited. Undoubtedly, many more applications exist, but due to the absence of a specific domain allocated to chemicals and waste they are, arguably, less likely to find their way into the database as compared to areas tracked systematically.

An analysis by Slunge and Alpizar (2019) shows that fiscal measures can be applied to all stages of the lifecycle of chemicals but are most commonly used for hazardous wastes. Taxes, fees and deposit-refund systems are frequently applied to products such as tires, batteries, accumulators, electrical and electronic products, vehicles, and other aspects of hazardous waste management. Some countries also use charges or deposit-refund systems for containers made for pesticides and other chemicals. Less common are taxes and charges imposed on pesticides, fertilizers, ozone-depleting substances and chlorinated solvents. Tradable permit systems were found only for ozone-depleting substances and chlorinated solvents.

4.3 Examples of fiscal measures

4.3.1 Taxes

This section provides examples of various types of taxes. Taxes refer to a payment required by law from persons, groups or companies in order to provide the state and municipalities with revenue, whereas fees are paid as compensation to cover costs of general or specific public administrative services (UNEP, 2019e). Conceptually, taxes should be set at a level that internalizes the true costs of environmental damage in order for tax to reflect the real environmental costs of pollution. This is known as a Pigouvian tax. However, experience shows that Pigouvian taxes have rarely been used due to the difficulties in assessing the cost of associated environmental damages. Thus, many countries have followed a more pragmatic "Baumol-Oates" approach, in which the tax is set at a rate that should influence taxpayers' behaviour (Khan, 2015). By enacting an environmental protection tax, a more comprehensive approach to environmentally-related taxation can be achieved, and chemical pollutants can be an important inclusion in this approach.

EXAMPLE 5: Environmental Protection Tax in Vietnam

In 2012, Vietnam implemented an Environmental Protection Tax (EPT) which set a range of tax rates for different pollutants, including those arising from the use of fossil fuels, pesticides, fertilizers and plastics. The EPT in Vietnam is often hailed as a best practice example of environmental taxation in the context of non-OECD countries because it is fairly comprehensive, covering a wide range of pollutants, while the design of the tax facilitates simplified adjustment (VIDC, 2018). To ensure that chemicals management meets intended objectives, Vietnam has invested in staffing: 15 staff are employed in pesticides management in the Plant Protection Department, 15 chemicals staff are employed in the Pollution Control Department and 38 staff are employed in the Vietnam Chemical Agency (VINACHEMIA) (UNEP, 2019e). There is some evidence of positive behavioral responses and reduced pollution and emissions as a result of the EPT (VIDC, 2018).

EXAMPLE 6: Environmental Protection Tax in China

In January 2018, the Environmental Protection Tax Law came into force in China with the objective of protecting and improving the environment, reducing pollutant emissions and promoting ecological civilization. The law imposes a tax on 41 gas pollutants, 61 water pollutants and four solid pollutants.

Enterprises, institutions and other producers who directly discharge taxable pollutants into the environment should be subject to an environmental protection tax. In conjunction with the tax reform, the 2004 "Regulations on Collection and Use of Sewage Fees" was abolished to allow more specific requirements for environmental protection, including improved integration of sound management of chemicals. The schedule attached to the 2018 law stipulates the types and amounts of relevant pollutants e.g. water pollutants are listed in two categories: the first category includes 10 pollutants (total mercury, total chromium, total cadmium, hexavalent chromium, total arsenic, total lead, total nickel, benzopyrene, total beryllium and total silver) and the second category includes suspended solids, BOD, COD, TOC and many organic chemical pollutants, such as o-xylene, p-nitrochlorobenzene and dibutyl phthalate. Experiences show that the tax has helped to simultaneously generate revenues and enhance sound management of chemicals: during the first seven months of 2019, the tax generated 16.5 billion yuan of taxes, a 70 % increase compared to 2018.

Flame retardants can be found in many consumer products. They are linked to serious health effects, including endocrine disruption (UNEP, 2019a). Halogenated options based on chlorine and bromine compounds are considered more hazardous than non-halogenated options, like phosphorus compounds. In cases like these, taxation can help countries transition to safer alternatives. For example, Sweden has pioneered a tax aiming to encourage the substitution of hazardous flame retardants in electrical and electronic products with less harmful alternatives. The tax has recently come into force and has not yet been evaluated.

EXAMPLE 7: Tax on flame retardants in electronics and electrical products in Sweden

In July 2017, Sweden introduced a tax on hazardous flame retardants in electronic and electrical products to incentivize their substitution with less hazardous alternatives. Producers and importers of electronics and electrical products pay a tax that is calculated on the weight of the goods amounting to EUR 1 per kilo for kitchen appliances and EUR 15 per kilo for other electronics. The tax is limited to a maximum of EUR 42 per item. Producers and importers receive a tax deduction based on two factors: which flame retardant compounds the product contains and whether the compounds are additive or reactive. The tax deduction is 50 % if the products do not contain additive bromine and chlorine compounds. If the products are, in addition, free from additive phosphorus compounds and reactive bromine and chlorine compounds, the tax deduction is 90%. However, the tax has been questioned by industry as not being based on a comprehensive risk assessment and for being administratively burdensome (Slunge & Alpizar, 2019). The tax is undergoing a formal evaluation in 2020.

Pesticide taxes can be efficient elements of an optimal pesticide policy (Skevas et al., 2013). In 1984, Sweden introduced the world's first special flat tax on pesticides based on the volume sold (Böcker & Finger, 2016). Today, similar taxes on pesticides are in place in Belgium, Canada, Denmark, Finland, France, Italy, the Netherlands, Norway, Vietnam, Mexico and the US state of Louisiana (UNDP, 2017; VIDC, 2018; Slunge & Alpizar, 2019). Several countries (Denmark, Norway, France and Mexico) use risk-differentiated taxation for pesticides to incentivize farmers to use less hazardous alternatives (Slunge & Alpizar, 2019). Evidence from European taxation schemes shows that despite the fact that taxes have not reduced total quantities of pesticide use, they have led to targeted reductions of risks caused by pesticide use (Böcker & Finger, 2016).

EXAMPLE 8: Pesticide tax in Norway

In 1999, a new taxation system for pesticides was introduced in Norway. Pesticides were grouped into seven categories based on their health and environmental risks, with higher taxation placed on products in higher risk categories. Consequently, there has been a shift towards the use of less hazardous pesticides. However, the tax has only led to a slight reduction in overall pesticide use (Kjäll, 2012). Further assessments have demonstrated reductions in violations of maximum allowed water nutrient levels as well as the number of detected residues, but it is not clear whether the differential tax played a role in this reduction (Böcker & Finger, 2016). The government estimates the tax generated approximately NOK 50 million (EUR 6 million) in 2015, although these revenues were not earmarked for environmental purposes (Böcker & Finger, 2016).

Fertilizers have been taxed in several countries, including Austria, Belgium, Finland, Denmark, the Netherlands, Norway and Sweden. Taxes on fertilizers are based predominantly on the weight of nitrogen and phosphorus (Slunge & Alpizar, 2019). However, many countries have abolished such fertilizer taxation schemes. For example, Austria and Finland abolished existing fertilizer tax schemes, arguing they had a negative impact on the competitiveness of their agricultural sector after they joined the EU in 1994. Sweden abandoned the tax in 2010 for the same reason (Slunge & Alpizar, 2019).

EXAMPLE 9: Tax to address cadmium contamination in fertilizer in Sweden

In 1994, Sweden introduced a tax based on the cadmium content of fertilizers. The aim was to elevate the price of cadmium-containing fertilizers to bring them in line with the price of less harmful fertilizers. The goal of the tax was also to provide incentives for environmentally sound cultivation and to contribute to more rapid development of cleaner technologies (SOU, 2017). The tax rate was set at SEK 30 per gram of cadmium in the fertilizer. The tax was found to be very effective because the average cadmium content per ton of phosphorus was reduced from 25 grams in 1995 to less than 10 grams in 2000 (SOU, 2003). Following the peak of world market prices for mineral fertilizers and the financial crisis of 2008–2009, pressure from farmers led to the abolishment of the fertilizer tax in 2010 (Andersen, 2016). Proposals have since been presented and discussed for its reintroduction, but challenges remain (Andersen, 2016).

Lead has been subject to taxation during its phasing out in gasoline. The most expeditious policy for eliminating lead in gasoline is to ban it outright (OECD & UNEP, 1999). However, as an interim measure prior to taking this final step, many countries chose to adopt a tax policy that assured the price of unleaded gasoline was lower than leaded forms. This helped develop a market drive, which stimulated the rapid increase in production of unleaded gasoline (OECD & UNEP 1999).

EXAMPLE 10: Introduction of unleaded petrol in Singapore

Unleaded petrol was introduced in Singapore in 1991. Its use was encouraged through a differential tax system making unleaded petrol about 10 cents per liter cheaper than leaded petrol. At the end of 1997, the sale of unleaded petrol constituted about 75% of total petrol sales. Availability of unleaded petrol enabled Singapore to rapidly adopt more stringent exhaust emission standards for petrol-driven vehicles that required the use of catalytic converters. Oil companies voluntarily agreed to phase out leaded petrol by July 1998. (OECD & UNEP, 1999).

4.3.2 Subsidy use and removal of harmful subsidies

Subsidy use is a policy instrument involving financing that encourages sound management of chemicals and waste (e.g., for organic farming and lead paint removal). Subsidies are a mirror image of fees and taxes. Subsidies can take many different forms, including direct payments, tax reductions or exemptions and favourable loans. For example, many countries use subsides to promote environmentally friendly agriculture. The Republic of Korea is one of few cases where organic fertilizers are subsidized (Slunge & Alpizar, 2019). The Common Agricultural Policy (CAP) provides support for farmers for maintenance and conversion to organic farming (European Commission, 2019a). Another example of subsidies comes from the US, where several states subsidize the removal of lead paint from private properties, e.g. in Massachusetts where a tax credit is available for property owners who have paid for deleading (Slunge & Alpizar, 2019).

Removal of harmful subsidies that encourage the unsound use of chemicals (e.g. fertilizers and pesticides) form another category that require attention. Subsidies often emanate from unanticipated side-effects of policies designed to attain other objectives. Many countries heavily subsidize fertilizer and pesticide production and use to promote agricultural production and increase food security (Slunge & Alpizar, 2019). However, these subsidies can have a severe negative environmental impact and have a high fiscal burden (Slunge & Alpizar, 2019). In particular, where water quality has deteriorated due to excessive fertilization with nitrogen, which eventually enters water bodies where it transforms into nitrates causing serious consequences for growth and brain development of exposed children (Damania et al., 2019).

EXAMPLE 11: Reform of subsidy scheme for chemical fertilizer in India

To increase agricultural production in India, the central government began subsidizing the use of chemical fertilizers in 1977 (Ravinutala, 2016). In 2015, the cost of fertilizer use in India was approximately USD 12 billion (Gulati and Banerjee, 2015). Large areas of farmland applying nitrogen (N) rich urea-based fertilizers have significantly lost fertility due to excessive fertilization with urea (CBD, 2011). Reforms have been undertaken to balance the use of fertilizers, including a 10 percent increase in the price of N rich urea-based fertilizers. In 2009, the Indian Cabinet decided to relax controls on the prices of fertilizers, with the exception of urea (CBD, 2011). It was hoped this would favor the use of potassic (K) and phosphate (P) based fertilizers in relation to N rich urea (CBD, 2011). In 2018, the subsidy programme was again reformed to prevent overuse of fertilizers and reduce costs (Slunge & Alpizar, 2019).

EXAMPLE 12: Removal of pesticide subsidies in Indonesia

In the mid-1980s, a decrease in rice production was observed in Indonesia as a result of the overuse of pesticides. Overuse had wiped out natural enemies of many pests, including the brown rice planthopper. The economic loss to the rice sector from pest infestations was estimated to be USD 1.5 billion. In 1986, the Indonesian government removed pesticide subsidies. This led to pesticide applications being halved and a growth in rice production with three million tons over four years was observed. An additional benefit of a USD 100 million fiscal saving resulted from the elimination on these subsidies. The pesticide subsidy removal occurred at the same time as the adoption of an integrated pest management programme and the decentralization of many government functions, including agricultural extension, which made it more likely to succeed. This experience suggests that subsidy removal is feasible even when there is strong opposition from some stakeholders (CBD, 2011).

4.3.3 Extended producer responsibility, including deposit-refund systems

Extended producer responsibility (EPR) extends manufacturers' responsibility beyond the production process to cover wider product cycle with a broad range of mandatory and voluntary measures, such as product take-back requirements, performance standards, market-based instruments or information instruments (OECD, 2016b). In May 2019, the Conference of Parties (COP) of the *Basel convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal* adopted practical manuals on EPR and financing systems for environmentally sound management, which highlights that EPR policies seek to shift the burden of managing certain wastes from municipalities and taxpayers to producers, in line with the Polluter Pays Principle (BRS, 2019).

The main emphasis of EPR is to provide an incentive for sustainable product design and the term is often used interchangeably with the term product stewardship. In practice, EPR consists of collecting products that have become waste and sorting these before treatment according to the waste hierarchy (OECD, 2016b). EPR systems have helped increase recycling and collection rates and generated revenues to cover associated costs, however, free riding associated with the growth of online sales has become a new challenge (Hilton et al., 2019).

Currently, around 400 EPR systems are in operation across the world, with the majority relating to electronic and electrical equipment, packaging, tyres, or batteries (Hilton et al., 2019). Most EPR applications can be found in high-income countries, but in the last decade, several low- and middle-income countries have introduced EPR schemes (Slunge Alpizar, 2019). For instance, both China and India have introduced EPR systems for electrical and electronic equipment (Gu et al., 2017; Awasthi & Li, 2017).

EXAMPLE 13: Industry Waste Management Plan in South Africa

South Africa is in the midst of a significant overhaul of product stewardship operations. The recent Industry Waste Management Plan includes 5-year EPR plans for three product streams: printed paper and packaging, electrical and electronic products, and lighting industries. The plan moved product stewardship from a voluntary scheme to a robust legal regime for each respective product stream with the aim of increasing recycling rates from 58.2 % to 66.9 % over five years. The projected income of R 2.482 million will be invested in growing collections, developing infrastructure, training and development, litter reduction and the creation of an inclusive recycling industry and its supply chains. It is also estimated that 11,067 new jobs will be created (Packaging SA, 2018).

Agrochemicals and empty containers provide a good example of EPR implementation. Although some countries have introduced EPR schemes to ensure proper collection and recycling of used agrochemical containers as well as obsolete, inherited or unknown agrochemicals, this category remains a significant problem in most countries.

EXAMPLE 14: EPR scheme for empty agrochemical containers and obsolete agrochemicals in Australia

In 1999, the drumMUSTER program was introduced in Australia for the collection of empty agrochemical containers in rural areas. It has led to the recycling of over 34 million chemical containers equivalent to 38,000 tonnes of waste, enabling savings of USD 33 million in landfill costs (DrumMUSTER, 2019). In 2003, the ChemClear program was also initiated to prevent the storage of obsolete, inherited and unknown agrochemicals. As a result of this program, 667 tonnes of hazardous chemicals have been collected to date (ChemClear, 2019). Both programs are funded by a 6c per lt/kg levy collected under a national Industry Waste Reduction Scheme.

EPR schemes for plastics are gaining prominence and are being introduced in many countries, with a focus on packaging waste. Packaging accounts for 17% of EPR schemes globally (OECD, 2016b). In the EU, 45% of product and packaging waste are covered by EPR programmes (Zero Waste Europe, 2017).

EXAMPLE 15: EU Directive on the reduction of the impact of certain plastics products

In January 2018, the EU adopted a European Plastic Strategy with a material-specific lifecycle approach to address plastic litter, including promoting the use of EPR schemes (European Commission, 2018c). In June 2019, the EU adopted the Directive on the reduction of the impact of certain plastics products that expands EPR schemes by applying it to such products as tobacco filters and fishing gear to cover the cost of cleaning up litter (EU, 2019). Thus, manufacturers of fishing gear, for example, and not fishermen, will be required to bear the costs of collecting fishing nets lost at sea. The directive is expected to stimulate innovation and bring about both environmental and economic benefits—by avoiding environmental damages which would cost the equivalent of EUR 22 billion by 2030—and save consumers a projected EUR 6.5 billion (European Commission, 2018d).

Deposit-refund systems are market-based instruments that give consumers an incentive to correctly dispose of hazardous waste. OECD classifies deposit-refund systems as a policy tool for EPR implementation (OECD, 2016b). However, deposit-refund systems are not fiscal measures per se, as they do not generate government revenue, but rather function as incentives to guide behavior. In traditional deposit-refund systems, consumers pay a deposit in addition to the price of a new product and receive a refund when returning the product for recycling once it is used (Slunge & Alpizar, 2019). This option is limited to specific easily identifiable items like beverage bottles and is not suitable for the broad range of existing packaging types (cyclos GmbH, 2019).

4.3.4 Tradable permits

Tradable permits appear to have few applications that can promote the sound management of chemicals and waste when compared to other categories of fiscal measures. However, they can be considered a potentially powerful policy instrument to control agricultural pollution in particular (Slunge & Alpizar, 2019).

EXAMPLE 16: Regulating nitrogen pollution from agriculture in New Zealand

In 2010, the Waikato regional government established a limit for environmental nitrogen levels, aiming at a 20% reduction by 2020. A system of nitrogen emission quotas has been set in place to enable those who need to increase nitrogen emissions beyond their allotted quota to buy unused quotas from other producers. The program has been somewhat successful as evidenced by 25 transfers of emissions rights, equating to a total of 150 tonnes nitrogen, from 2009 to 2014.

4.4 Examples of indirect economic instruments

A number of indirect incentive measures include, inter alia, liability, voluntary measures and information provisions.

4.4.1 Liability

The imposition of liability for damage to human health and the environment can be a powerful incentive to encourage responsible behavior by corporations, as well as a means of providing compensation to those who have been injured (EPA, 2004). If polluters are liable (and must pay) for the damage they cause, they will have an incentive to limit pollution. Many environmental statutes worldwide have liability provisions, though environmental liability actions in developing countries are typically weak. However, a promising example can be found in Vietnam, where the government collects a mining environmental fee to mobilize revenues for environmental rehabilitation activities (VIDC, 2018).

EXAMPLE 17: Superfund in the US

In 1980, the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), commonly known as Superfund, was enacted in the United States to hold polluters liable for clean-up costs of hazardous sites. The law created a tax on the chemical and petroleum industries and provided broad Federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. Over five years, USD 1.6 billion was collected and the tax went to a trust fund for cleaning up abandoned or uncontrolled hazardous waste sites. More specifically, the act established prohibitions and requirements concerning closed and abandoned hazardous waste sites, provided for liability of persons responsible for releases of hazardous waste at these sites, and established a trust fund to provide for cleanup when no responsible party could be identified.

4.4.2 Voluntary measures

Voluntary programs and agreements are becoming increasingly common for motivating companies to act beyond compliance with existing environmental regulations. This often includes agreements, such as memorandums of understanding, between governments and industry.

4.4.3 Information provisions

The provision of information can be a powerful tool to encourage firms to pursue environmentally friendly behavior. This includes labelling and disclosure of pollution releases.

A Pollutant Release and Transfer Register (PRTR) is a publicly accessible database, or multi-media inventory, of chemicals and pollutants released into the air, water or soil and transferred off-site for treatment or final disposal (UNEP, 2019a). PRTRs include information on point sources (e.g. of releases from industries) and diffuse sources (e.g. of releases from transport and agriculture) that provide an incentive for companies to avoid identification as major polluters and to voluntarily invest in emission reductions (UNEP, 2019a). Fifty countries have PRTRs in place, while many other countries are in the process of establishing PRTRs (UNEP, 2019a).

Labelling empowers consumers to make informed choices. Providing transparency that enables choice throughout the value chain is a way to indirectly promote the creation of economic incentives to use less hazardous substances. In other words, full transparency allows qualified choices to be made downstream and serves as an important market-based instrument.

5. International level

This section reviews activities implemented at the international level in relation to economic instruments for the sound management of chemicals and waste.

5.1 Information and policy support

5.1.1 Guidelines and manuals

UNEP has developed guidance documents to facilitate the introduction of cost recovery measures. The LIRA guidance, which sets out concrete options in particular for cost recovery systems at the domestic level, is the most notable tool (UNEP, 2015). The LIRA guidance provides practical guidance for instituting adequate legal frameworks and institutional capacity at the national level, which is considered a prerequisite for carrying out core risk reduction activities. It describes measures that governments can take at a domestic level to recover implementation costs such as registration, manufacturer import and user fees in order to cover overall national governance of chemicals expenditures. Recently, UNEP supplemented the LIRA guidance with a series of more specific guidance documents on:

- Benefits of chemicals control (UNEP, 2019d)
- Establishing and maintaining a national authority for chemicals control, including funding through cost recovery (UNEP, 2019e)
- Using risk reduction tools for chemicals control, including when economic instruments could be considered (UNEP, 2019f)
- Enforcement of chemicals legislation (UNEP, 2019g)

UNEP has also made information available on the use of fiscal measures for the sound management of chemicals, including within both editions of the Global Chemicals Outlook (UNEP, 2013a; UNEP, 2019a).

5.1.2 Economic valuations

In 2013, UNEP published the Cost of Inaction report that provides a practical assessment of the current state of knowledge of the economic costs of inaction on the sound management of chemicals (UNEP, 2013b). The World Bank has further complemented the concept of the cost of inaction with the notion of “benefits of action”. A future cost of inaction report could help to engage a broader community of economists and raise political awareness to achieve sound management of chemicals and waste. More specifically, tools could be developed to assess financial resources needed at the national level to implement existing chemicals and waste regulations. For instance, the Center for Economic and Social Rights (CESR) has developed a tool to analyze a government’s budget from the perspective of “maximum available resources” to determine whether resource allocations are equitable and effective and whether fiscal policy choices generate sufficient resources (CESR, 2020).

5.2 Measuring use of economic instruments

To date, no indicators have been developed to measure industry involvement, as pointed out by the independent evaluation of the integrated approach to financing the sound management of chemicals and waste (UNEP, 2019b). The use of economic policy instruments and their follow-up would benefit from a more strategic approach at the international level. Essentially, this could include the development of a baseline and essential indicators for determining global use of economic instruments. More ambitiously, a specific target could be set to guide the implementation and follow-up of using economic instruments.

The Convention on Biological Diversity (CBD) provides a useful example, since the role of incentives has gradually evolved in its work over the past two decades and their use and follow-up of implementation is now featured in Aichi Biodiversity Targets with a dedicated target and indicators, as displayed in Table 3 (CBD, 2010; CBD, 2016). In 2017, the OECD included biodiversity in the list of environmental domains in the Pine database, which has helped track the use of biodiversity incentives: OECD data shows that biodiversity-specific taxes alone generate USD 7.4 billion a year in revenue (OECD, 2017).

Table 3. Aichi Biodiversity Target 3 and its indicators concerning biodiversity incentives.

Aichi Biodiversity Target	Generic indicator	Specific indicator
Target 3 - By 2020, at the latest, incentives—including subsidies—that are harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied	Trends in the number and value of incentives, including subsidies, harmful to biodiversity, removed, reformed or phased out	Trends in potentially harmful elements of government support to agriculture
		Trends in potentially harmful elements of government support to fisheries
		Agricultural export subsidies (indicator for SDG target 2.b)
	Trends in development and application of incentives that promote biodiversity conservation and sustainable use	No. of countries with national instruments on biodiversity-relevant taxes, charges and fees
		No. of countries with national instruments on REDD plus schemes
		No. of countries with national instruments on biodiversity relevant tradable permit schemes

The use of indicators to monitor the use of economic instruments for chemicals and waste can be envisaged for both cost recovery measures and fiscal measures. Initially, such indicators could consist of simple indicators measuring outputs, i.e., “number of countries using economic instruments” or more specifically “number of countries that have mobilized domestic resources for recovering costs of national administration for sound management of chemicals and waste”. Following this, indicators could be developed to measure outcomes, e.g., generation of revenues. Currently, limited data prevents a clear overview of progress, but information extracted from the OECD Pine database enables the drawing of a global progress map on the use of fiscal measures in nine product categories (see Figure 1). The database has information gaps and the figure merely aims to exemplify the potential of developing and applying indicators at the global level.

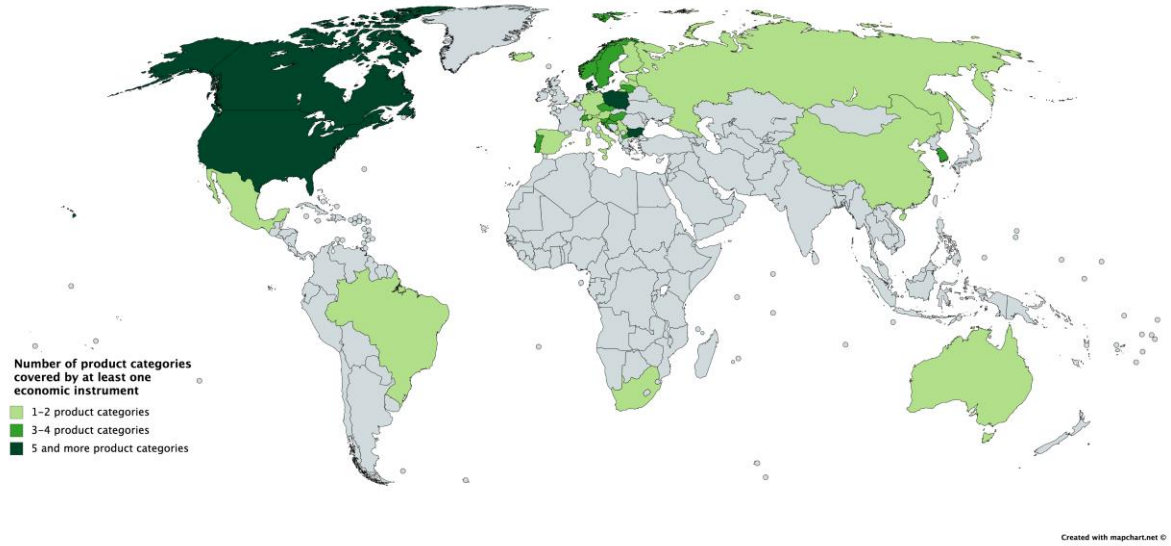

Figure 1. Countries applying fiscal measures in chemicals management in nine different product categories. Denmark is the only country with applications in all categories. (Adapted from Slunge & Alpizar, 2019)

5.3 External financing

The mobilization of domestic resources is the focus of this review. However, in many low- and middle-income countries, creating the required institutional setting and building sufficient capacity requires initial external support to achieve a national chemicals management system that is predominantly self-sustaining and self-financing in the long-term.

5.3.1 Existing sources

Illustrating examples of dedicated external financing is beyond the scope of this study. However, it is valuable to examine some existing financial mechanisms where private sector contributions are targeted towards the sound management of chemicals and waste.

The Global Environment Facility (GEF) is of relevance as 80% of chemicals and waste projects have engaged the private sector in some form (GEF, 2017). As of September 2016, the chemicals and waste portfolio had received USD 1.1 billion in grant funding and leveraged USD 3.1 billion in co-financing (GEF, 2017). Select projects have been able to attract significant levels of co-financing, e.g. the project on eliminating Persistent Organic Pollutants (POPs) in the Maldives (Project ID 9562) received a grant of USD 3.7 million with total co-financing of USD 59.4 million (GEF, 2015). Identifying examples and best practices that have contributed to high private sector co-financing shares from could help to further scale up industry involvement.

The Special Programme to support institutional strengthening at the national level has received USD 26.3 million from 10 donors, including nine governments and the EU (UNEP, 2019h). In line with the terms of reference of the Special Programme, not only governments, but also the private sector, foundations and other stakeholders are encouraged to contribute to the programme (UNEP, 2019h).

5.3.2 Exploring innovative possible new sources

Given the urgent need for funding, the vast untapped financial resources and the high cost of externalities caused by unsound management of chemicals and waste practices, sustainable long-term avenues of domestic resource mobilization, predominantly cost recovery systems, need to be urgently explored. To establish such mechanisms in countries, support from new and innovative sources could be considered. Previous efforts, in particular within climate context, may provide useful examples for the sound management of chemicals and waste.

Carbon pricing provides a promising example as, to date, 57 initiatives have been developed including 28 emission trading systems in regional, national and subnational jurisdictions and 29 carbon taxes, applied primarily at national level (World Bank, 2019a). Of the 185 Parties that have submitted Nationally Determined Contributions to the Paris Agreement, 96 are planning or considering the use of carbon pricing, including many low- and middle-income countries (World Bank, 2019a). In April 2019, the Coalition of Finance Ministers for Climate Action was established, which currently has 51 members that have endorsed the "Helsinki Principles" to promote national climate policy, including carbon pricing and other market-based instruments (World Bank, 2019b). In December 2019, at the margins of 25th session of the COP to the *United Nations Convention on Climate Change* (UNFCCC) held in Madrid, Spain the finance ministers launched the Santiago Action Plan that details ways to advance each of the Helsinki Principles (Valtiovarainministeriö & Ministerio de Hacienda, 2019).

More ambitiously, it may be timely to explore and attempt unconventional approaches, such as a global multilateral taxation scheme. Although no precedent exists, the idea is not new. For instance, to support discussions during the Fifth Replenishment, the GEF produced a document on innovative financing mechanisms that included the idea of a global tax stating that "the participants in the replenishment should lend support in principle to the idea of an international tax scheme built around a refined Tobin tax, carbon tax, etc., and encourage this debate across relevant government agencies and at the highest political levels possible" (GEF, 2009). In 2019, the Fiscal Monitor– a report issued by the International Monetary Fund (IMF)– proposed that instituting a global tax of USD 75 per ton of carbon by 2030 could limit warming to 2 degrees Celsius while also generating significant revenues (IMF, 2019). The report highlights that the merit of an internationally coordinated approach is that it would provide reassurance against losses in competitiveness and address free-rider issues (IMF, 2019).

IPEN has proposed the development of a global levy—resembling some discussions in the climate sector—to attract private funding for sound management of chemical and waste (IPEN, 2017). Given that the chemicals industry's annual turnover is approximately USD 5 trillion, a levy of 0.1 % could generate USD 5 billion annually (UNEP, 2019a). The proposal puts needs and available resources in proportion, as it would help to address prevalent funding needs, yet, arguably, have no financial implications for the chemicals industry or prices of products.

The proposal, however, does not detail practicalities. Evidently, the development of a global levy would be an extremely unusual commitment to be made internationally because it would entail countries come to reach an agreement on how to partition the tax (Falcão, 2016). Also, levying a tax is an act of state, connected to the enforcement of a country's sovereign rights. Thus, international tax treaties seldom create an obligation to tax or identify the level at which the tax should be levied (Falcão, 2016).

In practice, addressing this at the international level would require states to require industry to pay (e.g. via a tax or levy), to which states would act upon and implement rules to that effect in their national jurisdictions (Tuncak et al., 2019). The Aviation Solidarity Tax provides an example of a

similar approach. Consideration for initiating discussion on a possible global levy could occur in context of the integrated approach to financing the sound management of chemicals and waste.

EXAMPLE 16: Aviation Solidarity Tax

The Aviation Solidarity Tax on airline tickets—launched in Paris in February 2006 at the Ministerial Conference on "Solidarity and Globalization: Innovative Financing for Development"—was designed to channel funding to address health issues in developing countries. The tax is implemented by a dozen countries. Essentially, the solidarity tax is implemented through national taxes that countries voluntarily commit to levy. For instance, France applies a progressive taxation that distinguishes between destinations and classes, ranging between EUR 1-45 per airline passenger (European Commission, 2019b). The French solidarity tax is channeled to the International Drug Purchase Facility (UNITAID), hosted by the World Health Organization (WHO), which was created specifically to disseminate aviation solidarity levies to provide developing countries access to quality drug treatment for diseases such as malaria, tuberculosis and HIV/AIDS.

5.3.3 Financing core SAICM secretariat activities

The financing of the SAICM Secretariat has relied upon voluntary contributions from governments and other stakeholders. Since 2016, SAICM has received contributions from 14 countries, the EU, the International Council on Chemical Associations (ICCA) and in-kind contributions from UNEP's Environment Fund, as displayed in Figure 2. During the triennium 2016–2018, contributions from governments, including the UNEP's Environment Fund (EF), represented 97% of all voluntary contributions (SAICM, 2019b).

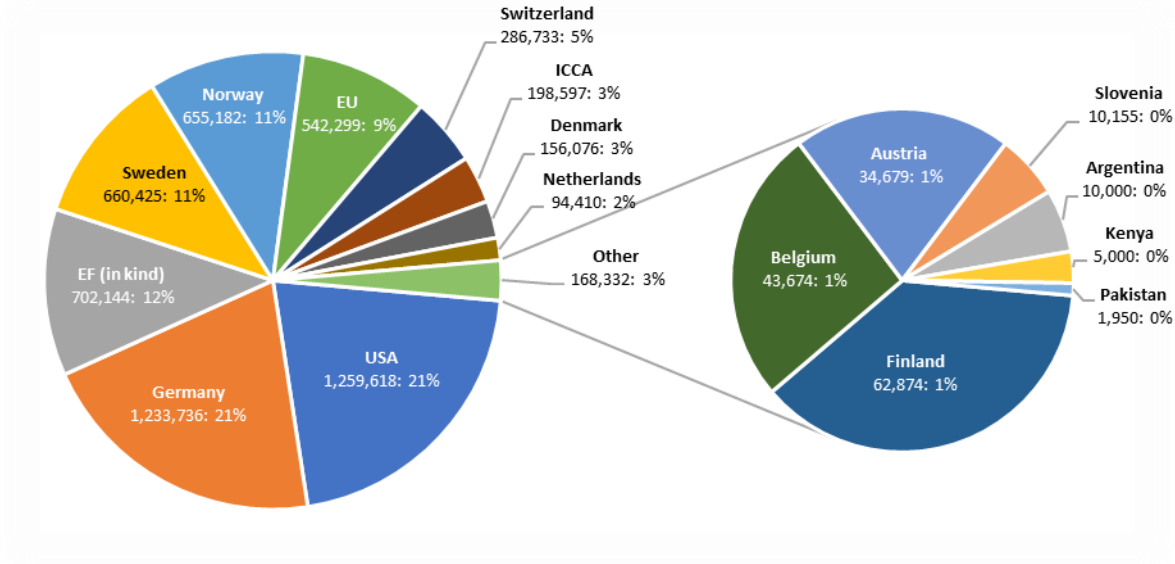

Figure 2. Voluntary contributions to the Strategic Approach indicative budget for the triennium 2016-2018 (Source: SAICM, 2019b).

The independent evaluation of SAICM highlights that despite approved budgets in past ICCM sessions "over the period 2006-2015, there was an annual shortfall in the amount of funds donated (voluntarily) such that the agreed budget was never achieved, ranging from a 4% shortfall in 2013 to a 56% shortfall in 2009" (SAICM, 2019a). The evaluation also states that the shortfalls in staff and resources affected the Secretariat's ability to deliver on number of functions (SAICM, 2019a).

The Secretariat has prepared a draft resource mobilization strategy for the consideration of the fourth meeting of the Intersessional Process, as requested by OEWG3 (SAICM, 2020). The primary objective of the strategy is to ensure that funding is available for the SAICM secretariat to fulfil its role and deliver on the mandate that will be assigned at ICCM5 decisions. In moving forward, the outcome of ICCM5 should recognize the requirement for an adequately financed secretariat and set out a commitment on behalf of all stakeholders and all sectors that they will ensure that financial contributions and other resources are provided to meet future policy goals.

5.4 Multi-stakeholder partnerships and private sector initiatives

Multi-stakeholder partnerships, including public-private partnerships, can provide an important avenue to step up industry engagement and create greater revenues for the sound management of chemicals and waste. The independent evaluation of SAICM highlights the establishment of the Global Alliance as a successful initiative for phasing out lead in paint, which has grown to a partnership with members from governments, intergovernmental and non-government organizations—including 22 industry members (SAICM, 2019a). Similarly, other emerging policy issues and issues of concern could benefit from the multi-stakeholder partnership model. The Circular Plastics Alliance is another promising example from the regional level with over 175 organizations representing industry, academia and public authorities that aims to increase the EU market for recycled plastics to 10 million tonnes by 2025.

Summary and conclusions

This review exemplifies a selection of mechanisms for cost recovery in use across various sectors and issues, highlighting implementation of the Polluter Pays Principle, and examines possibilities for their further application in the context of chemicals and waste. The predominant applications of economic policy instruments identified for chemicals and waste are summarized in Table 4.

Table 4. Summary of relevant economic policy instruments, including definitions.

	Categories	Instruments	Examples
Economic instruments Set of policy mechanisms that can provide financing for chemicals and waste management, in particular, cost recovery	**Cost recovery measures** Policy measures that seek to cover costs of services provided aiming to shift the hidden public costs of managing chemicals from government budgets to private sources	**Fee** Compulsory requited payments to the government that are levied in proportion to the services provided	**Annual fees** **Fees based on services**, including authorization fees, inspection fees, fees for import licenses and registration fees
	Fiscal measures Fiscal policies that generate national resources and aim to change the relative price of a given activity or input, either encouraging or discouraging its use	**Tax** Payment required by law from persons, groups or companies in order to provide the state and municipalities with revenue	Pesticides, inorganic fertilizers and chlorinated solvents
		Subsidies Reduces directly or indirectly the use of substances with a proven, specific negative impact on the environment	**Subsidy use** (Organic farming and lead paint removal) **Removal of harmful subsidies** (Fertilizers and pesticides)
		Extended Producer Responsibility Measures aiming to hold the producer responsible for the entire life cycle of a product	Waste electrical and electronic equipment
		Tradable permits An overall level of 'allowable' pollution is established and allocated among firms in the form of permits that can be traded on a market at market prices	Lead in petrol and ozone depleting substances

Source: adapted from OECD, 2016a; Slunge & Alpizar, 2019; UNEP, 2013a; UNEP, 2019c.

This review finds that practices in this area are emerging. However, the use of cost recovery measures and the use of economic instruments are still underdeveloped, and successful examples are limited predominantly to high-income countries. To this end, challenges remain in setting up and maintaining the legal and institutional basis needed for sound chemicals and waste management, including developing and overseeing effective implementation of mechanisms for cost recovery and other economic policy instruments for financing of the sound management of chemicals and waste. This reflects inadequate prioritization of sound management of chemicals and waste chemicals, and limited understanding of economic implications of inaction. Arguably, endemic societal challenges, such as the globalized nature of value chains, the lack of basic capacities to address the sound management of chemicals and waste at the national level in many countries and the lack of political will are challenges that may require creative solutions to avoid their hindrance of progress in this regard.

The elaboration of the Beyond-2020 framework provides a unique opportunity to increase understanding of and, ultimately, scale up the use of cost recovery measures and fiscal measures for the sound management of chemicals and waste. In light of this review, consideration could be given to the following:

A) INFORMATION, OUTREACH AND CAPACITY SUPPORT

Existing international efforts have focused predominantly on strengthening the information basis to provide policy support at the national level. The following additional measures could be taken to complement and build on existing work:

- Make appropriate use of and broadly disseminate existing guidance on mechanisms for cost recovery for the sound management of chemicals and waste
- Continue to collect best practices and to provide guidance on mechanisms for cost recovery measures and use off fiscal measures, coupled with the provision of capacity support, building on and complementing existing guidance
- Consider the collection of best practices at the national level to gradually expand a "living document" to be included in the SAICM clearing house to guide national action
- A future study on market-based instruments and cost of inaction of unsound management of chemicals could help engage more economists and mobilize political momentum for fiscal reform at all levels

B) POLICY DEVELOPMENT AND FOLLOW-UP

In light of the independent evaluation of the integrated approach to financing the sound management of chemicals and waste, the formulation of the Beyond-2020 framework would benefit from more clearly defining industry engagement and steps that need to be taken by all relevant stakeholders to internalize environmental externalities resulting from unsound management of chemicals and waste. This could include the following:

- Explore the development of a global cost internalization program in the context of the integrated approach to facilitate a more systematic implementation of the Polluter Pays Principle, utilizing best practices and exploring opportunities linked to innovative market-based mechanisms
- Promote the use of cost recovery measures and fiscal measures by designing specific targets beyond 2020 that signal to all relevant stakeholders the need to ensure safe use of chemicals and to internalize negative externalities arising from unsound management of chemicals and waste
- Develop a baseline and relevant indicators for beyond 2020 to track the use of national cost recovery measures and fiscal measures for the sound management of chemicals and waste, as well as to understand revenues generated from their use. The possibility of the Inter-Organization Programme for the Sound Management of Chemicals (IOMC) and, in particular, the OECD having a role in this regard could be considered.
- Encourage targeted research to assess the effectiveness of existing fiscal measures with a view to promoting their application and helping policymakers understand their impact and significance

Annex 1. Examples from select declarations and regimes that have internalized the Polluter Pays Principle (PPP)

a) The 1972 Stockholm Declaration Principle 21 says: “States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction”.
b) The 1990 International Convention on Oil Pollution Preparedness, Response and Cooperation declares PPP as a “general principle of international environmental law”. Under this Convention, the PPP applies along with existing civil liability and compensation schemes for damages inflicted.
c) The 1992 Rio Declaration Principle 16 urges national authorities “to promote internalization of environmental costs…taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment”.
d) The 1992 Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area mandates the application of the PPP: Article 3.4 makes the parties responsible for producing pollution responsible for paying for the damage done to the environment.
e) The 1992 Convention for Protection of the Marine Environment of the North-East Atlantic (Paris Convention, 1992). Article 2b says: “[t]he contracting parties shall apply…the polluter pays principle, by virtue of which the costs of pollution prevention, control and reduction measures are to be borne by the polluter”. Disincentives such as penalties and civil liability can also be seen as application of the PPP.
f) Madrid Protocol to the Barcelona Convention (Article 27).
g) Bamako Convention on the Ban of the Import into Africa and Control of Transboundary Movement and Management of Hazardous Waste Within Africa 1991 (Article 12).
h) Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region 1983 (Article 14).
i) The 1996 Protocol to the London Convention.

Annex 2. References to economic instruments for sound management of chemicals and waste

Document	Reference	Main text
SAICM Overarching Policy Strategy	Financial considerations (paragraph 19)	Financial arrangements for the Strategic Approach include, among other things a) actions at the national or sub-national levels to support financing of Strategic Approach objectives, including by • Assessing and where necessary adopting appropriate policies at the national and sub-national levels, which could include economic instruments, that can help to cover the cost of sound chemicals management • Where appropriate, assessing and adopting at the national and sub-national levels economic instruments intended to internalize the external costs of chemicals, bearing in mind that such instruments need careful design, especially in developing countries and countries with economies in transition • Governments and other stakeholders exchanging information on experience and studies in the national use of economic instruments and submitting such information to the UNEP to make it broadly available
SAICM Global Plan of Action	Activity no. 193	Promote a culture of compliance and accountability and effective enforcement and monitoring programmes, including through the development and application of economic instruments.
	New activity no. 11	Establish voluntary approaches and use of economic instruments, other incentives and extended producer responsibility, as appropriate, and e-products take-back schemes building on existing national and international activities.
SAICM International Conference on Chemicals Management	Resolution II/3 (paragraph 4)	Also encourages research on and, where appropriate, the assessment and adoption at the national and subnational levels of economic instruments that internalize the external costs related to chemicals, bearing in mind that such instruments need careful design, in particular in developing countries and countries with economies in transition
	Resolution IV/1 (paragraph 1)	Industry participation and defined responsibility across the life cycle, including cost recovery policies and systems as well as the incorporation of sound chemicals management into corporate policies and practices
UNEP's Integrated approach to financing of the sound management of chemicals and waste	UNEP GC Decision 27/12 (paragraph 5)	Further invites Governments to implement actions to further encourage industry involvement in the integrated approach, including the development of legislation on the responsibilities of industry and national administration, the provision of incentives for sound chemicals and wastes management, and promotion of measures by industry to internalize costs as per the polluter pays principle
	Report of the Executive Director on the Consultative process on financing options for chemicals and wastes (UN doc.	27. Economic instruments are a set of policy mechanisms that can provide financing for chemicals and wastes management through, in particular, cost recovery. Cost recovery measures seek to shift the hidden public costs of managing chemicals from government budgets to private sources. Cost recovery mechanisms may not cover the full costs of such systems but promote a more appropriate sharing of costs between the public and private sectors. 29. To ensure that industry involvement becomes an effective component of meeting the chemicals and wastes targets, the integrated approach

Document	Reference	Main text
	UNEP/GC.27/7)	proposes a non-exhaustive list of actions for implementation by Governments, industry and other stakeholders, as appropriate: (c) Develop cost recovery measures at the national level to fund the administrative process of providing and maintaining systems for governing the marketing of chemicals at the national level, in order to shift the administrative and operational costs of activities from government budgets to producers and importers that benefit from those activities (d) Further incorporate chemicals and wastes considerations into extended corporate responsibilities "downstream", including corporate social responsibility initiatives such as the UN Global Compact and triple-bottom-line accounting 30. Industry involvement through command and control, economic instruments and voluntary agreements will reduce the cost of the sound management of chemicals and wastes along the whole value chain. The main activity expected of industry is to take further measures to internalize costs, in accordance with the polluter pays principle, and to broaden and multiply voluntary agreements on the sound management of chemicals and wastes. Furthermore, financing contributions by industry through dedicated external financing as called for by the integrated approach would be strongly encouraged.

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