DEVELOPMENT OF POLICY, PLANNING AND STRATEGIES ON CLEANER PRODUCTION FOR THE SINDH PROVINCE
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DEVELOPMENT OF POLICY, PLANNING AND STRATEGIES ON CLEANER PRODUCTION FOR THE SINDH PROVINCE
European Union

The Member States of the European Union have decided to link together their know-how, resources and destinies. Together, they have built a zone of stability, democracy and sustainable development whilst maintaining cultural diversity, tolerance and individual freedoms. The European Union is committed to sharing its achievements and its values with countries and people beyond its borders.

International Labour Organization

The International Labour Organization (ILO), founded in 1919, is devoted to promote social justice and internationally recognized human and labor rights, pursuing its founding mission that social justice is essential to universal and lasting peace. It is the only tripartite UN agency, which brings together governments, employers and workers of 187 member states, to set labour standards, develop policies and devise programmes that promote decent work for all women and men. Today, the ILO’s Decent Work agenda is helping advance economic and working conditions that give workers, employers and governments a stake in lasting peace, prosperity and progress.

WWF-Pakistan

WWF’s mission is to stop the degradation of the planet’s natural environment and to build a future in which people and nature thrive.

International Labour and Environmental Standards Application in Pakistan’s SMEs (ILES)

The ILES project (2016-2022), funded by the European Union and implemented by ILO and WWF-Pakistan, aims to improve national compliance with international labour and environmental standards. It provides necessary policy and capacity building support to the federal and provincial governments as well as extends hand holding and capacity building support to the enterprises from the textile and leather industry. It has introduced its targeted enterprises to different approaches/methodologies that enable them to reduce waste production, ensure efficient resource utilization as well as have better working conditions, which in turn enables them to increase productivity and be more environment friendly. The project aims to contribute significantly to increasing competitiveness, as well as promote sustainable and inclusive growth in leather and textile sectors in Pakistan.
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<td>All Pakistan Textile Mills Association</td>
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<td>APR</td>
<td>Asia-Pacific region</td>
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<td>BAT</td>
<td>Best Available Technologies</td>
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<tr>
<td>CPC</td>
<td>Cleaner Production Centre</td>
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<td>CPI</td>
<td>Cleaner Production Institute</td>
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<td>CPT</td>
<td>Cleaner Production Technologies</td>
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<td>CT</td>
<td>Cleaner Technology</td>
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<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
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<td>ESM</td>
<td>Environmentally Sound Management</td>
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<td>FGDs</td>
<td>Focused Groups Discussions</td>
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<td>GoP</td>
<td>Government of Pakistan</td>
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<td>IEE</td>
<td>Initial Environmental Examination</td>
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<td>IEEC</td>
<td>Indus Environmental Engineering Consultant</td>
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<td>KATI</td>
<td>Korangi Association of Trade and Industry</td>
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<td>LATI</td>
<td>Landhi Association of Trade and Industry</td>
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<td>MESSCO</td>
<td>Management Environmental and Social Solutions Company</td>
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<tr>
<td>MEAs</td>
<td>Multilateral Environmental Agreements</td>
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<td>MoU</td>
<td>Memorandum of Understanding</td>
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<td>MRSLS</td>
<td>Manufacturing Restricted Substance List</td>
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<tr>
<td>NEAP</td>
<td>National Environmental Action Plan</td>
</tr>
<tr>
<td>NEQS</td>
<td>National Environmental Quality Standards</td>
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<td>NCS</td>
<td>National Conservation Strategy</td>
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<td>NCPC</td>
<td>National Cleaner Production Centre</td>
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<td>PEPA</td>
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</tr>
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<td>PTA</td>
<td>Pakistan Tanners Association</td>
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<td>PPP</td>
<td>Pollution Prevention Pays</td>
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<tr>
<td>REACH</td>
<td>Registration, Evaluation, Authorization and Restriction of Chemicals</td>
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<tr>
<td>RECP</td>
<td>Resource Efficient and Cleaner Production</td>
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<tr>
<td>PEPC</td>
<td>Provincial Environmental Protection Council</td>
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<td>SBP</td>
<td>State Bank of Pakistan</td>
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<td>SEPA</td>
<td>Sindh Environmental Protection Agency</td>
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<tr>
<td>SITE</td>
<td>Sindh Industrial Trading Estate</td>
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<tr>
<td>UNDP DTIE</td>
<td>United Nations Environment Programme, Division of Technology, Industry and Environment</td>
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<td>UNCED</td>
<td>United Nations Conference on Environment and Development</td>
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<td>WWF</td>
<td>World Wide Fund for Nature</td>
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SECTION 1

Introduction of Assessment

1.1 Overview

This section of the report discusses the objectives of the assessment and its background. For the organization/contents of this report, refer to table 1 to review the basic assessment information.

Table 1: Basic project information

<table>
<thead>
<tr>
<th>Assessment Type:</th>
<th>Policy development and strategic planning</th>
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<tr>
<td>Assessment Title:</td>
<td>Development of policy, planning and strategies on Cleaner Production (CP) for the Sindh Province</td>
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1.2 Objective

The key objective of this assessment is to develop a draft policy document on the subject of cleaner production in industrial processes in the Sindh Province.

1.3 Assessment background

WWF-Pakistan signed a Memorandum of Understanding (MoU) with SEPA under which both the parties identified the need for the development of a comprehensive action plan, strategies and policy for cleaner production in Sindh. This initiative has been taken to develop a robust cleaner production policy which is likely to be approved by the Government of Sindh (GoS).
and in the later stages; the document may provide a framework for implementation of certain environmental standards to address the environmental challenges as a result of industrial operations in Sindh. In addition to this, it has been observed that when a policy document is approved, it is generally included within the existing regulations of a particular department, which serves as an implementation tool and guiding document for the end users on which the given standards are applicable. In this case, it is envisaged that the end users of this policy document and the standards hereafter developed in the later stages will be relevant to the industrial units of the province (Sindh). The implementation of the CP will also improve the compliance of the province against the international environmental obligations.

Further, to promote better environmental performance by the introduction of CP mechanisms, this policy will be supplemented with a short and long-term action plan for its effective implementation.

1.4 Organization of the report

The study was conducted in different phases. Phase-I of the project specifically focused on the desktop review of existing literature on the subject matter. The literature review covered:

- Concept and background information of CP.
- Multilateral Environmental Agreements (MEAs) ratified by the Government of Pakistan.
- Implementation of existing CP policies in the Asia-Pacific region and their relevance to Pakistan.
- Existing legislative framework in Pakistan related to CP.
- Identification of relevant stakeholders for consultation meetings for documenting their input within the proposed policy document.

Followed by this, several key informant interviews, online consultation meetings and workshops with stakeholders were conducted. On the basis of the feedback/advice/suggestions received, the policy document was drafted and disseminated through workshops. The final assessment report has been organized in following manner:

Section 1: Introduction of the assessment
Section 2: Concept and background information of Cleaner Production
Section 3: Methodology
Section 4: Outcomes of stakeholder consultations
SECTION 2
Concept and Background Information of Cleaner Production

2.1. Overview

This section of the inception report highlights the background information of CP, delves into its concept and advantages and presents a comprehensive review about the concept of Multilateral Environmental Agreements (MEAs) and identification of linkages of CP with international conventions/treaties/protocols. Further, it identifies the most relevant MEAs ratified by the Government of Pakistan and the existing environmental legislative framework of the country in context of CP. Moreover, an overview of cleaner production policies in developing countries and related case studies is covered as well.

2.2 Introduction to CP and its evolution

2.2.1 Background of CP

A number of research papers, articles and reports highlight that some of the most significant and disastrous environmental events occurred as a result of industrialization after the second World War. Therefore, literature review reveals the need for the introduction and evolution of CP techniques across the globe, the details of which are given in the next section accordingly.

2.2.1.1 Concept of CP

The basic concept of CP is to introduce efficient systems and the strategies within the given industrial sectors for reducing the environmental impacts by pollution prevention at the source. Application of CP techniques within the industrial sector results in curbing the elevated costs of pollution control and management equipment for environmental compliance in general. This is done by replacing the ‘end of pipe’ approach to the extent possible with the approach to prevent pollution at the source referred as “eco-efficiency”. Additionally, CP is an integrated pollution prevention approach which may be applied throughout
2.2.1.2 Advantages of CP implementation

Since the inception of the CP programme, a number of projects have been developed across the globe where some of the key advantages of CP implementation include the following:

- Reduced waste at source and use of raw materials.
- Reduced environmental footprint.
- Reduced pollution control cost.
- Reduced waste disposal cost.
- Increased production efficiency.
- Return on investment calculations.
- Increased collaboration with key stakeholders.
- Brand promotion by projecting environment conservation.

Figure 1: Commonly adopted CP approaches in the industrial sector

Adapted from: http://www.unido.org/en/doc/4460
2.2.2 Paradigm shift to CP

During the year 1989, United Nations Environment Programme, Division of Technology, Industry and Environment (UNEP DTIE) coined the term “Cleaner Production” (CP) for the first time during the preparatory developments for the Rio Earth Summit 1992. The definition of term CP was developed by UNEP in 1991 as, “the continuous application of an integrated preventive environmental strategy applied to processes, products, and services to increase overall efficiency and reduce risks to humans and the environment”[2].

2.2.2.1 Evolution of CP

Figure 2 demonstrates the paradigm shift and evolution of the industrial sector in line with the CP approach from post the second World War till 1990s and onwards.

Figure 2: Evolution of the industrial sector in line with CP approach


2.2.2.2 CP centres

In Rio in 1992, UNEP and United Nations Industrial Development Organization (UNIDO) developed the strategies for prevention of environmental pollution with a major focus on developing countries and both organizations jointly launched National Cleaner Production Centers (NCPCs) in different parts of the developing world. Initially eight NCPCs were established during 1994-1995. The NCPCs were further expanded by the collective support of the Swiss and Austrian government and by the contributions of other donor countries like, Italy, Norway, Czech Republic, Slovenia, Denmark, Netherlands and Spain under the umbrella of UNEP and UNIDO to 47 developing and transition countries[3]. In Pakistan, the National Cleaner Production Center (NCPC) foundation was established by the UNIDO in collaboration with UNEP, UNDP and the Ministry of Climate Change (MOCC) for the betterment and promotion of cleaner production techniques. Refer to figure 3 to review the CP programme reach across the globe till the year 2015.

1994-1995

Initially, eight NCPCs were established during 1994-1995. The NCPCs were further expanded by the collective support of the Swiss and Austrian governments and by the contributions of other donor countries.
2.2.2.3 Milestones achieved in line with the CP concept

As discussed previously, after CP’s inception, the concept evolved with the passage of time and a number of milestones were achieved in a systematic manner by all the NCPCs established across the globe. Figure 4 shows a detailed summary of each milestone achieved from the year 1991 till 2015. 

Figure 4: Milestones achieved from the year 1991 till 2015

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<tr>
<td>Ground Work</td>
<td>Proof of Concept</td>
<td>Formalization</td>
<td>Market Orientation</td>
<td>Rewiring</td>
<td>Reach and Depth</td>
<td>Decoupling at large</td>
</tr>
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</table>

Concept of National Cleaner Production Center (NCPC) developed to facilitate industrial sector.

UNEP launched in 1997 its first manual on sustainable product development to assist NCPCs with extending cleaner production initiatives towards design and development of consumer goods.

UNIDO facilitated the development of the first comprehensive cleaner production policy resource package for NCPCs, which recognized the need for integration of environment, industry, technology and related policies.

A project aimed to facilitate investments in bilateral clean technology transfers from Switzerland to China and India, failed during 2003-2007 due to high cost and low adaptability of Western technology. Reorientation was done. The stage for clean technology innovations in chemical and textile sectors was set.

NCPC community started to explore the concepts of mainstreaming and scaling-up. Services of NCPCs, required new and diversified service delivery and partnership approaches for mainstreaming tools, strengthening and integration of environmental, industry and possibly other policies affecting small-scale industries.

UNIDO and UNEP had significant programmable funding available for supporting the further development and demonstration of Resource Efficient Cleaner Production methods and tools jointly with members of RECPnet, through contributions from respectively the Government of Switzerland and the European Commission through the Eco Innovation project.

NCPCs individually and RECPnet collectively can unlock and catalyze progress in particular in areas of responsible consumption and production, inclusive and sustainable industry and decent work and economic growth in line with Agenda 2030 while following SDGs (8,9 &12).

2.2.2.4 Distribution of NCPCs after 2015

By the end of 2015, the UNIDO-UNEP Resource Efficient and Cleaner Production (RECP) programme had worked with 58 NCPCs in 56 countries. The regional distributions of the centres are shown in figure 5.

Figure 5: Regional distribution of CP centres


2.3 MEAs and legislative framework in the context of CP

2.3.1 The concept of MEAs

The MEAs are designed to address various global environmental issues like biological diversity loss, species extinction, climate change related impacts, increase in utilization of hazardous waste, ozone layer depletion, organic pollutants, marine pollution, freshwater pollution, depletion and destruction of waterways and water bodies, as well as the trade of endangered species around the world, etc. Figure 6 shows the two most common forms of MEAs.
MEAs are either independent treaties consisting of set appendixes or annexures or they may have a framework of functions set out in the form of protocols for responding to specific environmental issues and would need more systemic and specialized negotiations. The working in developing MEAs happens in such a way that the set objectives and outcomes result in addressing a common goal. The ultimate intended result of all the MEAs comes down to the achievement of global sustainable development. The environmental agreements are implemented nationally through regulatory initiatives in different countries. MEAs usually become part of the national legislation[9].

2.3.2 Implementation, compliance and effectiveness of MEAs

The key considerations related to MEAs, in context of implementation, compliance and effectiveness are presented in figure 7.
2.3.3 Objectives and opportunities of MEAs

The objectives of MEAs are different from one another; however sustainable development is the common goal of each. The functions as well are the priorities of MEAs vary within a cluster, however, with the increase in effects of anthropogenic activities crossing the borders, eroding human health and natural goods and services, the development of MEAs provided the world with better environmental governance opportunities. There is no doubt about the effectiveness of individual MEAs focusing on a single global environmental issue; however, the overarching benefits of the implementation of different MEAs in bringing knowledge and resources together, as well as the implementation efforts and commitments of countries, are much larger.

MEA Opportunity

In light of the increase in effects of anthropogenic activities crossing the borders, eroding human health and natural goods and services, the development of MEAs provided the world with better environmental governance opportunities.
MEAs are a source of gathering knowledge resources at one place while assessing the financial resources of different parts of the world as well. This can enable addressing major environmental issues by pooling available financial resources effectively.

- MEAs are implemented in a unique way to strengthen similar agreements as there are MEA objectives that can correlate and implementation in a creative way can increase their effectiveness.

- They act as a framework which organizes international programmes so that the ultimate goals can be achieved in a systematic and coherent way.

- Agreement and ratification of MEAs are also a source of bringing about international funding together to address national and regional issues.

- The process of MEA implementation makes like-minded people sit together and conduct research on global levels and produce relevant knowledge material.

- MEAs encourage efforts to develop, measure and circulate technical and policy options for catering to particular environmental problems, granting an international imprimatur that may help countries agree on further commitments.

- MEAs can help facilitate agreements between donors and recipients.

- MEA commitments can also help address trans-boundary issues of the neighboring countries and may motivate the countries to make joint efforts to address the environmental challenges.

- MEAs act as an umbrella that ensures the overall effectiveness of the common goal the world is supposed to move towards. MEAs can be used to streamline the reporting process and assessments of environmental baselines on national, regional and global levels.

### 2.3.4 MEAs and CP

The overall focus of MEAs is to achieve sustainable development in the world. CP is recognized as an effective and efficient way of dealing with material changes and energy resource utilization. As an integrated preventive environmental strategy, CP is the ideal approach to be taken towards the achievement of pollution prevention and resource minimization. Thus, the application of CP techniques and concepts can contribute to the effective implementation of MEAs. The major MEAs are shown in figure 8, while on the other hand figure 9 shows direct relevance of CP with different MEAs. Additionally, it is important to note that CP can be applied as an innovative strategy to complement and reach the intended outcomes of the MEAs and act as supporting tools for one another. In particular, there are three MEAs (Stockholm Convention on Persistent organic pollutants (POPs), Rotterdam Convention and Basel Convention) which are specifically formulated to inhibit industrial and manufacturing sector related pollution and can be applied to industrial activities. A detailed description of the relevance of CP, with MEAs specifically formulated to inhibit industrial and manufacturing sector related pollution, is given in sections 2.3.5 and 2.3.6.
Figure 8: The major MEAs

MEAs relating to atmosphere
- Vienna Convention for the Protection of the Ozone Layer (1985)

MEAs relating to the biodiversity
- Convention on International Trade in Endangered Species (1973)
- Bonn Convention on Migratory Species (1979)
- Convention on Biological Diversity (1992)
- Ramsar Convention on Wetlands

MEAs relating to chemicals & wastes
- Montreal Protocol on Substances that Deplete the Ozone Layer (1987)

Other major MEAs
- United Nations Convention to Combat Desertification (UNCCD)
- United Nations Framework Convention on Climate Change (UNFCCC) – Kyoto Protocol
- UNESCO Man and the Biosphere Programme (MAB)

Adapted from: https://www.eac.int/environment/multilateral-environmental-agreements (Accessed on: 19-08-2020)

Figure 9: Relevancy of CP with different MEAs

Adapted from: https://www.eac.int/environment/multilateral-environmental-agreements (Accessed on: 19-08-2020)
2.3.5 The Basel convention and CP

The priorities of the Basel convention and CP are highly relevant and interconnected. The Basel convention addresses the dumping of hazardous waste; however, CP targets the root cause and avoids hazardous waste generation. The objectives of the Basel convention revolve around the principles of management of waste in an effective and best possible way. Refer to figure 10 to review the definition of Basel Convention. Implementing CP techniques in the industry ensures that inputs like water, chemicals and raw materials are applied in the system in an effective way. It is a general fact that the effective use of resources minimizes waste generation. Ensuring optimum efficiency is the key.

Figure 10: Definition of Basel convention


“The Basel Convention addresses the uncontrolled movement and dumping hazardous waste including Incident of illegal dumping in developing nations by companies from development countries”

Adapted from: http://www.basel.int


- The 3R (reduce, reuse and recycle) waste minimization strategy should be promoted at the least. Optimization of resources and waste prevention can be applied as the second step.
- Ensuring the use of cleaner technology has direct effects on the waste produced. The treatment and disposal of hazardous waste should be regulated.
- It is critical to build technical capacity and institutional knowledge on waste minimization and CP tools.
2.3.6 The Stockholm convention, Rotterdam convention and CP

The Stockholm and Rotterdam conventions both address the issues relating to transportation, trade, production and utilization of hazardous substances, which if mismanaged or mishandled have the tendency to pose serious threats to human health and the environment. Refer to figure 11, to review the definition of the Rotterdam convention on the prior informed consent procedures for certain hazardous chemicals and pesticides in international trade and figure 12, to review the definition of the Stockholm convention on the persistent organic pollutants. Application of CP techniques throughout the life cycle of the material and industrial processes can serve as an ideal solution to comply effectively with the obligations of the above conventions. CP fulfills the requirements of the Stockholm convention replacing hazardous substances with eco-friendly materials, whereas the Rotterdam convention deals with the reforms related to the final product, its handling and transportation.

Figure 11: Definition of Rotterdam convention


The Rotterdam Convention consists of set rules and standards to be considered by the countries around the world while importing hazardous chemicals and wastes from one place to another. It serves as a tool for the management of hazardous chemicals during their transactions.
The following requirements are particularly related to cleaner production:

- CP techniques are included as an integral part of the national policy, processes and regulations.
- Ensure measures are in place for reduction and elimination of hazardous substances.
- Process changes and input modifications are made to minimize the formation of hazardous substances.
- Develop information material and resources around the implementation of smart environmental management practices.

**Stockholm Convention on Persistent Organic Pollutants (2001)**

“Stockholm convention specially focuses on the reduction and elimination of the persistent organic pollutants (POPs) from the system as they pose a threat to human health and the environment. POPs are Hazardous substances which are based of carbon compounds, include chlorine as well and are organic in nature.”

2.4 Environmental framework of Pakistan and CP

2.4.1 The concept of environmental framework

The term ‘environmental framework’ refers to a law or a formal provision that assigns primary responsibility as well as the authority to an agency for dealing with regulatory affairs related to environmental management, conservation and protection, etc. The ultimate intended result of all the environmental frameworks comes down to the achievement of sustainable development through implementation of the set of regulations related to environmental management and conservation.
2.4.2 Pakistan’s environmental framework pre and post the 18th Amendment

Pakistan, like other developing countries, experiences multiple economic challenges. As a result, the subjects of environmental conservation, pollution control and prevention were not the priority for most of the parties in power and were left unaddressed within the country. However, the subject of environmental conservation evolved after 1983 when the Environmental Protection Ordinance (EPO) was approved for the first time in Pakistan. In 2010, a major amendment in the constitution of Pakistan named the 18th Amendment was passed that prevented the power of the president to dissolve the parliament. The amendment granted autonomous authority to the all provinces under the constitution by eliminating powers of the federal government. Prior to the 18th Amendment, all the legislative and executive powers related to the subject of environmental pollution and ecology were distributed between the federal and provincial governments. The federal government had exclusive legislative powers, whereas the laws were enacted by both federal and provincial governments.

After the 18th Amendment, environmental legislation became a provincial subject and the authority of the Pakistan Environmental Protection Agency (Pak-EPA) was shrunk to Islamabad city only. Moreover, the federal Ministry of Environment was abolished and all the functions were transferred to the provinces. A new ministry, the Ministry of Climate Change (MOCC) was created at the federal level with which the (Pak-EPA) is attached. The PEPA 1997 Act was no longer applicable at the provincial level and all provinces got their own acts and laws based on PEPA 1997. However, between 1993 and 2010, PEPA regularly promulgated several standards, rules and regulations and guidelines to implement the PEPA 1997 provisions.

Figure 13: The evolution of environmental legislations before and after the 18th Amendment in the Constitution of Pakistan

<table>
<thead>
<tr>
<th>Before the 18th Amendment in Constitution of Pakistan</th>
<th>After the 18th Amendment in Constitution of Pakistan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Protection Ordinance 1983:</td>
<td>Punjab Environmental Protection Act 1997:</td>
</tr>
<tr>
<td>In the 1983, EPO was approved for the first time in</td>
<td>The Punjab Environmental Protection Act 1997 (Amended 2012) is the basic legislative tool, broadly applicable to air, water, soil, marine, and noise pollution. Penalties have been prescribed for those contravening the provisions of the Act. According to Section 3 (1), the government has constituted inter-ministerial, multi-sectoral, and multi stakeholder’s body under the chairmanship of the Chief Minister.</td>
</tr>
<tr>
<td>Pakistan</td>
<td></td>
</tr>
<tr>
<td>National Conservation Strategy 1993:</td>
<td>Baluchistan Environmental Protection Act, 2012:</td>
</tr>
<tr>
<td>The NCS was developed over a nine-year period (1983-1992) through the collective efforts of the IUCN and the Government of Pakistan. The NCS development process included extensive consultation with thousands of experts, interested individuals, communities, NGOs, and government agencies. The final product, according to several observers, is outstanding, in terms of both comprehensiveness and quality.</td>
<td>The Baluchistan Environmental Protection Act, 2012 (BEPA, 2012) is the basic legislative tool, broadly applicable to air, water, soil, marine, and noise pollution. Penalties have been prescribed for those contravening the provisions of the Act. Projects need to be approving environmental assessments from the BEPA and must adhere NEQS.</td>
</tr>
<tr>
<td>Pakistan Environmental Protection Act, 1997:</td>
<td>KPK Environmental Protection Act, 2014:</td>
</tr>
<tr>
<td>An Act to provide for the protection, conservation, rehabilitation and improvement of the environment, for the prevention and control of pollution, and promotion of sustainable Development. Whereas it is expedient to provide for the protection, conservation, rehabilitation and improvement of the environment, prevention and control of pollution, promotion of sustainable Development.</td>
<td>The KPK Environmental Protection Act, 2014 is the basic legislative tool, broadly applicable to air, water, soil, marine, and noise pollution. Projects need to be approve environmental assessments from the EPA-KP and must adhere Khyber Pakhtunkhwa Environmental Quality Standards (KPEQS).</td>
</tr>
<tr>
<td>The Sindh Environmental Protection Act, 2014</td>
<td>The Sindh Environmental Protection Act, 2014 is the basic legislative tool empowering the provincial government to frame regulations for the protection of the environment. It is valid to a wide range of issues including air, water, soil, marine, and noise pollution, as well as the handling of hazardous wastes. The two essential considerations of the Act are the direct of project simply after endorsement of environmental assessments from the SEPA and adherence with Sindh Environmental Quality Standards (SEQS).</td>
</tr>
</tbody>
</table>

Adapted from: https://www.iucn.org.com
2.4.3 CP initiatives undertaken in Pakistan

In Pakistan, no institute is part of UNEP’s Cleaner Production Network (CPN). However, there are four cleaner production centres working in different areas initiated under different projects which have been funded by foreign government organizations, international aid institutions and the federal government of Pakistan. The most prominent donor agencies working for the promotion of CP in Pakistan include UNEP, Royal Netherlands Embassy and the government of Pakistan. Some of the most common CP initiatives undertaken in line with relevant MEAs and legislative framework of the country are shown in figure 14.

Figure 14: CP initiatives undertaken within the country

![Diagram showing CP initiatives undertaken within the country]

Adapted From: National Cleaner Production Centres (NCPCs) & Networks | UNIDO
2.4.4 Sindh Environmental Protection Act 2014 and its relevance with CP

Since the present study is focused on the development of CP policy, strategies and implementation tools for the province of Sindh, therefore it is important to have a detailed understanding of most relevant sections of SEPA Act 2014 which empowers the agency to formulate and implement the proposed CP policy, which at present is under development. Figure 15 shows the relevant sections of the act.

![Figure 15: SEPA Act 2014 and its relevance to CP](http://epasindh.gov.pk/)

<table>
<thead>
<tr>
<th>AREA OF INTEREST</th>
<th>RELEVANT SECTION NO.</th>
<th>BRIEF DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functions of Agency (Prepare Policies)</td>
<td>Section (6) 1 (a)</td>
<td>Prepare policy in coordination with the appropriate Government Agency or local council and, in consultation with the concerned Advisory Committees where established, environmental policies for the approval of the Council.</td>
</tr>
<tr>
<td></td>
<td>Section (6) 1 (g)</td>
<td>Where the quality of ambient air, water, land or noise so requires, the Agency may, by notification in the Official Gazette establish different standards for discharge or emission from different sources and for different areas and conditions as may be necessary.</td>
</tr>
<tr>
<td></td>
<td>Section (6) 2 (d)</td>
<td>Recommend to Government and the Council the adoption of financial and fiscal programs, schemes or measures for achieving environmental objectives and goals and the purposes of this Act, including:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(i) taxes, duties, cesses and other levies; and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ii) incentives, prizes, awards, rewards, subsidies, tax exemptions, rebates, and depreciation allowances.</td>
</tr>
<tr>
<td>Sindh Sustainable Development Fund</td>
<td>Section (6) 2 (a)</td>
<td>The Sindh Sustainable Development Fund shall be utilized, in accordance with such procedures as may be prescribed for:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(a) providing financial assistance to projects designed for the protection, conservation, rehabilitation and improvement of the environment, the prevention and control of pollution, the sustainable development of resources and for research in any specified aspect of the environment;</td>
</tr>
<tr>
<td>Prohibition of certain discharges or emissions and compliance with Standards</td>
<td>Section (11) 2 (a)</td>
<td>All persons, in industrial or commercial or other operations, shall ensure compliance with the Environmental Quality Standards for ambient air, drinking water, noise or any other standards established under section 6(1)(b); shall maintain monitoring records for such compliances; shall make available these records to the authorized person for inspection; and shall report or communicate the record to the Agency as required under any directions issued, notified or required under any rules and regulations.</td>
</tr>
<tr>
<td>Handling of Hazardous Substances</td>
<td>Section 13</td>
<td>No person shall import hazardous waste into Sindh province or its coastal, internal, territorial or historical waters, except acquiring prior approval of the Agency.</td>
</tr>
</tbody>
</table>

Adapted from: http://epasindh.gov.pk/

2.4.5 ILES implementation in context of CP in Sindh

The project code “PAK/16/03/EUR” titled as International Labor and Environmental Standards Application in Pakistan’s SMEs (ILES) is active since 1 September 2016 till 30 September 2022. This project is being implemented in Pakistan by the support of delegations of the European Union (EU), the International Labor Organization (ILO) for Pakistan and WWF-Pakistan. The project is also related to cleaner production as it focuses on strengthening of systems and capacity building of the industrial sector for alignment of environmental and labour standards with international standards in order to enhance sustainability in Pakistan. ILES is also implementing Smart Environmental Management Practices (SEMPs) in selected textile and leather industries in Karachi, Lahore, Faisalabad and Sialkot to devise a business case for compliance of labour and environmental standards.

**PAK/16/03/EUR**

ILES is related to cleaner production as it focuses on strengthening of systems and capacity building of the industrial sector for alignment of environmental and labour standards with international standards.
2.5 Prevailing interventions and efforts for CP in developing countries

In recent years, a number of developing countries have realized the importance of cleaner production for sustainable development and they have been formulating and implementing national level cleaner production policies. As a result, several initiatives have been taken in order to promote cleaner production within these countries\(^8\). It is important to discuss examples of CP initiatives taken by developing countries with similar economies like Pakistan, which may help define a way for adoption of CP interventions in Pakistan’s context.

### 2.5.1 Malaysia

In 1996, Danish Corporation for Environment and Development (DANCED), for the first time introduced cleaner technology (CT) concept in Malaysia. This was a technical cooperation between the governments of Malaysia and Denmark, which was carried out by the Standards and Industrial Research Institute of Malaysia (SIRIM) under the Ministry of Science, Technology and Innovation (MOSTI); to promote CT through conducting environmental and energy audits and provide information to the stakeholder through two different services known as Cleaner Technology Extension Services (CTES) and the Cleaner Technology Information Services (CTIS). Since 2012, the Malaysian Department of Environment started a national CP promotion programme to steer Malaysian industries to adopt efficient waste management and cleaner production technologies. This programme was followed by the publication of several guidelines such as Cleaner Production Audit Guidelines in 2007 and Guidelines for Green Industry Auditors in 2014\(^9\). Moreover, the environmental management concerns will continue to strengthen in the Eleventh Malaysia Plan 2016-2020. Malaysia is also focusing on adaptation of CP technologies in the industrial sector for the successful implementation of a National Green Technology Policy.

### 2.5.2 Kenya

Like other developing countries, Kenya has been moving towards sustainable development and implementing eco-friendly technologies. In 2000, the government of Kenya in collaboration with Kenya Industrial Research and Development Institute (KIRDI) and UNIDO built a Kenya National Cleaner Production Center (KNCPC). It aims to facilitate Kenyan industries to increase their production with minimum resources and reduced environmental pollution. Since 2001, KNCPC has been encouraging the industrial sectors to enhance efficiency by providing cleaner production technical assistance and implementing programmes to promote CP activities that result in reduced carbon emissions, efficient use of resources and reduced environmental pollution.
In 1999, Kenya for the first time rectified the parliament’s act named as Environmental Management and Coordination Act (EMCA) to establish appropriate legal and institutional framework for the management of the environment and the National Environmental Protection Agency (NEMA) was formed to coordinate and supervise all the environmental related matters\textsuperscript{[10]}. Afterwards, gradually many other regulations have been set by NEMA for the industries. Studies revealed that till date, Kenya has not had any cleaner production policy. Industries are adapting to cleaner production practices voluntarily in the country. However, NEMA is responsible for governing the environmental regulations which still have a gap for waste generation and unsustainable disposal.

### 2.5.3 India

In India, pollution reduction as a part of government’s policy statement boosted up the CP concept. The statement for pollution abatement in policy aims to provide technical assistance to small scale industries and to ensure the adoption of suitable technologies, waste minimization and conduction of environmental audits. Between 1993-1994, CP technologies were successfully implemented in the Indian industries. UNIDO started a project named Demonstration in Small Industries for Reducing Waste (DESIRE) which focused on waste reduction opportunities for SMEs. The state government of Gujarat with the technical support of UNIDO, devised a CP policy to ensure cleaner production in industries. This CP policy mainly focuses on energy efficiency, water management and waste management in various industrial sectors to adopt environmental friendly technologies and practices.

### 2.5.4 Sri Lanka

Sri Lanka has also been adopting CP in various economic sectors. Sri Lanka’s economy is dependent on agriculture and the country has been taking measures for sustainable management of agriculture and conservation of natural resources. In this regard, ministry of Agriculture in collaboration with the ministry of Environment Sri Lanka, devised a national policy on CP for the agriculture sector to achieve food security through sustainable agriculture systems and ensure efficient and effective management of natural resources \textsuperscript{[11]}. Moreover, the ministry of Environment also drafted a national policy on sustainable consumption and production to improve economic development and social welfare of the country \textsuperscript{[12]}.
2.6 Review of CP case studies

There are numerous studies and research articles demonstrating the adoption of CP practices and techniques in different industrial sectors. Implementation of CP technologies in manufacturing operations has benefits for businesses, workers and the environment.

In Malaysia, a study was carried out in a fruit juice production plant to check the feasibility of CP practices for reduction of carbon dioxide (CO$_2$) emissions. Electricity, water and fuel consumption along with solid waste were identified as a reason for CO$_2$ emissions. The results showed that before CP interventions, CO$_2$ emissions were 0.07 kg CO$_2$ per litre of the fruit juice which was later reduced to 0.048 kg CO$_2$ per litre of juice following the implementation of CP techniques. The investment to implement these practices was estimated to be US$9,455 with a payback period of six years, which turned out to be economical and environmentally sustainable\[13\].

Another study was conducted in a medium sized plastic resins manufacturing plant in Malaysia to estimate the CO$_2$ emissions. The results revealed that plant emitted 0.84 kg CO$_2$ per kg of resins produced and the main causes were solid waste generation and diesel consumption. Some CP techniques to reduce energy consumption were implemented and as a result it was found that CO$_2$ emissions reduced by 0.11 kg of CO$_2$ per kg production of resins. The study shows that CP strategies could also be beneficial for plastic manufacturing plants\[14\].

A study was carried out in a paper mill located in India under the UNIDO sponsored project named DESIRE. The CP interventions in the paper mill resulted in savings of US$88,000 annually on an investment of US$88,000. There was 28 per cent reduction in water consumption, 18 per cent reduction in solid waste generation, water pollution reduced by 46 per cent and 8.5 per cent reduction in air pollution loads was achieved. Moreover, effluent treatment costs were decreased by US$55,000 per year. In line with these benefits, the industry achieved a better working environment along with improved product quality\[15\].

A seafood processing industry in Vietnam implemented CP options to reduce its water and electricity consumption. Before CP interventions were taken at the plant, there were significant CO$_2$ emissions and high volume of contaminated wastewater being discharged. The industry identified some CP options to reduce water and energy consumption and the associated environmental risks. For the implementation of CP techniques, the industry invested about US$35,222 and got a benefit of approximately US$66,411 annually\[16\].

Another paper producing industry in Vietnam started a project for energy saving and implemented CP techniques for reduction in environmental emissions. The industry invested capital of about US$112,784 and achieved savings of US$123,390 annually\[16\].
3.1 Overview

This section of the report describes the methodology, which was carried out to achieve the objectives of the assessment and to draft a CP policy document for the Sindh Province.

3.2 Methodology

As per the work plan, the study was divided into four (04) different phases. The description of the phases is given below:

3.2.1 Phase-I, desk study and project inception report

This phase of the project specifically focused on the desktop review of existing literature on the subject matter. During this phase, the concept of the CP was reviewed along with its evolution with the passage of time across the globe, MEAs ratified by the government of Pakistan (GoP) to analyze how CP can be applied in practice to achieve outcomes of MEAs and implementation of existing cleaner production policies in the Asia-pacific region (APR) and their relevance to Pakistan. Moreover, it also included a comprehensive review of the case studies of similar economies in the APR. Subsequently, a stakeholder mapping activity was done on the basis of which the key stakeholders were identified by their type and nature of engagement. On the basis of the above-mentioned activities, a detailed inception report was prepared.

3.2.2 Phase-II, stakeholder consultative workshop

In the second phase of the project, a working paper/consultation workshop agenda was developed and key informant interviews (KIs), focused groups discussions (FGDs), online consultation meetings and detailed workshops were conducted. During KIs, FGDs and workshops, meeting outcomes for identification of the relevant legal and regulatory frameworks and
requirements of cleaner production in different industrial sectors in Sindh were documented. Gaps and limitations that may be experienced by SEPA during the implementation of the proposed CP Policy were also identified, therefore the participants of the consultative workshop were divided in four working groups for which different open-ended questionnaires were designed. The questionnaires are attached as Annexure-I.

### PHASE II

A working paper/consultation workshop agenda was developed and KII s, FGDs, online consultation meetings and detailed workshops were conducted.

#### 3.2.3 Phase-III, documentation

During this phase, all the information on CP gathered during phase-II was documented and policy documentation was drafted. The following activities were done during the execution of phase-III of the project:

- Compilation of associated documents.
- Engagement with stakeholders to get their feedback.
- Articulation of the draft CP policy applicable to all sectors in Sindh.
- Development of environmental policy instruments that can be used in promoting CP amongst different sectors in the province.
- Defining cross linkages of CP with MEAs, existing provincial environmental policies and laws.
- Development of monitoring and implementation mechanisms of CP policy.
- CP policy and action plan for SEPA.

#### 3.2.4 Phase-IV, project final report

During this phase, the final report was compiled including the CP policy and implementation strategy for SEPA.
SECTION 4
Stakeholder Consultations

4.1 Overview
This section of the report discusses and highlights the identification of stakeholders and outcomes of the consultative workshops and meetings.

4.2 Identification of stakeholders
A stakeholder map was developed and each organization was identified by its type and the nature of engagement with it over the course of the study, shown in table 2.

In order to get feedback and recommendations from key stakeholders, several formal interviews, online meetings and detailed workshops were conducted.
<table>
<thead>
<tr>
<th>Organization</th>
<th>Nature of Engagement</th>
</tr>
</thead>
<tbody>
<tr>
<td>World Wide Fund-Pakistan (WWF)</td>
<td>D, E, P</td>
</tr>
<tr>
<td>Sindh Environmental Protection Agency (SEPA)</td>
<td>E, P</td>
</tr>
<tr>
<td>Sindh Industrial Trading Estate (SITE)</td>
<td>E, P</td>
</tr>
<tr>
<td>Textile Commissioner Organization (TCO)</td>
<td>P</td>
</tr>
<tr>
<td>State Bank of Pakistan (SBP)</td>
<td>P</td>
</tr>
<tr>
<td>SITE Limited</td>
<td>P</td>
</tr>
<tr>
<td>Trade Development Authority (TDA)</td>
<td>P</td>
</tr>
<tr>
<td>Ministry of Industries and Production (MOIP)</td>
<td>P</td>
</tr>
<tr>
<td>NED University of Engineering and Technology (NED-UET)</td>
<td>D, E</td>
</tr>
<tr>
<td>University of Karachi</td>
<td>D, E</td>
</tr>
<tr>
<td>Sindh Madressatul Islam University (SMIU)</td>
<td>D, E</td>
</tr>
<tr>
<td>Bahria University (BU)</td>
<td>D, E</td>
</tr>
<tr>
<td>Mehran University of Engineering and Technology (MUET)</td>
<td>D, E</td>
</tr>
<tr>
<td>Korangi Association of Trade and Industries (KATI)</td>
<td>D, E, P</td>
</tr>
<tr>
<td>Federation of Pakistan Chamber of Commerce &amp; Industry (FPCCI)</td>
<td>P</td>
</tr>
<tr>
<td>Artistic Denim Mills</td>
<td>D, E</td>
</tr>
<tr>
<td>Soorty Enterprises</td>
<td>D, E</td>
</tr>
<tr>
<td>Bank Alfalah</td>
<td>D</td>
</tr>
<tr>
<td>Bank Al Habib</td>
<td>D</td>
</tr>
<tr>
<td>Meezan Bank</td>
<td>D</td>
</tr>
<tr>
<td>Federal B Area Association of Trade &amp; Industry (FBATI)</td>
<td>D, E, P</td>
</tr>
<tr>
<td>North Karachi Association of Trade &amp; Industry (NKATI)</td>
<td>D, E</td>
</tr>
<tr>
<td>Pakistan Sugar Mills Association Sindh Zone (PSMASZ)</td>
<td>D, E, P</td>
</tr>
<tr>
<td>Pakistan Chemical Manufacturers Association (PCMA)</td>
<td>D, E, P</td>
</tr>
<tr>
<td>Archroma Pakistan Ltd</td>
<td>D, E</td>
</tr>
<tr>
<td>Zaman Textile Mills Ltd</td>
<td>D, E</td>
</tr>
<tr>
<td>Rajiby Garments</td>
<td>D, E</td>
</tr>
<tr>
<td>Pakistan Denim Manufacturers &amp; Exporters Association (PDMEA)</td>
<td>D,E,P</td>
</tr>
<tr>
<td>All Pakistan Handloom &amp; Traditional Textiles Manufacturers &amp; Exporters Association</td>
<td>D,E,P</td>
</tr>
<tr>
<td>All Pakistan Marble Industries Association (APMIA)</td>
<td>D, E, P</td>
</tr>
<tr>
<td>All Pakistan Paper Merchants Association (APPMA)</td>
<td>D, E, P</td>
</tr>
<tr>
<td>All Pakistan Particle Boards Manufacturers Association (APPBMA)</td>
<td>D,E,P</td>
</tr>
<tr>
<td>All Pakistan PVC Pipe Manufacturers Association (APPPMA)</td>
<td>D,E,P</td>
</tr>
<tr>
<td>All Pakistan Textile Mills Association (APTMA)</td>
<td>D, E, P</td>
</tr>
<tr>
<td>All Pakistan Textile Processing Mills Association (APTPMA)</td>
<td>D,E,P</td>
</tr>
<tr>
<td>Indentors Association of Pakistan (IAP)</td>
<td>D, E, P</td>
</tr>
<tr>
<td>Karachi Cotton Association (KCA)</td>
<td>D, E, P</td>
</tr>
</tbody>
</table>

Table 2: List of stakeholders

D = Data Source  
E = Expert  
(technical inputs on assumptions)  
P = Policy influence
Figures 16 and 17 show the type of organizations which have been consulted during the project period and the nature of engagement with them.

**Figure 16: Stakeholder mapping with respect to type of organizations**

![Types of Organizations]

- Research and academia: 8%
- Representative associations of private: 8%
- Government: 10%
- Private sector: 74%

**Figure 17: Nature of engagement with stakeholders**

![Nature of Engagement]

- Data Source: 46%
- Expert (technical inputs): 34%
- Policy influence: 20%
4.3 Stakeholder consultations

In order to get feedback and recommendations from key stakeholders, several formal interviews, online meetings and detailed workshops were conducted. The first of the three workshops was conducted on 15 September 2020 where multiple government officials, industrial organization representatives and relevant financial institution personnel were invited to gather data and information through interviews and consultations on CP. The input and recommendations received by the participants provided deeper insights into the subject matter. The second and third consultative workshops were conducted on 25 and 30 September 2020 respectively. The three consultative workshops provided in-depth and necessary information regarding the financial implications, knowledge barriers and possible constraints in the adoption of CP techniques. The stakeholders also showed interest in sharing relevant useful data that may increase chances of successful implementation of the CP policy and strategies.

During these consultations, the researchers, practitioners and public stakeholders had a number of concerns and queries around the proposed CP policy. An interactive exercise of seeking recommendations around four major aspects of the CP implementation was conducted during the sessions. It included feedback on policy-making, limitations expected during the implementation of CP interventions, technological implications and financial investments. A significant amount of data and outputs were hence gathered from these meetings. In addition to the above consultative workshops, individual consultative meetings were also conducted by the consultant to gather further data and information. Figure 18 shows the participation level of the different stakeholders in the workshops and meetings.

Figure 18: Stakeholders participation

![Nature of Engagement chart]

- Government Bodies: 16%
- International Organizations, NGOs and others: 29%
- Academia: 18%
- Financial Sector: 15%
- Other: 5%

4.4 Consultation outcomes

The main objectives of the consultation workshops and meetings were to disseminate information related to the project, its current status, and to initiate discussions and gather feedback around CP policy development, implementation and anticipated impacts on the industrial sector. In this regard, stakeholders were divided into four groups i.e., policy implementation, technological barriers, financial incentives and capacity barriers. The outcomes from stakeholders’ consultations are given in figure 19.
4.4.1 Policy implementation

For effective policy implementation, awareness programmes need to be conducted for all stakeholders. Most of the stakeholders are aware of the CP concept and its importance and benefits, which is a starting point for the implementation of CP in industries. Industries face barriers in adopting CP practices due to lack of knowledge, technical expertise, commitment; moreover, each industry has different capital and human resource capacity. In this regard, there is a need to develop clear guidelines and standards that can be introduced as an outcome of the policy. Moreover, a proper monitoring system and a regulatory body is required to be put in place, which will regularly check the performance of the industries. Suggestions can be made for audits leading to the implementation of the policy in the industrial sector. Initiatives to introduce rebates in tariff of energy and duties of imported material, goods and services should be taken. Furthermore, recognition and rewards should be provided to industries on the successful implementation of CP practices and publish their success stories on online portals so as to raise morale of the industries complying with the policy.

4.4.2 Technology barriers

Technology barriers in the adoption of CP practices are:

- Lack of knowledge
- Resource availability
- Low industrial capacity
- High technology cost
- Unskilled labour
Non-availability of eco-friendly and sustainably sourced materials in the local market is another barrier, which raises costs. In order to remove these barriers and ensure successful implementation of the policy, it is recommended that the governing bodies initiate training programmes for managers and workers. A local market for green technologies should be developed that will ensure a steady supply of locally manufactured, cheaper green technologies. Moreover, authorities should rebate tariffs and taxes or develop funds for industries to adopt CP technologies.

### 4.4.3 Financial incentives

Financing CP technologies is one of the key factors which was mentioned by stakeholders. To ensure effective CP policy implementation in the province, the government should reduce import tariffs on CP technologies. A CP specific development fund needs to be established by the government and the financial institutes for encouraging the installation of cleaner technological equipment and machines on low interest rate. Moreover, tariffs on utilities should be rebated. There must be a grading system and reward for those who achieve CP in their processes. Furthermore, the government should subsidize lands in industrial parks to facilitate adoption of clean production equipment and machinery.

### 4.4.4 Capacity barriers

Few of the large-scale industries are practicing in-house CP practices. However, in general, there is still a lack of awareness about CP. To build a culture of CP implementation within the industrial sector, awareness and trainings programmes for both the upper and lower management need to be conducted. Industry specific CP policy should define roles and responsibilities of the managers and supervisors. During the policy development process, the government should consider the 4M (men, machine, material and methods) approach for the sector. Most of the local industries are not capable of adopting CP due to lack of capital for conventional and modern technologies. It is therefore recommended that the government allocate some funds for SMEs for CP specific interventions.

### 4.5 The way forward

During various consultative sessions, comments from different stakeholders were registered and incorporated in the draft policy. The draft policy has already been shared with the Sindh Environmental Protection Agency (SEPA) which will publish the policy on their website for a specific time duration and will open the forum for feedback/comments from the implementers.
REFERENCES


ANNEXURE-I: Questionnaires for working groups in consultative workshops

Group 1 Policy implementation

1. Identify the departments/agencies/authorities that may support implementation of cleaner production policy, both at provincial and federal level.

2. At present what capacity and awareness related issues do you foresee that may affect policy implementation and effectiveness?

3. How do you foresee your role in the implementation of cleaner production policy of Sindh? Identify at least three barriers that may affect policy implementation

4. What could be the possible policy implementation and monitoring tools?

5. What timeline would you like to suggest for each of the policy implementation phases and what could be the possible implementation timeline?

6. Would you support any punitive/penalties against entities not committed towards cleaner production under the phase wise approach?

7. What could be the possible policy incentives to encourage cleaner production?

Group 2 Technology barriers

1. Identify at least three key barriers for procurement of technology, raw material etc. and procurement advisory, while planning, designing and implementation of cleaner production initiatives.

2. At present what capacity and awareness related issues do you foresee that may affect policy implementation and effectiveness?

3. What could be the possible policy monitoring tools, equipment and software needed to support implementation of cleaner production?

4. What could be the possible policy incentives to encourage cleaner production?

5. What timeline would you like to suggest for each of the implementation phases of the policy?

6. What potential do you see in the local market to support the implementation of cleaner production?

Group 3 Financial incentives

1. What could be the possible financial incentives (sector wise) to encourage cleaner production processes in progress? Identify the incentives for at least the top five industrial sectors.

2. At present what products are available with banks/financial institutions that may support cleaner production initiatives.

3. In the present trade policies (import/export) what incentives are available that may promote cleaner production initiatives? What other incentives would you suggest to be offered in the current trade policies to promote cleaner production?

4. What tax related incentives would you propose to support cleaner production in a phase wise manner?
Group 4 Capacity barriers

1. At present, what capacity and awareness related issues do you foresee affecting policy implementation and effectiveness?

2. What are the possible options which may bridge the capacity and awareness related gaps for cleaner production?

3. What training needs do you identify that may encourage behaviour based cleaner production practices?

4. What certifications would you recommend for effective implementation of cleaner production and for providing competitive access to green products in the international market?
Industries face barriers in adopting cleaner production practices due to lack of knowledge, technical expertise, commitment; moreover, each industry has different capital and human resource capacity.

Non-availability of eco-friendly and sustainably sourced materials in the local market is another barrier, which raises the costs.

To build a culture of cleaner production implementation within the industrial sector, awareness and training programs for both upper management and lower management need to be conducted.

To ensure effective cleaner production policy implementation in the province, government should reduce import tariffs on cleaner production technologies. A cleaner production specific development fund needs to be established by the government and the financial institutes for encouraging the installation of cleaner technological equipment and machines on low interest rate.