



Generating Global
Environmental Benefits - GEB

POLICY ANALYSIS FOR IDENTIFYING THE KEY POLICY SHIFTS OR MAJOR DEVELOPMENTS THAT ARE REQUIRED TO INTEGRATE ENVIRONMENT & DEVELOPMENT IN PUNJAB PROVINCE

A STUDY CONDUCTED BY GEB PROJECT THAT REVIEWED THE CURRENT SYSTEM OF DATA COLLECTION, GENERATION AND ANALYSIS, IDENTIFIED AREAS OF IMPROVEMENT AND RECOMMENDED POLICY ACTIONS REQUIRED FOR THE ESTABLISHMENT OF AN INTEGRATED EIMS IN PUNJAB

*GEB - A Joint Initiative of United Nations Development Programme (UNDP)
& Ministry of Climate Change (MoCC)*



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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Generating Global Environmental Benefits (GEB) Project is funded by the UNDP/GEF. It is implemented by Ministry of Climate Change, Government of Pakistan. The Project Management Unit (PMU) of GEB Project is established in Islamabad.

1.2 OBJECTIVES OF GEB

Objectives of the GEB Project are as under:

- To collect, generate, compile and analyze environmental information
- To employ the information for improved decision making

1.3 EXPECTED OUTCOMES

The project has three outcomes as given in the following:

- Regular availability of consistent and reliable environmental data
- Coordinated and robust EIMS
- Enhanced commitment and capacity for sustainable development planning & legislation

1.4 AIMS OF GEB

Aims of GEB are given in following:

- To remove barriers to EIMS
- To mainstream global environmental concerns into economic decision making

CHAPTER 2

APPROACH AND METHODOLOGY

2.1 OUTLINE APPROACH

To conduct the subject study an open, participatory and pragmatic approach will be adopted comprising the following cardinal points:

2.1.1 Regular sharing of information/data with the PMU and apprising them with the quality & progress of assignment.

2.1.2 Unabated exchange of views with following stakeholders and incorporating their concerns in Inception Report and Draft Final Report:

- Environment Protection Department, Government of Punjab
- Environment Protection Agency, Government of Punjab
- Planning & Development Department, Government of Punjab
- Industries Department, Government of Punjab
- Transport Department, Government of Punjab
- Bureau of Statistics, Government of Punjab
- Other stakeholders

2.2 METHODOLOGY

Comprehensive methodology has been formulated as under:

2.2.1 Collection of Data / Information

- **Data/Information** will be obtained through desk work, review of available reports & literature and meetings with stakeholders.
- Relevant provincial departments & agencies will be contacted for procurement of their respective input on the following aspects:
 - Policy shifts or major developments required for integrating environment and development.
 - Environmental Information Management System (EIMS).

2.2.2 Desk Review

Following documents will be studied:

- Punjab Province ADP 2019-20
- Punjab Government Website
- Environmental Legislation of Punjab

2.2.3 Data Synthesis and Comparison

The raw collected data / information will be computerized, analyzed and integrated for further studies. Also comparison between various data will be carried out for future adopting the best practices of EIMS in Pakistan.

CHAPTER 3

REVIEW OF CURRENT SYSTEM OF COLLECTION, GENERATION, COMPILATION & ANALYSIS OF DATA RELATED TO STATE OF ENVIRONMENT IN PUNJAB AND ANALYZE ITS SHORTCOMINGS & ESTABLISH NEED OF EIMS FOR PUNJAB

3.1 CURRENT SYSTEM OF COLLECTION, GENERATION COMPILATION & ANALYSIS OF DATA RELATED TO STATE OF THE ENVIRONMENT IN PUNJAB

There exists no formal and central for current system of collection, generation compilation & analysis of data related to state of the Environment in Punjab. Both public and private sectors have devised their own ways and means of collection, generation compilation & analysis of data related to state of the Environment i.e. required for their particular needs. They may procure such data from the environmental consultancy companies & laboratories and EPD/EPA Punjab.

3.2 ANALYSIS OF SHORTCOMINGS AND GAPS UNDER EXISTING SYSTEM

3.2.1 No policy has been formulated to share environment information and data. The same situation prevails among provincial and federal departments.

3.2.2 Industries and businesses are always reluctant to provide the required information and data to researchers & academia. They consider these information and data as their trade secrets and do not like to transmit to others outside their circles. Mostly the government departments do not have research & development (R&D) cells / centres. These should play pivotal role for collection, generation compilation & analysis of data related to state of the Environment. Their role could be defined in government notifications.

3.2.3 In the organization of EPD/EPA Punjab no cell or section has been established for collection, generation compilation & analysis of data related to state of the Environment in Punjab. Without a dedicated team reliable information and data on Environment cannot be arranged.

3.2.4 Government departments relevant to various development sectors procure some environmental aspects of their projects to be included in ADP. They utilize such information in early stages of the project.

3.3 ESTABLISHING NEED OF EIMS FOR PUNJAB

In view of the foregoing deficiencies EIMS for Punjab is required to be established on emergent footing. In absence of EIMS Punjab province cannot be developed on principle of sustainable development. It is opined that departments of P&D and EPD should take the leading role in this respect.

CHAPTER 4

IDENTIFICATION OF KEY POLICY SHIFTS OR MAJOR DEVELOPMENTS

4.1 EXISTENCE OF REALIZATION FOR ENVIRONMENTAL INFORMATION

4.1.1 Environment as Common Subject

Environment is a subject of civil society, NGOs, public & private, sectors and other global & national organizations in Pakistan. Therefore, they collect, compile, synthesis, process and analyze the data keeping in view own needs. This implies that till today the environmental data/information is not managed centrally.

4.1.2. Realization for EIMS

It is opined that the public & private sectors, industries, businesses, civil society, and NGOs strongly realize significance of EIMS and its application in sustainable development of Punjab.

4.2 IDENTIFICATION OF KEY POLICY SHIFTS OR MAJOR DEVELOPMENTS

Important key policy shifts or major developments are given below:

4.2.1 Non-performance of Primary Responsibility

It is the Primary Responsibility of EPD/EPA to inform the public, Government and the concerned organizations about the state of environment in respect of the prevailing human condition and the status of the natural resources in a consistent and comprehensive manner. They are not performing this duty properly.

4.2.2 Guidance to Public & Private Sectors

It is the basic role of EPD/EPA Punjab to provide guidance to the public & private sectors on environmental concerns. Unfortunately, they are lacking in this respect.

4.2.3 Lack Technical & Financial Capacity

The EPD and EPA lack technical & financial capacity to be effective in implementation of EIMS project.

4.2.4 Non-formulation of Policy

There is no policy being followed in EPD/EPA for collection, generation, compilation & analysis of data.

4.2.5 Lack of Coordination

There is no coordination among government departments, Chambers of Commerce & industries and private sectors on account of which required environmental information and data are not available.

4.2.6 Non-availability of State of Environment (SOE) in Punjab

SOE has not been prepared in Punjab. In fact it may be done if sound EIMS is available in Punjab. This implies that first EIMS should be arranged and later on SOE may be arranged:

- Terrestrial Degradation
- Land Pollution
- Water Pollution
- Industrial Pollution
- Air Pollution
- Noise Pollution
- Food Pollution
- Environmental Health
- Environmental Education in Punjab
- Environmental Legislation
- Punjab Conservation Strategy
- Environmental Profile of Punjab
- Socio-Economic-Cultural-Political Environments

CHAPTER 5

INTEGRATION OF ENVIRONMENT AND DEVELOPMENT IN PUNJAB PROVINCE

5.1 SALIENT FEATURES OF PUNJAB PROVINCE

5.1.1 Punjab (Five waters) is Pakistan's most populous and the largest province of Pakistan. Its estimated population of 110,012,442 as of 2017. Forming the bulk of the transnational Punjab region, it is bordered by the Pakistani provinces of Sindh, Balochistan, and Khyber Pakhtunkhwa, the enclave of Islamabad, and Azad Jammu & Kashmir (AJ&K). It also shares borders with the Indian states of Punjab, Rajasthan and Occupied Jammu and Kashmir (OJ&K). Its capital is Lahore, a cultural, historical, economic and cosmopolitan centre of Pakistan.

(Source: https://en.wikipedia.org/wiki/Punjab,_Pakistan)

5.1.2 Punjab is basically an agricultural province. Main crops are Cotton, Wheat and Rice. All KHARIF and RABI crops are cultivated. Industrial sector is also heavily developed here. Many of the cities of Punjab are manufacturing industrial goods and small kind of handicrafts which are used all over in Pakistan. Punjab has best kind of education provided in the country. There is lot of cultural life in Punjab for the tourists.

5.1.3 Important Statistics of Punjab

- Area

It extends over an area of 205,345 square kilometers (97,192 square miles). It is 25.8% of the total area of Pakistan.

• Population	-	110 Million*
• Language	-	Punjabi
• Literacy Rate	-	59.6%
• Temperature	-	2°C to 40 °C
• Districts	-	36
• Tehsils/Towns	-	127
• Animal of Punjab	-	Uriah

- Bird of Punjab - Peacock
- Tree of Punjab - Shisham

***Source: Pakistan Bureau of Statistics Census Results 2017, Pakistan Economic Survey 2015-2016, Statistical Pocket Book of Punjab (2016), Multiple Indicator Cluster Survey 2014, Pakistan Demographic and Health Survey (2012 - 2013), Ministry of Planning, Development & Reforms (Population Projections for Year 2007-2030), Pakistan Social and Living Standard Measurement Survey 2013-14, World Bank Indicators.**

5.2 NATIONAL ECONOMY SURVEY 2018-19

Significant features of national economy survey 2018-19 are mentioned in the following:

- 5.2.1 As predicted by many economists, the central bank and multilateral lenders, the economic survey revealed that Pakistan's economy slowed down sharply in the current fiscal year, hitting a nine-year low at 3.3 per cent and missing the 6.2 per cent target by a wide margin.
- 5.2.2 Major challenges during the current fiscal year 2018-19 ending June 30, were runaway imports and swelling trade and current account deficits.
- 5.2.3 These put a lot of pressure on the country's meager foreign currency reserves, which got some cushion from around \$9.2 billion in deposits placed with State Bank of Pakistan by Saudi Arabia, UAE and China.
- 5.2.4 In May 2019, the government had reached a staff-level agreement with the International Monetary Fund (IMF) for a loan of \$6 billion over a period of 39 months. This, along with the deposits placed with the central bank by friendly countries, is expected to help Pakistan meet its payment obligations – import payments and debt servicing – over the next many months.
- 5.2.5 In the meantime, Pakistan's rupee has depreciated around 44% since December 2017, resulting in an increase in the debt servicing cost as well as inflationary pressure. Also, a massive challenge for the government was the widening fiscal deficit, fuelled by heavy domestic and foreign borrowing to meet growing expenditures.

- 5.2.6 The agriculture sector registered a growth rate of 0.85% against the target of 3.8%; industrial sector 1.4% against 7.6% and the services sector 4.7% against 6.5%.
- 5.2.7 During the outgoing year, the total investments as a percentage of Gross Domestic Product (GDP) were recorded at 15.4% against the target of 17.2%. The fixed investment as a percentage of GDP remained at 13.8% against the target of 15.6%, while public and private investments remained at 4.0 and 9.8% against the targets of 4.8 and 10.8% respectively.
- 5.2.8 The National Savings remained at 10.7% of GDP against the target of 13.1%. The consumption growth was recorded at 11.9% against 10.2% growth recorded last year. As a percentage of GDP, it increased to 94.8% as compared to last year's figure of 94.2%.
- 5.2.9 On the demand side, the exports declined by 1.9% despite the exchange rate depreciation, while imports declined by 4.9%. It helped in reducing the trade deficit by 7.3% during July-April 2019 while it had shown an expansion of 24.3% during the corresponding period of last year.
- 5.2.10 The workers' remittances played a major role in containing current account deficit to 4.03% of GDP. The current account deficit showed a contraction of 27% during July-April of the current year while it had expanded by 70% during the corresponding period of last year.
- 5.2.11 Meanwhile, the financial sector faced multifaceted challenges over the years due to excessive and unproductive expenditures on one hand and lower tax revenues on the other. Generally, higher current expenditures and lower tax revenues left limited fiscal space for public investment and social safety net. Furthermore, high-interest payments, untargeted subsidies, loss-making PSEs, energy subsidies and security-related issues all weighed on expanding the fiscal deficit.
- 5.2.12 During the last five years, total revenue as a percentage of GDP on average reached 14.9%, whereas

it stood at 15.1% in FY2018. The total expenditures as per cent of GDP on average reached to 20.5%, while during the preceding year FY2018, it was the highest at 21.6%. Resultantly, the fiscal deficit on average stood at 5.5%, while during the last year it was recorded at 6.5%.

- 5.2.13 During the first nine months July-March CFY2019, consolidated fiscal indicators suggested that total revenue registered zero growth, while growth in total expenditures was 8.7%.
- 5.2.14 Therefore, fiscal deficit as per cent of GDP was 5.0% as compared to 4.3% during the corresponding period of last year. Total revenue increased to Rs3,583.7 billion (9.3% of GDP) from Rs3,582.4 billion (10.3% of GDP) during the comparable period of last year, showing almost zero growth in comparison of growth of 13.9% during the same period last year.
- 5.2.15 Decelerated performance of total revenues primarily was due to marginal growth of 1.8% in tax revenues and negative growth of 16.7% in non-tax revenues.
- 5.2.16 During the period July-April CFY2019, the FBR's tax receipts remained at Rs 2,976.0 billion against Rs2,922.5 billion during the same period of FY2018, registering a growth of 1.8%.
- 5.2.17 Actual tax collection during the first ten months of CFY remained at 67.7% of the revised target of Rs 4,398 billion.
- 5.2.18 Total expenditures increased to Rs 5,506.2 billion (14.3% of GDP) during the first nine months of CFY2019 registering a growth of 8.7% against Rs5,063.3 billion (14.6% of GDP) showing the growth of 15.5%.
- 5.2.19 Within total expenditures, current expenditures posted a growth of 17.7% to Rs4,798.4 billion (12.4% of GDP) during July-March CFY2019 as compared to Rs4,075.4 billion (11.8% of GDP) in the same period last year. Federal and provincial governments' current expenditures grew by 19.9 and 13.7 per cent, respectively during the period under review.

Source:<https://www.pakistantoday.com.pk/2019/06/10/economic-survey-2018-19-pakistans-economy-hits-nine-year-low-at-3-3pc/>)

5.3 ECONOMY OF PUNJAB

5.3.1 Agriculture

- Economy of Punjab is agriculture based. The province plays the leading role in agricultural production. It contributes about 68% to the annual food grain production in the country. 51 million acres of land is cultivated. 9.05 million acres are lying as cultivable waste in different parts of the province.
- Cotton and rice are cash crops. These contribute substantially to the national exchequer.
- Attaining self-sufficiency in agriculture has shifted the focus of the strategies towards small and medium farming, stress on BARANI areas, farms-to-market roads, electrification for tube-wells and control of water logging and salinity.

5.3.2 Industrial Sector

- Industries make main contribution to provincial economy. Punjab has over 48,000 industrial units.
- The small and cottage industries are in abundance. There are 39,033 small and cottage industrial units.
- The number of textile units is 11,820. The ginning industries are 6,778. There are 6,355 units for processing of agricultural raw materials including food and feed industries.
- Lahore and Gujranwala Divisions have the largest concentration of small light engineering units. The district of Sialkot excels in sports goods, surgical instruments and cutlery goods.

5.3.3 Mineral Wealth

Punjab is a mineral rich province with extensive mineral deposits of coal, rock-salt, dolomite, gypsum, silica-sand. Punjab Mineral Development Corporation is running over a dozen economically viable projects.

5.3.4 Other Development Companies

Punjab has established a number of Development Companies dealing with sectors like cattle management, water management, meat management and solar energy. They are playing their respective role in the development of Punjab.

5.4 DEVELOPMENT SECTORS

Annual Development Programme (ADP) 2019-20 of Punjab Province includes the following sectors:

7.4.1 Social

7.4.2 Infrastructure

7.4.3 Production

7.4.4 Services

7.4.5 Others (including Environment & Climate Change)

7.4.6 Special Initiatives

5.5 EPD AND EPA PUNJAB

5.5.1 Organization of EPD Punjab

- It is headed by Secretary, Government of Punjab.
- Its sections are appended in the following:
 - Administration Section
 - Complaint Section
 - Environmental Approval Section
 - Environmental Laboratories Section
 - Implementation Section
 - Legal Section
 - Research and Investigation Section
 - Technology Transfer Section
 - Directorate of Environmental Health, Dengue Control & Hazardous Waste

5.5.2 Functioning of EPD Punjab

Various functions of EPD Punjab are given below:

- To administer and implement the provisions of Environment Protection Act and the rules and regulations made there under
- To prepare and establish the Punjab Environmental Quality Standards with approval of the Council and enforcement
- To take measures to promote research and development of science and technology which may contribute to the prevention of pollution, protection of the environment and sustainable development
- To Identify the needs for, and initiate legislation in various sectors of the environment
- To Provide information and guidance to the public on environmental matters
- To Specify safeguards for the prevention of accidents and disasters which may cause pollution
- To Encourage the formation and working of non-governmental, community and village organizations to prevent and control pollution and promote sustainable development
- To Take all necessary measures for protection, conservation, rehabilitation and improvement of the environment & for prevention and control of pollution
- To Promote sustainable development

5.5.3 Organization of EPA Punjab

- It is headed by Director General
- Its sections are appended in the following:
 - Administration Section
 - Complaint Section
 - Environmental Approval Section
 - Environmental Laboratories Section
 - Directorate of Environmental Health, Dengue Control & Hazardous Waste
 - Implementation Section
 - Legal Section
 - Research and Investigation Section

- Technology Transfer Section

5.5.4 History of EPD/EPA Punjab

Brief history of EPD/EPA Punjab is given below:

- Constitution of Pakistan (1973) had covered Environment and Ecology under Concurrent List. The provinces had been permitted to prepare their own Environmental Legislation.
- In 1975, Punjab Province created Environmental Pollution Control Organization (EPCO) in Public Health Engineering Department.
- In July, 1987 EPA Punjab was constituted.
- In December, 1996 EPD Punjab was formed.

5.5.5 Share of EPD/EPA in ADP 2019-20

- EPD/EPA has been given a share of Rs.1,000.00 million in ADP of year 2019-20. They will complete a few scheme in this amount.
- Punjab Green Development Project has been launched over five years. Under this project the **State of Environment in Punjab Report** will be prepared annually. Also Environmental Monitoring Centres will be established in various districts of Punjab.

5.6 INTEGRATION OF ENVIRONMENT AND DEVELOPMENT IN PUNJAB

Environment and development needs to be carried out at the same time and not at the cost of other. A few points in this direction are given below:

5.6.1 Connectivity of Environmental Assessment Study with Feasibility Report

Environmental Assessment Studies is carried out at all stages of project. Detailed IEE or EIA study should be undertaken at feasibility stage. In view of environmental restrictions changes in design of the project may be affected.

5.6.2 Role of Planning & Development (P&D) Department

P&D Department is the focal organization for ensuring the inclusion of environmental element in project planning & development.

5.6.3 Role of EPD/EPA Punjab

EPD/EPA has to play the most important role. It must oversee and monitor all projects from conception to implementation and post operation activities. It should control any anti-environment procedure which could jeopardize sustainable development of a project.

CHAPTER 6

COMPREHENSIVE FRAMEWORK FOR ESTABLISHMENT OF EIMS FOR PUNJAB

6.1 OBJECTIVES OF FRAMEWORK

Main objectives of framework for establishing EIMS for Punjab are as under:

- 6.1.1** To ensure effective and efficient system of collection, generation compilation and analysis of environmental information.
- 6.1.2** To assist in integration of environmental values in project development.
- 6.1.3** To minimize adverse of climate change on developmental projects.
- 6.1.4** To seek willing cooperation of all relevant stakeholders.

6.2 MAJOR FEATURES, CHARACTERISTICS AND DATA SOURCES FOR FEEDING PROSPECTIVE EIMS FOR PUNJAB

6.2.1 Salient Features of Prospective EIMS for Punjab

- Incorporation of Relevant features of environmental policy in the EIMS.
- Inclusion of strategic and tactical ecological scenarios.
- Inclusion of current environmental, GIS, remote sensing, space science etc in preparing EIMS.
- Incorporation of views of stakeholders in EIMS.
- Seeking international cooperation from organization like UNESCO and NASA.
- Application of comparative environmental and economic indicators in the EIMS.
- Rapid and efficient Public disclosure system.
- Active role of Provinces in framing EIMS.

6.2.2 Sources of Data Required for Prospective EIMS for Punjab

A few sources of data are as under:

- Departments of Punjab Government
- Ministries of Government of Pakistan
- UN Agencies like UNEP, UNDP, UNIDO, UNICEF, UNESCO etc
- Global Organizations such as World Bank, Asian Development Bank, JICA, CIDA etc

- Google Earth, National Geographic

6.2.3 Characteristics of Good EIMS

Characteristics of Good EIMS are appended below:

- Allow for easy data input and import
- Be secure
- Support industry standard Electronic Data Deliverable (EDD) formats
- Provide a robust query interface which allows to query environmental data by location, parameter and date
- Allow for easy State and Federal MCL Comparison
- Have allowance for data validation and verification
- Graph and map with flexible options
- Allow for flexible report generation
- Allow for export to third party software
- Be intuitive to use
- It should meet national and provincial needs

(Modified from <http://www.ess.co.at/EIMS/>)

6.3 ENVIRONMENTAL INDICATORS AND VARIABLES

6.3.1 Environmental Indicator

- It is a physical, chemical or biological scenario which may describe existing intricate environmental information or futuristic trends.
- It is a numerical value which indicates State of Environment (SOE) or health.
- It provides real and economical aspects of State of Environment (SOE).
- Environmental indicators form part of sustainable development.

- **Types of Environmental Indicators**

Types of Environmental indicators are as under:

- Ecological indicators
- Pressure indicators
- Impact indicators
- Response indicators, etc.

- Environmental indicators are employed to ascertain the implementation of environmental mitigation and enhancement measures for completion of a project in sustainable manner.

6.4 ENVIRONMENTAL VARIABLE

6.4.1 It is a dynamic process which indicates the State of Environment (SOE). It may be changing variable or constant.

6.4.2 It is a variable whose value is set outside the programme, either built into the operating system or micro service. It is made up of a name/value pair and any number may be created and available for reference at a point in time.

6.5 RELATIONSHIP BETWEEN INDICATOR AND VARIABLE

To explain relationship between indicator and variable two examples are cited:

6.5.1 Example 1- One indicator of Land and Soils is Ecological footprint. However its variables include land use and CO₂ emissions.

6.5.2 Example 2- One indicator of Freshwater is Water Footprint Global. However its variables include (green, blue and grey).

6.6 GLOBAL ENVIRONMENTAL INDICATORS

6.6.1 One set of **Global Key Environmental Indicators** are given in Table in 8.1. These are briefly enumerated below:

- Biological diversity
- Food production
- Average global surface temperature and CO₂ concentration
- Human population
- Resource depletion

Table 6.1 Global Key Environmental Indicators

Indicator	Recent trend	Outlook for the future	Overall impact on environmental quality
Biological diversity	Large number of extinctions, extinction rate increasing	Extinctions will continue	Negative
Food production	Per capita production possibly leveling off	Unclear	May affect the number of people Earth can support
Average global surface temperature and CO ₂ concentration	CO ₂ concentrations and temperatures increasing	Probably will continue to increase, at least in the short term	Effects are uncertain and varied but probably detrimental
Human population	Still increasing, but growth rate slowing	Population leveling off; resource consumption rates also a factor	Negative
Resource depletion	Many resources being depleted at rapid rate, but human ingenuity develops "new" resources, and efficiency of resource use is increasing in many cases	Unknown	Increased use of most resources has negative effects

Source: Environmental Science for AP, Second Edition, 2015
W.H. Freeman and Company

6.6.2 European Environment Agency Framework

European Environment Agency Framework suggests the adoption of **DPSIR**. It means drivers, pressures, state, impact, response framework.

- **Drivers and pressures indicators** are the human activities and resulting pressures on the environment in the form of pollution or land-use change, for example.
- **State and impact indicators** are the resulting conditions in the environment and the implications for the health of ecosystems and humans.
- **Response indicators** measure the reaction of human society to the environmental issue. Criteria tend to focus on three key areas – scientific credibility, policy/social relevance and practical monitoring and data requirements.

6.6.3 Organization for Economic Development and Cooperation (OECD) Environmental Indicators

OECD has formulated following **Key Environmental Indicators**:

- **Climate Change** – CO₂ and greenhouse gas emission intensities
- **Ozone Layer** – Ozone depleting substances
- **Air Quality** – SO_x and NO_x emission intensities

- **Waste Generation** – Municipal waste generation intensities
- **Freshwater Quality** – Waste water treatment connection rates
- **Freshwater Resources** – Intensity of use of water resources
- **Forest Resources** – Intensity of use of forest resources
- **Fish Resources** – Intensity of use of fish resources
- **Energy Resources** – Intensity of energy use
- **Biodiversity** – Threatened species

Source: OECD, 2008

6.6.4 The DPSIR Framework

The DPSIR Framework is shown in following Figure-1

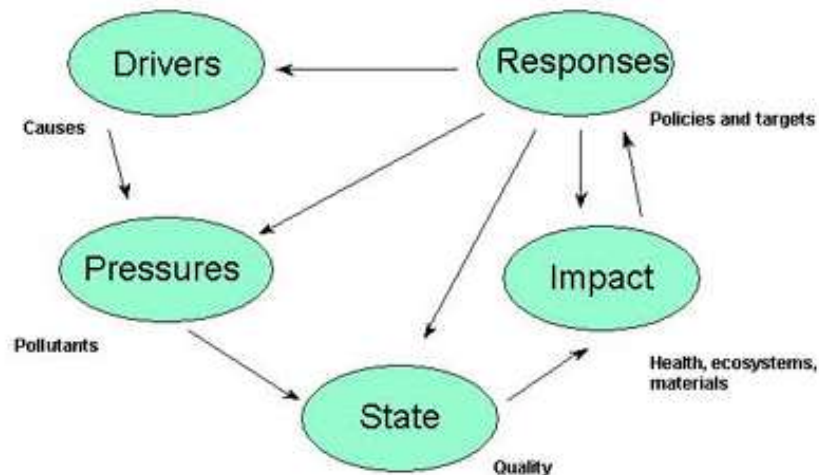


Figure 1. The DPSIR assessment framework

- **Driving Forces**
 - **Population** (number, age structure, education levels, political stability)
 - **Transport** (persons, goods; road, water, air, off-road)
 - **Energy use** (energy factors per type of activity, fuel types, technology)
 - **Power plants** (types of plants, age structure, fuel types)
 - **Industry** (types of plants, age structure, resource types)

- **Refineries/Mining** (types of plant/mining, age structure)
- **Agriculture** (number of animals, types of crops, stables, fertilizers)
- **Landfills** (type, age)
- **Sewage systems** (types)
- **Non-industrial sectors**
- **Land use**
- **Pressures**
 - Use of resources
 - Emissions (per driving force for numerous compounds)
 - direct emissions to air, water and soil
 - indirect emissions to air, water and soil
 - Production of waste
 - Production of noise
 - Radiation
 - Vibration
 - Hazards (risks)
- **States**
 - **Air quality** (national, regional, local, urban, etc.)
 - Water quality (rivers, lakes, seas, coastal zones, groundwater)
 - **Soil quality** (national, local, natural areas, agricultural areas)
 - **Ecosystems** (biodiversity, vegetation, soil organisms, water organisms)
 - **Humans** (health)
 - **Soil use**
- **Impacts**

Changes in the physical, chemical or biological state of the environment determine the quality of ecosystems and the welfare of human beings. Such changes in the state may have environmental or economic impacts on the functioning of ecosystems, their life supporting abilities, and ultimately on human health and on the economic and social performance of society.

- **Responses**

A response by society or policy makers is the result of an undesired impact and can affect any part of the chain between driving forces and impacts. An example of a response related to driving forces is a policy to change mode of transportation, e.g. from private (cars) to public (trains). An example of a response related to pressures is a regulation concerning permissible SO₂ levels in flue gases.

Source: Peter Kristensen, September 2004

6.6.5 Global Environmental Indicators

Another version of global environmental indicators is enlisted below:

- **Biodiversity**

- **Indicator- Species extinction rates and threatened species**

16.000 species have been identified to be threatened by extinction. (16% of estimated 200.000 species that have been comprehensively assessed on their conservation status). Total species described by science are 2 million species. Estimates for total species are between 5 and 30 million.

Extinction rates are estimated to be 100 times higher as indicated by fossil records. Respectively 30% of amphibians, 23% of mammals and 12% of bird species are threatened.

Tropical moist forests contain the highest numbers of threatened species followed by dry forests, mountain grasslands, and dry shrub lands. The terrestrial Living planet shows a decline of 33% of terrestrial species populations.

Marine species populations declined by 14% according to the Marine Living planet Index.

Distribution of threatened species in freshwater habitats is poorly known although the Freshwater living planet index suggests a decline of 35% in freshwater species populations from 1970-2005.

Invertebrate species comprise the majority of species. Information on extinction trends of is not available.

- **Land and Soils**

- **Indicator- Ecological footprint (land use and CO₂ emissions)**

In 2010, humanity is using 1.5 planets to sustain itself. US citizens consume 7 times more bio-capacity than Indian citizens.

Total bio-capacity of the globe: 1,8 Gigahectares

Global Ecological Footprint: 2,7 Gigahectares Range from developed to less developed nations: 10 Gh/capita – 0,5 Gh/capita

- **Indicator- land use change**

From 1987 – 2006, 130 Giga hectares have changed from forest to woodland, grassland and urban areas.

- **Indicator- Wetland surface change**

Since 1970, the available wetland area has declined by 50%

- **Indicator- land degradation: Net Primary production and rain use efficiency**

In the period 1981-2005, there was an absolute decline in the Net Primary Production of 12 % of the global land area. A further 1 percent shows a strong negative change. In the same period, rain use efficiency showed an absolute decline in 29% of the global land area. The combined area is home to 15% of the world population.

- **Freshwater**

- **Indicator- Water Footprint Global (green, blue and grey)**

Total global blue water footprint (blue 1/3, green 2/3): 7452 Gm³/year

Rough estimate of planetary freshwater boundary at: 4000 Gm³/yr

Blue water footprint is 62% of the planetary boundary for freshwater implying that humanity is safely operating within the boundary, however this is

a global average, water very unevenly distributed across the globe and local water scarcity.

- **Indicator- Freshwater Species Decline**
Since 1970, freshwater species populations declined by 35%.
- **Indicator- Rivers Alliterated**
60% of the world's largest 227 rivers are moderately to greatly restricted by dams, diversions and canals leading to severe changes in patterns of river flow and discharge and sedimentation.
- **Indicator- Rivers Running Dry**
10% of the world's major rivers fail to reach the sea as a result of water abstraction.
- **Indicator- Water pollution**
- **Indicator- Environmental water scarcity**
- **Marine**
 - **Indicator- Fish Stocks**
75% of global fish stocks are overexploited.
 - **Indicator- Ocean Temperature**
Has significantly increased since 1960 (depths up to 3000m) But how much?
Surface water temperature increases lead to higher frequency of coral bleaching events, also intense tropical cyclone activity is increasing.
 - **Indicator- Acidification of Oceans**
- **Forests**
 - **Indicator- Forest Area**
Global forest area shrank at a an annual rate of 0,2 % in the period 1990-2005. Largest reductions occurred in Africa, South America and the Carribean.
 - **Indicator- Forest Degradation**
33% of forests are primary forests, rest is degraded
 - **Indicator- Tropical forest species populations**
62 % decline

- **Atmosphere**

- **Indicator- Ozone Depletion**

The largest holes occurred in 2000, 2003 and 2006. On range of industrial chemicals first developed in the 1920s. 25 September 2006, it extended over 29 million square kilometers and the total ozone loss was the largest on record.

- **Indicator- GHG Emissions**

150% rise in methane since 19th century

Rise from 280 ppm in 18th century (pre-industrial) to 380 ppm today

- **Indicator- Earth's temperature**

0.74°C since 1905 (IPCC)

- **Indicator- Air pollution**

Two key pollutants (Sulphur Dioxide (SO₂) and Nitrogen oxides (NO_x) have been decreasing from 1990 in the US and Europe. Emissions in Asia and Latin America, emissions are increasing. In Africa, and in Latin America and the Caribbean, small increases have been reported. The main result is that global emissions of SO₂ and NO_x are increasing with respect to 1990 level.

In many large cities in developing nations, **air pollution concentrations** are very high and still many times higher than the guideline of the World Health Organization (annual daily mean SO₂ < 20µg/m³ annual mean PM₁₀ ≤ 20µg/m³). There are **severe impacts of air pollution on human health** (an estimated 2.4 million people die prematurely each year), agriculture (decreasing crop yields with value of estimated USD 8 billion/yr), environment and ecosystems (biodiversity loss through eutrophication effects).

Persistent Organic Pollutants and mercury are now found all over the globe and nest themselves in food webs, accumulate in predating wildlife and enter the food chain of indigenous people. There is no sufficient information available on amounts released and the effects of the POPs.

Source: http://www.goodstuffinternational.com/index.php/en/home/index.php?option=com_content&view=article&id=68:a-list-of-global-environmental-indicators&catid=41:indicators-and-statistics&Itemid=66

6.7 NATIONAL ENVIRONMENTAL INDICATORS

6.7.1 Pakistan has specified 92 national environmental indicators (NEC Consultants, 2008). These are given in Annexure E.

Source: <https://www.undp.org/content/dam/pakistan/docs/Environment%20%26%20Climate%20Change/UNDP-PK-ECC-HANDBOOK-environmental%20information%20and%20data.pdf>

6.7.2 Framework for Environmental Indicators

There is necessity of constituting proper framework for organizing Environmental Indicators in various categories. Categorization may be done on basis of environmental and socio-economic-cultural concerns in the overall backdrop of sustainable development.

6.7.3 State of Environment (SOE) Report

SOE report is required to be prepared in light of Rio declaration & Agenda 21, Pakistan Environmental Protection Act 1997. This report may be formulated on the basis of EIMS and environmental indicators.

CHAPTER 7

CONCLUSION AND RECOMMENDATIONS

7.1 CONCLUSION

From the ongoing discussions main conclusions drawn are given below:

- 7.1.1** Sustainable development can only be achieved if the development initiatives are environment friendly, economically viable and socially acceptable.
- 7.1.2** There is dire need of collection, generation, compilation & analysis of data related to state of environment in Punjab.
- 7.1.3** National environmental indicators had been prepared in the year 2008. Environmental scenario obtaining in that period has now significantly changed. Therefore these need revamping at national level.
- 7.1.4** Framing of EIMS for Punjab is required immediately for integration of environment in development sectors.

7.2 RECOMMENDATIONS

Recommendations are made for success of activity 2.2.1 with the ultimate aim of preserving environment and undertaking developmental activities in the national and provincial contexts:

- 7.2.1** There is urgent need of revisiting national environmental indicators. These should be updated in view of current & future physical, biological and socio-economic-cultural-political environments of Pakistan.
- 7.2.2** Establishment of EIMS is the pre-requisite for undertaking any developmental project in Punjab province.
- 7.2.3** Immediate actions should be taken to formulate EIMS on emergency basis. National and provincial legislation should be promulgated if required to undertake this task. It should be done on emergency basis.
- 7.2.4** For efficient and effective integration of environment and development sectors restructuring of EPD and EPA is immediately needed through establishment of EIMS cell.
- 7.2.5** Technical and financial support of UNEP, UNDP & GEF should be sought for establishment of EIMS cell in the organization of EPD and EPA Punjab.
- 7.2.6** A committee of specialists should be formed under the supervision of The PMU-GEB Project for preparing the draft EIMS for Punjab.

- 7.2.7** Once draft of EIMS is prepared, it should be widely circulated so that every stakeholder may share its views.
- 7.2.8** Local expertise is competent to undertake the job. However, some technical help may be sought from UN and other agencies.
- 7.2.9** Appropriate steps should be taken for preparation of state of environment (SOE) report at national and provincial levels.

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Source: <http://www.nec.com.pk/NEIMS.aspx>
- Pak EPA, Pakistan Environmental Protection Act, 1997.
- Pak EPA, Review of IEE and EIA Regulations, 2000.
- Punjab EPA, Pakistan Environmental Protection Act, 1997.
- Punjab EPA, Review of IEE and EIA Regulations, 2000.

ANNEXURE A

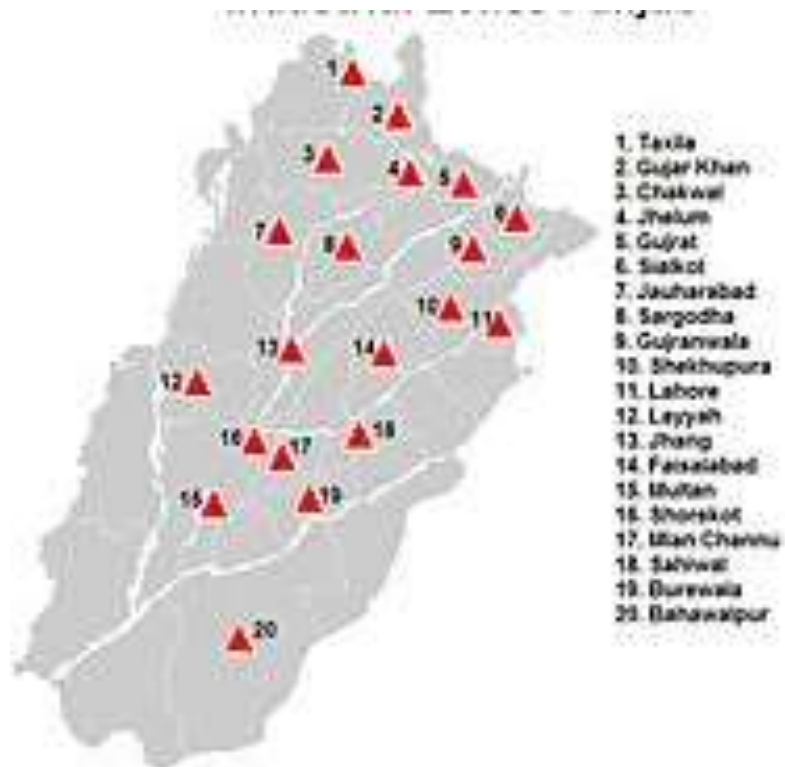
District-Wise Map of Punjab



Source: (Punjab smeda.org)

ANNEXURE B

Industrial Zones of Punjab



Source: (Punjab, Pakistan - en.wikipedia.org)

GEB MANAGEMENT



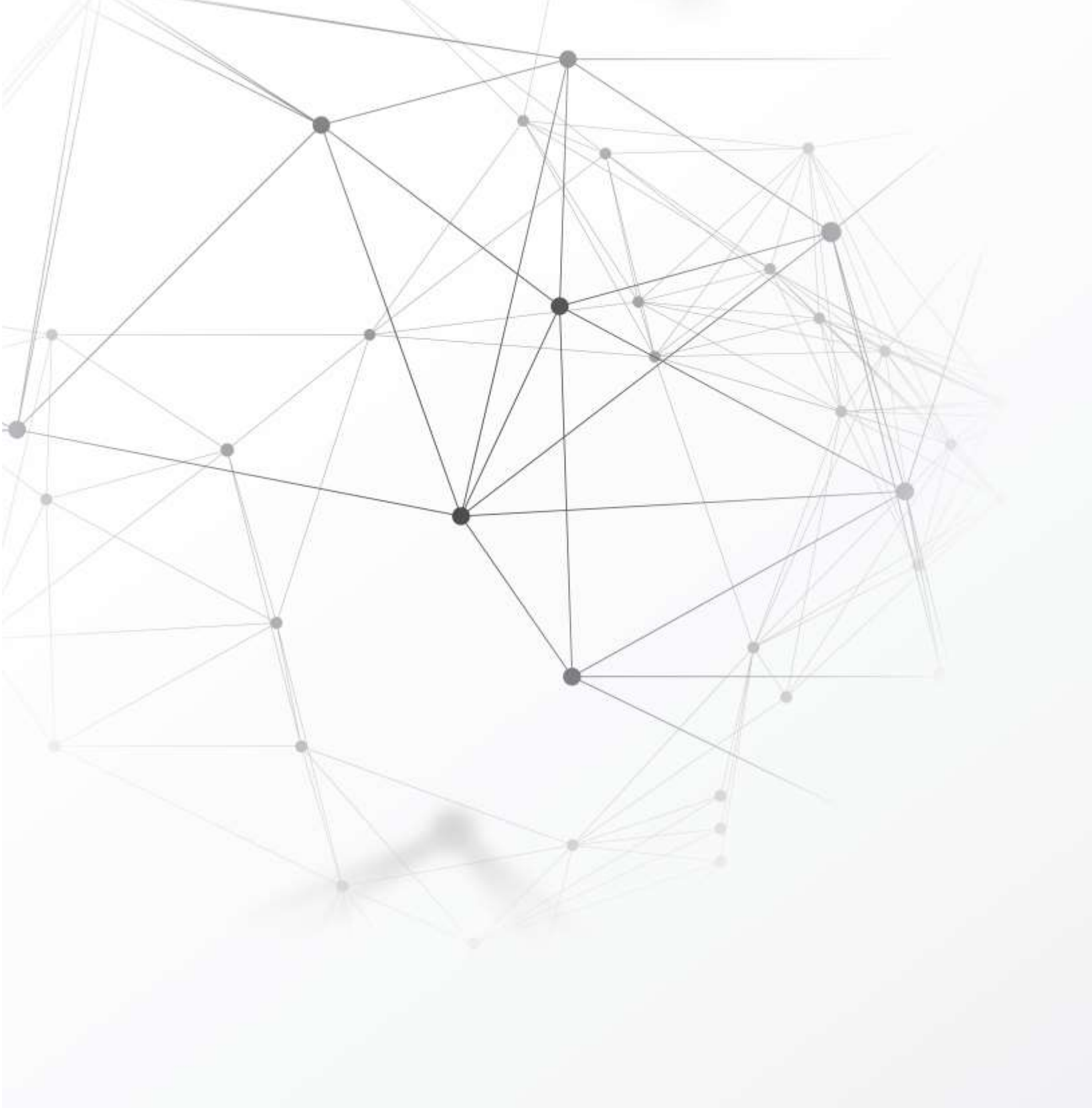
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