Generating Global Environmental Benefits – GEB

POLICY ANALYSIS FOR IDENTIFYING THE KEY POLICY SHIFTS OR MAJOR DEVELOPMENTS THAT ARE REQUIRED TO INTEGRATE ENVIRONMENT & DEVELOPMENT IN ICT/ISLAMABAD

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 ICT/ISLAMABAD

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

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UNDP

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Acronyms

ABTs: Aichi Biodiversity Targets

AWP: Annual Work Plan

BAP: Diversity Action Plan

CBD: Convention on the Bio-diversity

CCI: Council of Common Interest

CCTV: Closed Circuit Television

COP: Conference of the Parties

EIS: Environmental Information System

Pak-EPA: Pakistan Environmental Protection Agency

GCISC: Global Change Impact Studies Center

GEB: Generating Global Environment Benefits

GEF: Global Environment Facility

GEMS: Global Environmental Monitoring System

GHG: Green House Gases

ICT: Islamabad Capital Territory

INC: Initial National Communication

IRSA: Indus River System Authority

MAP: Medicinal and Aromatic Plants

MEAs: Multilateral Environmental Agreements

MOCC: Ministry of Climate Change

NBSAP: National Biodiversity and Strategic Action Plan

NCCD: National Coordination Committee on Desertification

NDMA: National Disaster Management Authority

NDRP:　　　National Disaster Response Plan

NEQS:　　　National Environmental Quality Standards

NIHRA:　　　National Industrial Hazard Assessment

NPC:　　　National Project Coordinator

OECD:　　　Organization for Economic Cooperation and Development

PIF:　　　Project Identification Form

PMU:　　　Project Management Unit

SDGs:　　　Sustainable Development Goals

SNC:　　　Second National Communication

SUPARCO:　　Space & Upper-Atmospheric Research Commission

UNCBD:　　　United Nations Convention on Bio-Diversity

UNCCD:　　　United Nations Conventions to Combat Desertification

UNDP:　　　United Nations Development Program

UNEP:　　　United Nations Environmental Program

UNFCCC:　　United Nations Framework Convention on Climate Change

WAA:　　　Water apportionment Accord

WAPDA:　　　Water & Power Development Authority

1. Executive Summary

Increased population and socio-economic developments, such as urbanization, put tremendous pressure on agriculture, biodiversity, climate, vegetation, wildlife, and water resources. Human's exploitation of these resources inevitably leads to environmental degradation in the form of soil erosion, deforestation, increased urbanization and irregular settlements.

Sound environmental management strategies, utilizing appropriate environmental information as input, have to be in place to achieve sustainable development. Environmental information includes information relating to topography, soil, geology, climate, minerals, land cover, vegetation, wildlife and land use etc. Environmental practitioners can use Environmental Information System (EIS) as a management tool to determine, organize and manage and the optimal utilization of environmental resources.

EIS provides a platform for environmental information which can be combined, structured, managed and made available to planners and policy/decision makers. Pakistan being the member of Rio-Convention, which focuses on the need of Environmental Information System in its chapter 12 of the Agenda 21, which states that; Governments at the appropriate level, with the support of the relevant international and regional organizations, should:

i. *Establish and/or strengthen environmental information systems at the national level;*

ii. *Strengthen national, state/provincial and local assessment and ensure cooperation/networking between existing environmental information and monitoring systems, such as Earthwatch and the Sahara and Sahel Observatory;*

iii. *Strengthen the capacity of national institutions to analyze environmental data so that ecological change can be monitored and environmental information obtained on a continuing basis at the national level."*

In this regard it became mandatory for Pakistan to establish an environmental information system within the country at national or provincial level to comply the Rio-Convention to

meet the prevailing environmental challenges. United Nations Development Program (UNDP) in collaboration with the Ministry of Climate change has launch a project known as Generating Global Environment Benefit (GEB) Project.   The purpose of the project is to develop mechanism for generating reliable and consistent environment related data which can then be incorporated into decision making process. Similarly to improve the country's reporting process, both to increase public awareness and adoption of environmentally sound decisions, and to fulfill obligations under international conventions.

Pursuant to the Annual Work Plan (AWP-2019) activity 2.2.3, of the GEB project, which aims to conduct a "*Policy analysis for identifying the key policy shifts or major developments that are required to integrate environment & development in ICT/Islamabad*" so that the same may be further explored for improvement in Pakistan. Under aforementioned assignment detail study was carried out, in which different federal organizations working on environment in one way or another were approached. Prevailing system for data generation, storage and dissemination mechanism of each department was assessed. Similarly, with the help of consultation process, discrepancies in the department which is leading to lack of consistent environmental data generation was determined. Web pages of respective organization were reviewed to see the level of environmental data availability and accessibility. Moreover key environmental indicators were also determined which will help formulate the proposed environmental information and management system for Islamabad/Pakistan; this will also fulfill country needs of reporting against the aforementioned environment related conventions and multilateral international agreements.

2. Introduction:

The term "Environmental Information System" is considered more as an institutional and technical framework than merely a technological solution. It is essential for improving the flow and use of data and information in environmental management. An EIS as a concept and as a very important part of environmental management system, emerged as a result of many environmental problems, which are listed in top priority agendas worldwide *(Kralisch et al., 2009)*. In particular the importance of having the timely and accurate environmental information is shown necessary in cases of forest fires, floods, drought, and other fields where the life and wellbeing of humans is directly affected *(Dilley et al., 2005)*. Nowadays, environmental information serves as the primary data in tackling the environmental challenges such as: air quality and climate changes, ecosystem and natural resource sustainable management, biodiversity protection, water scarcity and water quality, land use, urbanization, infrastructure development, and overall development planning processes *(Yadav & Rani 2011)*. Availability of the latest information, in many cases, is considered among key factors to success in policy making process. Furthermore, lack of this information may lead to inadequate and unsuccessful policies *(Jankowski, P. 2009)*.

In addition to the use of environmental information in the policy making processes and decision making, the integrated, timely, and easily accessible information is essential for the public in order to understand the quality of the environment they are living in. Also, the factors impacting their environment, the actions needed to prevent the environmental degradation, actions undertaken from the responsible authorities, and for their role on maintaining and protecting the environment. As part of the environmental management systems to addressing the above mentioned environmental challenges, the environmental information systems were developed progressively by the developed countries in respond to the needs and capacities.

It is obvious that parallel with the historical developments of environmental movements around the globe, the EISs are developed as well. The Stockholm conference on the Human Environment (1972) is considered a starting point in this area. As the outcome of this conference, the United Nations Environmental Program (UNEP) is established. One of the main tasks of UNEP is monitoring the status of the global environment and gathering and

disseminating environmental information. In this respect, the UNEP developed the Global Environmental Monitoring System (GEMS), which later, on 1975 was further developed on GEMS water, and GEMS food. Further to this the GEMS had created INFOTTERA – the International Environmental Information System - probably the first of its kind. The next promotion of EIS concept is evidenced in the RIO conference at the Earth Summit of 1992 and "Agenda 21". The EIS is first mentioned in chapter 12 of Agenda 21.

Since the United Nations Conference on Environment and Development in 1992, sustainability has become a widely shared goal. Although information can provide an improved basis for decision making and gauging progress, accountability is possible only if goals and measures of progress are clear. Appropriately formulated indicators can provide such measures, enhancing the diagnosis of the situation and making progress. Indicators are produced and used worldwide across all levels and sectors by public, private and civil society for a variety of purposes from knowledge provision to administrative control. Indicators are generally expected to enhance the rationality of policy-making and public debate by providing an objective, transparent, robust and reliable information base *(Lehtonen 2014),* representing a state or trend over a given area and time period.

Indicators can be any quantitative or qualitative measure that is used to assess the state of a process, system or entity or its performance relative to a benchmark. They identify relative positions to facilitate comparison and, if measured over time, help identify trends over time and help assess progress of certain interventions (OECD 2008). The OECD has been developing environmental indicators since the early 1990s. These indicators help to integrate environmental considerations into sectoral policies, such as energy, transport, agriculture etc. and to measure progress in dissociate environmental pressures from economic growth. Most recently, the OECD has developed a set of indicators to monitor progress toward green growth.

2.1. Goals and Objectives of the Project:
The project's overall goal is 'Generating Global Environmental Benefits from Improved Decision Making in Pakistan'. Its more specific objective is 'to remove the barriers to environmental information management and mainstreaming global environment concerns

into economic decision making'. The objective is two-fold in its focus, one related to environmental information, and the other to employing this information for improved economic decision making. The project will thus have two inter-related components of: (a) establishing a robust environmental information management system; and (b) stimulating commitments and filling gapes in capacities for integrating environment and development as laid down in Project Identification Form (PIF).

2.2. Expected Project Outcomes and Outputs:

The project will have three interrelated outcomes:

    i. Regular availability of consistent and reliable environmental data;

    ii. A coordinated and robust environmental information management system, and,

    iii. Enhanced commitment and capacity for sustainable development planning and legislation.

2.3. Environmental Information System and Sustainable Development Goals (SDGs):

Knowledge based societies require building up capacities to source, organize, interpret and communicate environmental data and information in an effective way in support of decision making. In line with the principles of Shared Environmental Information Systems (SEIS), there is recognition of the need for making national data from credible sources available in a meaningful way and in a format suitable to inform environmental governance.

In addition, environmental data and information need to be effectively collected, managed and shared online to support multiple uses at different governance levels to meet multiple reporting obligations, including reporting on Multilateral Environmental Agreements (MEAs) and on progress towards implementing the environmental dimension of the 2030 Agenda for Sustainable Development, including its Sustainable Development Goals (SDGs).

3.0.   Methodology:

The study was completed following a combine approach. Questionnaire based interviews among the core government departments were carried out. Organizations working for environment were visited to understand the prevailing data generation, collection, storage, and processing system. The concerned officers were questioned regarding the environmental information and management system. Moreover respective websites of the core environmental department in the capital territory were also reviewed. Additionally the reports submitted by Pakistan against the environment related conventions and multilateral international agreements, limited to the three Rio Conventions of UNCBD, UNFCCC and UNCCD were reviewed. On the basis of which key environmental indicators were highlighted to formulate EIMS for the Islamabad capital territory. During interview the following areas were targeted for the completion of this assignment;

i.   Types of data each federal department is dealing with;

ii.   Prevailing system for environmental data base management;

iii.   Frequency of environmental reporting;

iv.   Constraints faced by each department in generating environmental data and processing;

v.   How effectively the generated data are being utilized in policy/decision making process.

vi.   Understanding of the concern officers regarding EIMS;

In addition to the interviews, detail desk analysis was also conducted set environmental indicators to help formulate an advance environmental information management system for Islamabad. The scope of the desk analysis was not limited to the following;

i.   Review respective websites of the selected federal departments;

ii.   Review of the obligated report Pakistan has submitted in line with the 15th Multilateral Environmental Agreements (MEAs)/Conventions/protocols limited to UNFCC, UNCBD, UNCCD;

iii.   Prioritize environmental indicators to help formulate proposed EIMS for the country;

The following key federal departments were assessed;

i. Pakistan Environmental Protection Agency
ii. Global change Impact Study Center
iii. Indus River System Authority
iv. National Disaster Management Authority

4.0. Results & Discussion:

4.1. Pakistan Environmental Protection Agency;

Pakistan Environmental Protection Agency (Pak-EPA) is an attached department of the Ministry of Climate Change and responsible to implement the Pakistan Environmental Protection Act, 1997 in the country. An Act to provide for the protection, conservation, rehabilitation and improvement of environment, for the prevention and control of pollution, and promotion of sustainable development.

Pak-EPA also provides all kind of technical assistance to the Ministry of Climate Change. In order to assess the prevailing data generation and storage mechanism of the federal agency, their technical team was approached. Miss Mohsina Zubair, who is performing as Deputy Director (Lab/NEQS) at the Pak-EPA informed that the department deals with variety of environmental data such as, Air Quality, Water Quality, Hospital waste and data generated during environmental impact assessment studies. The said data are being generated through field monitoring, online air quality monitoring, surveillance through CCTV and self reported generated by the industries working under the department jurisdiction.

All the data are then stored in hard form, soft form as well as the department is having an advance database management system. On the basis of which they produces regular annual environmental reports. Furthermore she added that lack of capacity building; adequate financial and human resources are creating hurdles in generating and processing quality data. The focal person was having clear understanding the environmental information management system. And she added that capacity building and enhancing human resources can help formulate and advance data base management system for the department.

4.1.1. Official webpage of the Pak-EPA

Environmental protection agency is the core government organization mainly looking into environmental issues of the country. After the 18th constitutional amendment, the agency has been shifted to provinces, and presently each province is running a separate environmental protection agency. Therefore the Pak-EPA is only looking environmental issues under jurisdiction of ICT. The website of the agency is supposed to be updated regularly with the data pertaining to environmental produced by it using multiple approaches. During the visit to the concerned website, it was observed that the agency is displaying variety of data which includes the updated ambient air quality report 2019 of the Islamabad, water quality report of Rawal lake 2018 and measurement of the ambient concentration of NO2, in different cities of Pakistan in 2006, which seems outdated and needs to be updated to give a clear picture of the prevailing air quality situation. Additionally the webpage can be used to download several publications and interventions in the field of air quality, noise emission and solid waste generation across the country. However the webpage is still lacking to give a regular and consistent environmental data generated by the agency as mentioned earlier.

4.2. Global Change Impact Studies Center;

During the visit to the global change impact study centre Islamabad, it was revealed that the center carries out numerous environmental activities in the field of a). Physical sciences, b). Impact, adaptation and vulnerability and Mitigation & climate change policy. This particular department generates weather & climate related, hydrological and digital elevation data, on the basis of which the organization produces regular environmental reports on annual basis.

During in a meeting with the focal person Mr. Zia ur Rehman Hashmi, who is working as the head of Water Resource & Glaciology department, he added that the aforementioned data are acquired from the Pakistan Meteorological department, Water & Power Development Authority (WAPDA) and other online authentic sources. All the data produced are then stored in conventional hard file whereas soft files are also maintained

for internal uses and further necessary processing. However no advance data base management system such as EIMS developed so for by the department.

He continued that for producing consistent and authentic data pertaining to environment is not possible without having in house capacity building, adequate financial resource and required human resource. In addition to that the data produced by the department are not available on the respective website of the department. Therefore ones must need to have some kind of official collaboration with the department to get the desired data.

Furthermore the concern official added that the data/information produces here are integrated into policy making process. He maintained that the department has already formulated national climate change policy using their data. He suggested that in order to develop an EIMS for the department you need to introduce the system firstly and then provide it to the concern departments.

4.2.1. Official webpage of the Global Change Impact Studies Center;

Global Change Impact Studies Centre is a dedicated research institute for climate change studies in Pakistan. The Centre is mandated for national level R&D effort, capacity building, policy analysis, information dissemination and assistance to national planners and policymakers on issues related to past and projected future climatic changes in the country, their likely impacts on the key socio-economic sectors of the country such as water, food, agriculture, energy, forestry, health, and ecology, and appropriate adaptation and mitigation measures.

The research institute is maintaining its official webpage, which can be accessed easily. The webpage is regularly updated with the variety of research related information which has broadly been categorized as;

    i.   Physical Science Basis

    ii.   Impact, Adaptation & Vulnerability

    iii.   Mitigation and Climate Change Policy

The list of ongoing & completed projects as well as books/research articles published can be accessed easily.

4.3.   Indus River System Authority (IRSA):

Water Apportionment Accord (WAA) was signed amongst the Provinces on March-16, 1991 and was approved by the Council of Common Interests (CCI) on March-21, 1991. Under Clause 13 of the WAA '91, the need to establish an IRSA was recognized and accepted for the implementation of the Accord. The Authority would have its HQs at Lahore (shifted to Islamabad) and having representation from all the Provinces. IRSA was established for regulating and monitoring the distribution of water sources of Indus Rivers in accordance with the Accord amongst the Provinces and to provide matters connected therewith and ancillary thereto. It was established vide Act No. XXII of 1992 passed by the Parliament and approved by the President of Pakistan on, the 6th December 1992.

Indus River System Authority is working in Islamabad, during the visit a meeting was conducted with the Senior Engineer Operations Mr. Jalil Ahmad Soomro. The Senior Engineer added that the prime responsibility of our department is the distribution of surface water amongst the federating units according to the Water Apportionment Accord 1991, other than this our department do not produces environmental data. All the data we are dealing with is stored in tradition hard file system which is not an easy job to access and utilize effectively. Similarly soft version of the same data is also maintained by the department. Other than that no specific environmental data is being generated by IRSA. Since the webpage is not regularly update therefore one cannot access required data from their official webpage. Additionally, the concern official does not have clear understanding about an advance environmental information management system.

4.3.1. Official webpage of the IRSA:

IRSA which is mainly responsible for the distribution of surface water amongst the federating units according to the WAA-1991, is maintaining their respective official webpage. While visiting to the website, it was noted that the website was updated with the water situation of the country. The day, the website was visited; there was an updated version of the Daily Water Situation of Pakistan, published by the authority. which shows how frequently the authority is updating The data included; dead level, mean inflow, mean outflow of Indus River at Turbela, mean discharge of River Kabul at Nowshera, upstream discharge and downstream discharge of Kalabagh, Taunsa, Kotri, Guddu & Chenab; whereas the amount of water release in provinces can also be seen on the website.

4.4. National Disaster Management Authority (NDMA):

National Disaster Management Authority (NDMA) is an autonomous and constitutionally established federal authority mandated to deal with whole spectrum of disasters and their management in the country. The NDMA formulate and enforces national disaster policies at federal and provisional levels and collaborates closely with various government ministries, military forces, and United Nations-based organizations to jointly coordinate efforts to conduct its disaster management, search and rescue, and wide range of humanitarian operations in the country and abroad. The NDMA aims to develop sustainable operational capacity and professional competence to undertake its humanitarian operations at its full capacity.

The National Disaster Management Authority was also visited to meet the concern official to assess the prevailing data generation and processing mechanism. During meeting with the Mr. Zuhaib Durrani, who is working as Assistant Project Manager (APM), has said that NDMA generates Multi-Hazard vulnerability and Risk Assessment reports. In these reports we incorporate environment hazards and other aspects. Similarly the authority issues regular advisories for flood/torrential rainfall and other natural calamities, early warning system and public service messages.

NDMA acquires relevant data from respective technical department working in the capital territory which includes Pakistan Meteorological department, Space & Upper Atmospheric Research Commission SUPARCO & Geological Survey of Pakistan (GSP) etc. Due to non-availability of an advance database management system, the authority stores the data in traditional manual files; however the organization maintain soft version of the same data too. The APM further added that we can generate more authentic and regular environmental data, but due to lack of adequate financial allocations and weak in-house capacity it remains a challenge to do so. NDMA is maintaining their webpage regularly on which public service messages and advisories are issue. The generated data is then integrated into response planning and formulating risk reduction strategies.

4.4.1. Official webpage of NDMA;

The authority is running an official webpage. , maintained and updated regularly by the concern team. The main information displayed at the website includes a complete set of monthly reports from 2010 till 2018. Similarly the authority has published macro level National Industrial Hazard Assessment (NIHRA) report vol-1 & vol-2 in (2019), National Disaster Response Plan (NDRP-2019), drought situation report pertaining to Tharparkar 2018, Seismic Retrofitting and Repair Manual for buildings, district level population baseline, gender mapping and cyclone & flood mitigation manual etc.

Moreover Multi-Hazard vulnerability and Risk Assessment reports have been developed for various district including Bahawalpur, Jhang, Khushab, Multan & Rahimyar Khan which can be studied and downloaded easily. After visiting the overall website maintained, it was observed that the NDMA is handling the webpage in very professionally sound manner, from which researchers/academia, development sector practitioners and policy makers can be benefited.

4.5.   Multilateral Environmental Agreements:

Pakistan is signatory to fifteen Multilateral Environmental Agreements (MEAs)/conventions/protocols and has ratified all of them. Consequently, it is mandatory for the state to ensure the implementation of the agreements that have been endorsed. The international environmental instruments (conventions/ protocols) may be divided into five broad categories:

    i.   Biodiversity-related Conventions;

    ii.   Conventions related to Atmosphere / Climate Change (UNFCCC);

    iii.   Land Convention / Environmental Cooperation Conventions;

    iv.   Chemicals and Hazardous Wastes Conventions;

    v.   Regional Seas Conventions and related Agreements

A multilateral environmental agreement is a legally binding agreement between two or more countries containing commitments to meet specific environment-related objectives. Two elements of the definition are important to understand:

4.5.1.   Legal binding:

MEAs are legal instruments. They bind the countries that have agreed to become a party through ratification or agreement. Countries that have signed but have not yet ratified an MEA are nonetheless expected not to do anything that could affect the aims and purposes of the agreement. MEAs are not declarations of intention but are rules of international law. As such, an MEA is a powerful tool for the implementation of policies with environmental protection and sustainable development goals.

4.5.2.   Between two or more nation States:

The better-known environmental agreements are multilateral in the sense that they involve many nations and generally deal with broad aspects of environment (e.g. climate,

biodiversity etc.). However, the term MEA can refer to any treaty between two or more nations if, and when, it deals with direct environmental objectives.

4.6.   Three Rio- Conventions and Pakistan:

The Earth Summit was held in Rio de Janeiro, Brazil in 1992 and was attended by government representatives from approximately 180 States, including Pakistan. The following conventions were open for signature at the conference;

4.6.1.   The UN Framework Convention on Climate Change (UNFCCC);

This convention deals with climate and the atmosphere but also recognizes the broader impacts of climate change on ecosystems, food production and sustainable development. This convention highlights the broad guidelines to protect the Climate of the Planet. Pakistan ratified the United Nations Framework Convention on Climate Change (UNFCCC) in June 1994 and was among the first South Asian countries which realized the need to control the anthropogenic contribution to global climate change and need to respond effectively to its adverse impact. Under Article 4(1) of the UNFCCC, each party is required to submit, periodic, 'National Communications reporting inter alia an inventory of Greenhouse Gas (GHG) emissions by sources and removals by sinks, a general description of measures taken or envisaged to implement the Convention, and any other information considered relevant to achieving its objectives'. Pakistan submitted its Initial National Communication (INC) in 2003, whereas the Second National Communication (SNC) on climate change was submitted by the Ministry of Climate Change, Pakistan in 2018.

This SNC contains the updated information until the year 2015 about the consolidated efforts undertaken by Pakistan in different thematic areas related to climate change mitigation and adaptation. It has briefly described the National circumstances since the Initial National Communication (INC). It contains the GHG inventory with the anthropogenic emissions and removals from key sectors including waste, land-use-

change and forestry, agriculture, industrial processes and energy sector. An industrial process includes mining, chemical and metal production whereas the energy sector entails the manufacturing, transportation and energy industries of the economy. The report highlights that despite the expanding population, with ever growing energy and water demand, the total emissions (in kilograms of CO2- eq) per $GDP (in USD of 2010) of Pakistan was 1.88 kilograms of CO2- eq in comparison to 1.9 kg eq in 1994. Which its self presents the meager portion of Pakistan in terms of the anthropogenic cause of climate change as contrast to the collective but unevenly distributed share of responsibility at Pakistan. Regardless of Pakistan's very small contribution to GHG emissions, its role as responsible member of the global community in combating climate change is highly appreciable.

In this report, due importance has been given to mitigation efforts in sectors such as energy, transport, industries, urban planning, forestry and land- use, agriculture, livestock and waste. These overlapping thematic areas and the vulnerable sectors identified and then integrated into Climate Change Considerations into Social, Economic and Environmental Policies. Such integrations are big wins for Pakistan in terms of Strategy (National Climate Change Strategy), Plan (Climate Change and National Development Plan) and Policies (National Climate Change Policy, 2012). Furthermore, appropriate actions relating to disaster preparedness, capacity building, institutional strengthening and awareness rising in relevant sectors has also been part of this document. Inclusive and equitable measures with a focus on the most vulnerable segments of the society are at the forefront of Pakistan's response to the threat of climate change. (SNC, 2018), It has been concluded that the efforts of Pakistan in coping climate change issue which is being reflected in the document is remarkable. That data/information reflected in the SNC, can help conceptualize the framework for an advance environmental information system, because the information incorporated in the document can feed the proposed EIMS for the ICT.

4.6.2. The Convention on Biological Diversity (CBD);

Pakistan was among 150 countries that signed the Convention on Biological Diversity (CBD) at the 1992 Rio Earth Summit, and ratified it in 1994. A Biodiversity Action Plan (BAP) of Pakistan was approved by the Pakistan Environment Protection Council in 2000 as a principal instrument for implementing the Convention at the national level (CBD, Article 6) and mainstream the protection of biodiversity in policies and planning of the country. Conference of the Parties (CBD COP) regularly reviews the status of biodiversity and continues to set goals to halt its loss at the global level.

Pakistan developed its first Biodiversity Action Plan (BAP) in 1999 to implement the 2010 Biodiversity Targets. Pakistan's second NBSAP 2017-2030, has been prepared in line with Aichi Biodiversity Targets (ABTs) (2011-2020) and Sustainable Development Goals (SDGs) and demonstrates Pakistan's commitment to implement the objectives of the CBD: conservation of biodiversity, the sustainable use of its components, and fair and equitable sharing of the benefits arising out of the utilization of genetic resources. The Pakistan's NBSAP identifies legal, institutional, capacity, knowledge and technical gaps in implementing the ABTs and provides recommendations for overcoming these gaps. These include raising awareness and capacity, improving scientific and knowledge capabilities, mainstreaming biodiversity and thereby improving national coordination mechanisms, encouraging cross-sectoral collaboration and adopting a fresh financing strategy.

Additionally Pakistan being the signatory to the convention, it is obligatory to share detail report on the biodiversity. In this regard Pakistan has shared its 5th National Report on bio-diversity to the convention in 2014. Pakistan which is having a diverse kind of ecosystems ranges from coastline in the south to the mountain ranges of the Himalayas and Hindu Kush in the north along with deserts and plains. However due to unplanned urbanization and rapid population growth is tremendously affecting our ecosystem. The forests which are a valuable source of timber and provide vital ecological services that protect watersheds and maintain soil productivity. Despite the economic significance of

these assets, there is no reliable baseline information to guide effective policy making in the country.

The only component of biodiversity whose value is well documented is trade in Medicinal and Aromatic Plants (MAP). The preparation of 5th national report to the CBD not only provided an opportunity to review midterm progress towards the implementation of the Strategic Plan for Biodiversity 2010-2020 and progress towards the Aichi Biodiversity Targets, but also brought to the front the inherent institutional weakness for the implementation of the Convention on Biological diversity. Ineffective policy and planning frameworks as well as institutional weaknesses remain contributing causes for the loss of biological diversity. The value of biodiversity and ecosystem services, its contribution to the national economy, and potential to alleviate poverty has not been well-integrated into national and local planning or development processes. Consequently, the environment sector, including climate change, biodiversity, forestry, and wildlife remain at low priority. More or less similar situation prevails for other Natural Resource Management sectors including agriculture, livestock and fisheries indicating a dire need to explore opportunities and challenges for the necessary coordinated development strategies that recognize and account for the true value of natural resources, their ecosystem services, and the inherent resource trade-offs between sectors. Although there is still a long way to go towards achieving the objectives of the Convention and implementing the Strategic Plan. Nevertheless Pakistan has truly made a good progress despite the weak institutional capacity, lack of adequate financial and human resources.

Apart from Biodiversity Action Plan (BAP), Pakistan has not fixed any national or regional biodiversity targets for implementation of CBD Strategic Plan 2010-2020 and Aichi Biodiversity Targets. This is primarily due to lack of proper institutional arrangements for implementation of CBD at the national level and almost complete absence of any institutional arrangement at the provincial and regional level.

The national authority for implementation of CBD has however initiated process for revision of BSAP and is working with the provinces and other regions to designate focal points for CBD and to constitute provincial and regional Biodiversity Working Groups (BWGs) to steer the process of preparation of regional BSAPs and provide coordination for implementation of CBD. It is hoped that the process will lead to setting national and provincial biodiversity targets. There is neither a national biodiversity policy nor legal framework for mainstreaming biodiversity in the planning and development process. The initiative will also help to formulate the environmental information system at federal as well as provincial level.

4.6.3. UN Convention to Combat Desertification (UNCCD);

The United Nations Convention to Combat Desertification (UNCCD) plays a key role in the world's efforts to eradicate poverty, achieve sustainable development and reach the Millennium Development Goals (MDGs). It is the only internationally recognized legally binding instrument that addresses the problem of land degradation in dry land rural areas. It enjoys a truly universal membership of 191 parties. And, through the Global Environment Facility (GEF) as its funding mechanism, it is able to channel much-needed resources to projects aimed at combating the problem, The Convention was adopted in Paris on 17th June 1994 and entered in force on 26th December 1996, Pakistan signed the Convention on 15th October 1994 and ratified it on 24th February, 1997.

Pakistan which is predominantly an arid and semiarid country and is threatened with desertification and degradation of land due to rapid increase in population and growing pressure on the natural resource base to meet the needs of the people. In line with the conventions requirement, it is mandatory to share a detail national report by the each member country. Pakistan in its first national report of the UNCCD implementation briefly highlights the activities undertaken and the action, completed for the implementation of UNCCD. Various institutional reforms such as constituting National

Coordination Committee on Desertification (NCCD) were made to implement the convention. This committee is responsible for promoting education, bringing awareness among the masses, conducting capacity building sessions, revision/updating of the National Action Plan (NAP), strengthen interagency coordination and implementation of the specific programs for combating desertification.

5.0. Environmental Indicators and its Significance;

Indicators are produced and used worldwide across all levels and sectors by public, private and civil society for a variety of purposes from knowledge provision to administrative control. Indicators are generally expected to enhance the rationality of policy-making and public debate by providing an objective, transparent, robust and reliable information base *(Lehtonen 2016),* representing a state or trend over a given area and time period. Indicators can be any quantitative or qualitative measure that is used to assess the state of a process, system or entity or its performance relative to a benchmark. They identify relative positions to facilitate comparison and, if measured over time, help identify trends over time and help assess progress of certain interventions, or, on the contrary, inaction.

5.1. Indicators and decision making process;

There is a growing demand for indicator development that is relevant to decision making for natural resource management at different scales (Poff, et al. 2016). Policy makers and practitioners are demanding useful and usable knowledge that improves decision making by expanding alternatives, clarifying choice and enabling decision makers to achieve desired outcomes and improve society. Nevertheless, experience shows that linking indicators and the knowledge they provide to decisions on resource management and development remains one of the biggest challenges. It is often difficult to ensure and demonstrate that the resources invested in indicator collection and calculation generates real impact on future decisions about resource management and development. One of the

reasons is the nature and complexity of the processes underlying natural resources governance.

Ensuring links between science or the objective measurements (indicators) and decisions on the ground therefore requires a thorough understanding of the decision processes themselves. This includes understanding in what ways indicators are likely to inform management and planning specifically and requires first an understanding of who is demanding what indicators and for what purpose. Secondly, but no less importantly, the nature of the decision context and how decisions are made in that context is critical for determining how indicators can be useful and if they will be used.

Moreover; environmental indicators are important to help policy makers at national and international levels to better understand the undergoing changes to the environment, to feed assessments, to access comprehensive information in effective manner and to compare the results with neighboring countries in the region. A robust set of environment statistics is essential for measuring the environment-related Sustainable Development Goals and supporting the reporting compliance aspects, in particular for the UN and UNECE conventions (water, air, climate change, etc).

5.1.1. List of Environmental indicators to formulate EIMS for ICT:

An environmental indicator may be an aggregation of several statistics, or it may simply be a selected statistic. It is important in the sense that an indicator must indicate something. Unlike primary and analyzed data, which may to a large extent be characterized as basic or neutral information, indicators provide purposeful information to the stakeholders about the status of the environment. For example an indicator gives information on changes in a system. An example is the rate of soil loss which is an important indicator of environmental stability in arid and semi arid regions of Pakistan. They are purposeful in the sense that they are linked to defined environmental management concerns and objectives, say, the control of pollution or the conservation of biodiversity. For example, statistics on sulfur emissions are a relevant indicator for assessing the degree of pollution from power plants or diesel-based motor vehicles. In short, indicators are issue driven. They are not neutral information that may be used for any arbitrary purpose. Common environmental issues in Pakistan include deforestation, land degradation, water supply, and water and air pollution. The implication is that environmental indicators should be so organized as to indicate the environmental concern and management objectives they are related to.

The following key environmental indicator will help formulate the proposed environmental information and management system for Islamabad/Pakistan; furthermore it will also fulfill country needs of reporting against the aforementioned environment related conventions and multilateral international agreements;

S/No.	Category	Key Indicator(s)
1.	**Atmospheric pollution**	• Pollution emissions from Static & Mobile sources. • Urban ambient air quality • Air born diseases
2.	**Ozone depletion and climate change**	• Annual consumption ozone-depleting substances, • Annual GHG emissions • Increase in annual average temperature • Weather pattern/Extreme weather events (Flood, Storms & Heat waves etc.)
3.	**Water Resource (Ground & Surface Water**	• Annual groundwater extraction • Per capita groundwater availability • Amount of water consumed for industrial purposes • Amount of water used for domestic activities • Losses of water • Quality of drinking water • Rate of Eutrophication • Effluent discharge rate • Amount of water recycled/re-used • Water storage capacity • Nos. of waste water treatment facilities.
4.	**Biodiversity**	• Protected areas/National Parks • Wetlands and biosphere reserve • Forestation/Deforestation rate • Threatened or endangered species
5.	**Soil or land degradation**	• Rate of land degradation • Sediments load/erosion • Deforestation rate • Land use changes
6.	**Agriculture/live stock**	• Amount and type of fertilizer used • Irrigation system • Land use pattern • Amount of pesticides consume • Rice cultivation • Field Burning of Crops' Residue

		• Live stock population	
7.	**Waste**	• Municipal waste generation • Waste recycled/reused • Amount of waste converted to energy • Final disposal or dumping	
8.	**Energy**	• Total energy demand • Fuel combustion • Total energy produced from non-renewable sources • Total energy produced from renewable sources • Energy consumed	

The above list of key environmental indicators comprises 42 indicators across eight thematic areas, which correspond to priority themes for stronger environmental policy implementation: air pollution and ozone depletion, climate change, water, biodiversity, land & soil, Waste, Energy and agriculture. The main sources of environmental pressures from economic sectors are considered to be measured through areas of sectoral indicators: agriculture, energy, transport and waste etc.

5.2. Conceptual Framework for proposed EIMS:

Like any other country, environmental data and information play a vital role in the preparation and implementation of plans, programs and projects in Pakistan not only by the government but also by the private sector, multilateral organizations as well as NGOs and other interest groups. They also serve as a tool in monitoring and enforcing compliance with regulations/ standards and environmental policies. While providing an important instrument for policy integration, they also assist in informed decision making. Consequently, it has become imperative to deliver essential and reliable information on priority environmental issues to decision makers, and ability to harmonize with international standards and classifications. Therefore, there is a dire need of an advance system for environmental data base management for the country

An EIMS is an information technology solution for collecting and tracking environmental data as part of an overall environmental management system. In case of ICT, The EIMS must be designed to achieve the given objectives;

i.   To change individual and collective behavior, environmental management and implementation of environmental policies,

ii.   Support Institution/Organization's decision-making process and development, monitoring and evaluation of the existing policies.

The proposed EIMS would be providing a platform for environmental data and information collected from multiple sectors working for environment in one way or another, such as (Pak-EPA, Ministry of climate change IRSA, and NDMA etc.). The collected data would be aggregated and stored in an integrated data repository that can be queried using relevant search functions designed to help interpret the information. It will not only include the information itself, but also the actors producing and collecting the information as well as user of the information.

The proposed information system will help utilize and share environmental data in support to determine various segments of environment. Moreover; measuring economic effects of altering environmental conditions and developing effective policies to handle the economic challenges and improve overall environmental performance. Likewise; through it features the experts belong to various sectors across the country would be able to;

i.   Lead and share their perspectives, strategies, and valuable suggestions to integrate environment into development and achieve better economic outcomes and reduce environmental disfigurations.

ii.   They would monitor the prevailing performance of the system an anticipated action.

iii. The proposed EIMS must rely on the data gathered from all authentic sources which includes the aforementioned public sector organizations, Academia, Research Institutions, and National & International Organizations working at the federal level for environment.

5.2.1. Features of the proposed EIMS;

The goal is to ensure collection and processing of data which are important for the environment, to actually establish a network which will ensure data transmission to everyone who has right to it, in line with the law. Therefore, to ensure a completed and effective EIMS at the federal level is necessary to define standards which can be implemented on different hardware and software platforms. Data which is to be exchanged must satisfy certain conditions such as: data has to be validated and controlled before transmission. The system has to have the option of connecting with other systems –options of connecting with other information systems such as with waste management information system, water information system, air pollution information system, GHG dataset, etc. Furthermore it has to allow easy connection with international systems as well. As a conclusion, it has to be a web services system enabling communication and data transfer between computer systems via the internet because the use of web-based services has become increasingly popular over the last few years in the field of public-service provision.

The proposed EIMS must follow the basic principles of shared environmental information system (SEIS), prepared by the European Environmental Agency (EEA), The system basically encourages the modernization of data handling of Environmental Information System and a set of principles which underpin the decision-making process. The EIMS for the ICT should be based on the following principles;

i. The system must be managed as closed as possible to the data source.

ii. The acquired data to be shared with different organizations for different purposes.

iii. The data/information must be readily available to support environmental reporting and other research-oriented activities.

iv. The information/data should be accessible to multiple users which includes; (Policy makers, researchers & public).

v. The data or information to be accessible to support comparison at the appropriate geographical scale and citizen participation.

vi. Support through common and free/open software standards.

vii. Devise a framework to ensure the security of all available data or information.

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GEB MANAGEMENT

Mr. Hassan Nasir Jamy
Secretary / National Project Director - GEB
Ministry of Climate Change (MoCC)
Government of Pakistan

Dr. Saleem Janjua
National Project Coordinator - GEB
United Nations Development Programme (UNDP) &
Ministry of Climate Change (MoCC)
Government of Pakistan

GENERATING GLOBAL ENVIRONMENTAL BENEFITS (GEB)
BUILDING NO. 301, STREET 87, E-II/2, ISLAMABAD
TELL: 051-8319161

Generating Global
Environmental Benefits - GEB

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