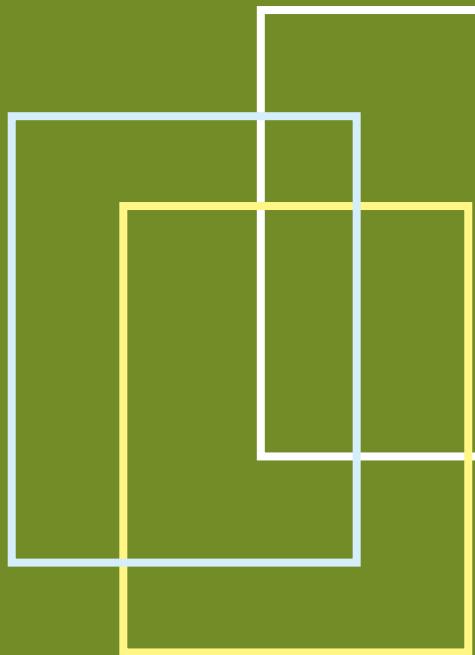


INVENTORY OF ORGANIZATIONS HAVING ENVIRONMENTAL DATA IN PUNJAB

*Scope, Components, Jurisdiction,
Protocols & Frequency*

August, 2023



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Environment Protection Department, Government of Punjab, Lahore**

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List of Abbreviations

AA	Ambient air
BWMC	Bahawalpur Waste Management Company
CDA	Cholistan Development Authority
DO	Dissolved Oxygen
ECSP	Engineering Consultancy Services Punjab
EPD	Environment Protection Department
FDA	Faisalabad Development Authority
FIEDMC	Faisalabad Industrial Estate Development and Management Company
FWASA	Faisalabad Water & Sanitation Agency
FWMC	Faisalabad Waste Management Company
GDA	Gujranwala Development Authority
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GW	Groundwater
GWASA	Gujranwala Water & Sanitation Agency
GWMC	Gujranwala Waste Management Company
HW	Hospital Waste
INGO	International Non-Governmental Organizations
IUCN	International Union for Conservation of Nature
LDA	Lahore Development Authority
LWASA	Lahore Water & Sanitation Agency
LWMC	Lahore Waste Management Company
MDA	Multan Development Authority
MS	Microsoft
MSW	Municipal Solid Waste
MW	Municipal Wastewater
MWASA	Multan Water & Sanitation Agency
MWMC	Multan Waste Management Company
P&SHD	Primary & Secondary Healthcare Department
PBIT	Punjab Board of Investment and Trade
PCRWR	Pakistan Council of Research in Water Resources
PCSIR	Pakistan Council of Scientific and Industrial Research
PEECA	Punjab Energy Efficiency & Conservation Agency
PEHCL	Punjab Energy Holding Company Limited
PERI	Punjab Economic Research Institute
PIEDMC	Punjab Industrial Estate Development and Management Company
PITB	Punjab Information Technology Board
PMA	Punjab Mass Transit Authority
PMD	Pakistan Meteorological Department
PMDFC	Punjab Municipal Development Fund Company

PMDFC	Punjab Municipal Development Fund Company
PRMP	Punjab Resource Management Program
PRTC	Punjab Road Transport Corporation
PSIC	Punjab Small Industries Corporation
PTA	Punjab Provincial Transport Authority
PTC	Punjab Transport Company
PTPL	Punjab Thermal Power Private Limited
QASP	Quaid-e-Azam Solar Power Limited
QATP	Quaid-e-Azam Thermal Power Limited
RDA	Rawalpindi Development Authority
RUDA	Ravi Urban Development Authority
RWASA	Rawalpindi Water & Sanitation Agency
RWMC	Rawalpindi Waste Management Company
SDG	Sustainable Development Goals
SDSC	Sustainable Development Study Centre
SE	Stack Emissions
SPIU	Strategic Planning & Implementing Unit
SUPARCO	Pakistan Space & Upper Atmosphere Research
SWMC	Sialkot Waste Management Company
TN	Total Nitrogen
TP	Totap Phosphorus
TPU	Transport Planning Unit
UET	University of Engineering and Technology, Lahore
VE	Vehicular Emissions
WW	Wastewater
WWF	World Wide Fund for Nature

Executive Summary

After Eighteenth Amendment to the Constitution of the Islamic Republic of Pakistan in 2010, the subject of environment and ecology was devolved to provinces. Subsequently, the Pakistan Environmental Protection Act 1997 was adapted, with amendments, for the province of the Punjab. The Act provides for the protection, conservation, rehabilitation and improvement of the environment, prevention and control of pollution, and promotion of sustainable development.

Environment Protection Department, Government of the Punjab is executing a World Bank assisted Punjab Green Development Program for strengthening of environmental governance and promoting green investments. The Department has established Strategic Planning & Implementation Unit (SPIU) for achieving the objectives of this program and for planning and implementation of future interventions related to improved environmental governance.

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH is executing the "Improvement of labour and environmental standards in Pakistan's textile industry (TextILES)" project. GIZ's TextILES project was approached by SPIU for assistance in the context of working with other organizations having environmental data. The goal is to strengthen the avenues of informed decision making and to strategize the policy goals/ priority areas of intervention for environment protection in the province. This project, in the long run, also aims at bringing stakeholders together for integrated and cohesive actions, through informed decision making, to address the current and futuristic needs pertaining to the strengthening of environmental standards in all sectors, especially the Textiles.

Environment is a cross cutting subject. Multiple organizations are playing their vital role for the betterment of the environment through their designated roles. The role of every organization is very important but limited to a certain aspect of the environment. The information

Environment is a cross cutting subject, multiple organizations are playing their vital role for the betterment of the environment through their designated roles

After Eighteenth Amendment to the Constitution of the Islamic Republic of Pakistan in 2010, the subject of environment and ecology was devolved to provinces

"TextILES" aims at bringing stakeholders together for integrated and cohesive actions, through informed decision making

– who is doing what – pertaining to the environmental data, is not available in one inventory. As a first step, it's of significant importance to identify the organizations having environmental data so that future course of action may be determined accordingly.

THE PROCESS OF

Identifying the organizations having environment data

FINDING "WHO IS DOING WHAT"

1

STOCKTAKE WITH SPIU EPD

DESIGNING OF SURVEY TOOLS,
FORMS, PROTOCOLS

2

3

LETTERS ISSUED TO
ORGANIZATIONS

4

APPROACHING ORGANIZATIONS

5

COLLATING INFORMATION

REPORT WRITING

6

7

DEVELOPMENT AND
DEPLOYMENT OF DASHBOARD

This study is mandated to develop an inventory of the organizations having an environmental data in Punjab. The organizations were broadly divided into government departments, academia, and international/private organizations. Every organization was gauged with regards to their working scope, jurisdiction/mandate, environmental component being dealt with, data acquisition frequency, data saving protocols and identification of data sharing constraints etc.

12-15th Dec, 22

Identification of Organizations



26th Jan to 25th Mar, 2023

Consultant Mobilized for Data Collection

26th January, 2023

Letters to various organizations



June, 2023

Report Compilation and Development of dashboard



From December, 22 to May, 23, the study was conducted through identification of the organization/ departments, preparation of formats and procedures for collecting the data, writing letters to various organizations for nomination of focal persons for providing the data, collecting the data from the organizations, drafting the report, preparation of dashboard and presenting the findings on the dashboard. For the intended tasks, following organizations were gauged i.e. thirteen (13) provincial government departments and their fifty-six (56) attached

departments/autonomous bodies & companies; three (03) Federal organizations; twelve (12) academic institutions and their twenty-one (21) institutes/departments; and two (02) international organizations, with regards to component of environment i.e., Air, Water, Solid Waste, Soil, Forest, Wildlife (**Figure-1**).

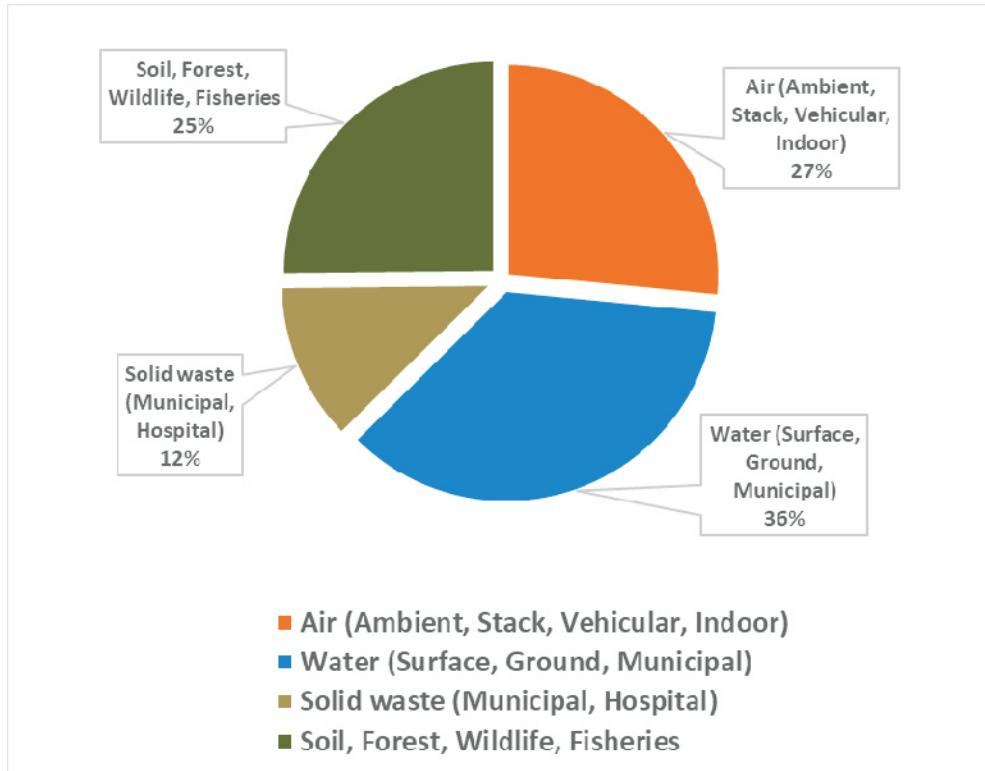


Figure 1 Division of organizations working in Air, Water, Solid Waste & Soil etc.

Afterwards, such organizations were grouped with regards to their scope and as well as component of environment i.e., air (Ambient Air (AA), Stack Emissions (SE), vehicular emissions (VE) and indoor air), water (surface water, groundwater, municipal wastewater, industrial wastewater), solid waste (municipal solid waste, industrial waste and any other), soil fertility, forest cover, wildlife and fisheries (**Figure-2**). Some of these organizations are working in more than one component of the environment.

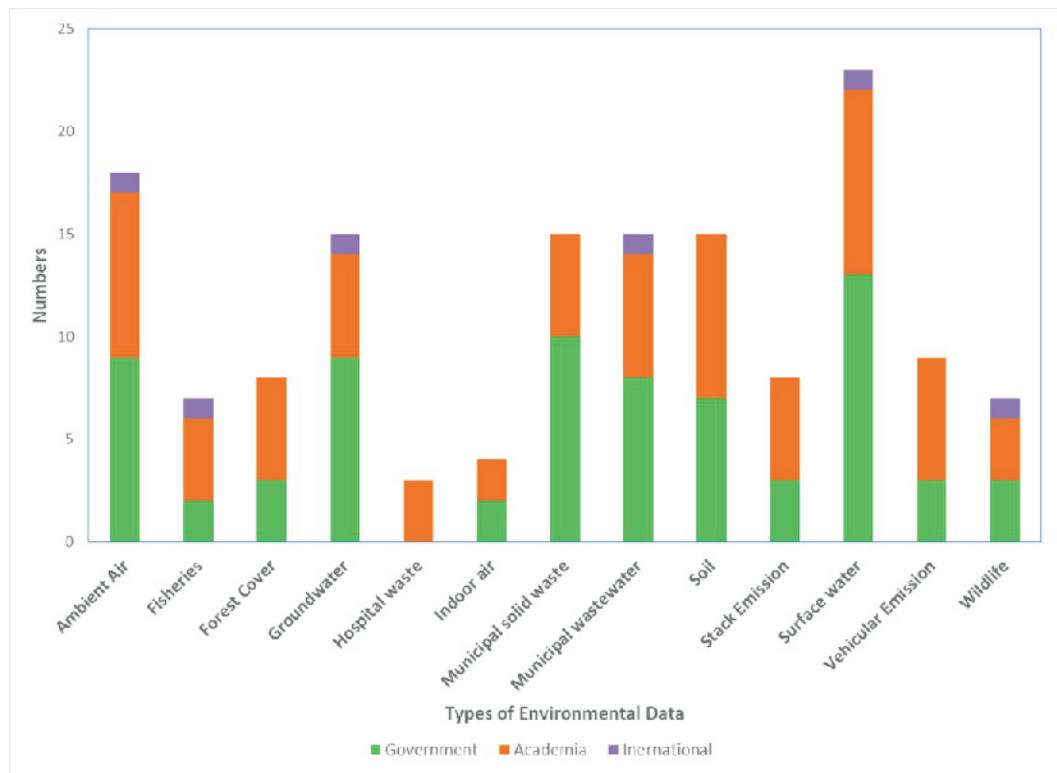


Figure 2 Distribution of Organizations having Environmental Data

Every organization has a different frequency of data generation i.e., Daily, Monthly, Annually, Project or Research based (**Figure-3**).

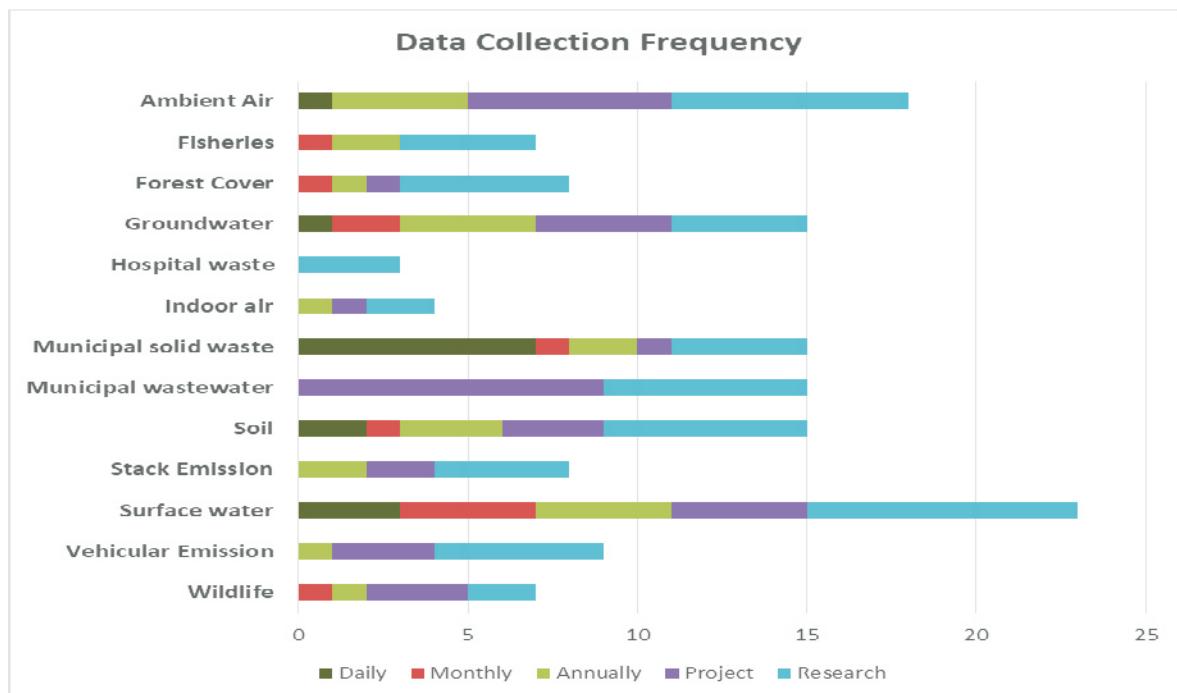


Figure-3 Date Collection Frequency

Twenty-one (21) organizations expressed various constraints in sharing data with the EPD including structural, legislative, HR and financial constraints (**Figure-4**). Nine (09) departments who do not share data with the EPD but did not express any constraints in the data sharing. Furthermore, eighteen (18) organizations including sixteen (16) government departments, one (01) academic institute and one INGO do share data with the EPD and have no constraints. However, twenty-six (26) organizations remained unresponsive in this regard (**Figure-5**).

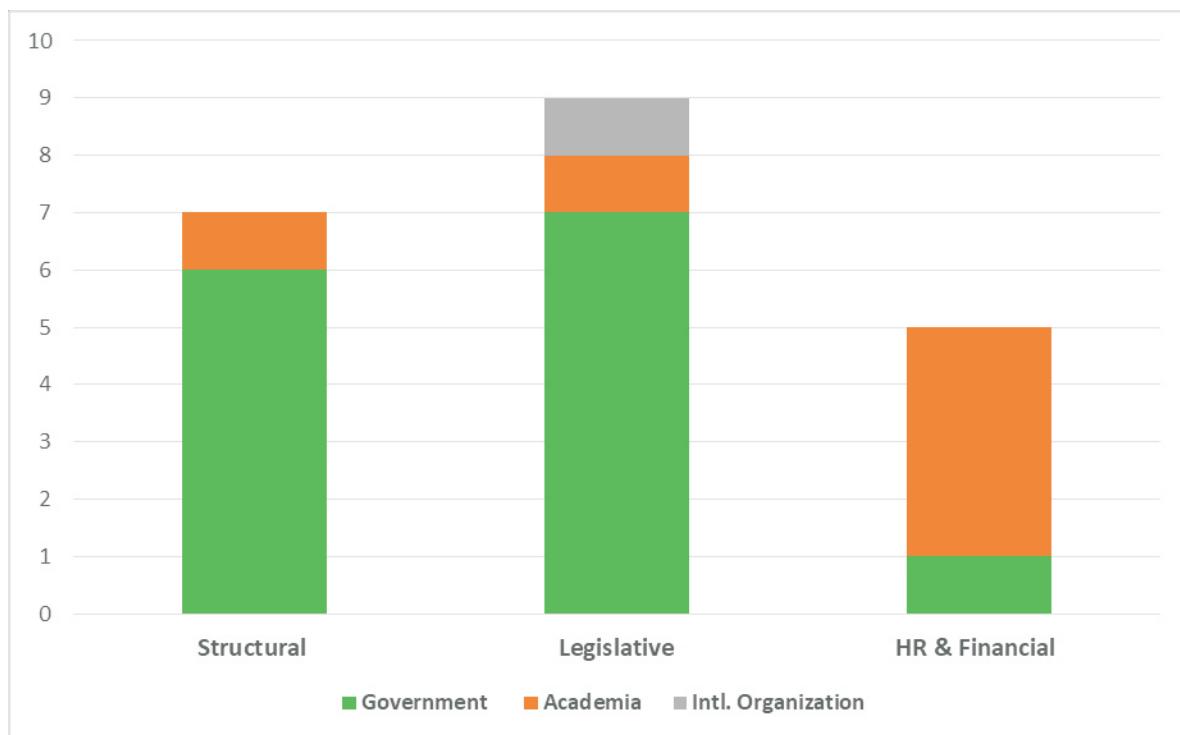


Figure 4 Division of Organizations who have constraints of sharing Environmental Data

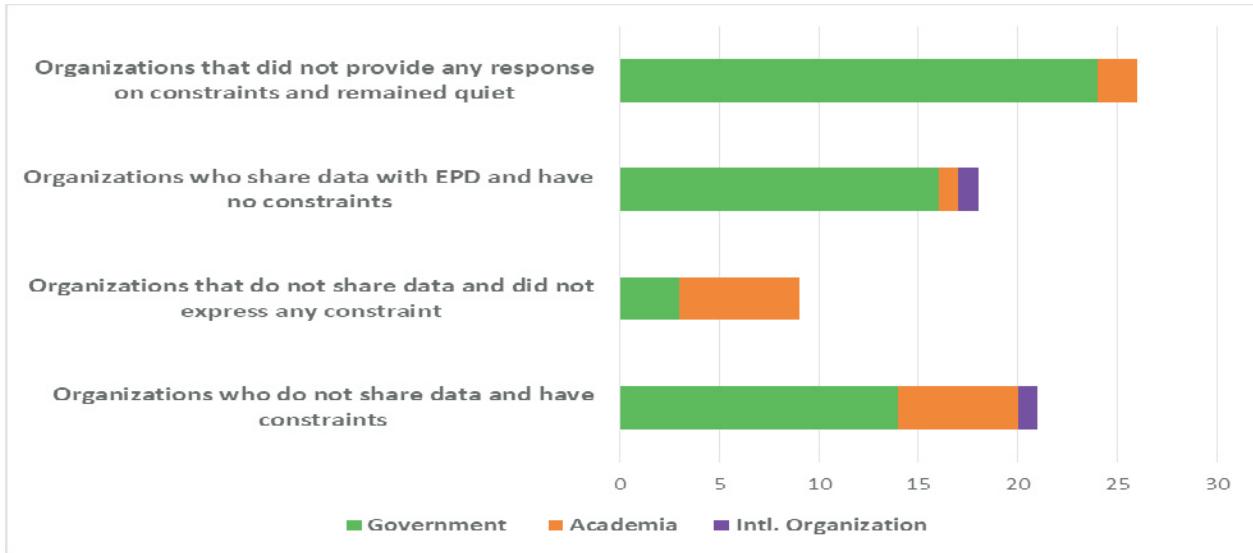


Figure 5 Analysis of Data Sharing Constraints

The Pakistan Council of Research in Water Resources is working on drinking/ground water and surface water and publishing reports. The monitoring data of the Council was analyzed in the context of this assignment. The data shows the quality of different surface water bodies flowing in the Punjab Province. Examining the findings of this monitored data, integrating it with the informed decision making would save cost, time and increase the resource efficiency in the perspective of the environmental governance in the Punjab.

This study's primary conclusions indicate that no importance is given to the environmental data. Such data is collected for the sake of regulatory compliance only and it is scattered even within organizations. Synergies of environmental data sharing need to be developed, as it's not present.

According to the Act *ibid*, the Environmental Protection Agency may request any person¹ to furnish any information or data relevant to its functions (§ 6 (2)(b) of the Act *ibid*). EPD at the institutional level needs to be strengthened both in terms of human resources and finance to coordinate with other government departments on acquiring the environmental data and integrating it for taking informed decision making. Further, a centralized system and protocols may be developed at the institutional level in the EPD for coordinating/ sharing the environmental data by government departments/ academia/ International Non-Governmental Organizations. Capacity building of other organizations especially government departments may be done for maintaining and sharing the environmental data with EPD.

¹ (§ 2(xxii) of the Act *ibid*) “person” means any natural person or legal entity and includes an individual, firm, association, partnership, society, group, company, corporation, co-operative society, Government Agency, non-governmental organization, community-based organization, village organization, local council or local authority and, in the case of a vessel, the master or other person having for the time being the charge or control of the vessel;

SECTION 1: INTRODUCTION

1.1 Overview

After Eighteenth Amendment to the Constitution of the Islamic Republic of Pakistan in 2010, the subject of environment and ecology was devolved to provinces. Subsequently, the Pakistan Environmental Protection Act, 1997 was adapted, with amendments, for the province of the Punjab. The Act provides for the protection, conservation, rehabilitation and improvement of the environment, prevention and control of pollution, and promotion of sustainable development.

Under the Punjab Environmental Protection Act 1997, the term 'Environment' is defined as air, water and, land; all layers of the atmosphere; all organic and inorganic matter and living organisms; the ecosystem and ecological relationships; buildings, structures, roads, facilities and works; social and economic conditions affecting community life; and the inter-relationships between any of the aforementioned factors (§ 2 (x) of the Act ibid).

The Punjab Environmental Protection Act 1997 provides for the protection, conservation, rehabilitation and improvement of the environment, prevention and control of pollution, and promotion of sustainable development

Environment is a cross cutting subject. Multiple organization including academia, research institutions and government departments etc. are playing their vital role for betterment of the environment through their designated roles. The role of every organization is very important but limited to a certain aspect of the environment. During this process, a valuable and significant amount of data related to environment is generated by each organization. The information – who is doing what – pertaining to the environmental data, is not available in one Inventory.

This study is mandated to develop an inventory of the organizations having an environmental data in Punjab. The organizations were broadly divided into government departments, academia, and international/private organizations. Every organization was gauged with regards to their working scope, jurisdiction, environmental component (including WW, MW, SE, AA, GW etc.), data acquisition frequency, data saving protocols, machinery and equipment, identification of data sharing constraints with Environment Protection Department (EPD) etc. The information was collected from the focal persons/representatives

The information – who is doing what – pertaining to the environmental data, is not available in one Inventory

of each department. The collected information has been rearranged in the form of an excel-based inventory and web-based dashboard.

This analysis helped in understanding and developing the baseline of environmental information in the province.

1.2 Background

EPD's Strategic Planning & Implementing Unit (SPIU) is mandated to execute the Punjab Green Development Program and other initiatives of the department. PGDP is based on eight disbursement linked indicators and five of them are related to the EPD i.e. improving EPD's capacity, enhanced air and water quality monitoring, disclosure of environmental information and citizen engagement, sound management of plastics and mobilization of sustainable green financing. The directorate of Environmental Policy and Planning at SPIU has a function to "*Compile and organize environmental data collected by others and work with those who collect the data and interpret it for informed decision making in environmental protection sector in the province*".

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH is executing the

The goal is to strengthen the avenue of informed decision making and to strategize the policy goals/ priority areas of intervention for environment protection in the province, as environment is a cross cutting subject

"Improvement of labour and environmental standards in Pakistan's textile industry (TextILES)" project. GIZ's TextILES project is approached by SPIU for assistance in the context of preparation of inventory of those organizations which are collecting and analyzing environmental data. The goal is to strengthen the

avenue of informed decision making and to strategize the policy goals/ priority areas of intervention for environment protection in the province, as environment is a cross cutting subject. Project, in the long run, aims at bringing stakeholders together for integrated and cohesive actions to address the current needs of strengthening of Environmental Standards in all sectors, especially the Textiles .

In order to achieve the function of SPIU, GIZ was approached to assist in compilation and organizing the environmental data collected by others. After thorough discussions and deliberations, it's been decided to take the first step and identify the organizations who are dealing with the environmental data and get the information about their working scope to pave a way for future interventions. Hence, this project was conceived.

1.3 Objectives

Objective of this assignment is to strengthen environmental governance through:

- (i) Evaluating various organizations for presence of environmental data;
- (ii) Understanding the methodology/procedure adopted for collection of environmental data by these organizations;
- (iii) Identification of the bottlenecks in sharing the environmental data with the EPD;
- (iv) Presenting the data of one to two organizations on the dashboard; and
- (v) Recommending the way forward for strengthening informed decision making.

1.4 Challenges

Following major challenges were faced while collecting the information:

- The letters written to the Departments/Institutions were not marked down to the concerned personnel's (nominations were not made in majority of the cases unless repeatedly followed up);
- Hesitation/Unwillingness in sharing the information by various departments; and
- Repeated reminders/calls to provide the requisite information.

1.5 Limitations

- There may be other departments working on the environmental data in Punjab province, but during the subject study, thirteen (13) departments and fifty-six (56) attached departments/autonomous bodies & companies from the government sector, (12) academic institutions and twenty-one (21) institutes/departments from the academia sector and two (02) organizations from the international organizations were covered;
- Information was collected from these organizations, through various means (including Google forms, meetings, telephone calls and emails), has been incorporated in the report. Lack of adequate understanding related to the objectives of the study may be found, because organizations have never been approached earlier in this context;
- The data collection exercise was limited to the certain components of environment as defined in the survey tool; and The quantitative data was displayed on the dashboard was limited to only one organization.

SECTION 2: METHODOLOGY

Methodology for the Study

The following methodology was adopted by the Consultant for carrying out this study. The methodology and timelines are presented in **Figure 2.1 and 2.2** respectively.

- i) **Identification of the organizations:**
Identification of organizations having environmental data with SPIU was carried out on December 12 - 15, 2022. Discussions were held, to create a mutual understanding, to achieve the objectives of the study;
- ii) **Preparation of formats and procedures:**
Formats and procedures were prepared in consultation with SPIU. A template/format (in Microsoft (MS) excel) as a preview tool was developed.
- iii) **Letters to various organization:** SPIU wrote letters to various organizations for nomination of focal persons and for facilitating the consultants in the designated task on January 25, 2023;
- iv) **Filling of the template & Report writing:**
The Consultant was mobilized on January 26, 2023 and collected the data (through Google forms, telephonic discussions, visits to the organizations, etc. attached as **Annex-I**) from the representative(s) of organizations from January 26, 2023 to March 15, 2023. The assessments were carried out from March 16, 2023 to March 25, 2023.



Figure 2.1 Methodology of the Study

- v) **Preparation of dashboard:** The data thus collected was presented in the form of a dashboard (**URL:** <https://idm.pgdp.pk/ioed>) to understand the inventory of organizations in a wholesome manner. The directory of organizations working in environmental sector is attached as **Annex-II**. Environmental data of one organization has been displayed on the dashboard; and
- vi) **Conclusion:** Challenges faced during the study, its limitations and findings as well as proposed way forward has been developed while concluding the study.



Figure 2.2 Timelines of the Study

The flowchart of the project activities is given below in **Figure 2.3**.

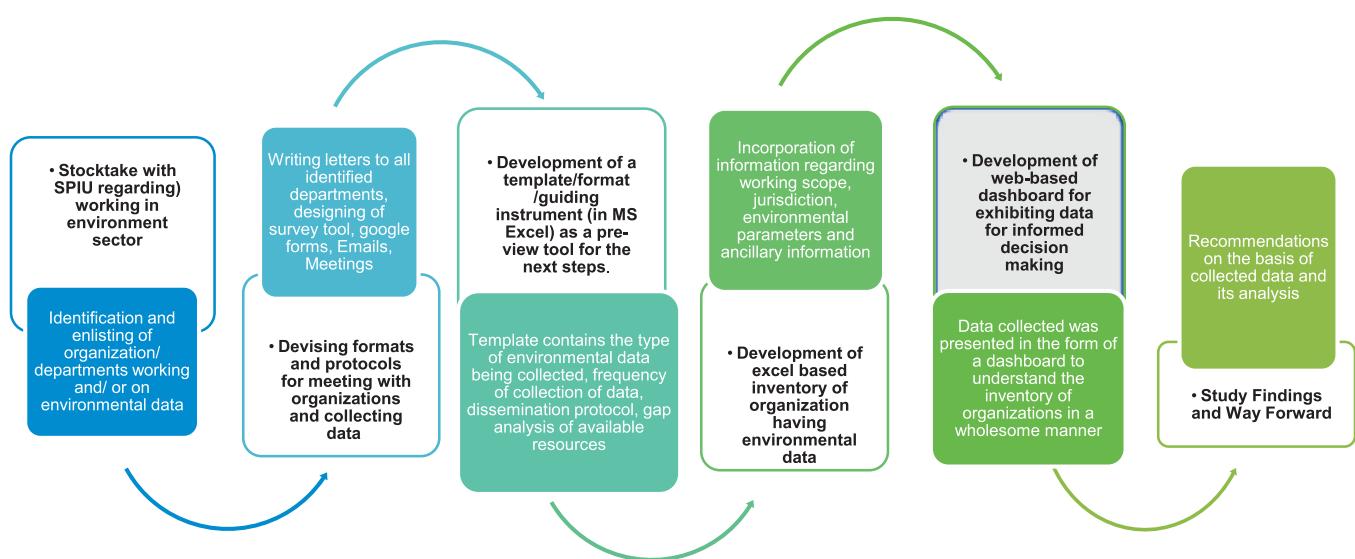


Figure 2.3 Process Flowchart

SECTION 3: INVENTORY OF DEPARTMENTS, ACADEMIA & INTERNATIONAL ORGANIZATIONS

Under the Punjab Government Rules of Business, 2011, EPD has to administer the Punjab Environmental Protection Act 1997. Under this Statue, Environmental Protection Agency is established to implement the provisions of the Act and rules and regulations made thereunder.

As of now, the environmental information by the Department and the Agency is disseminated through its website². A remarkable initiative is the sharing of ambient air quality of Lahore on daily basis. The information related to environmental issues and a rich resource center is also available containing legal instruments (Laws, rules, regulations, Punjab environmental quality standards etc.) and various reports (like environmental impact assessments, smog commission, state of environment etc.). With the implementation of “Guidelines to regulate public disclosure of environmental information”, further environmental information will be shared to the public. In this section, the focus has been made to identify the organizations and type of environmental data collected by them.

Details of government departments, academia and INGOs is given as follows:

3.1 Inventory of Government Departments

a. Provincial Government

For inventory development of the departments, a list was prepared. The list was systematically divided into three broader categories i.e. (i) Government Departments (it also includes the attached departments as well as Autonomous Bodies & Companies), (ii) Academia; and (iii) International organizations. During inventory development of the departments from the government sector, thirteen (13) departments and fifty-six (56) attached departments/autonomous bodies & companies were covered for identification of environmental data. The list of surveyed government departments having environmental data is given in **Table 3-1:**

² www.epd.punjab.gov.pk

Table 3-1 List of Provincial Government Departments

#	Name of Department	Name of Attached Department / Autonomous Body & Companies
1	Agriculture Department	(i) Ayub Agricultural Research Institute Faisalabad (ii) Extension and Adaptive Research Punjab, Lahore, (iii) On Farm Water Management, (iv) Soil Survey of Punjab
2	Housing, Urban Development & Public Health Engineering Department	(i) Faisalabad Development Authority (FDA), (ii) Faisalabad Water & Sanitation Agency (FWASA), (iii) Gujranwala Development Authority (GDA), (iv) Gujranwala Water & Sanitation Agency (GWASA), (v) Lahore Development Authority (LDA), (vi) Lahore Water & Sanitation Agency (LWASA), (vii) Multan Development Authority (MDA), (viii) Multan Water & Sanitation Agency (MWASA), (ix) Ravi Urban Development Authority (RUDA), (x) Rawalpindi Development Authority (RDA), (xi) Rawalpindi Water & Sanitation Agency (RWASA)
3	Energy Department	(i) Punjab Thermal Power Private Limited (PTPL), (ii) Punjab Energy Efficiency & Conservation Agency (PEECA), (iii) Punjab Energy Holding Company Limited (PEHCL), (iv) Quaid-e-Azam Solar Power Limited (QASP), (v) Quaid-e-Azam Thermal Power Limited (QATP)`
4	Health Department	Primary & Secondary Healthcare Department (P&SHD)
5	Irrigation Department	Small Dams Organization
6	Industries, Commerce, Investment and Skills Development Department	(i) Faisalabad Industrial Estate Development and Management Company (FIEDMC), (ii) Punjab Board of Investment and Trade (PBIT) (iii) Punjab Industrial Estates Development and Management Company (PIEDMC), (iv) Punjab Small Industries Corporation (PSIC)
7	Labour & Human Resource Department	Directorate General of Labour Welfare
8	Livestock Department	(i) Livestock & Dairy Development Department, (ii) Punjab Agriculture and Meat Company
9	Mines & Minerals Department	(i) Directorate General of Mines & Minerals, Punjab, (ii) Mines Labor Welfare Commissioner, Punjab, (iii) Punjab Mineral Company, (iv) Punjab Mineral Development Corporation
10	Planning & Development Department	(i) Agency of Barani Areas Development, (ii) Cholistan Development Authority (CDA), (iii) Engineering Consultancy Services Punjab (ECSP), (iv) Punjab Economic Research Institute (PERI), (v) Punjab Information Technology Board (PITB), (vi) Punjab Resource Management Program (PRMP), (vii) The Urban Unit
11	Forest, Wildlife & Fisheries Department	Forest, Wildlife & Fisheries Department
12	Local Government and Community Development Department	(i) Lahore Waste Management Company (LWMC), (ii) Bahawalpur Waste Management Company (BWMC), (iii) Faisalabad Waste Management Company (FWMC), (iv) Gujranwala Waste Management Company (GWMC), (v) Multan Waste Management Company (MWMC), (vi) Punjab

#	Name of Department	Name of Attached Department / Autonomous Body & Companies
		Municipal Development Fund Company (PMDFC), (vii) Rawalpindi Waste Management Company (RWMC), (viii) Sialkot Waste Management Company (SWMC)
13	Transport Department	(i) Punjab Provincial Transport Authority (PTA), (ii) Punjab Mass Transit Authority (PMA), (iii) Punjab Road Transport Corporation (PRTC), (iv). Punjab Transport Company (PTC) (v) Transport Planning Unit (TPU)

b. Federal Government

In addition to above, the following Federal Government organizations deals with the Environmental Data i.e. Pakistan Space & Upper Atmosphere Research Commission (SUPARCO), Pakistan Council of Scientific and Industrial Research (PCSIR) & Pakistan Meteorological Department (PMD).

3.2 Inventory of Academia

During inventory development of the departments from the academia sector, twelve (12) academic institutions and twenty-one (21) institutes/departments were covered working in the environmental sector. The list is given in the **Table 3-2**.

Table 3-2: List of Academia/Organization

#	Name of Academia/ Organization	Name of institutes/departments
1	Agriculture University Faisalabad	Institute of Soil & Environmental Sciences
2	Bahauddin Zakariya University Multan	(i) Department of Environmental Sciences, (ii) Institute of Botany (iii) Institute of Zoology
3	Forman Christian College University	Department of Environmental Sciences
4	Government College University Faisalabad	(i) Department of Environmental Sciences, (ii) Department of Chemical Engineering Technology,
5	Government College University Lahore	Sustainable Development Study Centre (SDSC)
6	Lahore College for Women University	Department of Environmental Sciences
7	Lahore School of Economics	Department of Environmental Sciences & Policy
8	Lahore University of Management Sciences	(i) Mushtaq Ahmad Gurmani School of Humanities and Social Sciences (Environmental Studies Centre), (ii) The Energy, Environment and Public Health Cluster at the Mahbub-ul-Haque Research Centre,
9	The University of Faisalabad	Department of Chemical Engineering

#	Name of Academia/ Organization	Name of institutes/departments
10	University of Engineering & Technology Lahore	Institute of Environmental Engineering and Research
11	University of Veterinary & Animal Sciences, Lahore	Faculty of Fisheries and Wildlife
12	University of the Punjab	(i) Department of Animal Sciences, (ii) College of Earth & Environmental Sciences, (iii) Department of Soil Science (iv) Institute of Agricultural Sciences, (v) Institute of Chemical Engineering & Technology, (vi) Institute of Energy & Environmental Engineering

3.3 International Organizations

During inventory development of the international organization, two (02) organizations were covered working in the environmental sector. The list of organizations working on the environmental data is given in the **Table 3-3.**

Table 3-3: List of International Organizations

#	Name of Organization
i	International Union for Conservation of Nature (IUCN)
ii	World Wide Fund for Nature (WWF)

SECTION 4: DATA ANALYSIS

4.1 Analysis of the Data Acquired from Survey

During the inventory development, information regarding environmental component was collected e.g., air (ambient air, stack emissions, vehicular emissions and indoor air), water (surface water, groundwater, municipal wastewater, industrial wastewater), solid waste (municipal solid waste, industrial waste and any other), soil fertility, forest cover, wildlife and fisheries. The analysis of the data acquired through the aforementioned means is presented hereunder:

4.2 Working Scope of Organizations

The working scope of organizations having environmental data is divided into environmental monitoring, research, biodiversity and policy. Under each working scope, the organizations are placed.

Based on the findings of the surveyed organizations, it was revealed that fifty-six (56) government departments are working in the environment sector in different capacities and have environmental information. Majority of these departments (28) are engaged in monitoring of various environmental parameters. Nine (09) departments are involved in policy-making within their specific domains (having certain elements of environment) and eight (08) departments are engaged in various research works. Only two (02) departments deal in biodiversity. Some autonomous bodies i.e., development authorities including LDA, RDA, GDA etc., have no direct linkage with the monitoring of environmental parameters, but they conduct Environmental Impact Assessment studies before commencement of various development projects and resultantly have environmental information (**Table 4.1**).

Thirteen (13) institutes/departments of various universities, by virtue of providing environmental education and carrying research, have environmental data. These departments are dealing in wide range of research work on various environmental parameters. Three (03) institutes deal in environmental monitoring and two (02) with the biodiversity.

The World Wildlife Fund (WWF)-Pakistan and International Union for Conservation of Nature (IUCN) Pakistan carry out environmental studies in Punjab (Pakistan). Their core purpose is policy-making and research.

Table 4.1: Working Scope of Organizations

Working Scope	Type of Organization	Name of Organization
Environmental Monitoring	Government	(i) BWMC, (ii) Directorate General of Mines & Minerals, (iii) ECSP, (iv) Forest, Wildlife & Fisheries Department, (v) FWMC, (vi) GWASA, (vii) GWMC, (viii) LWMC, (ix) MWASA, (x) MWMC, (xi) PCSIR Lahore, (xii) PEECA, (xiii) PIEDMC, (xiv) PMDFC, (xv) PTPL, (xvi) PTC, (xvii) QASP, (xviii) QATP (xix) RDA, (xx) RWMC, (xxi) Small Dams Organization (xxii) SWMC (xxiii) Soil Survey of Punjab, (xxiv) SUPARCO, (xxv) The Urban Unit, (xxvi) FWASA, (xxvii) RWASA, (xxviii) LWASA
	Academia	(i) College of Earth and Environmental Sciences, University of the Punjab Lahore, (ii) SDSC, Government College University Lahore, (iii) Institute of Environmental Engineering & Research, UET Lahore
	International	Worldwide Fund for Nature -Pakistan
Research	Government	(i) Ayyub Agricultural Research Institute Faisalabad, (ii) Forest, Wildlife & Fisheries Department, (iii) Livestock & Dairy Development Department, (iv) On Farm Water Management, (v) PCSIR Lahore, (vi) PRMP, (vii) SUPARCO, (viii) The Urban Unit
	Academia	(i) College of Earth and Environmental Sciences, University of the Punjab Lahore, (ii) Department of Environmental Sciences, Bahauddin Zakariya University Multan, (iii) Department of Environmental Sciences, Government College University Faisalabad, (iv) Department of Environmental Sciences, Lahore College for Women University, (v) Department of Environmental Sciences, University of the Punjab Lahore, (vi) Department of Soil Sciences, University of the Punjab Lahore (vii) Institute of Environmental Engineering & Research, UET Lahore, (viii) Institute of Botany, Bahauddin Zakariya University Multan, (ix) Institute of Soil & Environmental Sciences, Agriculture University Faisalabad, (x) Institute of Chemical Engineering & Technology, University of the Punjab Lahore, (xi) Institute of Energy and Environmental Engineering, University of the Punjab Lahore, (xii) Institute of Zoology, Bahauddin Zakariya University Multan, (xiii) Sustainable Development Study Center, Government College University Lahore
	International organization(s)	(i) WWF-Pakistan, (ii) IUCN Pakistan
	Government	(i) Forest, Wildlife & Fisheries Department, (ii) The Urban Unit
Biodiversity	Academia	(i) Institute of Environmental Engineering & Research, UET Lahore, (ii) SDSC, Government College University Lahore.
	International organization(s)	IUCN, Pakistan
Policy	Government	(i) Directorate General of Mines & Minerals, Punjab, (ii) Energy Department, (iii) Forest, Wildlife & Fisheries Department, (iv) Livestock & Dairy Development Department, (v) MDA, (vi) PEHCL, (vii) PMDFC, (viii) RUDA, (ix) The Urban Unit

4.3 Environmental Data Details

The majority of the surveyed organizations focus on the "Water sector (Surface, Ground, and Municipal)", accounting for 36% of the total. Following closely behind is the "Air sector (Ambient, Stack, Vehicular, and Indoor)", comprising 27% of the organizations. Together, these two sectors make up 63% of the organizations included in the study. The remaining 37% is a mix of the "Soil, Forest, Wildlife, Fisheries" sector (25%) and the "Solid waste (Municipal, Hospital)" sector (12%) (**Figure 4.1**).

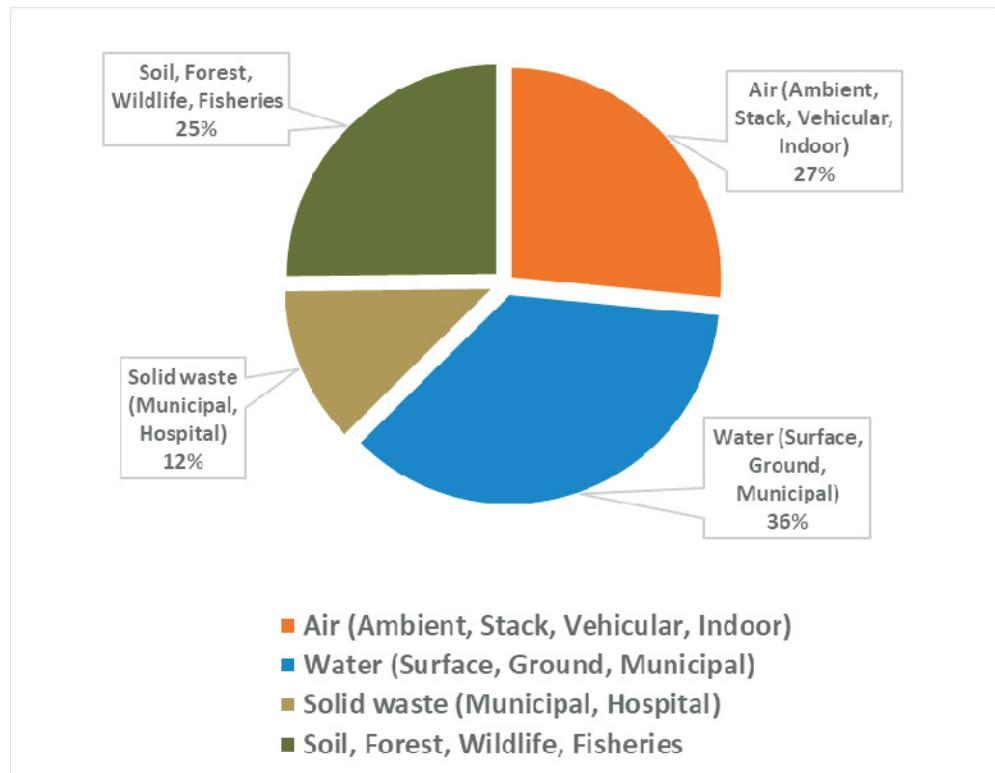


Figure 4.1 Division of organizations working in Air, Water, Solid Waste & Soil etc.

This section is systematically divided with regards to the various components of the environmental information i.e. AA, SE, VE, Indoor Air, SW, GW, MW, MSW, HW, Soil, Forest Cover, Wildlife and Fisheries. Every organization (Government, Academia & International Organizations) are further divided into the said component of environmental information in the following manners:

a. Ambient Air:

Nine (09) organizations from government sector, eight (08) educational institutes and one (01) international organization are currently working on Ambient Air. Whereas, QATP is monitoring the air quality on daily basis. Three (03) departments conduct annual monitoring of AA and rest of the departments study the AA on project basis. The academia studies the AA on research basis only which is published in the form of research papers and thesis. The

environmental information is hereby presented in the form of data acquisition frequency as shown in **Table 4.2A**.

Table 4.2A: Organizations having Environmental Data (Ambient Air)

#	Frequency of Data Generated	Type of Organization	Name of Organization
1	Annually	Government	(i) PTPL (ii) PIEDMC, (iii) QASPL
		Academia	SDSC, Government College University (GCU), Lahore
2	Project Based	Government	(i) Engineering Consultancy Services Punjab, (ii) PCSIR Laboratories Complex, Lahore, (iii) PMDFC, (iv) SUPARCO, (v) The Urban Unit
		International	Worldwide Fund for Nature
3	Research Based	Academia	(i) College of Earth and Environmental Sciences, University of Punjab; (ii) Department of Environmental Sciences, Lahore College for Women University (LCWU); (iii) Department of Environmental Sciences, Bahauddin Zakariya University; (iv) Department of Environmental Sciences, Forman Christian College University, (v) Department of Environmental Sciences, GCU Faisalabad. (vi) Institute of Energy and Environmental Engineering, University of Punjab, (vii) Institute of Environmental Engineering & Research, UET Lahore
4	Daily	Government	QATP

b. Stack Emissions

A total of eight (08) organizations including three (03) from government sector and five (05) from academia sector are working on SE. The scope of academia is all research based. Latest equipment including CEMS and gas analyzers are used by Government departments for measuring the stack emissions as shown in **Table 4.2B**.

Table 4.2B: Organizations having Environmental Data (Stack Emissions)

#	Frequency of Data Generated	Type of Organization	Name of Organization
1	Annually	Government	PTPL
		Academia	SDSC, Government College University Lahore
2	Project Based	Government	(i) PMDFC, (ii) PEHCL

#	Frequency of Data Generated	Type of Organization	Name of Organization
3	Research Based	Academia	(i) College of Earth and Environmental Sciences, University of the Punjab, (ii) Department of Environmental Sciences, Forman Christian College Lahore, (iii) Institute of Chemical Engineering & Technology, University of the Punjab, (iv) Institute of Environmental Engineering & Research, University of Engineering and Technology (UET) Lahore.

c. Vehicular Emissions

A total of nine (09) organizations including three (03) from government sector and six (06) educational institutions are currently working on VE. The primary department is Punjab Provincial Transport Authority (PPTA) which uses Vehicle Inspection & Certification System. The work of academia is research based and they are equipped with various laboratory equipment as shown in **Table 4.2C**.

Table 4.2C: Organizations having Environmental Data (Vehicular Emissions)

#	Frequency of Data Generated	Type of Organization	Name of Organization
1	Annually	Academia	SDSC, Government College University, Lahore
2	Project Based	Government	(i) PMDFC (ii) RDA, (iii) The Urban Unit,
3	Research Based	Academia	(i) College of Earth and Environmental Sciences, University of Punjab, (ii) Department of Environmental Sciences, Government College University Faisalabad, (iii) Department of Environmental Sciences, Lahore College for Women University, (iv) Institute of Chemical Engineering & Technology, University of Punjab, (v) Institute of Environmental Engineering & Research, UET Lahore.

d. Indoor Air Quality

Indoor air quality is least monitored parameter among all the other environmental parameters. None of the department is dedicatedly monitoring the indoor air quality. However, two (02) departments i.e., PMDFC and PIEDMC are monitoring it on project-to-project basis. The

trend is also the same in academia as only two (02) institutes are conducting indoor air quality analysis for research purposes as shown in **Table 4.2D**.

Table 4.2D: Organizations having Environmental Data (Indoor Air Quality)

#	Frequency of Data Generated	Type of Organization	Name of Organization
1	Annually	Government	PIEDMC
2	Project Based	Government	PMDFC
3	Research Based	Academia	(i) College of Earth and Environmental Sciences, University of Punjab, (ii) Institute of Environmental Engineering & Research, UET Lahore

e. Surface Water

Thirteen (13) Government Organizations, nine (09) educational institutes and one (01) international organizations (NGOs) are monitoring surface water quality. The subject is predominantly taken up by WASAs. The academia is also proactive in surface water quality analysis through various modern laboratory equipment as shown in **Table 4.2E** .

Table 4.2E: Organizations having Environmental Data (Surface Water)

#	Frequency of Data Generated	Type of Organization	Name of Organization
1	Annually	Government	(i) Agency for Barani Areas Development, (ii) PIEDMC, (iii) RDA
		Academia	SDSC, Government College University Lahore
2	Project Based	Government	(i) ECSP, (ii) PCSIR Laboratories Complex Lahore, (iii) The Urban Unit
		International	World Wide Fund for Nature -Pakistan
3	Research Based	Academia	(i) College of Earth and Environmental Sciences, University of Punjab, (ii) Department of Environmental Sciences, Baha Uddin Zakariya University, (iii) Department of Environmental Sciences, Forman Christian College University, (iv) Department of Environmental Sciences, GCU Faisalabad, (v) Department of Environmental Sciences, Lahore College Women University, (vi) Institute of Chemical Engineering & Technology, University of Punjab, (vii) Institute of Energy and Environmental Engineering, University of Punjab, (viii) Institute of

#	Frequency of Data Generated	Type of Organization	Name of Organization
			Environmental Engineering & Research, University of Engineering and Technology Lahore.
4	Daily	Government	(i) Ayub Agricultural Research Institute, Pakistan, (ii) QATP; (iii) RWASA
5	Weekly	Government	(i) FWASA, (ii) MWASA
6	Quarterly	Government	On Farm Water Management
7	Monthly	Government	GWASA

f. Ground Water

A total of fifteen (15) departments including nine (09) from government sector, five (05) educational institutes and one (01) international organization are working on groundwater as shown in **Table 4.2F**.

Table 4.2F: Organizations having Environmental Data (Ground Water)

#	Frequency of Data Generated	Type of Organization	Name of Organization
1	Annually	Government	(i) PIEDMC, (ii) RDA, (iii) PTPL
		Academia	SDSC, Government College University Lahore
2	Project Based	Government	(i) PMDFC, (ii) PCSIR Laboratories Complex, Lahore, (iii) The Urban Unit
		International	WWF -Pakistan
3	Research Based	Academia	(i) College of Earth and Environmental Sciences, University of the Punjab, (ii) Department of Environmental Sciences, Forman Christian College University, (iii) Department of Environmental Sciences, Government College University Faisalabad, (iv) Institute of Environmental Engineering & Research, UET and Technology Lahore
4	Daily	Government	QATP
5	Monthly	Government	(i) GWASA, (ii) LWASA

g. Municipal Wastewater

A total of nine (09) departments including all five WASAs (Faisalabad, Gujranwala, Lahore, Multan, Rawalpindi) of Punjab are working on municipal wastewater on project basis. In addition to these departments, six (06) educational institutes are also working on municipal wastewater for research purposes. The international organizations are also playing their roles in municipal wastewater studies as shown in **Table 4.2G**.

Table 4.2G: Organizations having Environmental Data (Municipal Wastewater)

#	Frequency of Data Generated	Type of Organization	Name of Organization
1	Project Based	Government	(i) ECSP, (ii) PMDFC, (iii) The Urban Unit (iv) FWASA (v) GWASA (vi) LWASA (vii) MWASA (viii) RWASA (ix) RUDA
		International	WWF -Pakistan
2	Research Based	Academia	(i) College of Earth and Environmental Sciences, University of Punjab, (ii) Department of Environmental Sciences, Forman Christian College University, (iii) Department of Environmental Sciences, Lahore College for Women University, (iv) Institute of Chemical Engineering & Technology, University of Punjab, (v) Institute of Energy and Environmental Engineering, University of Punjab (vi) Institute of Environmental Engineering & Research, UET Lahore

h. Municipal Solid Waste

Sixteen (16) government organizations including seven (07) waste management companies in major cities including Bahawalpur, Faisalabad, Gujranwala, Lahore, Multan, Sialkot are working on municipal solid waste. The reports of collected solid waste (in tonnes) are being continuously monitored on live video walls placed at head offices of some of aforementioned seven companies. PIEDMC is working on annual basis and PCSIR conducts project-based monitoring of municipal solid waste. The role of academia in this aspect is research based, as shown in **Table 4.2H**.

Table 4.2H: Organizations having Environmental Data (Municipal Solid Waste)

#	Frequency of Data Generated	Type of Organization	Name of Organization
1	Annually	Government	PIEDMC
		Academia	SDSC, Government College University Lahore
2	Project Based	Government	(i) PCSIR Laboratories Complex Lahore, (ii) The Urban Unit
3	Research Based	Academia	(i) College of Earth and Environmental Sciences, University of Punjab, (ii) Institute of Environmental Engineering & Research, University of Engineering and Technology Lahore, (iii) Institute of Energy and Environmental Engineering,

#	Frequency of Data Generated	Type of Organization	Name of Organization
			University of Punjab, (iv) Institute of Chemical Engineering & Technology, University of Punjab
4	Daily	Government	(i) Bahawalpur Waste Management Company, (ii) Faisalabad Waste Management Company, (iii) Gujranwala Waste Management Company (iv) Lahore Waste Management Company, (v) Multan Waste Management Company, (vi) Rawalpindi Waste Management Company (vii) Sialkot Waste Management Company
5	Monthly	Government	RUDA

i. Hospital Waste

Despite being a parameter of significant importance, hospital waste is not much studied by the majority of departments. Three (03) institutes of academia carry out research purpose as shown in **Table 4.2I**.

Table 4.2I: Organizations having Environmental Data (Hospital Waste)

#	Frequency of Data Generated	Type of Organization	Name of Organization
1	Research Based	Academia	(i) College of Earth and Environmental Sciences, University of Punjab, (ii) Institute of Environmental Engineering & Research, University of Engineering and Technology, Lahore, (iii) Institute of Chemical Engineering & Technology- University of Punjab

j. Soil

Soil survey of Punjab was established for research on soil. This is a project-based department and dedicatedly working on soil studies. Ayub Agriculture Research Institute is also working on soil quality to improve agriculture. In total, seven (07) Government departments are working on soil. The academia (08) is proactive in soil studies and working on research in this field as shown in **Table 4.2J**.

Table 4.2J: Organizations having Environmental Data (Soil)

#	Frequency of Data Generated	Type of Organization	Name of Organization
1	Annually	Government	(i) Agency for Barani Areas Development, (ii) RDA
		Academia	SDSC Government College University Lahore
2	Project Based	Government	(i) ECSP, (ii) PMDFC, (iii) Soil Survey of Punjab
3	Research Based	Academia	(i) College of Earth and Environmental Sciences, University of Punjab (ii) Department of Environmental Sciences, Lahore College for Women University, (iii) Department of Environmental Sciences, Government College University Faisalabad, (iv) Department of Environmental Sciences, Forman Christian College University, (v) Institute of Botany, Bahauddin Zakariya University, (vi) Institute of Environmental Engineering & Research, UET Lahore
4	Daily	Government	(i) Ayub Agricultural Research Institute Faisalabad, Pakistan, (ii) QATP
5	Monthly	Academia	Institute of Soil & Environmental Sciences, Agriculture University Faisalabad

k. Forest Cover

Forest, Wildlife and Fisheries Department deals with the important sectors of the environment i.e. tree and fauna. The department has detailed data of forest cover including areas and types of species etc. PIEDMC and Urban Unit study the forest sector on project basis. Five (05) educational institutes also offer studies/courses in the forest sector. IUCN Pakistan is working on conservation of nature as shown in **Table 4.2K**.

Table 4.2K: Organizations having Environmental Data (Forest Cover)

#	Frequency of Data Generated	Type of Organization	Name of Organization
1	Annually	Government	PIEDMC
2	Project Based	Government	The Urban Unit
3	Research Based	Academia	(i) College of Earth and Environmental Sciences, University of Punjab, (ii); Department of Environmental Sciences, Lahore College for Women University, (iii) Institute of Botany, Bahauddin Zakariya University, (iv) Institute of Environmental

			Engineering & Research, University of Engineering and Technology Lahore, (v) SDSC, Government College University Lahore.
4	Monthly	Government	Chief Conservator of Forests

I. Wildlife

Three (03) departments are currently working on wildlife in Punjab. PMDFC and The Urban Unit conduct project-based studies. The research data on wildlife is available with the academia as well as shown in **Table 4.2L**.

Table 4.2L: Organizations having Environmental Data (Wildlife)

#	Frequency of Data Generated	Type of Organization	Name of Organization
1	Annually	Academia	SDSC, Government College University Lahore.
2	Project Based	Government	(i) PMDFC, (ii) The Urban Unit
		International	WWF -Pakistan
3	Research Based	Academia	(i) Department of Environmental Sciences, Government College University Faisalabad, (ii) Institute of Zoology- Baha Uddin Zakariya University
4	Monthly	Government	Directorate General Wildlife

m. Fisheries

The scope of fisheries is very limited. It is primarily taken up by the Forest, Wildlife and Fisheries Department. The second department working having data on fisheries is PIEDMC. The academia has adequate research in this sector and four (04) academic institutes are working on fisheries on project basis. The IUCN Pakistan is focused on the conservation of species as shown in **Table 4.2M**.

Table 4.2M: Organizations having Environmental Data (Fisheries)

#	Frequency of Data Generated	Type of Organization	Name of Organization
1	Annually	Government	PIEDMC
		Academia	SDSC, Government College University Lahore
2	Research Based	Academia	(i) College of Earth and Environmental Sciences, Government College University, Lahore, (ii) Department of Environmental Sciences, Government College University Faisalabad (iii) Institute

			of Environmental Engineering & Research, UET Lahore, (iv) Institute of Zoology, Baha Uddin Zakariya University
	International	IUCN Pakistan	
3	Monthly	Government	Directorate General Fisheries

The summary of above findings is graphically represented in **Figure 4.2**.

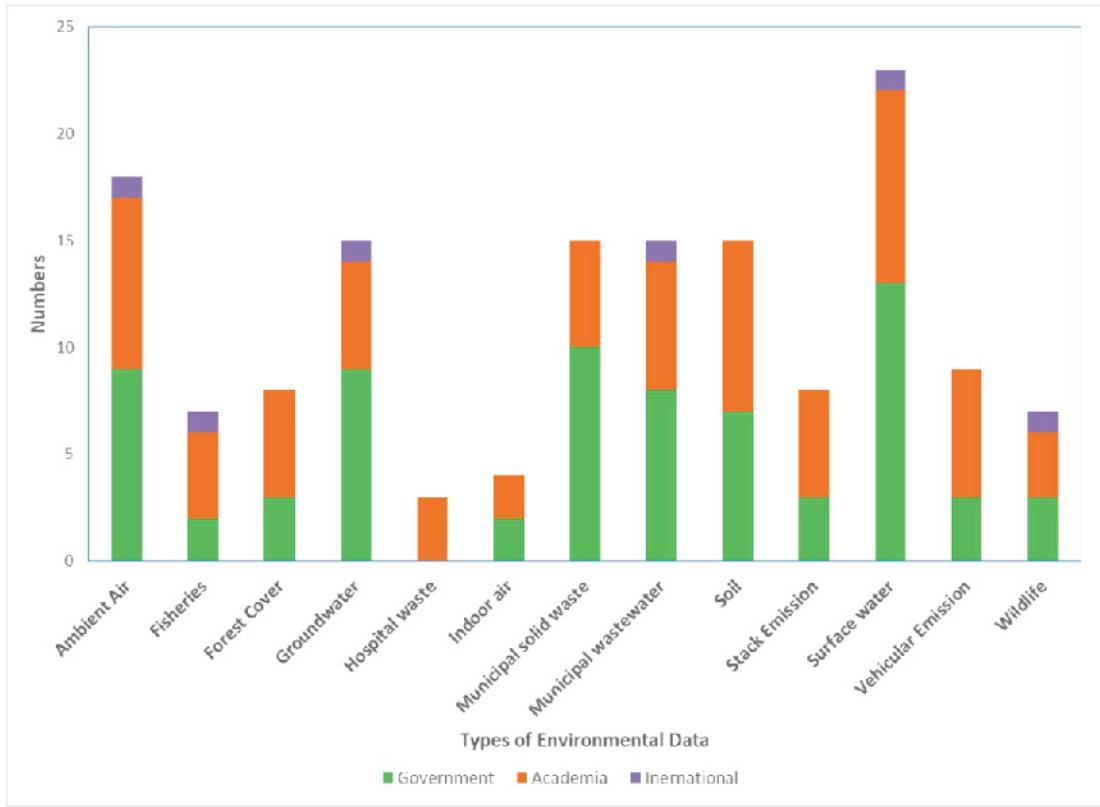


Figure 4.2 Distribution of Organizations having Environmental Data

4.4 Constraints for data sharing with EPA Punjab

Twenty-two (22) organizations expressed various constraints in sharing data with the EPD including structural, legislative, HR and financial constraints. In addition to that, there are nine (09) other departments that neither share data with EPD nor those expressed any constraints in this regard.

Furthermore, eighteen (18) organizations including sixteen (16) government departments, one (01) academic institute and one INGO do share data with the EPD and have no constraints. However, twenty-six (26) organizations remained nonresponsive in this regard.

Table 4.3 provides the summary of these organizations.

Table 4.3: Data Sharing Constraints

#	Nature of Constraints	Type of Organization	Name of Organization
A Organizations who do not share data and have constraints			
1	Structural	Government	(i) Directorate General Mines and Minerals (ii) Energy Department, (iii) Forest, Wildlife & Fisheries Department (iv) Livestock & Dairy Development Department, (v) PEHCL, (vi) Small Dams Organization
		Academia	Department of Environmental Sciences, Lahore College for Women University
2	Legislative	Government	(i) BWMC (ii) FWMC, (iii) GWMC, (iv) LWMC, (v) MWMC, (vi) RWMC, (vii) RUDA (viii) SWMC
		Academia	SDSC, Government College University Lahore
		International	WWF-Pakistan
3	HR and Financial	Government	PCSIR Lahore
		Academia	(i) Department of Environmental Sciences, Bahau Uddin Zakariya University, (ii) Institute of Soil & Environmental Sciences, Agriculture University Faisalabad, (iii) Institute of Zoology, Baha Uddin Zakariya University, (iv) Institute of Botany- Baha Uddin Zakariya University
B Organizations that do not share data and did not express any constraint			
		Government	(i) Agency for Barani Areas Development (ii) GWASA (iii) Soil Survey of Punjab
		Academia	(i) College of Earth and Environmental Sciences, UoP (ii) Department of Soil Sciences, UoP (iii) Department of Environmental Sciences, Forman Christian College University (iv) Department of Environmental Sciences, Government College University Faisalabad (v) Institute of Energy & Environmental Engineering, UoP (vi) Institute of Chemical Engineering & Technology
C Organizations who share data with EPD and have no constraints			
		Government	(i) Ayub Agricultural Research Institute Faisalabad, Pakistan (ii) ECSP, (iii) FWASA, (iv) LWASA, (v) MDA, (vi) MWASA, (vii) PPTA, (viii) PMDFC, (ix) PTPL, (x) PIEDMC, (xi) QATP, (xii) QASP,

#	Nature of Constraints	Type of Organization	Name of Organization
			(xiii) RWASA (xiv) RDA, (xv) SUPARCO (xvi) The Urban Unit
		Academia	Institute of Environmental Engineering and Research, UET Lahore
		International	IUCN Pakistan
D	Organizations that did not provide any response on constraints and remained quiet		
		Government	(i) Agricultural Secretariat (ii) CDA, (iii) Directorate General of Labour Welfare, (iv) Extension and Adaptive Research Punjab, (v) FDA (vi) FIEDMC, (vii) LDA, (viii) Mines Labour Welfare Commissioner, Punjab (ix) On Farm Water Management (x) PMA, (xi) PRTC (xii) PTC, (xiii) Punjab Mineral Company, (xiv) Punjab Mineral Development Corporation, (xv) PBIT, (xvi) PSIC, (xvii) Punjab Agriculture and Meat Company, (xviii) PITB, (xix) PERI, (xx) PRMP, (xxi) PEECA, (xxii) Primary & Secondary Healthcare Department (xxiii) Pakistan Meteorological Department, (xxiv) TPU
		Academia	(i) Department of Chemical Engineering Technology, Government College University Faisalabad (ii) Department of Animal Sciences, UoP

The above tabulated data is presented in **Figure 4.3**. The evaluation of data sharing constraints in terms of the structural, legislative, HR and financial is presented in **Figure 4.4**.

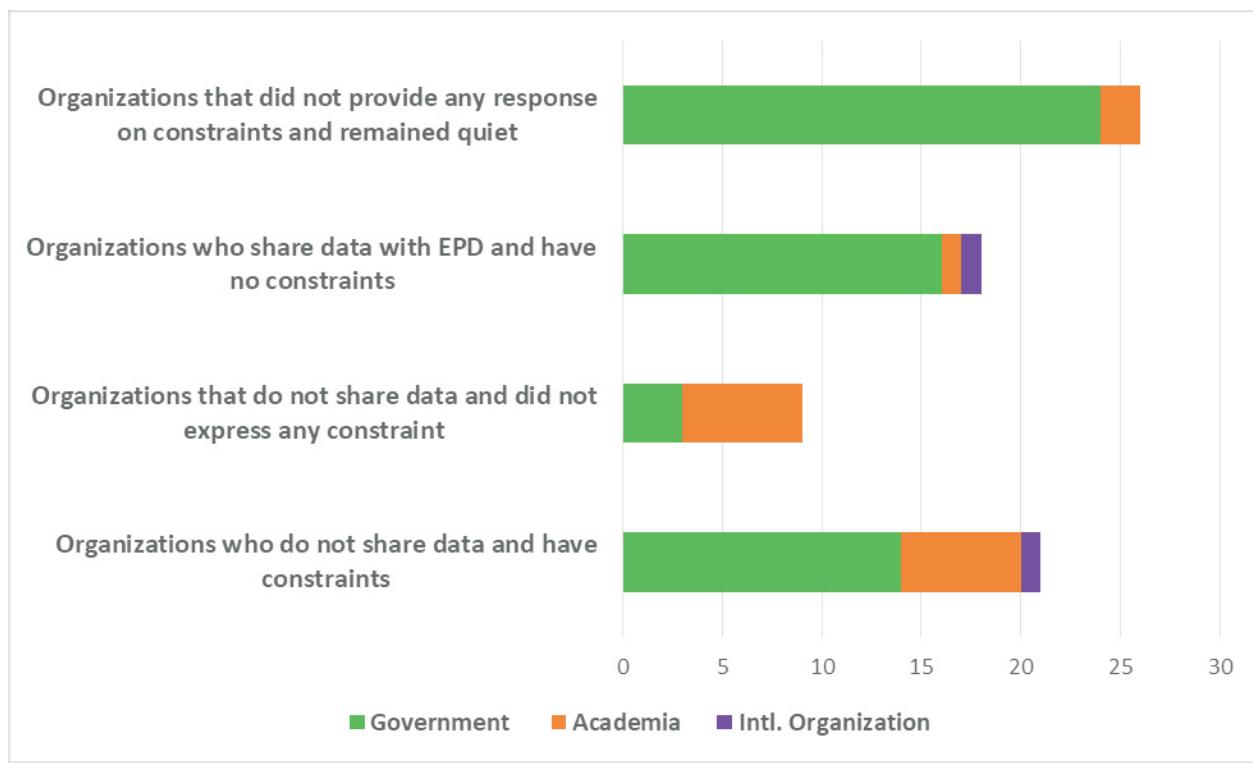


Figure 4.3 Analysis of Data Sharing Constraints

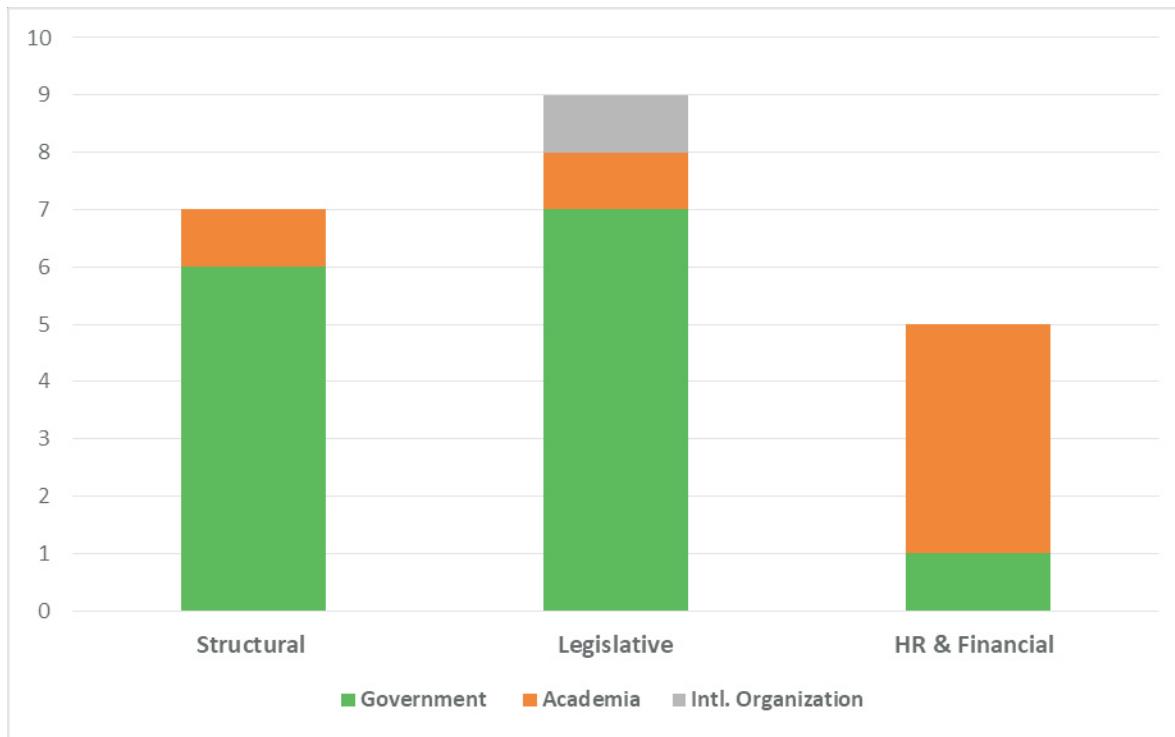


Figure 4.4 Division of Organizations who have constraints of sharing Environmental Data

SECTION 5: INTEGRATION OF ENVIRONMENTAL DATA & DASHBOARD

5.1 Integration of Environmental Data

The Pakistan Council of Research in Water Resources (PCRWR) is working on drinking/ground water and surface water. The real-time and recorded monitoring data from PCRWR was analyzed. The analysis and outcome of the collected data is presented hereunder:

PCRWR has taken the initiative to monitor quality of surface water bodies in all three hydrological units of Pakistan during wet and dry seasons and develop a baseline data. Following the UN Water guidelines and methodology to develop baseline data for reporting on Sustainable Development Goals (SDG) indicator 6.3.2, the ambient water quality data of surface water bodies in Punjab from current study and from other studies of PCRWR were taken into account (**Table 5.1**).

Table 5.1: Water quality of water bodies in Punjab as per core parameters³

Geographical Area of Water Body	Water Body	pH	TDS	DO	TN	TP	Overall Quality
Permissible limits NSDWQ/UNEP		6.5-8.5	1000 mg/L	5 mg/L	0.7 mg/L	0.02 mg/L	*Good (✓) Bad (✗)
Western Rivers	Jhelum River	✓	✓	✓	✓	✓	✓
	Chenab River	✓	✓	✓	✓	✓	✓
Eastern Rivers	Sutlej River	✓	✓	✓	✗	✓	✗
	Ravi River	✓	✓	✗	✗	✗	✗
Reservoir/Barriages/Headworks	Head Khanki	✓	✓	✓	✓	✓	✓
	Head Qadirabad	✓	✓	✓	✓	✓	✓
	Head Baloki	✓	✓	✗	✓	✓	✗
	Head Marala	✓	✓	✓	✓	✓	✓
	Head Sulemanki	✓	✓	✓	✓	✓	✓

³ <https://pcrwr.gov.pk/wp-content/uploads/2023/02/Water-Quality-Profile-of-Surface-Water-Bodies-in-Pakistan-2022.pdf>

Geographical Area of Water Body	Water Body	pH	TDS	DO	TN	TP	Overall Quality
Permissible limits NSDWQ/UNEP		6.5-8.5	1000 mg/L	5 mg/L	0.7 mg/L	0.02 mg/L	*Good (✓) Bad (✗)
	Head Rasool	✓	✓	✓	✓	✓	✓
	Taunsa Barrage	✓	✓	✓	✓	✓	✓

* Good (✓) Bad (✗): criteria for the ambient water quality reporting as per SDG 6.3.2.

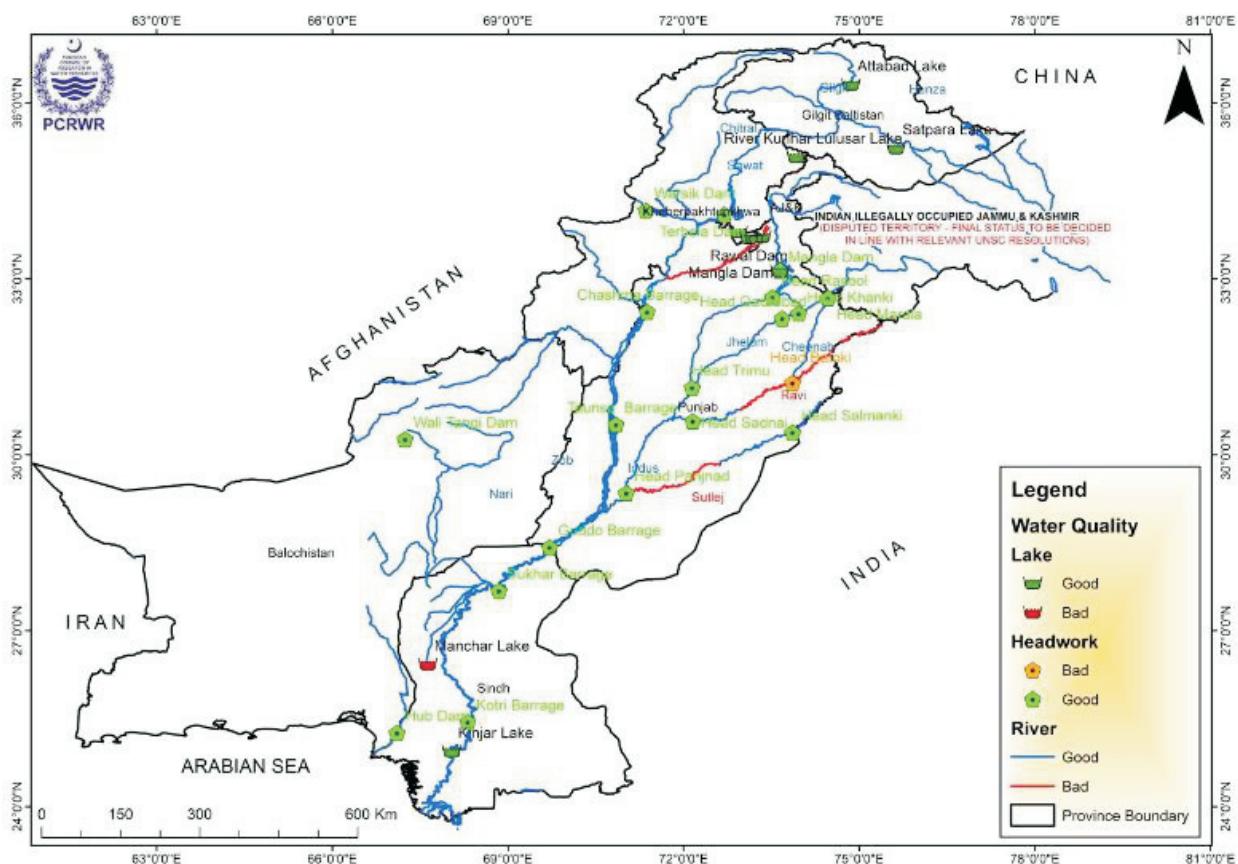


Figure 5.1: Water Quality Map of the Surface Water Bodies in Punjab

Analysis:

The monitoring data shows the quality (as per permissible limits) of different surface water bodies flowing in the Punjab Province. This baseline data also indicates different important quality parameters like dissolved oxygen (DO), total nitrogen (TN) and total phosphorus (TP) which are not meeting the permissible standards and need to be addressed. Considering the findings of this

monitored data, the development of a surface water monitoring network preferably deploying the real time monitoring system becomes very important. This may help the regulators to develop effective plans to maintain, manage and restore surface water quality.

Following are the outcomes of the baseline monitored data:

- This study by PCRWR can become the footprint for future baseline data not only for textile sector but also for pharmaceutical, leather, chemical industries too;
- This may lead us to information regarding academia, government departments and international organizations who are monitoring any kind of pollutant data related to any industrial sector. Subsequently, it will also pave forward different ways and get to know to how to treat/mitigate the pollution and types of sustainable measures that needs/could be adopted to tackle the pollution streams in the future. In this way, planning can be done for sharing of information of specific/desired environmental data with the relevant stakeholders;
- The availability of environmental monitoring data, specifically wastewater monitoring data, can provide significant benefits to the textile sector in formulating their strategies related to wastewater treatment plant technologies and establishing new textile sector plants;
- Monitoring parameters provide valuable information that can be used to optimize the efficiency of treatment plants and reduce the environmental impact of industrial operations;
- By having access to wastewater monitoring data, specifically textile industry professionals can develop a more comprehensive understanding of the wastewater characteristics generated from their manufacturing processes. This data can be used to select and design the most appropriate wastewater treatment technologies to effectively remove contaminants and reduce pollutants from the wastewater stream.
- Furthermore, this information can be used to optimize wastewater treatment plant performance, reduce operational costs, and improve compliance with environmental regulations.
- The monitoring data can also aid in the establishment of new industries by providing critical information for environmental impact assessments and permit applications; and
- The baseline information can help to ensure that new industries are designed with proper wastewater treatment systems to meet local environmental regulations and avoid potential environmental impacts.

5.2 Environmental Information Dashboard

A web-based dash board has been developed for this study and can be viewed on the following web link: (URL: <https://idm.pgdp.pk/ioed>). The salient features of the dashboard are as follows:

- The dashboard provides access to the inventory of organizations including government departments, academia and INGOs working on environmental data in Punjab.
- The dashboard enlists the EPA certified laboratories along with their contact details.
- It summarizes the working scope of organizations including environmental monitoring, meteorology, biodiversity, research, and policy.
- It further segregates the departments based on the environmental parameters including AA, SE, VE, IA, GW, WW, SW, HW, MSW, forest cover, soil, wildlife, fisheries.
- The web portal helps the user in finding the departments based on their working scope and environmental components.

SECTION 6: CONCLUSION & RECOMMENDATIONS

The study aimed at developing an inventory of organizations/ departments (government, academia, international organizations) in Punjab working on environmental data, their scope and understanding the availability of environmental data. The conclusion in terms of study findings and recommendations in terms of proposed way forward are as follows;

6.1 Study Findings

Following are the major findings of the study:

- No importance is given to the environmental data. Such environmental data is broadly collected for the sake of regulatory compliance only;
- Environmental data is scattered even within organizations. Synergies of environmental data sharing are not present;
- Various departments conduct environmental assessment studies (through consultants), just to meet the legal compliance. This data needs to be stored in a coherent manner and shall be available for informed decision making.
- The environmental data is not well managed in the organizations as there is no specific record keeping procedures or mandate for this specific purpose;
- There are different approaches of data collection in same department of different cities, which needs to be coherent.
- Some organizations have no dedicated positions for data handling (archiving and retrieval) protocols;
- Lack of coherent mechanism/protocols for continuous data sharing among organizations;
- The donor Projects like TextILES or many other projects may get the environmental baselines or other relevant data, if there exists a specific data sharing management system among the departments;
- EPD lacks resources (Both financial and HR constraints) at the institutional level to deal/coordinate with other organizations regarding environmental data collection, storage and sharing;
- Data collection frequency of various departments is not consistent. Most of the data is collected randomly on requirement basis; and
- The use of modern software and tools is not common (majority rely on manual records or MS Office).

6.2 Proposed Way Forward

- EPD at institutional level may be strengthened both in terms of human resources and finances to coordinate with other government departments on environmental data;
 - A centralized system and protocols may be developed at the institutional level in the EPD for coordinating/ sharing the environmental data by government departments/ academia/ INGOs;
 - All the government departments shall nominate personnel/focal persons on the subject of environment, within their own organization, and shall also maintain their environmental data;
 - Legislative support may be provided to other organizations for sharing of environmental data;
 - Capacity building of other organizations especially government departments may be done for maintaining and sharing the environmental monitoring data; and
 - Scaling up this study at a larger scale for a centralized storage of organizations working on the environmental data which will be accessible to the general public through a web-based dashboard. This will help in strengthening environmental governance and pave a way towards the informed decision making.
-

DESIGNING AND DEVELOPMENT OF INVENTORY TEMPLATE AND INVENTORY OF ORGANIZATIONS HAVING ENVIRONMENTAL DATA

STRATEGIC PLANNING AND IMPLEMENTATION UNIT - EPD PUNJAB

1. Email *

Respondent Details

2. Name

3. Designation

4. Contact No.

5. Email Id

Departmental Details

6. Name

7. Sector (Govt. / Academia / Private / NGO / Other)

Mark only one oval.

Government

Academia

Private

NGO

Other: _____

8. Attached Department/ Unit/ Authority/ Cell/ Agency/ College?

9. Parent Department / University / Ministry

10. Working Scope

Check all that apply.

- Environmental Monitoring
- Meteorology
- Biodiversity
- Research
- Policy

11. Jurisdiction

Mark only one oval.

- UC
- Tehsil
- District

Environmental Data Details

12. Environmental Parameters

Check all that apply.

- Ambient Air
- Surface Water
- Soil
- Stack Emissions
- Groundwater
- Forest Cover
- Vehicular Emissions
- Municipal Water
- Wildlife
- Indoor Air
- Municipal Solid Waste
- Fisheries
- Hospital Waste

13. Data Acquisition Frequency

Mark only one oval.

Daily

Weekly

Fortnightly

Monthly

Quarterly

Annually

Other: _____

14. Data saving protocol

15. Equipment Used

16. Functional Since/Status

Data sharing with EPD Punjab?

17. Response

Mark only one oval.

Yes

No

18. If No, reasons of not sharing?

Mark only one oval.

Structural

Legislative

Financial

Human Resource

Operational

Other: _____

Particulars

Please provide particulars of the focal person of Environment

19. Highest Position

20. Current Head/Focal Person

21. Address(es)

22. City

23. Office Telephone

24. Cell Number

25. Email

26. Remarks

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Annex-II:

Sr. No	Departments/Academic/International Organizations			Components of Environment										Web URL				
	Parent Department	Attached Department/ Institute	Air	Ambient Air	Stack Emissions	Vehicular Emissions	Indoor air	Surface water	Ground water	Municipal wastewater	Industrial wastewater	Solid Waste	Hospital Waste	Any Other Waste	Soil (in terms of fertility and contamination)	Forest Cover	Wildlife	Fisheries
Government Departments																		
1	Agriculture Department	Lahore Agriculture Research Institute Faisalabad, Pakistan Sial Survey of Punjab On Farm Water Management																https://ext.agronet.punjab.gov.pk/
2	Housing, Urban Development & Public Health Department (HUD and PHED)	Lahore Development Authority Rawalpindi Development Authority Gujranwala Development Authority Faisalabad Development Authority Multan Development Authority Lahore Water Sanitation Agency Rawalpindi Water & Sanitation Agency Faisalabad Water & Sanitation Agency Multan Water & Sanitation Agency Gujranwala Water & Sanitation Agency Punjab Urban Development Authority (PFUDL)																https://lau.punjab.gov.pk/
3	Energy Department	Punjab Energy Efficiency & Conservation Agency (PEECA) Punjab Thermal Power Private Limited (PTPL) Quaid-e-Azam Thermal Power Limited (QATPL)																https://peea.punjab.gov.pk/
4	Health Department	Department of Health (DHD) Bureau of Radiological and Trade (BRT)																https://dhd.punjab.gov.pk/
5	Irrigation Department	Punjab Industrial Estates Development and Management Company (PIEDMC) Faisalabad Industrial State Development and Management Company (FISDMC)																https://piedmc.punjab.gov.pk/
6	Industries, Commerce, Investment and Skills Development Department	Punjab Small Industries Corporation (PSIC)																https://psic.punjab.gov.pk/
7	Labour & Human Resource Department	Director General of Labour Welfare Punjab Mineral Company																https://mlm.punjab.gov.pk/
8	Livestock Department	Livestock & Dairy Development Department, Punjab Agriculture and Meat Company Director General of Mines & Minerals, Punjab Mines Labour Welfare Commissioner, Punjab																https://lambd.punjab.gov.pk/
9	Mines & Minerals Department	Punjab Mineral Development Corporation Agency of Barani Areas Development Punjab Information Technology Board Cholistan Development Authority Punjab Economic Research Institute The Urban Unit																https://pidc.punjab.gov.pk/
10	Planning & Development Board	Engineering Consultancy Services Punjab Punjab Resource Management Program Punjab Mineral Development Corporation Lahore Water Management Company Faisalabad Water Management Company Gujranwala Water Management Company Sialkot Water Management Company Rawalpindi Water Management Company Multan Water Management Company Sahiwal Water Management Company Punjab Municipal Development Fund Company Punjab Provincial Transport Authority (PTA) Punjab Mass Transit Authority (PMA)																https://lwm.punjab.gov.pk/
11	Forestry, Wildlife & Fisheries Department	Forest, Wildlife & Fisheries Department Faisalabad, Lahore Gujranwala, Sialkot, Multan, Sahiwal Transport Planning Unit (TPU)																https://fwf.punjab.gov.pk/
12	Local Government and Community Development Department - Solid Waste Management Companies	Punjab Road Transport Corporation (PRTC) Punjab Transport Company (PTC)																https://ltdc.punjab.gov.pk/
13	Transport Department																	https://ttdc.punjab.gov.pk/

Sr. No	Name of University	Department/ Institute	Parameters												Source	Date of access		
			Air	Ambient Stack	Vehicular Emissions	Indoor Air	Surface water	Ground water	Municipal Wastewater	Industrial Wastewater	Municipal Solid waste	Hospital Solid waste	Any Other Waste	Soil fertility and cont.	Forest Cover	Wildlife	Fisheries	
Academia																		
1	Agriculture University Faisalabad	Institute of Soil & Environmental Sciences	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	http://ufaf.edu.pk/faculties/agriinsts/soil_environmental/soil_overview.html	1/3/2023
2	Bahaudin Zakaria University Multan	Institute of Zoology													✓		https://www.bzu.edu.pk/02_department.php?cd=028	1/3/2023
3	Forman Christian College University	Department of Environmental Sciences	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	https://www.bzu.edu.pk/02_department.php?cd=029	1/3/2023
4	Government College University, Lahore	Sustainable Development Study Centre (SDSC)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	https://www.bzu.edu.pk/02_department.php?cd=057	1/3/2023
5	Government College Faisalabad	Department of Environmental Sciences	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	https://www.ecu.edu.pk/02_faculty/department/Environmental%20Sciences/	1/3/2023
6	Lahore College for Women University	Department of Environmental Sciences	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	https://www.lcu.edu.pk/environmental_science_overview.html	1/3/2023
7	University of the Punjab	Department of Animal Sciences													✓	✓	https://pu.edu.pk/home/department/0009/02/Department-of-Animal%20Sciences	1/3/2023
		Department of Soil Science													✓	✓	https://pu.edu.pk/home/department/0009/02/Department-of-Soil%20Science	1/3/2023
		Institute of Energy & Environmental Engineering	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	https://pu.edu.pk/home/department/0005/02/Department-of-Energy-&Environmental%20Engineering	1/3/2023
		College of Earth & Environmental Sciences	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	https://pu.edu.pk/home/department/0007/02/College-of-Earth-&Environmental%20Sciences	1/3/2023
		Institute of Agriculture Sciences															https://pu.edu.pk/home/department/0005/02/Department-of-Agriculture%20Sciences	1/3/2023
		Institute of Engineering & Technology															https://pu.edu.pk/home/department/25/Institute-of-Chemical-Engineering---Technology	
8	Lahore University of Veterinary & Animal Sciences,	Faculty of Fisheries and Wildlife													✓	✓	https://lucas.edu.pk/#esc-tab-0	1/3/2023
9	University of Engineering & Technology Lahore	Institute of Environmental Engineering and Research	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	https://uet.edu.pk/p/	1/3/2023
10	The University of Faisalabad	Department of chemical Engineering															https://www.uf.edu.pk/	
11	Lahore School of Economics	Department of Environmental Sciences & Policy															https://lareschoolofeconomics.edu.pk/	
12	Lahore University of Management Sciences	Mustafa Ahmed Gujmani School of Humanities and Social Sciences (Environmental studies Centre)															https://mhrciums.edu.pk/energy-environment-and-public-health/	
International Organizations																		
Sr. No	Departments/Academic/International Organizations			Parameters												Date of access		
	International Organization			Air	Ambient Stack	Vehicular Emissions	Indoor air	Surface water	Ground water	Municipal Wastewater	Industrial Wastewater	Municipal Solid waste	Hospital Solid waste	Any Other Solid waste	Forest Cover	Wildlife	Fisheries	
1	International Union for Conservation of Nature (IUCN)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	https://www.iucn.org/	1/3/2023
2	World Wide Fund For Nature (WWF)																https://www.worldwidewildlife.org/	1/3/2023

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