

PC-II

**FORMULATION OF WASTE MANAGEMENT
PLANS FOR VARIOUS CITIES IN THE
PUNJAB.**

Estimated Cost Rs. 44.724 million

January, 2020

**LOCAL GOVERNMENT & COMMUNITY DEVELOPMENT
DEPARTMENT, GOVERNMENT OF THE PUNJAB**

GOVERNMENT OF PAKISTAN
PLANNING COMMISSION

PC-II

1) NAME BY WHICH ASSIGNMENT WILL BE IDENTIFIED:	
	Formulation Of Waste Management Plans For Various Cities In The Punjab
2) ADMINISTRATIVE AUTHORITIES RESPONSIBLE FOR :	
1. Sponsoring	Local Govt. & Community Development Department
2. Execution	Local Govt. & Community Development Department
3) DETAILS OF THE ASSIGNMENT:	
a) General Description & Background	<p>Solid waste management is a universal issue affecting every single person in the world. Rapid urbanization and population growth create larger population centers making the collection of all waste, its treatment and disposal more difficult. Growth in prosperity and movement to urban areas are linked to increase in per capita generation of the waste. Urban waste management is expensive as it can be single highest budget item for many local governments.</p> <p>The world generate 2.01 billion tons¹ of municipal solid waste annually. Worldwide waste generated per person per day averages 0.74 kg² but ranges widely from 0.11 to 4.54 kg per person per day. Globally most waste is currently dumped or disposed of in some form a landfill. Around 37% of waste is disposed of in some form a landfill, 8% of which is disposed of in sanitary landfill with collection for gas. Open dumping accounts for around 33% of waste³. 19% is recovered to recycling and composting and 11% is incinerated for final disposal. It is estimated that 1.6 billion tons of Corban dioxide (CO₂) equivalent greenhouse gas emissions were generated from solid waste treatment and disposal in 2016. This is about 5% of global emissions. Solid waste sector emissions are anticipated to increase to 2.6 billion tons⁴ of CO₂ equivalent by 2050 if no improvement is made in sector.</p> <p>The South Asia region generated 334 million tons of waste in 2016 at an average of 0.52 kg per capita per day. Total waste generation is expected to double in the region by 2050. As per a study of World Bank, per capita per day waste generation of Pakistan is 0.43 kg. Pakistan is included in top fifteen waste generating countries of the world but despite of this high magnitude, we don't have any strategy to handle this menace.</p> <p>The list of top 15 waste generating countries of the world and their annual waste generation for the year 2016 is as under;</p>

^{1,2,3,4}2018 - World Bank Report “ What a Waste 2.0 . A Global Snapshot of Solid Waste Management to 2050”

Sr. #	Country	Municipal Solid Waste Generation In 2016 (Tons) ⁵
1	India	277,136,133
2	United states	263,726,732
3	China	220,402,706
4	Brazil	79,081,401
5	Indonesia	65,200,000
6	Russian Federation	59,585,899
7	Mexico	54,151,287
8	Germany	51,410,863
9	Japan	44,374,189
10	Nigeria	34,572,968
11	France	32,544,914
12	United kingdom	32,037,871
13	Turkey	31,983,941
14	Pakistan	30,352,951
15	Canada	25,666,127

This huge volume of waste reflects seriousness of the issue. For this purpose, the current government has initiated a “**Clean & Green Pakistan Programme**” however it will address this issue only partially and more is direly needed for stepping towards holistic solutions of this sector.

b) Justification

The Punjab having an area of 205,344 sq km with a population of 110 million in 2017 out of which 40.39 million are living in urban areas. More than 50% of urban population of Punjab is residing in just 10 mega cities of the Punjab. Rapid urbanization and rapidly increasing population of big cities has challenged the government ability as well as capacity to provide effective municipal, industrial hospital and hazardous solid waste management services properly to collect, store, transport, treat and dispose solid waste in these cities. LWMC has recently initiated Waste Management plan of Lahore through a consultancy, there, it has not been included in the study.

The list of 04 large cities of Punjab is produced here as under alongwith their latest population.

⁵ 2018 - World Bank Report “ What a Waste 2.0 . A Global Snapshot of Solid Waste Management to 2050”

Sr. No.	City	Population as per census of 2017	Remarks
1	Faisalabad	3,204,726	Included in current study
2	Rawalpindi	2,098,231	Included in current study
3	Gujranwala	2,027,001	Included in current study
4	Multan	1,871,843	Included in current study

Cities falling in Punjab Intermediate Cities Improvement Investment Program (PICIIP) and Punjab Cities Program (PCP) are being excluded from study cities as their SWM plans would be developed in respective donor funded projects/programs. Dera Ghazi Khan 's SWM plan is also in process so its not included in the current study.

Ten (10) intermediate cities selected as per their populations are being selected along with above mentioned 04 large cities. This would provide a good mix of universe for the study on which provincial strategy/policy and legal framework would be formulated in the study.

S. NO	Tehsil Council	Population as per census of 2017
1	Municipal Corporation, Sheikhpura	571,251
2	Municipal Corporation, Gujrat	513,964
3	Municipal Corporation, Ferozewala	509,700
4	Municipal Corporation, Kasur	407,390
5	Municipal Corporation, Chiniot	274,438
6	Municipal Corporation, Sadiqabad	253,399
7	Municipal Committee, Mandi Bahauddin	246,120
8	Municipal Committee, Khanpur	203,597
9	Municipal Committee, Pakpattan	183,486
10	Municipal Committee, Chakwal	182,757

Upto now, solid waste management sector is not being studied holistically as all previous plans or studies just focused few segments of solid waste management cycle while ignoring the all other stages. These projects in bits and pieces could not give a significant impact on the solid waste management in the province and situation of the sector is still critical without having any holistic approach and guidelines as well as without any comprehensive regulatory framework for cleanliness.

This study will find out a holistic solution of all issues related with all stages of solid waste management cycle for above listed 10 cities and finally alongwith a combined report of eight cities, the consulting firm will be required to submit individuals report for all the eight cities which may provide holistic solutions for these cities in accordance with their own ground realities.

The consultancy firm to be engaged for the purpose must have relevant exposure of solid waste management sector and have at

	<p>least studied and provided SWM solutions and prepared integrated solid waste management plans of 05 cities at least. The proposed TORs of the study covering all aspects right from studying the generation of waste, analyzing its compositions, collection mechanism, storage pattern, transportation, dumping, treatment, recycling and finally conversion into different forms of energy.</p> <p>In Punjab, Solid waste management faces difficulties in terms of organized and effective service delivery, including effective coordination among the 264 local responsible bodies. So far, there is no formal sanitation system existing at the provincial level. Realizing the severity of the issue, the Punjab Government established 07 Special Purpose vehicles (SPV) i.e. waste management companies in Lahore, Faisalabad, Gujranwala, Rawalpindi, Sialkot, Multan and Bahawalpur. Lahore waste Management Company was established in 2010 while all remaining companies were established in 2013. Despite of above mentioned initiative, these SPV could give a widely accepted impact only in 1-2 cities due to numerous organizational and capacity level issues. Despite of all efforts, the solid waste management process could not go beyond dumping of the waste at controlled or open dumping sites while all further opportunities of recycling, upcycling, composting, methane capturing, pyrolysis or other waste to energy options are still left unexplored.</p> <p>Huge funds are still being consumed by the municipalities on the account of solid waste management but performance is quite poor. Hence Punjab Government is direly needed to develop a strategy for effective solid waste management solutions. The outcome of current study will be comprehensive solid waste management plans of 10 cities which will be further replicated to all over the province to resolve this longstanding issue.</p>
<p>c) <u>Objectives of the Study</u></p>	<p>The study will respond to LG&CDD's need for cost-effective and sustainable service delivery models for Solid Waste management with holistic solutions leading towards the ultimate goal of 'Zero Waste Punjab' in the long-term.</p> <p>The main objective of this assignment is to prepare solid waste management long term strategic plans and short term action plans with participatory approach in coordination with concerned stakeholders.</p> <p>The specific objectives of this study are;</p> <ul style="list-style-type: none"> • Develop a cost effective and economically sustainable integrated approach towards waste management covering all segments of Solid waste management cycle for 04 large cities and 10) intermediate cities separately with its aspiration for achieving zero waste Punjab in the long term. • Explore and evaluate all possible options of each segment of waste management cycle right from waste generation upto recycling, up-cycling and waste-to-energy and recommend most suitable solutions as per actual ground realities, waste volumes and composition of each city. • Develop viable financial and institutional models of each stage of waste management cycle for each city included in the study. • To conduct waste generation and waste characterization study

	<p>to estimate the Quality and Quantity of solid waste for each city.</p> <ul style="list-style-type: none"> • Recommended legal framework and policy measures to LG&CD department for effective, efficient and economic waste management regime. • Compliance and adoption of all international and regional charters of solid waste and 3R reforms and recommend way forward for active compliance. • To establish a sound and economically self-sustainable institutional framework to initiate, operate and supervise the solid waste management program and identify the appropriate approach and technology for effective and sustainable SWM • To investigate the potential sources of revenue for the sustainability of SWM system and develop business plans for each city. • The plans will also cover devising strategy for public private partnership. Consultants will carry out stakeholder meetings in each city and suggest how to formulize a comprehensive PPP model. This stakeholder's conference will provide market let information to form basis of this model. • Recommend SWM Legal Framework for the province taking into account legal aspects and recommend most effective policy measures • Recommend Provincial SWM Management policy/Strategy <p>Specific deliverables are located in section (e).</p> <p>The study will address existing institutional and financing constraints for effective SW management as well as to promote sustainable and affordable service delivery models.</p> <p>Based on the outputs of this study, it is expected that LG&CDD will develop a sustainable Punjab Solid Waste management strategy in consultation with relevant stakeholders.</p> <p>The study will require considerable literature review, quantitative analysis as well as field visits, including site visits and on-site interviews of local officials, citizens, private sector stakeholders and existing service providers. The consulting firm is expected to produce assessment reports and deliver presentations. As needed, the consulting firm may also advise LG&CDD on how to implement specific recommendations of the study.</p>
<p>d) Scope of Work</p>	<p>The current study will Study the existing solid waste management systems of following 04 big cities of Punjab as well as 10 Intermediate cities selected as per their populations (maximum) and will submit recommendations for holistic solutions of solid waste management of those cities.</p> <ul style="list-style-type: none"> • Multan • Rawalpindi • Faisalabad • Gujranwala <p>And 10 intermediate cities selected on basis of their populations (maximum based).</p>

- Sheikhpura
- Gujrat
- Ferozwala
- Kasur
- Chiniot
- Sadiqabad
- Mandi Bahauddin
- Khanpur
- Pakpattan
- Chakwal

As final deliverables, the consulting firm will be required to submit separate set of recommendations along with deliverables for all above mentioned 04 cities and 10 Intermediate cities in the form of separate reports.

The scope of work for the current study will include following 13 tasks. The firm will submit separate reports for each of city covering its comprehensive findings and final recommendations regarding following 13 tasks after conducting its detailed technical, environmental financial and economic analysis;

Task – 1 Study of Background and gathering base-line data

- 1.1 Review previous studies, reports and plans, institutional framework of solid waste management of these study cities of Punjab and assess demographic, economic, legal and social frameworks of existing systems.
- 1.2 Study on ground situations of all cities including demographic, social, income levels, consumption pattern, street lengths, infrastructure support or gaps, commercial areas, public places with specific reference to solid waste generation and its management.
- 1.3 To conduct waste generation study and its projections upto 2050 by assumption and relying on results of study.
- 1.4 To conduct waste composition / characterization study to explore waste composition as of today and give its realistic projections upto 2050 keeping in view future consumption patterns.
- 1.5 Carry out the field surveys and studies for waste composition and conduct meetings and discussions with various stakeholder including relevant Waste management companies, municipalities, public and private institutions, NGOs, local people to identify existing SWM related problems and possible solutions. The consultation goal is to develop a strategy that is supported by the community and takes their concerns, ideas and feedback into account.

Task – 2 Study of Current waste collection practices and recommend most suitable option for waste collection

- 2.1 Study current waste collection mechanism, evaluate them socially, financially, economically and technically and propose best suitable mechanism keeping in view all technical, social, economic and financial options.
Evaluate and recommend strategies for
 - 2.1.1 Door to door collection
 - 2.1.2 Street sweeping and waste collection.
 - 2.1.3 Manual sweeping vs mechanical sweeping
 - 2.1.4 Promoting organic and inorganic sorting at source at household levels and collection of sorted waste at source.
 - 2.1.5 Using colored bins for separate waste streams. Evaluate its economic and technical viability and cost effectiveness.
 - 2.1.6 Equipment required for primary collection. Add Design and specifications alongwith diagram in recommendations.
 - 2.1.7 Development strategy for waste collection from narrow streets.
 - 2.1.8 Development strategy for waste collection from wide streets.
 - 2.1.9 Develop a cost comparison of different model options.
 - 2.1.10 Submit short term, medium term and long term action plans for this segment

Task – 3 Study of Current waste storage practices and recommend most suitable city-specific options for waste storage

- 3.1 Study current waste storage mechanism, evaluate them socially, financially, economically and technically and propose best suitable mechanism keeping in view all technical, social, economic and financial options.
- 3.2 Waste storage requirements in the form of Bins and containers as per available space alongwith routes for lifting, access of households and capacity of storage equipment. This requirement will be different for narrow and wide street areas.
- 3.3 Monitoring of containers through chip-based sensors.
- 3.4 Develop a cost comparison of different model options.
- 3.5 Submit short term, medium term and long term action plans for this segment

Task – 4 Study of Current waste transportation practices and recommend most suitable option for waste transportation along with O & M plan

- Waste transportation comprehensive analysis including details of;
- 4.1 Available and recommended vehicles alongwith types, capacity and detailed specifications.
 - 4.2 Economical Routes with distance and complete

route plan.

- 4.3 Cost effective measures for waste transportation
- 4.4 Possibilities of Mini transfer stations for cost effectiveness
- 4.5 Efficient Maintenance of containers and vehicles. Analysis of existing repair and maintenance mechanism for solid waste management fleet, gaps identification and new working model for vehicle Repair and Operations will be proposed.
- 4.6 Efficient management of POL consumptions
- 4.7 IT based monitoring of vehicles movement
- 4.8 Develop a cost comparison of different model options.
- 4.9 Submit short term, medium term and long term action plans for this segment

Task – 5

Evaluate and recommend need of cost effective transfer stations alongwith preliminary design options and cost

- 5.1 Requirement of Transfer stations – its need, potentials, cost effectiveness, design, economic life, economic impact.
- 5.2 Number of transfer station, availability of space, permanent structure/ temporary structure. Detailed designs, equipment required with estimated cost.
- 5.3 Develop a cost comparison of different model options.
- 5.4 Submit short term, medium term and long term action plans for this segment

Task – 6

Study of Current waste sorting practices and recommend most suitable option for waste sorting

- 6.1 Study of current practices
- 6.2 Evaluate technically, economically and socially at-source waste sorting options.
- 6.3 Evaluate technically, economically and socially waste Sorting at intermediate places i.e. transfer station.
- 6.4 Evaluate Sorting options at dumpsite / landfill site
- 6.5 Identify Role of scavengers, evaluate it and propose multiple options for their legal role in sector
- 6.6 Role of private sector to be studied and propose recommendations
- 6.7 Options to formalize the role of scavengers.
- 6.8 Calculate Economics of waste sorting
- 6.9 Submit short term, medium term and long term action plans with recommended options for waste sorting and segregation

Task – 7

Study of Current waste dumping practices and recommend most suitable option for waste dumping

- 7.1 Current dumping site analysis.
- 7.2 Explore Need for development of Landfill facilities

- 7.3 Explore cost effective options of regional landfill sites with specific reference to each city included in the study as per best practices in East Asian Countries.
- 7.4 Mechanical and biological treatment facilities (MBT)
- 7.5 Submit recommendation along with tentative cost estimate.

Task – 8

Study of Current waste recycling practices and recommend most suitable option for waste recycling

Processing of different waste Streams

- 8.1 Separate waste streams quantification
- 8.2 Processing possibilities
- 8.3 Value chain analysis of each waste stream
- 8.4 Value addition possibilities of each waste stream
- 8.5 Plastic recycling – potentials, identifying & linkages with processing institutions & potential markets – Outsourcing options to private sector
- 8.6 Paper and cardboard recycling - potentials, identifying & linkages with processing institutions & potential markets - outsourcing options. role of private sector
- 8.7 Formalizing role of scavengers – possibilities and options for converting informal sector to formal sector
- 8.8 Composting from organic waste – potential, nutritious values, legal framework, Branding, Marketing, Outsourcing options
- 8.9 Processing of C&D waste
- 8.10 Methane recovery
- 8.11 RDF recovery and possible options
- 8.12 Waste to energy or other options for alternate energy with costing and calculated rate of return in environment friendly manner.
- 8.13 Carbon trading / emissions trading options. Interaction with Carbon Markets.
- 8.14 Pyrolysis options for bio-fuel or diesel generation from plastic
- 8.15 Calculating rate of return on each investment
- 8.16 Exploring possibilities of Donors investments
- 8.17 Analysis of tipping fee

Task – 9

Study of all environmental and social aspects and formulate effective policy.

Task – 10

Study of all financial and Economic aspects and devise effective policy measures.

- 10.1 Overall costs of recommended options
- 10.2 Economic analysis of investments required in each stage of waste cycle & analyzing rate of return.
- 10.3 Assess the investment options from the private sector for waste management related infrastructure activities
- 10.4 Explore Opportunities and Challenges of Private Sector Involvement specially outsourcing of solid

	<p>waste management Function</p> <p>10.5 Evaluate different options under all above listed tasks on the basis of economic rate of return.</p> <p>10.6 Finalize most suitable option which may have higher rate of return.</p> <p>10.7 Complete comprehensive business model for sustainability.</p> <p>10.8 Legal framework for recovery and cost recovery mechanism</p> <p><u>Task – 11</u> Summarize the complete waste management cycle model for each city developed under holistic solution approach and proposed institutional arrangements</p> <p><u>Task – 12</u> Study of all legal aspects and recommend most effective policy measures and devise SWM Legal Framework for the province.</p> <p>12.1 Study the different Acts and Regulations including Environment Protection Act, Environment Protection Regulation, Solid Waste Management National Policy, and others SWM related existing laws, by-laws, rules and regulations, policies, plans and strategies and propose recommendations for amendments and improvements to make them more effective.</p> <p>12.2 Study legal aspects of all proposed solutions under prevailing laws, rules and regulations and propose amendments if needed to strengthen legal framework</p> <p>12.3 Evaluate Legal Environment for Private Sector Participation in waste management processes.</p> <p>12.4 Develop SWM Legal Framework for the province</p> <p><u>Task – 13</u> Formulate Draft Provincial SWM Management policy/Strategy</p> <p>13.1 Develop Strategy/policy including current situation, identify future goals, and outline a detailed plan of action to advance the solid waste management sector in the province.</p> <p>13.2 Sets targets for the sector about recycling, financial sustainability, citizen awareness, promotion of a green economy, reduction of greenhouse gases, and rehabilitation of contaminated sites etc.</p> <p>13.3 Recommend 5-10 years SWM Provincial Strategy including cost impacts.</p>
e) Deliverables	As mentioned above, the consulting firm will submit a combined report for all cities while separate reports for each city would also be submitted. Additionally, two separate reports on Provincial SWM Legal Framework and Provincial Strategy/policy are required.

Sr. #	Deliverable	Timeline (months)	Payment Schedule
1	Inception Report	0.5	10%
2	Waste Characterization Studies for waste generation and characterization of waste in each city	2.5	10%
3	Report on Waste collection patterns and recommended most suitable option for waste collection along with short term, medium term and long term action plans in each city	3	20%
4	Report on current waste storage practices and recommend most suitable city-specific options for waste storage along with short term, medium term and long term action plans in each t city	3	
5	Report on current waste transportation practices and recommend most suitable option for waste transportation along with O & M plan in each city	3	
6	Report on cost effective transfer stations along with preliminary design options and cost in each city	3	
7	Report on current waste sorting practices and recommend most suitable option for waste sorting	4	20%
8	Report on current waste dumping practices and recommend most suitable option for waste dumping in each project city	4	
9	Report on current waste recycling practices and recommend most suitable option for waste recycling in each project city	4	20%
10	Report on environmental and social aspects and recommend most effective policy measures in each project city	4.5	
11	Study of all financial and economic aspects and formulate effective policy measures in each project city	4.5	

	12	Summarize the complete waste management cycle model for each city developed under holistic solution approach and proposed institutional arrangements	5	5%								
	13	Combined Report of SWM of all study cities	5									
	14	Formulate SWM Legal Framework for the province taking into account legal aspects and recommend most effective policy	5.5	5%								
	15	Formulate Provincial SWM Management policy/Strategy	6	10%								
f) Implementation Period	The estimated time required to complete the study will be 06 months with some activities being carried out simultaneously, while the other activities would be started after the completion of the preceding activities. Implementation Plan attached at Annexure C.											
g) Cost Estimate	<p>The total estimated cost for 10 months is PKR 44.724 million. Detail of cost is attached at Annex-B.</p> <p>The budget allocation for the Fiscal year 2019-20 has already been approved in the Annual Development Plan 2019-20, detailed as under:</p> <table border="1"> <tr> <td>ADP</td> <td>2019-20</td> </tr> <tr> <td>G.S. No</td> <td>2793</td> </tr> <tr> <td>Scheme ID</td> <td>01371901805</td> </tr> <tr> <td>Allocation</td> <td>PKR 100 Million</td> </tr> </table>				ADP	2019-20	G.S. No	2793	Scheme ID	01371901805	Allocation	PKR 100 Million
ADP	2019-20											
G.S. No	2793											
Scheme ID	01371901805											
Allocation	PKR 100 Million											
h) Manpower Requirement	<p>A consultancy firm will be hired for this scheme through provisions of PPRA. The mandatory criteria for such firm would include;</p> <p>The consultancy firm to be engaged for the purpose must have relevant exposure of solid waste management sector and have at least studied and provided Solid waste management solution and prepared integrated solid waste management plans of 05 cities at least.</p> <p>The firm must have engage services of following experts; Details in Annexure A.</p> <ol style="list-style-type: none"> 1. Team leader/ Solid Waste Management Expert National 2. Solid Waste Management Expert (International) 3. Environmentalist / Environmental Engineer 											

	<ul style="list-style-type: none">4. Civil Engineer5. Mechanical Engineer6. Institutional development expert7. Waste Value Chain Expert8. Waste to Energy Expert9. Financial analyst10. Economist11. Legal Expert12. GIS Expert
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CONSULTANTS' PROFILE & QUALIFICATIONS

It is estimated that following key personnel will be required for the consultant's services collectively. The team composition will include the followings.

Sr. #	Designation	Basic Requirements	Input (Months)
1	Team leader/ Solid Waste Management Expert (National)	Team Leader/SWM expert should hold at least master's degree in Civil/environmental engineering with 20 years general experience in planning, civil engineering and planning projects and at least 15 years experiences in solid waste management,. Involving in developing SWM strategies and action plans, designing sanitary landfill site, conducting SWM baseline assessment, preparing and implementing technical and financial viable SWM approach including 3R principles (Reduce, Reuse, and Recycling) and various SWM technologies including composting, biogas, Reduced Derived Fuels (RDfs) etc. shall be needed. Experience in periodic Plan, master plan, environmental management plan, physical infrastructure development plan etc. will be beneficial.	06
2	Solid Waste Management Expert (International)	SWM expert should hold at least master's degree in Civil/environmental engineering with 15 years general experience in planning, civil engineering and planning projects and at least 10 years experiences in solid waste management. SWM Expert will provide expert experience on SWM plan development Provide key input in SWM study on all aspects as per need by Team Lead	02
3	Environmentalist	Environmentalist should hold the master degree in environmental management/engineering/science with 7 years' work experience in related field. Experiences on environmental issues including solid waste management, water, and air pollution due to solid waste will be necessary. Experiences in IEE, EIA of various projects including SWM projects will be beneficial.	03
4	Civil Engineer	Should hold at least master degree in civil engineering with 10 years experience of sanitary landfill site designing and solid waste management infrastructure development experience, master plan of city solid waste management experience,	03
5	Mechanical Engineer	Should hold master degree in mechanical engineering with experience of SWM Detailed Engineering Surveys and Designs of various processing facilities like Composting unit with leachate collection system, waste to energy unit compaction/packaging Including civil, mechanical and electrical components of waste processing based on best international/national practice.	04
6	Institutional development expert	Institutional development expert should have master's degree in management and public administration with 5 years work experience in	04

		related field.	
7	Waste Value Chain Expert	Value Chain expert with 10 years relevant experience of value chain analysis of different waste streams right from origin till final product.	02
8	Waste to Energy Expert	Waste to energy expert with 10 years relevant experience of planning, designing and implementing waste to energy projects in 3-5 countries	02
9	Financial Analyst	Financial analyst should hold master degree in economics/commerce/business administration with 5 years experiences in related field. Experiences in public private partnership SWM and environmental related project shall be essential.	04
10	Economist	Economist with 10 years' experience in economic evaluation of different options of solid waste sector	03
11	Legal Expert	Legal expert should hold at least bachelor degree in Law with 5 years experiences in environmental law sector including municipal solid waste management.	04
12	GIS Analyst	GIS Specialist should hold at least Master's degree in GIS/Spatial Science with 7 years' experience in mapping, analysis and databases of municipal services or municipal solid waste management.	06

Sr . #	Designation	Minimum Experience	Maximum Age Limit	Qualification	Job Description
1	2	3	4	5	6
1	Team leader/ Solid Waste Management Expert International	20 Years	63	Master's Degree In Civil/ Environmental Engineering	<ul style="list-style-type: none"> • Making plans for his team to achieve targets setting TORs / scope of work as outlined in task. • Finalization in inception report and prepared monitoring plans provided in inception report. • Submission of progress report as outlined in PC-II and accordingly in contract agreement. • Making mobilization plan for each team to achieve tasks reports of scope of work.
2	Solid Waste Management Expert (International)	15 Years	63	Master's Degree In Civil/ Environmental Engineering	<ul style="list-style-type: none"> • Provide expert experience on SWM plan development • Provide key input in SWM study on all aspects as per need by Team Lead
3	Environmentalist	7 Years	63	Master Degree In Environmental Management/ Engineering/ Science	<ul style="list-style-type: none"> • Environmentalist supervise and manage studies, investigations regarding Solid waste Plan and landfill site, compliance assessments to proposing appropriate actions in support of compliance municipal regulations and standards. • Recommendation for Assurance and environmental monitoring for groundwater, landfill gas, and air monitoring. • Lead environmental design of projects from the conceptual phase through design completion for project needs and requirements • Responsible for QA/QC

					<p>process adherence.</p> <ul style="list-style-type: none"> • Lead environmental design of projects from the conceptual phase through design completion for project • Prepare technical reports, feasibility studies, work plans, design documents, and construction documents.
4	Civil Engineer	10 Years	63	Master Degree In Civil Engineering	<ul style="list-style-type: none"> • Responsible for plan of city solid waste management. • Conducting solid waste management baseline assessment. • Organize and prepare reports, maps, drawings, tests, and other topographical and hydrologic data to plan and design projects • Preparing technical and financial viable SWM approaches including 3R principals • Will be involved in all phases of project, including planning, design, and construction administration. to solve problems, reduce risk and costs, optimize performance, and satisfy client needs. • Projects will involve managing engineering tasks such as grading, excavation and fill volume calculations, landfill gas collection system design. • You will also help with the Construction Quality • you'll impact the entire project from conceptual and design phases, through the regulatory permitting and review process, bidding, and construction.
5	Mechanical Engineer	7 Years	63	Master Degree In Mechanical	<ul style="list-style-type: none"> • To responsible for conduct survey and

				Engineering	<p>design of various processing facilities like composting unit with leachate collection system.</p> <ul style="list-style-type: none"> waste to energy unit compaction/packaging Including civil, mechanical and electrical components of waste processing based on best international/national practice introduce and recommended various SWM technologies according to city waste characterization
6	Institutional development expert	10 Years	63	Master's Degree In Management And Public Administration	<ul style="list-style-type: none"> Analyze organizational structure, business processes and operations and suggest measures to improve efficiency. Examine the existing human resource structure and resource utilization Assessment of Frameworks that are in place to identify gaps if any. Assessment of existing staff skills and capacities. Develop mechanisms and systems to increase organizational effectiveness contributing to strategic goals and objectives of the P&DD department. Conduct a diagnostic analysis of the business processes of the department identifying bottle necks and recommends solutions within the provincial policy and legal frame work. Study the functional, operational and geographic overlaps of different units within the department; draft set of

					<p>recommendations for streamlining and rationalizing roles and responsibilities.</p> <ul style="list-style-type: none"> Identify areas where functional/planning integration is required due to interdependent services and recommended appropriate revision in the institutional and functional structures of the department. Develop key performance indicators for the performance appraisal and, develop grading mechanism for their performance and examine the shortcomings and achievements
7	Waste Value Chain Expert	10 Years	63	MBA/ Economist / Masters' in Supply chain	<ul style="list-style-type: none"> Responsible to analyze of different waste stream right from origin till final product. Propose business models for waste processing for each city separately Conduct research and provide the reports and recommendations related to waste reduction, recycling and waste disposal
8	Waste to Energy Expert	10 Years	63	Master's Degree In Mechanical / Electrical Engineer	<ul style="list-style-type: none"> Consultant will evaluate all possible waste to energy options on the basis of environmental, technical, social and financial aspects and will recommend most suitable option for each city separately. Consultant will submit a design layout of proposed waste to energy models with various capacities for each city included in the study alongwith its financial details for the client.
9	Financial	7 Years	63	Master Degree	<ul style="list-style-type: none"> Will be responsible for

	analyst			In Economics/ Commerce/ Business Administration	<p>completion of the financial components of the study.</p> <ul style="list-style-type: none"> • Cost of doing business (CDB) analysis of the relevant SWM systems. • The financial part of business models that lead to a SWM system improving the (financial) sustainability and environmental health. • An assessment of the relevant recyclables market and how this can contribute to financial sustainability of the SWM systems.
10	Economist	7 Years	63	Master Degree in Economics/ Finance / Business Administration	<ul style="list-style-type: none"> • Leading the planning efforts on solid waste projects, consistent with project delivery and design processes, and interface with the client on work progress and technical aspects of the project. • Supporting business development activities related to waste management planning projects in California, leading to the award of contracts. This would include client relationship development, project-specific positioning activities, proposal preparation, and oral presentations consistent with established business development processes.
11	Legal Expert	7 Years	63	Bachelor Degree In Law	<ul style="list-style-type: none"> • Researches state and federal regulation in relation to solid waste. • Determine impact of new or modified regulation are state policies develop or assist in modifying solid waste plans are facilitate to comply with

					these regulations.
12	GIS Analyst	7 Years	55	MSc GIS/Spatial Science	<ul style="list-style-type: none"> • Detailing patterns and trends through spatial mapping of data. Providing details for designing digital maps with geographic data and other data sources. Creating procedures for "shape files" to merge topographical data with external data by layering external data over a topographical map. • Developing details of Managing a digital library of geographic maps in various file types

DETAILED COST ESTIMATES

Core Team HR Costing						
Sr#	Designation	No. of Post	No. of Months	Required Experience	Unit Rate (PKR)	Total Cost (PKR)
1	Team Lead/Solid Waste Management Expert (National)	1	6	20 Years	600,000	3,600,000
2	Solid Waste Expert (International)	1	2	20 Years	1,500,000	3,000,000
3	Waste to Energy Expert	1	2	10 Years	400,000	800,000
4	Civil Engineer	1	3	10 Years	400,000	1,200,000
5	Mechanical Engineer	1	4	10 Years	400,000	1,600,000
6	GIS Analyst	1	6	7 Years	400,000	2,400,000
7	Waste Value Chain Expert	1	2	7 Years	400,000	1,600,000
8	Financial Specialist	1	4	10 Years	400,000	1,600,000
9	Institutional Development Expert	1	4	10 Years	400,000	1,600,000
10	Economist	1	3	10 Years	400,000	1,200,000
11	Legal Expert	1	4	10 years	400,000	1,600,000
12	Environmentalist	1	6	7 Years	400,000	2,400,000
Total HR Cost					Rs	22,600,000

DETAILED HEAD	UNITS	TOTAL COST (PKR)
A. General Admin Expenses	Lump sum	1,500,000
B. Travel & Lodging		
<i>Rented Vehicles cost</i>	Lump sum	2,133,600
<i>Lodging</i>		1,890,000
Travel & Lodging (Sub total)		4,023,600
C. Surveys / studies	Lump sum	9,800,000
D. HR cost		22,260,000
Grand total		37,583,600
<i>Add 2% Contingency</i>		751,672
<i>Add 17% (GST) Taxes</i>		6,389,212
Total Cost		44,724,484

Annexure-C

SIMULATION OF WASTE MANAGEMENT PLANS FOR VARIOUS CITIES IN THE PUNJAB

	1st Month				2nd Month				3rd Month				4th Month				5th Month				6th Month					
	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19	W20	W21	W22	W23	W24		
Deliverables																										
Task 1																										
Task 2																										
Task 3																										
Task 4																										
Task 5																										
Task 6																										
Task 7																										
Task 8																										
Task 9																										
Task 10																										
Task 11																										
Task 12																										
Task 13																										
Task 14																										
Task 15																										
Task 1	<i>Inception Report</i>																									
Task 2	<i>Waste Characterization Studies for waste generation and characterization of waste in each project city/TC</i>																									
Task 3	<i>Report on Waste collection patterns and recommended most suitable option for waste collection along with short term, medium term and long term action plans in each project city/TC</i>																									
Task 4	<i>Report on current waste storage practices and recommend most suitable city-specific options for waste storage along with short term, medium term and long term action plans in each project city/TC</i>																									
Task 5	<i>Report on current waste transportation practices and recommend most suitable option for waste transportation along with O & M plan in each project city/TC</i>																									
Task 6	<i>Report on cost effective transfer stations along with preliminary design options and cost in each project city/TC</i>																									
Task 7	<i>Report on current waste sorting practices and recommend most suitable option for waste sorting</i>																									
Task 8	<i>Report on current waste dumping practices and recommend most suitable option for waste dumping in each project city/LG</i>																									
Task 9	<i>Report on current waste recycling practices and recommend most suitable option for waste recycling in each project city/TC</i>																									
Task 10	<i>Report on environmental and social aspects and formulate effective policy measures in each project city/TC</i>																									
Task 11	<i>Review of all financial and economic aspects and formulate most effective policy measures in each project city/TC</i>																									
Task 12	<i>Summarize the complete waste management cycle model for each city/LG developed under holistic solution approach and proposed institutional arrangements</i>																									
Task 13	<i>Combined Report of SWM of all project cities/TC</i>																									
Task 14	<i>Formulate SWM Legal Framework for the province taking into account legal aspects and recommend most effective policy measures</i>																									
Task 15	<i>Formulate Provincial SWM Management policy/Strategy</i>																									

Prepared by:

(Name)
(Designation)

Checked by:

Approved by:
