‘Waste to Energy Power Potential & Opportunities in Punjab'

Presented by

Amir Shahzad Butt
Manager Renewables/Biofuels
Punjab Power Development Board

Sequence

- **Pakistan Power sector – Key Players**
- **Promoting Private Power Projects – Punjab Initiative**
- **Solid Waste Sector in Punjab**
- **Integrated Solid Waste Management (ISWM) Approach – Framework Applicability**
- **Waste to Energy Prospects**
- **40 MW WtE Power Project at Lahore & WtE Potential in Punjab**
- **WtE Challenges – Limiting Factors**
- **Way forward – WtE is a success in Regional Countries**

Pakistan Power Sector – Key Players

Key players in the power sector

- National Electric Power Regulatory Authority (NEPRA)
- National Transmission & Despatch Co. Ltd. (NTDC)
- Central Power Purchase Agency (CPPA-G)
- Private Power Infrastructure Board (PPIB) / Alternative Energy Development Board (AEDB)
- Provincial Facilitators – Punjab Power Development Board (PPDB), Energy Department in Punjab

Promoting Private Power Projects – Punjab Initiative

Role of Provinces in Power Sector

- The Constitution of Pakistan allows provinces to construct or cause construction of power projects of any size based on any technology – clarification provided by CCI on April 28, 2011

- Punjab provides facilitation to power projects under Punjab Power Generation Policy 2006 revised 2009 – this policy is in full conformance with federal power policies

- Federal Power Policy, 2015 & Renewable Power Policy, 2006 fully recognize this facilitation role of provinces

Functions of PPDB

- Facilitate development of hydro, coal, solar, wind, biomass / solid waste potential in Punjab
- Award of private power projects in raw or solicited mode
- Facilitate private investors for setting up power projects in line with the provincial and national power policies
- Extend fiscal & financial concessions to projects under the policy
- Supervise Feasibility Studies through independent panel of experts
- Support to projects during project agreements and financial close
- Facilitation, in coordination with Federal counterparts, during project construction and operation

Recent Success Stories

In exercise of its constitutional & policy role and to mitigate the then prevailing severe power shortfall situation, Punjab initiated development of;

- Large imported coal projects of 3960 MW – 1320 MW Sahiwal Coal project has started commercial operation (CPEC)
- Quaid-e-Azam Solar Park 1000 MW – 400 MW has started commercial operation (CPEC)
- RLNG based power projects 3600 + 1200 MW – 3600 has started operation

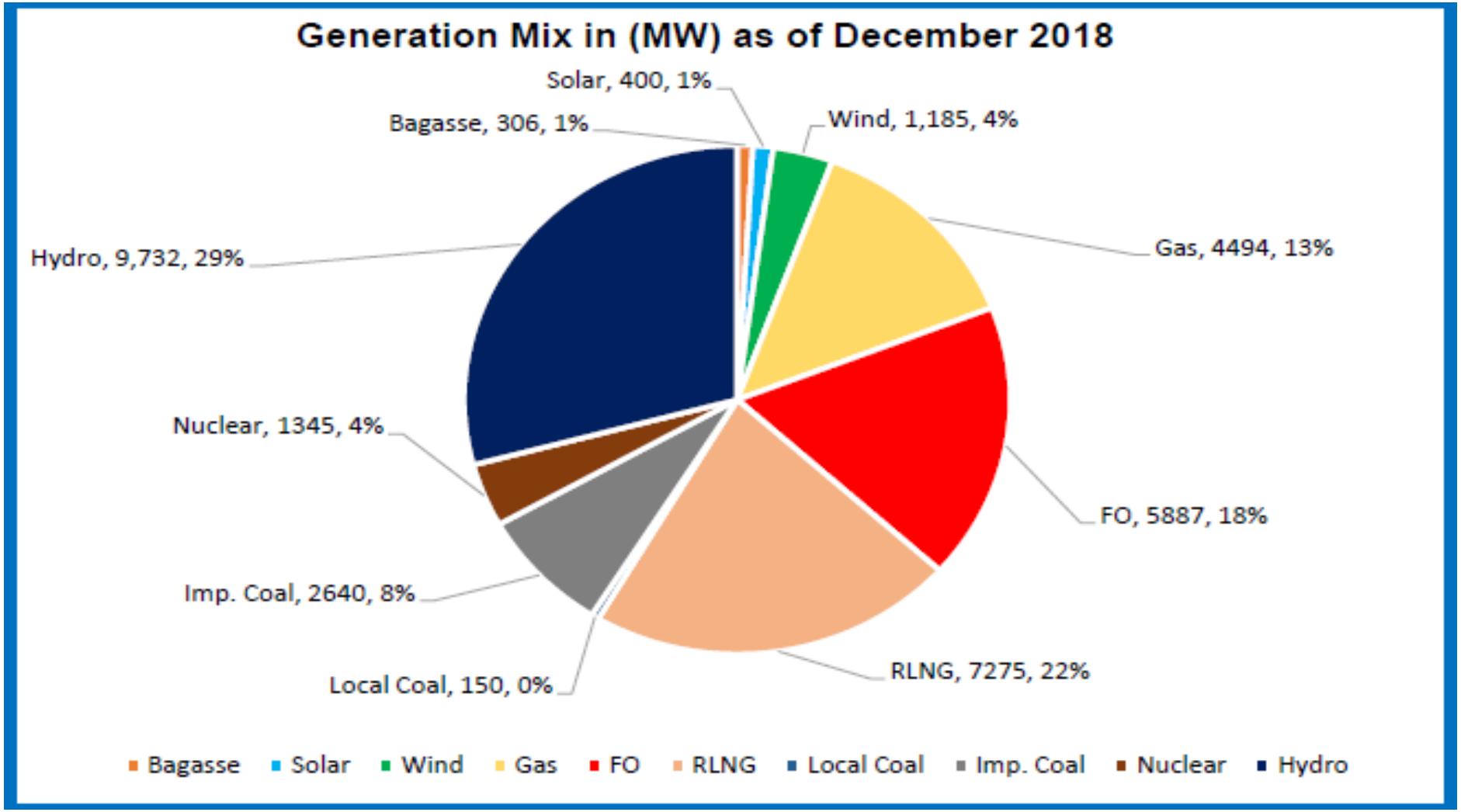
PPDB Project Portfolio

Technology	Capacity (MW)
Thermal Projects	3960
Renewable Projects	2719
Hydro Projects	274
TOTAL	**6953**

Solar Power Project Bahawalpur

- Foreign Direct Investment (300 MW)- 450 million US$
- COD Achieved on May to July, 2016

Country's Installed Fuel Mix – 33,414 MW (31st Dec 2018)



Source: NTDC

Project Development Cycle - IPPs

Submission of proposal by sponsor to PPDB

Evaluation on approved criteria by PPDB Committee

Approval by PPDB Board /Award of LOI to sponsor

i. Submission of LOI BG US$1000/MW
ii. Formation of SPV – project company by sponsor

Conduct of Feasibility Study by company including;

i. IEE/EIA & its approval by EPA, GoPb **ii.** Grid Interconnection Study & its approval by **NTDC**

iii. Approval of Feasibility Study by POE of PPDB (return of BG in case of approval or non-feasible)

Application of tariff by project company to **NEPRA** (GoP)

Tariff approval by **NEPRA** after public hearing - notification by GoP

Application of Generation License by project company to **NEPRA**

Award of Generation license by **NEPRA** after public hearing

Tri-Partite Letter of Support (LOS) by AEDB/PPIB, PPDB & project company

Negotiation with lenders by project sponsor/company

Negotiation with power purchaser and execution of project Agreements;

i. Power/Energy Purchase Agreement (PPA/EPA) with **CPPA-G/ DISCO**
ii. Implementation Agreement (IA) with **PPIB/AEDB**
iii. Other Agreements (Land Lease Agreement, Water Use Agreement, Fuel Supply Agreement etc.)

Financial Close of project

Engineering, Procurement & Construction (EPC) of project

- **Start of construction**
- **Commercial Operation Date (COD)**

Solid Waste Sector in Punjab

Municipal Solid Waste Management

- As per World Bank Report 2016, Pakistan's solid waste generation per capita per day 0.43 kg
- Total MSW generation of country is about 31 Million tons/year – Census 2018
- Punjab, the largest province having population more than 110 million generates more MSW amongst other provinces
- Waste Management Companies are established at larger populated cities like Lahore, Faisalabad, Gujranwala etc.
- Prime objective is for centralized collection of waste, collection & transportation to respective dumping/landfill sites

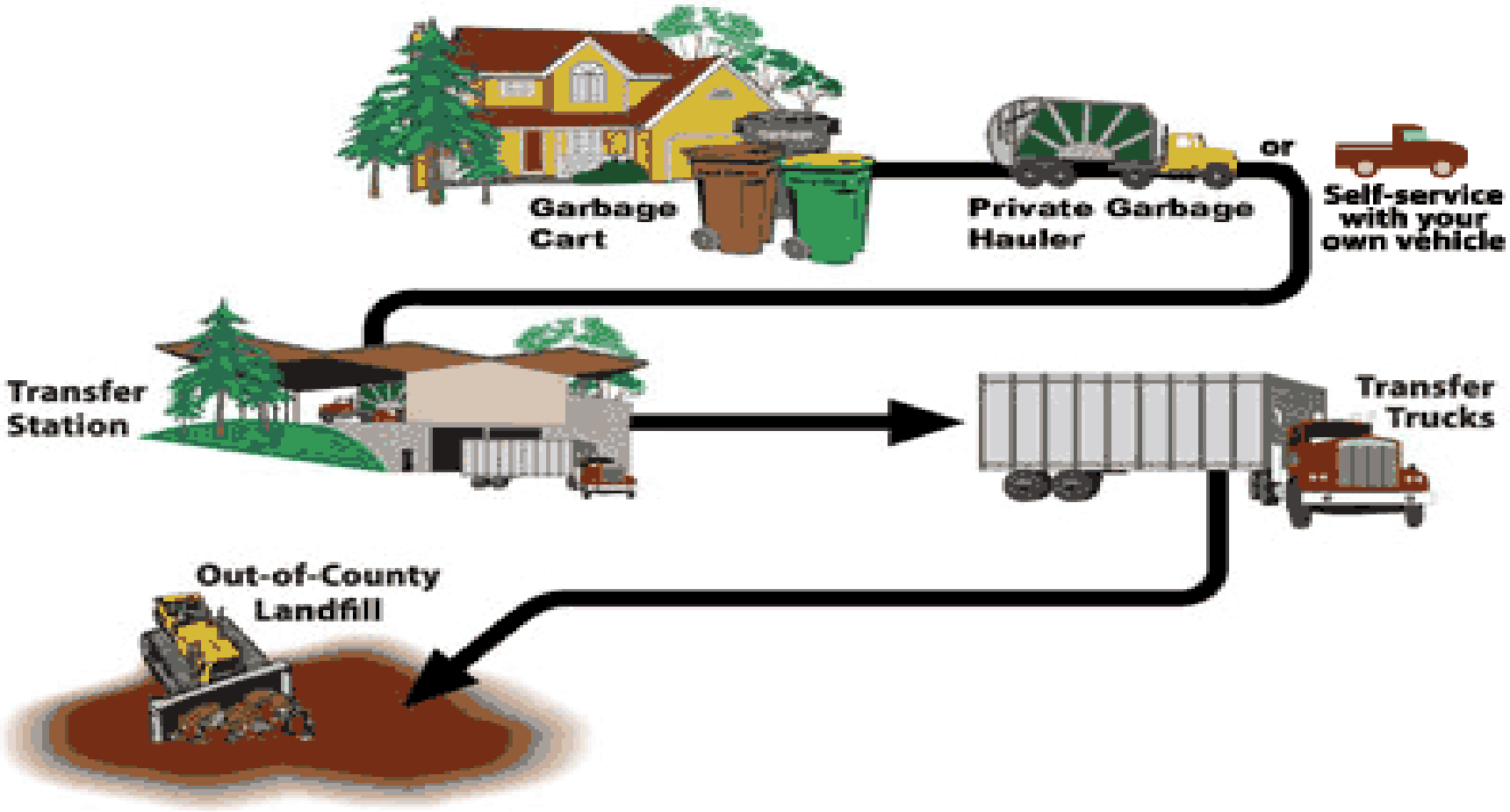
Solid Waste Profile at Lahore

- Solid Waste generation — 7000 TPD
- Solid Waste collection — 6500 TPD
- Commitment by LWMC;
  - RDF Plant to Cement Factory — 1000 TPD
  - Compost Plant — 500 TPD
- MSW available for Waste to Energy (WtE)
  - At Lakhodair landfill site — 2000 TPD
  - MRF at Sundar — 3000 TPD

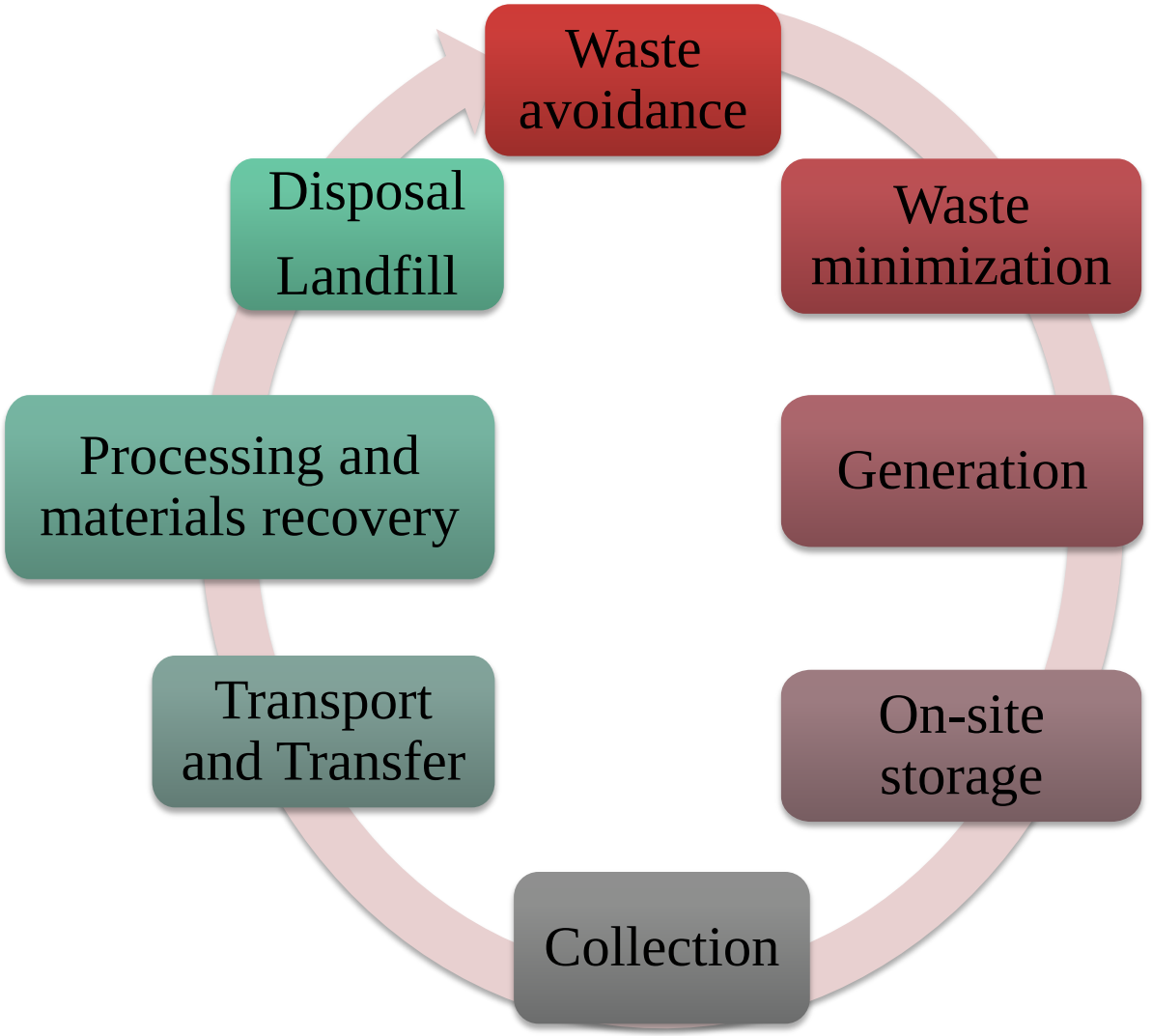
Source: Lahore Waste Management Company (LWMC)

ISWM Approach - Framework Applicability

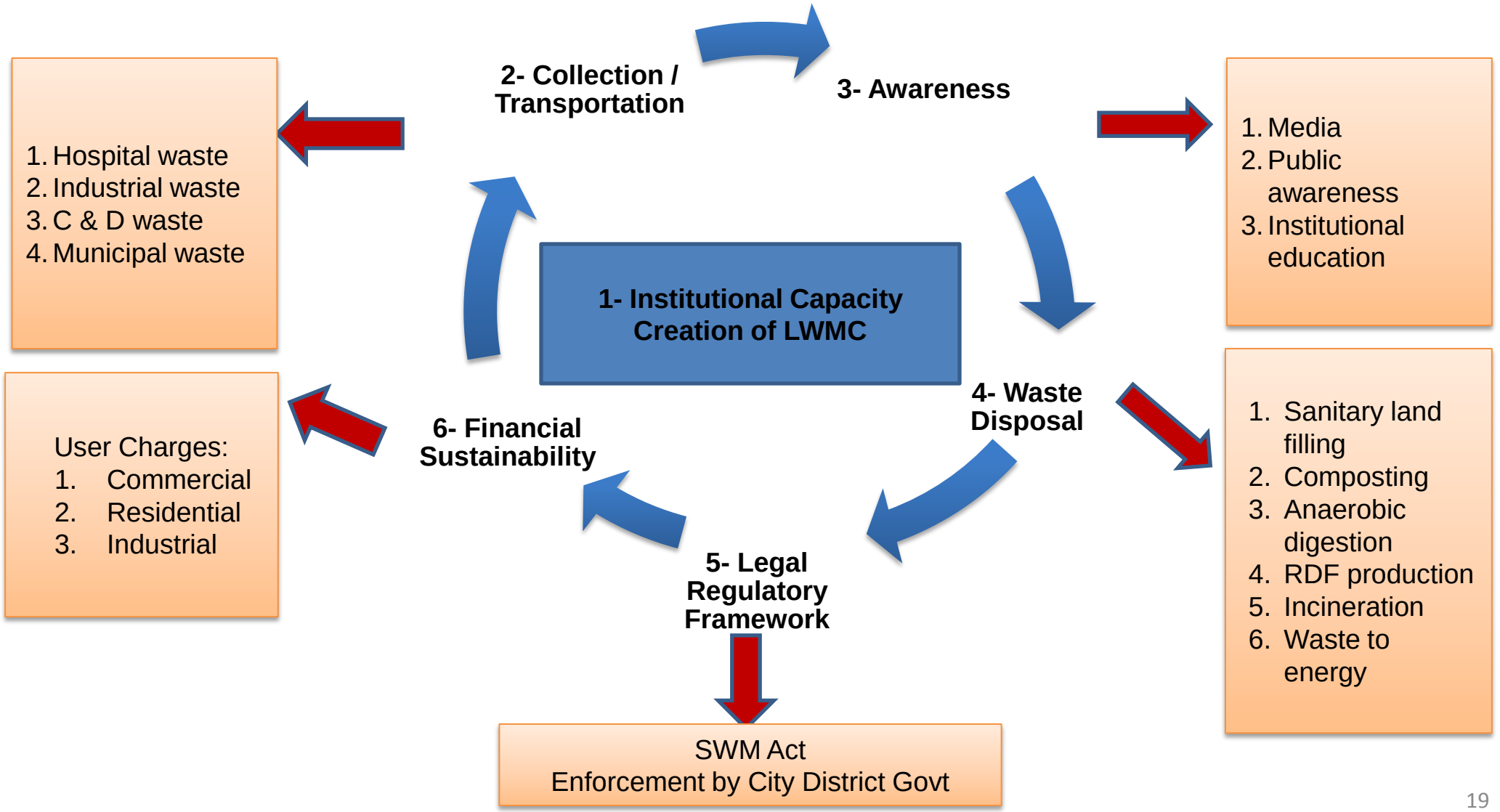
How Waste is Managed?



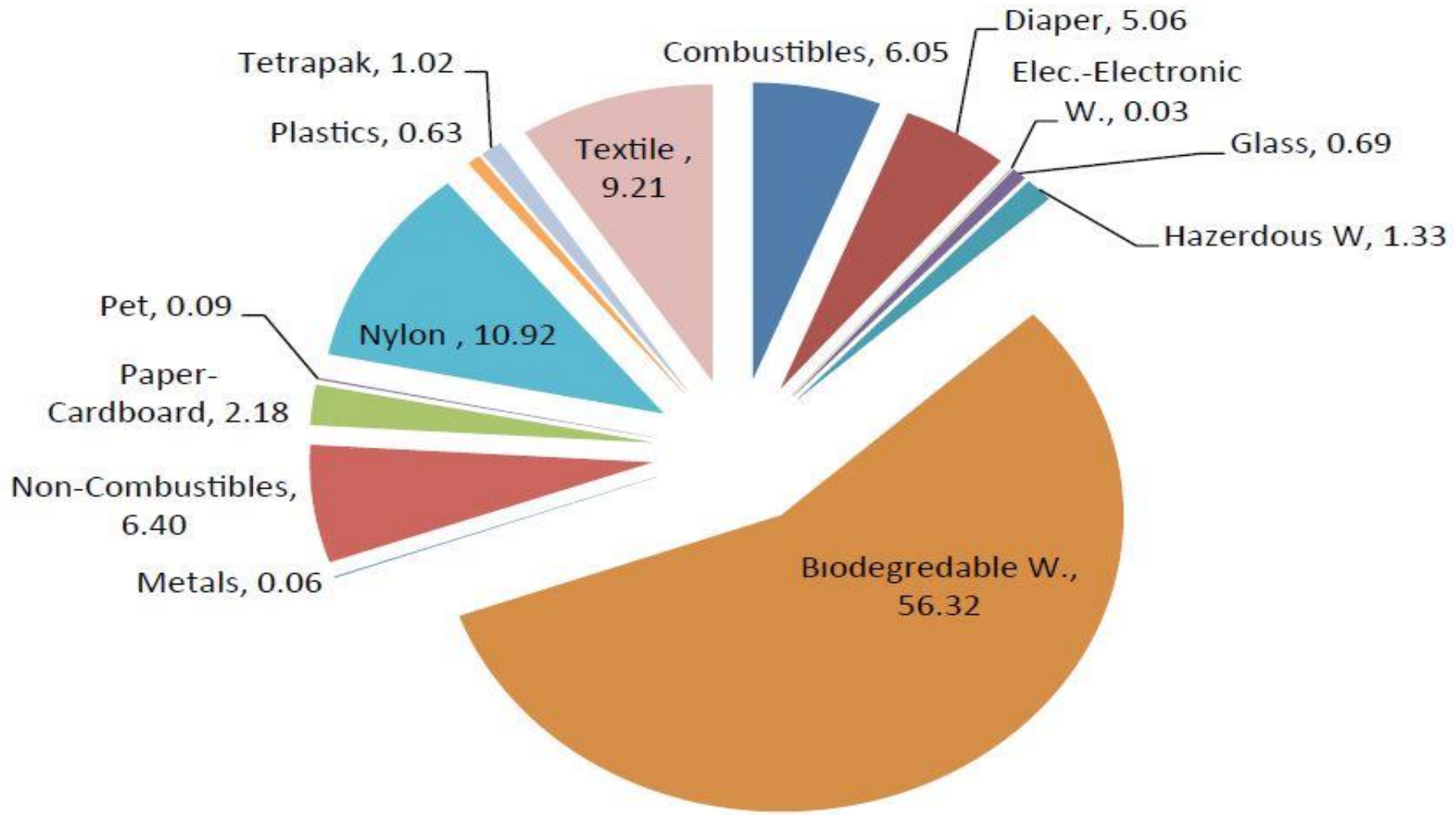
ISWM Approach



ISWM Framework Applicability - LWMC



Waste Characterization Study by LWMC – 2011/14



Waste Characterization Study by LWMC – 2011/14

Season	Calorific Value (kCal/kg)	Moisture Contents (%)
April 2011	1428	53.07
July 2012	1657	47.01
November 2012	1481	62.69
Sep 2014	1711	43.62

Waste to Energy Prospects

Backdrop of WtE - MSW Risks

- Serious threat to ambient air & underground water
- Hazardous Methane gas emissions from dumping sites
- Rain and Seepage cause under ground water contamination - potential threat for drinking water
- Risk of air and water bourn diseases - Hepatitis, Malaria, Gastrointestinal
- Perpetual need for new landfill sites if waste is untreated

Dumping/Landfill Site at Lahore

Mahmood Booti – Closed Dumped site

- 77 acre full of heaps of garbage
- 13 million ton waste is dumped
- More than 80 feet waste heap
- Site closed since September 2016

Lakhodair landfill site

- 130 acre reserved area
- Dumping started in October, 2016
- 6 million ton waste already dumped on 60 acre
- Area reserved for WtE project

Waste to Energy Prospects

- WtE power projects are considered as environment projects through scientific disposal/reduction of MSW – power generation additional benefit
- WtE help in saving precious public land that could otherwise be used for dumping waste at dumping site
- Other key benefits include;
  - Air quality improvement
  - Reduced health risks
  - Safeguard against contamination of underground water table
  - Long life of environmentally hazardous dumping / landfill sites

40 MW Waste to Energy Power Project at Lahore

40 MW Waste to Energy Power Project at Lahore

- Based on effective waste management supply chain at Lahore by LWMC, private sector was encouraged for WtE project
- Subsequently, LWMC provided waste assurance of 2000 TPD of MSW
- Private sector shown keen interest for development of approximately 40 MW WtE power project in IPP mode under Punjab Power Generation Policy
- After competitive process & fulfillment of procedural requirements, LOI was awarded by PPDB to international private company for conduct of detailed bankable Feasibility Study (FS)
- FS completed/approved including grid & environment studies
- Company has been awarded Upfront Tariff & Generation License by NEPRA
- Next steps are projects agreements under LOS before financial close

Waste to Energy Power Potential in Punjab

Waste Management Companies	Total Waste Generation (tons/day)	Waste Collection (tons/day)	Estimated Potential (MW)	Dumping sites status
Lahore Waste Management Company	7000	6500	100 MW	• Mehmood Booti dumping site – 100% filled • Lakhodair landfill site • Sundar Material Recovery Facility
Faisalabad Waste Management Company	1650	1150	25 MW	• Jaranwala Road Faisalabad
Gujranwala Waste Management Company	1000	700	15 MW	• Gondlawa (operational -700 tons/day) • Sherakot (in pipeline)
Multan Waste Management Company	850	510-550	10-12 MW	• Habiba Sial (operational)
Rawalpindi Waste Management Company	850	-	10-12 MW	• Muza Losar (95% filled)

Waste to Energy Challenges – Limiting Factors

Waste to Energy Challenges – Limiting Factors

- Mixed MSW contain all type of waste including biodegradable, C&D waste etc.
- Scavenging of high calorific value waste & recycling in absence of waste regulations
- Waste assurance limitation in general
- No mechanism in place for tipping /gate fee – generally provided to project developers on account of waste disposal
- Province wise ceiling of 50 MW to each province to avail Upfront Tariff
- Upfront Tariff regime in Pakistan has almost exhausted
- Introduction of competitive bidding for RE projects - New RE Policy is expected in few months
- No grid-connected WtE completed project in place so far

Way forward – WtE a success in Regional Countries

Way forward – WtE is a success in Regional Countries

- Countries like China is way ahead in incineration based WtE power projects - As per China National Renewable Energy Centre June 2017, China has completed 296 projects in 28 provinces with aggregate capacity of 6250 MW
- India has also installed 138 MW capacity of WtE projects and number of projects are under development – Ministry of New Renewable Energy (March 31, 2018)
- Similarly Thailand, Turkey & Japan have also established WtE projects
- In Pakistan, 40 MW WtE project at Lakhodair landfill site would be the 1st of its kind which is under development stage
- 60 MW WtE power project at Sundar near Lahore would be launched shortly by PPDB
- Private sector shown keen interest for WtE projects in other cities of Punjab

Thank you