Inter-Municipal Waste Management

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Kakogawa City・Takasago City・Inami Town・Harima Town

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Inter-Municipal Waste Management Summary

- Cooperation from all participating municipalities essential
- Reduction in construction + operation costs
- Reduce environmental burden

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Agenda

1 Location

2 Background of inter-municipal initiative

3 Technical and location considerations of facility

4 PPP(public-private partnership) structure

5 Governance and current operations

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1 Location – Kakogawa City

- 70km west of Osaka
- Residential city
- Major steel factory located in southern coast
- Agricultural land in north

Pop: 254,103
Area: 138/48 km2

Source: Geospatial Information Authority of Japan (GSI)

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2 Background of Inter-Municipal Initiative

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Regional Issues

1. Incineration facilities getting old → Needed to renovate or build anew
2. Facilities with high dioxin emissions in region
3. Facilities' energy consumption was high

- 2007 4 municipalities begin discussing integrated waste disposal facility
- 2010 4 municipalities officially decide to participate in inter- municipal disposal initiative
- 2011 Formulation of waste disposal policy (facility scale, ball park cost, schedule, etc.)
- 2013 Decide to build facility in Takasago City
- 2014 Decide on disposal method and formulate detailed facility plan
- 2016 Appoint companies for construction and operation of facility
- 2017-2022 Construction of facility
- 2022 Completion and beginning of operation

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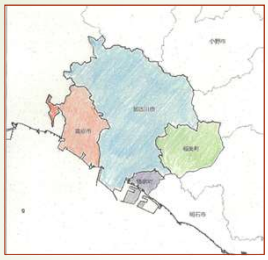
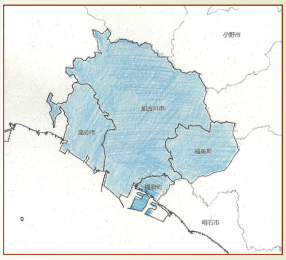
Comparison of Inter-Municipal vs. Individual Disposal





	Unit	Invididual	Joint	Comparison
Total Cost (construction, garbage collection, facility operations)	USD	579 million	442 million	▼137 million
Electricity	MW	8.9	11.9	△ 3
Revenue from electricity	USD	571k	1.6 million	△ 1.02 million
CO2	t-CO2/year	76000	70000	▼6000
Dioxin emissions	pg-TEQ/year	0.71	0.07	▼0.64
Disaster Risk		○	△	

140 yen = 1 USD

Source: Toban Coastal Municipality Joint Waste Management Feasibility Report (Oct. 2010)

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Operational Management + Division of Responsibility

- GOAL = Increased Operational Efficiency
  - Centralization of operations
- Administrational control given to Takasago City (where disposal facility is located)
  - Quick decision making
  - Build rapport with local citizens
- Other 3 municipalities will offset environmental burden on Takasago by contributing funds to improving living env. (build park, renovate roads)

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3 Technical and Location Considerations of Facility

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Setting Facility Disposal Capacity

- Goal = Reduce environmental impact
  - Purposely set lower disposal capacity
  - Kakogawa set goal to reduce waste by ~20%

	Combustiable Waste(t/yr)			Non-Combustible・Bulk waste(t/yr)		
	2010	2024	Reduction（%）	2010	2024	Reduction（%）
Kakogawa	88,705	71,553	19.3	4,950	3,962	20.0
Takasago	32,958	25,658	22.1	1,862	1,521	18.3
Inami	8,963	8,643	3.6	683	580	15.1
Harima	9,517	9,284	2.4	807	731	9.4

		Capacity	Estimated Cost
Integrated Facility	Combustible waste	430t/day	186 million
	Non-combustible・bulk waste	40t/day	10.7 million

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Waste Quality

		Unit	Waste Quality		
			High	Standard	Low
Lower Heating Value(LHV)		(kJ/kg)	12,800	9,800	6,700
Composition	Combustible	(%)	56.71	49.15	40.34
	Ash	(%)	9.21	8.01	7.28
	Moisture	(%)	34.08	42.84	52.38
Unit Volume Weight		(t/m 3)	0.09	0.14	0.19

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Emissions Standards

	Legal Standard	Our Standard
Concentration of Dust	Less than 0.04g/m³N	**Less than 0.01g/m³N**
Hydrogen Chloride(HCl)	Less than700mg/m³N	**Less than 10ppm**
	Less than 430ppm	
Sulfer Oxides(SOx)	K value 1.75	**Less than 10ppm**
	100 to several hundred ppm	
Nitrogen Oxides(NOx)	Less than 250ppm	**Less than 30ppm**
Dioxins (DXNs)	0.1ng-TEQ/m³N以下	**Less than 0.05ng-TEQ/m³N**

Emissions corrected to 12% O_2

Source: Toban Coastal Municipality Waste Treatment Facility Development Plan

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Selecting Facility Location

Comprehensive evaluation based on

- Proximity to Residential areas
- Population density
- Amount of waste disposed in each area
- Distance to collection points
- Residential opinion

Choose a central location that reduces waste collection costs and does not require permissions from neighboring municipalities (outside of the partnership)

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Selection of Waste Disposal Method

Incineration Method		Residue Disposal Method	Selection
Incineration	Stoker	Landfill	○
		Cement	○
	Fluidized Bed	Landfill	
		Cement	
Incineration+Ash Melting	Stoker + Ash Melting	Slag	
	Fluidized Bed + Ash Melting	Slag	
Furnace	Shaft-type Gasification + Melting	Slag	
Pyrolysis Gasification	Fluidized Bed Gasification Melting	Slag	
	Kiln Gasification Melting	Slag	
Gasfication+Reforming	Gasification + Reforming	Gas,Slag	

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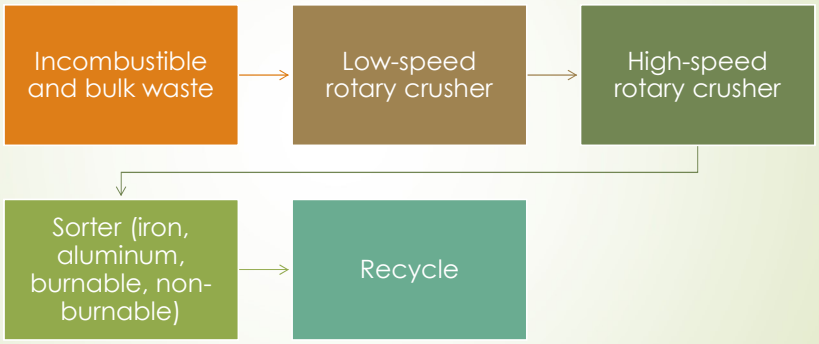
Incombustible • Bulk Waste Treatment Method



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4 PPP Structure

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Selecting Operational Structure

Public-Public
DB+O
PPP
(DBM,DBO)
PFI
(BTO,BOT,BOO)

[establish selection criteria]

- Any non acceptable terms?
- ease of actualization?
- special advantages?

[narrow down]

- Public-public
- DBO
- BTO
- BOT

[final decision]
DBO

Maximizes ability to achieve goals of project

7.2014 — 8.2014 — 9.2014 — 11.2014 — 1.2015

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Eco Clean Peer Harima (integrated facility)

Const. cost : 157.5 million USD (excl. tax)

Opr. cost : 89.3 million USD (excl. tax)
(over 20 year period)

Incineration facility
•429t/day（143t/incinerator× 3） (cont. operation)
•Incineration method : Rotary Stoker incinerator
•Steam condition : 4 MPa×400℃
•excess heat energy : converted to electricity using steam turbine（12,000kW）
•Stack Height : 59m

Incombustible・Bulk Waste Treatment Facility
•34t/day（1 day/5 hrs opr.）
•Processing system : Low speed rotary crusher + high speed rotary crusher + sorter

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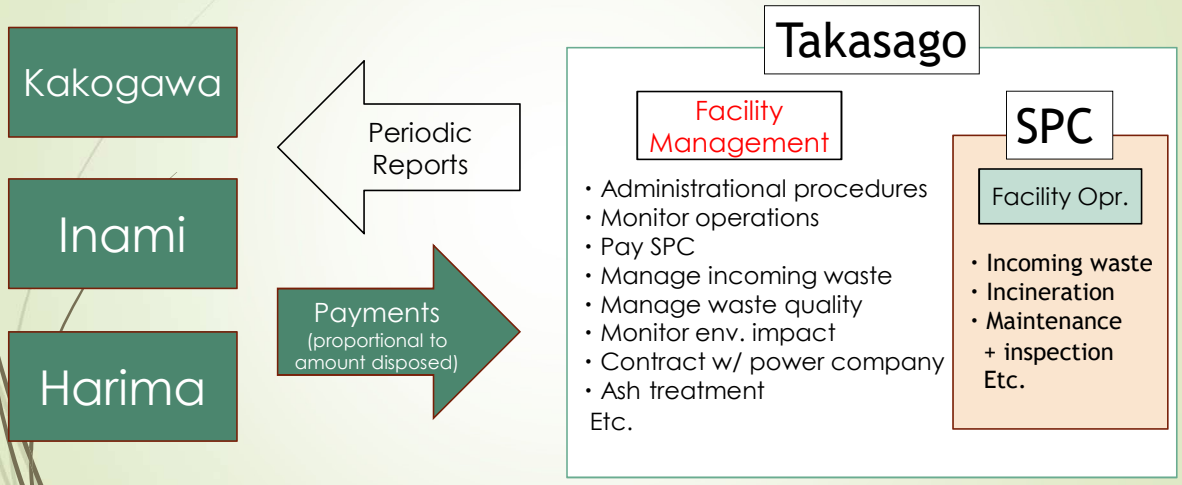
Inter-Municipal Administrational Structure



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Monitoring Operations (from Municipal Perspective)

- Final responsibility falls on public sector
  - Ensure proper maintenance and precautions being taken at facility
- Automatic recording system for facility operations set in place. Municipal employees can check up on facility operations at any time
- Be flexible and willing to accept advice from DBO operator
- Be able to respond quickly in event of natural disaster
- It is good to have municipal employees with understanding of mechanical and electrical systems, as well as chemistry to check up on facility operations

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5 Governance + Current Operations

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Governance

- By Japanese Law we must protect citizen living environment
  - Test for emissions, noise, residential impact, etc.
- Informational sessions! → gain citizen understanding and support
- Standardization of waste quality + waste reduction
- Cooperation of the residents, city council and municipality where the facility is constructed
  - Be patient and considerate in gaining approval

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Waste Quality Analysis (4.2023-3.2024)

	Composition			Apparent Density	LHV (measured)		LHV (calculated)	Chemical Breakdown of Combustible Waste					
	Combustible (%)	Moisture (%)	Ash (%)	t/m^3	kJ/kg	kcal/kg	kJ/kg	Carbon C (%)	Hydrogen H (%)	Nitrogen N (%)	Chlorine Cl (%)	Sulfer S (%)	Oxygen O (%)
Wet Basis	49.1	43.3	7.6	0.1	9888.3		8150.8	26.6	3.8	0.5	0.5	0.2	17.5
Dry Basis	86.5		13.5					46.9	6.8	0.8	0.9	0.3	31

	Waste Composition						
	Paper (%)	Cloth (%)	Plastic (%)	Pruning, etc. (%)	Kitchen Waste (%)	Incombustible (%)	Other (%)
Wet Basis							
Dry Basis	40.2	8	26.7	9.2	7.3	3	5.7

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Waste Treatment Amount (4.2023-3.2024)

(Unit: t)

	Combustible	Incombustible/bulk
Kakogawa	60,869	3,219
Takasago	21,048	1,642
Inami	7,734	546
Harima	7,371	612
Total	97,022	6,019

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Emissions Analysis (4.2023-3.2024)

	Unit	Legal Standard	Our Standard	Average Value	Low	High
Emissions	m3/h			31,018	27,200	34,100
Dust Concentration	g/Nm3	0.1	0.01	<0.0006	0	0
Sulfer Oxide	ppm			2.7	1.6	4.1
Hydrogen Chloride	ppm	429	10	7	4.1	8.2
Nitrogen	ppm	250	30	10	4	15
Dioxins	ng-TEQ/Nm3	0.1	0.05	0.000060	0.000011	0.00019
Mercury（Gas・Particle）	mg/Nm3	0.03	0.03	0.00081	0.00034	0.0023

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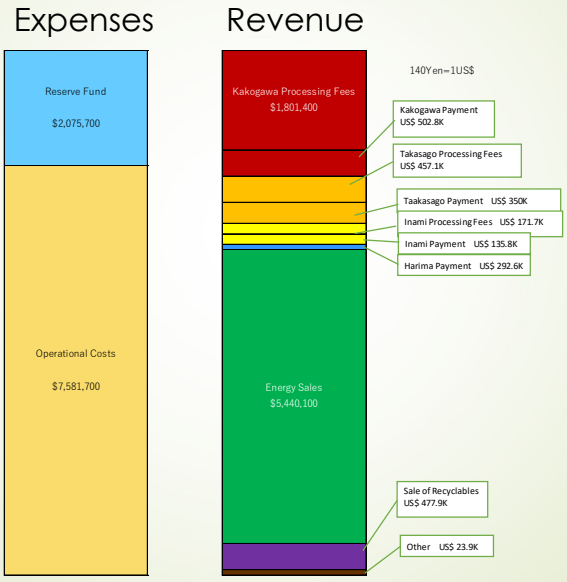
Operational Finances (1 year)



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Takeaways on Inter-Municipal Initiative

- Achieved through cooperation of participating municipalities, leaders, city councils and residents
- Cooperation from Takasago City residents and council were especially important
- Succeeded in lowering construction and operation costs
- Succeed in reducing env. burden → lowered dioxin, CO2 and waste

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Recyclables

Combustible Waste

Designated Garbage Bags

Collection Point

Inside bag

Rules for Sorting Waste