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GLOBAL ECO-INDUSTRIAL PARKS PROGRAMME



Evaluation of Industrial Symbiosis Opportunities

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Types of Industrial Symbiosis

1

Within the park

Factory to factory

Park management to
factories

2

**Within park and local
community** Factories to
factories in nearby
community

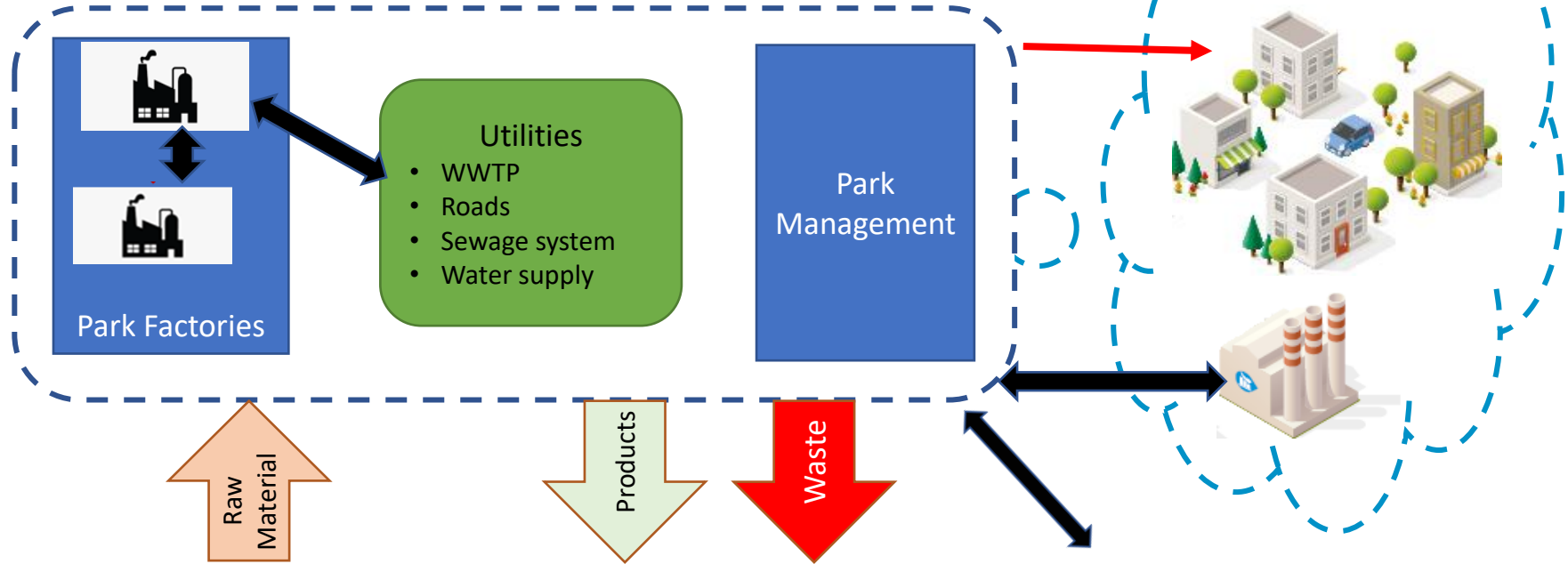
3

Factories to region

Factories to recyclers

Factories to factories

Industrial symbiosis



Identification of Industrial Symbiosis options

Park facilities → External

Wastes / by-products	External entity
Fleshing of limed hides	Soap industry or poultry feed makers
Raw trimmings	
Wet trimmings/ wet shavings after chrome tanning	Poultry feed makers
Dry trimming/ dry shaving	
Wet blue	Another tannery
Unsplit hide	Technology Center
Chromium containing effluent	Central WWTP
WWTP sludge	Cement companies

External → park facilities

External entities	Park facilities
Central WWTP	Treated High salinity wastewater
Central WWTP	Recovered Chrome
Technology center	Provides service (splitting ..)
Another tannery	Provides part of the operation

Evaluation of IS Opportunities – Context Analysis (1)

Context analysis

- Collect information about waste, or by-products that require valorizations.
- Define relations among cluster stakeholders.
- Preliminary identification of synergy opportunities

IS opportunity	Sender	Receiver	Interest score max 5
Fleshing of limed hides	Tanneries	Poultry feed maker / Soap manufacturing	4
Raw trimmings	Tanneries		4
Wet trimmings/ wet shavings after chrome tanning	Tanneries		4
Dry trimming/ dry shaving	Tanneries		4
Wet blue	Small tannery	Large tannery	5
Unsplit hide	Tannery	Technology center	4
Chrome containing effluent	Tannery	Central WWTP	1
Recovered chrome	Central WWTP	Tanneries	0
Treated high salinity water	Central WWTP	Tanneries	2
Split hide	Technology center	Tanneries	0
Crust production	Large tanneries	Small tanneries	1
WWTP sludge	Central WWTP	Cement plants	0

Evaluation of IS Opportunities – SWOT analysis (2)

	Strength	Weakness
Internal origin	<ul style="list-style-type: none"> Established industries with long history in the local industry and community Willingness to collaborate All partners willing to participate in policy recommendations All partners within the same market Striving to export 	<ul style="list-style-type: none"> Geographic proximity is not optimum for some types of exchange High water consumption requirements Currently the volumes of shared streams for industry symbioses are not high enough to incite interest to partners
	Opportunity	Threat
External origin	<ul style="list-style-type: none"> All opportunities identified in Context analysis table Financial gain in case if all tanneries act together 	<ul style="list-style-type: none"> Stricter regulations on transportation of waste Higher water price Competitiveness

Evaluation of IS Opportunities – Scope definition (3)

Set of stakeholders

Focusing on tannery waste to Poultry fodder and soap manufacturing.

Central stakeholders: the tanneries and the soap and fodder manufacturers.

Peripheral stakeholders: waste collector, transporter, treatment facility.

External: raw material supplier to manufacturers (less sales). Society will profit from improved environment

Data collection

More detailed data will be required:

Amount of waste per tannery and from all tanneries

Price of raw material supplied to manufacturers of soap and fodder

Price of waste sold to manufacturers

Transportation cost

Sorting cost according requirements of manufacturers

Symbiosis scenarios

1. Individual tannery to waste collector
2. All tanneries to waste collector
3. Individual tannery to individual manufacturer
4. All tanneries to a manufacturer nearby or nationwide
5. All tanneries pretreatment (sorting) to requirements of manufacturer then sold to higher price nearby or nationwide





Evaluation of IS Opportunities – Symbiosis scenarios

The several symbiosis are evaluated according to three parameters:

1. Transportation options:
 - Distance travelled (in park, near by community, region)
 - Transportation type (tricycle – environmentally compliant truck)
 - Cost of transportation
2. Configuration of pre-treatment process
 - Presence of required specifications
 - Level of complexity of treatment process based on required specifications
 - Individual pretreatment versus combined pretreatment
 - Cost of pretreatment
3. Development of potential business model



Evaluation of IS Opportunities – Economic/other Values (4)

Values created

- New revenues from selling unutilized resources. The value depends on the resource and its quality.
- Costs avoided related to public bodies (e.g., penalties)

Values destroyed (New costs)

New costs depend on the type of the new symbiosis (transportation cost, new equipment, on-site operation)

Other values

- **Environmental values:** evaluated through a Life-Cycle Analysis
- **Social values:** include improved people/employee well being, improves relationship with local communities
- **Regional values:** The symbiosis would create full time jobs, mainly through transportation, and it increases the level of local expertise in resource valorisation. Finally, the positive environmental impacts of the symbiosis also create a benefit for the local society. This results in promoting the region

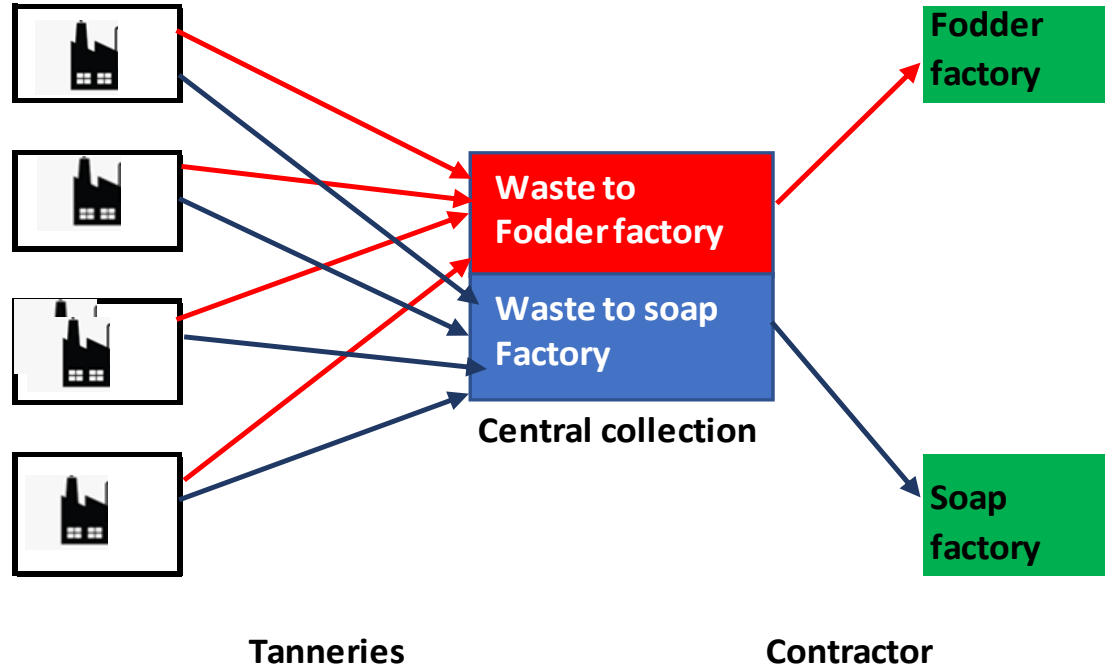
Evaluation of IS Opportunities – Development of business model (5)

Description of the business case: **Tannery waste to Poultry feed and soap factories:**

- Waste is washed segregated into two barrels based on specs
- Waste weighed and delivered at a central location in two different containers
- Contractor picks up waste and pays according to weight
- Waste transported by truck to buyers and gets payed

Assumptions

- Pre-treatment will increase value of resource
- Tanneries will come together as one entity
- Receiving factory is in the community in neighborhood of park
- Park management will provide two large containers in central location free of charge since waste disposal is a utility that should be provided by park to tenants



Tanneries

Contractor

Evaluation of IS Opportunities – Development of Feasibility Study (6)

Revenue:

Weight of waste for poultry feed x selling price of waste

+

Weight of waste for soap factory x selling price of waste

Operating Cost:

Cleaning waste (wage of worker)

Cost of collection bags

Transportation to central collection site
dumpsters (wage of worker)

Transportation to soap and poultry feed factories

$$\text{Profit} = \text{Revenue} - \text{Operating cost}$$



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