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State Secretariat for Economic Affairs SECO

Introduce the draft framework for guideline to reuse waste in industrial parks

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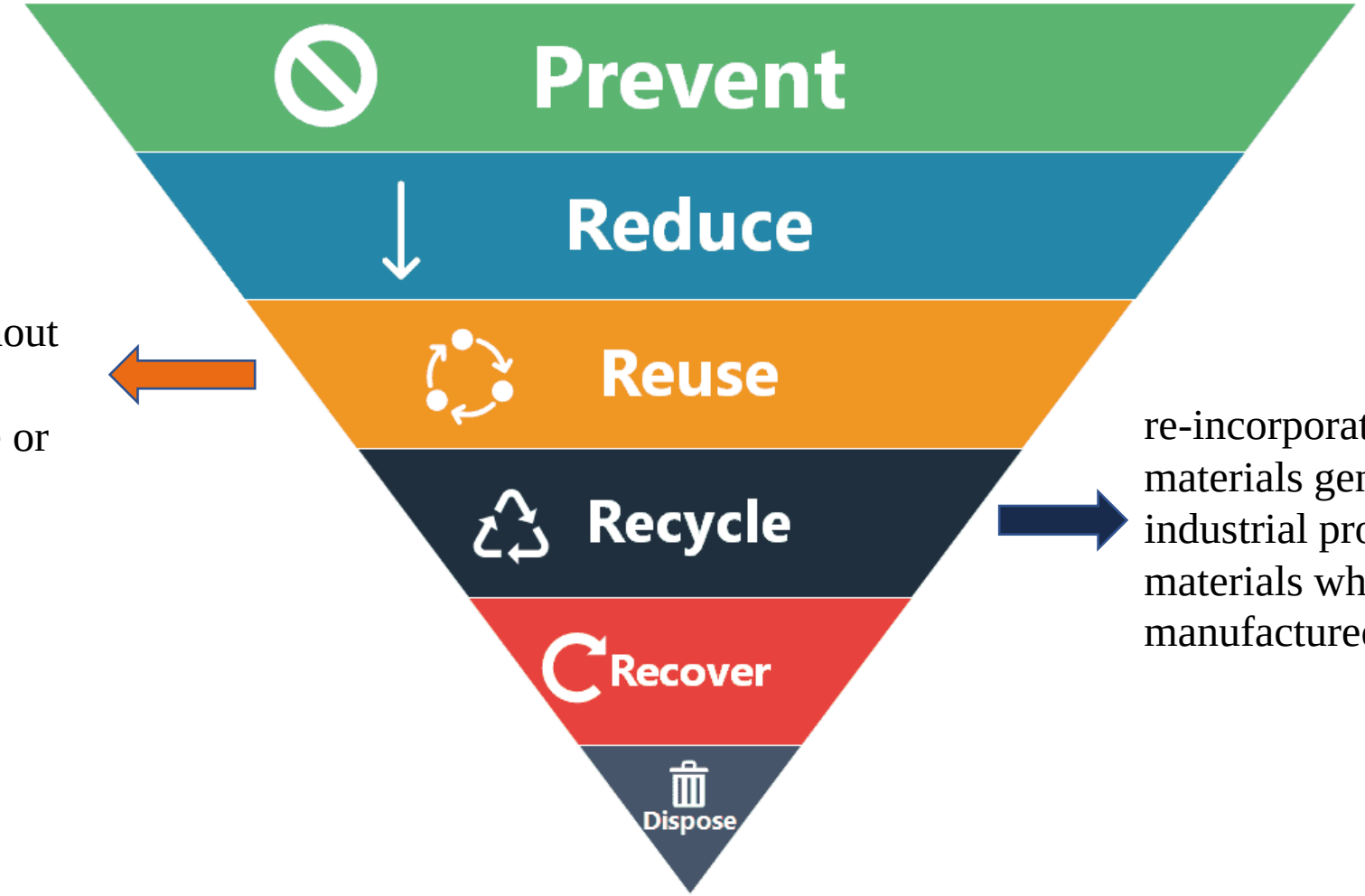
Content

- Legal regulations on common industrial solid waste management
- Current status of solid waste management in industrial zones in Vietnam

Waste management hierarchy

using a waste product without further transformation and without changing its shape or original nature



re-incorporating valuable waste materials generated from industrial processes into raw materials which can be manufactured for new products

Benefits of industrial solid waste reuse, recycling

- Treatment cost reduction. In addition, valorizing waste streams by recycling into reusable energy and resources can generate new revenue streams for enterprises
- Resources and energy savings
- Sustainable brand recognition, creation of corporate social responsibility
- Creation of new jobs
- More efficient waste management

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Draft guideline framework on solid waste reuse in industrial park: Practical basis

- Reducing the environmental problems associated with the large amount of waste generated by industrial activities and the depletion of natural resources has become an urgent priority on a global scale.
- In fact, many types of waste are still valuable as resources and environmental pollution due to waste can be reduced by reusing them in industrial processes.
- In industrial symbiosis, scrap and waste can be exchanged and used to replace raw materials or additives needed for industrial processes by the enterprise itself or another enterprise in the industrial park; increase overall efficiency of natural resource use, reduce emissions and eliminate waste compared to independent enterprises
- Strategies need to be implemented that enable enterprises to increase competitiveness, create production-supply chains, utilize waste or by-products, stimulate the economy and reduce the environmental impacts of waste

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Draft guideline framework on solid waste reuse in industrial park: Legal basis (1)

- Article 72, Clause 2b of the LEP 2020: The owners of hazardous waste and ordinary industrial solid waste are responsible for reusing, recycling, treating and recovering energy from the waste, or for transferring them to facilities with appropriate function and granted environmental permits
- Article 82, Clause 1 of the LEP 2020: Production, business and service enterprises; concentrated production, business and service zones; industrial clusters; agencies and organizations generating ordinary industrial solid waste must reuse, recycle, recover energy and treat ordinary industrial solid waste or transfer them to licensed functional facilities
- Article 82, Clause 4, Law on Environmental Protection: Organizations and individuals that generate ordinary industrial solid waste must be able to self-process, recycle, treat, co-treat and recover energy when meeting the requirements as prescribed

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Draft guideline framework on solid waste reuse in industrial park: Legal basis (2)

- Article 47, Clause 3, Decree 08/2022/ND-CP : Encourage reuse of waste, application of cleaner production technology, energy saving, implementation of industrial symbiosis and circular economy in concentrated production, business and service zones
- Article 65, Decree 08/2022/ND-CP stipulating the reuse, direct use and treatment of ordinary industrial solid waste
- Article 77, Decree 08/2022/ND-CP : Organizations and individuals manufacture and/or import into the Vietnamese market any products and packages specified in Column 3, Appendix XXII attached to this Decree, must carry out the responsibility to recycle these products and packages according to the compulsory recycling rates and recycling specifications specified in Column 4, Appendix XXII

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Draft guideline framework on solid waste reuse in industrial park: Legal basis (3)

- Article 24 Circular 02/2022/TT-BTNMT: The list of hazardous wastes, industrial wastes subject to control and ordinary industrial solid wastes and waste codes is specified in Form No. 01, Appendix III issued. attached to this Circular. Ordinary industrial solid waste is recovered, classified, selected for reuse, direct use as raw materials and fuels for production activities (symbol TT-R)
- Article 35, Clause 3, Circular 02/2022/TT-BTNMT: In case hazardous wastes are reused, preliminarily processed, recycled, treated, co-treated, and recovered energy on site according to granted environmental permits, the hazardous waste source owner can choose to classify or not classify hazardous waste

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Draft guideline framework on solid waste reuse in industrial park: Legal basis (4)

- Article 36, Clause 2a, Decree 35/2022/ND-CP : Enterprises in industrial parks shall cooperate with each other for the common use of technical and social infrastructure works, services, raw materials and inputs for production; reuse raw materials, excess water, energy, waste and scrap of their own and other enterprises in the industrial park to reduce costs, improve operational efficiency and competitiveness
- Article 36, Clause 2b, Decree 35/2022/ND-CP: Enterprises in industrial parks may cooperate with third parties to implement industrial symbiosis. Third parties include investors implementing industrial park infrastructure construction and business, and other enterprises providing infrastructure works or construction services to support development and implementation of industrial symbiosis

Approach to industrial solid waste reuse

Developing common economic interests based on economic gains and the interest and engagement of each enterprise

Determine material flows to ensure supply at local and regional levels to secure supplies and necessary resource diversification

Ensure long-term support of the state and regional authorities, including comprehensive and coherent strategies supplemented with binding objectives, regulations, subsidies and other economic incentives

Establishment of waste exchange centers in industrial parks to seek opportunities and promote industrial symbiosis, including helping enterprises find relevant partners, identify new synergy opportunities and develop business plans

Strategies for industrial solid waste reuse

1. Internal exchange (industrial solid waste reuse within the enterprise itself): enterprise can use industrial solid waste generated by a given production process to replace inputs from their own other production processes

2. External exchange (industrial solid waste reuse outsite the enterprise): entrprise transfers industrial solid waste generated in the production process to other enterprises for use in production process

Parties involved in the solid waste recycling process

In essence, reusing industrial solid waste to replace input materials in the production process is a corporate social responsibility, bringing economic benefits to the enterprise itself and protecting the environment, and increasing benefits for the community

The Industrial Park Management Board plays a supporting role in infrastructure development for enterprises to compliance with current legal regulations..

Enterprises are main responsible for choosing to participate in and actively implement all steps of the solid waste reuse process in the industrial symbiosis model

In many cases, it is necessary to have a group of technical consultants/experts to support and guide the implementation of these steps in accordance with the actual conditions of the enterprises

List of industrial solid wastes proposed for reuse in industrial parks in Vietnam (1)

No.	Type of waste	Waste code*	Regulations to be referred
1	Fly ash, slag ash from coal-fired, wood-fired thermal power	04 01 04 04 01 05 04 01 06 04 02 06	- Symbol TT in the List of hazardous wastes, industrial wastes subject to control and ordinary industrial solid waste** - TCVN 12249:2018 on coal ash of thermal power plant used as backfill material
2	Gypsum		
2.1	*Gypsum-based construction material waste*	*11 07 02*	*- Symbol TT-R in the List of hazardous wastes, industrial wastes subject to control and ordinary industrial solid waste*** *- Construction and demolition wastes are under the EU and Australian recyclable waste lists*
2.2	*Phosphorus gypsum from residues of H3PO4 production process*		*TCVN 11833:2017 Phosphorus gypsum for cement production*
3	Blast furnace grain slag		
3.1	*Black metallurgical blast furnace slag*	*05 08 07*	*- Symbol TT-R in the List of hazardous wastes, industrial wastes subject to control and ordinary industrial solid waste*** *- QCVN 67:2018/BTNMT on environment for imported slag from iron or steel indusstry for production*
3.2	*Non-ferrous metallurgical blast furnace slag*	*05 09 07*	
4	Sand used in casting moulds		
4.1	*Black metallurgical casting cores and mould*	*05 08 09*	*- Symbol TT-R in the List of hazardous wastes, industrial wastes subject to control and ordinary industrial solid waste*** *- QCVN 67:2018/BTNMT on environment for imported slag from iron or steel indusstry for production*
4.2	*Non-ferrous metallurgical casting cores and mould*	*05 09 08*	

List of industrial solid wastes proposed for reuse in industrial parks in Vietnam (2)

No.	Type of waste	Waste code*	Regulations to be referred
5	Packaging		
5.1	*Paper and cardboard packaging*	*18 01 05*	*- Symbol TT-R in the List of hazardous wastes, industrial wastes subject to control and ordinary industrial solid waste*** *- Waste packagings are under the EU and Australian recyclable waste list*
5.2	*Metal packaging*	*18 01 08*	
5.3	*Plastic packaging*	*18 01 06*	
5.4	*Glass packaging*	*18 01 09*	
5.5	*Wooden packaging*	*18 01 07*	
5.6	*Fabric packaging*	*18 01 10*	
5.7	*Composite and other material packaging*	*18 01 11*	
6	Plastics (HDPE, LDPE, PET, PP)		
6.1	*Plastic waste*	*03 02 12*	*- Symbol TT-R in the List of hazardous wastes, industrial wastes subject to control and ordinary industrial solid waste*** *- QCVN 32:2018/BTNMT on environment for imported plastic scrap for production*
6.2.	*Plastic pouring mould*	*07 03 15*	
6.3	*Plastic waste from construction and demolition*	*11 02 04*	
6.4	*Plastics from preliminary mechanical processing of waste at the place of generation or transshipment*	*12 08 06*	
6.5	*Plastics from demolition and maintenance of transport equipment and vehicles*	*15 01 17*	
6.6	*Plastics recovered from discarded electrical and electronic equipment (via EPR mechanism)*	*Refer to item 17 of this table*	*- Appendix XXII. List of products and packaging to be recycled, compulsory recycling rate and recycling specifications (Attached to Decree No. 08/2022/ND-CP)* *- QCVN 32:2018/BTNMT on environment for imported plastic scrap for production*

List of industrial solid wastes proposed for reuse in industrial parks in Vietnam (3)

No.	Type of waste	Waste code*	Regulations to be referred
7	Paper and cardboard		
7.1	*Paper, cardboard from preliminary mechanical processing of waste at the place of generation or transshipment*	*12 08 03*	*- Symbol TT-R in the List of hazardous wastes, industrial wastes subject to control and ordinary industrial solid waste*** *- QCVN 33:2018/BTNMT on environment for imported paper scrap for production*
8	Glass		
8.1	*Waste glass*	*06 01 10*	*- Symbol TT-R in the List of hazardous wastes, industrial wastes subject to control and ordinary industrial solid waste*** *- QCVN 65:2018/BTNMT on environment for imported glass scrap for production*
8.2	*Waste glass from construction and demolition*	*11 02 03*	
8.3	*Glass from preliminary mechanical processing of waste at the place of generation or transshipment*	*12 08 07*	
8.4	*Glass from demolition and maintenance of transport equipment and vehicles*	*15 01 18*	
8.5	*Glass recovered from discarded electrical and electronic equipment (via EPR mechanism)*	*Refer to item 17 of this table*	*- Appendix XXII. List of products and packaging to be recycled, compulsory recycling rate and recycling specifications (Attached to Decree No. 08/2022/ND-CP)* *- QCVN 65:2018/BTNMT on environment for imported glass scrap for production*

List of industrial solid wastes proposed for reuse in industrial parks in Vietnam (4)

No.	Type of waste	Waste code*	Regulations to be referred
9	Wood		
9.1	*Bark and cork removed from wood processing*	*09 01 02*	*- Symbol TT-R in the List of hazardous wastes, industrial wastes subject to control and ordinary industrial solid waste*** *- Construction and demolition wastes are under the EU and Australian recyclable waste lists*
9.2	*Wood chips from pulp, paper and cardboard production*	*09 03 01*	
9.3	*Sawdust, shavings, wood cuttings and scraps, chipboard and veneer*	*09 01 03*	
9.4	*Wood from construction and demolition*	*11 02 02*	
9.5	*Wood from preliminary mechanical processing of waste at the place of generation or transshipment*	*12 08 08*	
10	Textile and garment waste		
10.1	*Wastes from unprocessed or processed textile fibres*	*10 02 10*	*- Symbol TT-R in the List of hazardous wastes, industrial wastes subject to control and ordinary industrial solid waste*** *- Textile waste is under the Australian recyclable waste list*
10.2	*Fabrics and fibers from preliminary mechanical processing of waste at the place of generation or transshipment*	*12 08 09*	
11	Rubber, tyres		
11.1	*Rubber from preliminary mechanical processing of waste at the place of generation or transshipment*	*12 08 06*	*- Symbol TT-R in the List of hazardous wastes, industrial wastes subject to control and ordinary industrial solid waste*** *- Waste rubber, tyres are under the EPA, EU and Korea recyclable waste lists*
11.2	*End of-life tyres*	*15 01 10*	
12	Vehicles		
12.1	*Dismantled end-of-life vehicles (containing neither liquids nor other hazardous components)*	*15 01 11*	*- Symbol TT-R in the List of hazardous wastes, industrial wastes subject to control and ordinary industrial solid waste*** *- End-of-life vehicles are under the EPA and EU recyclable waste lists*
12.2	*Completely empty tanks for liquefied gas*	*15 01 14*	
12.3	*Parts, equipment and components not containing hazardous wastes from dismantling and maintaining waterway transport means*	*15 02 15*	

List of industrial solid wastes proposed for reuse in industrial parks in Vietnam (5)

No.	Type of waste	Waste code*	Regulations to be referred
13	Iron and steel, non-ferrous metals		
13.1	*Mill scalles*	*05 01 08*	*- Symbol TT-R in the List of hazardous wastes, industrial wastes subject to control and ordinary industrial solid waste*** *- QCVN 31:2018/BTNMT on environment for imported steel scrap for production* *- QCVN 66:2018/BTNMT on environment for imported non-ferrous metal scrap for production*
13.2	*Waste alumina*	*05 02 13*	
13.3	*Discarded hard zinc (crumbs, lumps, bars, plates)*	*07 02 04*	
13.4	*Discarded ferrous metal casting moulds and filings*	*07 03 12*	
13.5	*Discarded non-ferrous metal casting moulds and filings*	*07 03 14*	
13.6	*Metals and alloys of all kinds not mixed with hazardous wastes from construction and demolition*	*11 04 03*	
13.7	*Metal cables from construction and demolition*	*11 04 04*	
13.8	*Ferrous metals recovered from bottom ash of the incinerator not mixed with hazardous waste*	*12 01 09*	
13.9	*Ferrous metals from preliminary mechanical processing of waste at the place of generation or transshipment*	*12 08 04*	
13.10	*Non-ferrous metals from preliminary mechanical processing of waste at the place of generation or transshipment*	*12 08 05*	
13.11	*Ferrous metals from dismantling and maintaining transport means*	*15 01 15*	
13.12	*Non-ferrous metals from dismantling and maintaining transport means*	*15 01 16*	

List of industrial solid wastes proposed for reuse in industrial parks in Vietnam (6)

No.	Type of waste	Waste code*	Regulations to be referred
14	Construction and demolition		
14.1	*Bricks*	*11 01 03*	*- Symbol TT-R in the List of hazardous wastes, industrial wastes subject to control and ordinary industrial solid waste*** *- Construction and demolition wastes are under the EU and Australian recyclable waste lists*
14.2	*Tiles and ceramics*	*11 01 04*	
14.3	*Rock ballast*	*11 05 07*	
14.4	*Insulation materials*	*11 06 05*	
15	Unused products discarded from off-specification batches and unused products		
15.1	*Inorganic products*	*19 03 03*	*- Symbol TT-R in the List of hazardous wastes, industrial wastes subject to control and ordinary industrial solid waste*** *- Wastes are under the EPA, EU and Australian recyclable waste lists*
15.2	*Organic products*	*19 03 04*	
16	Waste from agricultural product processing		
16.1	*Animal-tissue waste*	*14 03 02*	*- Symbol TT-R in the List of hazardous wastes, industrial wastes subject to control and ordinary industrial solid waste*** *- Wastes are under the EU and Australian recyclable waste lists*
16.2	*Materials unsuitable for consumption or processing*	*14 03 03* *14 04 03* *14 06 01* *14 07 01* *14 08 04*	
16.3	*Wastes from spirits distillation*	*14 08 02*	

List of industrial solid wastes proposed for reuse in industrial parks in Vietnam (7)

No.	Type of waste	Waste code*	Regulations to be referred
17	Sludge and mud		
17.1	*Mud dredged from construction and demolition activities*	*11 05 06*	*- Symbol TT-R in the List of hazardous wastes, industrial wastes subject to control and ordinary industrial solid waste**** *- Wastes are under the EU and Australian recyclable waste lists*
17.2	*Sludge from water supply treatment system, wastewater treatment system not containing hazardous components*	*01 04 11* *12 09 07* *12 10 02* *14 03 04* *14 04 01* *14 05 03* *14 06 02* *14 07 03* *14 08 05*	*- Symbol TT in the List of hazardous wastes, industrial wastes subject to control and ordinary industrial solid waste** *- According to regulations and standards issued by MARD****
17.3	*Digestate from anaerobic treatment of animal and vegetable waste*	*12 05 07*	
18	Electricity - electronics (via EPR mechanism)	19 01 10 19 02 07	- Symbol TT in the List of hazardous wastes, industrial wastes subject to control and ordinary industrial solid waste* - Appendix XXII. List of products and packaging to be recycled, compulsory recycling rate and recycling specifications (Attached to Decree No. 08/2022/ND-CP) *- Wastes are under the EPA, EU, Australian and Korea recyclable waste lists*

Implementation process of industrial solid waste reuse

Step 1. Preliminary assessment: current situation and needs as an alternative

Purpose: to identify the characteristics of the IP, and the needs of enterprises and stakeholders

Information to be collected for preliminary assessment:

- Type and number of businesses or other organizations involved (activity sector, number of employees, etc.)
- Raw material inputs of enterprises in industrial zones
- Type, quantity and method of industrial solid waste treatment

Step 2. Encourage cooperation: raise awareness, identify potential partners, promote cooperation

Purpose: to help enterprises realize the problem to be solved or the potentials for optimizing and sharing resources through industrial symbiosis

Activities for implementation:

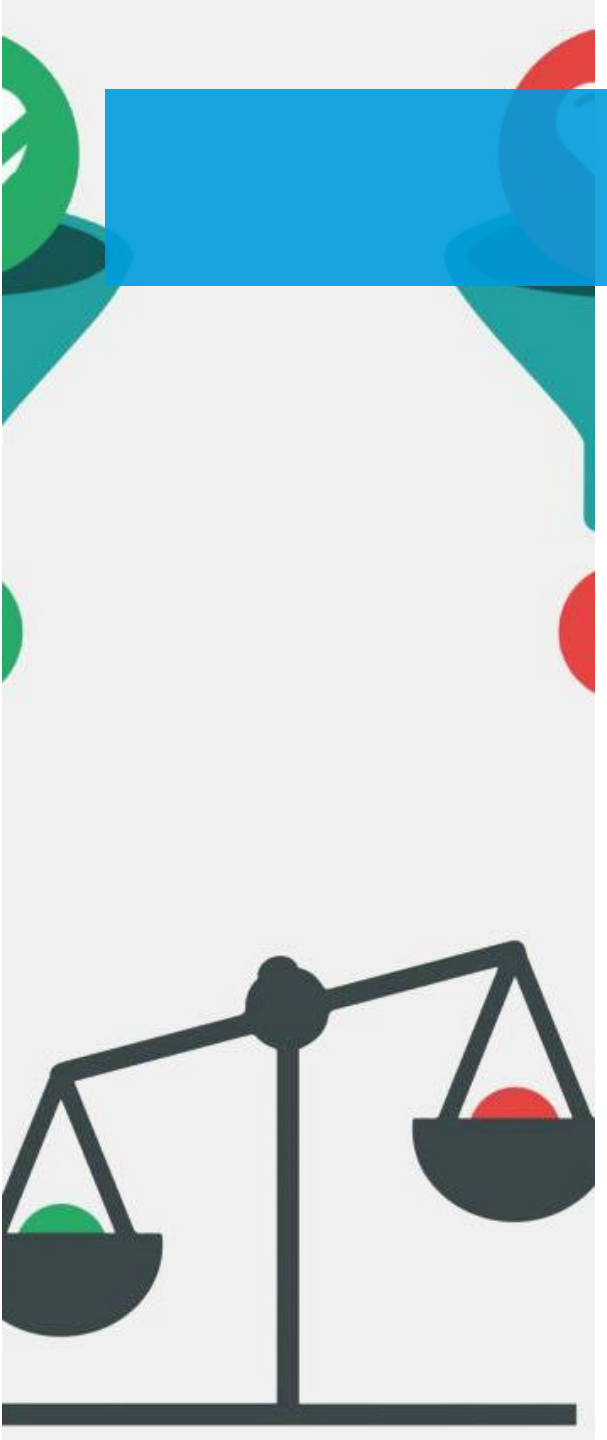
- *Communication of benefits of industrial symbiosis, solid waste reuse to receive from business leadership a clear and strong commitment to implementation*
- *Promotion of management support from the Industrial Park Management Board to ensure the consistency of stakeholders' environmental goals and form a culture of industrial symbiosis practice among businesses*
- *Establishment of solid waste exchange center in the IP to provide information on solid waste that can be exchanged between enterprises, and at the same time receive and preliminarily treat solid waste before transferring them to businesses that have needs outside the IZ*

Step 3. Analyze opportunities: collect data, share information; input/output and technology process analysis; looking for cooperation opportunities

Purpose: to find opportunities to implement industrial symbiosis, solid waste reuse

Activities for implementation:

- *Solid waste audit*
- *Solid waste classification*
- *Identify problematic material flows (wasting resources, sending material to landfill, lack of recovery options, high disposal costs, etc.) to quantify potential supply available*
- *Identify possible linkages between proposed enterprises for further analysis to plan implementation*
- *Assess existing infrastructure and solid waste-related services to identify sectors and services that are lacking or need improvement.*
- *Identify local and external resources available to support the various steps in the process*



Step 4. Determination of feasibility: cost benefit analysis; consideration of implementation options; assessment of risks

Purpose: to prioritize the possible options

Activities for implementation:

- Analysis and consideration of technical factors in all affected units of the enterprise
- Analysis and consideration of economic factors: one-off cost of implementation (capital investment, design, costs of testing and implementation); ongoing cost of operating or maintaining the solution on an ongoing basis (operating costs, maintenance costs); savings from associated costs (material costs and other related costs) and disposal costs
- Analysis and consideration of environmental factors: how much waste can be reduced; environmental costs-benefits of the proposed solutions; will be there other environmental problems?
- Overall assessment and prioritization of the most feasible options to reduce waste flows and select cooperation opportunities

Step 5. Implementation: industrial solid waste transaction execution; environmental, economic and social impact assessment; monitoring and reporting (1)

Purpose: to exchange and reuse solid waste

Activities for implementation:

- *Inform participating enterprises about the possibility of cooperation*
- *Support participating enterprises in decision making and implementation of recommendations*
- *Check and evaluate the feasibility (economic, technical, logistic, etc.) based on the criteria of the acceptability of enterprises. Where necessary can be through preliminary laboratory testing, on-site technology testing or expert consultation*
- *Set terms of waste exchange*
- *Identify obstacles to collaborative performance and how to overcome them, as needed.*
- *Monitor progress of the exchange, collect feedback, and share results. Evaluation and monitoring must be carried out regularly to ensure that the implementation plan is continuously updated*

Step 5. Implementation: industrial solid waste transaction execution; environmental, economic and social impact assessment; monitoring and reporting (2)

Indicators to support monitoring and evaluation:

- *Economic indicators: Primary material cost savings; Water cost savings; Equipment and infrastructure cost savings; Operating and management cost savings; Waste treatment cost savings; Waste disposal cost savings; Savings from avoided purchase of greenhouse gas allocations; Savings from avoided regulatory fines; Revenue from the sale of secondary materials; Revenue from the creation of new products or services; Revenue from the sale of greenhouse gas emission allocations; Improve reputation and increase competitiveness*
- *Environmental indicators: Amount of waste generated (including hazardous waste); Amount of primary raw material saved; Amount of energy saved; Amount of water saved; Amount of GHG emitted; Number of environmental certificates obtained; Number of eco-design products*
- *Technical indicators: Number of processes optimized; Level of process optimization achieved; Amount of time saved; Number of shared facilities or equipment; Number of new technology developed; Number of technology transferred*
- *Social indicators: Number of jobs created; Number of shared services; Number of shared spaces and facilities; Number of corporate social responsibility (CSR) certifications obtained; Number of new stakeholders; Number of trainings offered; Rate of health and safety incidents; Rate of business cooperation; Rate of community participation; Rate of organization and community awareness; Level of social acceptance*

Step 6. Report and lessons learned

Purpose: Experience sharing to improve the success rate of industrial symbiosis model, industrial solid waste reuse

Principles of information sharing:

- *Professional conduct (respect of confidentiality, no conflict of interest in proposal of potential synergies, transparency of the partnership, etc.)*
- *Good relationship with the network of environmental service providers*
- *Priority focus given to synergies showing strong potential*
- *Dissemination of feedback from organizations that have implemented sybergies to inform the public about their experiences and benefits of industrial symbiosis, industrial solid waste reuse*
- *Timeline to continue working closely with participating organizations*

Some barriers to industrial symbiosis, industrial solid waste reuse

- Lack of commitment by managers in developing and participating in symbiotic projects
- Lack of information sharing, hindering discovery of new connections and limiting opportunities for new potential exchanges between enterprises
- Lack of cooperation and trust, especially on the longer term, it can hinder discovery of new symbionts and development of the whole network
- Technical infeasibility due to failure to meet for technical knowledge, time and effort to develop new technologies, as well as for quantity, quality and availability of resource-waste exchanged
- Uncertainty in environmental legislation
- Communities are not fully aware of environmental and social benefits brought by industrial symbiosis
- Economic infeasibility due to lack of appropriate market conditions to create opportunities for industrial symbiosis, e.g. too high additional transaction costs and insignificant economic gains to meet the cost – benefit requirements

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