



# The EIP concept and its benefits, including RECP and Industrial Symbiosis (IS)





## Agenda

- ✓ Introduction to Eco-Industrial Parks
- ✓ Eco-Industrial Park baseline and opportunity assessment
- ✓ Introduction to RECP
- ✓ Introduction to Industrial Symbiosis
- ✓ Discussion and Q&A



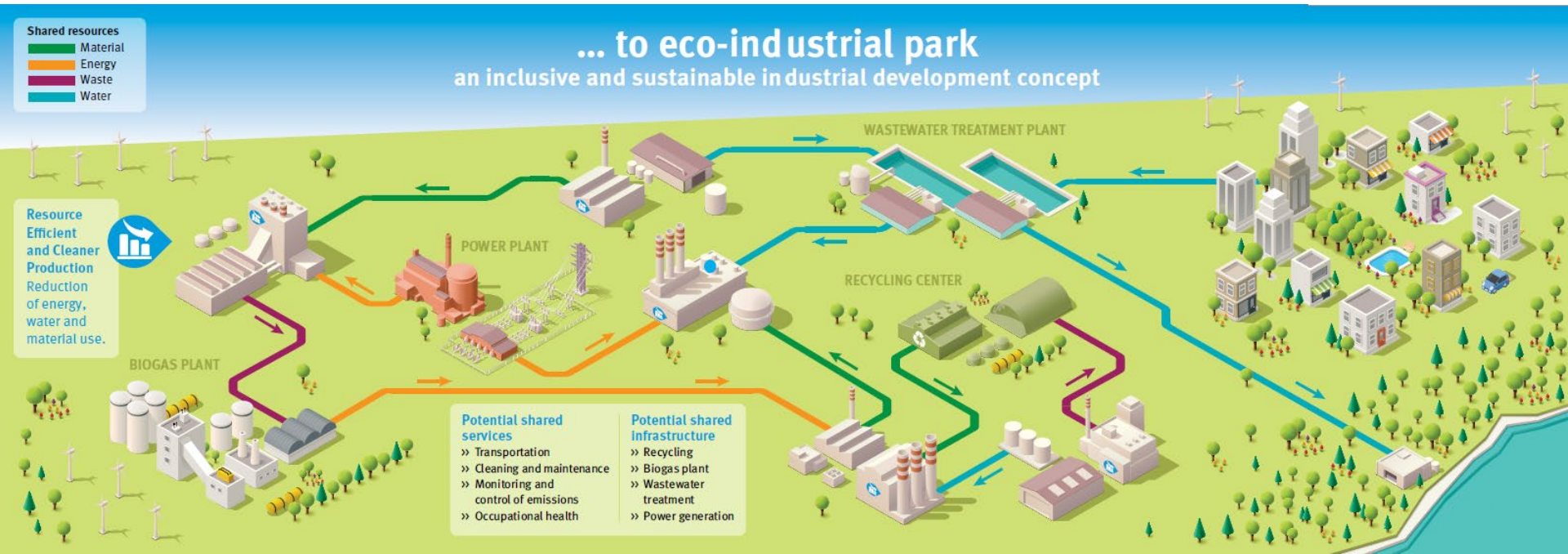


# Introduction to Eco-Industrial Parks



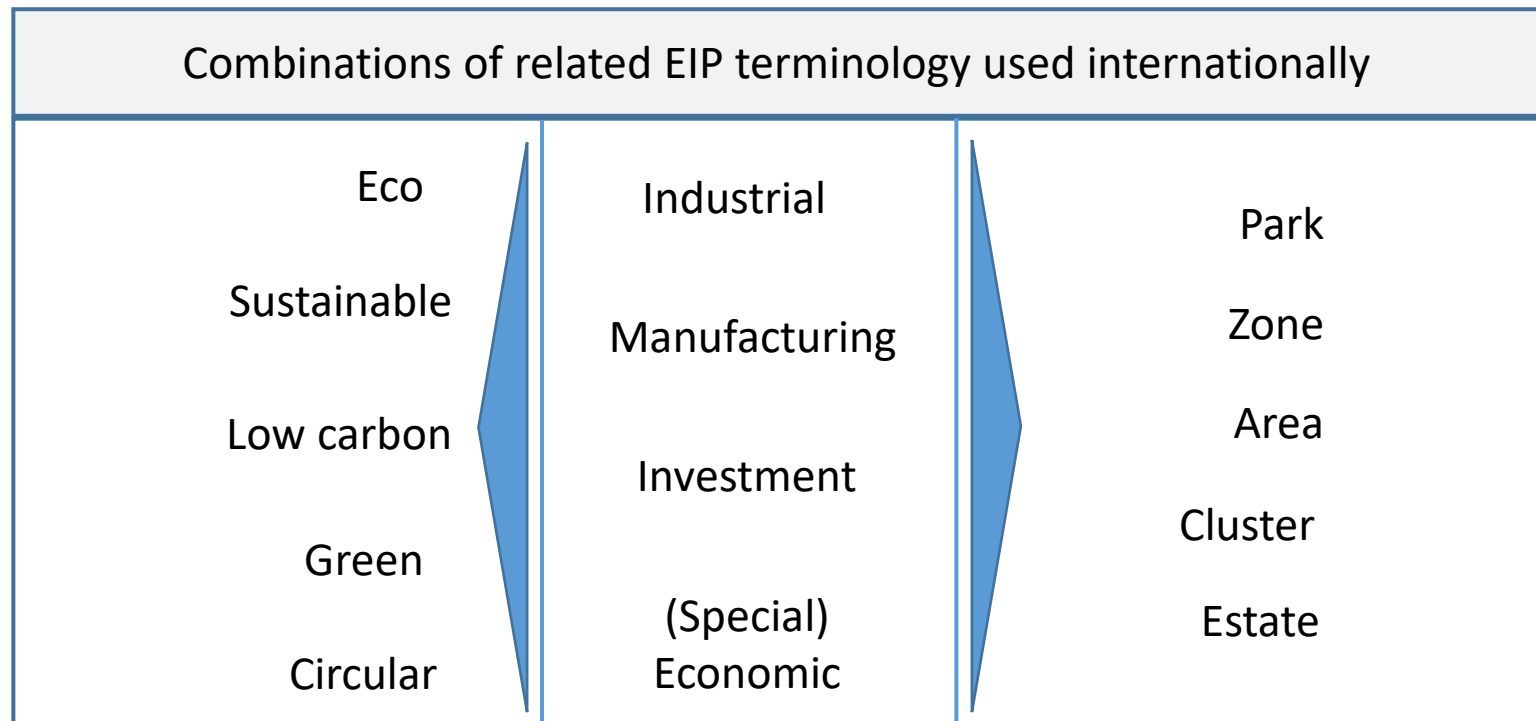
# Eco-Industrial Park (EIP): Definition

“... is a **community of manufacturing and service businesses** located on common property. Members seek **enhanced environmental, economic and social performance** through **collaboration** in managing environmental and resource issues.” *(Lowe 1997)*



# Different terminologies are used internationally

But all based on same principles and concept



# Combination of EIP and Sustainable Cities: International Methodology

*“Industrial-urban symbiosis fosters inclusive and sustainable industrial development through outward integration”*

## Company



- Resource Efficiency & Cleaner Production
- Low Carbon Technology
- Green Chemistry
- Renewable Energy

## Industrial Park

Collective resource efficiency solutions



- Resources
- Infrastructure
- Supply
- Services



## Urban Symbiosis

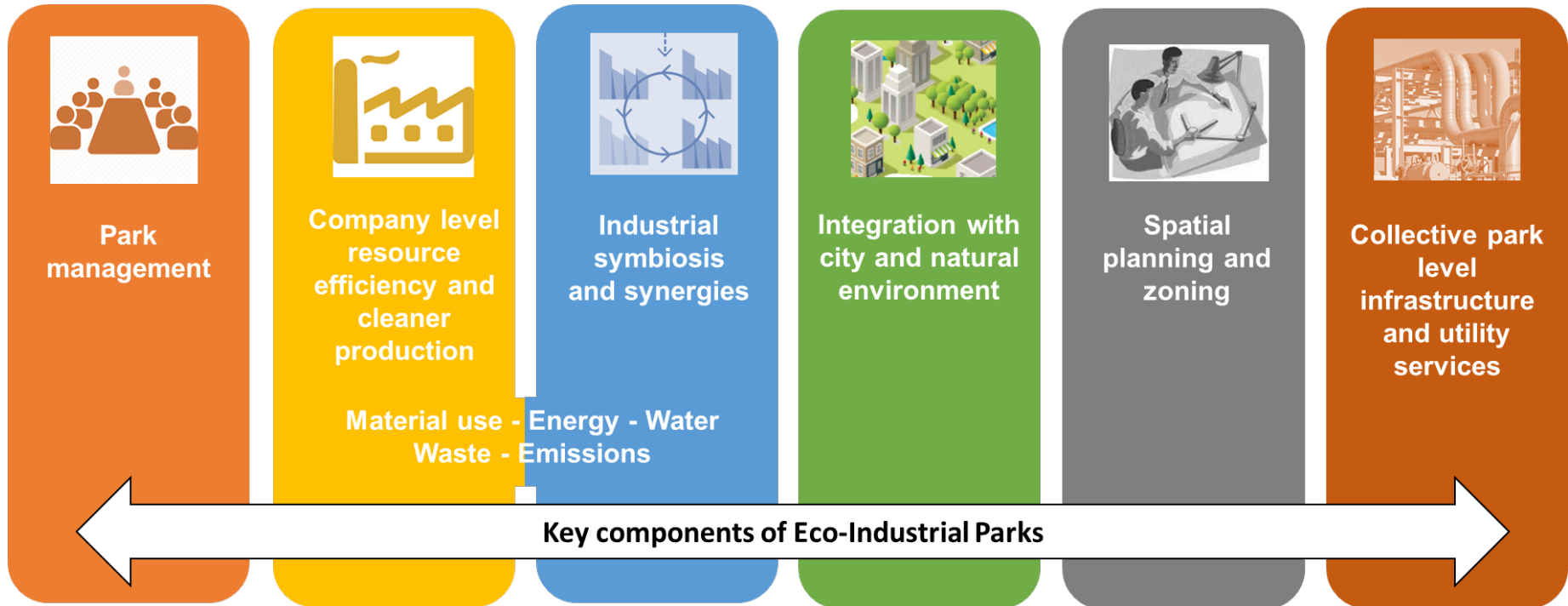


- Waste Management
- Recycle
- Corporate Social Responsibility

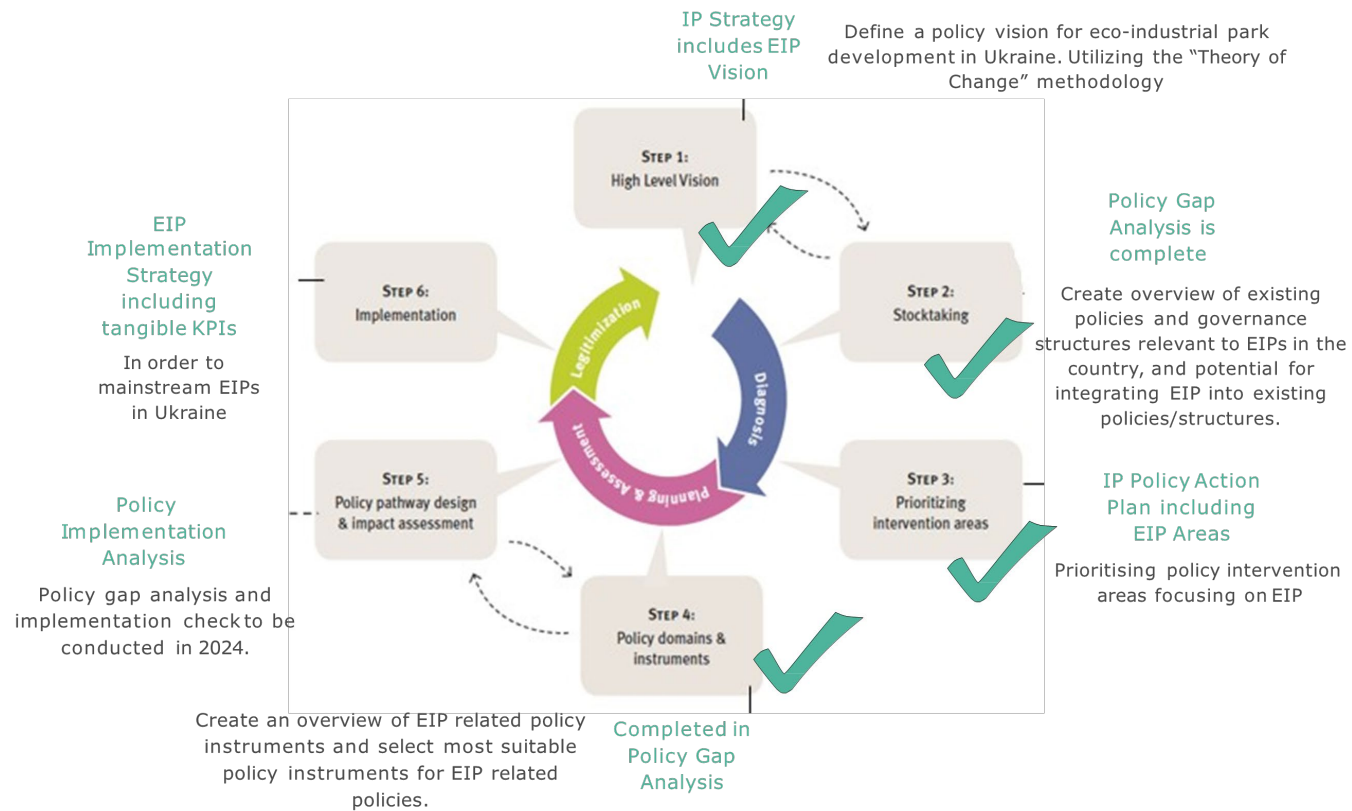
## Sustainable Cities



# Key EIP components



# Ukraine EIP policy status





# Ukraine IP Roadmap summary

## Objective 1

Improve the legal framework for the creation, operation and development of industrial parks ensuring the practical implementation of the model of eco-industrial park in Ukraine

## Objective 2

Establishment of financial and economic incentives for the IPs and ensure scaling up and multiplication of IPs that are environmentally and socially conscious

## Objective 3

Incorporation of initiatives for the generation of new IPs

## Objective 4

Establish cooperation with relevant international organizations, governmental and non-governmental organizations of Ukraine and foreign countries to attract investments and ensure operation of IPs

## Objective 5

Institutionalization of the mechanism for forming and implementing state policies on IP creation and operation

## Objective 6

Facilitate the development (transformation) of IPs based on the EIP model



# Greenfield vs. Brownfield EIPs

## Development of new eco-industrial parks

- + Optimise design of park from start - “empty canvas”
- + Allow for strategic planning of parks across country
- Uncertainties about industry mix and needs
- Upfront investments

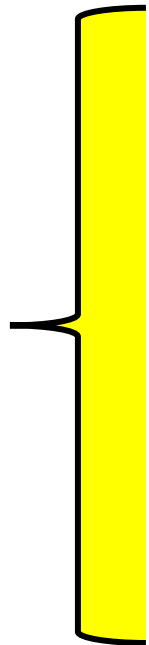


## Optimising existing industrial parks

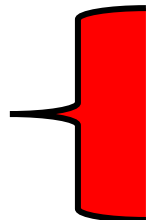
- + Build upon existing industry initiatives
- + Certainty about industry mix and needs
- Retrofitting existing infrastructure
- Dealing with “historical legacies”



# Eco-Industrial Parks: Success Factors



- Strong coordination (management center), decision-making capacity of on-site companies
- Supportive government and policies (social corporate responsibility), enforced monitoring
- Good collaboration between economic players and local stakeholders
- Cooperation with academia and research centers
- Value added from efficiency towards industrial symbiosis
- Diversity of industrial sectors and economic activities generate new sets of feedback flows. Strong linkages between EIP and agriculture
- Instruments: Toolbox, requirements, certifications



- Trade-off logic between industrial development and environment
- Insufficient inclusion of social and economic dimensions
- Insufficient priority on shared infrastructure and water management

# Key benefits of EIPs

## Beneficiaries

Authorities

Environment

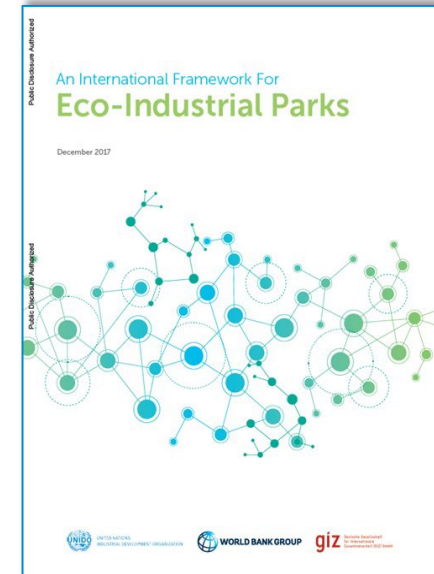
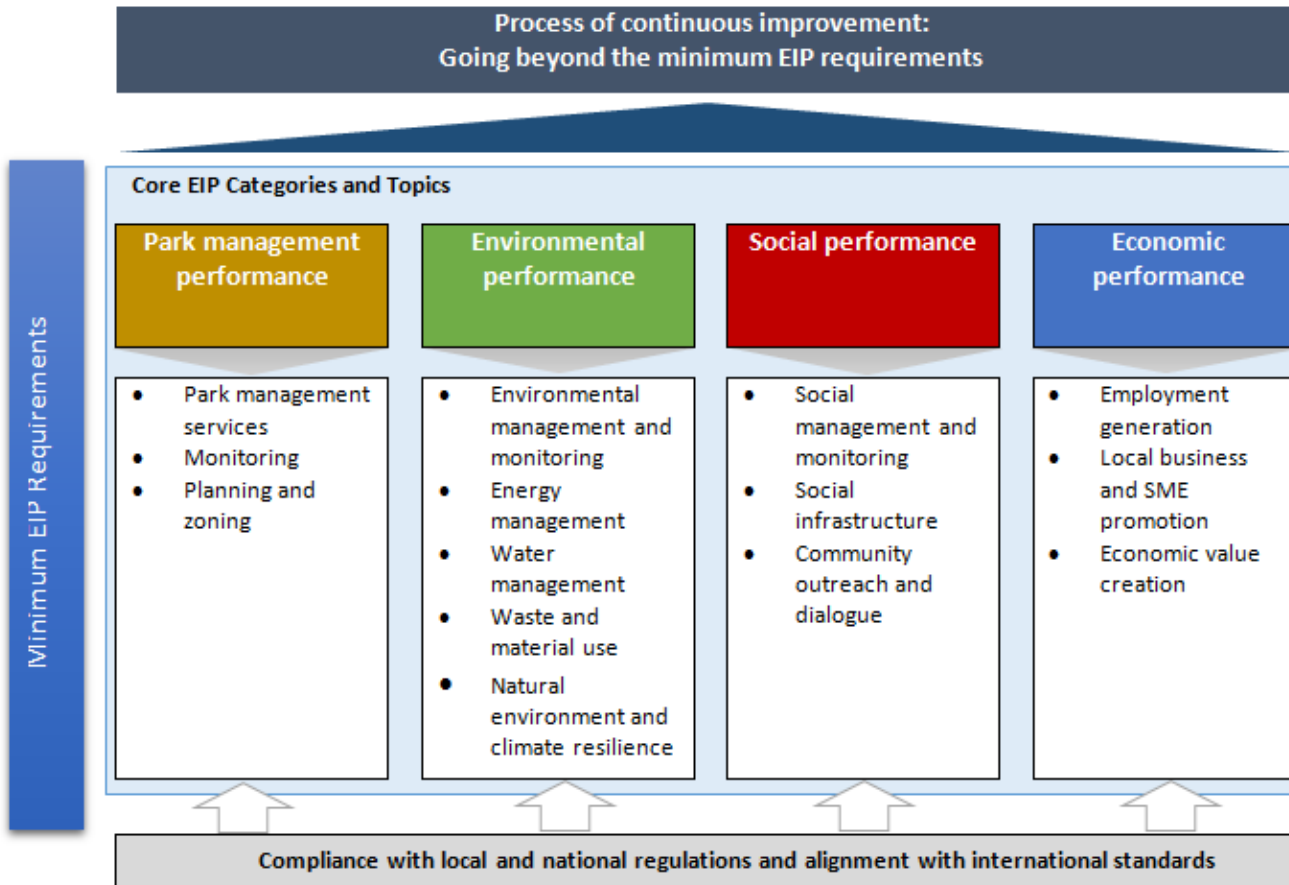


Industries

Cities

- Reduced use of raw materials, water and energy
- Minimized GHG emissions, reduced release of POPs and (toxic) chemicals use
- Reduced waste through resource circularity
- Shared recycling facilities
- Improved competitiveness and profitability
- Creation of good-quality jobs
- Improved workers health and safety
- Increased quality of life for communities
- Better access to new technologies and finances

# International Framework for EIPs



UNIDO, World Bank Group, GIZ (2017). An International Framework for Eco-Industrial

- <https://openknowledge.worldbank.org/handle/10986/29110>

Version 2.0 released February 2021:

- <https://openknowledge.worldbank.org/handle/10986/35110>

# Overview of UNIDO's tools

We will use selected tools during the training

UNIDO's EIP Tools	Scope of the tools			
	Existing industrial parks (Brownfields)	New industrial parks (Greenfields)	Technical	Organizational and political
EIP Selection Tool	√	(√)	√	√
EIP Policy Support Tool	√	√		√
EIP Assessment Tool	√		√	√
Industrial Symbiosis Identification Tool	√	√	√	
RECP Monitoring Tool	√		√	
Industrial Synergies Monitoring Tool	√		√	
EIP Concept Planning Tool	√	√	√	
Access to Finance Tool	√	√	√	√

Upcoming tools

UNIDO's EIP Toolbox is freely available online: <https://www.greenindustryplatform.org/initiatives/global-eco-industrial-parks-programme>



# Eco-Industrial Park baseline and opportunity assessment





# Eco-Industrial Park: Minimum Requirements

- **Aim:** to achieve a balance between developing a meaningful level of requirements and indicators that can appropriately **distinguish genuine Eco-Industrial Parks** from “traditional” or **poorly performing industrial parks**.
- Structure of the requirements:
  - **Topics:** key topics and sub-topics which are considered relevant as components/ requisites of Eco-Industrial Parks and their environmental, social and economic performance.
  - **Criteria:** performance indicators for each of the (sub-) topics, including clarification if the indicator is applicable to greenfield and/or brownfield industrial park.
  - **Requirements:** minimum performance level requirements for each indicator.

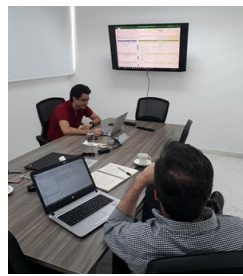


## Eco-Industrial Park: Performance Indicators

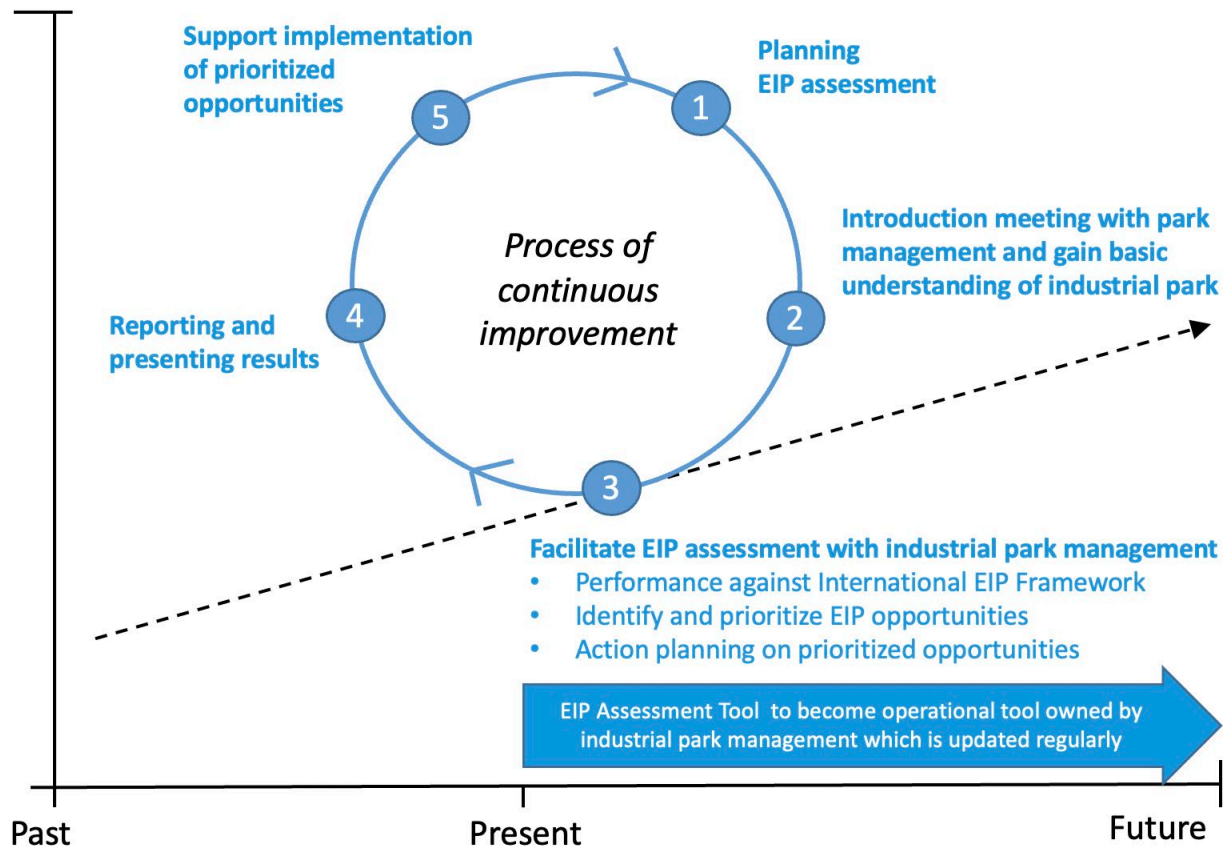
- Focus on **key environmental, social, and economic impacts**, rather than focusing on very detailed requirements which may differ per industrial park
- Key focus on “**compliance +**” types of indicators as **compliance** with national and local regulations should be **the minimum requirements for all industrial parks**
- Aim for maximum three indicators per (sub-) topic in order to keep indicator set **practical and manageable**
- Include indicators which can be **monitored, managed or influenced** by the **park management or companies** in the industrial park
- Consider **data availability, measurability** and confidentiality. Indicators should not extensively burden the park operator entity or companies
- Achieve a balance of **qualitative** and **quantitative** indicators

# EIP baseline and opportunity assessment

- Assess an industrial park against the International Framework for Eco-Industrial Parks (UNIDO, WBG and GIZ, 2017)
- Identify and prioritize EIP improvement opportunities for industrial park
- Plan, manage and monitor EIP opportunities



# Steps of EIP baseline and opportunity assessment

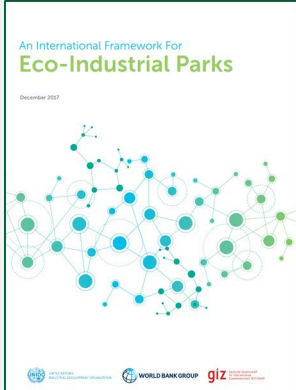


# UNIDO EIP Assessment Tool

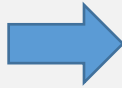
## Objectives of EIP Assessment Tool:

- Assess an industrial park against the International Framework for Eco-Industrial Parks (UNIDO, WBG and GIZ, 2017)
- Identify and prioritize EIP improvement opportunities for industrial park
- Plan, manage and monitor EIP opportunities

### International EIP Framework



### EIP Assessment Tool



**EIP ASSESSMENT TOOL: INSTRUCTIONS**

**RATIONALE FOR THE TOOL**

The management of an industrial park plays a crucial role in the daily operations of the industrial park property, ensuring the continuous implementation of EIP opportunities and engaging with the park's stakeholders, including resident firms, communities, and regulating bodies. An effective park management structure is a key requisite for a successful EIP development. It is important for park management to understand their performance against international EIP benchmarks to identify gaps and take action on EIP opportunities which are achievable and can generate substantial benefits (e.g. economic, environmental, and social).

**TOOL OBJECTIVES**

The objective of this tool is to assess an industrial park against the International Framework for Eco-Industrial Parks (UNIDO, WBG and GIZ, 2017) and subsequently identify, prioritize, plan, manage and monitor eco-industrial park initiatives. It can be used and adapted to all types of existing (brownfield) industrial parks and management structures (e.g. private company, public authority, public private set-up, real estate).

**STEPS AND INSTRUCTIONS**

The tool is designed to be used by international development agencies (e.g. by UNIDO staff members as part of EIP projects) and service providers (e.g. National Cleaner Production Centres, consulting companies) who work with industrial park management units in their countries.

**STEPS IN TOOL**

**STEP 1**

Assess industrial park performance against the prerequisites and performance indicators of the International EIP Framework

**STEP 2**

[CLICK HERE TO START](#)

**DETAILED INSTRUCTIONS**

Together with park management team, go through the benchmarks of the International EIP Framework and assess to what extent the park meets each benchmark. This assessment is done for the park's current performance, but can also be done for its future intended performance (e.g. 2-3 years).

If a benchmark is not met, brainstorm about a specific opportunity that could be undertaken by park management and/or companies in order to meet the benchmark. Write down the consolidated opportunities in the respective cells.

For each of the EIP opportunities identified, select a qualitative rating (e.g. Low, Medium, High) of the likely achievability, anticipated benefits and interest from park management and companies to work on the opportunity.

**ESTIMATED TIME TO COMPLETE TOOL**

Time investment is subject to desired level of detail	Simple basic analysis	Detailed analysis
Expert / consultant	2 to 3 person days	3 to 5 person days
Park management	1 person day	2 person days
Location where step can be undertaken	Preparatory work can be done at office of expert(s). Step 1 should be completed at park management office with team	
Time investment is subject to desired level of detail	Simple basic analysis	Detailed analysis
Expert / consultant	1 to 2 person days	2 to 4 person days

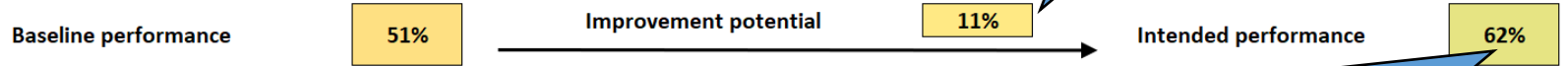


# EIP score card for Viet Nam

## EIP SCORE CARD VIET NAM: COUNTRY LEVEL

### COMPLIANCE LEVELS AGAINST INTERNATIONAL EIP FRAMEWORK

Average of 8 industrial parks assessed in Viet Nam. Compliance formula = Counts "Yes" / (Total number of responses - Counts "Not applicable")



Overall improvement potential for all parks is 11% for all benchmarks of International EIP Framework

#### PARK MANAGEMENT

High baseline compliance on park management

Overall intended performance against International EIP Framework of all four assessed parks at end of GEIPP is 62%

Low baseline compliance on "Local community outreach"

	Baseline performance	Improvement potential	Intended performance
<b>Park management overall</b>	78%	8%	86%
Park management services	88%	0%	88%
Monitoring and risk management	59%	13%	72%
Planning and zoning	88%	13%	100%
<b>Social performance overall</b>	32%	9%	41%
Social management systems	40%	6%	46%
Social infrastructure	43%	15%	58%
Local community outreach	13%	6%	19%

#### ENVIRONMENTAL PERFORMANCE

Improvement potential economic performance is highest overall, compared to other categories

#### ECONOMIC PERFORMANCE

	Baseline performance	Improvement potential	Intended performance
<b>Environmental performance overall</b>	41%	11%	52%
Management and monitoring	25%	6%	31%
Energy	46%	2%	48%
Water	56%	9%	66%
Waste and material use	38%	13%	50%
Climate change and the natural environment	43%	23%	65%
<b>Economic performance overall</b>	58%	15%	74%
Employment creation	67%	17%	83%
Local business and SME promotion	38%	4%	42%
Economic value creation	71%	25%	96%

High improvement potential for "Climate change and the natural environment"

High improvement potential for "Economic value creation"

Note: Score card is based on 8 industrial parks assessed in Viet Nam. Performance indicators which are fully met.

# Examples of technical assistance per topic of International EIP Framework

Topics EIP Framework	Common technical assistance options
<b>Park management</b>	
(Basic) park management services	<ul style="list-style-type: none"> <li>• Set up and operate a well-functioning park management entity.</li> <li>• Set up and effectively operate contracts/charters/agreements with tenant companies.</li> <li>• Upgrade services and common infrastructures which meet demands of existing and new tenant companies.</li> </ul>
Monitoring and risk management	<ul style="list-style-type: none"> <li>• Set up and maintain a plan to react to possible negative impacts due to climate change risks.</li> <li>• Set up and maintain a functioning system to comply with regulations and international standards.</li> <li>• Set up and maintain sustainability reporting for the park (e.g. in line with International EIP Framework).</li> </ul>
Planning and zoning	<ul style="list-style-type: none"> <li>• Develop a Master Plan incorporating all key building blocks of Master Planning and embedding EIP approaches.</li> </ul>

Topics EIP Framework	Common technical assistance options
<b>Environmental performance</b>	
Management and monitoring	<ul style="list-style-type: none"> <li>• Set up and maintain environmental / energy management system for industrial park.</li> <li>• Set up and maintain environmental / energy management system.</li> </ul>
Energy	<ul style="list-style-type: none"> <li>• Energy efficiency and RECP related approaches.</li> <li>• Identify and assess renewable energy opportunities in the park, including feasibility studies.</li> <li>• Support access-to-finance investigations.</li> </ul>
Water	<ul style="list-style-type: none"> <li>• Water efficiency and RECP related approaches.</li> <li>• Industrial effluent treatment standards and treatment processes.</li> <li>• Identify and assess industrial effluent reuse opportunities in the park and feasibility studies on potential reuses.</li> </ul>
Waste and material use	<ul style="list-style-type: none"> <li>• Identify and assess available waste and materials streams in the park, and feasibility studies on potential reuses.</li> <li>• Resource efficiency and RECP related approaches.</li> <li>• Identify and assess waste avoidance, minimisation, reuse opportunities in the park and feasibility studies.</li> </ul>
Climate change and the natural environment	<ul style="list-style-type: none"> <li>• Monitoring, managing, and minimizing GHG emissions.</li> <li>• Assess operational environmental impact and minimize impacts on prioritized ecosystems.</li> <li>• Set up and maintain risk management frameworks.</li> </ul>

Topics EIP Framework	Common technical assistance options
<b>Social performance</b>	
Social management systems	<ul style="list-style-type: none"> <li>• Plan and manage social quality standards.</li> <li>• Set up and maintain OH&amp;S management system.</li> <li>• Set up and maintain effective and efficient grievance management system.</li> <li>• Set up code of conduct systems to deal with grievances (and other social aspects as required).</li> <li>• Set up and maintain harassment prevention and response system.</li> </ul>
Social infrastructure	<ul style="list-style-type: none"> <li>• Review existing social infrastructures in the park and business case development for missing social infrastructures.</li> <li>• Undertake survey with employees working in the park on their satisfaction and suggestions on social infrastructure.</li> <li>• Set up and maintain effective and efficient security management and monitoring system for the park.</li> <li>• Develop skills / vocational training and development programs.</li> <li>• Encourage female workforce to benefit from skills development programmes.</li> </ul>
Local community outreach	<ul style="list-style-type: none"> <li>• Undertake community surveys in relation to opportunities, challenges of industrial parks.</li> <li>• Set up and deliver community dialogue on ongoing / regular basis.</li> </ul>

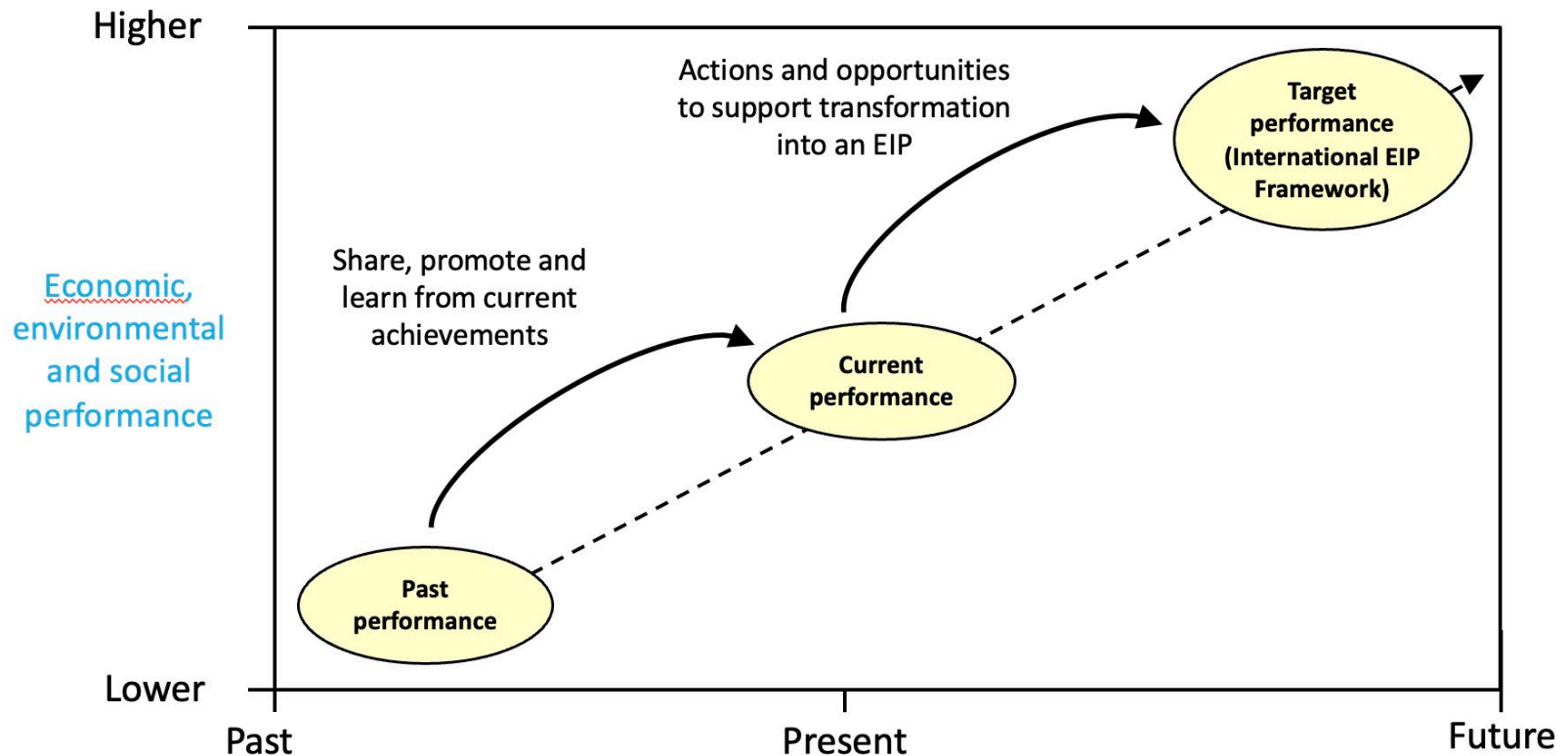


Topics EIP Framework	Common technical assistance options
<b>Economic performance</b>	
Employment generation	<ul style="list-style-type: none"> <li>• Awareness raising on importance, benefits and lower risks arising from direct employment of workers.</li> </ul>
Local business & SME promotion	<ul style="list-style-type: none"> <li>• Promote the establishment of SMEs in industrial park which add value to park and its (larger) tenant companies.</li> <li>• Sustainable and local procurement.</li> </ul>
Economic value creation	<ul style="list-style-type: none"> <li>• Develop feasibility studies for promising EIP initiatives, including facilitating access-to-finance.</li> <li>• Attract new and keep existing anchor tenants through EIP and industrial synergy approaches.</li> </ul>



# Transformation into an EIP is a process of continuous improvement

„Where are we now, where do we want to be, and how do we get there?“





# Questions or comments?





# Introduction to RECP





# Resource Efficient and Cleaner Production (RECP)

## DOING MORE WITH LESS!

RECP is continuous application of preventive environmental strategies to processes, products and services to increase efficiency and reduce risks to humans and the environment

### Three dimensions of RECP:

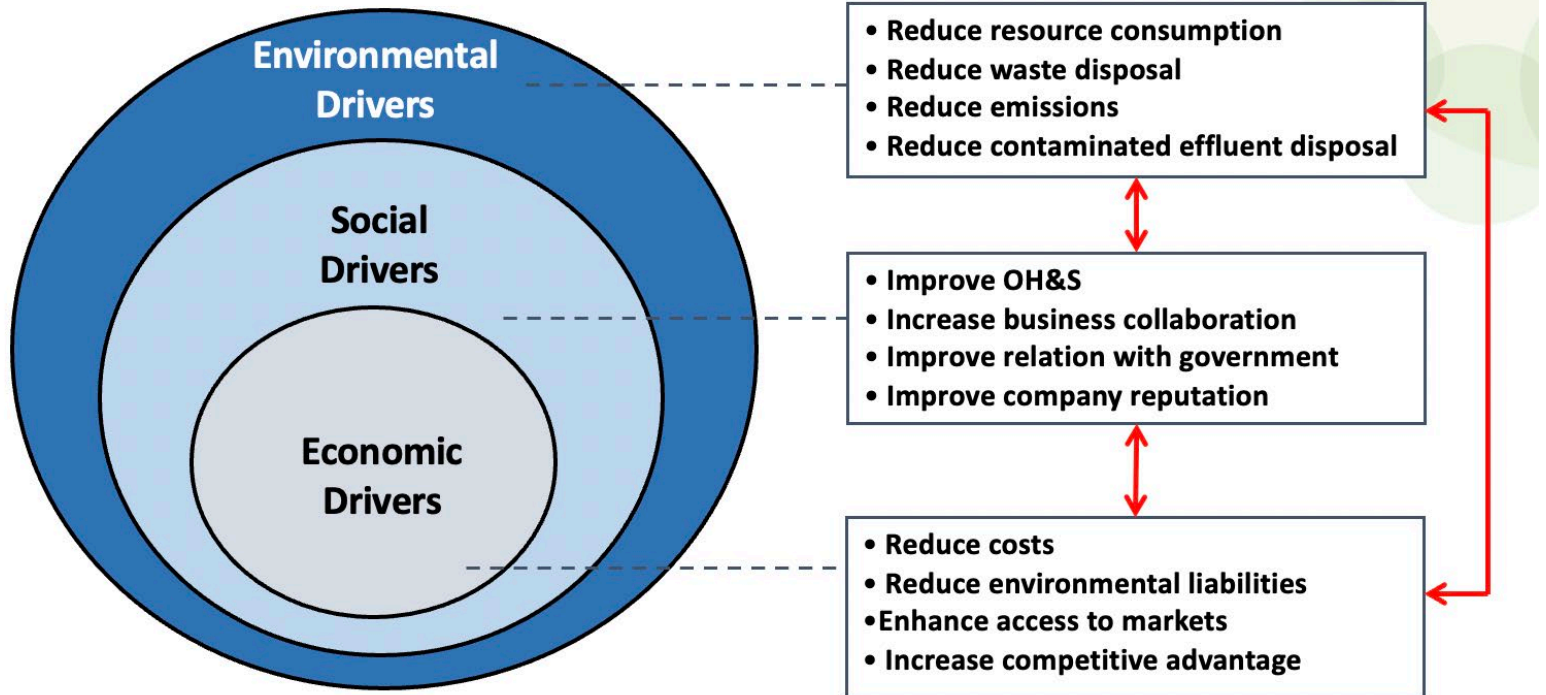
- Production efficiency
- Environmental management
- Human development

### Focus

- Low-hanging fruit opportunities (“good housekeeping”)
- Investment opportunities

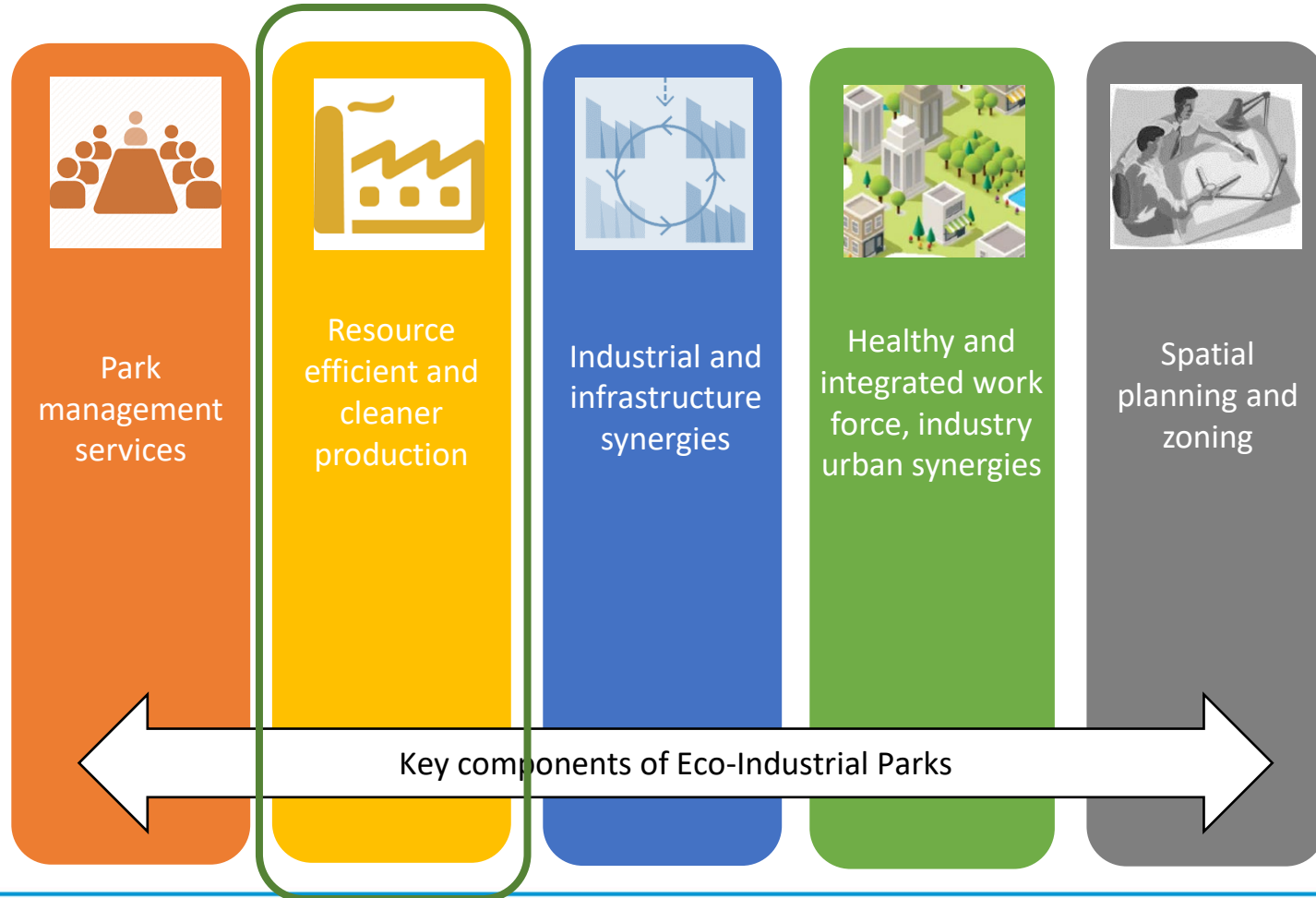


# Drivers of RECP



**Environmental and social risks are business risks ! \$\$\$**

# RECP: An integrated approach within EIPs...



# RECP good practices

## Resource efficient and cleaner production (RECP) assessment:

- Good Housekeeping
- Input Material Change
- Better Process Control
- Equipment Modification
- Technology Change
- Onsite Reuse & Recycling
- Production of by-products
- Product Modification/Innovation



### Benefits of RECP:

Reduce **raw** materials consumption

Reduce **energy** consumption

Reduce **CO<sub>2</sub>** emissions

Reduce **waste** and disposal costs

Increased **profitability**

**New revenues** from residuals

## *Changes in operational procedures and workplace management to reduce unnecessary 'wastage'*

Good  
House-  
keeping

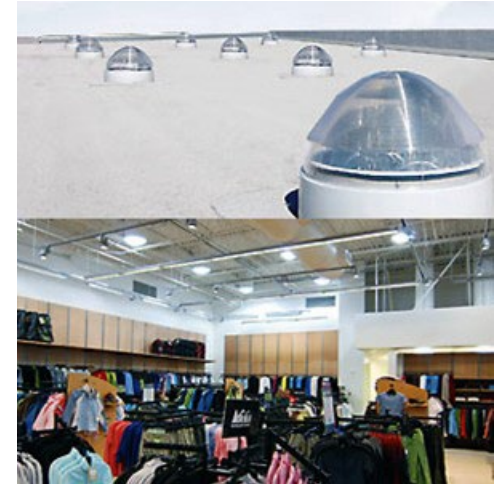
Measuring water volume with a bucket and a watch



Using a simple laser thermometer



Solar tubes conduct daylight into a room



**Source:** UNEP and UNIDO (2010). PRE-SME – Promoting Resource Efficiency in Small & Medium Sized Enterprises Industrial training handbook

Use of alternative inputs so that less or less problematic waste is created and/or renewable and less harmful materials are used

Input  
Material  
Change

Metalexacto in Peru started to use more appropriate refractory materials and installed hood on furnace to save energy and increase lead recovery

- Investment of USD 2500 saves USD 17,000 annually



Source: [www.unido.org/cp](http://www.unido.org/cp)

## Improve control over processes and equipment to operate these continuously at highest efficiency and lowest wastage

Better  
Process  
Control

Feltex Fehrer achieved significant saving up to ZAR400k in energy savings by SWITCHING OFF all foam pouring systems during idle production periods

Source: RECP IPA Report,  
South Africa



## Improve production equipment to avoid wastage and improve efficiency

Equipment  
Modification

Steam from the Compactor machine which smooths out the dyed fabric, is captured, re-directed and returned to the boiler as condensate return.  
Invested ZAR18,943 - Saved ~ZAR54,550/yr



Source: RECP IPA Report

## Useful application of waste (material, energy, water) within the same company for similar or alternative purpose

Rathkerewwa coconut industries in Sri Lanka recovered coconut shells and started to reuse these as alternative fuel in its boiler.

- Invested <USD2,000 to save ~USD165,000 annually

On Site  
Reuse



Source: [www.unido.org/cp](http://www.unido.org/cp)

## Convert a previously wasted material into a substitute input material for another company or user

Use of waste plastics by Clariter in the East London Industrial Development Zone to produce solvents, oils and waxes

Production of  
Useful By-Product



## Redesign product in order to reduce its environmental impact during production, use and/or disposal

Product  
Modification

Short length seagrass was converted into twisted rope to create new products and markets for grass roots handicraft producers in Viet Nam



Source: [www.unido.org/cp](http://www.unido.org/cp)

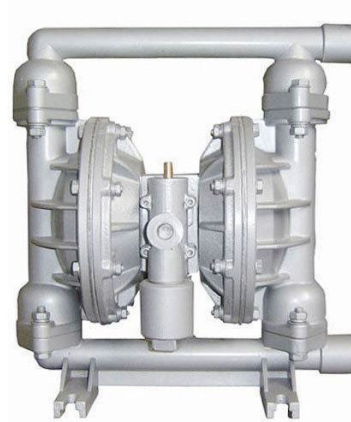
## Replacement of (process) technology with more efficient and/or less wasteful technology

Technology  
Change

Feltex Fehrer Replaced air operated diaphragm pumps with electrical operated pumps.

- Invested ZAR30, 000 - saved ZAR 178 000

Source: RECP IPA Report,  
South Africa



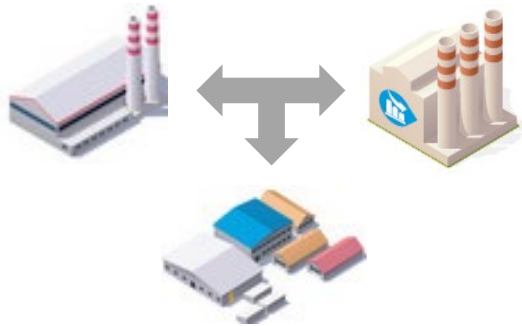


# Introduction to Industrial Symbiosis (IS)



# Industrial Symbiosis: an overview

**Utility synergies & infrastructure sharing:** Shared use of utility infrastructure, mainly revolving around water and energy (e.g. water recovery and energy cogeneration);



**Supply synergies & co-location of suppliers and clients:** Co-location and clustering of companies in the supply and value chains (e.g. producers and suppliers of raw materials, fabricators, manufacturing, business clients);

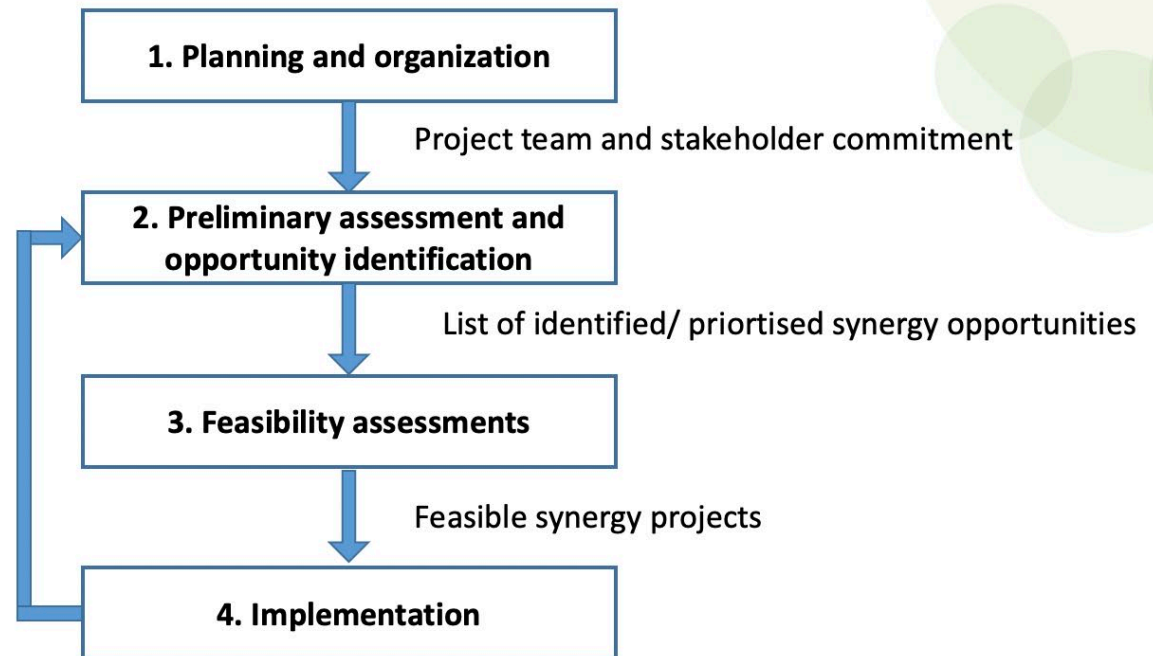
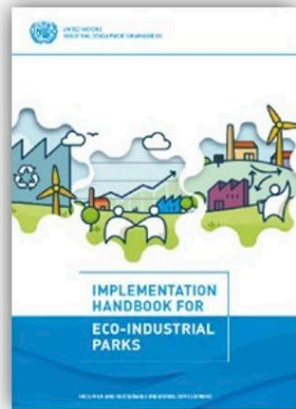
**By-product synergies & waste exchanges:** The use of a previously disposed by-product (as solid, liquid, or gas) from one facility by another facility to produce a valuable by-product.

**Service synergies:** Sharing of services and activities between companies (e.g. joint training of staff and sharing of maintenance contractors).

# Types of industrial synergies

- **Utility synergies and infrastructure sharing:** Shared use of utility infrastructure, mainly revolving around water and energy (e.g. water recovery and energy cogeneration).
- **Supply synergies and co-location of suppliers and clients:** Co-location and clustering of companies in the supply and value chains (e.g. producers and suppliers of raw materials, fabricators, manufacturing, business clients).
- **By-product synergies and waste exchanges:** The use of a previously disposed by-product (as solid, liquid, or gas) from one facility by another facility to produce a valuable by-product.
- **Service synergies:** Sharing of services and activities between industries in an industrial area (e.g. joint training of staff and sharing of maintenance contractors).
- **Urban-industrial synergies:** Interlinkages and collaborations between companies and cities/municipalities on the collection, processing and reuse of materials, wastes, energy and water streams.

# Approach to develop Industrial Synergies



Source: UNIDO (2018). Implementation Handbook for Eco-Industrial Parks.

[www.unido.org/sites/default/files/files/2018-05/UNIDO%20Eco-Industrial%20Park%20Handbook\\_English.pdf](http://www.unido.org/sites/default/files/files/2018-05/UNIDO%20Eco-Industrial%20Park%20Handbook_English.pdf)



# Identification of IS opportunities

The identification of synergy opportunities can be done through various ways:

- **Collecting and connecting company inputs and outputs**
  - What outputs from companies (e.g. effluent streams, wastes / by-products, emissions, waste heat) could be used as input for another company?
- **Bilateral discussions with park management and tenant companies**
  - Park management and value added services are a source for ideas of utility, by-product, supply and service synergies
- **Review of international experiences**
  - Industrial synergies happen in many industrial parks around the world.
- **Opportunity identification workshops**
  - This usually involves bringing together park management and tenant companies for half-day, and identify and prioritize synergy opportunities through facilitated group discussions
- **Use of automated tools**
  - e.g. UNIDO's Industrial Symbiosis Identification Tool



# Industrial Symbiosis Identification Tool

- **Tool objective:** Support the identification of industrial symbiosis opportunities (by-product and waste exchanges) between companies.
- Tool is not all inclusive!
- Tool identifies “top-of-the iceberg” opportunities and serves as a starting point to identifying synergy opportunities and having constructive discussions with park management and tenant companies.
- Tool is part of UNIDO EIP toolbox available from:  
<https://open.unido.org/projects/C6/projects/170222>

# Prioritization of synergy opportunities

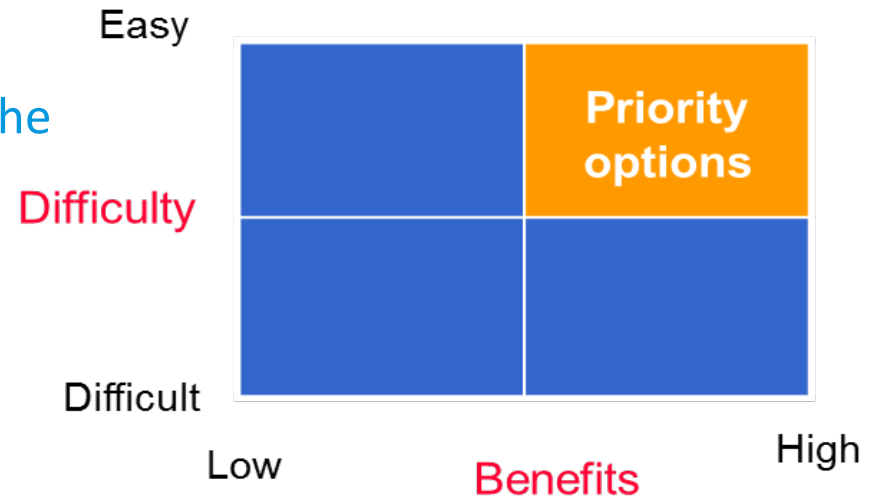
Not all synergy opportunities identified will be of high interest or great value!

It is therefore important to prioritize the opportunities based on:

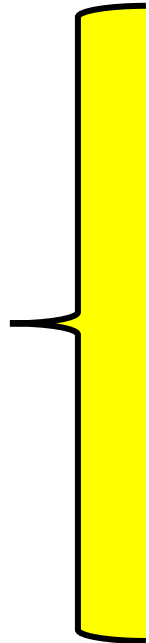
- Their achievability
- Their anticipated benefits
- Interest from park management and tenant companies to assess further

This is not a feasibility assessment

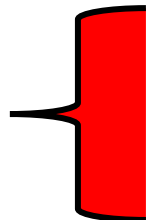
- It is just an exercise to assist in the selection of opportunities for follow-up or pre-feasibility assessment



## Eco-Industrial Parks: Success Factors



- Strong coordination (management center), decision-making capacity of on-site companies
- Supportive government and policies (social corporate responsibility), enforced monitoring
- Good collaboration between economic players and local stakeholders
- Cooperation with academia and research centers
- Value added from efficiency towards industrial symbiosis
- Diversity of industrial sectors and economic activities generate new sets of feedback flows. Strong linkages between EIP and agriculture
- Instruments: Toolbox, requirements, certifications



- Trade-off logic between industrial development and environment
- Insufficient inclusion of social and economic dimensions
- Insufficient priority on shared infrastructure and water management



# Questions or comments?





Thank you!

**Ankit Kapasi**  
[ankit.kapasi@consultdss.com](mailto:ankit.kapasi@consultdss.com)

