

**RESULTS AND LESSONS LEARNT FROM THE  
TRANSFORMATION TO ECO-INDUSTRIAL PARKS OF  
GEIPP PHASE I PRIORITY PARKS**

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# RESULTS AND LESSONS LEARNT FROM THE TRANSFORMATION TO ECO-INDUSTRIAL PARKS OF GEIPP PHASE I PRIORITY PARKS

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Based on technical assistance to 21 industrial parks in seven countries during  
Phase I of the Global Eco-Industrial Parks Programme (2019 – 2023)



2024

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Special acknowledgements to all staff members of the park management and tenant firms of the 21 priority industrial parks, which actively participated in and contributed to Phase I of the Global Eco-Industrial Parks Programme. This report is based on the technical assistance provided to these industrial parks.

- » **Colombia:** Parque Industrial Malambo (PIMSA), ZF de Occidente, ZF del Cauca;
- » **Egypt:** El Robbiki IP, Polaris & Al Zamil IP, Orascom IP (in Suez Canal SEZ);
- » **Indonesia:** Batamindo IP, KIIC, MM2100;
- » **Peru:** Indupark, La Chutana IP, Sector 62 IP;
- » **South Africa:** East London IDZ, Ekandustria IP, Phuthaditjhaba IP;
- » **Ukraine:** IP Agromash (Zaporizhzhia), IP BTsVAK, IP Chemical metallurgical plant, IP Patriot;
- » **Viet Nam:** Amata, Deep C1&C2, Hiep Phuoc.

The Global Eco-Industrial Parks Programme (GEIPP) is made possible by funding provided by the Swiss Government through the State Secretariat for Economic Affairs of Switzerland (SECO).



## ABBREVIATIONS

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A2F	Access to Finance
EIP	Eco-Industrial Park
ESCO	Energy Service Company
GEIPP	Global Eco-Industrial Parks Programme (UNIDO)
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Development Cooperation)
IDZ	Industrial Development Zone
IFC	International Finance Corporation (part of World Bank Group)
IP	Industrial Park
IZ	Industrial Zone
PPP	Public Private Partnership
RECP	Resource Efficient and Cleaner Production
SDG	Sustainable Development Goal
SEZ	Special Economic Zone
SME	Small and Medium-sized Enterprise
UNIDO	United Nations Industrial Development Organization
WBG	World Bank Group
ZF	Zona Franca



## EXECUTIVE SUMMARY

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### Introduction

This report is the sixth publication of the GEIPP’s “Lessons Learnt” series, which aims to collect and disseminate results from the Global Eco-Industrial Parks Programme (GEIPP). The main chapters of the report present compiled results and analyses from GEIPP-participating countries. Further, each GEIPP country-level intervention has its dedicated annexe that provides results and findings from each GEIPP pilot industrial park.

Drawing from the technical assistance provided to 21 pilot industrial parks in seven countries during Phase I, this report provides insights into the results and lessons learnt on their transformation into eco-industrial parks. This report will specifically cover:

- » Comparative country overview of EIP opportunities identified, under development and implemented in each country, detailing environmental savings (e.g. energy, GHG, water, waste and materials) and economic savings (e.g. financial benefits, return on investment);
- » Comparative analysis of baseline conditions versus intended and achieved improvements of the 21 selected industrial parks across seven countries, benchmarked against of the International Framework for Eco-Industrial Parks;
- » Summary of country-specific results and conclusions highlighting park-level achievements during GEIPP I, including EIP opportunities and industrial parks’ performance against the benchmarks of the International Framework for Eco-Industrial Parks.

### Comparative analysis of EIP opportunities

A total of 783 opportunities have been identified in the GEIPP Phase I, and 177 of these EIP opportunities (22%) have been implemented to date. These opportunities span across resource-efficient and cleaner production (RECP) and industrial synergies, park management services, and planning and zoning. 371 EIP opportunities (47%) are being planned for implementation.

The analysis highlights the substantial resource savings that have been implemented, such as improved energy efficiency by 44,803 MWh/yr, 117,925 metric tonnes/yr of CO<sub>2</sub> reductions, 510,151 m<sup>3</sup>/yr of water savings, and 13,676 metric tonnes/yr of waste/material savings.

A substantial amount of resource savings are planned for implementation with the assistance of GEIPP I, ranging from 46% (energy efficiency improvements) to a notable 77% (waste/materials savings). This demonstrates the significant potential for GEIPP Phase II to support industrial parks and their tenant companies by implementing the resource savings identified and developed during GEIPP Phase I.

A smaller share of the identified opportunities for renewable energy electricity (2%) and water recycling (8%) have been implemented to date, with a considerable proportion of these projects in the planning phase (60% and 74%, respectively). This delay is partly due to the time required to develop investment projects. Based on international experience, infrastructure and investment projects typically take five to seven years to progress from identification to actual implementation. Given that industrial parks have lifespans often exceeding 100 years with major overhauls, such timelines for specific EIP-related infrastructure investments are expected.





Therefore, a large proportion of these planned opportunities will likely yield positive impacts and resource savings only during GEIPP Phase II. This underscores the urgent need to translate national and international policies into conducive conditions for developing and implementing renewable electricity generation and water recycling in industrial parks across all GEIPP countries.

### **Comparative analysis of park scorings against the International EIP Framework**

The performance of industrial parks against the International EIP Framework varies widely, reflecting each park's unique opportunities, challenges, and the type of assistance provided. Countries such as Colombia, Indonesia, and Viet Nam exhibit higher average baseline performance.

Significant progress has been achieved in assisting industrial parks in transitioning towards EIPs. At the outset of GEIPP Phase I (2019), the average baseline EIP score across all 21 parks was 49%. By the end of GEIPP Phase I (December 2023), the average achieved performance had risen to 64%, marking a 15% increase. Progress has been evident across all categories of the International EIP Framework, encompassing park management, environmental, social, and economic performance.

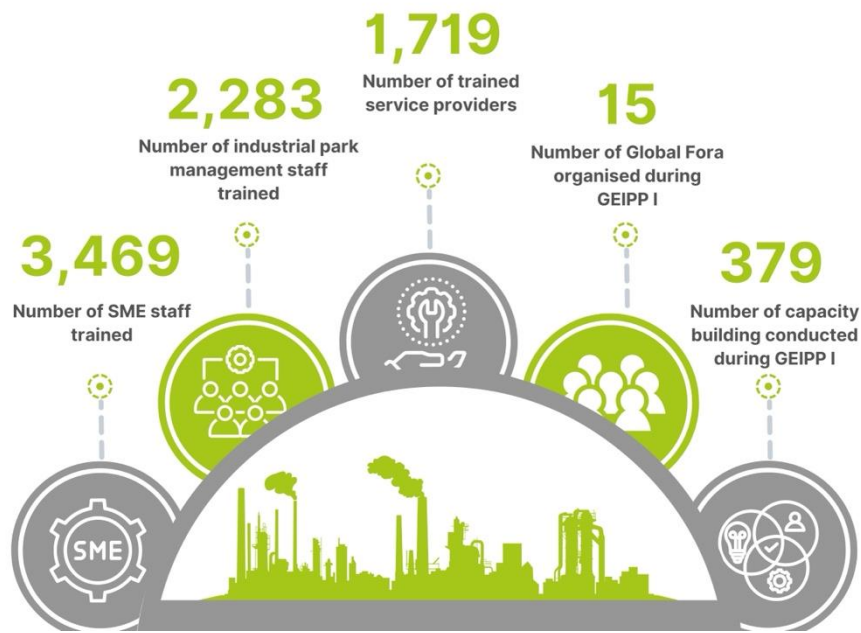
As anticipated, lighthouse parks demonstrate higher overall EIP scores compared to the average for industrial parks within their respective countries. In scenarios where a country hosts a high-performing lighthouse park (e.g., Colombia, Indonesia, South Africa), technical assistance in GEIPP Phase II should prioritize knowledge dissemination, experience sharing, and peer-to-peer learning among industrial parks.

Recognizing the diverse national contexts and operating conditions across GEIPP countries, the pace of EIP transformation varies. In summary:

- » Colombia, Indonesia, Peru, and Viet Nam have experienced significant progress.
- » South Africa has shown substantial overall progress in EIP transformation despite facing economic challenges, institutional issues, and infrastructure limitations (e.g., unstable electricity supply and load shedding).
- » Ukraine has made good strides in EIP transformation despite the ongoing war situation.
- » Egypt faced delays in the implementation process, resulting in a slower progress trend line for EIP transformation in its industrial parks.



## Country and industrial park level results and lessons learnt



The following table provides a consolidated quantitative summary of the EIP opportunities identified and developed for each GEIPP country with the assistance of the GEIPP Phase I. The summary confirms the high number of identified and implemented EIP opportunities to date through the GEIPP Phase I, and their associated resource and financial savings. Considering the time it takes to develop infrastructure and investment projects, the table also confirms the high potential for GEIPP Phase II to support industrial parks and companies to implement the resource savings identified and developed during GEIPP Phase I.

*Table 1: Summary of EIP opportunities per GEIPP country – Results GEIPP Phase I*

GEIPP country	Number of EIP opportunities #	Energy efficiency improvements MWh/yr	Renewable electricity generation MWh/yr	CO <sub>2</sub> emission reductions Metric tonnes/yr	Water savings m <sup>3</sup> / yr	Waste / material savings Metric tonnes/yr	Financial savings USD/yr
<b>Colombia</b>							
Identified	52	20,894	10,758	26,054	577,848	7,103	2,860,649
Implemented	12	3,322	925	9,639	0	2,295	1,505,393
Planned implementation	27	10,281	5,497	4,526	476,183	14	640,980
<b>Egypt</b>							
Identified	293	110,502	0	48,229	1,076,782	34,705	5,563,401
Implemented	1	370	0	111	52,399	0	21,519
Planned implementation	180	48,496	0	21,518	652,854	34,279	2,234,001



GEIPP country	Number of EIP opportunities #	Energy efficiency improvements MWh/yr	Renewable electricity generation MWh/yr	CO <sub>2</sub> emission reductions Metric tonnes/yr	Water savings m <sup>3</sup> / yr	Waste / material savings Metric tonnes/yr	Financial savings USD/yr
<b>Indonesia</b>							
Identified	86	19,210	621	12,694	119,902	99	1,533,919
Implemented	86	19,210	621	12,694	119,902	87	1,533,919
Planned implementation	0	0	0	0	0	12	0
<b>Peru</b>							
Identified	68	16,583	230	4,608	190,838	1,923	1,443,567
Implemented	8	388	1	66	65,611	121	217,536
Planned implementation	54	16,174	229	4,537	70,890	1,785	1,217,769
<b>South Africa</b>							
Identified	25	9,022	162,816	250,288	446,818	16,044	22,708,832
Implemented	1	6,386	68	2,414	0	0	78,398
Planned implementation	20	2,634	126,134	209,047	336,817	16,032	20,725,763
<b>Ukraine</b>							
Identified	62	6,500	377	2,916	6,646	126	627,770
Implemented	23	2,857	0	759	2,879	111	259,608
Planned implementation	35	3,262	377	2,000	3,243	15	338,642
<b>Viet Nam</b>							
Identified	197	71,878	88,104	203,463	3,855,688	22,062	16,125,457
Implemented	44	12,270	990	92,241	269,360	11,062	2,282,004
Planned implementation	55	36,653	26,493	44,858	3,128,159	10,932	6,895,453

Further lessons learnt from the park-level efforts in the seven GEIPP I countries can be summarised as follows:

- » **Integrated EIP approach:** There is clear evidence that GEIPP is making significant strides in demonstrating the viability and benefits of eco-industrial park (EIP) approaches for scaling up resource productivity and enhancing the economic, environmental, and social performances of businesses in GEIPP countries. It is encouraging to note that industrial parks adopting EIP approaches are showing tangible progress in improving resource productivity, expanding business opportunities, and enhancing their overall economic, environmental, and social performance.
- » **International EIP Framework:** A key success factor for industrial parks to increase their compliance with the EIP international framework is the commitment of senior park and tenant company management to identify, develop and implement tailored EIP opportunities that



deliver tangible economic, environmental and social benefits. While the on-the-ground implementation takes time, assessments of industrial parks against the International EIP Framework and feasibility studies demonstrate that the transformation of industrial parks towards eco-industrial parks results in more resource-efficient facilities with reduced risks and increased business opportunities. Providing hands-on guidance to industrial parks to comply with international EIP indicators, particularly in the areas of energy efficiency, water reuse, master planning, and climate change adaptation, is integral to this transformation. Despite notable progress, no industrial park has yet met all benchmarks of the International Framework. This underscores that EIP transformation is an ongoing process of continuous improvement.

- » **Documentation and project communication:** Industrial parks and their companies frequently undertake EIP-related initiatives without explicitly recognising or labelling them as sustainable development efforts. To address this, GEIPP should support the documentation of these initiatives to communicate sustainable industrial practices effectively. This includes documenting infrastructure and utility upgrades, industry collaborations, emissions mitigation efforts, added-value services, and integrated planning strategies. Such documentation will enhance awareness and showcase the positive impact of these initiatives within the industrial park context.
- » **Financing:** Access to finance and collaboration with financial institutions pose significant challenges for both state-owned and privately-owned industrial parks and their tenant companies. Therefore, there is a critical need to enhance finance facilitation within GEIPP countries and globally. Many companies lack awareness of potential tax benefits associated with sustainable development projects. Providing specialised financial advice is essential to help industrial parks and companies access suitable financing, ultimately reducing investment payback periods. Strengthening these efforts will enable greater uptake of sustainable initiatives and support the broader goals of the GEIPP.
- » **EIP tools:** As part of the GEIPP, UNIDO has developed a comprehensive set of customised EIP tools designed to assist industrial parks in their EIP planning, implementation, and monitoring. These tools offer structured and practical approaches to help parks identify and capitalise on EIP opportunities while effectively addressing key challenges.
- » **Capacity building:** For the further development and implementation of EIP opportunities in industrial parks, it is critical to continue with periodic tailored training and building in-house capacities as well as the facilitation of multi-stakeholder collaborations. Continuous effort in capacity building in non-pilot industrial parks is beneficial, particularly on specific EIP topics such as EIP concept/master planning (including business planning and market research), park management, added value services and industrial synergies.
- » **Key role of industrial park management:** Industrial park management plays a critical role as the entry point and driver to achieve the objectives of EIPs. By fostering close collaboration with tenant companies, government agencies and the wider community, park management entity acts as leaders in facilitating multi-stakeholder collaborations, park-level monitoring and reporting, developing joint corporate projects, and industrial synergies.
- » **Intra-company collaboration:** Experiences with the GEIPP I pilot parks indicate that establishing topic-specific technical park-level committees is an effective way to address key opportunities and challenges within the industrial park and its companies. Instead of each company trying to



solve its challenges, these committees provide a platform to collaborate, share experiences, find collective solutions, and replicate good practices implemented by others. These technical committees are typically set up and facilitated under the leadership of park management.

- » **Monitoring:** The GEIPP I results clearly demonstrate the critical need to offer training and technical assistance on data monitoring to industrial parks and companies. This effort aims to establish a clear and practical baseline for projects, enabling the quantification of their benefits. It has been observed that many pilot industrial parks and their tenant companies lack of basic monitoring data and defined performance indicators.
- » **Master planning:** A master plan is a comprehensive document that directs the planning, development, and operation of an industrial park. Unfortunately, master plans for industrial parks in GEIPP countries are often outdated, incomplete, or sometimes unavailable. This situation poses significant challenges and risks to industrial parks and their stakeholders, including companies and communities. Proper master planning is essential for the transformation towards eco-industrial parks. It is crucial to integrate EIP approaches into master plans, incorporating elements such as added value services, resource efficiency strategies, integrated and shared infrastructure/utilities, industry clustering, and benchmarks from the International EIP framework. This integration ensures that industrial parks are developed and managed in a sustainable and efficient manner, benefiting both businesses and surrounding communities.
- » **Urban-industrial synergies:** The results from GEIPP I clearly demonstrate that industrial parks are integral components of larger operating systems, encompassing adjacent local communities and broader industrial-urban developments within the region. There is a rapid evolution of urban-industrial synergies occurring globally, including within the GEIPP countries. This evolution is driven by the increasing adoption of circular economy principles, heightened resource scarcity, and associated price escalations. Given the evident economic, social, and environmental benefits of industrial and urban symbiosis, there is a growing interest in promoting collaboration between industrial parks and surrounding cities. Urban-industrial synergies should be viewed as strategic business development opportunities aligned with the EIP approach. Therefore, it is imperative for GEIPP II to further support the unlocking of these synergies in each country and its respective industrial parks.

Introduction

1



## 1 INTRODUCTION

### 1.1 THIS REPORT

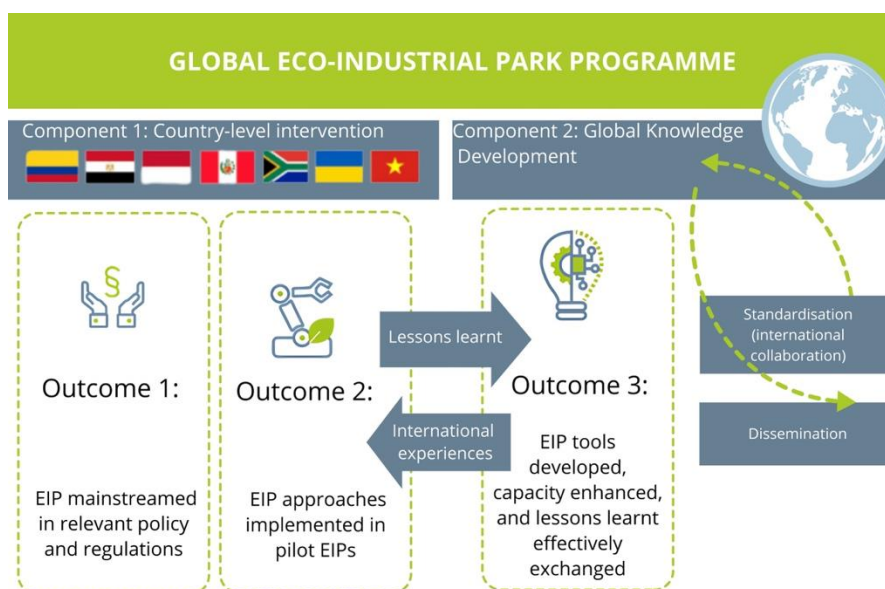
This report is the sixth publication of the GEIPP’s “Lessons Learnt” series, which aims to collect and disseminate results from the Global Eco-Industrial Parks Programme (GEIPP). The main chapters of the report present compiled results and analyses from GEIPP-participating countries. Further, each GEIPP country-level intervention has its dedicated annexe that provides results and findings from each GEIPP pilot industrial park.

Drawing from the technical assistance provided to 21 pilot industrial parks in seven countries during Phase I, this report provides insights into the results and lessons learnt on their transformation into eco-industrial parks. This report will specifically cover:

- » Comparative country overview of EIP opportunities identified, under development and implemented in each country, detailing environmental savings (e.g. energy, GHG, water, waste and materials) and economic savings (e.g. financial benefits, return on investment);
- » Comparative analysis of baseline conditions versus intended and achieved improvements of the 21 selected industrial parks across seven countries, benchmarked against of the International Framework for Eco-Industrial Parks;
- » Summary of country-specific results and conclusions highlighting park-level achievements during GEIPP I, including EIP opportunities and industrial parks’ performance against the benchmarks of the International Framework for Eco-Industrial Parks.

### 1.2 GLOBAL ECO-INDUSTRIAL PARKS PROGRAMME

Figure 1: Overview of the Global Eco-Industrial Parks Programme



The objective of the Global Eco-Industrial Parks Programme (GEIPP) is to demonstrate the viability and benefits of greening industrial parks by improving resource productivity and economic,





environmental and social performances of businesses and thereby contributing to inclusive and sustainable industrial development in the participating developing and transition economies.

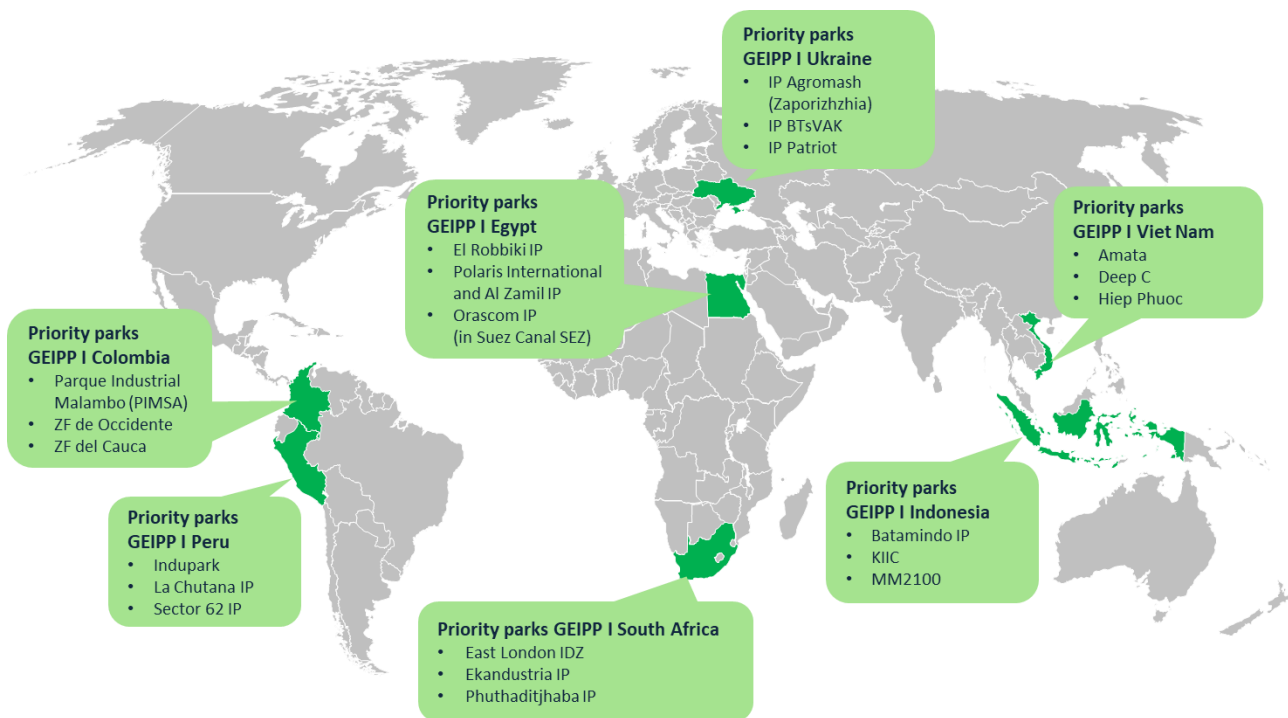
Component 1 (Country level interventions) implements tailor-made initiatives in seven countries: Colombia, Egypt, Indonesia, Peru, South Africa, Ukraine and Viet Nam, including the incentivisation of EIPs in policies/ regulations as well as identification and implementation of EIP opportunities in selected industrial parks.

Component 2 (Global Knowledge Development) focuses on the development of specific EIP tools, providing methodological guidance and dissemination of good practices between GEIPP countries and lessons learnt from international experiences.

Phase I of the Global Eco-Industrial Parks Programme (2019-2023) is made possible by funding provided by the Swiss Government through the State Secretariat for Economic Affairs of Switzerland (SECO).

GEIPP Phase I provided technical assistance to 21 selected industrial parks in seven countries, as presented in the following figure. The results and lessons learnt on EIP transformation, as presented in this report, are based on the work with these parks.

*Figure 2: Priority industrial parks that received technical assistance through GEIPP Phase I*





Comparative analysis  
of EIP opportunities

2

The background features a large, abstract graphic composed of several overlapping, curved, light blue shapes that resemble segments of a globe or a stylized architectural structure. These shapes are set against a solid light blue background. The overall aesthetic is clean and modern.



## 2 COMPARATIVE ANALYSIS OF EIP OPPORTUNITIES

### 2.1 OVERVIEW

In GEIPP Phase I, technical assistance was provided to 21 pilot industrial parks, focusing on advancing specific opportunities for Eco-Industrial Park (EIP) development. This effort aimed to achieve resource efficiency gains resulting in environmental (e.g., energy, GHG, water, waste, and materials) and economic savings (e.g., financial benefits, return on investment).

Based on the unique needs of each industrial park, these EIP opportunities were identified and developed through various approaches aligned with the components of eco-industrial parks. These approaches, illustrated in the accompanying figure, included Resource Efficient and Cleaner Production (RECP), industrial synergies, park management services, community development, local job creation, natural environment preservation, and planning and zoning considerations.

Figure 3: Key components and intervention areas of eco-industrial parks



This chapter presents the key results and lessons learned from the identification, development and implementation of EIP opportunities with the 21 selected industrial parks across the seven GEIPP I countries. The chapter includes an analysis of the types and quantity of EIP opportunities identified, as well as their result in energy, water, material and waste savings, and CO<sub>2</sub> emission reduction. Further it examines the financial savings achieved and the return on investment.

### 2.2 QUANTITY AND SCOPE OF EIP OPPORTUNITIES

The following figures provide a comparative review of the number of Eco-Industrial Park (EIP) opportunities identified, planned, and implemented within the 21 priority parks across seven GEIPP countries during GEIPP Phase I. Key observations from these figures include:

- » A total of 177 EIP opportunities were implemented with technical assistance during GEIPP Phase I, representing 22% of the 783 opportunities identified. These opportunities encompass resource efficient and cleaner production (RECP), industrial synergies, park management services, and planning and zoning.



- » 371 EIP opportunities (47% of total opportunities) are in the planning stage for implementation, involving feasibility studies, access-to-finance support, stakeholder collaborations, and technical advice. International experiences suggest that infrastructure and investment projects typically take five to seven years to progress from conceptualization to implementation, depending on project size and complexity. Therefore, a large proportion of opportunities that are planned for implementation will likely result in positive impacts and resource savings during GEIPP Phase II;
- » Egypt leads in the number of EIP opportunities due to a significant focus on low-investment RECP options and good housekeeping practices, supported by robust tracking using the EIP monitoring tool. Conversely, South Africa emphasizes infrastructure-related opportunities, which require longer implementation times.
- » Indonesia shows the highest implementation rate of identified EIP opportunities, largely due to numerous low-investment and good housekeeping options. Ukraine's 37% implementation rate is noteworthy given the country's challenging conflict situation. Vietnam also demonstrates high implementation rates, while Egypt, South Africa, and Peru show comparatively lower rates of implementation."

Figure 4: Number of identified, planned, and implemented opportunities – GEIPP Phase I

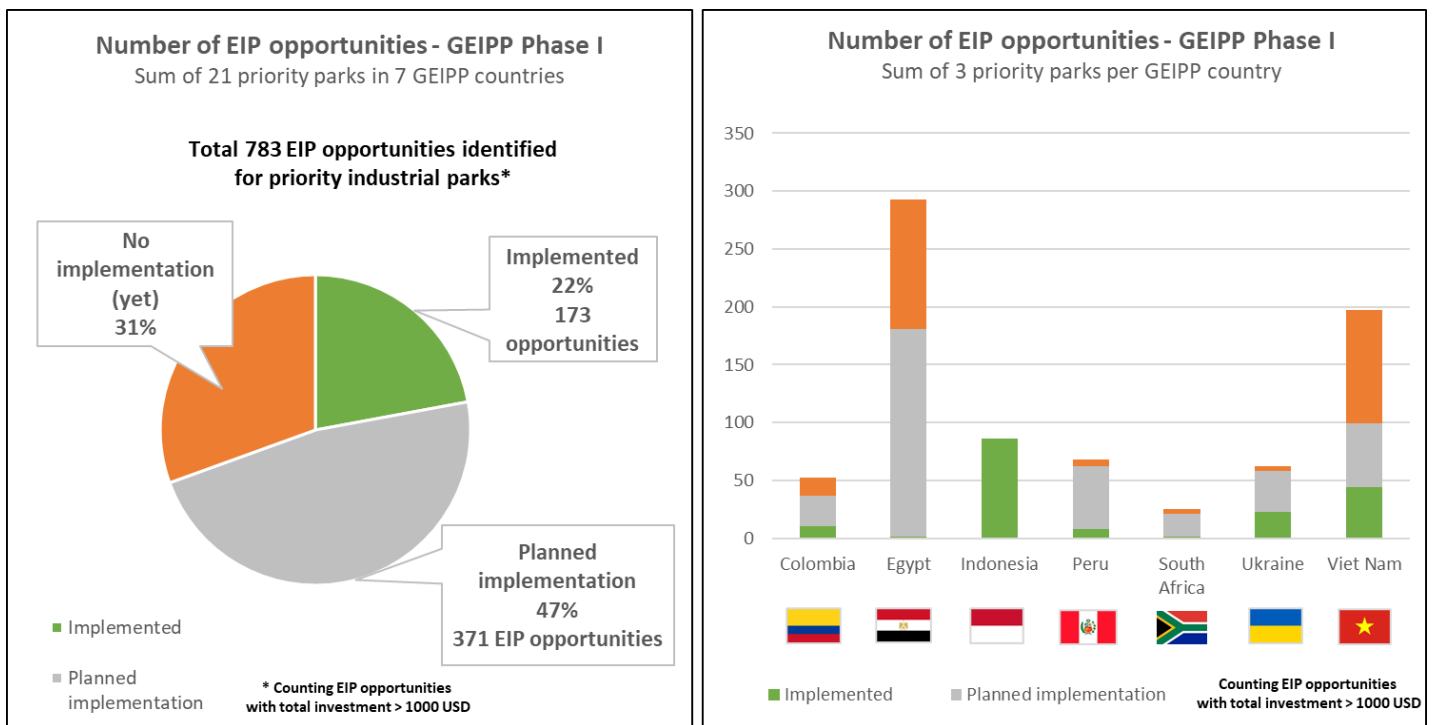
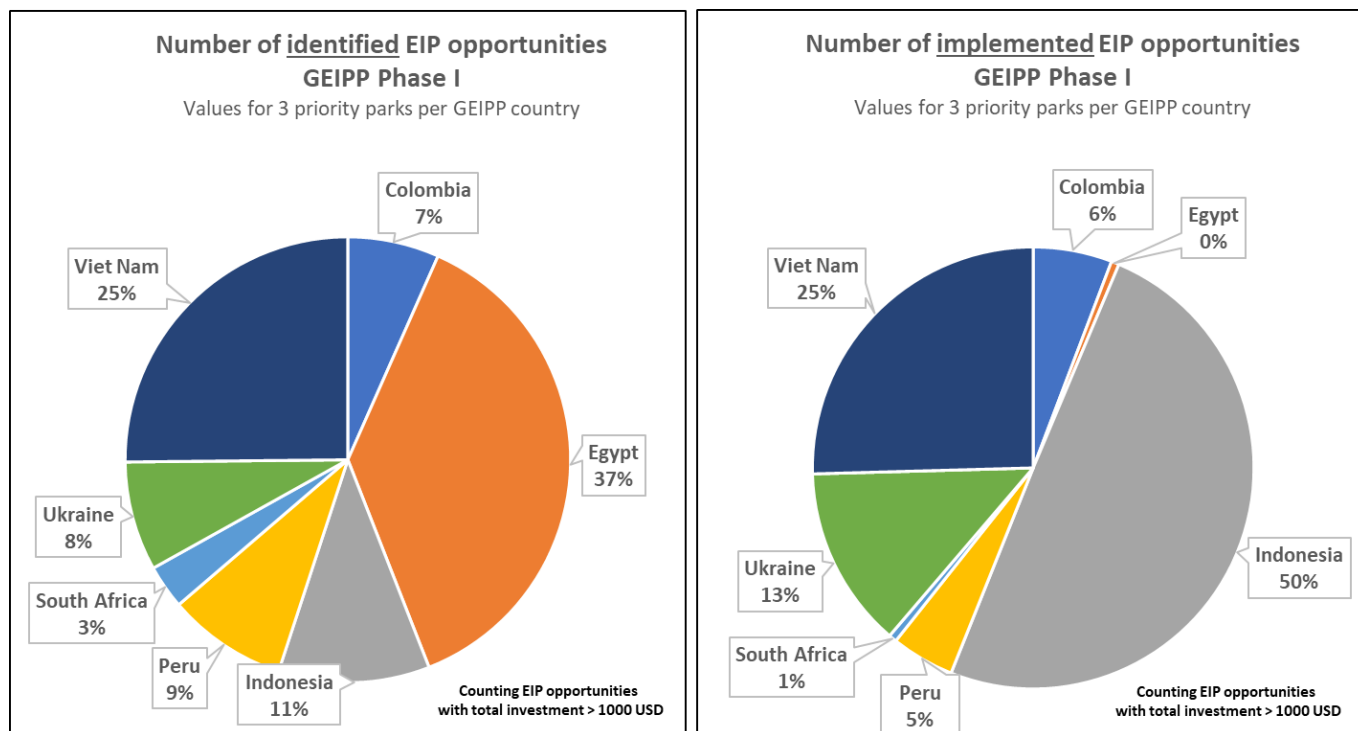




Figure 5: Number of identified and implemented opportunities - By country



### 2.3 EIP APPROACH AS A MEANS TO EXTEND RESOURCE EFFICIENT AND CLEANER PRODUCTION

Key components of the eco-industrial park approach cover park management services and governance, Resource Efficient and Cleaner Production (RECP), industrial synergies and shared infrastructure, community collaboration and local jobs creation, planning and zoning. More specifically, Resource Efficient and Cleaner Production (RECP) refers to the integrated and continued application of preventive environmental practices and total productivity techniques to processes, products and services to increase efficiency and reduce risks to humans and the environment<sup>1</sup>. Therefore, RECP is a key integrated part of the EIP approach and, visa versa, EIPs are a natural extension of RECP.

Since the mid-1990s, UNIDO and UNEP have collaborated to foster the global uptake of RECP, amongst others through the Global RECP Programme. This programme is the predecessor of the Global Eco-Industrial Parks Programme (GEIPP) which officially started in 2018.

One of the targeted outcomes of the GEIPP is to scale up RECP from company level to industrial park level improvements. As part of the GEIPP Phase I, a range of EIP opportunities were identified, developed and implemented with the pilot industrial parks. These EIP opportunities cover RECP as well as non-RECP options. The non-RECP options mainly cover park management services, industrial synergies, shared infrastructure, natural environment, community collaboration, renewable energy, planning and zoning.

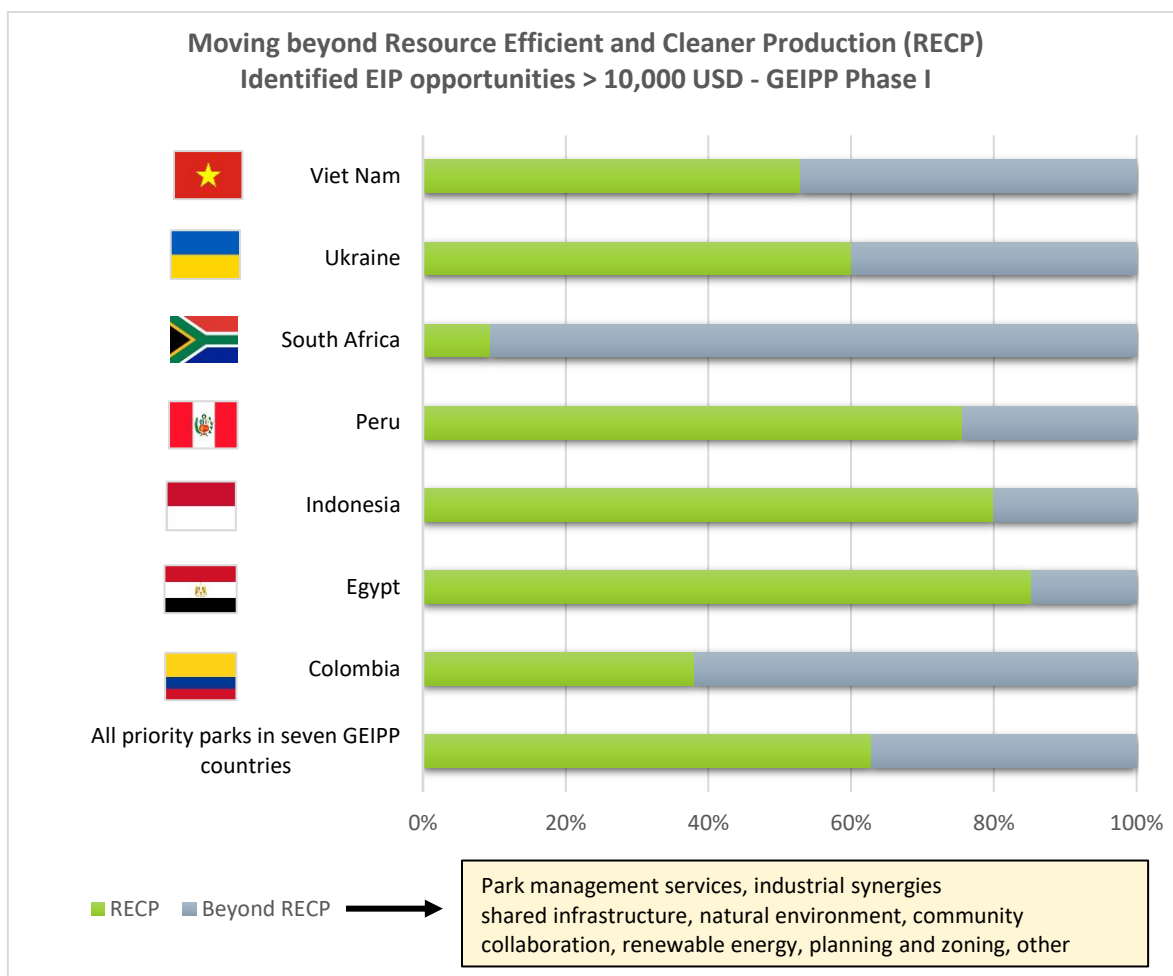
The following figure provides an overview of the proportions of RECP and non-RECP opportunities progressed in each GEIPP country as well as for all priority parks in all seven GEIPP countries. Overall,

<sup>1</sup> UNIDO & UNEP (2010).



the figure shows that 37% of all identified EIP opportunities are non-RECP options across the seven GEIPP countries. This demonstrates that GEIPP Phase I has started to move overall beyond Resource Efficient and Cleaner Production and that RECP is an integrated part of EIP transformation process. The figure also highlights the opportunity for GEIPP Phase II to further accelerate its efforts to move beyond RECP and further address park-level opportunities. The two countries with the highest proportion of non-RECP opportunities are South Africa (90% of total opportunities are beyond RECP) and Colombia (62% of total opportunities are beyond RECP).

Figure 6: Moving beyond Resource Efficient and Cleaner Production – GEIPP Phase I



## 2.4 ENERGY SAVINGS

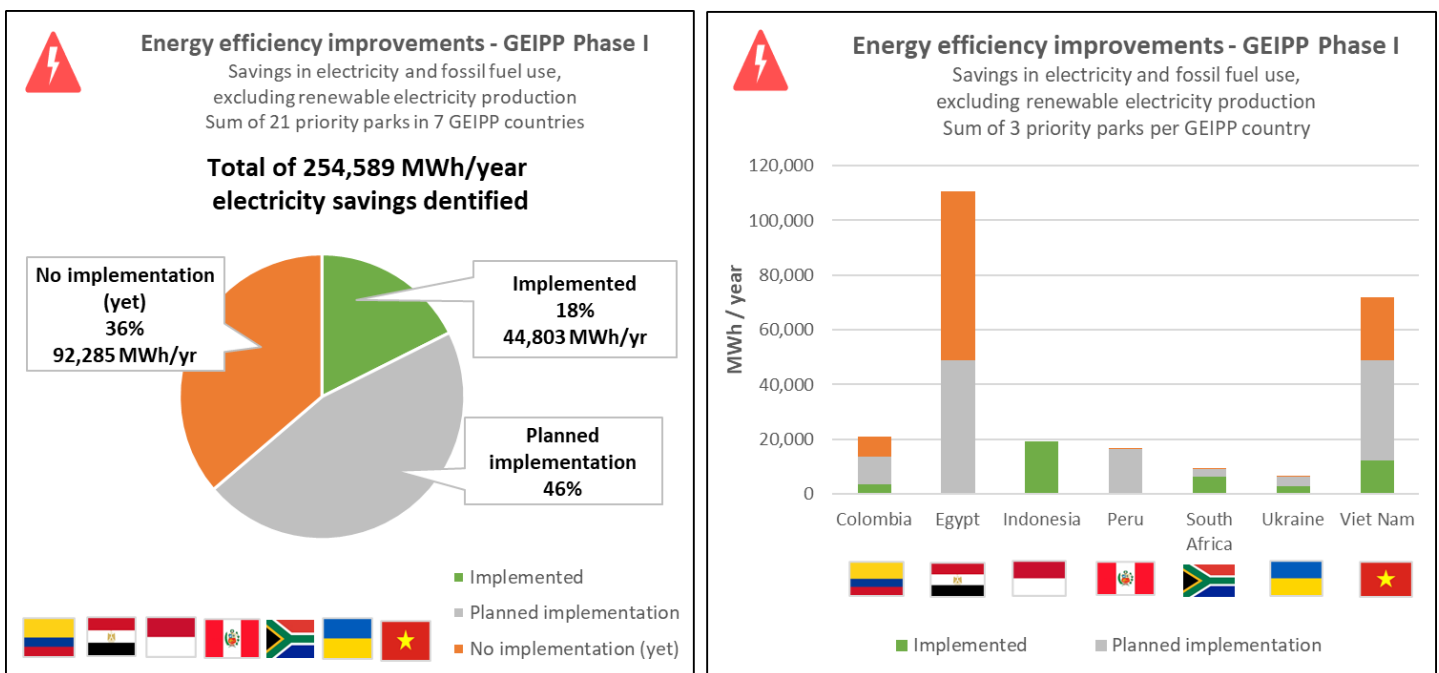
### 2.4.1 Energy efficiency improvements

In the context of the GEIPP, energy efficiency improvements encompass savings at both park and company levels in electricity and fossil fuel usage, excluding renewable electricity production, which is separately monitored and reported in the subsequent subsection of this report. The following figures present a comparative review of megawatt-hours per year (MWh/yr) in energy efficiency opportunities identified, planned, and implemented in the 21 priority parks receiving technical assistance through GEIPP Phase I. Key observations include:



- » A total of 254,589 MWh/yr of energy efficiency improvements have been identified. Of these identified savings, 44,803 MWh/yr (18%) have been implemented to date, while 117,500 MWh/yr (46%) are planned for implementation, and 92,285 MWh/yr of savings (36%) have not yet shown progress towards implementation.
- » These figures highlight the substantial energy efficiency improvements achieved thus far and underscore the significant potential for GEIPP Phase II to support industrial parks and companies in implementing the identified energy efficiency improvements from GEIPP Phase I.
- » From a country comparative perspective, the highest energy efficiency improvements have been implemented in Indonesia (19,210 MWh/yr) and Vietnam (12,270 MWh/yr). Egypt and Vietnam demonstrate the highest potential for energy efficiency improvements through planned EIP opportunities (48,496 MWh/yr and 36,653 MWh/yr respectively).

Figure 7: Comparative summary of energy efficiency improvements – GEIPP Phase I



Illustrative examples of energy efficiency improvements are presented in the following table. This table is not all-inclusive and is provided to give an impression of the types of energy efficiency improvements supported through the GEIPP Phase I.

Table 2: Illustrative examples of energy efficiency improvements supported through GEIPP Phase I - Not all-inclusive

Country	Industrial park / company	Energy efficiency improvement	Saving MWh/yr	Implementation status
Colombia	Cinal in ZF del Cauca	Optimization of the compressed air system by implementing leak management actions	724	Implemented



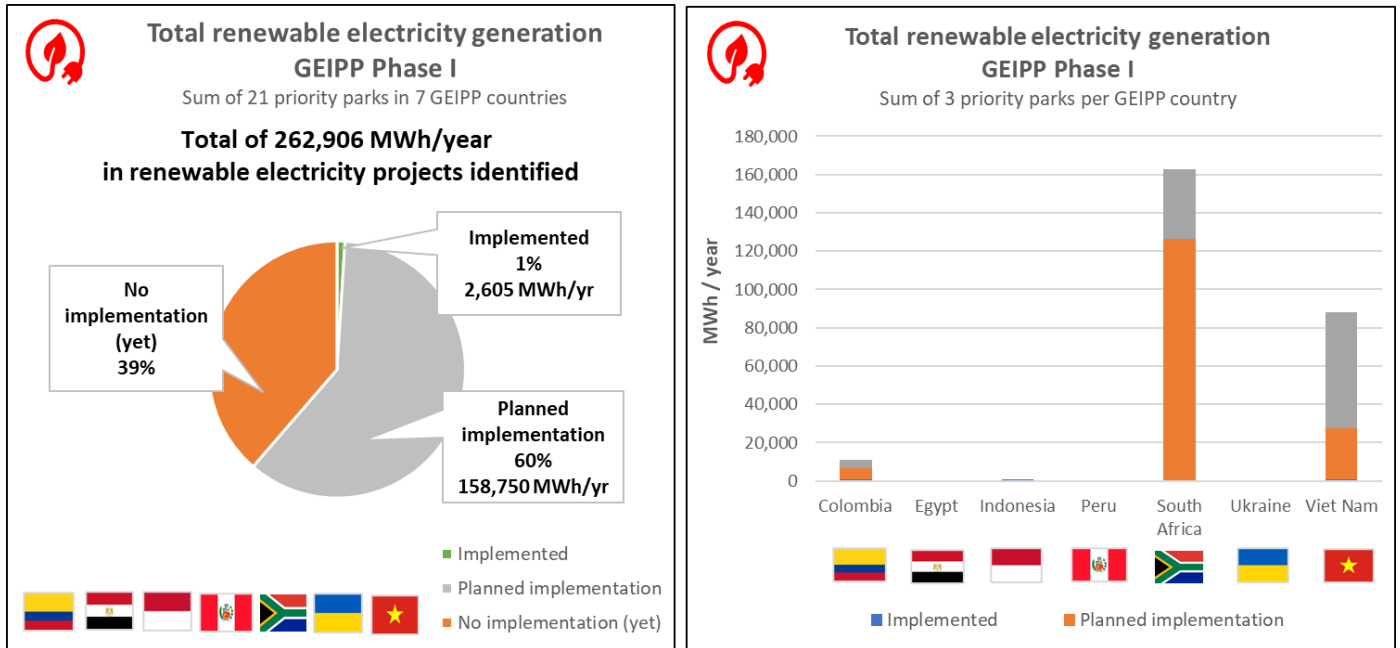
Country	Industrial park / company	Energy efficiency improvement	Saving MWh/yr	Implementation status
	Integral de empaques in ZF del Cauca	Optimization of the compressed air system	1,604	Planned
Egypt	Mansour Tannery in El Robbiki IP	Automatic and/or manual controls of ventilation systems in place	18	Implemented
	Global Napi in Polaris IP	Install a variable speed drive (VSD) to Control the main water pumps	1,714	Planned
Indonesia	MM2100 IP	Install standardized compressed air connector to reduce leaking	2,768	Implemented
	Batamindo IP	Replace the chiller system from Piston type to Screw type at Plaza Batamindo	675	Implemented
Peru	Estec in La Chutana IP	Replace LPG forklifts with electric forklifts	308	Planned
	La Chutana IP	Optimization of waste transport routes and waste collection times	129	Planned
South Africa	Qwa Qwa Laundry in Phuthaditjhaba IP	The use of alternative fuels in boilers leads to a significant reduction in coal consumption, and improved production efficiency.	68	Implemented
	East London IDZ	Intelligent street lighting in ELIDZ, including smart monitoring	181	Implemented
Ukraine	Kyiv Standard, LLC in IP BVAK	Correct selection and adjustment of compressors at compressor stations of shop No.1	43	Implemented
	IP BVAK	Install a solid fuel boiler	270	Planned
Viet Nam	VEAM in Hiep Phuoc IP	Increase testing and fixing of compressed air leaks	350	Implemented
	Dona Newtowner Natural Drink and Food in Amata IP	Optimize the operation of the steam supply system	3,994	Planned



## 2.4.2 Renewable electricity

The following figures present a summary of the megawatt-hours/yr in renewable electricity opportunities identified, planned and implemented in the 21 priority parks with support of the GEIPP Phase I.

Figure 8: Comparative summary of renewable electricity opportunities - GEIPP Phase I







Key observations from these figures are as follows:

- » A total of 262,8906 MWh/yr of renewable electricity projects have been identified. Only 2,605 MWh/yr (2%) of these identified projects have been implemented to date, while 158,730 MWh/yr (60%) are planned for implementation, and 101,571 MWh/yr of renewable electricity projects (36%) show no progress towards implementation.
- » These numbers illustrate that the implementation of renewable electricity is low across all seven GEIPP countries. There is a strong need to optimize the conducive conditions for renewable electricity generation in industrial parks across all GEIPP countries. On the other hand, based on international experiences, it is noted that park and company-level solar and wind energy projects can take up to five years to progress from identification to actual implementation. Their implementation is subject to access to finance, operational arrangements (e.g., built-own-operate, ESCO, PPPs), and legal conditions (e.g., wheeling agreements to allow the transfer of electricity over the existing distribution network, feed-in tariffs to sell excess electricity).
- » From a country comparative perspective, South Africa and Vietnam show by far the highest potential for renewable electricity projects in industrial parks through planned opportunities (126,134 MWh/yr and 26,493 MWh/yr respectively).

The following table provides illustrative examples of renewable electricity opportunities. This table is not exhaustive and is provided to give an impression of the types of renewable electricity opportunities supported in the GEIPP Phase I.

*Table 3: Illustrative examples of renewable electricity opportunities supported through GEIPP Phase I - Not all-inclusive*

Country	Industrial park / company	Renewable electricity opportunity	Generation MWh/yr	Implementation status
Colombia	Alival in ZF del Cauca	Photovoltaic self-generation through the installation of solar panels	728	Implemented
	PIMSA	Solar energy System for drinking-water treatment plant	309	Planned
Egypt	Edita in Polaris IP	Install on-grid solar PV system	4,759	Planned
	Polaris IP	Install a 20 MW on-grid PV system to offset a portion of the electrical consumption of IP	38,000	Not yet
Indonesia	Batamindo IP	Pilot solar photovoltaic plant	621	Implemented
	PT Jotun Indonesia in MM2100 IP	Installation of PV Solar Panels in Jotun 1	557	Implemented



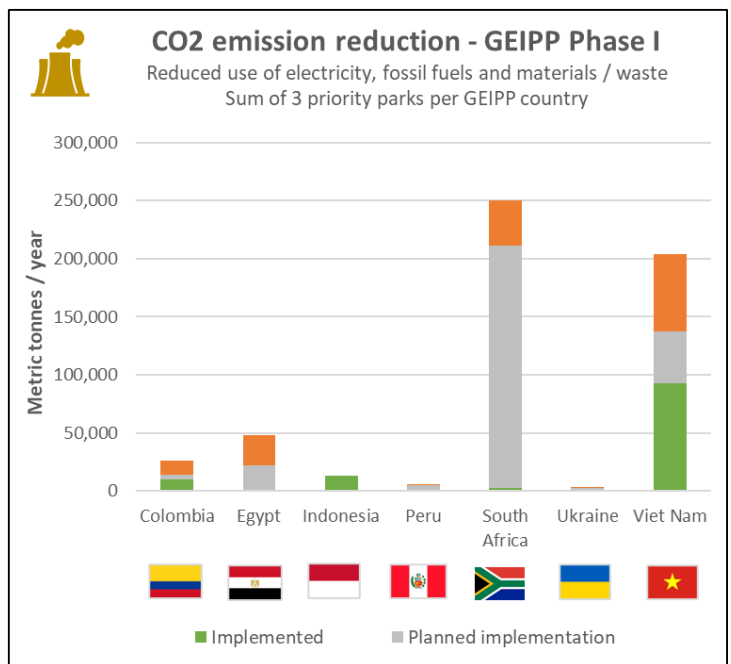
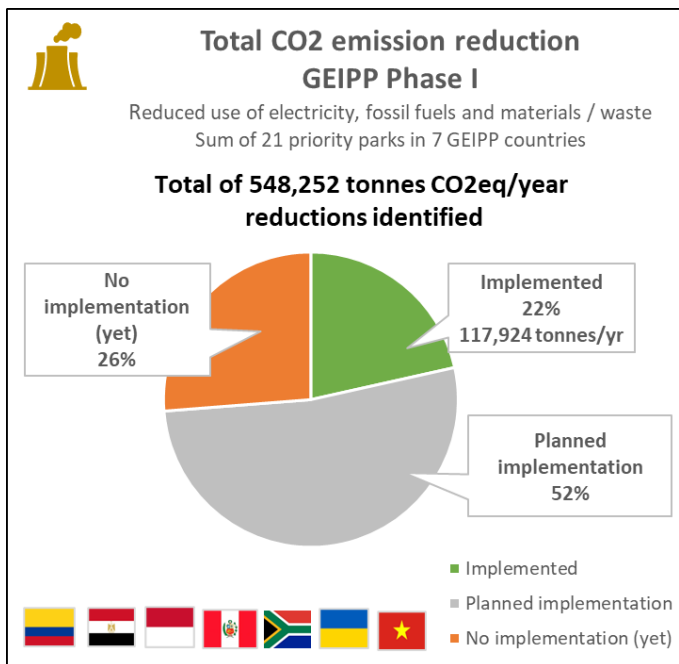
Country	Industrial park / company	Renewable electricity opportunity	Generation MWh/yr	Implementation status
Peru	Lurin Industrial Zone	Install photovoltaic panels at the Production Plant to supply electrical energy	227	Planned
	Globalplast in Sector 62 IP	Use of renewable energies	20	Planned
South Africa	East London IDZ	1.8 MW Wind farm for the ELIDZ	5,834	Planned
	East London IDZ	2x1MW Battery Storage System	4,380	Planned
Ukraine	IP Agromash	Replace electricity from fossil fuels with electricity from solar panels	624	Planned
	IP BVAK	Solar power plant on a cooperative basis	377	Planned
Viet Nam	Jotun Paint Vietnam in Hiep Phuoc IP	Invest in a solar PV system	990	Implemented
	USI Vietnam in Deep C IP	Invest in a solar PV system	1,116	Planned

### 2.4.3 Greenhouse gas reductions

Within the context of the GEIPP, greenhouse gas reductions encompass reductions in CO<sub>2</sub> emissions at both park and company levels, achieved through lower electricity consumption from national grids, reduced use of fossil fuels, decreased material consumption, and minimized waste generation. The following figures present CO<sub>2</sub> emission savings identified, planned, and implemented in the 21 priority parks receiving technical assistance through GEIPP Phase I. Key observations include:

- » A total of 548,252 metric tonnes per year (metric tonnes/yr) of CO<sub>2</sub> emissions reductions have been identified. Of these identified savings, 117,925 metric tonnes/yr (22%) have been implemented to date, while 286,486 metric tonnes/yr (52%) are planned for implementation, and 143,841 metric tonnes/yr (26%) have not yet shown progress towards implementation.
- » From a comparative country perspective, the highest CO<sub>2</sub> emission reductions have been achieved in Vietnam (92,241 metric tonnes/yr), Indonesia (12,694 metric tonnes/yr), and Colombia (9,639 metric tonnes/yr). South Africa demonstrates by far the highest potential for CO<sub>2</sub> reductions, with 209,047 metric tonnes/yr through planned EIP opportunities. Vietnam also exhibits significant potential for CO<sub>2</sub> reduction, with 44,858 metric tonnes/yr through planned EIP opportunities.

Figure 9: Comparative summary of CO<sub>2</sub> emission reductions – GEIPP Phase I



Illustrative examples of CO<sub>2</sub> emission reductions are presented in the following table. This table is not all-inclusive and is provided to give an impression of the types of CO<sub>2</sub> reductions supported through the GEIPP Phase I.

*Table 4: Illustrative examples of CO<sub>2</sub> emission reductions supported by GEIPP Phase I - Not all-inclusive*

Country	Industrial park / company	CO <sub>2</sub> emission reduction	CO <sub>2</sub> reduction metric tonnes/yr	Implementation status
Colombia	Alpina in ZF del Cauca	Correction of existing and new steam leaks in the pipelines in different sections of the process	279	Implemented
	Acesco in PIMSA	Change burners of one of the steam generation boilers to optimize natural gas consumption	492	Planned
Egypt	Orascom IP	Install a centralized 1 MW capacity gas turbine unit, with a potential upgrade to cogeneration	1,236	Planned
	Polaris IP	Install a 20 MW on-grid PV system to offset a portion of the electrical consumption of IP	19,000	Not yet



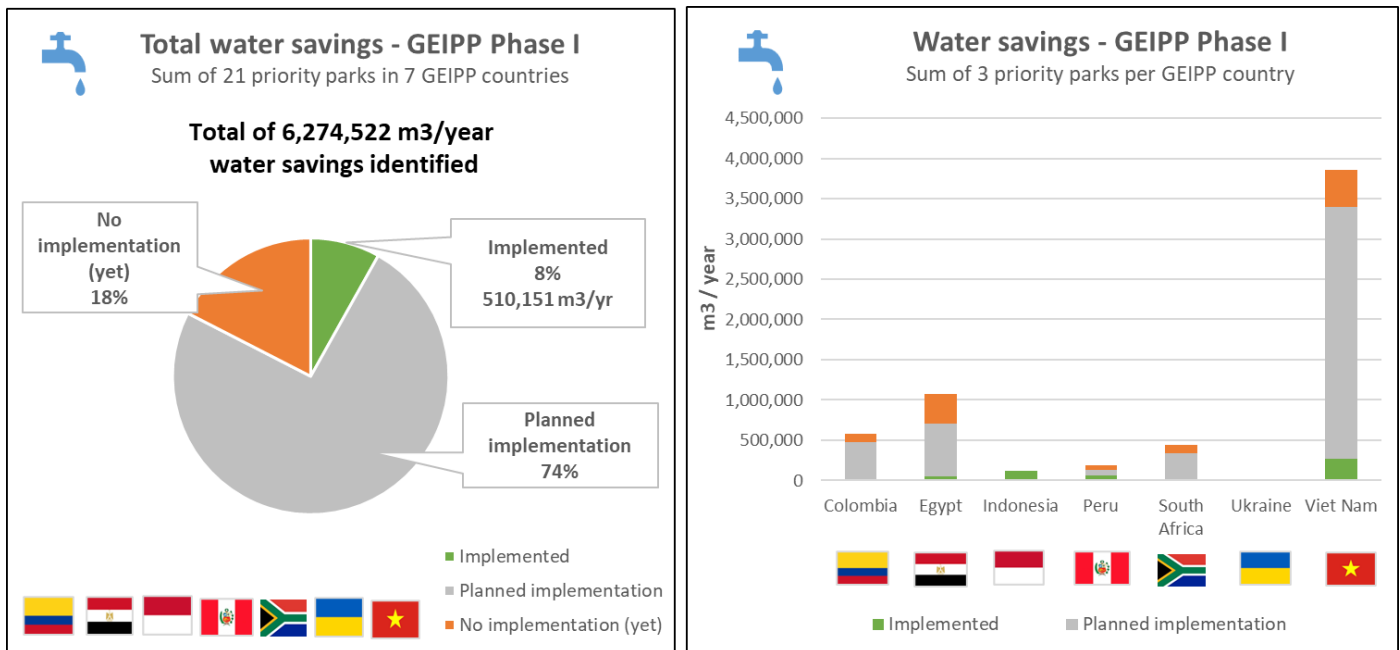
Country	Industrial park / company	CO <sub>2</sub> emission reduction	CO <sub>2</sub> reduction metric tonnes/yr	Implementation status
Indonesia	PT Sumitomo Wiring System Batam in Batamindo IP	Replacing 1 unit air-cooled chiller in Lot 8 with air-cooled chiller	595	Implemented
	PT Hitachi Astemo Bekasi Powertrain Systems in MM2100 IP	Die-casting flue gas heat recovery	113	Implemented
Peru	Indupark	Multiple opportunities following risk analysis of IP and companies undertaken as part of the master planning process	2,680	Planned
	La Chutana IP	Install variable speed drives (VDF) on compressor motors	438	Planned
South Africa	East London IDZ	50-megawatt (MW) solar farm	77,963	Planned
	Ekanustria	Ground-mounted solar PV installations	38,811	Not yet
Ukraine	Trivium Packaging Ukraine in IP BVAK	Heat recovery of flue gases of coating and lacquering process	303	Implemented
	LLC Level in IP Molfar	Insulation of premises façade	177	Implemented
Viet Nam	Deep C and Bridgestone Tire Manufacturing	Build a pilot model of industrial symbiosis using rooftop solar energy	18,021	Planned
	Flat (Vietnam) in Deep C	Invest in rooftop solar systems	9,014	Not yet



## 2.5 WATER SAVINGS

The following figures present a comparative review of water savings identified, planned and implemented in the 21 priority parks with technical assistance through GEIPP Phase I.

Figure 10: Comparative summary of water savings – GEIPP Phase I



Key observations from these figures are as follows:

- » A total of 6,274,522 cubic meters per year (m<sup>3</sup>/year) of water savings have been identified. Only 510,151 m<sup>3</sup>/year (8%) of these identified projects have been implemented to date, while 4,668,146 m<sup>3</sup>/year (74%) are planned for implementation, and 1,095,724 m<sup>3</sup>/year (18%) of water-saving projects do not yet show progress towards implementation.
- » The comparative ratio of implemented water-saving opportunities across the GEIPP I priority industrial parks indicates a need for more preparatory work to facilitate water-saving investments. Based on international experiences, it is noted that park-level water infrastructure projects can take five to seven years to progress from identification to actual implementation. Their implementation is primarily subject to access to finance, given the high investments and pay-back time required, as well as legal conditions such as regulations permitting the reuse of treated industrial effluents.
- » From a comparative country perspective, the highest water savings during GEIPP I have been implemented in Vietnam (269,360 m<sup>3</sup>/yr) and Indonesia (119,902 m<sup>3</sup>/yr). The highest potential for water savings through planned EIP opportunities is in Vietnam (3,128,159 m<sup>3</sup>/yr) and Egypt (652,854 m<sup>3</sup>/yr). Based on results to date, Ukraine and Indonesia exhibit the lowest water-saving potential among the GEIPP I countries. Key observations from these figures are:

The following table provides illustrative examples of water savings. This table is not all-inclusive and is provided to give an impression of the types of water savings supported through the GEIPP Phase I.





Table 5: Illustrative examples of water-saving opportunities supported through GEIPP Phase I - Not all-inclusive

Country	Industrial park / company	Water saving opportunity	Water saving m <sup>3</sup> /yr	Implementation status
Colombia	ZF de Occidente	Lagoon water management and use	423,000	Planned
	ZF del Cauca	Rainwater management and use	9,136	Planned
Egypt	Al-Montazah Tannery in El Robbiki IP	Monitor/control the opening and closing of the feed water entering the drums	28,725	Implemented
	Siemens in Orascom IP	Construct a Minimum Liquid Discharge (MLD) water treatment plant for reusing wastewater	24,000	Planned
Indonesia	MM2100 IP	Set up a system to anticipate industrial water pipe leakage	11,056	Implemented
	PT Infineon Technologies Batam in Batamindo IP	Reuse RO reject water for cooling water consumption	36,221	Implemented
Peru	Sector 62 IP	Improve reverse osmosis technology at IP water treatment plant to increase yields	30,416	Implemented
	Pescanova in Indupark	Improve processing efficiency of fish, squid and squid waste to produce silage	6,781	Planned
South Africa	East London IDZ	Secure water supply ELIDZ through rainwater harvesting and stormwater	113,000	Planned
	Phuthaditjhaba IP	Rainwater harvesting	110,000	Not yet
Ukraine	TM Era Mebli in IP BVAK	Install water meter and repair water leakages	153	Implemented
	IP BVAK	Modernize the water supply system and water consumption and replace valves	3,222	Planned



Country	Industrial park / company	Water saving opportunity	Water saving m <sup>3</sup> /yr	Implementation status
Viet Nam	Amata IP	Invest in a reverse osmosis system to reuse the treated wastewater	1,095,000	Planned
	Xuan Mai Paper in Hiep Phuoc IP	Recovery, recycling, reuse of treated wastewater,	300,000	Not yet

## 2.6 WASTE AND MATERIAL SAVINGS

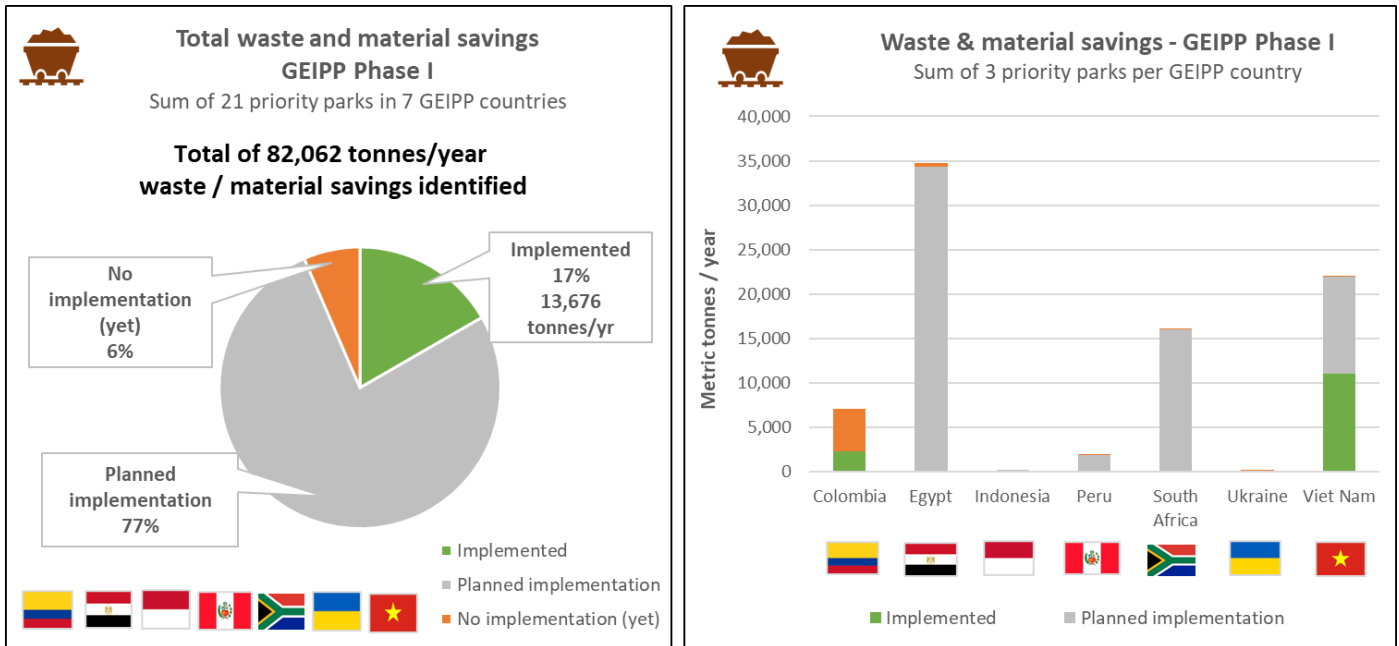
The following figures present a comparative review of waste and material savings identified, planned, and implemented in the 21 priority parks receiving technical assistance through GEIPP Phase I. Key observations are as follows:

- » A total of 82,062 metric tonnes per year (metric tonnes/yr) of waste and material savings have been identified. Of these identified savings, 13,676 metric tonnes/yr (17%) have been implemented to date, with a significant 63,069 metric tonnes/yr planned for implementation. A lower proportion (6%, 5,325 metric tonnes/yr) of the identified waste/material savings do not yet show progress toward implementation.
- » From a comparative country perspective, the highest waste and material savings have been implemented in Vietnam (11,062 metric tonnes/yr). There is significant potential for waste/material savings in Egypt through planned EIP opportunities (34,279 metric tonnes/yr). However, limited EIP opportunities for waste and material savings were identified and implemented in Indonesia and Ukraine.





Figure 11: Comparative summary of waste and material savings – GEIPP Phase I



Illustrative examples of waste and material savings are presented in the following table. This table is not all-inclusive and is provided to give an impression of the types of waste and material savings supported through the GEIPP Phase I.

Table 6: Illustrative examples of waste and material savings supported by GEIPP Phase I - Not all-inclusive

Country	Industrial park / company	Waste and material saving opportunity	Waste / material saving metric tonnes/yr	Implementation status
Colombia	Forsa and Propulsora in ZF del Cauca	Use of scrap for ingot production	330	Implemented
	PIMSA	Park-level composting and bio-digestion system	2,074	Not yet
Egypt	Lafarge Ready Mix in Orascom IP	Recycle concrete waste from rejected samples and batches to produce concrete bricks	1,920	Planned
	Ovo in Polaris IP	Recycle eggshell waste into calcium carbonate powder	400	Planned

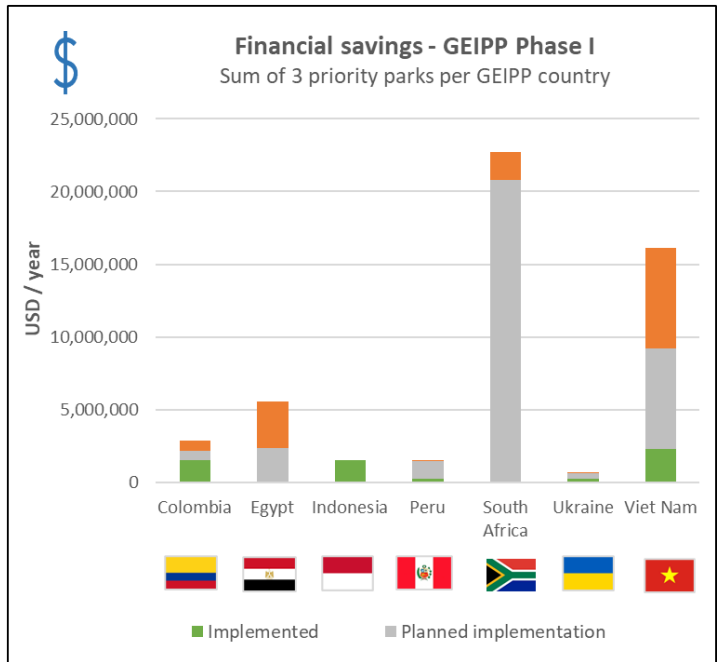
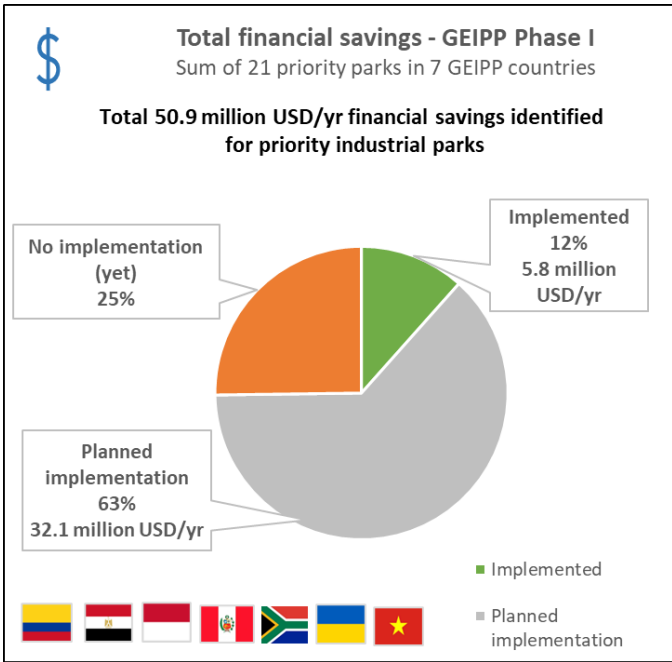


Country	Industrial park / company	Waste and material saving opportunity	Waste / material saving metric tonnes/yr	Implementation status
		that can be sold as animal feed or chemical fertilizers		
Indonesia	PT Sekisui Polymatech Indonesia in MM2100	Utilize waste rubber in rubber industries	30	Implemented
	PT Seiwa Indonesia in MM2100	Reduce R3 fabric cut length from 500mm to 450mm	13	Implemented
Peru	Sector 62 IP	Environmental Information Management Platform (materials exchange)	116	Implemented
	La Chutana IP	Park-level composting system	27	Planned
South Africa	Qwa Qwa Laundry in Phuthaditjhaba IP	Setting up a fabric waste unpicking plant	7,800	Planned
	Olysmart in East London IDZ	Waste tyre recovery through pyrolysis	7,272	Planned
Ukraine	LLC Level in IP Molfar	Insulation of premises façade	101	Implemented
	TM Era Mebli in IP BVAK	Use water-based enamel, primer and varnish	8	Planned
Viet Nam	Jotun Paint Vietnam in Hiep Phuoc IP	Increase the efficiency of wastewater treatment works and treatment chemicals	23	Implemented
	Thanh Tung 2 Co. in Amata IP	Thanh Tung 2 Co., Ltd collects scrap paper from companies in Amata IP	993	Planned

## 2.7 FINANCIAL SAVINGS

The following figures present a comparative review of the financial savings identified, planned and implemented in the 21 priority parks with technical assistance through GEIPP Phase I.

Figure 12: Comparative summary of financial savings – GEIPP Phase I





Key observations from these figures are as follows:

- » A total of 50.9 million USD per year (USD/yr) of financial savings have been identified for the industrial parks and their tenant companies. Of these identified savings, 5.9 million USD/yr (12%) have been implemented to date. A significant 32.1 million USD/yr in financial savings are planned for implementation, while 12.8 million USD/yr of financial savings do not yet show progress towards implementation. This highlights the critical importance of ongoing support to the GEIPP I priority industrial parks and their companies for the actual implementation of planned high-impact opportunities through finance facilitation, technical advice, matchmaking, and stakeholder collaborations.
- » From a comparative country perspective, the highest financial savings have been implemented in Vietnam (2.3 million USD/yr), followed by Colombia (1.5 million USD/yr). South Africa stands out with the highest potential for financial savings through planned EIP opportunities (e.g., 20.7 million USD/yr). The focus in South Africa is primarily on infrastructure-related opportunities to address the country's current infrastructure and utilities challenges. While these opportunities promise significant financial savings, they also necessitate substantial investments.

Illustrative examples of financial savings are provided in the following table. This table is not exhaustive and is intended to demonstrate the types of financial savings supported through GEIPP Phase I.

*Table 7: Illustrative examples of financial savings supported by GEIPP Phase I - Not all-inclusive*

Country	Industrial park / company	Financial saving	Financial saving USD/yr	Implementation status
Colombia	All companies in ZF del Cauca	Establishment of a centralized waste management site in IP	1,120,956	Implemented
	PIMSA	Establish a park-level cooling district to serve tenant companies	211,750	Not yet
Egypt	Egypt Anode in Orascom IP	Optimize the coke cooler system	274,200	Planned
	Polaris IP	Install a 20 MW on-grid PV system	1,455,000	Not yet
Indonesia	PT Sekisui Polymatech Indonesia in MM2100 IP	Standardized compressed air connector to reduce leaking	187,730	Implemented
	PT Seiwa Indonesia in MM2100 IP	Install solar PV panels on roofs in PT Seiwa Indonesia	100,000	Implemented



Country	Industrial park / company	Financial saving	Financial saving USD/yr	Implementation status
Peru	Sector 62 IP	Multiple reuses of treated wastewater from industrial park treatment plant	140,875	Implemented
	Sector 62 IP	Set up a park-level platform/site for waste management	35,340	Planned
South Africa	Qwa Qwa Laundry in Phuthaditjhaba IP	Setting up a fabric waste unpicking plant	5,329,981	Planned
	East London IDZ	50-megawatt (MW) solar farm	3,966,059	Planned
Ukraine	Energy System Innovations & Metal Industry in IP BVAK	Nitrogen generation station	103,960	Implemented
	IP BVAK	Solar power to reduce dependence on outside power suppliers	60,000	Planned
Viet Nam	Can Tho Fertilizer and Chemicals Company, Nam Hung Phat Paper Enterprise, Saigon-Western Beer, ESCO in Tra Noc IP	Mutualization of the use of boilers between three companies	553,255	Implemented
	Thanh Tung 2, Mechanical Eng. & Metallurgy in Amata IP	Purchasing scrap iron and steel for recycling from companies in Amata IP	3,131,148	Planned

## 2.8 RETURN ON INVESTMENTS

### 2.8.1 Return on investment for all EIP opportunities

The figures on the following page summarize the return on investments of the EIP opportunities in the 21 priority parks supported by GEIPP Phase I (Figure 13) and the average investment per EIP opportunity (Figure 14). Please note the logarithmic scale for the investment value (y-axis) in Figure 14. Key observations include:

- » The average payback time for all EIP opportunities identified across all seven GEIPP countries is 3.3 years. For implemented EIP opportunities across these countries, the average payback time is 2.4 years. This highlights that decisions regarding EIP opportunity implementation by



industrial parks and companies are primarily driven by financial returns rather than environmental or social considerations.

- » From a comparative country perspective, the payback time for implemented EIP opportunities is the lowest in Egypt (0.6 years) and Vietnam (0.6 years), largely due to the prevalence of lower investment options in these countries.
- » Excluding low investment opportunities, the average investment per identified EIP opportunity across the seven GEIPP countries is just over 250,000 USD. The average investment per implemented opportunity is 53,000 USD, while the average investment per opportunity that is not implemented is close to 300,000 USD. Alongside return on investment, decisions on EIP opportunity implementation by industrial parks and companies are heavily influenced by access to finance. This underscores the critical need for GEIPP Phase II to prioritize finance facilitation and access to finance.
- » There are significant variations in the level of investment per EIP opportunity across the GEIPP countries. The average investment per implemented EIP opportunity is lowest in Egypt (4,300 USD per opportunity) and highest in Colombia (275,000 USD per opportunity). The investment and payback time for planned EIP opportunities are highest in South Africa, reflecting their focus on advancing higher investment opportunities to address infrastructure challenges faced by industrial parks, companies, and the country as a whole.



Figure 13: Average return on investments of EIP opportunities – GEIPP Phase I

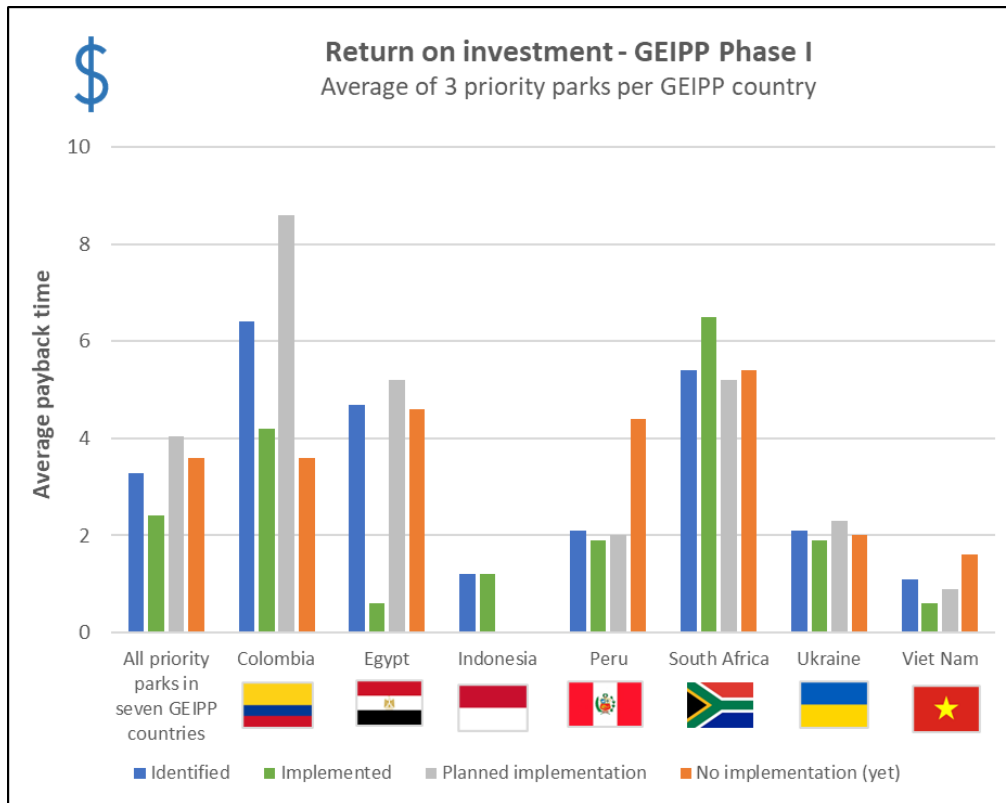
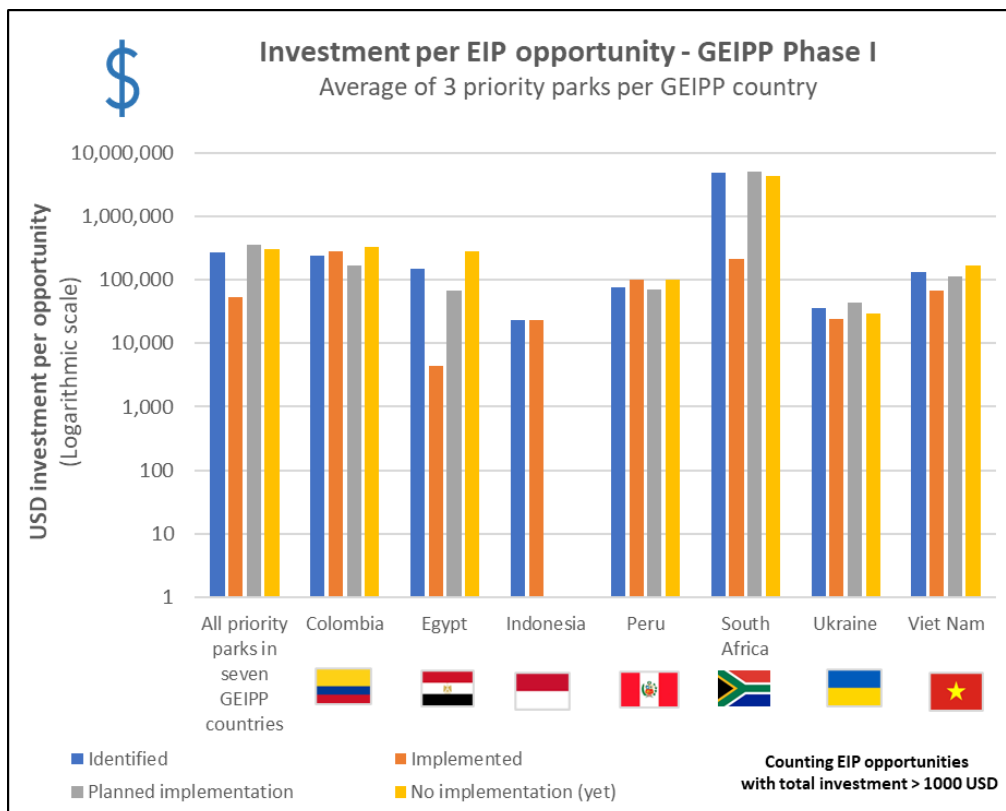


Figure 14: Average investment per EIP opportunity – GEIPP Phase I, y-axis logarithmic





### 2.8.2 Return on investment by opportunity type

The GEIPP Phase I provided technical assistance to 21 pilot parks in seven countries. The assistance included multiple EIP approaches based on the specific needs of the industrial parks and their companies, such as:

- » Conducting Resource Efficient and Cleaner Production (RECP) assessments with tenant companies and park-level facilities to implement resource efficiency opportunities.
- » Identifying and developing industrial synergies and shared infrastructure, particularly focused on water and waste processing, reuse, and recycling.
- » Developing renewable energy projects.
- » Identifying and developing park management services.
- » Strengthening community collaboration.
- » Enhancing planning and zoning of industrial parks to incorporate the EIP concept and master planning.

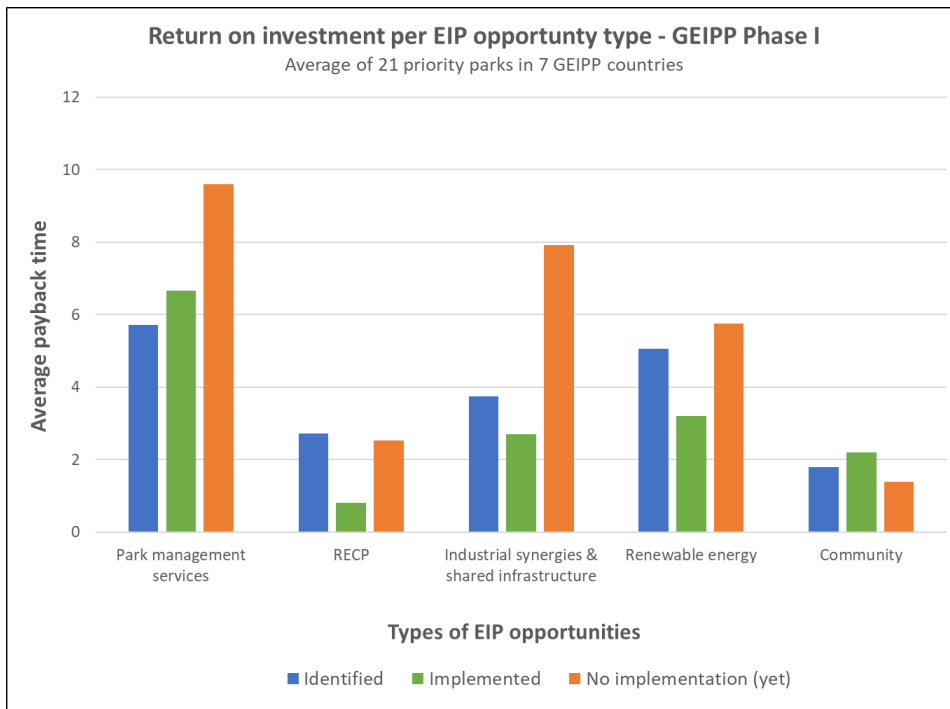
The following figure offers an overview of the return on investment per type of EIP opportunity. Implemented opportunities generally have a significantly lower payback time compared to those that have not been implemented. Therefore, return on investment serves as both a key success factor and a barrier for implementing renewable energy, water, waste, social, and management opportunities.

Implemented RECP opportunities exhibit the lowest payback time of 0.8 years, followed by community collaboration projects (2.2 years), industrial synergies and shared infrastructure (2.7 years), renewable energy (3.2 years) and park management services (6.7 years).





Figure 15: Average return on investment per type EIP opportunity – GEIPP Phase I



Comparative analysis  
of park scorings against the  
International EIP Framework

3

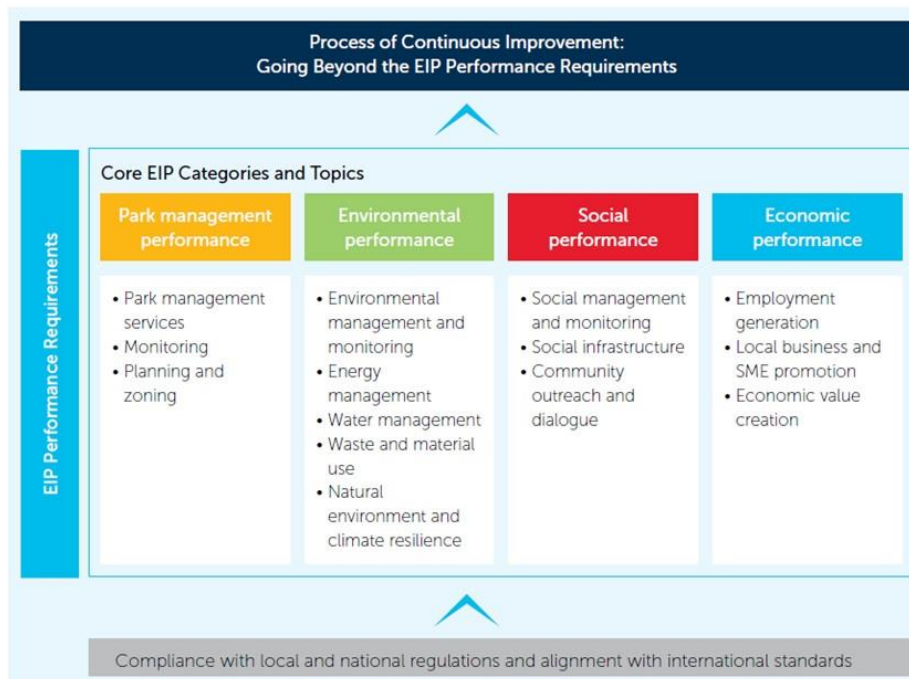


### 3 COMPARATIVE ANALYSIS OF PARK SCORINGS AGAINST THE INTERNATIONAL EIP FRAMEWORK

#### 3.1 OVERVIEW

UNIDO, World Bank Group and GIZ (German Development Cooperation) have collaborated to develop an international framework which provides guidance on what constitutes an eco-industrial park and how an industrial park can work towards becoming an eco-industrial park<sup>2</sup>. As a baseline, industrial parks must comply with all applicable local and national regulations. The figure below presents the International Framework for Eco-Industrial Parks (hereafter referred to as “International EIP Framework” in this report). Further details on the international framework can be downloaded from the publication weblink in the footnote.

Figure 16: Overall framework for describing Eco-Industrial Parks (UNIDO, WBG, GIZ)



The framework is based on four key categories: Park management performance; Environmental performance; Social performance; and Economic performance. The requirements within each category are divided into “prerequisites” and “performance indicators,” which can be verified and measured in qualitative or quantitative terms. The prerequisites highlight the basic requirements for EIPs, and the performance indicators describe the expected performance levels that an EIP must meet.

Following the development of the International EIP Framework, an EIP Assessment Tool was developed by UNIDO to operationalize the framework. The EIP Assessment Tool assists industrial parks with (a) assessing their baseline and intended performance against the prerequisites and performance indicators outlined in the International EIP Framework; (b) identifying and prioritizing EIP initiatives; and (c) planning the implementation of prioritized EIP initiatives.

<sup>2</sup> UNIDO, WBG, GIZ. An International Framework for Eco-Industrial Parks. [Weblink](#).



UNIDO's EIP Assessment Tool provides the following options for rating the performance of industrial parks against each prerequisite and performance indicator of the International EIP Framework:

- » "Yes": Industrial park fully meets the prerequisite/performance indicator;
- » "No": Industrial park does not meet the prerequisite/performance indicator;
- » "Partly": Industrial park meets large parts of the prerequisite and made efforts to work on this, but the prerequisite is not fully met yet. "Partly" rating is only possible for prerequisites, as performance indicators include percentage levels that are either met or not;
- » "To be confirmed": Further data is required to decide whether or not the park meets the prerequisite/performance indicator;
- » "Not applicable": Prerequisite/performance indicator does not apply to industrial park (e.g. park does not have companies with more than 250 employees, whereas an indicator applies only to companies with more than 250 employees).

This chapter provides a comparative analysis of the baseline, intended and achieved EIP scorings of the 21 industrial parks in seven countries that received technical assistance through GEIPP Phase I. The chapter includes a review of the total EIP scorings, park-level scorings per country, and scorings per category of the International EIP Framework (e.g. park management, environmental, social and economic performance).

It is noted that the results of the analysis presented in this chapter may include some margin of variability. The EIP assessments were conducted by a small team of experts, covering disciplines of engineering, management consulting, and social science. However, given the use of the standardized rating options in UNIDO's EIP Assessment Tool (i.e. "Yes, No, Partly, To be confirmed"), the statistical error is somehow mitigated.

### 3.2 TOTAL EIP SCORINGS

The total EIP scoring of an industrial park is defined as the percentage of the 51 prerequisites and performance indicators from the International EIP Framework (UNIDO, WBG, GIZ, 2017) that the park meets. As described earlier, UNIDO's EIP Assessment Tool was used to evaluate these industrial parks.

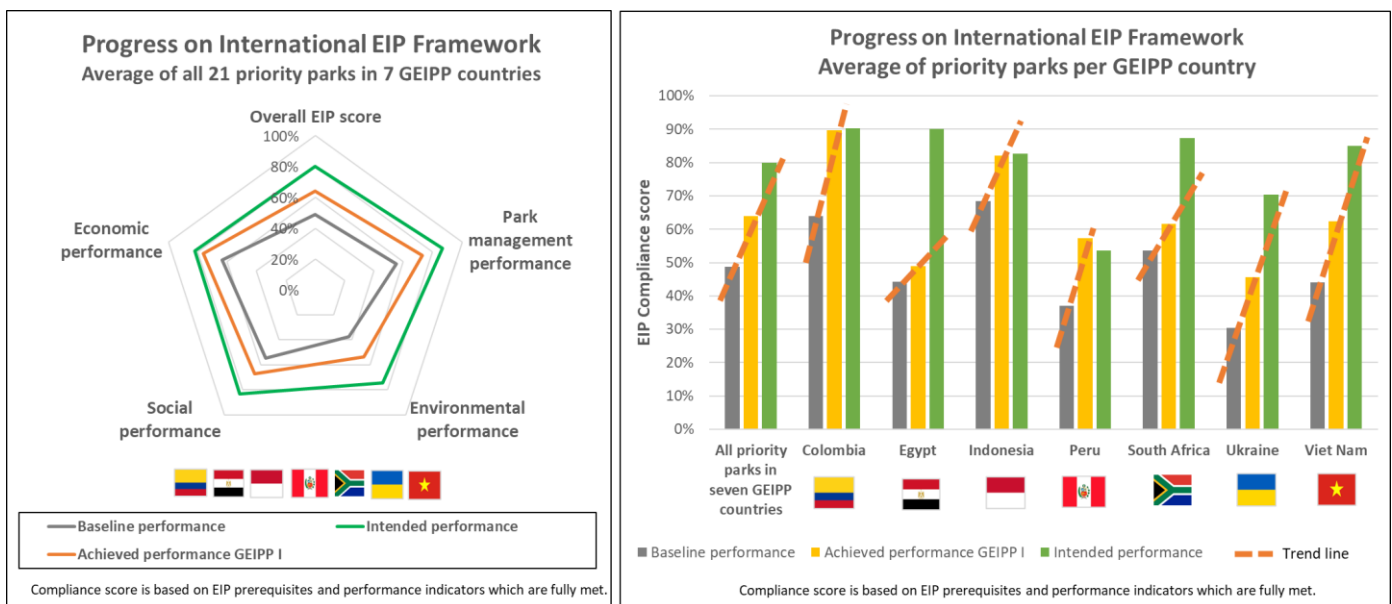
The following figures provide a summary of the baseline, intended, and achieved EIP scores for the 21 industrial parks across seven countries that received technical assistance through GEIPP Phase I. Key observations from these figures are as follows:

- » Significant progress has been made in assisting priority parks during GEIPP Phase I in their transformation towards EIPs. The average EIP score for all 21 parks was 49% at the baseline (start of GEIPP Phase I in 2019). By the end of GEIPP Phase I (December 2023), the average achieved performance had increased to 64%, representing a 15% improvement.
- » Progress has been evident across all categories of the International EIP Framework, including park management performance (increase of 18%), environmental performance (increase of 16%), social performance (increase of 12%), and economic performance (increase of 13%).
- » In most cases, the achieved EIP scores have not yet reached the intended performance levels of the industrial parks. This underscores the ongoing need for additional time and effort by the parks to achieve their intended performance levels and sustain their EIP transformation.
- » It's important to recognize that the speed of EIP transformation varies across GEIPP countries due to differing national contexts and operating conditions:



- Steep progress has been observed in Colombia, Indonesia, Peru, and Vietnam.
- South Africa has shown substantial overall progress in EIP transformation despite economic challenges, institutional issues, and infrastructure difficulties (e.g., unstable electricity supply and load shedding).
- Ukraine has made good progress in EIP transformation despite the challenges posed by the war situation.
- Egypt experienced delays in the implementation process, resulting in less time for EIP transformation of industrial parks and a flatter progress trend line.

Figure 17: Summary of progress on International EIP Framework – GEIPP Phase I



### 3.3 PARK-LEVEL EIP SCORINGS PER COUNTRY

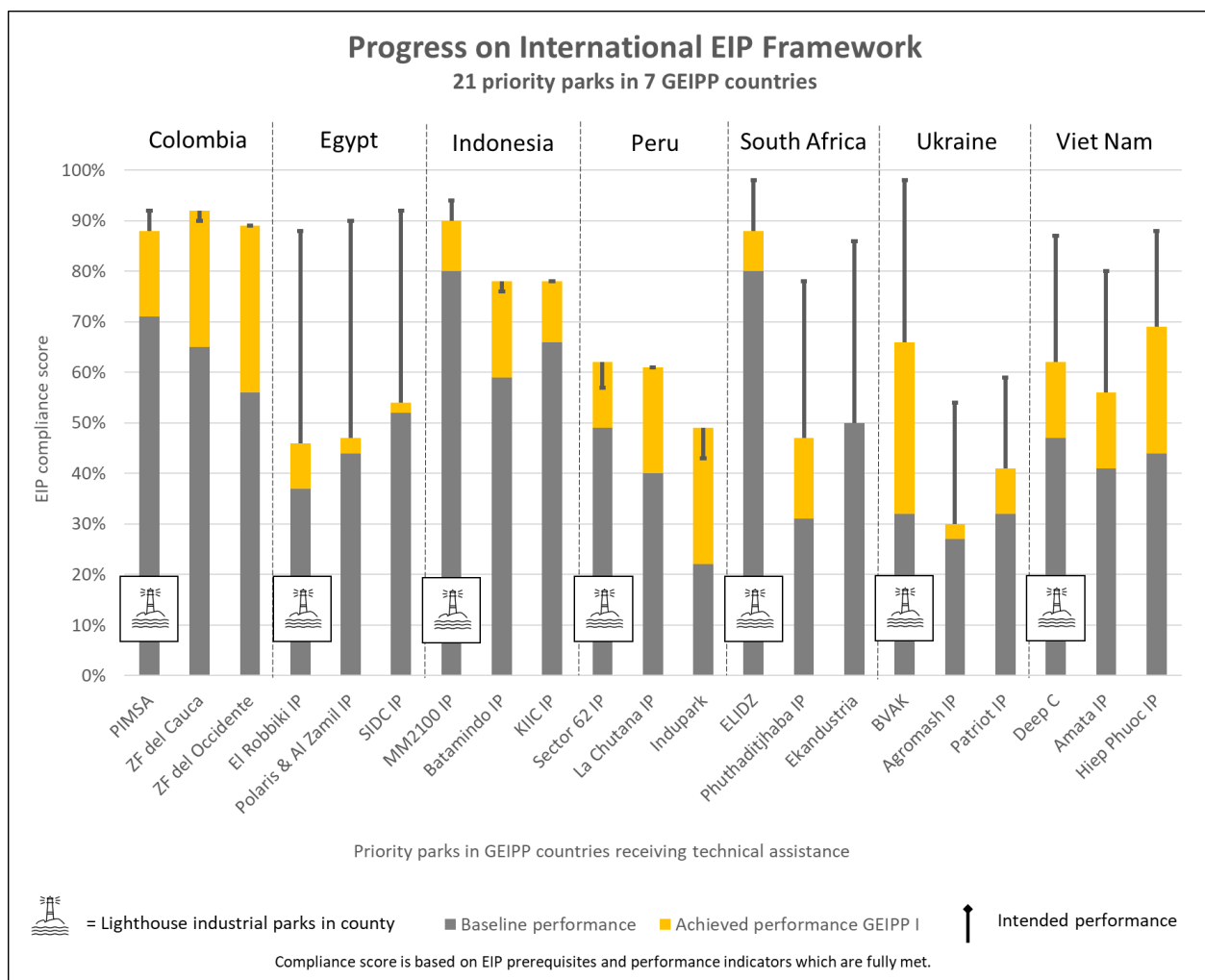
The following figure presents the average baseline and intended performance of the three priority parks in each of the seven GEIPP countries. Key observations from the figure are:

- » There is a wide range in current and intended performance against the International EIP Framework. EIP transformation progress per park varies as expected. Each industrial park is unique, including its specific opportunities and challenges and the type of assistance provided;
- » Overall, high-performing parks have implemented most “easy to do” solutions while lower-performing parks are in their earlier EIP development stages. Therefore, industrial parks with a lower EIP scoring typically have a higher proportion of lower-cost initiatives to transform towards an eco-industrial park compared to higher-performing industrial parks;
- » Achieved performance of some parks exceeded the intended performance set at the start of GEIPP I (2019), such as Batamindo, Sector 62, BVAK;
- » As expected, the lighthouse parks have a higher total EIP scoring than the average score of industrial parks assessed in their respective countries. The highest difference between lighthouse park and the average of the parks are in Indonesia and South Africa, indicating differences in park management approaches and the ability of parks to attract new “modern” tenant companies;



- » In the scenario of having a high-performing lighthouse in a country (e.g. Colombia, Indonesia, South Africa) technical assistance in GEIPP Phase II should include a stronger focus on knowledge dissemination, sharing experiences and peer-to-peer learning between industrial parks.

Figure 188: Progress on the International EIP Framework – EIP scorings for priority parks per country





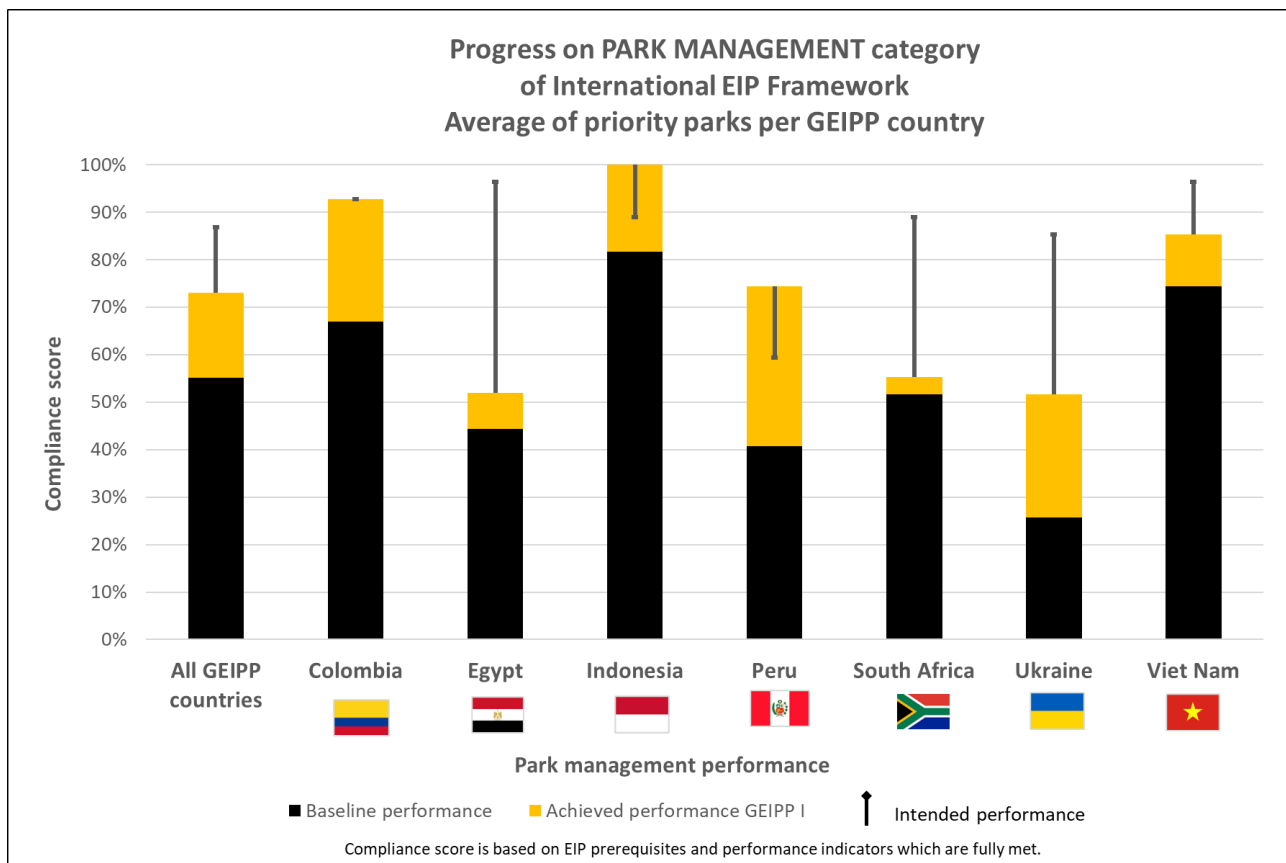
### 3.4 PARK MANAGEMENT PERFORMANCE

#### 3.4.1 Scorings

The following figure presents the overall progress by country of the 21 priority parks against the park management benchmarks of the International EIP Framework. Key observations from the figure are:

- » Across all parks in the seven countries, the baseline performance in the park management category is 55% with an intended performance of 87%. The achieved performance at the end of GEIPP I (December 2023) is 73%, an increase of 18%;
- » The highest baseline performance in the park management category was in Indonesia (82%) and Viet Nam (74%). The lowest baseline performance in the park management category was in Ukraine (26%) and Peru (41%);
- » The highest increase from the baseline performance (start of GEIPP I 2019) to at the end of GEIPP I achieved performance (December 2023) in the park management category is in Peru (34% increase) and Colombia and Ukraine (both at 26% increase);
- » The achieved performance of three priority parks in Indonesia and Peru exceeded the intended park management performance set at the start of GEIPP I (2019).

Figure 19: Progress in the park management category of the International EIP Framework



### 3.5 ENVIRONMENTAL PERFORMANCE

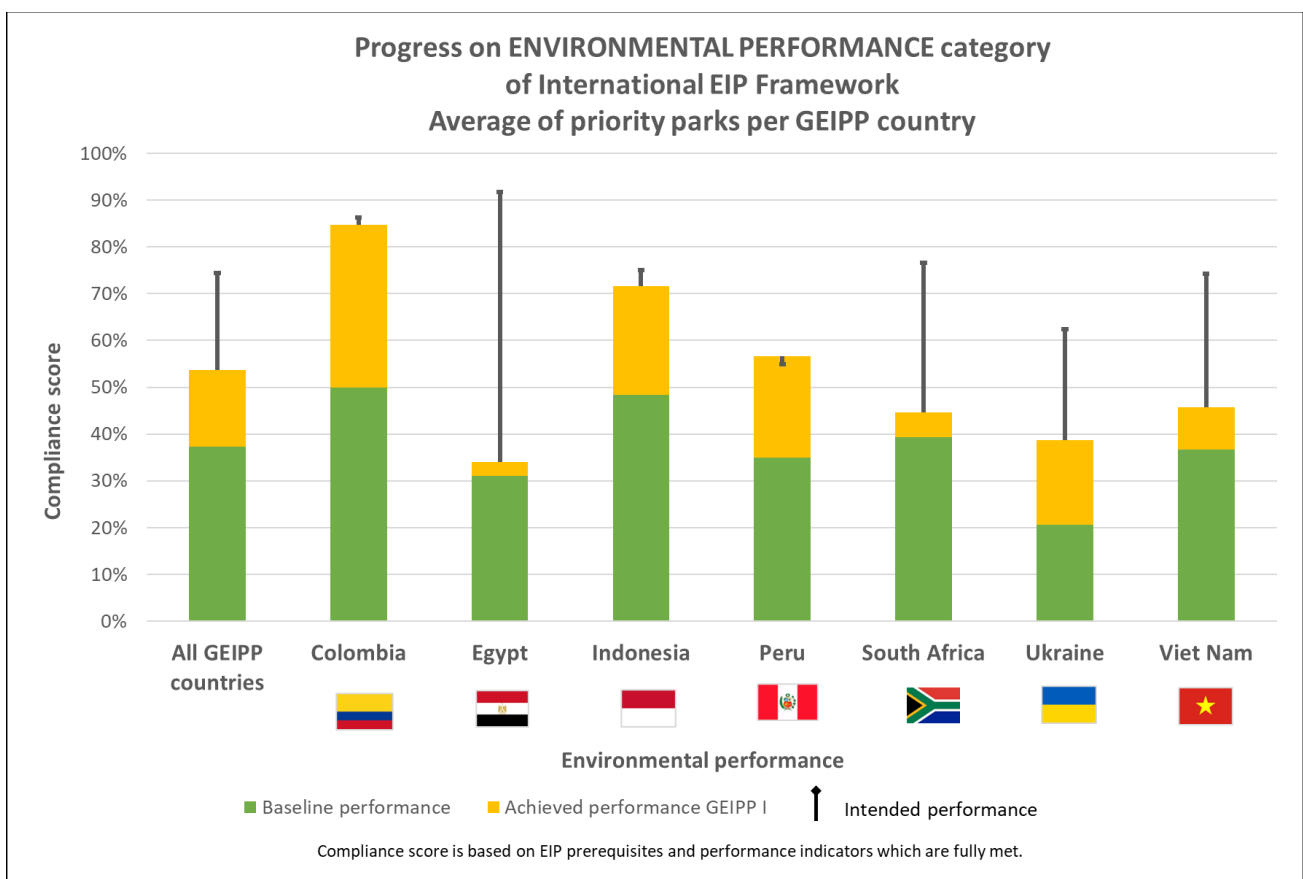
#### 3.5.1 Scorings

The following figure presents the overall progress by country of the 21 priority parks against the environmental performance benchmarks of the International EIP Framework. Key observations are:



- » Across all parks in the seven countries, the baseline performance in the environmental category is 37% with an intended performance of 74%. The achieved performance at end of GEIPP I (December 2023) is 54%, an increase of 16%;
- » The highest baseline performance in the environmental category was in Colombia (50%) and Indonesia (48%). The lowest baseline performance in the environmental category was in Ukraine (21%) and Egypt (31%);
- » The highest increase from the baseline performance (start of GEIPP I 2019) to achieved performance (at end of GEIPP, December 2023) in the environmental category is in Colombia (35% increase) and Indonesia (23% increase);
- » The achieved performance of three priority parks in Peru exceeded the intended environmental performance set at the start of GEIPP I (2019).

Figure 190: Progress in the environmental performance category of the International EIP Framework



### 3.6 SOCIAL PERFORMANCE

#### 3.6.1 Scorings

The following figure presents the overall progress by country of the 21 priority parks against the social performance benchmarks of the International EIP Framework. Key observations from the figure are:

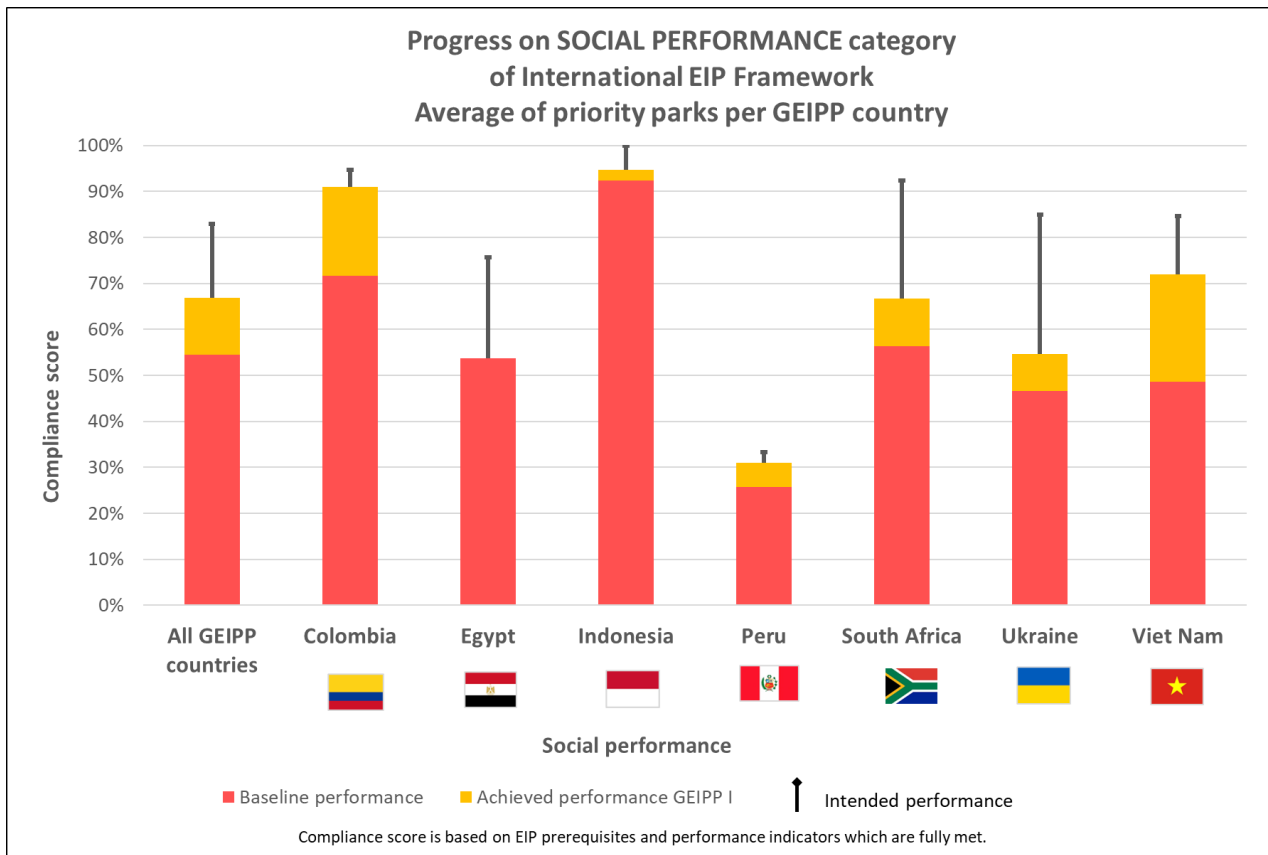
- » Across all parks in the seven countries, the baseline performance in the social category is 55% with an intended performance of 83%. The achieved performance at end of GEIPP I (December 2023) is 67%, an increase of 12%;
- » The highest baseline performance in the social category was in Indonesia (92%) and Colombia (72%). The lowest baseline performance in the social category was in Peru (26%);





- » The highest increase from the baseline performance (start of GEIPP I 2019) to achieved performance (at end of GEIPP, December 2023) in the social category is in Viet Nam (23% increase) and Colombia (19% increase).

Figure 21: Progress in the social performance category of the International EIP Framework



### 3.7 ECONOMIC PERFORMANCE

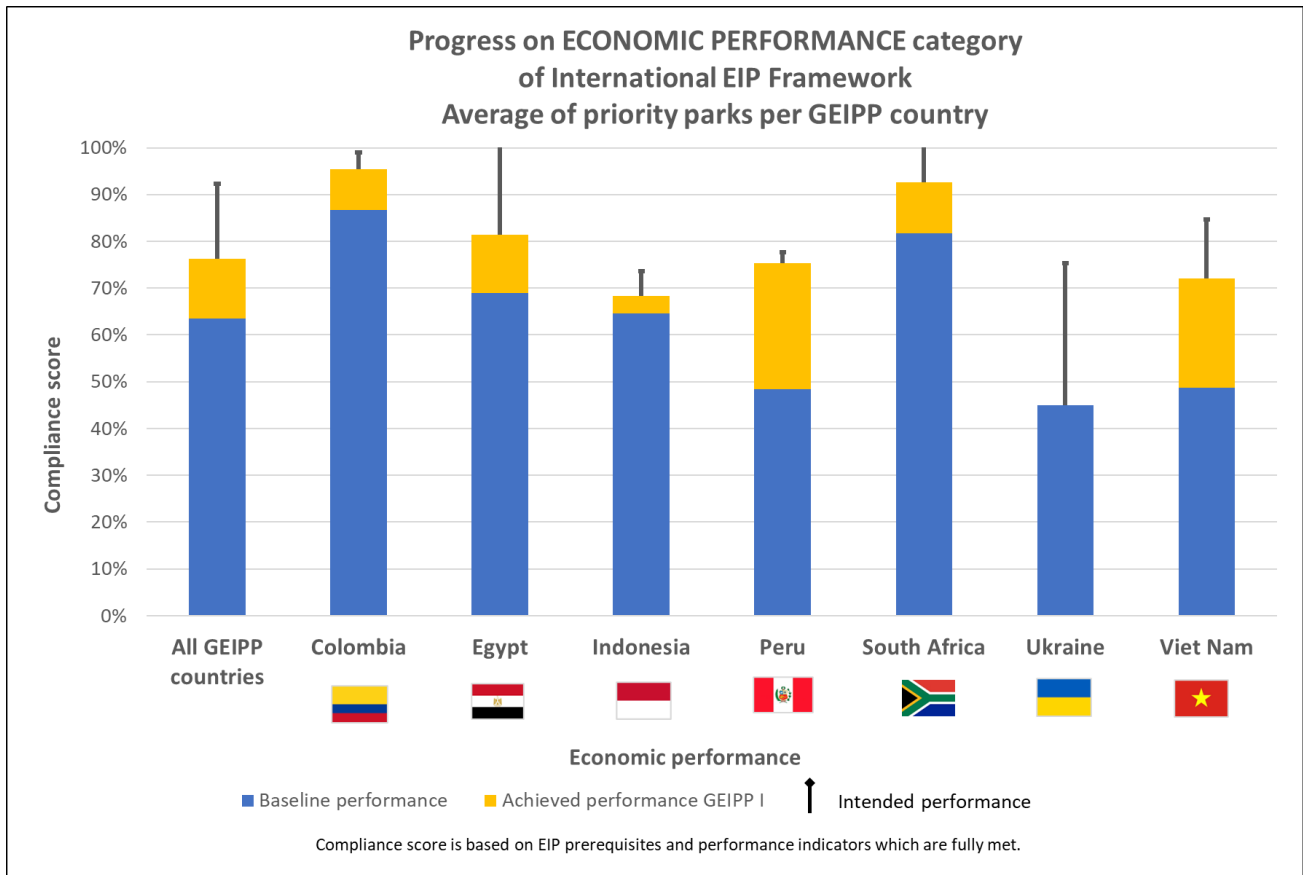
#### 3.7.1 Scorings

The following figure presents the overall progress by country of the 21 priority parks against the economic performance benchmarks of the International EIP Framework. Key observations from the figure are:

- » Across all parks in the seven countries, the baseline performance in the economic category is 63% with an intended performance of 82%. The achieved performance at the end of GEIPP I (December 2023) is 76%, an increase of 13%;
- » The highest baseline performance in the economic category was in Colombia (87%) and South Africa (82%). The lowest baseline performance in the economic category was in Ukraine (45%), Peru (48%) and Viet Nam (49%);
- » The highest increase from the baseline performance (start of GEIPP I 2019) to achieved performance (at end of GEIPP, December 2023) in the economic category is in Peru (27% increase) and Viet Nam (23% increase).



Figure 20: Progress in economic performance category of the International EIP Framework



# Conclusions and recommendations

# 5





## 4 CONCLUSIONS AND RECOMMENDATIONS

### 4.1 CONCLUSIONS

Key conclusions based on the results and lessons learnt from the transformation process to eco-industrial parks in the GEIPP Phase I priority parks, as documented in this report, are:

#### **EIP opportunities identified, developed and implemented by industrial parks**

- » Types and number of EIP opportunities: A total of 783 opportunities were identified, of which 177 EIP opportunities (22%) have been successfully implemented. These opportunities include initiatives for resource-efficient and cleaner production (RECP), industrial synergies, park management services, and planning and zoning. Additionally, 371 EIP opportunities (47%) are currently in the planning phase for implementation.
- » Transition from Resource Efficient and Cleaner Production, RECP, to EIP implementation: Among all identified EIP opportunities, 37% represent non-RECP options across the seven GEIPP countries. This shift indicates that GEIPP Phase I has begun to move beyond RECP while integrating it into the broader EIP transformation process. Notably, South Africa (90% of total opportunities) and Colombia (62% of total opportunities) lead in non-RECP opportunities.
- » Implemented resource savings: Analysis of GEIPP I results underscores significant resource savings achieved, including improved energy efficiency (44,803 MWh/yr), CO<sub>2</sub> reductions (117,925 metric tonnes/yr), water savings (510,151 m<sup>3</sup>/yr), and waste/material savings (13,676 metric tonnes/yr).
- » Planned resource savings: A high amount of resource savings have been planned for implementation with the assistance of GEIPP Phase I (e.g. through feasibility assessments, finance facilitation, technical advice, and matchmaking). The proportion of planned opportunities ranges from 46% (energy efficiency improvements) to 77% (waste and materials savings). This illustrates the significant potential for GEIPP Phase II to support industrial parks and companies in implementing the resource savings identified and developed during GEIPP Phase I. Based on international experiences, infrastructure and investment projects, on average, can take five to seven years to progress from a good idea to actual implementation (depending on the size and complexity of the project and local context). Therefore, a large proportion of these planned opportunities will likely result in positive impacts and resource savings during GEIPP Phase II;
- » Renewable electricity and water recycling: Only 2% of identified renewable energy electricity and 8% of water recycling projects have been implemented to date. This is partly due to the time required to develop investment projects. It underscores the urgent need across all GEIPP countries to optimize conditions for implementing renewable electricity generation and water recycling projects, including facilitating access to finance.

#### **Industrial park scorings against benchmarks of International EIP Framework**

- Total EIP scorings: There is a wide range in the baseline and intended performance of the industrial parks against the International EIP Framework. Each industrial park is unique, including its specific opportunities and challenges and the type of assistance provided. Higher average baseline performance can be found in Colombia, Indonesia and Viet Nam;



- **Progress:** Substantial progress has been made to assist the industrial parks with transforming towards EIPs. The average baseline EIP scoring of all 21 parks was 49% at the start of the GEIPP Phase I (2019) and the average of the achieved performance at the end of GEIPP Phase I (December 2023) was 64%. This is an increase of 15%. Progress has been made in all categories of the International EIP Framework;
- **Lighthouse parks:** As expected, the lighthouse parks have a higher total EIP scoring than the average score of industrial parks assessed in their respective countries. In the scenario of having a high-performing lighthouse in a country (e.g. Colombia, Indonesia, South Africa) technical assistance in GEIPP Phase II should include a strong focus on knowledge dissemination, sharing experiences and peer-to-peer learning between industrial parks;
- **Comparative country perspective:** Recognizing that the national context and operating conditions are different in each GEIPP country, the speed of EIP transformation differs per country. For example:
  - Steep progress in Colombia, Indonesia, Peru and Viet Nam;
  - Overall substantial progress on EIP transformation in South Africa;
  - Good progress on EIP transformation in Ukraine despite war situation;
  - Egypt started the implementation process with delay, so there was less time for the EIP transformation process of the industrial parks resulting in a flatter progress trend line.
- **Park management performance:** Across all parks in the seven countries, the baseline performance in the park management category is 55% with an intended performance of 87%. The achieved performance at the end of GEIPP I is 73%, an increase of 18%. The highest increase in achieved performance in the park management category is in Peru, and Colombia and Ukraine;
- **Environmental performance:** The baseline performance across all countries in the environmental category is 37% with an intended performance of 74%. The achieved performance at the end of GEIPP I is 54%, an increase of 16%. The highest increase in achieved performance in the environmental category is in Colombia and Indonesia;
- **Social performance:** Across all parks in the seven countries, the baseline performance in the social category is 55% with an intended performance of 83%. The achieved performance at the end of GEIPP I (December 2023) is 67%, an increase of 12%. The highest increase in achieved performance in the social category is in Viet Nam and Colombia;
- **Economic performance:** The baseline performance across all countries in the economic category is 63% with an intended performance of 82%. The achieved performance at the end of GEIPP I is 76%, an increase of 13%. The highest increase in achieved performance in the economic category is in Peru and Viet Nam.

## 4.2 RECOMMENDATIONS

Recommendations based on the results and lessons learnt from the transformation process to eco-industrial parks in the GEIPP Phase I priority parks, as documented in this report, are:

- » **Opportunities planned for implementation:** A high amount of resource savings have been planned for implementation with the assistance of GEIPP Phase I. It is therefore recommended



that GEIPP Phase II continues its support to these industrial parks and companies to implement the resource savings identified and developed in GEIPP Phase I;

- » **Strengthen inducive conditions:** Given the lower implementation rates of renewable electricity and water recycling projects and their significant proportion of planned implementation, GEIPP Phase II to include a strong focus on strengthening their inducive conditions. These inducive conditions include access-to-finance, effective operational arrangements (e.g. built-own-operate, PPPs), and legal aspects. Legal aspects for renewable energy projects cover wheeling agreements to allow the transfer of electricity over existing distribution networks, and feedback tariffs to sell excess electricity. Legal aspects for water recycling cover streamlined regulations that allow the reuse of treated industrial effluents);
- » **Ensure national Policy Support for ensuring inducive conditions:** The above inducive conditions are not created solely by the industrial parks or the manufacturing sector. Public policy, support mechanisms and incentives play an important role in the process. For an EIP transition, strong policy support is needed at all levels and GEIPP Phase II should include such.
- » **Balanced set of EIP opportunities:** GEIPP Phase II to ensure that a balanced set of EIP opportunities are being progressed with the industrial parks in each country covering all components of eco-industrial parks (e.g. RECP, industrial synergies, park management, planning and zoning, water, energy, waste/materials). Thereby the GEIPP can continue the process of scaling up its interventions beyond resource-efficient and cleaner production into park-level interventions;
- » **Continue to move towards higher investments:** The GEIPP rationale is based on scaling up investments to answer to the increased urgency for action due to resource depletion and greenhouse gas emissions. The GEIPP has moved from Resource Efficient Cleaner Production towards multi-company EIP Opportunity implementation. This transition needs to be accelerated and encompass additional partners, particularly in the finance sector.
- » **EIP scorings to guide GEIPP Phase II:** The EIP scorings of 21 priority industrial parks during GEIPP Phase I provide insights into the technical assistance needs at the country level to transform conventional industrial parks into eco-industrial parks. Low compliance levels illustrate a higher need for support to the industrial parks in the respective countries. It is therefore recommended that the results of the EIP scorings are used to formulate customized approaches for technical assistance to the parks and guide the planning and implementation of country-level activities in GEIPP Phase II;
- » Conclusions and recommendations for each GEIPP country are provided in the annexes, one annex dedicated to each GEIPP country level intervention.

# Annex A

Results from GEIPP I Priority Parks in Colombia



## ANNEX A: RESULTS COLOMBIA

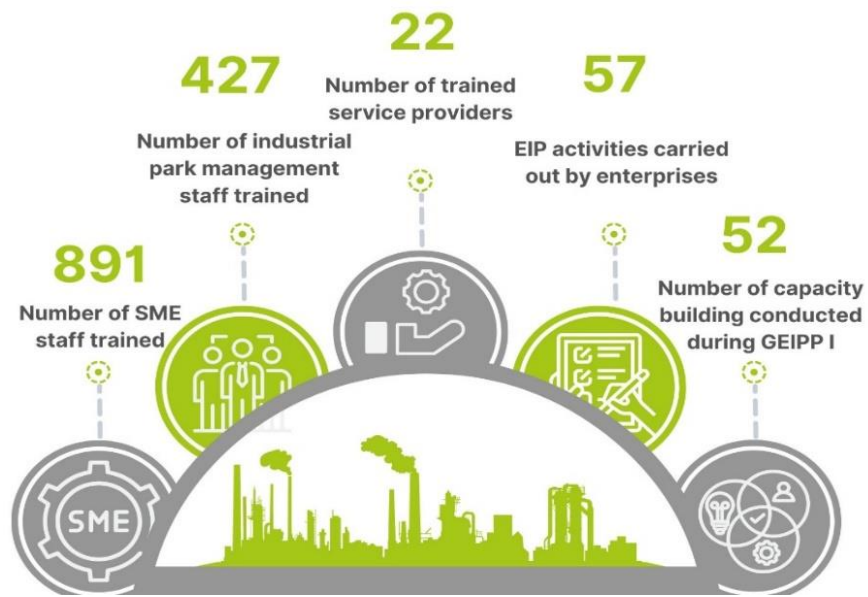
In Colombia, there are 42 multi-company free trade zones and over 150 industrial parks have been identified for implementing the Eco-Industrial Park model. The GEIPP project started in 2019 with the selection of three priority parks: two free trade zones (Zona Franca del Cauca and Zona Franca de Occidente) and one industrial park (Parque Industrial Malambo). The industrial parks were chosen from an initial list of 10 parks using UNIDO's EIP Selection Tool.

In 2020, a Baseline and EIP Opportunities Assessment was conducted, revealing that Colombian industrial parks started at an average of 65% compliance against the International EIP Framework, version 1. This analysis provided crucial information about the starting point and opportunities for improvement on the journey toward industrial sustainable development. The expectation is to achieve 89% compliance against the EIP International Framework, version 1, by 2023.

The GEIPP Colombia has assessed and implemented EIP approaches and practices in these selected priority parks, to enhance their sustainability and efficiency. Initiatives such as enhanced waste management, optimized water and energy consumption, and the integration of clean technologies have been pivotal in elevating sustainability benchmarks within the Colombian industry.

<i>Country</i>	<i>Colombia</i>
<i>Number of Industrial Parks in the Country</i>	<i>42 Free Trade Zones and more than 150 Industrial Parks</i>
<i>Number of GEIPP Priority Parks</i>	<i>3</i>
<i>Number of Industrial Parks taking part in the awareness and capacity-building activities of GEIPP</i>	<i>9</i>





GEIPP Colombia has offered training to 891 personnel in Small and Medium Enterprises (SMEs), 427 individuals in industrial park management, and 22 service providers. Enterprises have independently carried out 57 Eco-Industrial Parks (EIP) activities without additional support from GEIPP. This outcome resulted from implementing 52 capacity-building initiatives over the five-year duration of GEIPP I.

### ZONA FRANCA DEL CAUCA (ZFC)





## Background of the Park, Initial EIP Scoring, and Areas of Improvement

Zona Franca del Cauca (ZFC) is strategically located near Cali, the most industrialised city in southern Colombia and extends throughout three municipalities of the Department of Cauca (Caloto, Puerto Tejada and Guachené). The industrial park covers 134 hectares and has approximately 6,253 employees and 32 industrial enterprises, including the food and feed, paper, chemical, plastic, manufacturing, construction, and steel processing sectors.

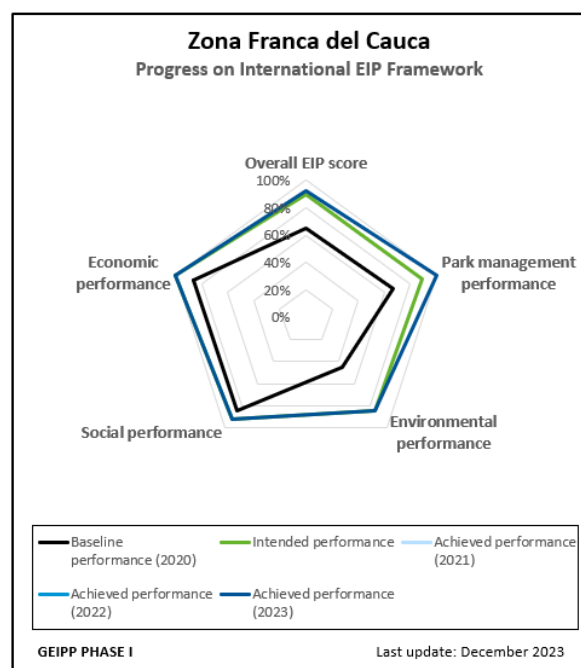
The free zone has positioned itself among the top three nationwide in imports and exports thanks to its proximity to the port of Buenaventura and the border with Ecuador. It has services such as a wastewater treatment plant and conduction system, truck yard, security area, customs offices, cafeteria, and hazardous and reusable waste collection area.

In 2020, ZFC met 65% of the benchmarks of the EIP international framework. According to the expected performance, ZFC planned to meet 80% of the indicators by 2023. However, it was identified that they could increase compliance to 92% by 2023 due to the technical assistance of the GEIPP and the autonomous work by the park.

During the initial evaluation of ZFC, various areas for improvement were identified, including environmental management, companies monitoring, waste utilization, rainwater and water conservation, energy efficiency, climate change adaptation, and community engagement, among others. These areas were prioritized in the evaluation and have been actively addressed since 2020.

Thanks to GEIPP, 16 companies have benefitted from studies or RECP assessments, and 4 additional companies in developing industrial symbiosis.

*Annual progress against International EIP Framework – ZFC:*





Regarding the opportunities identified at the industrial park level, 12 opportunities were addressed, of which 67% (8 opportunities) have already been implemented, 25% (3 opportunities) are currently in the process of implementation, and 8% (1 opportunity) is on hold. The 3 projects in implementation are in financing advisory by the GEIPP. Implemented EIP opportunities by ZFC are:

- » Sewerage system optimization.
- » Waste management site construction and operation.
- » Strategic and master planning.
- » Environmental Management System.
- » Sustainability report.
- » EIP Monitoring system.
- » Wastewater reuse planning.
- » (Re-)usable waste transportation.
- »

At the company level, 137 opportunities were identified of which 20% (27 opportunities) have already been implemented, 32% (44 opportunities) are in the study or planning phase, and 48% (66 opportunities) have not yet been implemented. Although their identification is complete, several factors contribute to the non-implementation of projects, including low financial viability, limited internal interest from company departments, lack of information to proceed with implementation, lack of monitoring, among other reasons. Similarly, of 61 recommendations on legal-environmental aspects, 51% have been implemented.

In the context of industrial symbiosis (IS), 21 opportunities were initially identified. Among these, 42% have been successfully implemented (9 IS projects – involving 7 waste exchanges, 1 collaborative provision of public services, and 1 joint supplier arrangement). Additionally, 4% (1 IS project) is currently under active study, while the remaining 54% (11 IS projects) are either on hold or have been discarded due to technical or commercial considerations from the companies. Regarding the IS implemented, 5 out of 7 IS of waste exchange are being developed with 1 anchor company as follows:

5 companies, belonging to sectors such as metal mechanics, food, agro-industry, and construction, generated plastic waste as part of their operations. A company dedicated to producing cleaning and kitchen items from recycled plastic, required this material for its production process. Thanks to the implementation of a methodology developed by the ZFC administration supported by the GEIPP Colombia, the exchange of waste between companies was facilitated. 5 successful IS were established, utilizing a total of 102.4 tons of plastic waste per year. Additionally, the anchor company became a supplier of cleaning materials for one of the companies, establishing a joint supply and location relationship. This initiative has demonstrated the potential of inter-company collaboration to reduce waste and promote the circular economy in the industrial park.

### **Capacity Building**

Seven awareness and training sessions (approximately 16 hours) were held for Zona Franca del Cauca. There was a total of 117 participants, which 23% were industrial park managers (27 participants) and 77% were staff of resident companies (90 participants). Notably, 97% of satisfaction ratings were perceived as "Very positive" or "Positive".



The following Eco-Industrial Parks (EIP) training sessions with associated training objectives were organized for Zona Franca del Cauca and tenant companies:

Industrial parks waste management training:

- » Issues, recommendations and experiences regarding waste management and production of each participating company of ZFC was discussed;
- » Overall understanding of the concepts of biodigestion and composting, and their environmental and economic benefits, biodigestion project at ZFC;

EIP Training

- » Learn about the application and benefits at corporate level and the importance within the framework of ISO 26000;
- » Better understanding of the application of human rights within the organization and its relationship or scope to surrounding communities.
- » Understand the definition of ethics codes within the organization as a strategy for defining values.
- » Provide the general concepts of industrial symbiosis as a business strategy to optimize resources and energy in EIP. Participants were also introduced to the conceptual bases of adaptation to climate change and tools for establishing adaptation plans.

Policy Training

- » Better understanding of the concept of corporate governance, from ISO 26000, and its importance in the proper operation of an organization

### **Technical Assistance**

At the industrial park level, technical assistance has been developed, such as pre-feasibility and feasibility studies focused on optimising the sewerage system and wastewater treatment, design of the collection centre for (re-)usable material for resident companies, change of streetlights to LED to reduce energy consumption, use of rainwater from the truck yard for common areas and use of photovoltaic solar energy for wastewater treatment. Also, studies have been carried out focused on improving its management, structuring its environmental management system, structuring the sustainability report, creating a master plan focusing on strategic planning, and measuring greenhouse gases, among others.

At the company level, the GEIPP has worked with 16 companies to develop RECP assessments, and feasibility studies as well as financial support for the implementation of projects. These are focused on reducing energy consumption, saving water, reducing waste generation and GHG emissions, and saving companies money. Some examples of these are the optimisation of the compressed air system, water reuse in drinking water treatment, reuse of packaging boxes, and generation of photovoltaic solar energy, among others.

Finally, at the industrial symbiosis level, work has been done on documenting, evaluating, and developing synergies within the industrial park. A methodology was designed with management to encourage industrial symbiosis, which consists of linking companies, identify technical and commercial aspects, and evaluating the feasibility synergies. Likewise, the





documentation of existing synergies is supported to quantify impacts and demonstrate the benefits of these relationships.

## ZONA FRANCA DE OCCIDENTE (ZFO)



### Background of the Park, Initial EIP Scoring and Areas of Improvement

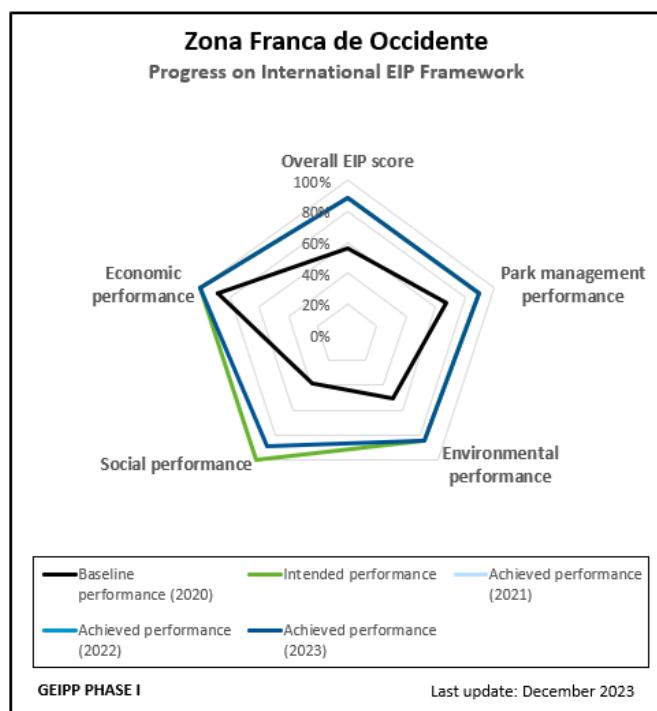
The Zona Franca de Occidente (ZFO) is located in Mosquera, Cundinamarca, near Bogotá, and spans over 64 hectares. Within this industrial park, around 56 companies are in operation, out of which 10 belong to various sectors including plastics, food, metal, and pharmaceuticals. The park has services such as a wastewater treatment plant, security and emergency services (fire truck), a natural gas network, conference rooms, and a solid waste collection centre.

In 2020, ZFO complied with 58% of the EIP international framework benchmarks. Initially, ZFO planned to meet 68% of the indicators by 2023. However, it was identified that they could increase compliance to 89% by 2023 due to technical assistance from GEIPP and its autonomous work. 5 companies benefiting from the GEIPP program participate in studies or assessments, and 4 additional companies are participating in developing industrial symbiosis.

The areas for improvement identified in the initial evaluation of ZFO included improving company monitoring, GHG monitoring and mitigation, environmental management, energy efficiency for companies, waste management, community involvement, and adaptation to climate change, among others. These areas were prioritised in the evaluation and have been worked on from 2020.



## Progress on International EIP Framework



Regarding the opportunities identified at the level of ZFO, 5 opportunities have been explored, out of which 60% have already been executed (3 opportunities), 20% are currently in the process of implementation (1 opportunity), and 1 opportunity has not yet been developed (20%). Implemented EIP opportunities by ZFO are:

- » Environmental Management System.
- » EIP Monitoring system.
- » GHG monitoring system.

At the company level, 32 opportunities have been identified, of which 22% (7 opportunities) have been implemented, 28% (9 opportunities) are in the study or planning phase, and 50% (16 opportunities) have not yet been implemented, despite being fully identified. The opportunities that have been identified but not yet implemented can be attributed, in part, to the need for collaboration with other areas within the companies. In many cases, a lack of effective communication within the organizations has become evident. Furthermore, some of these opportunities involve additional efforts that the companies are not currently willing to undertake. Additionally, the availability of financing is a key factor that also influences decision-making. Finally, of 9 recommendations on legal-environmental elements, 89% of these opportunities have been implemented.

In the industrial symbiosis aspect, 3 potential collaborations have been identified while 1 industrial symbiosis has been successfully implemented, specifically concerning the establishment of an environmental committee. This committee operates as a platform for



exchanging knowledge and shared services, encouraging collaborative sustainability initiatives among the participating entities.

In summary, the status of identified improvement opportunities for the ZFO, its resident companies and their industrial symbiosis is shown below.

### **Capacity Building**

Eight awareness and training sessions (approximately 18 hours) were explicitly held for Zona Franca de Occidente. A total of 129 participants were obtained, where 11 % corresponded to industrial park management personnel (14 participants) and 89 % compared to resident company personnel (115 participants). Notably, 88% of satisfaction ratings were perceived as "Very positive" or "Positive".

The following Eco-Industrial Parks (EIP) training sessions with associated training objectives were organized for Zona Franca de Occidente and tenant companies:

Industrial parks water management training:

- » Provide an overall understanding the importance and best practices in water management, and its environmental and economic benefits.
- » Get to know about the concept of biodegradability of wastewater and the presence in industrial wastewater of elements that limit or inhibit the possibility of biological treatment.
- » Identify water opportunities for ZFO according to companies and industrial park needs, challenges and expected benefits.

Industrial parks waste management training:

- » Understand the concept of a collection center, best practices in its operation, and current operation of a collection center.
- » Better understand of the concepts of management and recycling of usable and hazardous waste, as applied to the Free Trade Zone.

EIP Training:

- » Learn about the concepts of environmental management and definition of management systems as strategies for operational control, impact reduction, compliance with the applicable regulatory framework.
- » Learn how the general concepts of industrial symbiosis, as a business strategy, optimize resources and energy in EIP's. Participants were also introduced to the conceptual bases of adaptation to climate change and tools for establishing adaptation plans.
- » Review the most commonly used methods of pest control, as well as recommendations for difficult or seasonal pests, and become familiar with occupational health and safety systems.



## Technical Assistance

At the industrial park level, technical assistance has been provided through a feasibility study focused on using lagoon water (rainwater) for drinking water purification. In addition, GEIPP have provided advisory services focused on improving management, aimed at structuring the environmental management system, the greenhouse gas monitoring and mitigation system, the EIP monitoring system, and strengthening the environmental committee, among others.

At the corporate level, GEIPP has collaborated with five companies to conduct Resource Efficiency and Cleaner Production (RECP) assessments. These projects primarily target the reduction of energy consumption, water conservation, waste minimization, and the mitigation of greenhouse gas emissions, all while generating cost savings for the companies involved. Noteworthy initiatives include the implementation of photovoltaic solar energy systems on rooftops with grid injection, the utilization of rainwater, and the optimization of compressed air systems through compressor upgrades, among other innovations.

Finally, at the industrial symbiosis level, GEIPP has worked on documenting, evaluating, and developing synergies within the industrial park.

## PARQUE INDUSTRIAL MALAMBO SA (PIMSA)



### Background of the Park, Initial EIP Scoring, and Areas of Improvement

The Malambo Industrial Park (PIMSA) is located in Malambo, Atlántico, 40 minutes from the city of Barranquilla, the most important industrial development centre of the Colombian Caribbean coast. Thanks to its wide range of aggregated services, PIMSA has positioned itself as a service infrastructure centre for the industry, oriented towards reducing costs in operations. PIMSA currently has 600 hectares, of which 250 hectares are dedicated exclusively to industrial operation. Currently, the park generates approximately 5,300 jobs in



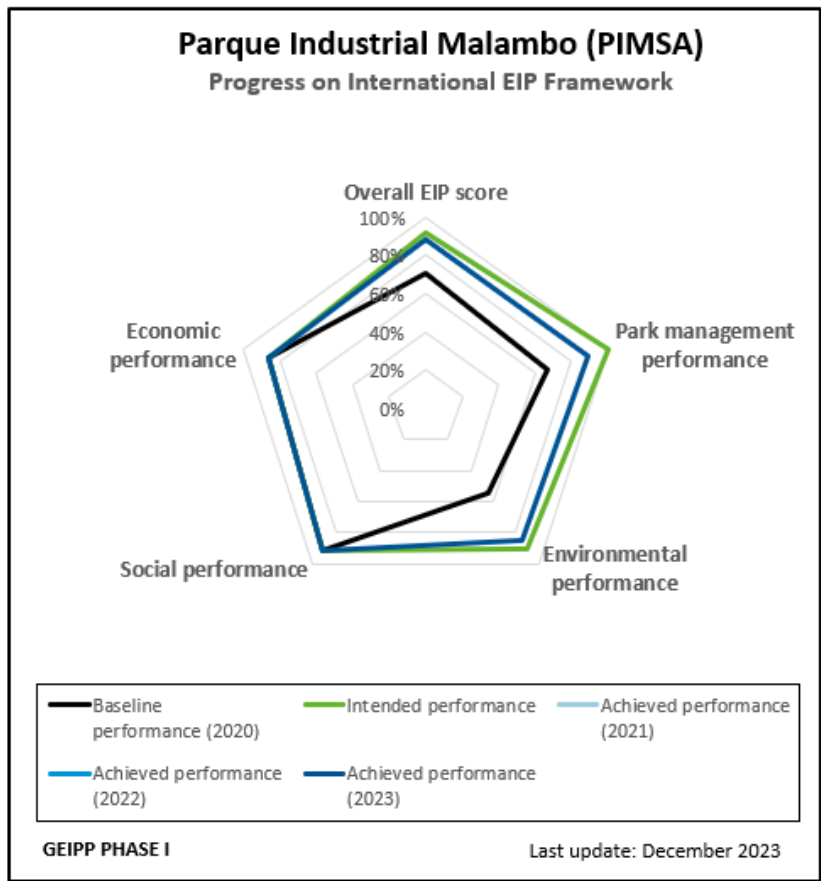


the 35 companies operating, mainly in metalworking, chemical, food and beverage, and logistics and services sectors.

In 2020, PIMSA achieved 71% of the benchmarks outlined in the EIP International Framework. The initial target was for PIMSA to meet 80% of these indicators by 2023. However, it was recognized that this rate could be elevated to 88% by 2023, owing to the autonomous efforts of the park administration, coupled with the technical assistance and guidance provided by the GEIPP. 7 beneficiary companies of the GEIPP engaged in studies or assessments, and 2 companies are currently in the process of developing industrial symbiosis initiatives.

### Progress on EIP International Framework

In the initial evaluation of PIMSA, the following areas for improvement were identified: monitoring and risk management, planning and zoning, park management services, energy, monitoring of companies, monitoring of environmental and social management, social infrastructure, climate change and environment, use of waste and materials, among others. These areas were prioritised in the evaluation and have been worked on since 2020.



Regarding the opportunities identified at the industrial park level in PIMSA, 10 opportunities have been explored, out of which 40% (4 opportunities) have been implemented, 20% (2 opportunities) are currently in the planning process, and 40% (4 opportunities) are on hold. Implemented opportunities by PIMSA are:



- » Change of lighting fixtures on roads for energy savings.
- » EIP Monitoring system.
- » GHG monitoring system.
- » Thermal energy recovery strategy.

At the company level, 54 opportunities were identified. Of these, 9% (5 opportunities) have been implemented, 22% (12 opportunities) are in the study or planning phase, and 68% (37 opportunities) have not yet been implemented, despite being fully identified. Of 9 recommendations on legal-environmental elements, 55% of these opportunities have been implemented.

Regarding industrial symbiosis, 3 IS had been identified. 67% (2 IS) were already implemented before the GEIPP program (documentation is being developed), while there is a symbiosis with development potential that has not yet begun its implementation. 1 IS to highlight is PIMSA's mutual aid group, in which 33 companies participate: 15 joint trainings have been conducted and more than 233 people from the companies have been trained.

### **Capacity Building**

Nine awareness and training sessions (approximately 20 hours) were explicitly held for PIMSA. There were 142 participants: 20 % industrial park management personnel (29 participants) and 79 % resident company personnel (112 participants). It should be noted that 96 % of satisfaction ratings were perceived as "Very positive" or "Positive".

The following Eco-Industrial Parks (EIP) training sessions with associated training objectives were organized for Parque Industrial Malambo S.A and tenant companies:

#### **Industrial parks water management training**

- » Provide an overall understanding on the main concepts and best practices for improving water management, wastewater treatment plant project by PIMSA management.
- » Learn about the basic concepts and the main elements of the Colombian national regulatory framework specific to the treatment, reuse and discharge of non-domestic wastewater were established, the presentation and comparison of the different types of treatment
- » Identify the improvement opportunities for the sewage system and for WWTP of PIMSA. Recommendations were identified.

#### **Industrial parks waste management training**

- » Understand the of main concepts and methods of organic waste valorisation, with emphasis on biodigestion and composting processes, and the results of the pre-feasibility study.

#### **Policy Training**

- » Provide an overall understanding of the structure of the compilation decree on environmental matters, the topics covered in other compilation decrees on related



topics, as well as the internal structures that allow monitoring of compliance and regulatory changes.

#### EIP Training

- » Learn about the progress of the Colombian legislation for the cases of footprint calculation for means of transportation, the benefits of the truck yard in the park and the importance of having sustainable mobility plans.
- » Better understand of the GEIPP program in Colombia. Demonstrate the progress and impacts of the GEIPP program in prioritized parks and resident companies.
- » Review the formats or matrices for the collection of information associated with the use of waste heat in the industrial park.
- » Learn about the general concepts of industrial symbiosis as a business strategy to optimize resources and energy in EIP's. Participants were also introduced to the conceptual bases of adaptation to climate change and tools for establishing adaptation plans.

#### Technical Assistance

At the industrial park level, PIMSA has benefited from technical assistance, including prefeasibility and feasibility studies aimed at designing a wastewater treatment plant. These studies explored both conventional approaches (Gray Infrastructure) and nature-based solutions (Green Infrastructure), capitalizing on the park's buffer zone. In addition, designing a thermal cooling district to exchange thermal energy from installed companies has been studied as well. Other projects supported are the design of a composting project and management of organic waste of companies, the generation of electricity from the installation of photovoltaic solar panels, the design of a program for measuring and mitigating climate change, creation of a master plan with a focus on strategic planning and attraction of new customers according to a perspective of sustainability and implementation of a system of environmental monitoring to companies.

At the company level, the GEIPP program has worked with 7 companies to develop RECP assessments. These are focused on implementing circular economy strategies, generating energy and water savings, reducing waste generation and GHG emissions, and process efficiency. Some examples are rooftop photovoltaic solar power generation and boiler burner change.

At the industrial symbiosis level, PIMSA has advanced by promoting the generation of exchanges of services between the resident companies of the industrial park (2 IS implemented). One of the installed companies offers within the park the service of training, advice, and consulting on occupational health and safety issues, facilitating the mandatory certification process that companies must carry out in this regard. Another of the resident companies offers gardening services to the common areas of the park and companies.



## SUMMARY AND CONCLUSION

- » Training and monitoring: It is imperative to provide training and support for data monitoring in companies and industrial parks, thus establishing a baseline for projects and enabling the quantification of their benefits. The lack of basic monitoring data and performance indicator definition has been observed in the majority of companies and industrial parks.
- » Strategic role of management: The management team of an industrial park plays a fundamental role in replicating the model among its resident companies. They act as leaders in information monitoring, support for corporate projects, and guidance for the development of industrial symbiosis. This significant contribution has led ZFC to be invited to present its success story at three international events (Argentina, the Dominican Republic, and Costa Rica).
- » Technical discussion committees: The creation of technical discussion committees between companies and industrial parks is essential for the exchange of experiences and lessons learned. In Colombia, an exchange of experiences has taken place among the three priority parks, with 6 sessions held to promote increased park performance according to international Eco-Industrial Park standards.
- » Financial Assistance: Financial assistance must be a priority to increase investments in companies and industrial parks.
- » Support and guidance for autonomous work: Providing guides and methodologies to support the autonomous work of Industrial Parks and companies is crucial. This support has contributed to the projected increase in the priority parks for 2023, following the International Eco-Industrial Park framework.
- » Documentation and project communication: Companies usually implement sustainable projects, although they are often not aware of it. It is vital to support the documentation of these projects for effective communication of sustainable industrial practices, including changes in equipment and infrastructure associated with service savings and emissions mitigation.
- » Standardization and methodologies: Creating methodologies is essential for standardizing procedures. For example, the methodology developed with ZFC for creating industrial symbiosis is already being successfully implemented.
- » Guides for compliance with indicators: Guides have been developed for compliance with indicators related to energy efficiency, water reuse, master planning, and climate change adaptation. These guides have enabled Industrial Parks to achieve the projected objectives for 2023. In Colombia, 5 guides were created for supporting EIP transition.
- » Consultation for new industrial parks: Providing indirect consultation to new Industrial Parks is crucial for replicating the Eco-Industrial Park model in a country. This strategy has enabled 9 more Colombian industrial parks to begin their autonomous processes with guidance from the GEIPP Colombia.
- » Challenges in water reuse projects: Implementing water reuse projects in countries like Colombia faces challenges due to the low cost of water, which increases the return on investment. Incentives need to be explored to promote these projects
- » Tax incentives and financial advisory: Companies have limited knowledge of tax benefits for the implementation of sustainable projects. Providing specialized financial advice is crucial



for reducing investment payback periods. In Colombia, the application of tax incentives can reduce return on investment by 30% to 50%.

# Annex B

Results from GEIPP I Priority Parks in Egypt

## ANNEX B: RESULTS EGYPT

The Global Eco-Industrial Parks Programme in Egypt (GEIPP-Egypt: Country Level Intervention) started in January 2022. The project addresses Eco-Industrial development in Egypt, under the framework of the Global Eco-Industrial Parks Programme (GEIPP) in developing and transition countries currently implemented by UNIDO and funded by Swiss Government through the State Secretariat for Economic Affairs of Switzerland (SECO). The project is delivered through the collaboration of UNIDO with the Ministry of Trade and Industry (MoTI) as a main counterpart and its executive coordinating agency Industrial Development Authority (IDA), and the Suez Canal Economic Zone (SCZone) and the General Authority for Investment (GAFI) are the partners.

The development objective of the GEIPP-Egypt is to demonstrate the viability and benefits of Eco-Industrial Park approaches in scaling up resource productivity and improving economic, environmental and social performances of businesses, thereby contributing to inclusive and sustainable industrial development (ISID). The project provided technical assistance to three selected industrial parks, however, it aims to reach a large number of industries at a national level through awareness raising and capacity building activities. Through these actions, it aims to increase the role of EIP in environmental, industrial and other relevant policies.

In Egypt, there are clear and substantial differences between various types of industrial parks and zones. There are currently 147 industrial zones (or industrial parks) in Egypt, 74 industrial parks managed by governorates, 33 industrial parks managed by the New Urban Communities Authority (NUCA) and regulated by NUCA and IDA, 14 industrial parks managed by GAFI, 20 industrial parks managed by MoTI and IDA, 4 industrial parks managed by the SCZone and 2 industrial zones managed by the Holding Company for Construction and Development. The industrial parks vary greatly in scale, characteristics, and governance structure. Several industrial zones follow special fiscal and tax regimes (e.g. special economic zones, investment zones and free zones) that define the investment and industrial development conditions in these zones as well as their governance structure. Most large, existing industrial zones are managed by the governorates.

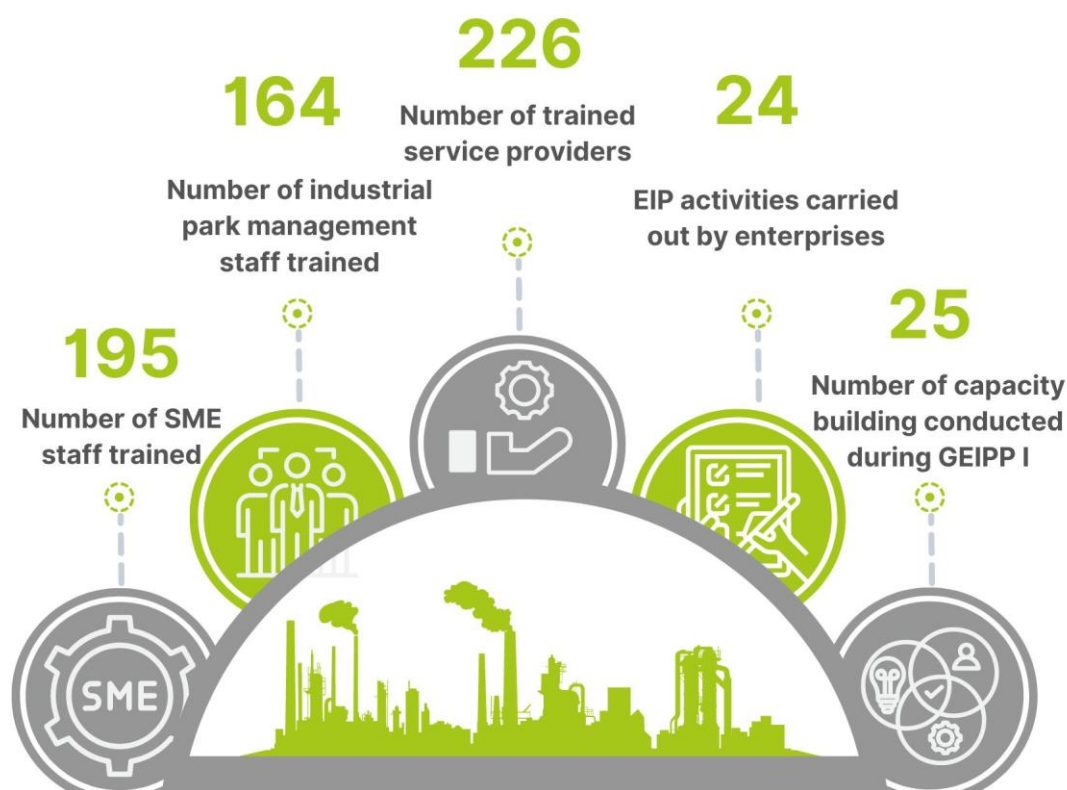
Country	Egypt
Number of Industrial Parks in the Country	147 industrial parks
Number of GEIPP Priority Parks	3 Industrial Parks
Number of Industrial Parks taking part in awareness and capacity-building activities of GEIPP	12 Industrial Parks

The methodology used to select GEIPP Priority industrial parks for Egypt was applied in a systematic and transparent manner to support stakeholder discussions and provide the final selection of industrial parks for in-depth GEIPP support in Egypt.

Based on the process, three industrial parks were selected; SIDIC IP (name changed to Orascom), El- Robbiki leather clusters and Polaris IP. Each industrial park offering an unique case study and learning opportunities for other parks/zones in the country.



The three industrial parks are assessed against the International Framework for Eco-Industrial Parks v2. This updated review provides insights into the current performance and the intended performance envisaged at the end of the GEIPP (in terms of % of EIP benchmarks fulfilled) for the three selected industrial parks (Orascom, Al Robbiki, and Polaris).



GEIPP Egypt has offered training to 195 personnel in Small and Medium Enterprises (SMEs), 164 individuals in industrial park management, and 226 service providers. Enterprises have independently carried out 24 Eco-Industrial Parks (EIP) activities without additional support from GEIPP. This outcome resulted from implementing 25 capacity-building initiatives over the five-year duration of GEIPP I.

### ORASCOM INDUSTRIAL PARK

#### Background of the park, initial EIP Scoring and areas of improvement

Orascom Industrial Park is located in Suez Canal Economic Zone (SCZone). Orascom is the first industrial park in the SCZone, with an area of 1000 ha. Being 40 kilometers south of the Suez Canal, located at the crossing of the Cairo-Sokhna and Suez-Hurghada highways. Orascom is located nearby other industrial parks in the SCZone NCIC and Aldorado.

The SCZone is an industrial production and trade hub along the newly expanded Suez Canal. The sustainable development of the SCZone is a key government priority for economic development. The general regulating authority for SCZone indicates a clear commitment to apply EIP approaches in the zone. The SCZone hosts multiple brownfield and greenfield industrial parks, including the Orascom Industrial Park. Orascom Industrial Parks founded the first privately-owned industrial park in Egypt in 1998, as the leading industrial developer in Egypt.





The total allocated area for the three phases of development in Orascom IP is 875 ha, of which 300 ha for phase 1. Almost 85% of land is sold, 50% is occupied for production and 25% is under construction.

Orascom IP houses around 102 companies, 41 of them are currently in operation and 50% are SMEs. The tenants include large heavy energy intensive international companies from sectors such as cement plant, oil refinery, fertilizers, chemicals and petrochemicals.

Orascom IP maintains the main infrastructures and utilities in the park such as roads, fencing, security, seawater desalination plant and ground water extraction plant for water supply, gas pipeline and electricity. Orascom IP is designed to be "self-sustainable" on its water supply. They have 2 plants treating municipal wastewater and operates seawater desalination plant and groundwater extraction plant to supply water to the companies. Besides that, companies can also buy potable water from municipality.

The review of Orascom IP against the International Framework for Eco-Industrial Parks (UNIDO, World Bank, GIZ, 2021) was conducted. The EIP Assessment Tool developed by UNIDO was used to update the collected information. The reviews were undertaken in collaboration with the park owners and/or management entities.

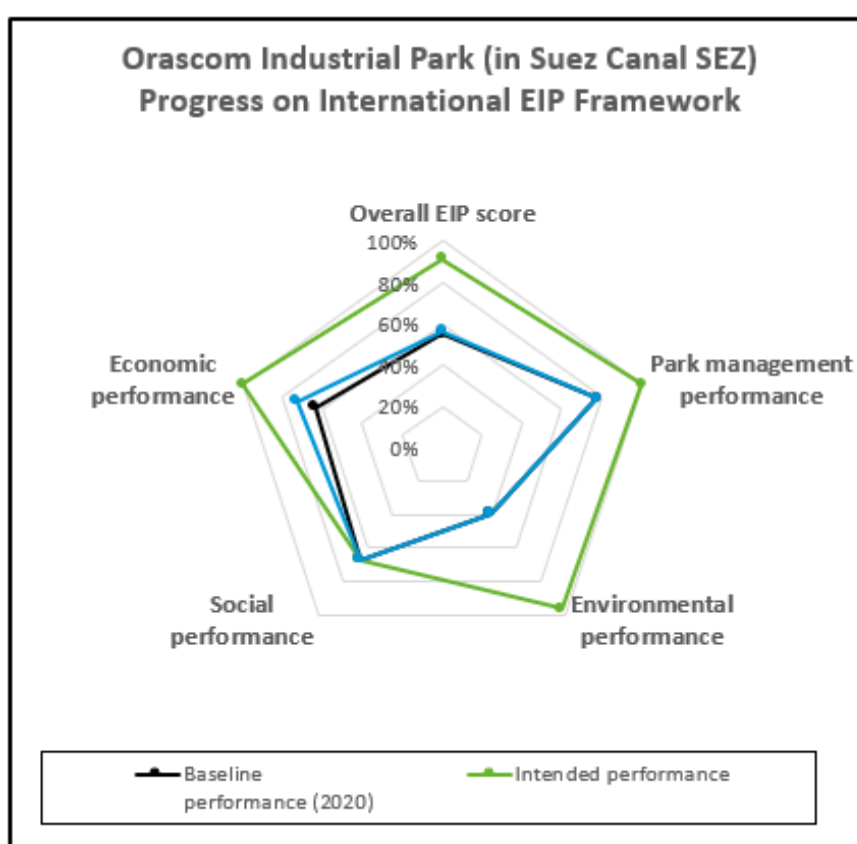
In 2020, Orascom IP (in Suez Canal SEZ) was the most performant IP against the International EIP Framework. In summary, Orascom Industrial Park complied with the the International EIP Framework by 55%. With current and upcoming initiatives Orascom intends to reach a performance of meeting 92% of the international benchmarks.



The following topics had lower baseline compliance scoring indicating that efforts overall should prioritize these topics:

- » Management and monitoring;
- » Energy;
- » Water.

A set of practical EIP opportunities were identified and prioritized for Orascom based on the review against the International EIP Framework. These opportunities included management and monitoring, water supply and wastewater climate change and the natural environment, management and monitoring, local business and SME promotion, resource efficiency and industrial synergies, energy, waste and material use.



The Orascom scored 55% against the performance benchmarks of the international EIP framework in 2020 and improved to 57% in 2022, due to an increase in its park management performance. The Orascom's progress against the International EIP Framework is illustrated in the chart below.

### Capacity Building

The following Eco-Industrial Parks (EIP) training sessions with associated training objectives were organized for Orascom and tenant companies:



## EIP Training

Capacity Building Workshop Eco-Industrial Parks in Egypt “Towards more sustainable and profitable industrial parks:

- » Raise awareness on Eco-Industrial Park concept and its benefits as well as motivate the Orascom Industrial Parks – Sokhna Complex and its tenant companies and management to move towards implementing EIP measures.
- » Raise awareness and share basic knowledge to facilitate the implementation of industrial symbiosis (IS) and resource efficient and cleaner production (RECP) measures.
- » Solicit interest and gain commitment of the park developer and tenant companies to join the UNIDO GEIPP-Egypt project and receive free technical assistance to transform towards Eco-Industrial parks.
- » Create initial networking and linkages between tenants and service providers.

### **Industrial Symbiosis Workshop:**

- » Introduction to the project and workshop benefits.
- » Industrial Symbiosis (National and international experience)
- » Introduction to industrial symbiosis workshop objectives and benefits for the industrial park and industries.
- » International Experience
- » Outcomes and statistics on previous industrial symbiosis workshop done in Sokhna at 2018
- » Present Egyptian successful case studies (one or two firms did a successful case study to present)
- » Detailed methodology and the mechanism explaining the general methodology of the interactive workshop and let the participants to fill the resources forms.
- » Resource matching activity (The core of the workshop).
- » Results of the activity and a short summing up of the number of resources and synergy ideas identified.

### **Training on strategic IP site selection, EIP feasibility assessment and EIP concept planning for Eco-Industrial Parks:**

- » Learn about the rationale, benefits and process to undertake a strategic industrial park site selection and EIP feasibility assessments.
- » Engage participants to exchange their experiences on strategic industrial park site selection and EIP feasibility assessments.
- » Develop practical competences to apply the EIP concept planning approach to industrial parks, and prioritize the steps in the approach which are most relevant to the industrial park being investigated.



- » Equip participants in using the EIP Concept Planning Tool.
- » Engage participants to exchange their experiences on EIP concept planning.

### **Training on industrial park master planning and EIP master plan review for Eco-Industrial Parks:**

- » Increase the understanding of how an EIP should be planned from the early stages, and how it can bring concrete business opportunities for park managers, while economic and environmental savings are achieved and competitiveness of the park enhanced;
- » Learn about the key basic topics part of industrial park master planning and how EIP approaches can strengthen IP master planning.
- » Develop practical competences to undertake a basic and an EIP review of an industrial park master plan.
- » Equip participants in using the Master Plan EIP Review Tool.
- » Engage participants to exchange their experiences on industrial park master planning.
- » Learn about the key roles of park management entities in EIP transformation process including associated business opportunities.
- » Develop practical competences to identify, prioritize and develop added value services by industrial park management entities.
- » Equip participants in using the EIP Management Services Tool.
- » Engage participants to exchange their experiences on added value services offered by industrial park management entities.

### **Capacity Building Workshop Green Hydrogen in industrial parks: “International Experience, Outlook and Best Practices:**

- » Acquire knowledge and skills necessary to handle hydrogen safely, efficiently and sustainability.
- » Raise awareness on GH2 as a renewable and clean energy solution to reduce the industry's carbon footprint and create a sustainable and decarbonized future.
- » Understand possible applications and economic outlook for GH2 at the level of manufacturing companies and infrastructure, to promote the adoption of this clean energy carrier.
- » Transfer knowledge on international experiences and best practices for GH2 park development, as well as the current and future market for hydrogen.

### **Training-of-Trainers for Eco-Industrial Parks (EIPs) in Egypt**

A new training programme to provide capacity building to technical experts who can support mainstreaming of the EIP approach at industrial parks in Egypt. The training programme consists of 3 in-class training courses and 1 on-job-training.

- » The first course titled “EIP approach, its benefits, and best practices from around the world”, it introduced the EIP concept, the EIP international framework, EIP



development stages, and presented both local and international case studies. It also trained the participants on using some of the UNIDO EIP tools such as UNIDO EIP assessment tool and UNIDO EIP selection tool.

- » The second training course in the Eco-Industrial Parks (EIP) capacity building programme introduced the concept of Resource Efficiency and Cleaner Production (RECP), methodology, tools, and showcased previous projects and case studies from Egypt and the world.
- » The third training course “Identification of Industrial Synergies” introduced the concept of industrial synergies, its different types, and how it relates to circular economy. The detailed development stages of industrial synergies were explained and attendees were trained on using UNIDO’s industrial symbiosis tool. Additionally, the course presented ongoing attempts of EIPs in Egypt, and the different success factors and challenges faced.

### **Technical Assistance**

RECP assessments were conducted in 16 tenant companies at Orascom aimed at identifying RECP and EIP implementable opportunities that would contribute to each company’s resource savings in energy, water waste, and materials to achieve more sustainable practices and increased competitiveness through resource-efficient production practices. The assessments consisted of evaluating the company’s RECP management practices, observing the operations of significant resource users, and evaluating any potential opportunities.

A key focus of the Global Eco-Industrial Parks Programme in Egypt is the implementation of feasible Eco-industrial Park (EIP) opportunities. Therefore, a set of opportunities have been identified for feasibility studies at Orascom IP, the following are the set of identified EIP opportunities along with their benefits:

- » Installation of a 2 MW on-grid PV system to offset a portion of the overall electrical energy consumption of the park management.
- » Construction of phase one of a Minimum Liquid Discharge treatment plant to treat 25% of the waste water generated from the park facilities to be reused for landscaping purposes.
- » Installing a centralized 1 MW capacity gas turbine cogeneration unit to produce electricity for facilities that currently use diesel generator to generate electricity. Additional revenue stream from generated thermal energy.

### **Short description of the EIP opportunity, results, and implementation**

Develop a plan to mitigate/adapt to climate change impacts:

- » Conducting interviews and investigating potential risks due to climate change as well as identifying previous problems at the park.



- » Identifying measures related to climate change adaptation should be included in the plan.
- » Identifying mitigation measures and developing an action plan on climate change adaptation.

#### Developing an industrial heat recovery strategy

- » A preliminary assessment of the industrial processes and facilities to identify main sources of waste heat.
- » Gather data on energy consumption, temperature profiles, and heat dissipation points to understand the heat recovery potential at the level of the industrial park.
- » Determine the major (top 10) thermal energy-consuming businesses.
- » Indicate the needed investment for implementation of heat recovery solutions and an action plan at the level of the industrial park (not individual companies).

#### Develop a plan for water efficiency:

- » Conducting a water audit and assessing current water usage at the level of the industrial park.
- » A mechanism to engage firms and establish a team (in the IP management entity) to improve water efficiency.
- » Setting water efficiency goals.
- » Identifying water efficiency measures.
- » Developing an implementation plan for water efficiency.

#### Implement a (hazardous and non-hazardous) waste monitoring system:

- » Review relevant local, regional and national regulations pertaining to waste surveillance and management.
- » Create and conduct a surveillance and inventory plan for waste at the level of the industrial park (not single companies).
- » Identify potential sources, types and generated amount of waste.
- » Establish a system for waste management at the park.
- » Suggest a training program to enhance capacity in hazardous and non-hazardous waste management and conduct a training workshop that targets the industrial park and industries.

#### Develop a plan for monitoring and reducing GHG emissions:

- » Establishing and implementing a programme to measure carbon footprint at the industrial park.
- » Identifying opportunities for reducing CO<sub>2</sub> emissions by companies.
- » Setting targets for the IP management entity to reduce CO<sub>2</sub> emissions.





### **Develop a system for resource management, energy efficiency and pollution prevention:**

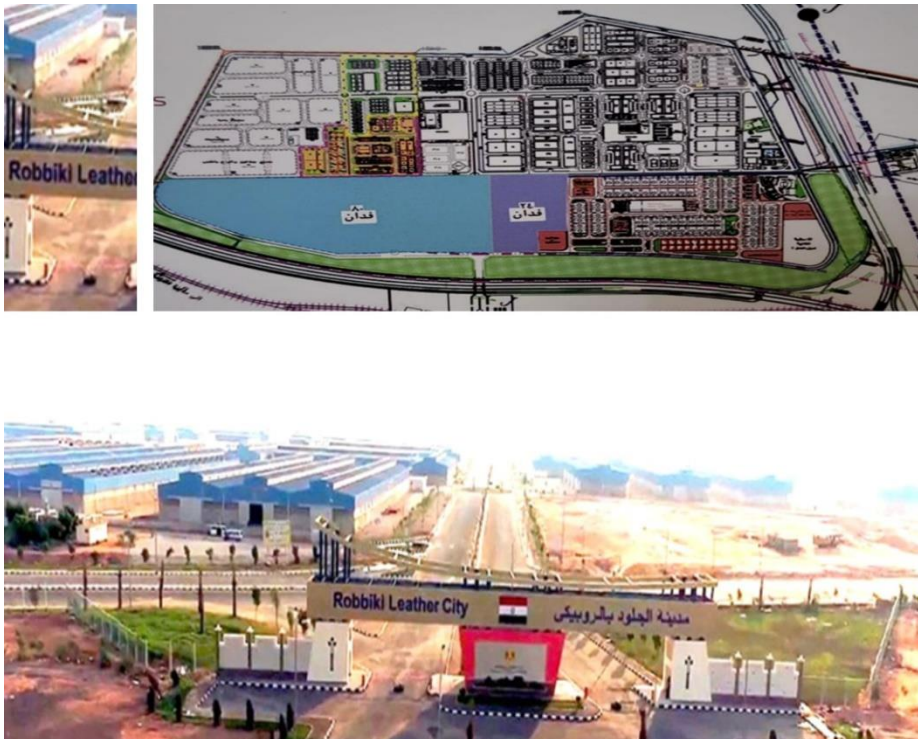
- » Developing a benchmark for water and energy consumption for the last 12 months.
- » Establishing and conducting energy & water and environmental data collection, evaluation & diagnosis, in consultation with relevant resident firms.
- » Identifying potential sources of pollution to air, water and land, different types and amounts of generated waste, waste heat, etc.
- » Setting strategic targets for reducing resources consumption per unit turnover.
- » Designing a strategy for pollution prevention, emission reduction and a resource monitoring system for energy, water, waste and products.

### **Green Hydrogen Ecosystem in SCZone**

- » The Suez Canal Economic Zone (SCZone) is one of the main partners in Egypt, which is the primary regulatory authority for all industrial zones located within the SCZone and cooperates with GEIPP Egypt for the implementation of EIP project in one its industrial parks (Orascom Industrial Park), in Sokhna.
- » The SCZone management expressed interest in mobilizing investments in green hydrogen production and aims to become a leading regional hub in the green hydrogen industries, coinciding with the global transformation to clean energy uses, also aims to localize this type of industry in its integrated zones in Sokhna and East Port Said.
- » As a response to the request of the SCZone, GEIPP Egypt is supporting the SCZone in implementing the EIP standards in the allocated GH2 production area for achieving sustainability as envisaged in the framework for Eco-Industrial parks.
- » In the framework of GEIPP Egypt, a workshop has been organized in June 2023 on "Green Hydrogen in industrial parks: International Experience, Outlook and Best Practices". The workshop aimed at raising awareness on GH2 as a renewable and clean energy solution to reduce the industry's carbon footprint and create a sustainable and decarbonized future, transfer knowledge on international experiences and best practices for GH2 park development, as well as the current and future market for hydrogen.

## ROBBIKI LEATHER CITY

### Background of the park, initial EIP Scoring and areas of improvement



The leather city in Robbiki is considered one of the most important specialized industrial cities, which was designed according to the latest international standards. The city is specialized in everything related to leather tanning, leather products and all feeding and complementary industries, it is performed to make Egypt restore its leading role in this industry.

The objectives of the leather city are to relocate and develop the traditional tanneries in Old Cairo to the Leather city in Robbiki, aiming to contribute in removal of pollution in Cairo and to preserve the archaeological area of the Magra Al-Ayoun wall. In addition to developing the tanning and leather industry sector and increasing the value added of the Egyptian product to achieve competitiveness in global markets with investments of (7.2 billion EGP) for all the project various phases. Moreover, to double the production capacity of tanned leather.

The Cairo company for investment and urban industrial development (CID) is established by the Ministry of Industry to manage, develop and promote Robbiki IP. CID is a Joint stock Company, in which the shareholders are IDA, Ministry of Finance, Industrial and Mining Projects Authority (IMPA), and Cairo governorate. Later, CID will be fully responsible for the management and development of Robbiki IP.

The IP is located in the Robbiki area between Badr city and the 10<sup>th</sup> of Ramadan. It has an area of 654.8 hectares, divided as follow:

- » - The first phase (71.2 hectares) for tanning leather.
- » - The second phase (44.1 hectares) for intermediate industries.
- » - The third phase (89.4 hectares) for manufacture of leather end products.





- » - Waste water plants (114 hectares) for the treatment of industrial wastewater.
- » - Tree forest (335.9 hectares) to use treated water for planting trees.

Around 150 SMEs are resident in Robbiki IP and they are exclusively tanneries. The IP includes a training and technological centre for leather tanning, which is currently closed, an administrative building consisting banks, police station, ambulance point, fire station, natural gas station, water lifting and sewage treatment plant, commercial shops and service areas.

Robbiki Industrial Park fully met 26 international benchmarks out of the 61 (43%), since there are 3 benchmarks are not applicable and 35 are not yet met. With current and upcoming initiatives Ribbiki Industrial Park intends the reach a performance of meeting 89% of the international benchmarks. The review against the International EIP Framework provided the basis to identify and prioritize a set of practical EIP opportunities. The opportunities were prioritized based on their anticipated benefits, achievability and interest from CID/companies. A summary of the prioritized opportunities is as below:

Transformation towards Eco-Industrial Park will require:

Park management services:

- » Establish and build capacity of an environmental and energy management unit for following up the environmental performance.
- » Establish a maintenance plan for roads, landscaping, street lighting, security surveillance and monitoring plan for street cleaning.
- » Establish SMEs for the provision of mechanical and electrical repair services, business centre with office space for service providers (internet, post office, etc.)

Environmental performance

- » Exploring and suggesting possible changes in technology and/or in chemicals usage by the tanneries that could be tested and demonstrated by the technology centre when re-operated.
- » Investigate the resources monitoring system (energy, water, waste and products) and benchmarking of water, energy and material consumption.
- » Developing pollution prevention and emission reduction strategy, establishing a monitoring system for waste/ secondary raw materials.
- » Developing a programme for monitoring, mitigating and minimizing CO<sub>2</sub> and GHG emissions in tanneries/leather industry.
- » Investigating the best environmental options for the safe handling and management of hazardous materials/ waste, non-recyclable waste generated from tanneries and conducting related training programs.

Social performance

- » Establishing a grievance mechanism and formulating a community engagement plan.

Economic performance

- » Investigate the consolidated purchasing and companies in the local market producing tanning chemicals.

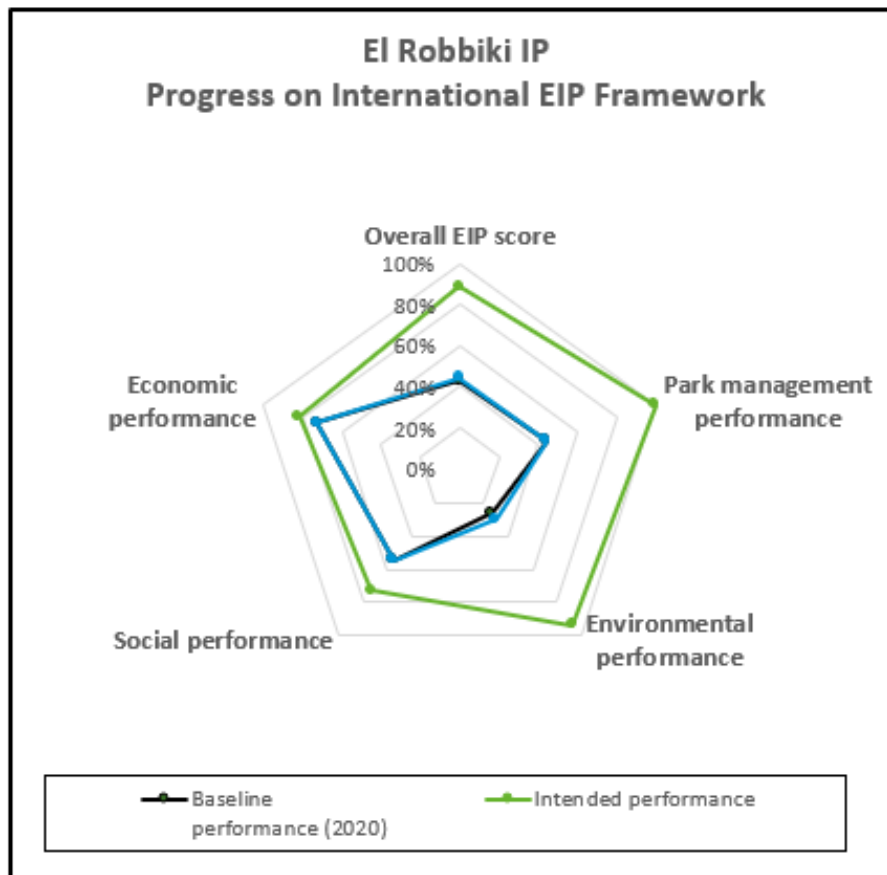
Tannery level (RECP) opportunities:

- » Improve storage practices
- » Monitor/control the opening and closing of the feed water entering the drums
- » Use water for cleaning the floor in the area of the drums only, while cleaning the floor at the rest of the tannery using dry cleaning (such as brooms)
- » Separate the chromium effluent waste from other effluents.
- » Reuse the relatively polluted water in the initial rinsing of hides.
- » Install nozzles on the water hose used for floor cleaning.
- » Install of water flow meters on drums.
- » Apply mechanical desalting
- » Install of capacitors/ power factor correction panel
- » Improve the lighting system by substituting the fluorescent lamps by LED lamps
- » Use solar water heating.
- » Maintain the fuel (LPG) connection system
- » Use spill kits and sorbent materials
- » Install gaskets on the drum doors
- » HVLP spray guns could be used instead of the traditional guns.
- » Install meshed duct
- » Raising the workers awareness
- » Provide the workers with PPEs

Maintenance of the automatic spraying booth in some tanneries, that have not sealed glass.

Robbiki Industrial Park scored 43% against the performance benchmarks of the international EIP framework in 2022 and improved to 48% in 2023. Performance improvements were on environmental indicators.

## Progress on International EIP Framework



### Capacity Building:

The following Eco-Industrial Parks (EIP) training sessions with associated training objectives were organized for Robbiki Industrial Park and tenant companies

#### EIP Training:

Capacity Development Workshop “Transforming the Robbiki Leather Park to an Eco-industrial Park”:

- » Raise the awareness of the park management and the resident leather and tanning companies on the concepts, benefits and added value of EIP and RECP opportunities.
- » Discussion and linking with the leather community at Robbiki IP for the successful implementation, follow up and assessment of the identified RECP at the selected companies.
- » Presenting Eco industrial parks concepts, opportunities and assessment, resources efficiency and cleaner production (RECP) interventions at the companies, industrial symbiosis, urban synergy options, and legal and economic obstacles.

Industrial Symbiosis and Resource/ Waste Exchange Opportunities” workshop:

- » Identifying and reaching a common understanding of Industrial Symbiosis (IS) Opportunities at Robbiki Leather City through interaction.
- » Discussions with the companies to agree on the best possible IS options.

- » Support identifying potential inter-company collaboration on reuse and recycling of materials, waste, water, wastewater and energy or joint services, training and power supply.

Training on strategic IP site selection, EIP feasibility assessment and EIP concept planning for eco-industrial parks:

- » Learn about the rationale, benefits and process to undertake a strategic industrial park site selection and EIP feasibility assessments.
- » Engage participants to exchange their experiences on strategic industrial park site selection and EIP feasibility assessments.
- » Develop practical competences to apply the EIP concept planning approach to industrial parks, and prioritize the steps in the approach which are most relevant to the industrial park being investigated.
- » Equip participants in using the EIP Concept Planning Tool.
- » Engage participants to exchange their experiences on EIP concept planning.

Training on industrial park master planning and EIP master plan review for eco-industrial parks:

- » Increase the understanding of how an EIP should be planned from the early stages, and how it can bring concrete business opportunities for park managers, while economic and environmental savings are achieved and competitiveness of the park enhanced;
- » Learn about the key basic topics part of industrial park master planning and how EIP approaches can strengthen IP master planning.
- » Develop practical competences to undertake a basic and an EIP review of an industrial park master plan.
- » Equip participants in using the Master Plan EIP Review Tool.
- » Engage participants to exchange their experiences on industrial park master planning.
- » Learn about the key roles of park management entities in EIP transformation process including associated business opportunities.
- » Develop practical competences to identify, prioritize and develop added value services by industrial park management entities.
- » Equip participants in using the EIP Management Services Tool.
- » Engage participants to exchange their experiences on added value services offered by industrial park management entities.

### **Training-of-Trainers for Eco-industrial Parks in Egypt**

A new training programme to provide capacity building to technical experts who can support mainstreaming of the EIP approach at industrial parks in Egypt. The training programme consists of 3 in-class training courses and 1 on-job-training.

- » The first course titled “EIP approach, its benefits, and best practices from around the world”, it introduced the EIP concept, the EIP international framework, EIP development stages, and presented both local and international case studies. It also trained the participants on using some of the UNIDO EIP tools such as UNIDO EIP assessment tool and UNIDO EIP selection tool.

- » The second training course in the Eco-Industrial Parks (EIP) capacity building programme introduced the concept of Resource Efficiency and Cleaner Production (RECP), methodology, tools, and showcased previous projects and case studies from Egypt and the world.
- » The third training course “Identification of Industrial Synergies” introduced the concept of industrial synergies, its different types, and how it relates to circular economy. The detailed development stages of industrial synergies were explained and attendees were trained on using UNIDO’s industrial symbiosis tool. Additionally, the course presented ongoing attempts of EIPs in Egypt, and the different success factors and challenges faced.

### **Technical assistance**

Resource Efficient and Cleaner Production (RECP) assessments were conducted in 40 tanneries at Robbiki IP, aimed at identifying RECP and EIP implementable opportunities that would contribute to each company’s resource savings in energy, water waste, and materials to achieve more sustainable practices and increased competitiveness through RECP practices. The assessments consisted of evaluating the tanneries’ RECP management practices observing the operations of significant resource users and evaluating any potential improvement opportunities. The list of potential opportunities identified for feasibility assessments for Robbiki IP are:

- » Treatment and recycling of salt water generated from tanneries.
- » The recycling of the tanneries’ waste, specifically green biowaste (post tanning flesh) in the fertilizer and eco-paper industry.
- » Co-processing of sludge generated from the central WWTP to produce alternative fuel in cement plants.
- » Recycling buffing particulates/ dust as a filler in the polymer and plastic industry.
- » Chromium separation by tanneries and recovery in the chromium recovery unit.
- » Viability of rooftop PV power generation.

### **Short description of the EIP opportunity, results, and implementation**

Develop a plan to react against climate change negative impacts:

- » Conducting interviews and investigating potential risks due to climate change as well as identifying previous problems at the park.
- » Identifying measures related to climate change adaptation should be included in the plan.
- » Identifying mitigation measures and developing an action plan on climate change adaptation.

Develop a plan for monitoring and reducing GHG emissions:

- » Establishing and implementing a programme to measure carbon footprint at the industrial park.
- » Identifying opportunities for reducing CO2 emissions by companies.
- » Setting targets for the IP management entity to reduce CO2 emissions.

Develop a system for resource management, energy efficiency and pollution prevention:

- » Developing a benchmark for water and energy consumption for the last 12 months.

- » Establishing and conducting energy & water and environmental data collection, evaluation & diagnosis, in consultation with relevant resident firms.
- » Identifying potential sources of pollution to air, water and land, different types and amounts of generated waste, waste heat, etc.
- » Setting strategic targets for reducing resources consumption per unit turnover.
- » Designing a strategy for pollution prevention, emission reduction and a resource monitoring system for energy, water, waste and products.

Preparation of a detailed study on best options for wastewater separation and collection from tanneries:

- » Investigating the current problem of separating wastewater streams from tanneries.
- » The best options for designing and implementing a system that separates different types of wastewater from tanneries (sedimentation rooms, chromium drainage) and constructing combined sedimentation rooms for a group of small tanneries, indicating related the investment needs.

The following interventions will be investigated during the next period:

- » Treatment and recycling of salt water generated from tanneries.
- » The recycling of the tanneries' waste, specifically green biowaste (post-tanning flesh) in the fertilizer and eco-paper industry.
- » Co-processing of sludge generated from the central WWTP to produce alternative fuel in cement plants.
- » Recycling buffering particulates/ dust as a filler in the polymer and plastic industry.
- » Chromium separation by tanneries and recovery in the chromium recovery unit.
- » Viability of rooftop PV power generation.

## **POLARIS INDUSTRIAL PARK**

### **Background of the park, initial EIP Scoring and areas of improvement**

Polaris Industrial Parks is the first private industrial development company to be established in Egypt. It was inaugurated in 2007, with an area of 200 hectares. It was completed and successfully hosting multinational and local investors within only three years. Polaris Parks offers its Standard Factory Buildings (SFBs) as the ideal business space, for various industries or warehousing based on each investor's needs.

Polaris industrial park is located in the 6<sup>th</sup> of October area of Giza governorate, 30 kilometers northwest of Cairo. The park was planned to include land for both industrial and non-industrial uses, including a large logistics hub.

The Polaris Management Company (PMC) was established to provide facility management services to ensure optimum quality for its clients. The factory buildings are equipped with necessary infrastructure and ready utilities such as electricity, water, gas and sewage.





The key development needs for Polaris include the expansion of income generating park management services to the tenants, RECP assessments with the industrial tenant companies, focusing on energy savings, renewable energy, and reducing GHG emissions. Water reuse and solid waste management, including symbiosis opportunities between tenant companies, are being considered by the park management.

Polaris IP houses around 40 small, medium and large reputable local and multinational companies, such as Procter & Gamble, General Motors-Mansour Automotive, SCIB paints, Edita, Hayat Egypt, Henkel, and Evapharma.

Key industrial sector(s) currently present in Polaris IP are: Chemicals and paints;

- » Pharmaceutical ;
- » Paper ;
- » Plastic;

- » Automotive;
- » Food processing ;
- » Household appliances industry;
- » Metal industry;
- » Steel structure;
- » Packaging materials production From the EIP assessment, Polaris met 27 out of the 60 international benchmarks (45% of the applicable benchmarks). There are 4 benchmarks are not applicable, and 33 benchmarks are not yet met. With current and upcoming initiatives Polaris IP intended to reach a performance of meeting 92% of the international benchmarks. This indicates an intended improvement of 47%.

Environmental and park management performances have the lower compliance (30% and 44% respectively) compared to economic and social performances (71% and 58% baseline compliance respectively). The following topics had lower baseline compliance scorings indicating that efforts overall should prioritize these topics:

- » Park Monitoring and risk management;
- » Management and monitoring;
- » Energy
- » Water management
- » Waste and material use;

Local business & SME promotion and Employment generation had the highest baseline compliance scorings, indicating overall that, Polaris IP management and tenant firms need less intensive technical assistance on these topics covered by the International EIP Framework.

A set of EIP opportunities were identified and prioritized for Polaris IP based on the review against the International EIP Framework:

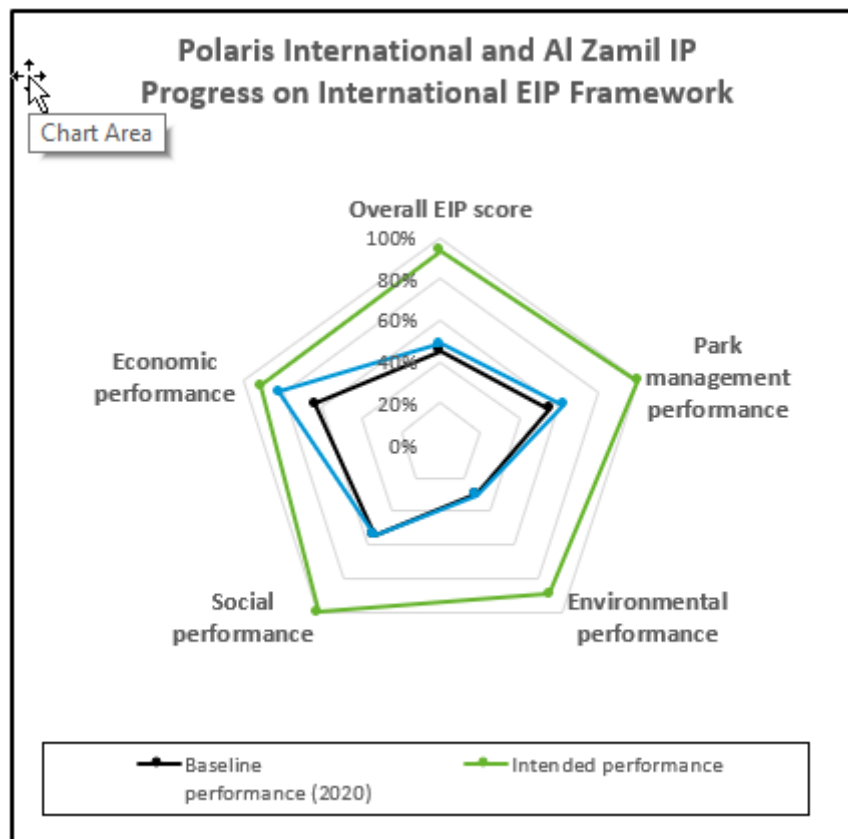
- » Establish an EIP and an environmental-energy management unit.
- » Conduct energy efficiency training programme, awareness session on energy consumption and optimization of existing energy system at park level.
- » Develop an industrial heat recovery strategy for the park.
- » Create industrial park water efficiency Plan jointly with firms.
- » Investigate relative opportunities and suitable business models for waste management.
- » Develop a programme on monitoring, mitigating and/or minimizing GHG emissions such as carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrogen oxides (NO<sub>x</sub>).
- » Prepare a plan for integration of resource efficiency with proposed list of interventions and potential of integration of renewable energy sources.



- » Create a database on wastewater reuse, reuse and recycle of non-hazardous, safe disposal of solid industrial waste generated by firms and handling, storage, transport and disposal of toxic and hazardous materials, through surveying firms, conducting workshops/ training programs for raising awareness and linkage with stakeholders and financial institutes.

Polaris Industrial Park scored 45% against the performance benchmarks of the international EIP framework in 2022 and improved to 48% in 2023. Performance improvements were for park management indicators. Polaris’s progress against the international EIP framework is illustrated in the chart below.

Progress on International EIP Framework



### Short description of the EIP opportunities, results, and implementation

Developing an industrial heat recovery strategy:

- » A preliminary assessment of the industrial processes and facilities to identify main sources of waste heat.
- » Gather data on energy consumption, temperature profiles, and heat dissipation points to understand the heat recovery potential at the level of the industrial park.
- » Determine the major (top 10) thermal energy-consuming businesses.
- » Indicate the needed investment for implementation of heat recovery solutions and an action plan at the level of the industrial park (not individual companies).

Develop a plan for water efficiency:

- » Conducting a water audit and assessing current water usage at the level of the industrial park.
- » A mechanism to engage firms and establish a team (in the IP management entity) to improve water efficiency.
- » Setting water efficiency goals.
- » Identifying water efficiency measures.
- » Developing an implementation plan for water efficiency.

Implement a (hazardous and non-hazardous) waste monitoring system:

- » Review relevant local, regional and national regulations pertaining to waste surveillance and management.
- » Create and conduct a surveillance and inventory plan for waste at the level of the industrial park (not single companies).
- » Identify potential sources, types and generated amount of waste.
- » Establish a system for waste management at the park.
- » Suggest a training program to enhance capacity in hazardous and non-hazardous waste management and conduct a training workshop that targets the industrial park and industries.

Develop a plan for monitoring and reducing GHG emissions:

- » Establishing and implementing a programme to measure carbon footprint at the industrial park.
- » Identifying opportunities for reducing CO<sub>2</sub> emissions by companies.
- » Setting targets for the IP management entity to reduce CO<sub>2</sub> emissions.

Develop a system for resource management, energy efficiency and pollution prevention :

- » Developing a benchmark for water and energy consumption for the last 12 months.
- » Establishing and conducting energy & water and environmental data collection, evaluation & diagnosis, in consultation with relevant resident firms.
- » Identifying potential sources of pollution to air, water and land, different types and amounts of generated waste, waste heat, etc.
- » Setting strategic targets for reducing resources consumption per unit turnover.
- » Designing a strategy for pollution prevention, emission reduction and a resource monitoring system for energy, water, waste and products.

Design a strategy to attract female workforce and skilled persons:

- » Conduct root cause analysis for gender imbalance at the industrial park.
- » Conduct a survey among firms to investigate the need for skill development programmes.
- » Communicate with related stakeholders to facilitate access to programs.
- » Design a programme to attract female and skilled workers.

## **Capacity Building**

The following EIP training sessions with associated training objectives were organized for Polaris and tenant companies.

EIP Training:

Eco-Industrial Parks in Egypt “Towards More Sustainable and Profitable Industrial Parks:

- » Raise awareness on the EIP concept and its benefits in order to motivate “Polaris Industrial Parks – 6<sup>th</sup> of October” and its tenant companies and management to move towards implementing EIP measures.
- » Raise awareness and share basic knowledge to facilitate the implementation of industrial symbiosis (IS) and resource efficient and cleaner production (RECP) measures.
- » Create interest and gain commitment of tenant companies to join the UNIDO GEIPP-Egypt project and to transform towards eco-industrial parks.
- » Establish a network and create linkages between beneficiary tenants and service providers.

Industrial Symbiosis Workshop

- » Raising awareness of companies on the benefits of industrial symbiosis (IS).
- » Establishing synergies to achieve joint training, joint services and successful exchanges of energy, water, materials and waste between companies.
- » Strengthening the linkage between factories and service providers.
- » Identifying industrial symbiosis opportunities and creating industrial symbiotic matches.

Training on strategic IP site selection, EIP feasibility assessment and EIP concept planning for eco-industrial parks:

- » Learn about the rationale, benefits and process to undertake a strategic industrial park site selection and EIP feasibility assessments.
- » Engage participants to exchange their experiences on strategic industrial park site selection and EIP feasibility assessments.
- » Develop practical competences to apply the EIP concept planning approach to industrial parks, and prioritize the steps in the approach which are most relevant to the industrial park being investigated.
- » Equip participants in using the EIP Concept Planning Tool.
- » Engage participants to exchange their experiences on EIP concept planning.

Training on industrial park master planning and EIP master plan review for eco-industrial parks:

- » Increase the understanding of how an EIP should be planned from the early stages, and how it can bring concrete business opportunities for park managers, while economic and environmental savings are achieved and competitiveness of the park enhanced;
- » Learn about the key basic topics part of industrial park master planning and how EIP approaches can strengthen IP master planning.
- » Develop practical competences to undertake a basic and an EIP review of an industrial park master plan.
- » Equip participants in using the Master Plan EIP Review Tool.

- » Engage participants to exchange their experiences on industrial park master planning.
- » Learn about the key roles of park management entities in EIP transformation process including associated business opportunities.
- » Develop practical competences to identify, prioritize and develop added value services by industrial park management entities.
- » Equip participants in using the EIP Management Services Tool.
- » Engage participants to exchange their experiences on added value services offered by industrial park management entities.

#### Training of future service providers for Eco-industrial Parks in Egypt

A new training programme to provide capacity building to technical experts who can support mainstreaming of the EIP approach at industrial parks in Egypt. The training programme consists of 3 in-class training courses and 1 on-job-training.

- » The first course titled “EIP approach, its benefits, and best practices from around the world”, it introduced the EIP concept, the EIP international framework, EIP development stages, and presented both local and international case studies. It also trained the participants on using some of the UNIDO EIP tools such as UNIDO EIP assessment tool and UNIDO EIP selection tool.
- » The second training course in the Eco-Industrial Parks (EIP) capacity building programme introduced the concept of Resource Efficiency and Cleaner Production (RECP), methodology, tools, and showcased previous projects and case studies from Egypt and the world.

The third training course “Identification of Industrial Synergies” introduced the concept of industrial synergies, its different types, and how it relates to circular economy. The detailed development stages of industrial synergies were explained and attendees were trained on using UNIDO’s industrial symbiosis tool. Additionally, the course presented ongoing attempts of EIPs in Egypt, and the different success factors and challenges faced.

#### Technical assistance

RECP assessments are being conducted in 25 tenant companies at Polaris IP aimed at identifying RECP and EIP opportunities that would contribute to company’s resource savings in energy, water waste, and materials and EIP improvement to achieve more sustainable practices and increased competitiveness through RECP and EIP practices.

Potential EIP opportunities identified for Polaris IP are:

- » A centralized industrial WWTP for the industrial park.
- » Creating physical network for water reuse/cascading of water.  
Investigate the feasibility of having a common shared PV plant

#### SUMMARY AND CONCLUSION

- » It is clear from technical reviews and assessments of pilot industrial parks against the International EIP Framework and technical assessments that the development and promotion of pilot industrial parks as Eco-industrial parks will offer better and more resource-efficient industrial parks with lower risks and offering more business opportunities inline with the

National Action Plan for Sustainable Consumption and Production (SCP) and Egypt vision 2030.

- » The GEIPP-Egypt project started only in early 2022. Nonetheless, it is progressing very fast and the opportunities identified are very relevant and with very high expected environmental, social and economic benefits.
- » With the willingness to uptake and upscale EIP approaches in the pilot industry parks based on technical assistance provided, the efforts underway by each pilot industrial park to take forward implementation of EIP feasibility opportunities, and with the Ministry of Trade and Industry commitment to include EIP approaches in national industrial policy and strategies, it is evident that GEIPP is demonstrating the viability and benefits of EIPs in scaling up resource productivity and improving the economic, environmental, and social performances of businesses in the country. Continued technical support of the pilot industrial parks will ensure that the project objectives are realized in a possible next phase of the project.
- » Based on EIP work done at Orascom Industrial Park, the park has demonstrated high level of commitment to implement the identified EIP opportunities, so efforts to support the park will be continued to improve its performance against the International EIP Framework.
- » Robbiki IP performs quite well in economic development dimension of EIP, as it meets 8 out of 11 economic performance benchmarks. There are still gaps concerning the environmental and social components. The suggested opportunities are taking traction at the Industrial Development Authority (IDA) and Robbiki management (CID), and work will be continued to manage and monitor progress on the prioritized EIP opportunities. Continued support of the park will result in EIP improvement results.
- » Polaris IP continues to demonstrate improvement potential with regards to the International EIP framework. Efforts are being exerted in cooperation with the park management to apply EIP approaches according to EIP international standards. More technical support would contribute to the park achieving its intended improvement potential as per the EIP Frameworks.

## ANNEX C: RESULTS INDONESIA

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The Global Eco-Industrial Parks Programme in Indonesia (GEIPP-Indonesia) started in July 2020 and is funded by the Swiss Government through the State Secretariat for Economic Affairs of Switzerland (SECO). Global Eco-Industrial Parks Programme in Indonesia is delivered through the collaboration of UNIDO with the Ministry of Industry as the national counterpart and the Indonesia Cleaner Production Centre (ICPC) as the execution partner.

The GEIPP-Indonesia aims to maximize the stability and benefits of eco-industrial parks by improving the productivity and economic, environmental, and social performances of businesses, thereby contributing to inclusive and sustainable industrial development. An industrial park within the Indonesian context exists to support, manage and administer industrial activities within a specified area to facilitate socio-economic benefits for the surrounding area, its tenants, and the country as a whole.

### Results from GEIPP I Priority Parks in Indonesia

Of the overall 136 industrial parks (as of August 2023), 15 Industrial Parks are owned by state enterprises (Badan Usaha Milik Negara, BUMN), four are owned by regional enterprises (Badan Usaha Milik Daerah, BUMD), and the rest are privately owned.

The methodology applied to select Pilot industrial parks for GEIPP-Indonesia is outlined below;

Short-listing Industrial Parks for consideration in the selection process based on a review of available national databases and consultation with national stakeholders.

Pre-selection of Industrial Parks based on minimum selection criteria (e.g., management, size, industrial activities, law and regulation, confidentiality, risk, location, and commitment).

- » Prioritise pre-selected Industrial Parks based on a set of qualitative criteria formulated as statements.
- » Review the prioritised Industrial Parks against the International Framework for Eco-Industrial Parks (UNIDO, World Bank, GIZ, 2017). This review provided insights into their current and intended performance at the end of the GEIPP.
- » Shortlisting and final selection of the Industrial Parks where three were selected for in-depth technical assistance through GEIPP-Indonesia, including one leading “model” Industrial Park with high performance regarding the International EIP Framework and a second with significant improvement potential. While selecting the industrial parks, the geographic distribution was also considered; one park was established on Java Island, and the other in Batam (outside Java). One additional park was added later in March 2022 as the third pilot industrial park.

A broader group of Industrial Parks were identified for capacity-building and awareness-raising activities.



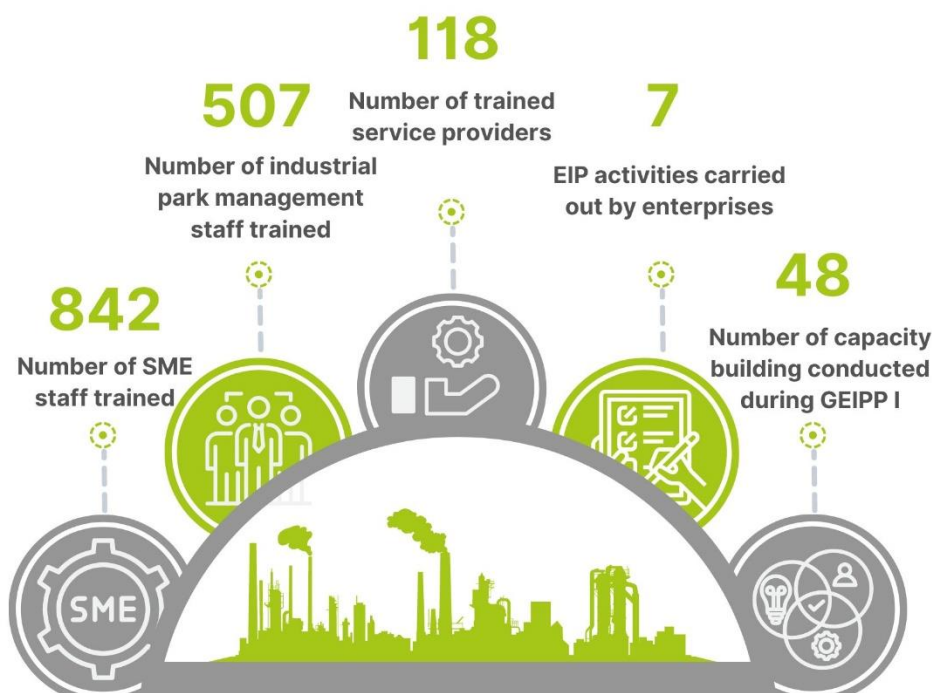
To date, GEIPP-Indonesia's achievements are summarised below;

- » Energy efficiency kilowatt-hours saved through energy efficiency/year: 18,464,000
- » Kilowatt-hours additionally produced from renewable energy/year: 621,000
- » Water efficiency Cubic meter water saved (Ratio of water reused/recycled)/year: 119,801
- » Waste reuse and recycling Metric ton material saved (Ratio of solid waste reused/recycled)/year: 99
- » Climate change benefits tCO<sub>2</sub> Eq. / year: 12,642
- » Actual investments on RECP/EIP identified options (USD) Park management and tenant companies: 1,966,783

<i>Country</i>	<i>Indonesia</i>
<i>Number of Industrial Parks in the Country</i>	<i>136 industrial parks (as of August 2023)</i>
<i>Number of GEIPP Priority Parks</i>	<i>3 Industrial Parks</i>
<i>Number of Industrial Parks taking part in awareness and capacity-building activities of GEIPP</i>	<i>20 Industrial Parks</i>

UNIDO and the World Bank also jointly organized a knowledge exchange visit to the Republic of Korea on Eco-Industrial Parks from 8 to 12 May 2023, participated by representatives from Indonesia, Vietnam, Haiti, and Brazil. From Indonesia, representatives from the Ministry of Industry, the Coordinating Ministry for Economic Affairs, the Ministry of Environment and Forestry, and the Indonesian Industrial Estates Association (HKI) attended the event. During the event, it was discussed that GEIPP-Indonesia and GEIPP-Vietnam could significantly benefit from structured exchanges to accelerate the development of Eco-Industrial Parks (EIPs) in both countries. These country exchanges took place in September and October 2023.





GEIPP Indonesia has offered training to 842 personnel in Small and Medium Enterprises (SMEs), 507 individuals in industrial park management, and 118 service providers. Enterprises have independently carried out 7 Eco-Industrial Parks (EIP) activities without additional support from GEIPP. This outcome resulted from implementing 48 capacity-building initiatives over the five-year duration of GEIPP I.

## MM2100 INDUSTRIAL TOWN

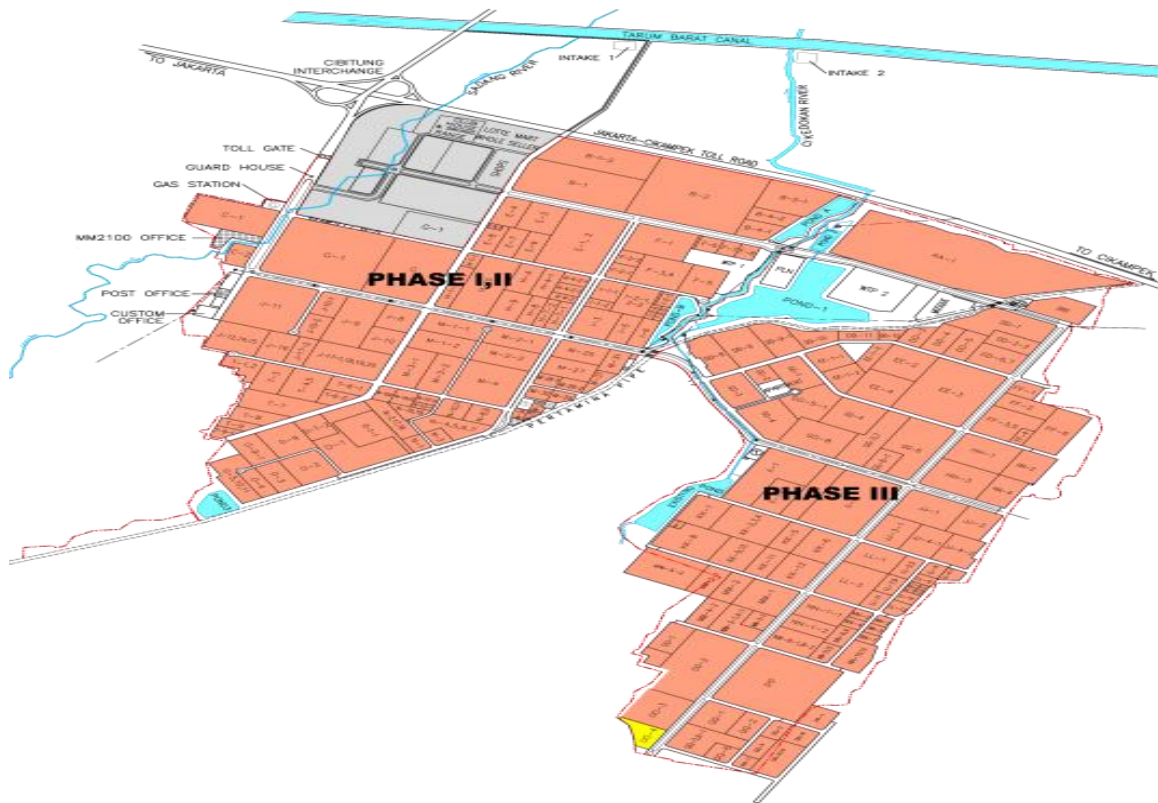
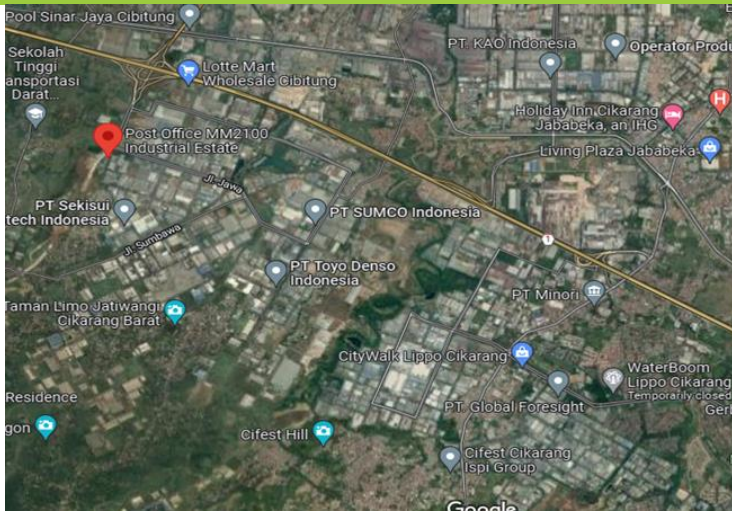
### Background of the Park, Initial EIP Scoring, and Areas of Improvement

MM2100 Industrial Town is a fully integrated Industrial Estate developed by PT. Megalopolis Manunggal Industrial Development (PT. MMID). Established in 1990 by the Marubeni Corporation of Japan and the Manunggal Group of Indonesia, the estate is presently known as one of the best-value industrial estates in Indonesia.

It is located in a prime area in Cikarang Barat County, Bekasi Regency, West Java Province. Bekasi Regency is situated next to Jakarta, the Capital City. The Municipal City of Bekasi is a rapidly developing urban city in eastern Jakarta and a densely populated area.

MM2100 has more than 190 tenant companies and various facilities. These facilities include adequate main road width for land transportation, wastewater treatment facilities, clean water treatment facilities, electricity supply from private companies, infrastructure for gas, hotels, minimarkets, ATMs, police stations, firefighters, logistics offices, restaurants, and others. The existing tenants in the MM2100 area have a variety of types of production businesses, including production in automotive, services, food and beverage, garment, electrical, and other sectors.

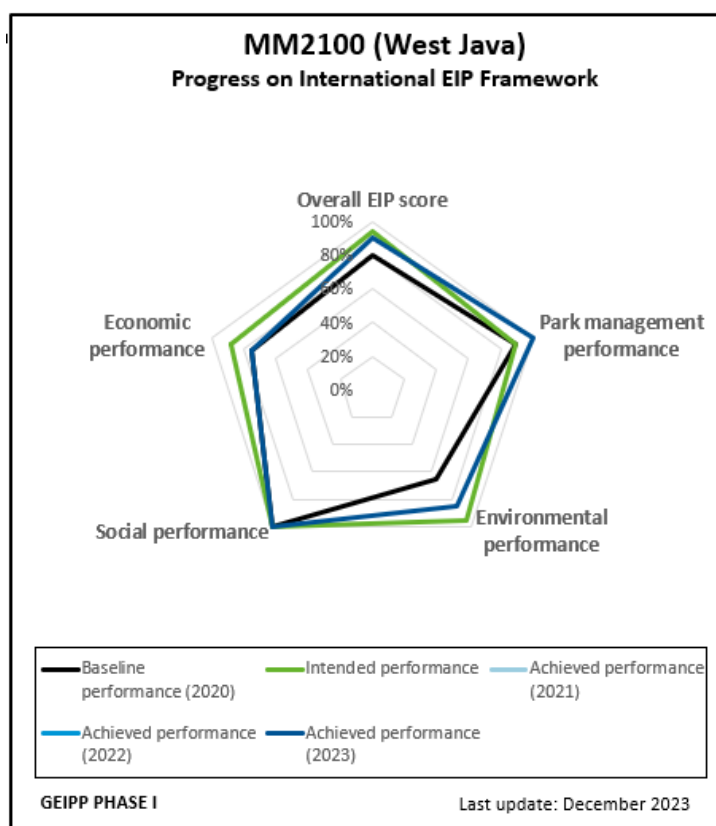




The MM2100 Industrial Town scored 80% against the performance benchmarks of the international EIP framework in 2020 and improved to an overall score of 90% in 2023 due to increased park management and environmental performance. The progress of MM2100 Industrial Town against the international EIP framework is illustrated in the chart below.



## Progress on International EIP Framework



### Initial EIP Scoring and the identified area of improvement.

The review of MM2100 Industrial Town against the International Framework for Eco-Industrial Parks was conducted. The key observations from the EIP assessment of MM2100 Industrial Town included the following:

MM2100 Industrial Town performs and compares very favourably against large proportions of the benchmarks in the International EIP Framework. In summary, MM2100 fully met 41 out of the 51 international 2017 benchmarks (80% of the applicable benchmarks in 2020 and improved to an overall score of 82% in 2022 due to increased economic performance. MM2100 Industrial Town intends to meet 94% of the international benchmarks with current and upcoming initiatives. This indicates an intended improvement of 12%.

The social performance category had the highest compliance (100%) compared to park management (89% baseline compliance), environmental performance (65% baseline compliance), and economic performance (88% baseline compliance).

Environmental performance shows the highest intended improvement potential (30%) compared to other categories, followed by economic performance (13% intended improvement);



The following topics had lower baseline compliance scorings, indicating that efforts overall should prioritise these topics:

- » Management and monitoring
- » Energy
- » Water

The following topics had the highest baseline compliance scorings (100%), indicating overall that MM2100 Industrial Park management and tenant firms need less intensive technical assistance on these topics covered by the International EIP Framework:

- » Park management services
- » Planning and zoning
- » Waste and material use
- » Climate change and the natural environment
- » Social management systems
- » Social infrastructure
- » Local community outreach
- » Employment generation
- » Local business & SME promotion

A set of practical EIP opportunities was identified and prioritized for MM2100 Industrial Town based on the review of the International EIP Framework. These opportunities include the digital economy, monitoring and risk management, resource efficiency and industrial synergies, energy, water, climate change and natural environment, and economic value creation.

### **Capacity Building**

The following Eco-Industrial Parks (EIP) workshop sessions with associated training objectives were organised for MM2100 and tenant companies.

#### EIP introduction workshop

Learn how the EIP approach can bring concrete business opportunities, economic savings, and enhanced competitiveness to industrial parks and their tenant companies;

Learn about the benefits and application of EIP approaches to industrial parks and its tenant companies

Understand the opportunities, challenges, and success factors of applying EIP approaches in industrial parks.

#### Solid waste workshop

- » Answering specific problems in Solid waste issues faced by industrial Park.
- » Improve technical skills and practical knowledge in implementing the EIP program.



- » Encouraging the Industrial Park to implement the EIP program.
- » Maintain communication and exchange of information regarding the implementation of the EIP.
- » Prepare the action plan for the implementation of EIP activities.

#### Wastewater workshop

- » Identification of wastewater in industrial areas.
- » Considerations and strategies for selecting wastewater treatment technologies.
- » Synergy of Water and Wastewater Treatment in Industrial Park
- » Reuse water treatment
- » Reducing the generation of sludge
- » Optimization of wastewater treatment

#### Green House Gas Emission (GHG) workshop

- » Introducing the concept of the EIP framework and its relevancy of improvement on environmental performance, specifically on GHG Emission (including the potential of implementing renewable energy)
- » Introducing several aspects and key factors to establish a proper GHG Emission (including the potential of implementing emission reduction) in the industrial park
- » Introducing technologies and approaches to install and establish emission reduction
- » Identifying key pressing issues of emission reduction in Industrial Park and pointing out the approaches of follow-up solutions
- » Encouraging the budding interest in EIP implementation in the Industrial Park.
- » Maintaining the communication and information exchange regarding EIP implementation
- » Identifying the potential EIP synergies

#### Implementation of Solar Photo Voltaic (PV) workshop

- » Awareness of the importance of using Renewable Energy for Sustainable Development in industrial areas
- » Alternative Solar PV as Renewable Energy that can be implemented in Industrial Estates as Alternative energy
- » Introducing Solar PV Regulations and Policies in Indonesia
- » Understanding how to implement Solar PV, its benefits and challenges, and current regulations and cases in Indonesia
- » Increasing the motivation to implement Solar PV technology in the Eco-Industrial Park (EIP) program



### Social indicator workshop

- » Creating awareness of the important social issue management in sustainable development in the industrial park
- » Creating an understanding of knowing parameters and social indicators in EIP
- » Discussing relevant key regulations and policies for social issues in an industrial park
- » Identifying potential social programmes from EIP
- » Learning case studies and success stories from implementing proper management of the social aspect of Eco-Industrial Park.

### Energy management workshop

- » The importance of energy management
- » Energy Management System Refers to SNI ISO 50001:2018
- » Benefits of Energy Management System Implementation Referring to SNI ISO 50001:2018.

### Environmental impact assessment and detailed environmental management plan and monitoring plan

- » knowing about environmental Indonesia regulation number 22 2021 about environmental impact assessment
- » knowing about Indonesia regulation from the Ministry of Environment and Forestry number 5 of 2021 about wastewater impact and emission
- » Technical approval for building an environmental management system

### Water reuse for industrial park workshop

- » Understanding the importance of implementing water reuse as a resource optimization;
- » Wastewater utilization and treatment strategy
- » Understanding the basic techniques and technologies for applying water reuse
- » Awareness of the current and existing relevant regulations for water reuse in industrial areas
- » Understanding the application of water reuse for industrial activities
- » Understanding concrete examples of the application of existing reuse water

### Sustainability reporting development workshop

- » Introduction to the Sustainability Reporting
- » Introduction to GRI Standard for Sustainability Reporting
- » GRI standard to address sustainable challenges



- » Sustainability report for Environmental, social, and corporate governance
- » Relevance of sustainability reporting for industries
- » Starting Sustainability Reporting with GRI Standards

#### Solid waste treatment from waste4change

- » The importance of waste management in Industrial Areas
- » Key steps to be integrated for Waste Management in Industrial Areas and Industrial Parks
- » Best practice and Study Cases of Waste Management in Industrial Parks

#### Regulation and opportunity to implement eco-industrial park

- » Related regulations to improve the development of the Eco-Industrial Park
- » Opportunities and benefits of implementing Eco-Industrial Park
- » Prerequisite requirements to implement Eco-Industrial Park

#### Treatment and opportunities of hazardous waste workshop

- » Newest regulation of hazardous waste
- » Opportunity and benefit of treating hazardous waste in industrial parks
- » Permit needed to treat hazardous waste
- » Study case treatment and recycling of hazardous waste

#### Wastewater recycling process in an industrial area

- » Problematic wastewater treatment in an industrial area
- » Opportunity and benefit of treating wastewater in industrial parks
- » Permit needed to treat wastewater
- » Study case treatment and recycling of hazardous waste

### **Technical Assistance**

#### **a. RECP Assessments**

Resource Efficient and Cleaner Production (RECP) were conducted in 15 tenant companies at MM2100 Industrial Park aimed at identifying RECP and EIP implementable opportunities that would contribute to each company's resource savings in energy, water, and materials to achieve more sustainable practices and increased competitiveness through resource-efficient production practices. The assessments evaluated the company's RECP management practices (if any), observed significant resource users' operations, and evaluated potential opportunities.





Most participating companies are from the automotive and electronic components industry, but there are also companies in other sectors, i.e., beverage, paints, and sports footwear. During the assessment, 222 RECP options were identified. The total number of RECP options can be categorised into eight RECP practices: 62 good housekeeping, 26 input material change, 18 better process control, 39 equipment modification, 49 technology changes, 18 onsite reuse and recycle, two production of valuable by-products, and eight product modifications.

This number includes the recommendation from the RECP team and the program planned or implemented by the companies.

### **b. Industrial Synergies**

The industrial synergies in MM2100 have been assessed by doing a preliminary assessment that aims to collect baseline data from industrial park management and generate a list of industrial synergy opportunities. The assessments usually focus on data collection and option generation. The industrial synergy opportunities in MM2100 have been identified through the discussion with staff working at the companies, matching inputs (raw material use, water, etc.) with outputs (wastes, by-products, etc.), review of international experiences, good practice, and case studies in industrial synergies, as well as analysis of existing and potential new park management, utility services, and shared infrastructure. A prioritization exercise was undertaken to highlight opportunities of interest to undertake a detailed feasibility study and eliminate opportunities that could readily be identified as unfeasible or without significant benefits.

Feasibility assessments were undertaken for MM2100 for a selected set of promising EIP opportunities. Eight feasibility studies were completed for MM2100 Industrial Town, i.e.,

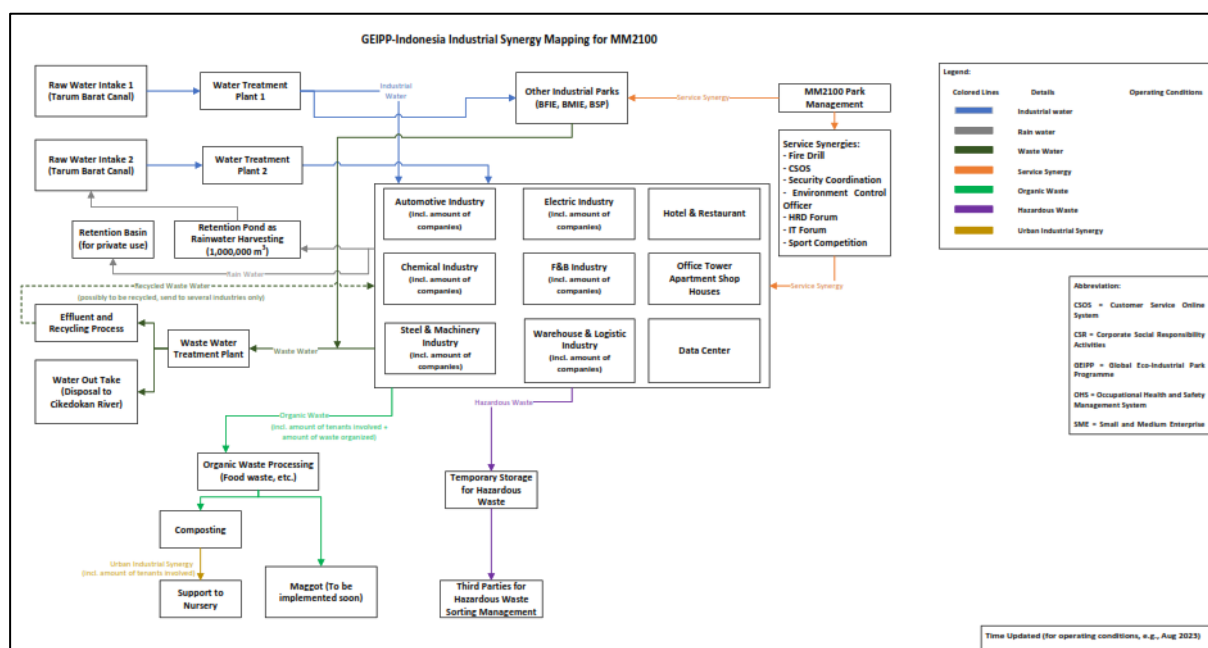
- » Rainwater harvesting
- » Waste sorting implementation
- » Facilitating the calculation of greenhouse gas emission
- » Training for integrated disaster
- » Old Street lighting bulbs replaced with LED
- » Sharing knowledge, training, and improving the code of conduct
- » Social activities between tenants
- » Opening a job fair and career hub

Workshops and focus group discussions on Industrial Synergies have been organized to discuss and identify opportunities for industrial synergies such as utility and infrastructure sharing, supply synergies, co-location of suppliers and clients, by-product synergies, and waste exchanges. The feasibility assessments have been carried out for the most promising industrial synergies, such as:

- » Rainwater harvesting: Planned
- » Waste sorting implementation: Planned
- » Facilitating the calculation of greenhouse gas emission: Ongoing
- » Training for integrated disaster: Has been implemented
- » Old Street lighting bulbs replacement with LED: Implemented
- » Sharing knowledge, training, and improving the code of conduct: implemented.
- » Social activities participated by the tenants: Ongoing.
- » Opening a job fair and career hub: Organized



The Industrial Synergy Mapping for MM2100 Industrial Town is ongoing, and case studies for the success stories have been drafted.



**Figure 2: Industrial Synergy Mapping in MM2100 Industrial Town.**

## Short Description of the EIP Opportunity, Results, and Implementation

### Rainwater harvesting:

- » The availability of six retention ponds in MM2100 Industrial Town can be utilized for rainwater harvesting. This pond is sufficient to accommodate the increasing number of clean water requirements of tenants in the industrial park and to reduce the use of municipal supply water.
- » CAPEX required for rainwater harvesting will require further investigation as each tenant may have to install their system, and the cost will depend on the length of gutters needed, the sizes of the pond, lengths of PVC pipes, and whether additional treatment, such as ultraviolet (UV) filtration and triple stage filtration systems are required.
- » MM2100 park management is still researching governance and legal aspects regarding rainwater usage in the current implementation progress.

### Waste Sorting Implementation

- » By sorting food waste, the tenant's organic waste can be utilized as compost, thus minimizing the waste generation to the nearby landfill and reducing the need for chemical fertilizers. The compost can also be used for maintaining the plants and trees in the MM2100 area.





- » The capacity of the nearby landfill, Burangkeng, is already over capacity by 2020. Waste sorting and composting will reduce the amount of waste that goes to the landfill.
- » Financing (CAPEX) is fully funded by a third party (Rekosistem or Waste4Change). Park management will take the lead. Operational costs will be recovered from revenue. This requires additional research in the industrial park as some tenants may have done waste recovery activities with waste banks/local communities.

#### Facilitating the calculation of greenhouse gas emission

- » By calculating greenhouse gas emissions, industrial park managers can identify and track emissions sources and make decisions to improve air quality. Estimating greenhouse gas emissions can inform policymakers and the public about the number of emissions from industrial parks; park management can also use GHG Emission data to market themselves as environmentally friendly, which can attract new tenants and businesses.
- » CAPEX and OPEX will be discussed with the vendor of the GHG calculator.
- » Progress of the implementation: MM2100 park management has found a vendor and begun to sign the contract.

#### Training for integrated disaster

- » Java Island, Indonesia, is one area included in the Ring of Fire and is expected to have many earthquakes.
- » Bekasi, where MM2100 is located, might be prone to flooding.
- » In MM2100 Industrial Town, a fire drill is the most common disaster management training conducted for the tenants. This drill is conducted by request with a minimum frequency of one training session per tenant per year. MM2100 also collaborates with the local government to conduct flooding training alongside the community.

#### Old Street lighting bulbs replaced with LED

- » Electricity consumption is the most significant energy use in MM2100 industrial town. One of the easiest (low-hanging fruit) approaches is energy-efficient lights to decrease the energy demand.
- » Some tenants already use LED lighting for their buildings. Some use wind energy for lighting. However, the LEDs are not 100% used, especially for streetlights.
- » Progress of the implementation: MM2100 park management has replaced 50 street lighting bulbs with LED lamps.

#### Sharing knowledge, training, and improving the code of conduct

- » Code of conduct training is one of the significant components of a comprehensive and detailed ethics and compliance program. This training will increase awareness of a wide range of ethical and legal issues in the workplace, such as conflicts of interest, bribery and corruption, insider trading, data privacy, information security, diversity and inclusion, and social media use.



- » No capital expenditure (CAPEX) will be required to set up the training facility because there is already a meeting room that is usually used as a training facility. The estimated operational expenditure (OPEX) is IDR 30,860,000 per year for 380 trainees.
- » Progress of the implementation: several trainings have been held by MM2100 park management for the tenants.

#### Social activities between tenants

- » By organizing social activities such as group outings or company mixers, employees can interact with each other outside of their work environments and form connections that can lead to new ideas and partnerships.
- » No capital expenditure (CAPEX) will be required to set up the program because the cost does not generate long-term assets for the park and the company.
- » The estimated operational expenditure (OPEX) for the two activities is IDR 19.000.000 annually.
- » There will be revenue obtained from the registration fee of tenant participants for IDR 9.500.000/activity, which can cover expenditures made by the park management.
- » The MM2100 industrial park hosts an annual sports event, such as sports activities and mangrove planting, for tenants to unite and promote wellness and camaraderie.

#### Opening a job fair and career hub

- » Job fairs are an excellent way for job seekers to find employment suited to their talents, interests, and abilities. Job fairs can also reduce poverty, a severe problem in Indonesia.
- » CAPEX is unnecessary because the event was held at Mitra Industri MM2100 Vocational School. The estimated OPEX for the job fair event is estimated IDR 305,000,000.
- » For several years, MM2100 has partnered with the Bekasi government to host job fairs in the community. These job fairs have been a valuable resource for job seekers, allowing them to meet with employers and learn about available positions.

## BATAMINDO INDUSTRIAL PARK

### Background of the Park, Initial EIP Scoring, and Areas of Improvement

Batamindo Industrial Park is an industrial area located in Sei Beduk, Batam City. This area was formed from the collaboration between the Government of Indonesia and the Government of Singapore in 1990 and is managed by PT. Batamindo Investment Cakrawala. Having an area of 320 hectares, Batamindo has a strategic location because it is located on international shipping lanes, i.e., the waters of the Malacca Strait and the Singapore Strait. This is also supported by transportation facilities around the area, such as Batam Centre International Ferry Terminal (7 km), Batu Ampar Seaport (18 km), Hang Nadim International Airport (20 km), etc.

Batamindo Industrial Park has 68 tenants, which can be divided into various business fields. Most tenants in the Batamindo Industrial Estate are engaged in manufacturing electronic

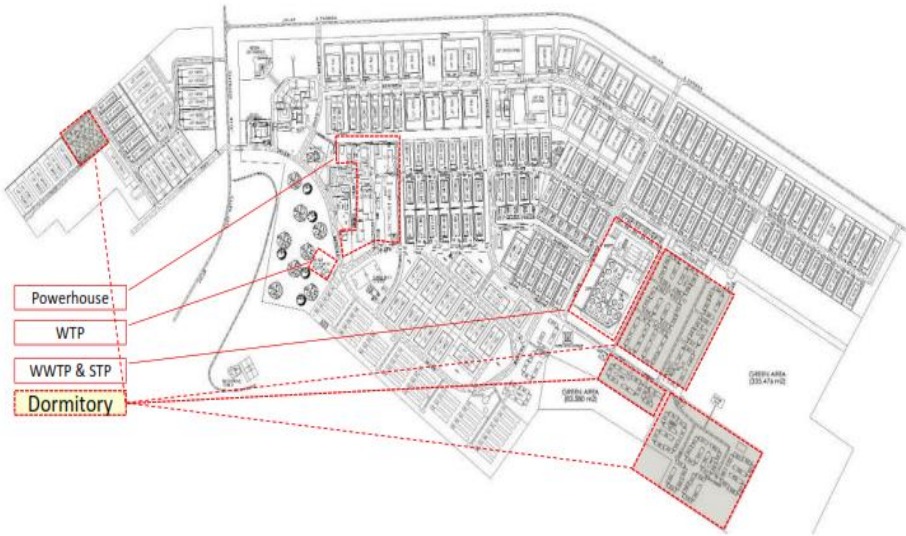


products, which are 23 tenants. This number is followed by the number of tenants involved in the metal/metal business sector, with nine tenants; the plastic business sector, with six tenants; and the marine equipment and bicycle business sector, with five tenants. Each has three tenants for logistics, coating/painting, automotive, and medical equipment. Apart from these fields, each has a total of 1 tenant. Figure 1 is a pie chart depicting the number of tenants from each type of business field.



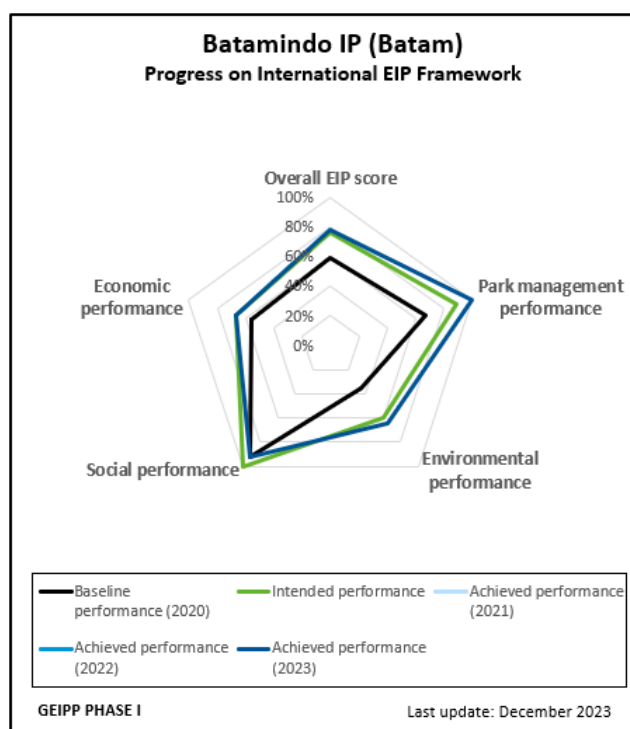
### **BATAMINDO INDUSTRIAL PARK**

- WTP, WWTP, PH Layout





The Batamindo Industrial Park scored 59% against the performance benchmarks of the international EIP framework in 2020 and improved to an overall score of 78% in 2023 due to increased park management performance, environment performance, and economic performance. The progress of Batamindo Industrial Park against the international EIP framework is illustrated in the chart below.



### Initial EIP Scoring and the identified area of improvement.

A review of Batamindo Industrial Park against the International Framework for Eco-Industrial Parks was conducted. The key observations from the EIP assessment of Batamindo Industrial Park included the following:

Batamindo Industrial Park performs and compares very favourably against large proportions of the benchmarks in the International EIP Framework. In summary, Batamindo fully met 36 out of the 51 international 2017 benchmarks (59% of the applicable benchmarks in 2020 and improved to an overall score of 71% in 2022 due to increased park management performance, environment performance, and economic performance. With current and upcoming initiatives, Batamindo Industrial Park intends to meet 82% of the international benchmarks. This indicates an intended improvement of 11%.

The park management performance category had the highest compliance (100%) compared to social performance

(92% baseline compliance), economic performance (67% baseline compliance), and environment performance (45% baseline compliance).



Environmental performance shows the highest intended improvement potential (20%) compared to other categories, followed by economic performance (11% intended improvement);

The following topics had lower baseline compliance scorings, indicating that efforts overall should prioritize these topics:

- » Management and monitoring (environment)
- » Energy
- » Water
- » Waste and material use
- » Climate change and the natural environment

The following topics had the highest baseline compliance scorings (100%), indicating overall that MM2100 Industrial Park management and tenant firms need less intensive technical assistance on these topics covered by the International EIP Framework:

- » Park management services
- » Monitoring and risk management
- » Planning and zoning
- » Social management systems
- » Local community outreach

Based on the International EIP Framework review, a set of practical EIP opportunities were identified and prioritized for Batamindo Industrial Park. These opportunities include management and monitoring (environment), resource efficiency and industrial synergies, energy, water, waste and material use, climate change and natural environment, local business and SME promotion, and economic value creation.

### **Capacity Building**

The following Eco-Industrial Parks (EIP) training sessions with associated training objectives were organized for Batamindo Industrial Park and tenant companies.

#### EIP introduction workshop

- » Learn how the EIP's approach can bring concrete business opportunities, economic savings, and enhanced competitiveness to industrial parks and their tenant companies;
- » Learn about the benefits and application of EIP approaches to industrial parks and its tenant companies
- » Understand the opportunities, challenges, and success factors of applying EIP approaches in industrial parks.

#### Solid waste workshop

- » Answering specific problems in Solid waste issues faced by industrial Park
- » Improve technical skills and practical knowledge in implementing the EIP program





- » Encouraging the Industrial park to implement the EIP program
- » Maintain communication and exchange of information regarding the implementation of the EIP
- » Prepare the action plan for the implementation of EIP activities

#### Wastewater workshop

- » Identification of wastewater in industrial areas
- » Considerations and strategies for selecting wastewater treatment technologies
- » Synergy of Water and Wastewater Treatment in Industrial Park
- » Reuse water treatment
- » Reducing the generation of sludge
- » Optimization of wastewater treatment

#### Green House Gas Emission (GHG) workshop

- » Introducing the concept of the EIP framework and its relevancy of improvement on environmental performance, specifically on GHG Emission (including the potential of implementing renewable energy)
- » Introducing several aspects and key factors to establish a proper GHG Emission (including the potential of implementing emission reduction) in the industrial park
- » Introducing technologies and approaches to install and establish emission reduction
- » Identifying key pressing issues of emission reduction in Industrial Park and pointing out the approaches of follow-up solutions
- » Encouraging the budding interest in EIP implementation in the Industrial Park.
- » Maintaining the communication and information exchange regarding EIP implementation
- » Identifying the potential EIP synergies

#### Implementation of Solar Photo Voltaic (PV) workshop

- » Awareness of the importance of using Renewable Energy for Sustainable Development in industrial areas
- » Alternative Solar PV as Renewable Energy that can be implemented in Industrial Estates as Alternative energy
- » Introducing Solar PV Regulations and Policies in Indonesia
- » Understanding how to implement Solar PV, its benefits and challenges, and current regulations and cases in Indonesia
- » Increasing the motivation to implement Solar PV technology in the Eco-Industrial Park (EIP) program



## Social indicator workshop

- » Creating awareness of the important social issue management in sustainable development in the industrial park
- » Creating an understanding of knowing parameters and social indicators in EIP
- » Discussing relevant key regulations and policies for social issues in an industrial park
- » Identifying potential social programmes from EIP
- » Learning case studies and success stories from implementing proper management of the social aspect of Eco-Industrial Park.





#### Energy management workshop

- » The importance of energy management
- » Energy Management System Refers to SNI ISO 50001:2018
- » Benefits of Energy Management System Implementation Referring to SNI ISO 50001:2018.

#### Environmental impact assessment and detailed environmental management plan and monitoring plan

- » Learning about environmental regulation number 22 2021 about environmental impact assessment
- » Learning about ministerial regulation issued by the Ministry of Environment and Forestry number 5 of 2021 about wastewater impact and emission
- » Technical approval for building an environmental management system

#### Water reuse for industrial park workshop

- » Understanding the importance of implementing water reuse as a resource optimisation;
- » Wastewater utilization and treatment strategy
- » Understanding the basic techniques and technologies for applying water reuse
- » Awareness of the current and existing relevant regulations for water reuse in industrial areas
- » Understanding the application of water reuse for industrial activities
- » Understanding concrete examples of the application of existing reuse water

#### Regulation and opportunities in implementing eco-industrial park

- » Related regulations to improve the development of the Eco-Industrial Park
- » Opportunities and benefits of implementing Eco-Industrial Park
- » Prerequisite requirements to implement Eco-Industrial Park

#### Treatment and opportunities of hazardous waste workshop

- » Newest regulation of hazardous waste
- » Opportunity and benefit of treating hazardous waste in industrial parks
- » Permit needed to treat hazardous waste
- » Study case treatment and recycling of hazardous waste



## Wastewater recycling process in an industrial area

- » Problematic wastewater treatment in an industrial area
- » Opportunity and benefit of treating wastewater in industrial parks
- » Permit needed to treat wastewater
- » Study case treatment and recycling of hazardous waste



## Technical Assistance

### a. RECP Assessments

Resource Efficient and Cleaner Production (RECP) assessments were conducted in 10 tenant companies at Batamindo Industrial Park aimed at identifying RECP and EIP implementable opportunities that would contribute to each company's resource savings in energy, water, and materials to achieve more sustainable practices and increased competitiveness through RECP practices. The assessments evaluated the company's RECP management practices, observed significant resource users' operations, and evaluated potential opportunities.

Most participating companies are from the automotive and electronic components industry. During the assessment, 184 RECP options were identified. The total number of RECP options can be categorized into eight RECP practices: 29 good housekeeping, 26 input material change, 28 better process control, 34 equipment modification, 36 technology change, 25 onsite reuse and recycle, four production of valuable by-products, and two product modification. This number includes the recommendation from the RECP team and the program planned or implemented by the companies.

### b. Industrial Synergies

The assessment of the industrial synergies in Batamindo IP was started by doing a preliminary assessment that aims to collect baseline data from industrial park management and generate a list of industrial synergy opportunities. The assessments usually focus on data collection and option generation. The industrial synergy opportunities in Batamindo IP have been identified through the discussion with staff working at the companies, matching inputs (raw material use, water, etc.) with outputs (wastes, by-products, etc.), review of international experiences, good practice, and case studies in industrial synergies, as well as analysis of existing and potential new park management, utility services, and shared infrastructure. A prioritization exercise was undertaken to highlight opportunities of interest to undertake a detailed feasibility study and eliminate opportunities that could readily be identified as unfeasible or without significant benefits.

Feasibility assessments were undertaken for Batamindo IP for a selected set of promising EIP opportunities. Six feasibility studies were completed for Batamindo Industrial Park, i.e.

- » Rainwater harvesting
- » Waste sorting implementation
- » Facilitating the calculation of greenhouse gas emission
- » Training for integrated disaster
- » On-grid rooftop solar panel installation
- » Customer Service Online System (CSOS)

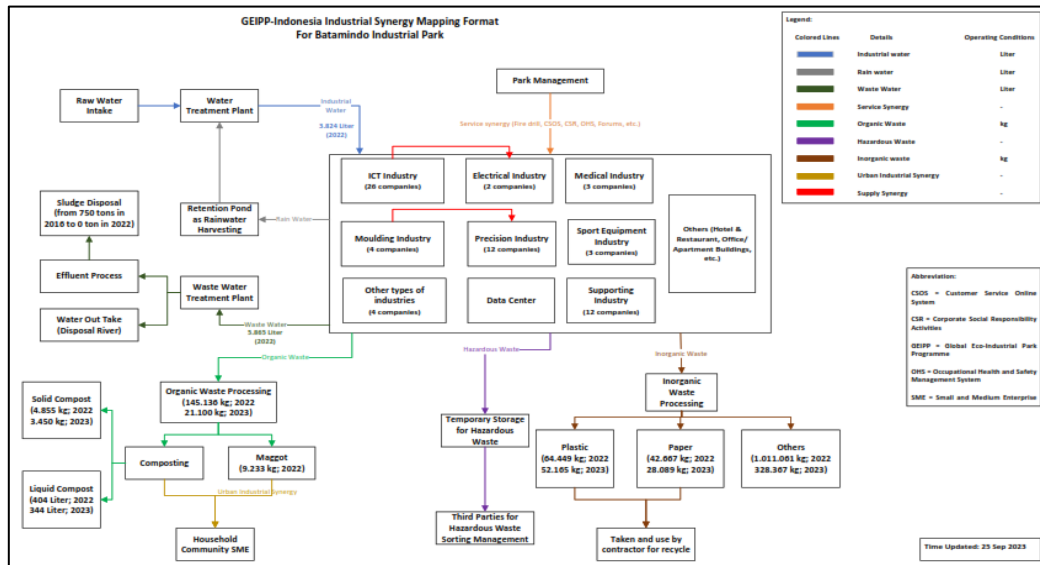
Workshops and focus group discussions on Industrial Synergies have been organized to discuss and identify opportunities for industrial synergies such as utility and infrastructure sharing, supply synergies, co-location of suppliers and clients, by-product synergies, and waste exchanges. The feasibility assessments have been carried out for the most promising industrial synergies, such as:

- » Rainwater harvesting: Planned
- » Waste sorting implementation: Planned
- » Facilitating the calculation of greenhouse gas emission: Ongoing



- » Training for integrated disaster: Implemented.
- » On-grid rooftop solar panel installation: Implemented in a few buildings.
- » Customer service online system (CSOS): Implemented.

The Industrial Synergy Mapping for Batamindo Industrial Park is ongoing, and case studies for the success stories have been drafted.



**Figure 6: Industrial Synergy Mapping in Batamindo Industrial Park.**

## Short Description of the EIP Opportunity, Results, and Implementation

### Rainwater harvesting

Integrated rainwater harvesting can reduce surface water withdrawal in the future and the extent to which runoff volume can potentially be mitigated. Rainwater harvesting from the occupied factory units is estimated at 38,876 m<sup>3</sup>/month or 466,508 m<sup>3</sup>/year, while the volume estimation of rainwater harvesting from the pond is 30,560 m<sup>3</sup>/month or 366,720 m<sup>3</sup>/year. The total volume of rainwater harvesting is 69,436 m<sup>3</sup>/month or 833,228 m<sup>3</sup>/year.

CAPEX required for rainwater harvesting will require further investigation as each tenant may have to install their own system. The cost will depend on the length of gutters needed, the pond size, the lengths of PVC pipes, and whether additional treatment, such as ultraviolet (UV) and triple-stage filtration systems, are required. There are too many variables to estimate indicative cost based on the total m<sup>2</sup> available alone.



In the current implementation progress, Batamindo Park management is still researching the rainwater harvesting system installation structure and searching for a vendor.

#### Waste sorting implementation

Organic waste can cause fires in the Batam landfill that can endanger the surrounding community. By building a waste sorting facility, tenant's organic waste can be utilized as compost, thus minimizing the waste generation to the Batam landfill and reducing the need for chemical fertilizers. Compost can be used for maintaining the plants and trees in the IP.

Waste banks that collect plastic waste are available in the local community area of Batamindo IP, but BIC (Batamindo Investment Cakrawala) has not collaborated with them yet. Some of the tenants had the same waste-sorting third party.

#### Facilitating the calculation of greenhouse gas emission

By calculating greenhouse gas emissions, industrial park managers can identify and track emissions sources and make decisions to improve air quality.

Calculating greenhouse gas emissions can inform policymakers and the public about the number of emissions from industrial parks.

Progress of the implementation: Batamindo Park management is still researching data collection to perform a GHG calculator.

#### Training for integrated disaster response

The rationale for investigating the Training for Integration for Disaster and/or Emergency Response in Batamindo Industrial Park is that the industrial environment is prone to fire and explosion risk due to errors in operating procedure; Batam is in the ring of fire and is expected to have many earthquakes.

A critical risk for the implementation is that the operation can be constrained due to the tenants' lack of motivation to join the training. The park management must secure and ascertain to the tenants that this training integration for disaster management is needed for all the tenants. Park management must provide training that caters to the tenants' needs.

Legal enablers include Regulation from the Ministry of Health in Indonesia No. 48 Year 2016.

#### On-grid rooftop solar panel installation

Batamindo Industrial Park considers that solar power is renewable energy readily available today and can be effortlessly found in nature; also, there is a very high demand from tenants in Batamindo Industrial Park to use renewable energy.

The 5 MW solar PV could produce 6+ GWh energy over a year, with the potential carbon emission of the 5 MW solar PV installation being 6000+ ton CO<sub>2</sub>eq or about 90% CO<sub>2</sub> reduction over a year.



Financing (CAPEX) of the project is entirely by a second party (Vendor), but the 5 MWp solar panel implementation business model is still under discussion.

Batamindo has successfully implemented solar PV on the rooftop of the Power House with a capacity of 472 kWp (without Battery). However, the electricity produced is only used for the internal Batamindo Indonesia Cakrawala (BIC) or the park management. It is planned that Batamindo will utilize rooftop solar panels with a higher capacity of up to 5,000 kW or 5 MW for six tenants in the park area.

#### Customer Service Online System (CSOS)

CSOS can provide a list of service providers/suppliers' recommendations for tenants. Therefore, supply synergy between tenants can be achieved. CSOS offers a possible solution to gain real-time visibility and information sharing.

The capital expenditure (CAPEX) required to set up the internet hub facility is IDR 9.000.000,-.

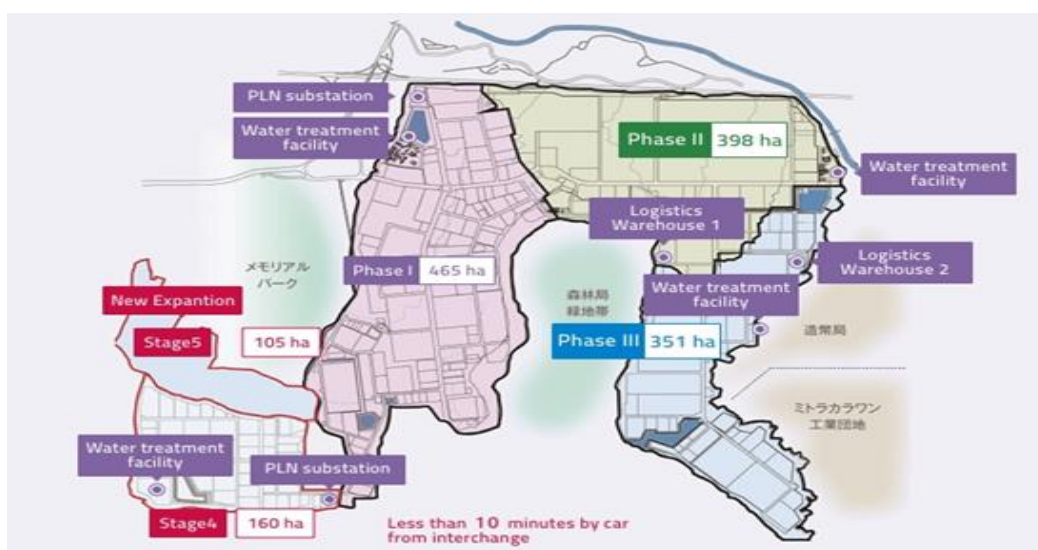
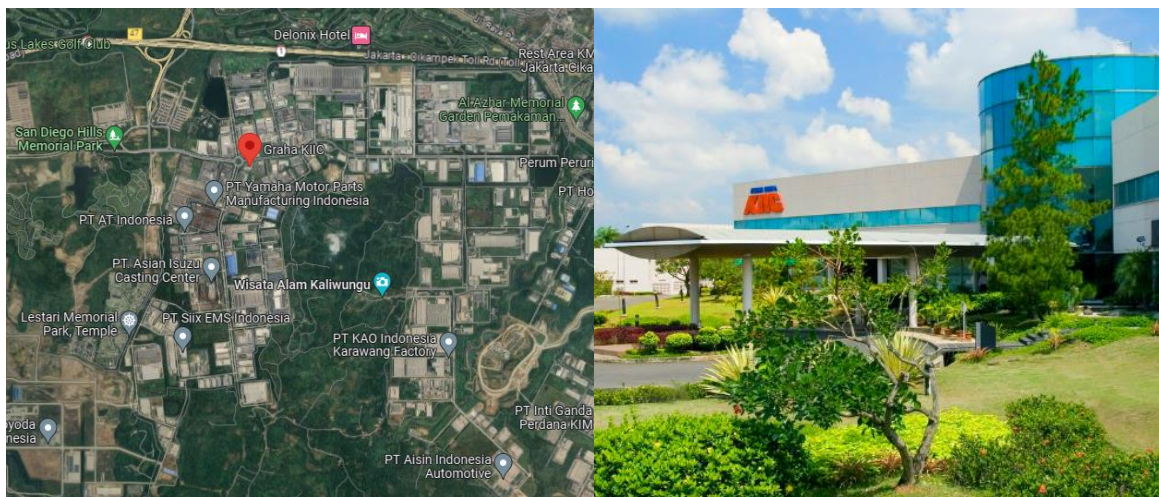
The estimated operational expenditure (OPEX) is IDR 1.700.000,- per year.

Progress of the implementation: Batamindo Park management has already implemented the CSOS with more features and tangible.

### **KARAWANG INTERNATIONAL INDUSTRIAL CITY (KIIC)**

#### **Background of the Park, Initial EIP Scoring, and Areas of Improvement Karawang**

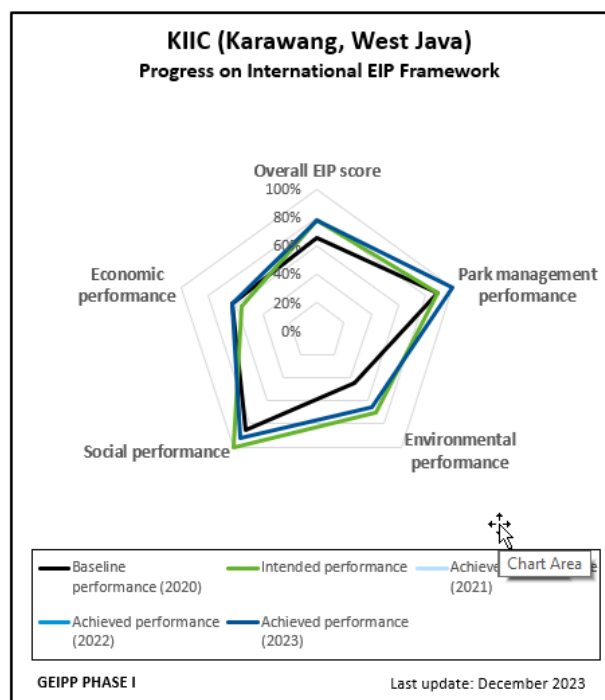
International Industrial City (KIIC) is an Industrial Estate with Approximately 1500 ha of land operating since 1993. KIIC is located in Karawang Regency, Central West Java, approximately 50 km from the centre of Jakarta. Around 60 thousand people work in KIIC, and most Indonesian workers commute from central Karawang. In Central Karawang, several extensive commercial facilities, hotels, and hospitals have recently been developing rapidly.



In the KIIC, around 170 companies come from all over the world, including Europe, America, Central Asia, and Southeast Asia, to have a manufacturing base for domestic and international needs. Tenants find many advantages in the KIIC for its location, service, and other benefits. Because of the developed history, most industry here is related to automobiles. However, as time passes, there are many different types of industries here in KIIC, such as the Daily Product and Food Industry.

The KIIC scored 66% against the performance benchmarks of the international EIP framework in 2022 and improved to an overall score of 78% in 2023 due to increased park management performance, environment performance, and social performance.. The progress of KIIC against the international EIP framework is illustrated in the chart below.





### Initial EIP Scoring and the identified area of improvement.

KIIC joined the GEIPP-Indonesia in March 2022, and the review of KIIC against the International Framework for Eco-Industrial Parks was conducted. The key observations from the EIP assessment of KIIC included the following:

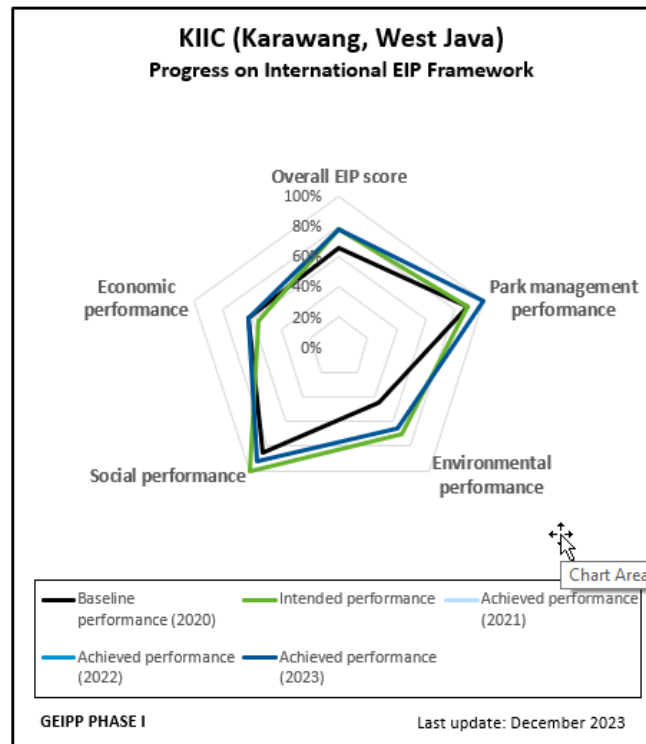
KIIC performs and compares favourably against large proportions of the benchmarks in the International EIP Framework. In summary, KIIC fully met 33 of the 51 international 2017 benchmarks (66% of the applicable benchmarks in 2022). With current and upcoming initiatives, KIIC intends to complete 80% of the global benchmarks. This indicates an intended improvement of 14%.

The park management performance category had the highest compliance (89%) compared to social performance (85% baseline compliance), economic performance (63% baseline compliance), and environment performance (45% baseline compliance).

Environmental performance shows the highest intended improvement potential (25%) compared to other categories, followed by social performance (15% intended improvement);



## Progress on EIP International Framework



The following topics had lower baseline compliance scorings, indicating that efforts overall should prioritize these topics:

- » Energy
- » Water
- » Waste and material use
- » Climate change and the natural environment
- » Local community outreach
- » Local business and SME promotion

The following topics had the highest baseline compliance scorings (100%), indicating overall that MM2100 Industrial Park management and tenant firms need less intensive technical assistance on these topics covered by the International EIP Framework:

- » Park management services
- » Planning and zoning
- » Management and monitoring (environment)
- » Social infrastructure
- » Employment generation



A set of practical EIP opportunities was identified and prioritized for MM2100 Industrial Town based on the review against the International EIP Framework. These opportunities include energy, water, resource efficiency and industrial synergies, energy, water, climate change, natural environment, and local business and SME promotion.

### **Capacity Building**

The following Eco-Industrial Parks (EIP) training sessions with associated training objectives were organized for KIIC and tenant companies.

#### EIP introduction workshop

- » Learn how the EIP's approach can bring concrete business opportunities, economic savings, and enhanced competitiveness to industrial parks and their tenant companies;
- » Learn about the benefits and application of EIP approaches to industrial parks and its tenant companies
- » Understand the opportunities, challenges, and success factors of applying EIP approaches in industrial parks.

#### Water reuse for industrial park workshop

- » Understanding the importance of implementing water reuse as a resource optimization;
- » Wastewater utilization and treatment strategy
- » Understanding the basic techniques and technologies for applying water reuse
- » Awareness of the current and existing relevant regulations for water reuse in industrial areas
- » Understanding the application of water reuse for industrial activities
- » Understanding concrete examples of the application of existing reuse water

#### Hazardous waste treatment for industrial park workshop

- » Introduction of hazardous waste (B3)
- » Legislation regarding hazardous waste management in Indonesia
- » Industrial best practices of hazardous waste management, including case study examples
- » Hazardous waste management strategy

#### Sustainability reporting development workshop

- » Introduction to the Sustainability Reporting
- » Introduction to GRI Standard for Sustainability Reporting
- » GRI standard to address sustainable challenges
- » Sustainability report for Environmental, social, and corporate governance
- » Relevance of sustainability reporting for industries
- » Starting Sustainability Reporting with GRI Standards



»

#### Identifying clean energy and renewable energy implementation workshop

- » Introduction to the renewable energy and clean energy practice
- » The importance of renewable energy implementation and clean energy activities
- » Best practice and strategic steps
- » Renewable energy and clean energy practices in an industrial park

#### Regulation and opportunities in implementing eco-industrial park

- » Related regulations to improve the development of the Eco-Industrial Park
- » Opportunities and benefits of implementing Eco-Industrial Park
- » Prerequisite requirements to implement Eco-Industrial Park

#### Treatment and opportunities of hazardous waste workshop

- » Newest regulation of hazardous waste
- » Opportunity and benefit of treating hazardous waste in industrial parks
- » Permit needed to treat hazardous waste
- » Study case treatment and recycling of hazardous waste

#### Wastewater recycling process in an industrial area

- » Problematic wastewater treatment in an industrial area
- » Opportunity and benefit of treating wastewater in industrial parks
- » Permit needed to treat wastewater
- » Study case treatment and recycling of hazardous waste

### Technical Assistance

#### a. RECP Assessments

Resource Efficient and Cleaner Production (RECP) assessments were conducted in 7 tenant companies at KIIC, aimed at identifying RECP and Eco-industrial Park (EIP) implementable opportunities that would contribute to the company's resource savings in energy, water waste, and materials and EIP improvement to achieve more sustainable practices and increased competitiveness through RECP and EIP practices. The assessments evaluated the company's RECP management practices, observed significant resource users' operations, and evaluated potential opportunities.

Most participating companies are from the automotive and electronic components industry. A fast-moving consumer goods producer and a textile chemicals company are also part of this programme. During the assessment, 91 RECP options were identified. The total number of RECP options can be categorized into eight RECP practices: five good housekeeping, eight input material changes, 11 better process control, 27 equipment modifications, 28 technology changes, 11 onsite reuse and recycle, and one production of valuable by-products. This number includes the recommendation from the RECP team and the program planned or implemented by the companies.



## **b. Industrial Synergy**

Industrial synergy in KIIC was started by preliminary assessment to collect baseline data from industrial park management and generate a list of industrial synergy opportunities. The assessments usually focus on data collection and option generation. The industrial synergy opportunities in KIIC have been identified through the discussion with staff working at the companies, matching inputs (raw material use, water, etc.) with outputs (wastes, by-products, etc.), review of international experiences, good practice, and case studies in industrial synergies, as well as analysis of existing and potential new park management, utility services, and shared infrastructure. A prioritization exercise was undertaken to highlight opportunities of interest to undertake a detailed feasibility study and eliminate opportunities that could readily be identified as unfeasible or without significant benefits.

Feasibility assessments were undertaken for KIIC for a selected set of promising EIP opportunities. Six feasibility studies were completed for KIIC, i.e.

- » Rainwater harvesting
- » Waste sorting implementation
- » Facilitating the calculation of greenhouse gas emission
- » Integrated digitalisation of detailed RKL-RPL report
- » Opening a job fair and career hub
- » Customer Service Online System (CSOS)

Workshops and focus group discussions on Industrial Synergies have been organized to discuss and identify opportunities for industrial synergies such as utility and infrastructure sharing, supply synergies, co-location of suppliers and clients, by-product synergies, and waste exchanges. The feasibility assessments have been carried out for the most promising industrial synergies, such as:

The implementation of feasibility studies in KIIC has been carried out with the following details:

- » Rainwater harvesting: Planned
- » Waste sorting implementation: Planned
- » Facilitating the calculation of greenhouse gas emission: Ongoing
- » Integrated digitalization of detailed RKL-RPL report: KIIC park management is still reconsidering the options (medium priority).
- » Opening a job fair and career hub: In consideration
- » Customer Service Online System (CSOS): In consideration

The Industrial Synergy Mapping for MM2100 Industrial Town is ongoing, and case studies for the success stories have been drafted.

### Opening a job fair and career hub

One of the rationales for opening a job fair and career hub, based on KIIC Park Management statistics, is that the percentage of workers coming from Karawang regency (residents) is still below 40%. Moreover, there is a mismatch of worker criteria needed by tenants because there are irresponsible persons who smuggle employees.



This EIP opportunity's main risk and success factors are the available funds for implementing job fairs, equipment, and precise target participants. These factors can be addressed by securing financial access and establishing clear communication between the park, governance, and top tenant management.

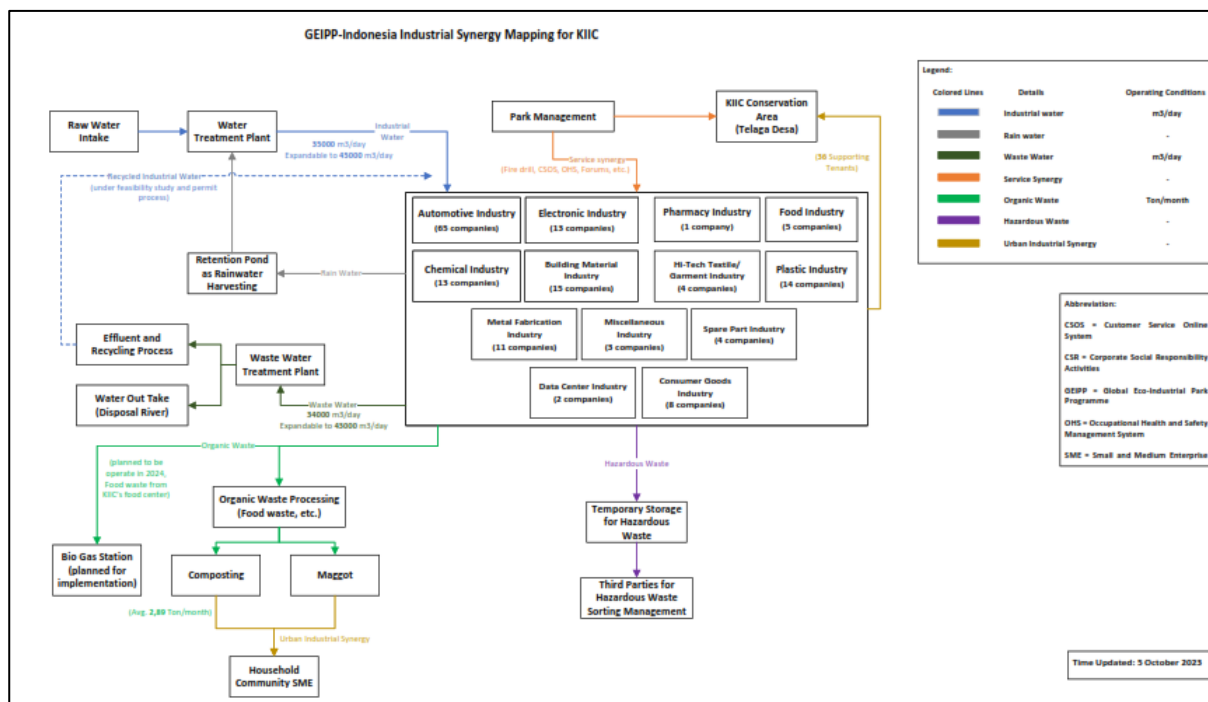


Figure: Industrial Synergy Mapping in KIIC.

### Customer Service Online System (CSOS)

Karawang International Industrial City Park management has conducted a plan for making an internet hub (CSOS), which is still being reviewed. The website aims to help park management monitor and manage services in the industrial park area, making it easier for tenants to submit complaints to park management.

The capital expenditure (CAPEX) required to set up the internet hub facility is IDR 9.000.000,-. The estimated operational expenditure (OPEX) is IDR 1.700.000,- per year. Finance options for CSOS should be discussed internally between park management and shared with the tenants for potential funding of the internet hub (helpdesk website) to offset the park management fees.

### SUMMARY AND CONCLUSION

- » It is clear from technical reviews and assessments of pilot industrial parks against the International EIP Framework and pre-feasibility assessments outlined in this report that the development and promotion of pilot industrial parks as Eco-industrial parks will offer better and more resource-efficient industrial parks with lower risks and offering more business opportunities.
- » With the willingness to uptake and upscale EIP approaches in the pilot industry parks based on technical assistance accorded the efforts underway by each pilot industrial park to take



forward implementation of EIP feasibility opportunities, and with national government – the Ministry of Industry commitment to include EIP approaches in industry revitalization policy. There is a clear demonstration that GEIPP is making headway in demonstrating the viability and benefits of Eco-Industrial Park approaches in scaling up resource productivity and improving the economic, environmental, and social performances of businesses in the country. Continued technical support of the pilot industrial parks will ensure the project objectives are realized in potential GEIPP-Indonesia II.

- » Based on EIP work done at MM2100 Industrial Town, the park has demonstrated a high level of commitment to implementing identified EIP opportunities, so continued support to the park has the potential to improve its performance against the International EIP Framework.
- » Batamindo Industrial Park has high improvement potential in the International EIP Framework, with highly proactive tenants to improve performance in the park and an increased interest from park management to continue applying EIP approaches. Continued support of the park will yield substantial EIP improvement results.
- » KIIC joined as a pilot industrial park in 2022 but continues to demonstrate a high commitment to improving the performance regarding the International EIP framework. More technical support would contribute to the park achieving its intended improvement potential as per the EIP Frameworks.
- » further support is needed for the implementation of promising EIP opportunities in pilot industrial parks and continue receiving technical assistance for supporting the implementation of promising EIP opportunities developed during GEIPP-Indonesia Phase 1.
- » Collaboration with financial institutions, especially the World Bank and IFC, to facilitate access to finance for the state-owned and privately owned industrial parks in GEIPP-Indonesia Phase II should be forged.
- » Continue with awareness-raising and capacity-building efforts in pilot and other industrial parks through creating an EIP Center would help to replicate the implementation of EIP approaches in Indonesia on various specific EIP topics, e.g., EIP master planning, park management, and industrial synergies
- » Create more synergies between GEIPP-Indonesia and other initiatives in the country by building upon pre-existing work and continuing the EIP transformation processes already started.



# Annex D

Results from GEIPP I Priority Parks in Peru



## ANNEX D: RESULTS PERU

The Global Eco-Industrial Parks Programme in Peru started in August 2020 and is funded by the Swiss Government through the State Secretariat for Economic Affairs of Switzerland (SECO). Global Eco-Industrial Parks Programme of Peru (GEIPP-Peru) is delivered through in partnership with the Ministry of Production – PRODUCE.

The objective of the GEIPP-Peru is to demonstrate the viability and benefits of greening industrial parks by improving resource productivity and economic, environmental, and social performances of businesses, thereby contributing to inclusive and sustainable industrial development.

<i>Country</i>	<i>Peru</i>
<i>Number of Industrial Parks in the Country</i>	12 identified IP. However, there are four parks recognized within the National System of Industrial Parks.
<i>Number of GEIPP Priority Parks</i>	3 Industrial Parks
<i>Number of Industrial Parks taking part in awareness and capacity building activities of GEIPP</i>	6

The methodology applied to select Pilot industrial parks for GEIPP is outlined below;

- » Short-listing Industrial Parks for consideration in the selection process based on a review of available national databases and consultation with national stakeholders.
- » Pre-selection of Industrial Parks based on minimum selection criteria (e.g. management, size, industrial activities, law and regulation, confidentiality, risk, location, and commitment). A discussion within the project team on the respective industrial park's suitability occurs if a park does not meet one or more of these criteria.
- » Prioritization of pre-selected Industrial Parks based on a set of qualitative criteria formulated as statements. Each question is answered for the pre-selected parks, giving scores.
- » Review the prioritized Industrial Parks against the International Framework for Eco-Industrial Parks (UNIDO, World Bank, GIZ, 2019). This review provided insights into their current performance and their intended performance envisaged at the end of the GEIPP.
- » Shortlisting and final selection of the Industrial Parks where three were selected for in-depth technical assistance through GEIPP-Peru, including one leading “model” Industrial Park with a high performance regarding the International EIP Framework and two parks with significant improvement potential.
- » A broader group of Industrial Parks were identified for capacity-building and awareness-raising activities.
- » The selected GEIPP priority industrial parks La Chutana, Sector 62, and Indupark were evaluated against the International Framework for Eco-Industrial Parks (UNIDO). As a result, a work plan was established to support the transformation of the parks into existing Eco-Industrial Parks. The beneficiary parks received technical assistance, capacity building, and feasibility studies on opportunities for improving resource efficiency and industrial park



management. Likewise, companies from Lurin Industrial Zone were included in receiving technical assistance and training sessions as a part of project capacity-building activities.



GEIPP Indonesia has offered training to 280 personnel in Small and Medium Enterprises (SMEs), 89 individuals in industrial park management, and 181 service providers. Enterprises have independently carried out 18 Eco-Industrial Parks (EIP) activities without additional support from GEIPP. This outcome resulted from implementing 47 capacity-building initiatives over the five-year duration of GEIPP I

## SECTOR 62 INDUSTRIAL PARK

### Background of the Park, Initial EIP Scoring, and Areas of Improvement

Sector 62 Industrial Park was established in 2016, and its located on Panamericana Sur Km 62 in the district of Chilca and has 208 hectares. The companies installed mainly engaged in plastics manufacturing, engineering, and metal-mechanical activities.

Park management: Sector 62 is managed by a Board of Directors, elected by the Board of Owners, which selects an entity to administer the IP.

“In Group Consulting” is the company currently in charge of managing the IP, mainly the contracts with service providers (e.g., security, maintenance of green areas, operation of the WWTP, management of collections and billing, among others).

At the park level, they ensure compliance with the environmental limits applicable to the tenant company, have a Disaster Risk Plan, a Risk Vulnerability Study, a Master Plan with a commercial approach, and an Operational Plan for infrastructure and service maintenance.



Environmental actions: Sector 62 records energy, water and solid waste consumption only at the park level. However, it is necessary to monitor and extend the recording of information to the company level in order to generate common needs and improvements at the cluster level.



Sector 62 has implemented improvements with respect to lighting in common areas, and plans to conduct an energy efficiency study to evaluate reactive energy consumption in addition to switching to free client (consumption >200KW).

Sector 62 has three brackish water wells and an osmosis water purification system that supplies the companies.

Sector 62 does not have a baseline of environmental performance indicators. They have implemented LED lighting in common areas and are very interested in developing renewable energy projects: natural gas, solar panels, among others. There is a clear need for an energy efficiency analysis to eliminate reactive energy and optimize energy consumption in the IP.

Regarding water management, Sector 62 can provide freshwater 80 l/s, but only half of the capacity is consumed. It treats 100% of its wastewater. The effluent complies with the water quality standard for irrigation (ECA 3).

Solid waste segregation and disposal is carried out by each company. Sector 62 has been developing natural area conservation projects by planting forest species and has set aside 1% of the park as a green area (perimeter fence).

Community actions: Due to the low number of companies established in the park, the social infrastructure is not developed. A commercial area (recreation area, rest area, dining area, etc.) is planned, but its implementation timetable will depend on the pace new industries are established.



There is a virtual system for complaints and claims, which are handled directly, but there is no response time. There is a high potential for improvement for Sector 62 in relation to the management system in the companies to address labor issues such as discrimination and harassment, decent work, satisfaction survey, among others. There is only one report of incidents and accidents in the park, but for the security service it provides.

Economic performance: Market studies were conducted to identify the services that the park could provide to companies. In addition, a process of strategic commercial rethinking is carried out every two years.

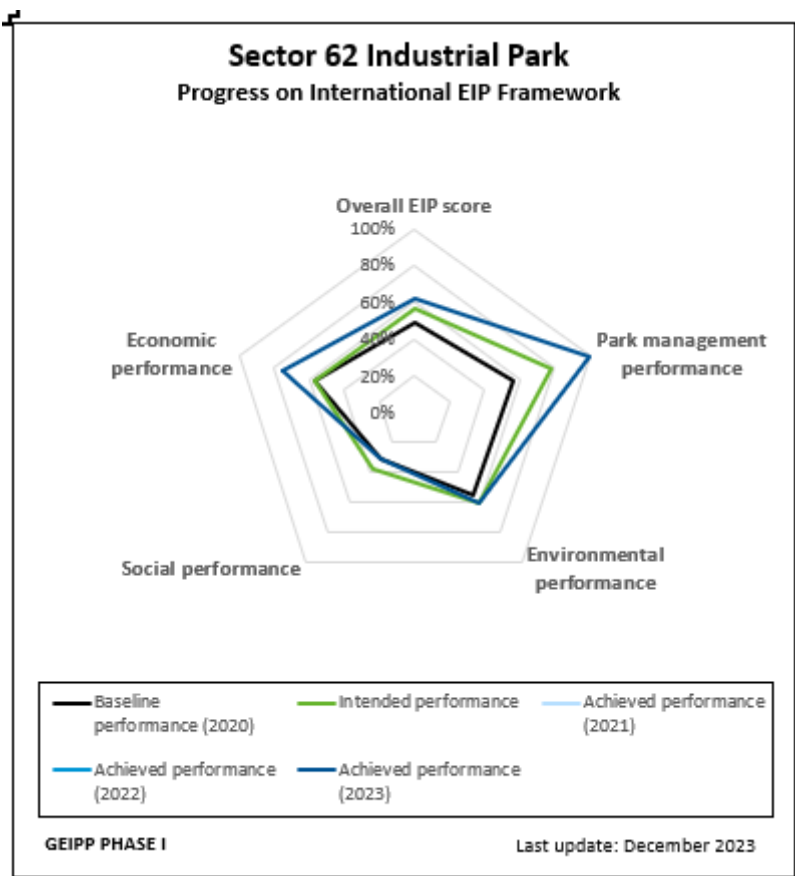
The review of Sector 62 in 2021 against the International Framework for Eco-Industrial Parks was conducted. The key observations from the EIP assessment of Sector 62 included:

Sector 62 complies with 38% of the benchmarks of the International EIP Framework. The park meets 19 of the 51 benchmarks (50 considered applicable to the park), and 31 benchmarks are not yet met or only partially met.

For the "Management" category, Sector 62 achieves 4 out of 9 indicators (44%): the park has an entity in charge of park management, risk plans, and a functional system to comply with local and national requirements. There is room for improvement in the monitoring systems for environmental, social, and economic performance indicators. Existing management systems could also be improved, particularly at the environmental and energy levels. Developing the park's master plan and creating a PEI management committee could help improve these aspects.

For the "Environmental" category, the park meets 8 of 20 indicators (40%): Sector 62 has good pollution prevention practices, as well as adequate treated water infrastructure, but could improve the use (and promote reuse) of process water in collaboration with the park's companies. Waste management and valorization also have great potential for improvement, and there is a lack of data to evaluate energy indicators.

In the "Social" category, 1 of 13 indicators is met (8%): the park has an operational security system, but could develop its social management systems to achieve more indicators. There are no periodic or systematized instances of generating surveys to address these issues, either with complaint management systems or user and worker satisfaction. Sector 62 could also propose additional capacity building services to improve its performance in this category.



Sector 62 achieves 6 out of 8 applicable "Economic" indicators (75%). This is the area where the park is best evaluated. The park contributes to the local economy and jobs, actively promotes the establishment of SMEs and has a market study that identified needs in terms of services and infrastructure.

The Sector 62 scored 38% against the performance benchmarks of the international EIP framework in 2021 and improved to an overall score of 56% in 2023. The Sector 62 progress against the international EIP framework is illustrated in the chart below.

According to the evaluation carried out in 2023, Sector 62 increased its performance in the economic category. In the short term, in March 2025, it is expected to reach 94% of total indicators.



### Short Description of the EIP Opportunity, Results, and Implementation

The EIP opportunities identified and their prioritization are indicated below:

- » Enhance the use of the Document Management Platform and performance indicators.
- » Develop a Risk Assessment and Risk Management Plan.
- » Develop a Satisfaction Survey on a regular basis.
- » Implementation of a management system (based on ISO 14001 and 50001 standards) or certification in energy audits.
- » Improve the park's energy performance (record energy consumption in the IP and by company, and even perform a load potential analysis to identify negotiation opportunities with respect to tariff plans).
- » Develop an Operational Plan for Wastewater Reuse (ECA3) for the reuse of treated water in their processes, after analyzing the technical feasibility for each company (if the quality is valid in their processes).
- » Water management is the highest priority. One of the opportunities is the characterization of wastewater, to avoid contingencies.
- » Reuse of solid waste with a focus on circular economy.
- » Designate a person in charge of social issues
- » Stakeholder mapping and risk assessment.
- » Structuring of a system for handling complaints and grievances, development of a social strategy
- » Develop a communication/marketing strategy with a focus on sustainability to highlight the benefits that the park offers through its services in order to attract more SMEs.

From the mapping of opportunities identified for the industrial park, six opportunities were prioritized to improve Sector 62's PEI performance:

1. Master Plan update (PEI category: park management)
2. Internal PEI management committee (PEI category: park management)
3. Efficient water management system (PEI category: environmental)
4. Environmental management and monitoring system (IEP category: environmental).
5. OSH management system and surveys (PEI category: social).
6. Strategy for the promotion of local businesses and SMEs (economic).





## Capacity Building

The following Eco-Industrial Parks (EIP) training sessions with associated training objectives were organized for Sector 62 Industrial Park and tenant companies:

### EIP training:

- » Eco-Industrial Parks introduction
- » International Framework
- » UNIDO Toolkit
- » Resource efficiency and cleaner production - linked with EIP
- » Eco-industrial parks management- value-added services
- » Performance of Eco-industrial parks performance and International Framework and evaluation of opportunities in EIP
- » Industrial and urban synergies
- » Eco-industrial parks design concept process
- » Implementation of opportunities
- » Support policies for the development of PEIs

### EIP Assessment:

- » Applied training: discussion and session follow-up with IPs

### Master plan EIP Review and Conceptual planning:

- » Presentation of the context of the EIP training course, theory in master plans and practical exercises
- » Theory in master plans in EIP with practical examples and interactive exercises
- » Training in the theory and application of EIP conceptual planning, based on practical examples and interactive exercises

### EIP projects investment tools

- » Training with theory and applied exercises in the analysis and formulation of feasibility studies, as well as other tools for the preparation and formulation of industrial investment projects
- » Analyze different investment models and possible sources of financing in Peru for EIP projects
- » Strategies to promote investments in eco-industrial parks from investment plans to the understanding of relevant stakeholders
- » Strategies to promote investments in eco-industrial parks and applied exercise

### Management of collection and recycling center workshop

- » Concepts of waste valorization in the Peruvian framework
- » Common problems in waste management and valorization
- » Design and management of a collection center at the industrial park level.

### Industrial and urban synergies: cleaner production

- » Conceptual framework for industrial and urban synergies
- » Tools for IS, SU and industrial symbiosis
- » Industrial symbiosis opportunities for resource efficiency



- » Case studies

#### Efficient water resource management workshop

- » Concepts of efficiency and integrated management in the specific Peruvian framework (legal and natural context) of water management in an industrial parks
- » Technical and operational factors to be considered in the analysis of the efficiency of water use systems
- » Good practices and opportunities for improvement in water management in an industrial park; To introduce the possibilities of reusing treated wastewater as an efficiency option

#### EIP Technical Advisement for Master Plan and Added Value Services Options for IP

- » Improvements of economic, social and environmental performance
- » Economic and environmental risks management.

#### **Technical Assistance**

##### Added Value Services

- » The identification and development of new value added services for tenant companies

##### Water reuse

- » Reverse osmosis wastewater
- » Domestic wastewater
- » Washing water for industrial use

##### Energy efficiency

- » Electricity supply
- » Diesel to electric forklifts
- » Steam boilers
- » Compressed air system
- » Air conditioning system
- » Heat recovery in steam boilers
- » Engines: Replacing old engines with high-efficiency engines
- » Light fixtures
- » Air compressors

##### Renewable energy

- » Use of renewable energy reducing the cost of natural gas and minimizing CO2 emissions.



## INDUPARK INDUSTRIAL PARK

### Background of the Park, Initial EIP Scoring, and Areas of Improvement

Indupark Industrial Park is located in the district of Chilca and has 207 hectares of land, distributed in more than 100 lots. To date, 92% of these lots have been sold, with 15% of companies already installed. The first companies were installed in 2017.

The type of industries that Indupark houses belong to the light industry (I2) and large industry (I3) categories, including companies in the food, chemical, pharmaceutical, warehousing, plastics and construction sectors, among others.

Management of the park: Indupark maintains a 5-year contract for the management, with a model of adhesion of the owners with the purchase-sale contracts, with Indupark maintaining the major responsibility as articulator or manager of the park.

Environmental actions: Basic services such as water treatment and waste collection support are provided. At the same time, the company reports that it complies with regulations.

At the moment there are no environmental or energy management systems or energy efficiency plans. They state that the responsibility for complying with environmental legislation lies with the companies. Opportunities for improvement in terms of implementing resource reuse systems for materials, water, and energy.





Social actions: Within the framework of property management, occupational health and safety and prevention are planned and will be implemented in stages, including the position of a preventionist, but are not yet foreseen. They state that they do not have the necessary flow of people to make the implementation of the planned food and commercial services viable.

Lack of information about the companies' management systems, and information on the working conditions of each company is considered sensitive. Opportunity to implement complaint and grievance management systems. The Pucusana Chilca chamber of commerce has been formed, with the parks and companies in the area, to address relational issues with the communities and the local population.

Economic performance: The park's real estate development has been focused on land sales. Opportunity to develop future value-added and economic planning and development for the PEI with the incorporation of additional services. Local development activities are channeled through the guild. There is an opportunity to define transfers of responsibility between the real estate company, the management company, and the chamber of commerce.

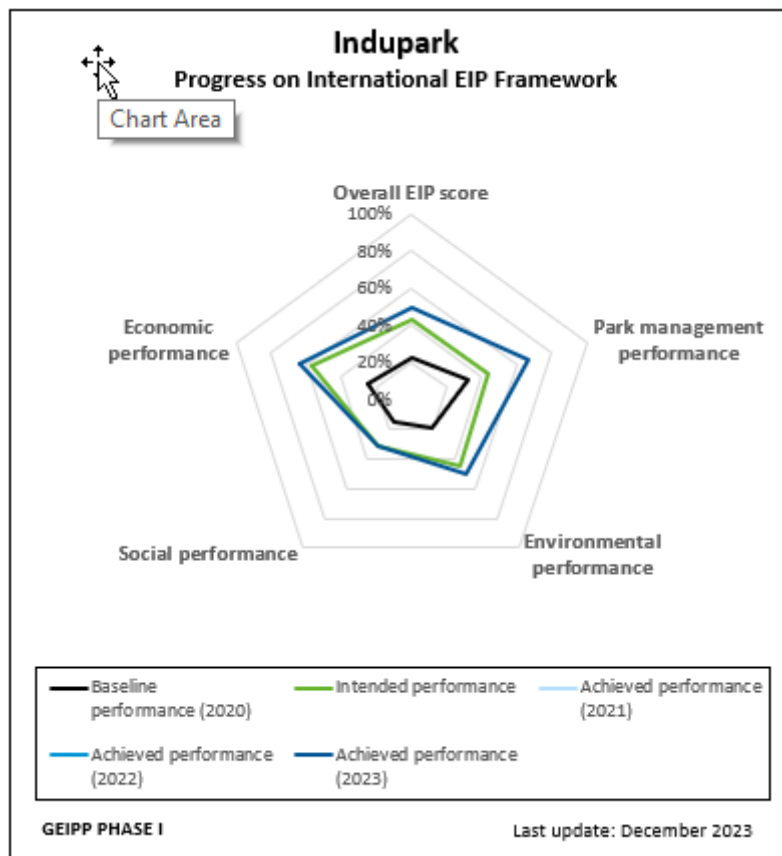
In 2021, Indupark meets 22% of the benchmarks of the International EIP Framework. The park meets 11 of the 51 benchmarks (50 benchmarks that are considered to be applicable).

For the "Administration" category, Indupark reaches 3 out of 9 indicators (33%) and is the area where the park is best evaluated: the park has an entity in charge of park administration, so the indicators of governance, provision of services, and administrative and resident responsibility are achieved. There is room for improvement in the monitoring systems that allow for environmental, social, and economic performance indicators. Additional services could also be generated to facilitate companies' compliance with local and national requirements, and a master plan could be developed to visualize the park's development project as an eco-industrial park.

For the "Environmental" category, the park meets 4 of 20 indicators (20%): Indupark has a water management system, treated water infrastructure, and waste management practices that meet 4 indicators. However, the international framework in its environmental category calls for a review of specific performance in energy management, waste recovery or recycling, and carbon footprint reduction, among others, for both the park and the resident companies. To improve in this category, it is necessary to work with park users on management plans and indicator improvement through environmental management systems or a cleaner production strategy, for example.

In the "Social" category, it meets 2 of 13 indicators (15%): the park does not know the details of all the social management systems implemented by the companies, which means that several indicators remain to be confirmed. In addition, there are no periodic or systematized instances of generating surveys to address these issues, either with complaint management systems or user and worker satisfaction. Indupark also intends to develop its relationship with the community and propose complementary capacity building services.

To conclude the analysis by category, Indupark reaches 2 out of 8 applicable "Economic" indicators (25%). The park actively promotes the establishment of SMEs, but does not have enough information available to confirm or achieve most of the indicators in this category.



Indupark IP scored 22% against the performance benchmarks of the international EIP framework in 2021 and improved to an overall score of 41% in 2023. Indupark progress against the international EIP framework is illustrated in the chart above.

According to the evaluation carried out in 2023, Indupark increased its performance in the management category. In the short term, in March 2025, it is expected to reach 98% of total indicators.

### Short Description of the EIP Opportunity, Results, and Implementation

The opportunities identified and their prioritization are indicated below:

- » Environmental monitoring (RECP)
- » Provide facilitation services for and among the hosted companies (such as networking and training in Resource Efficiency and Cleaner Production to personnel of the park's companies).
- » Elaboration of Master Plan
- » Implement an environmental management system (voluntary or certified), based on ISO 14001:2015.
- » Solid waste management plan
- » Reuse treated water in the production processes of the companies that are part of the industrial park; the effluent treatment plant receives 80% of the total water consumption, which is treated using primary and secondary treatment processes, in addition to passing



the water through a membrane process to remove sodium and thus obtain water quality suitable for raising animals and planting plants.

- » Complaints and claims system
- » Opportunity in social management issues, evaluating the implementation of an SGSST based on an internationally recognized standard such as 45001 (OHSAS 18001:2007) in any type of organization, size or sector adds value to it and generates a competitive advantage, not only for the industrial park but also for the companies that comprise it.
- » Complementary and capacity building services
- » Promotion generation strategy for local SMEs

From the mapping of opportunities identified for the industrial park, three opportunities were prioritized to improve Indupark EIP performance:

- » Efficient water management system
- » Environmental management system
- » Solid waste management system

## Capacity Building

The following Eco-Industrial Parks (EIP) training sessions with associated training objectives were organized for Sector 62 Industrial Park and tenant companies

The following Eco-Industrial Parks (EIP) training sessions with associated training objectives were organized for Indupark Industrial Park and tenant companies:

EIP training:

- » Eco-Industrial Parks introduction
- » International Framework
- » UNIDO Toolkit
- » Resource efficiency and cleaner production - linked with EIP
- » Eco-industrial parks management- value-added services
- » Performance of Eco-industrial parks performance and International Framework and evaluation of opportunities in EIP
- » Industrial and urban synergies
- » Eco-industrial parks design concept process
- » Implementation of opportunities
- » Support policies for the development of PEIs

EIP Assessment:

- » Applied training: discussion and session follow-up with Ips

Master plan EIP Review and Conceptual planning:

- » Presentation of the context of the EIP training course, theory in master plans and practical exercises
- » Theory in master plans in EIP with practical examples and interactive exercises



- » Training in the theory and application of EIP conceptual planning, based on practical examples and interactive exercises

#### EIP projects investment tools

- » Training with theory and applied exercises in the analysis and formulation of feasibility studies, as well as other tools for the preparation and formulation of industrial investment projects
- » Analyze different investment models and possible sources of financing in Peru for EIP projects
- » Strategies to promote investments in eco-industrial parks from investment plans to the understanding of relevant stakeholders
- » Strategies to promote investments in eco-industrial parks and applied exercise

#### Management of collection and recycling center workshop

- » Concepts of waste valorization in the Peruvian framework
- » Common problems in waste management and valorization
- » Design and management of a collection center at the industrial park level.

#### Industrial and urban synergies: cleaner production

- » Conceptual framework for industrial and urban synergies
- » Tools for IS, SU and industrial symbiosis
- » Industrial symbiosis opportunities for resource efficiency
- » Case studies

#### Efficient water resource management workshop

- » Concepts of efficiency and integrated management in the specific Peruvian framework (legal and natural context) of water management in an industrial parks
- » Technical and operational factors to be considered in the analysis of the efficiency of water use systems
- » Good practices and opportunities for improvement in water management in an industrial park; To introduce the possibilities of reusing treated wastewater as an efficiency option

#### EIP Technical Advisement for Master Plan and Added Value Services Options for IP

- » Improvements of economic, social and environmental performance
- » Economic and environmental risks management.

### **Technical Assistance**

#### Master plan development

- » Technical assistance to improve and update the industrial park master plan

#### Water reuse

- » Reverse osmosis wastewater
- » Domestic wastewater
- » Washing water for industrial use

#### Energy efficiency

- » Electricity supply
- » Diesel to electric forklifts
- » Steam boilers





- » Compressed air system
- » Air conditioning system
- » Heat recovery in steam boilers
- » Engines: Replacing old engines with high-efficiency engines
- » Light fixtures
- » Air compressors

#### Renewable energy

- » Use of renewable energy reducing the cost of natural gas and minimizing CO2 emissions.

### LA CHUTANA INDUSTRIAL PARK



#### Background of the Park, Initial EIP Scoring, and Areas of Improvement

La Chutana industrial park is located in the district of Chilca and has 525 hectares of land, of which 230 hectares are developed.

There are 16 companies, of which 7 are established companies and 9 are under construction in the park. Their main activities are warehousing, logistics, and metalworking.

Park management: The park is managed by the homeowners' board, which is responsible for providing park management services. The main areas of improvement would be risk monitoring, common services, and development of a master plan. Park management is empowered through the purchase and sale agreement and the homeowners' board bylaws.

Environmental actions: Basic services such as water treatment and waste collection support are provided. At the same time, management reports compliance with regulations. At the moment there are no environmental or energy management systems or energy efficiency plans.



Opportunities for improvement in terms of implementing resource reuse systems for materials, water, and energy.

Social actions: There are personnel dedicated to social management in the park, and some primary social infrastructure services are provided, but there are still areas for improvement. Management reports that work is being done in this area and, for example, there are plans to build a service center.

Lack of information about enterprise management systems. Opportunity to implement complaint and grievance management systems, and worker surveys to gain a deeper understanding of working conditions.

Economic performance: The park's strongest performance area. The industrial center is ready to receive investments. The Covid situation affected land sales and company activities. An area of opportunity for improvement is the search for financing possibilities for PEI development projects.

In 2021, La Chutana meets 40% of the benchmarks of the International EIP Framework. The park meets 20 of the 50 benchmarks (of a total of 51 benchmarks).

For the "Administration" category, La Chutana achieves 3 out of 9 indicators (33%): the park has an entity in charge of park administration, so the indicators of governance, provision of services, and administrative and resident responsibility are met. There is room for improvement in the monitoring systems that allow for performance indicators in the different categories. Risk management plans could also be generated, as well as management systems and a master plan that allows visualizing the park's development project as an eco-industrial park.

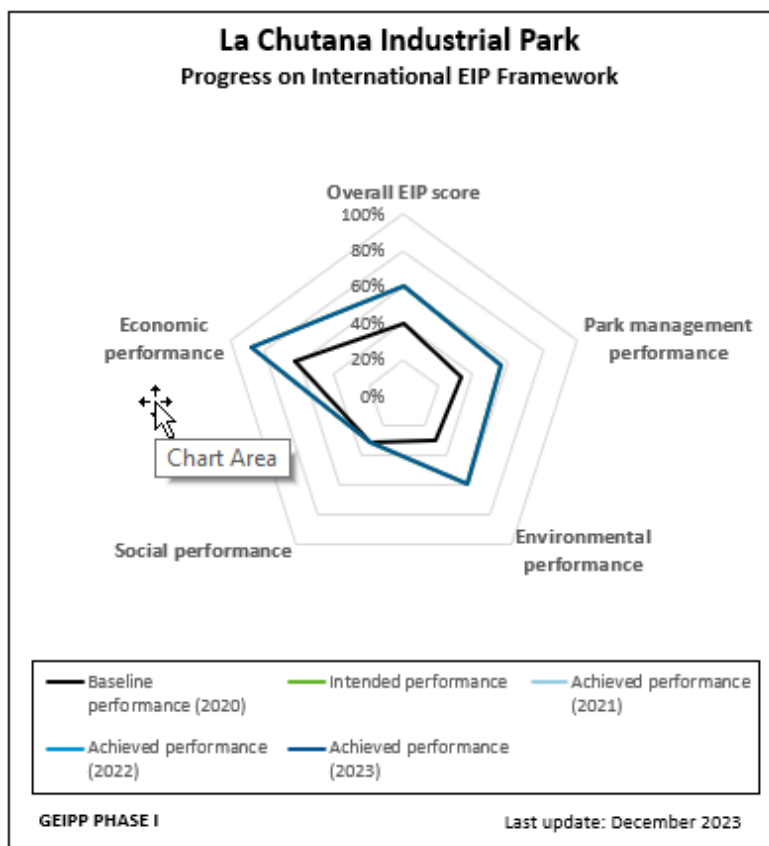
For the "Environmental" category, the park meets 6 out of 20 indicators (33%): it has incorporated environmental considerations since its inception through an environmental impact study, in addition to large areas of open space, so some indicators are evaluated positively. However, the international framework in its environmental category calls for a review of specific performance in energy management, water reuse, waste recycling, and carbon footprint reduction, among others, both for the park and the resident companies, so to improve in this category it is necessary to work with park users on management plans and improvement of indicators through environmental management systems or others. It should also be noted that the park already has some very interesting projects in terms of improving environmental performance indicators, such as the reforestation plan and the WWTP, but in order for these projects to generate the expected benefits, they need time to mature or increase the number of companies residing in the park and thus increase the volumes treated.

In the "Social" category, it meets 6 of 13 indicators (46%): the park has personnel in charge of the social area that provides a communication channel with the resident companies and complies with various indicators regarding occupational health and safety systems, both for the park and for the resident companies; it is evaluated as non-compliant when there are no periodic or systematized instances for generating surveys to address these issues, with systems for managing complaints or user and worker satisfaction.



The "Economic" category is the one where the park is best evaluated, reaching 5 out of 8 applicable indicators (62%). This is the result of recognizing the financial solvency of the industrial park's development project, while ensuring and making visible good practices in terms of hiring and responsibility. It would be necessary to move forward with the organization of small surveys to determine whether these good practices are affecting the different stakeholders, particularly with regard to the promotion of SMEs.

La Chutana IP scored 40% against the performance benchmarks of the international EIP framework in 2021 and improved to an overall score of 44% in 2023. Indupark progress against the international EIP framework is illustrated in the chart below.



### Short Description of the EIP Opportunity, Results, and Implementation

The opportunities identified and their prioritization are indicated below:

- » Conduct a study of the risks present in the industrial park (a
- » ccidental release or discharge, natural disasters and others) and develop response plans for each of these. Once the risk study has been carried out, implement annual monitoring of its performance.
- » Study to define possible negative impacts caused by climate change.
- » Implement a master plan that includes the possibility of industrial synergies to ensure energy and resource efficiency, which will ultimately represent economic savings.



- » Implementation of a management system (based on ISO 14001 and 50001 standards).
- » Implementation of a cleaner production strategy, focusing on electricity consumption aspects.
- » Implementation of renewable projects (photovoltaic and/or wind).
- » Complaints and claims system
- » Surveys of working conditions
- » Design of the financial strategy for the implementation of new infrastructures, new services or expansion of existing ones.

From the mapping of opportunities identified for the industrial park, three opportunities were prioritized to improve La Chutana EIP performance:

1. Master plan update (management)
2. Solid waste management system (environmental)
3. Reforestation

### **Capacity Building**

The following Eco-Industrial Parks (EIP) training sessions with associated training objectives were organized for La Chutana Industrial Park and tenant companies:

EIP training:

- » Eco-Industrial Parks introduction
- » International Framework
- » UNIDO Toolkit
- » Resource efficiency and cleaner production - linked with EIP
- » Eco-industrial parks management- value-added services
- » Performance of Eco-industrial parks performance and International Framework and evaluation of opportunities in EIP
- » Industrial and urban synergies
- » Eco-industrial parks design concept process
- » Implementation of opportunities
- » Support policies for the development of PEIs

EIP Assessment:

- » Applied training: discussion and session follow-up with Ips

Master plan EIP Review and Conceptual planning:

- » Presentation of the context of the EIP training course, theory in master plans and practical exercises
- » Theory in master plans in EIP with practical examples and interactive exercises
- » Training in the theory and application of EIP conceptual planning, based on practical examples and interactive exercises

EIP projects investment tools

- » Training with theory and applied exercises in the analysis and formulation of feasibility studies, as well as other tools for the preparation and formulation of industrial investment projects



- » Analyze different investment models and possible sources of financing in Peru for EIP projects
- » Strategies to promote investments in eco-industrial parks from investment plans to the understanding of relevant stakeholders
- » Strategies to promote investments in eco-industrial parks and applied exercise

#### Management of collection and recycling center workshop

- » Concepts of waste valorization in the Peruvian framework
- » Common problems in waste management and valorization
- » Design and management of a collection center at the industrial park level.

#### Industrial and urban synergies: cleaner production

- » Conceptual framework for industrial and urban synergies
- » Tools for IS, SU and industrial symbiosis
- » Industrial symbiosis opportunities for resource efficiency
- » Case studies

#### Efficient water resource management workshop

- » Concepts of efficiency and integrated management in the specific Peruvian framework (legal and natural context) of water management in an industrial parks
- » Technical and operational factors to be considered in the analysis of the efficiency of water use systems
- » Good practices and opportunities for improvement in water management in an industrial park; To introduce the possibilities of reusing treated wastewater as an efficiency option

#### EIP Technical Advisement for Master Plan and Added Value Services Options for IP

- » Improvements of economic, social and environmental performance
- » Economic and environmental risks management.

### **Technical Assistance**

#### Master plan development

- » Technical assistance to improve and update the industrial park master plan

#### Water reuse

- » Reverse osmosis wastewater
- » Domestic wastewater
- » Washing water for industrial use

#### Energy efficiency

- » Electricity supply
- » Diesel to electric forklifts
- » Steam boilers
- » Compressed air system
- » Air conditioning system
- » Heat recovery in steam boilers
- » Engines: Replacing old engines with high-efficiency engines
- » Light fixtures



- » Air compressors

#### Renewable energy

- » Use of renewable energy reducing the cost of natural gas and minimizing CO2 emissions.

### SUMMARY AND CONCLUSION

- » It is clear, from technical reviews and assessments of pilot industrial parks against the International EIP Framework and potential opportunities outlined in this report, that the development and promotion of pilot industrial parks as Eco-industrial parks will offer better and more resource-efficient industrial parks with lower risks and offering more business opportunities.
- » There is a clear demonstration that GEIPP is making headways in demonstrating the viability and benefits of Eco-Industrial Park approaches in scaling up resource productivity and improving the economic, environmental, and social performances of businesses in the country.
- » For the prioritization of opportunities, the need was identified to update the master plan aligned with the EIP indicators established in the international framework.
- » Among the success factors for increasing the percentage of compliance with the EIP international framework, it is worth noting that senior management is committed to environmental issues and companies are required to have updated information (plans, zoning, plans) as a fundamental basis for identifying opportunities for synergies between companies that are already established and those yet to be established.
- » Sector 62, Indupark and La Chutana EIP assessments have identified specific needs that require technical assistance to improve organizational performance as a park. Therefore, for the implementation of PEI opportunities, it is recommended to continue with periodic trainings and to continue building in-house capacities on topics within the PEI framework and of interest to the park and the operating companies so that, consequently, an integrated management is generated, a primary information network system is established, the exchange among stakeholders is encouraged, and a solid business network is built within the park.
- » Based on the EIP work conducted for the three industrial parks, they have demonstrated a high level of commitment to implement the identified IPE opportunities, so continued support to the park has the potential to improve their performance against the International IPE Framework.

# Annex E

Results from GEIPP I Priority Parks in  
South Africa





## ANNEX E: RESULTS SOUTH AFRICA

The Global Eco-Industrial Parks Programme in South Africa (GEIPP-SA) started in December 2020 and is funded by the Swiss Government through the State Secretariat for Economic Affairs of Switzerland (SECO). Global Eco-Industrial Parks Programme of South Africa (GEIP-SA) is delivered through the collaboration of UNIDO with the Department of Trade, Industry and Competition (*the dtic*) and the National Cleaner Production Centre of South Africa (NCPC-SA).

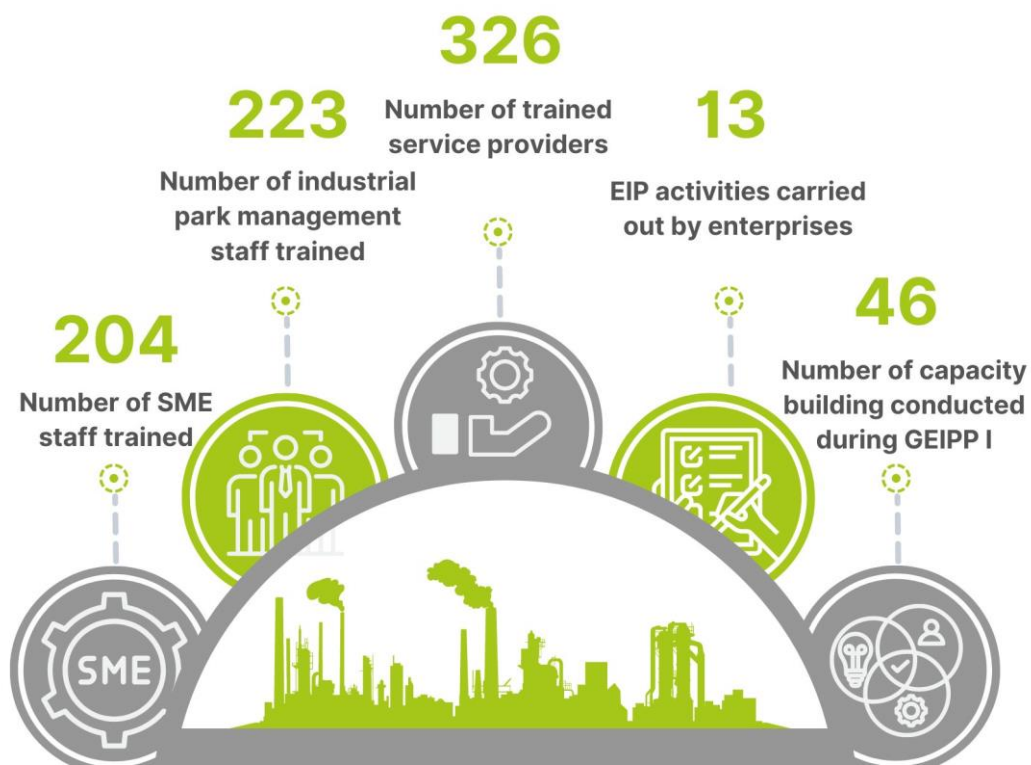
The objective of the GEIPP-SA is to demonstrate the viability and benefits of greening industrial parks by improving resource productivity and economic, environmental, and social performances of businesses, thereby contributing to inclusive and sustainable industrial development. An industrial park within the South African context exists to support, manage and administer industrial activities within a specified area in order to facilitate socio-economic benefits for the surrounding area, its tenants and the country as a whole.

Of the overall 300 industrial parks in private and public ownership, 27 Industrial Parks are operated by the provincial government and have been identified to be part of *the dtic* industrial parks revitalisation program as well as 15 Special Economic Zones (SEZs) in South Africa. The more developed industrial and economic areas in the country include; Johannesburg-Vereeniging, Durban-Pinetown, Port Elizabeth-Uitenhage and Cape Town.

The methodology applied to select Pilot industrial parks for GEIPP SA is outlined below;

- » Short-listing Industrial Parks for consideration in the selection process based on a review of available national databases and consultation with national stakeholders.
- » Pre-selection of Industrial Parks based on minimum selection criteria (e.g. management, size, industrial activities, law and regulation, confidentiality, risk, location, and commitment).
- » Prioritisation of pre-selected Industrial Parks based on a set of qualitative criteria formulated as statements.
- » Review the prioritised Industrial Parks against the International Framework for Eco-Industrial Parks (UNIDO, World Bank, GIZ, 2017). This review provided insights into their current performance and their intended performance envisaged at the end of the GEIPP.
- » Shortlisting and final selection of the Industrial Parks where three Industrial Parks were selected for in-depth technical assistance through GEIPP-SA, including one leading “model” Industrial Park with a high performance with regards to the International EIP Framework two parks with significant improvement potential.
- » A broader group of Industrial Parks were identified for capacity building and awareness-raising activities.

<i>Country</i>	<i>South Africa</i>
<i>Number of Industrial Parks in the Country</i>	<i>Over 300 industrial parks</i>
<i>Number of GEIPP Priority Parks</i>	<i>3 Industrial Parks</i>
<i>Number of Industrial Parks taking part in awareness and capacity building activities of GEIPP</i>	<i>18 Industrial Parks and 4 industrial development zones (22 in total)</i>



GEIPP South Africa has offered training to 204 personnel in Small and Medium Enterprises (SMEs), 223 individuals in industrial park management, and 326 service providers. Enterprises have independently carried out 13 Eco-Industrial Parks (EIP) activities without additional support from GEIPP. This outcome resulted from implementing 46 capacity-building initiatives over the five-year duration of GEIPP I.

## EAST LONDON INDUSTRIAL DEVELOPMENT ZONE

### Background of the Park, Initial EIP Scoring, and Areas of Improvement

The East London Industrial Development Zone (ELIDZ) was established in 2002 and is located in East London, in the Eastern Cape Province of South Africa. The park covers 236 hectares of land. As of February 2022, ELIDZ comprised 31 active manufacturing operations, of which six were busy ramping up production, an aquaculture operation producing fin fish, seven freight companies (or logistics service providers), a waste collection and recycling operation, a conference centre with a canteen, one loose-standing office complex, and a Science and Technology Park (STP).

Four of the active manufacturing operations had more than 250 employees in February 2021. Therefore, the rest of the tenant companies can be regarded as small and/or medium enterprises (SMEs). Products currently manufactured at the ELIDZ include automotive components, dairy products, plastic products, steel products, electronics, textile products and plastic waste reprocessed products.

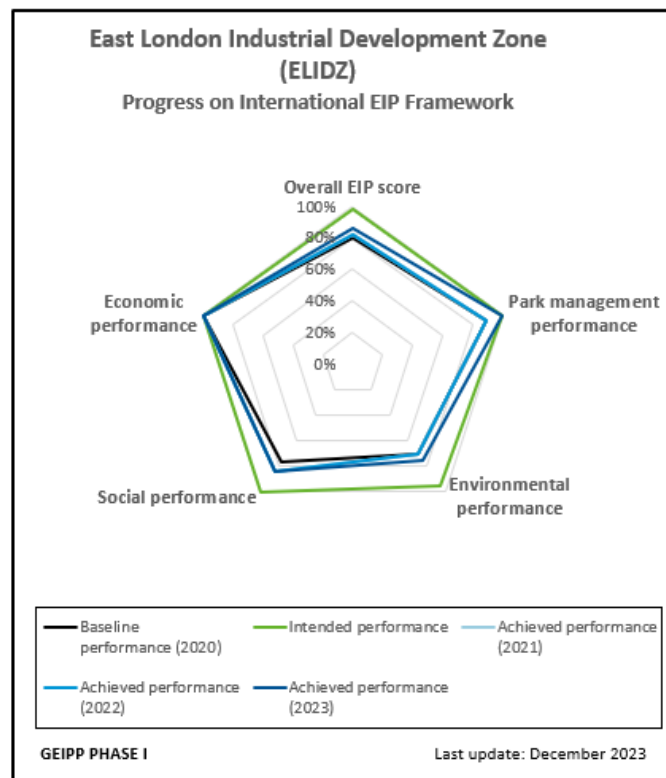
The STP hosts a water sample testing laboratory, an artisan training academy, and several other office-based tenants. Park management also owns a three-dimensional (3D) printing facility, which



uses a Makerspace Model. It allows for the exploration of new technologies and engages universities to be involved in research while also generating revenue for the ELIDZ.



The ELIDZ is a state-owned corporation owned by the provincial government, i.e. the Department of Economic Development, Environmental Affairs and Tourism (DEDEAT) (74%) and Buffalo City Metropolitan Municipality (BCMM) (26%). It is funded by the Department of Trade, Industry and Competition (the dtic) and DEDEAT. Still, it also generates its own income streams from the utilisation of the Industrial Development Zone's (IDZ's) property assets and associated zone services under its management control.



The review of ELIDZ against the International Framework for Eco-Industrial Parks was conducted. The key observations from the EIP assessment of ELIDZ included. The ELIDZ scored 80% against the performance benchmarks of the international EIP framework in 2020 and improved to an overall score of 82% in 2022, due to an increase in its social performance. The ELIDZ's progress against the international EIP framework is illustrated in the chart below.

ELIDZ performs and compares very favourably against large proportions of the benchmarks in the International EIP Framework. In summary, ELIDZ fully met 41 out of the 51 international 2017 benchmarks (80% of the applicable benchmarks in 2020 and improved to an overall score of 82% in 2022 due to an increase in its social performance). With current and upcoming initiatives, ELIDZ intends to reach a performance of 92% of the international benchmarks. This indicates an intended improvement of 10%.

The economic performance category had the highest compliance (100%) compared to park management (89% baseline compliance), environmental performance (70% baseline compliance), and social performance (77% baseline compliance).

Environmental performance shows the highest intended improvement potential (20%) compared to other categories, followed by the park management category (11% intended improvement) and the social performance category (8% intended improvement);

The following topics had lower baseline compliance scorings indicating that efforts overall should prioritise these topics:

- » Local community outreach;
- » Energy;
- » Water.



The following topics had the highest baseline compliance scorings (100%) indicating overall that ELIDZ management and tenant firms need less intensive technical assistance on these topics covered by the International EIP Framework:

- » Park management services;
- » Environmental management and monitoring;
- » Waste and material use;
- » Climate change and the natural environment;
- » Social management systems;
- » Local business and SME promotion;

A set of practical EIP opportunities was identified and prioritised for ELIDZ based on the review of the International EIP Framework. These opportunities include digital economy, marketing and promotion, planning and zoning, resource efficiency and industrial synergies, energy, water waste and material use, social infrastructure, concept planning.

### **Short Description of the EIP Opportunity, Results, and Implementation**

#### **Solar Energy**

- » Solar energy produced to be fed into the grid must adhere to the Grid Connection Code for Renewable Power Plants Connected to the Electricity Transmission System or the Distribution System in South Africa
- » 50 MW solar PV farm in Berlin (Outside the ELIDZ boundary)
- » Solar PV rooftop installations 21,8 MW
- » Solar PV installation 8MW ground-mounted within the ELIDZ boundary:
- » 1.8 MW wind farm outside the boundary of the ELIDZ in Berlin, East London
- » .Two 1-MW battery storage systems inside the boundary of the ELIDZ
- » Waste tyre recovery through pyrolysis

#### **Green Hydrogen Production in ELIDZ**

To assist in the potential implementation of eco-industrial park (EIP) opportunities, resources were made available in 2022 for supporting and facilitating EIP opportunities implementation, i.e. to follow up the progress of identified EIP and resource efficient and cleaner production opportunities, identify implementation support requirements, and provide implementation support as agreed with UNIDO and the NCPC-SA.

It was also made for facilitating the financing of EIP opportunities implementation, i.e. to follow the process of using a transactional advisor for financing of EIP opportunities for industrial parks in South Africa and to contact potential funders identified for pre-feasibility studies completed from the UNIDO Access-to-Finance Tool to determine whether the specific projects could be funded, and what would be required from the developers to apply for funding.

- » In securing sustainable water supply, the ELIDZ is in discussions with a transactional advisor to finance this opportunity. Buffalo City Metropolitan Municipality is also doing a feasibility study for a wastewater recovery project elsewhere in East London, which could feed into a potential feasibility study for the ELIDZ. There are three potential private investors for



desalination projects in the ELIDZ. One investor is already in discussion with a potential green hydrogen investor in the ELIDZ.

- » ELIDZ is in discussion with a transactional advisor and other private investors to finance solar PV installations. A potential investor in green hydrogen production is also in discussions with potential private investors for solar PV installations. A tender was advertised in March 2023 for the solar PV rooftop and ground-mounted installations inside the ELIDZ.
- » The ELIDZ is in discussion with a transactional advisor on financing battery storage opportunity, which forms part of the solar PV discussions. ELIDZ is marketing battery storage as an opportunity for investment but is yet to secure funding.
- » Olysmart (Pty) Ltd, a potential investor in tyre waste recover, has submitted their investor application forms and business plan to the ELIDZ. The Environmental Impact Assessment (EIA) will commence in 2023.

### **Capacity Building**

The following Eco-Industrial Parks (EIP) training sessions with associated training objectives were organized for ELIDZ and tenant companies

#### EIP Training

- » Learn how the EIP s approach can bring concrete business opportunities, economic savings and enhanced competitiveness to industrial parks and its tenant companies;
- » Learn about the benefits and application EIP approaches to industrial parks and its tenant companies
- » Understand the opportunities, challenges and success factors to apply EIP approaches in industrial parks.

#### Access to finance training

- » Provide an overview of the types of financing mechanisms available.
- » Provide relevant information about national incentive schemes, grants as well as credit financing available for industrial parks and industries in South Africa.
- » Provide practical guidance to industrial parks and companies on accessing finance.
- » Piloting testing of the Tool, especially ELIDZ

#### Community collaboration training

- » Learn about the basics of community collaboration in relation to industrial parks;
- » Better understand the current status, opportunities and challenges of community collaboration for industrial parks in South Africa;
- » Learn from national and international good practices in community collaboration;

#### Eco-Industrial Parks Master Planning

- » Learn about the basics of industrial park master planning;
- » Get to know resources, tools and (inter)national good practices available to support the development and implementation of master plans and supporting EIP approaches.

#### EIP Management Service Tool Training





- » Learn about added value park management and Industry 4.0 services and their concrete business opportunities, economic savings and enhanced competitiveness to industrial parks and its tenant companies;
- » Interactive exercises to apply the EIP Management Services Tool to the industrial parks to identify, prioritize and scope added value park management and Industry 4.0 services for which there is a demand and business case.

#### Industrial parks waste management training

- » Learn about practical solutions, approaches and key requirements for hazardous waste storage, waste management and recycling at an industrial park level;
- » Better understand the current status, challenges and opportunities of waste management and recycling in industrial parks in South Africa;
- » Learn how the eco-industrial park approach can bring concrete business opportunities, economic savings and enhanced competitiveness to waste management and recycling in industrial parks.

#### Technical Assistance

RECP assessments were conducted in 5 tenant companies at ELIDZ aimed at identifying RECP and EIP implementable opportunities that would contribute to each company's resource savings in energy, water waste, and materials to achieve more sustainable practices and increased competitiveness through resource-efficient production practices. The assessments consisted of evaluating the company's RECP management practices (if any), observing the operations of significant resource users, and evaluating any potential opportunities.

A key focus of the Global Eco-Industrial Parks Programme in South Africa is the implementation of feasible Eco-industrial Park (EIP) opportunities. Therefore, pre-feasibility assessments were undertaken for ELIDZ for a selected set of promising EIP opportunities.

- » 2 MW of the 8 MW ground-mounted solar installations inside the boundary of the ELIDZ.
- » 1.8 MW wind farm outside the boundary of the ELIDZ in Berlin, East London.
- » Two 1-MW battery storage systems for peak shaving, i.e. discharging energy stored in batteries to supply peak period needs and charging the batteries during off-peak times
- » Waste tyre recovery through pyrolysis.
- » Green hydrogen production.

The rationale for undertaking the renewable pre-feasibility studies were:

- » Energy security needs in South Africa, with load shedding on-going since 2008.
- » Interest and commitment from the ELIDZ and tenant companies to reduce greenhouse gas emissions and lower the carbon footprint of the ELIDZ.
- » Reduction of Scope 2 carbon taxes that will be added to the grid-supplied electricity price in the future.
- » Several automotive component manufacturers that are tenants in the ELIDZ who supply original equipment manufacturers are starting to set stringent short-term requirements for these manufacturers to replace conventional energy with renewable energy.
- » Maintaining status on Eskom's, i.e. South Africa's electricity public utility, curtailment program, i.e. load reduction required from industry when Eskom declares load shedding. To





reduce an estimated 10% of the 20 MW installed capacity of the ELIDZ, the following potential renewable energy installations are relevant:

The EIP concept and master planning approach was applied at the ELIDZ in order to future-proof the SEZ and support the ELIDZ with refining its Master Plan to cater for:

- » Future tenants requirements;
- » Ensure competitiveness and unique value proposition of ELIDZ on the short, medium and long-term;
- » Ensure maximum flexibility in ELIDZ concept and master plans to allow different scenarios to happen over time;
- » Increase resource efficiencies and industrial synergies of tenants and SEZ as a whole;
- » Enhanced interactions with local municipality, communities, society and other regional and (inter)national stakeholders.

## PHUTHADITJHABA INDUSTRIAL PARK

### Background of the Park, Initial EIP Scoring, and Areas of Improvement

Phuthaditjaba Industrial Park is situated within the Thabo Mofutsanyana District Municipality in the Maluti-A-Phofung Local Municipality. It is owned and managed by the Free State Development Corporation (FDC), which is the official agency responsible for driving economic development in the Free State Province. The Park is part of the Department of Trade Industry and Competition (dtic) under the Industrial Parks Revitalization Programme (IPRP).

Phuthaditjaba Industrial Park was established about 40 years ago and accommodates a tenant pool of companies comprising textile factories, plastic products manufacturers, construction and quarrying factories, chemical processing companies, agro-processing companies, pulp and paper factories, and snack-producing companies.

The Industrial Park covers a total area of 250 hectares, with an approximately 75% occupancy rate and a total of 296 companies. The park has one of the biggest local employers in the Cut Make and Trim (CMT) textile sector, employing over 2000 employees, of which more than 90% are women. It is a major economic hub in the region. Small and medium-sized companies (SMEs) typically occupy lots less than 500 m<sup>2</sup>, while large companies in the park typically occupy more than 500 m<sup>2</sup>.

Tenant companies utilise shared infrastructure and utility services, including facilities management (e.g. water and electricity supply), ICT services and centralised security services. A total of about 7100 workers are employed by companies in Phuthaditjaba Industrial Park, including FDC employees.

Phuthaditjaba Industrial Park fully met 18 out of the 51 international benchmarks (37% of the applicable benchmarks), 3 are partly met, 5 need to be confirmed, 2 are not applicable, and 23 are not yet met. With current and upcoming initiatives, Phuthaditjaba Industrial Park intends to reach a performance of 67% of the international benchmarks. This indicates a high improvement potential of 31% in 2020 and improved to 41% in 2021 and 43% in 2022. Performance improvements were for economic and social indicators. The review against the International EIP Framework provided the basis to identify and prioritise a set of practical EIP opportunities which were identified and prioritised for Phuthaditjaba Industrial Park. The opportunities were prioritised based on their



anticipated benefits, achievability and interest from FDC/companies. A summary of the prioritised opportunities is as follows;



#### Transformation towards eco-industrial park

- » Park management services:
- » Upgrade industrial park infrastructures and utilities. Key priorities: Buildings, water supply and treatment, electricity supply,
- » Water:
- » FDC to facilitate joint-company groundwater extraction system to ensure sustainable and cost-effective groundwater use,
- » FDC to promote and support water saving "good housekeeping" measures to reduce water consumption without significant investment.
- » Potential support through National Cleaner Production Centre of South Africa to identify water saving measures at tenant companies



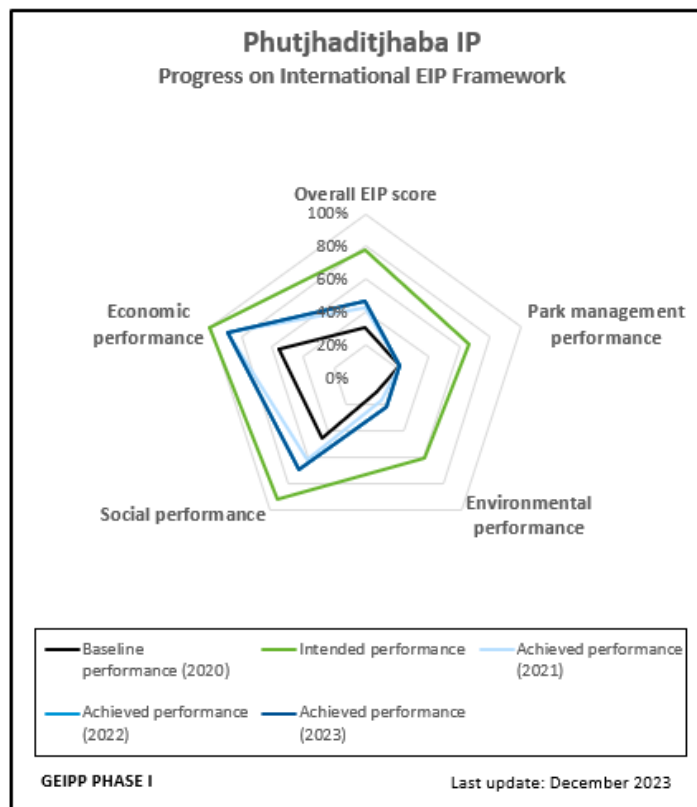
- » Energy:
- » Investigate renewable energy options relevant to Phuthaditjhaba Industrial Park to address current energy supply challenges
- » Waste and material use:
- » FDC to collaborate with municipality to clean up industrial park and keep it clean to increase attractiveness of the park
- » Local Community Outreach:
- » FDC to expand Policy and Business Forum with community members to include other key opportunities and challenges affecting Phuthaditjhaba IP

Company level (RECP) opportunities:

- » Maintenance:
- » Set up a reliable and reasonable maintenance plan by FDC to address frequent facility challenges like roof leakage, malfunctioning streetlights (FDC)

Industrial synergy opportunities:

- » Service synergies:
- » Set up industry committees on priority topics for industrialists like waste management, water scarcity and management, skill training, capacity building
- » Collective training for industrial sectors in the park on specific topics like good housekeeping, basic accounting, human resource, ICT
- » Set up a dedicated area for informal trading within Phuthaditjhaba Industrial Park





Phuthaditjhaba Industrial Park scored 31% against the performance benchmarks of the international EIP framework in 2020 and improved to 41% in 2021 and 43% in 2022. Performance improvements were for economic and social indicators.

### **Short Description of the EIP Opportunity, Results, and Implementation**

- » Setting up a dedicated area for informal trading
- » Establishment of a training centre and training services
- » Setting up industry committees in the industrial park
- » Setting up a fabric waste unpicking plant
- » Investment in solar photovoltaic installations
- » Building a new wastewater treatment plant and rainwater harvesting
- » Upgrading of 3 incubator buildings (aka Beehives) in Phuthaditjhaba IP to support SMMEs
- » Central waste collection services in Phuthaditjhaba Industrial Park

### **Capacity Building**

The following Eco-Industrial Parks (EIP) training sessions with associated training objectives were organized for Phuthaditjhaba Industrial Park and tenant companies

#### **EIP Training:**

- » Learn how the EIP approach can bring concrete business opportunities, economic savings and enhanced competitiveness to industrial parks and its tenant companies;
- » Learn about the benefits and application EIP approaches to industrial parks and its tenant companies
- » Understand the opportunities, challenges and success factors to apply EIP approaches in industrial parks.

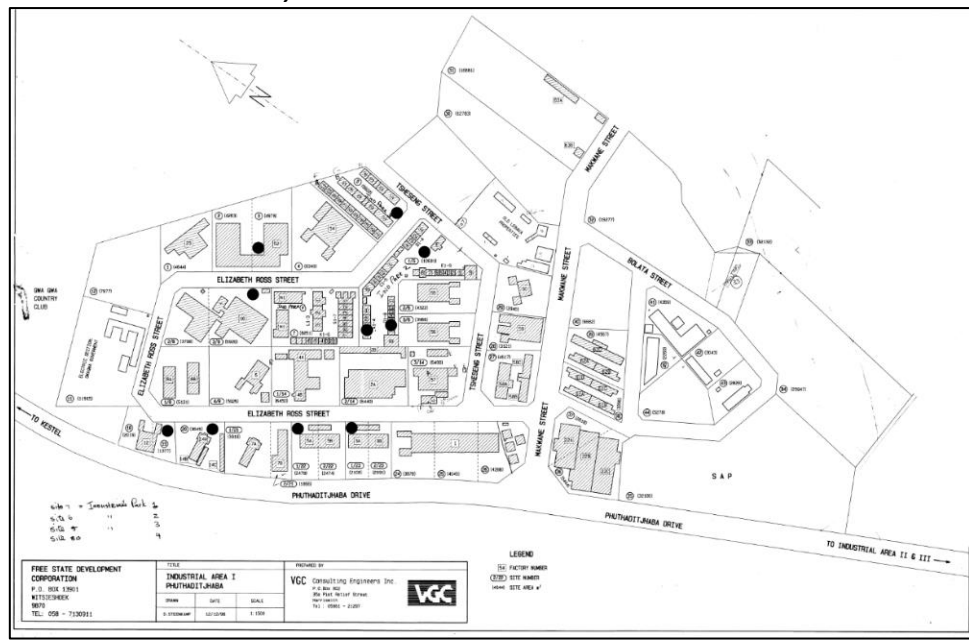
#### **Access to finance training X 2**

- » Provide an overview of the types of financing mechanisms available.
- » Provide relevant information about national incentive schemes, grants as well as credit financing available for industrial parks and industries in South Africa.
- » Provide practical guidance to industrial parks and companies on accessing finance.
- » Piloting testing of the Tool, especially ELIDZ

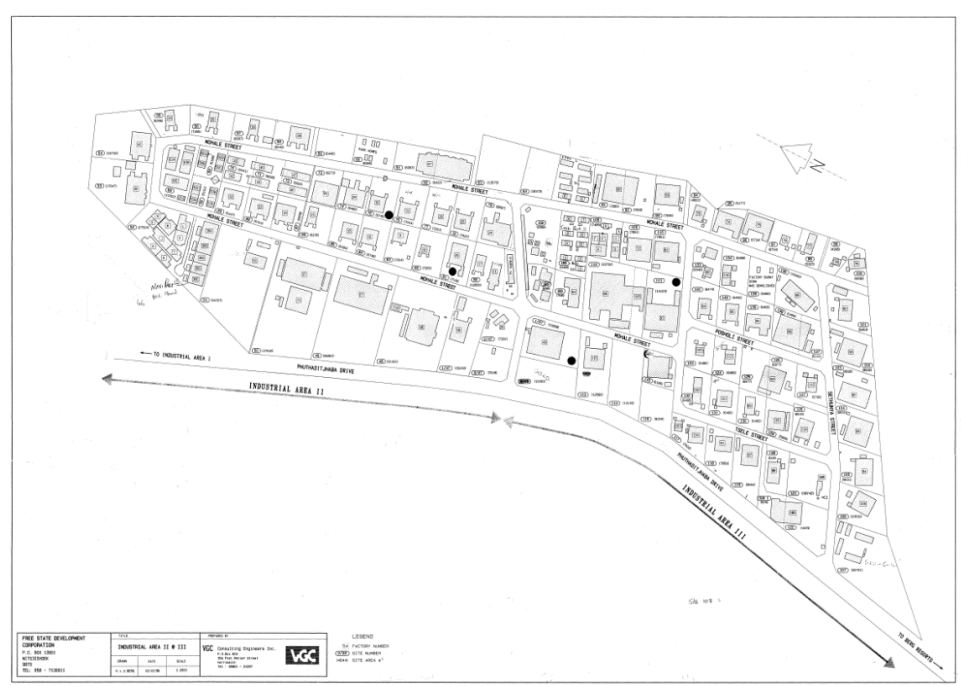


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### Phuthaditjhaba Industrial Park Layout Plan – Area 1 and 2



### Phuthaditjhaba Industrial Park plan – Area 3



### Community collaboration training

- » Learn about the basics of community collaboration in relation to industrial parks;
- » Better understand the current status, opportunities and challenges of community collaboration for industrial parks in South Africa;
- » Learn from national and international good practices in community collaboration;

### EIP Master Planning Training





- » Learn about the basics of industrial park master planning;
- » Get to know resources, tools and (inter)national good practices available to support the development and implementation of master plans and supporting EIP approaches.

#### EIP Management Service Tool Training

- » Learn about added value park management and Industry 4.0 services and their concrete business opportunities, economic savings and enhanced competitiveness to industrial parks and its tenant companies;
- » Interactive exercises to apply the EIP Management Services Tool to the industrial parks to identify, prioritize and scope added value park management and Industry 4.0 services for which there is a demand and business case.
- » Economic savings and enhanced competitiveness to master plans of industrial parks;

#### IP Waste management training, the training objectives were X 2

- » Learn about practical solutions, approaches and key requirements for hazardous waste storage, waste management and recycling at an industrial park level;
- » Better understand the current status, challenges and opportunities of waste management and recycling in industrial parks in South Africa;
- » Learn how the eco-industrial park approach can bring concrete business opportunities, economic savings and enhanced competitiveness to waste management and recycling in industrial parks.

#### Technical Assistance

Resource Efficient and Cleaner Production (RECP) assessments were conducted in 14 tenant companies at Phuthaditjhaba IP aimed at identifying RECP and EIP implementable opportunities that would contribute to each company's resource savings in energy, water waste, and materials to achieve more sustainable practices and increased competitiveness through RECP practices. The assessments consisted of evaluating the company's RECP management practices observing the operations of significant resource users, and evaluating any potential opportunities.

GEIPP-SA also focuses on the implementation of feasible Eco-Industrial Park (EIP) opportunities. Therefore, pre-feasibility assessments were undertaken for Phuthaditjhaba IP for a selected set of promising EIP opportunities.

Eight pre-feasibility studies were completed for Phuthaditjhaba Industrial Park (IP) between 2021 and 2023, i.e.

- » Setting up industry committees in the industrial park (2021)
- » Fabric waste unpicking plant, i.e. waste textiles to fibres and yarns (2021)
- » Textile and woodworking training centre (2021)
- » Dedicated area for informal trading (2021)
- » New wastewater treatment plant (2021)
- » Ground-mounted solar PV installations (2021)
- » Central waste collection services in the park (2022)
- » Support for small, medium and micro enterprise (SMME) development in the park (2022)

The overall rationale for undertaking pre-feasibility studies were:



- » To contribute to the overall industrial park performance potential towards eco-industrial park, while prefeasibility studies on energy were informed by;
- » Energy security needs in South Africa, with load shedding on-going since 2008.
- » Interest and commitment from tenant companies to reduce greenhouse gas emissions and lower the carbon footprint
- » Maintaining status on Eskom's, i.e. South Africa's electricity public utility, curtailment program, i.e. load reduction required from industry when Eskom declares load shedding.

## EkANDUSTRIA



### **Background of the Park, Initial EIP Scoring, and Areas of Improvement**

Ekandustria is a provincial government-owned industrial park, managed by Mpumalanga Economic Growth Agency (MEGA). Ekandustria is situated outside Bronkhorstspuit, 57 km east of Pretoria and 79 km northeast of OR Tambo International Airport. The industrial park is close to the N4 Highway (Maputo Corridor) linked to Mpumalanga Province via Witbank and Middelburg. Although the industrial park is located within the boundaries of Gauteng Province, it falls under the jurisdiction of Mpumalanga.

Ekandustria is split into two main areas, namely Ekandustria North and Ekandustria South. Ekandustria North is the area controlled by MEGA, and therefore, the focus of the EIP





implementation. Ekandustria South is privately owned, not under the control of MEGA. The total area of Ekandustria North is 455 ha, including 363 ha of serviced land and 92 ha of vacant land. 30% of Ekandustria North's total land area is developed with 102 factory buildings of which about 40% are currently used and rented out. 44 industrial companies are currently operating in Ekandustria, of which 12 are Small and Medium-sized Enterprises (SMEs).

Over the past few years, a number of companies ceased their operations in the park due to multiple factors, including the economic downturn in South Africa, instability of the surrounding community, union strikes, mismanagement, lack of reliable supply of water and electricity in the park, and the Covid-19 lockdown in 2020.

The existing 44 tenant companies currently employ approximately +-800 workers. Seven property team members are stationed at MEGA Ekandustria Office.

Key industrial sector(s) currently present in Ekandustria are: Textile dyeing;

- » Textile Cut Make Trim (CMT);
  - » Shoe production;
  - » Pet food production;
  - » Polystyrene products manufacturing;
  - » Automotive repair;
  - » Pallet recycling;
  - » Refractory and ceramics;
  - » Mining explosion materials;
  - » Plastic recycling;
  - » Transport and logistics;
  - » Retail businesses and shops
- From the EIP assessment, Ekandustria met 25 out of the 51 international benchmarks (50% of the applicable benchmarks). One benchmark was partly met, one benchmark is not applicable, and 24 benchmarks are not yet met. With current and upcoming initiatives Ekandustria intended to reach a performance of meeting 72% of the international benchmarks. This indicates an intended improvement of 22%.

Environmental performance, park management, and social performance have lower compliance (42%, 44%, and 46% respectively) compared to economic performance (78% baseline compliance). The following topics had lower baseline compliance scorings indicating that efforts overall should prioritize these topics:

- » Planning and zoning;
- » Waste and material use;
- » Local community outreach;
- » Park monitoring and risk management;
- » Water management.

Employment generation, economic value creation, and local business and SMME promotion topics had the highest baseline compliance scorings, indicating overall that, Ekandustria management and

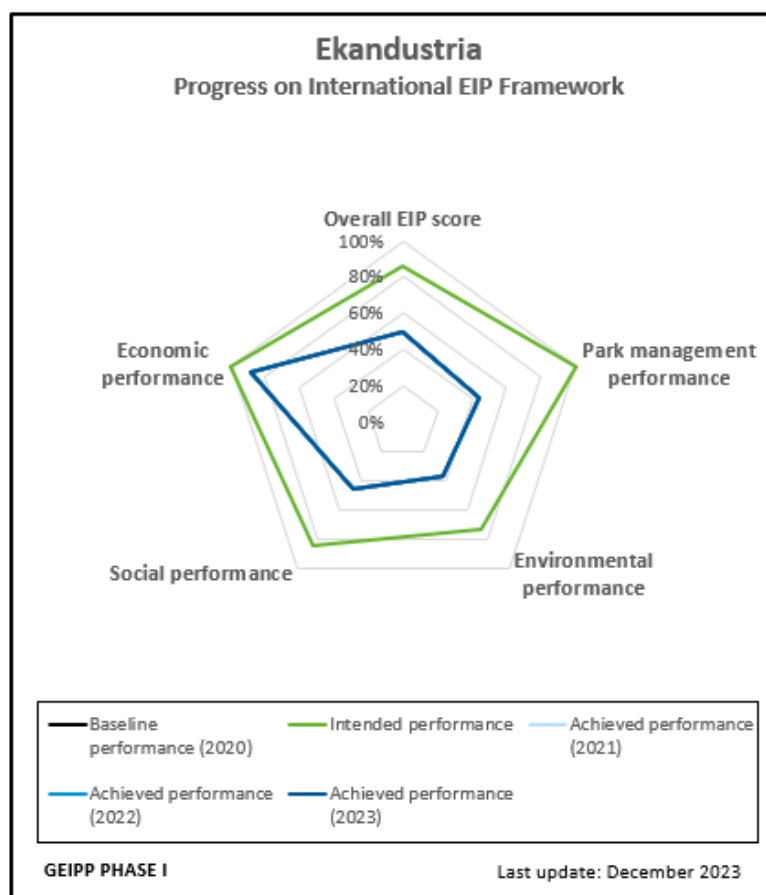


tenant firms need less intensive technical assistance on these topics covered by the International EIP Framework.

A set of practical EIP opportunities were identified and prioritized for Ekandustria based on the review against the International EIP Framework;

- » Engage and work with the local municipality to find solutions to secure "quality" of bulk supplied water for use by companies in Ekandustria. This is ongoing effort by MEGA.
- » Upgrade the existing wastewater treatment plant (WWTP) located in Ekandustria so that it can better process industrial effluents (e.g. with a pre-treatment facility). The current WWTP is designed to treat municipal effluent, not industrial effluent.
- » Develop a turnaround strategy to attract new investments into Ekandustria and also support the transformation of Ekandustria into a SEZ.
- » Collaborate with NCPG-SA to undertake RECP assessments with additional Ekandustria companies.

Ekandustria Industrial Park scored 50% against the performance benchmarks of the international EIP framework in 2020, with no identified improvements since then. Ekandustria's progress against the international EIP framework is illustrated in the chart below.





## Short Description of the EIP Opportunity, Results, and Implementation

Three EIP pre-feasibility studies have been completed for Ekandustria between 2022-2023, i.e.:

- » 20-MW ground-mounted solar PV installations to
- » Pre-treatment and reclamation of industrial wastewater
- » Licensing of the MEGA landfill site and associated waste collection services.

## Capacity Building

The following Eco-Industrial Parks (EIP) training sessions with associated training objectives were organized for Ekandustria and tenant companies

### EIP Training:

- » Learn how the EIP approach can bring concrete business opportunities, economic savings and enhanced competitiveness to industrial parks and its tenant companies;
- » Learn about the benefits and application EIP approaches to industrial parks and its tenant companies
- » Understand the opportunities, challenges and success factors to apply EIP approaches in industrial parks.

### Access to finance training X 2 :

- » Provide an overview of the types of financing mechanisms available.
- » Provide relevant information about national incentive schemes, grants as well as credit financing available for industrial parks and industries in South Africa.
- » Provide practical guidance to industrial parks and companies on accessing finance.
- » Piloting testing of the Tool, especially ELIDZ

### Community collaboration training

- » Learn about the basics of community collaboration in relation to industrial parks;
- » Better understand the current status, opportunities and challenges of community collaboration for industrial parks in South Africa;
- » Learn from national and international good practices in community collaboration;

### EIP Master Planning Training

- » Learn about the basics of industrial park master planning;
- » Get to know resources, tools and (inter)national good practices available to support the development and implementation of master plans and supporting EIP approaches.

### EIP Management Service Tool Training

- » Learn about added value park management and Industry 4.0 services and their concrete business opportunities, economic savings and enhanced competitiveness to industrial parks and its tenant companies;



- » Interactive exercises to apply the EIP Management Services Tool to the industrial parks to identify, prioritize and scope added value park management and Industry 4.0 services for which there is a demand and business case.
- » Economic savings and enhanced competitiveness to master plans of industrial parks;

IP Waste management training, the training objectives were X 2;

- » Learn about practical solutions, approaches and key requirements for hazardous waste storage, waste management and recycling at an industrial park level;
- » Better understand the current status, challenges and opportunities of waste management and recycling in industrial parks in South Africa;
- » Learn how the eco-industrial park approach can bring concrete business opportunities, economic savings and enhanced competitiveness to waste management and recycling in industrial parks.

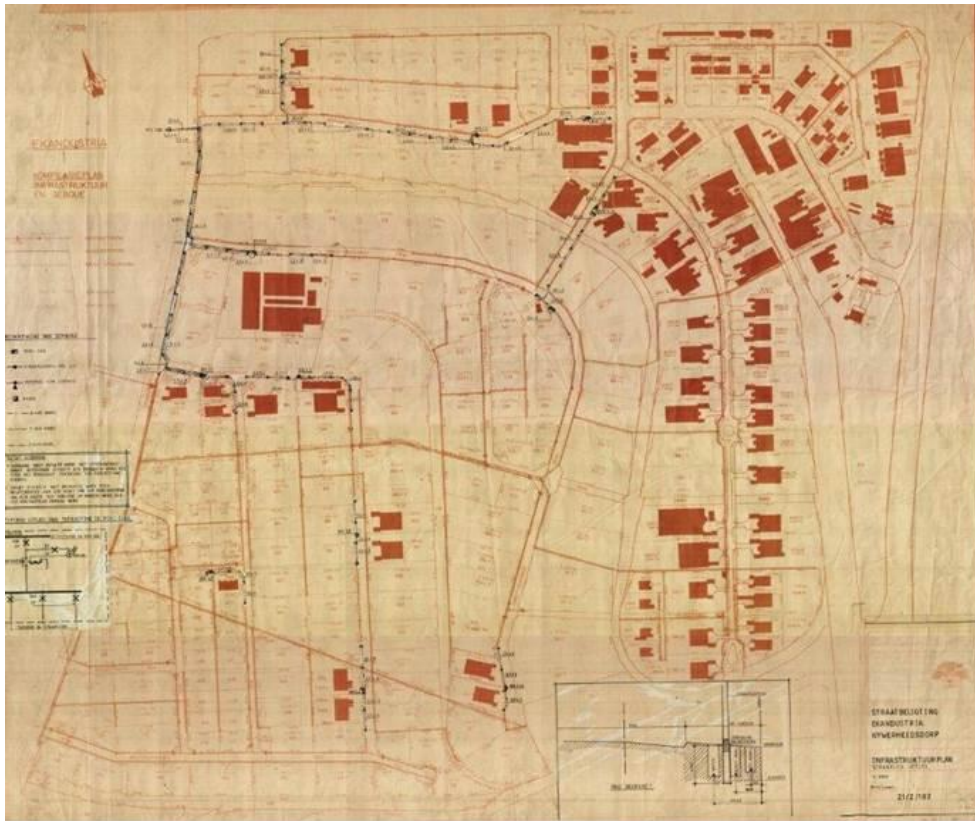
### **Technical Assistance**

Resource Efficient and Cleaner Production (RECP) assessments were conducted in 4 tenant companies at Ekandustria aimed at identifying RECP and Eco-industrial Park (EIP) implementable opportunities that would contribute to company's resource savings in energy, water waste, and materials and EIP improvement to achieve more sustainable practices and increased competitiveness through RECP and EIP practices. The assessments consisted of evaluating the company's RECP management practices observing the operations of significant resource users, and evaluating any potential opportunities.

GEIPP-SA also focused on the identification and implementation of feasible EIP opportunities. Therefore, pre-feasibility assessments were undertaken for Ekandustria for a selected set of promising EIP opportunities.

Three pre-feasibility studies were completed for Ekandustria between 2022 and 2023, i.e.

- » 20-MW ground-mounted solar PV installations (2022)
- » Pre-treatment and reclamation of industrial wastewater (2022)
- » Securing potable water supplies for food manufacturers (2022)



*Picture of Ekandustria park plan (as provided by MEGA Ekandustria Office)*

The overall rationale for undertaking pre-feasibility studies were:

- » To contribute to the overall industrial park performance potential towards eco-industrial park, while prefeasibility studies on energy were informed by;
- » Energy security needs in South Africa, with load shedding on-going since 2008.
- » Interest and commitment from tenant companies to reduce greenhouse gas emissions and lower the carbon footprint
- » Maintaining status on Eskom's, i.e. South Africa's electricity public utility, curtailment program, i.e. load reduction required from industry when Eskom declares load shedding.

The EIP concept plan was prepared for Ekandustria park management and will be presented to the Special Purpose Vehicle (SPV) Company for consideration in the new management of Ekandustria, its focus was;

- » Future tenants requirements;
- » Ensure competitiveness and unique value proposition of ELIDZ on the short, medium and long-term;
- » Ensure maximum flexibility in ELIDZ concept and master plans to allow different scenarios to happen over time;
- » Increase resource efficiencies and industrial synergies of tenants and SEZ as a whole;



- » Enhanced interactions with local municipality, communities, society and other regional and (inter)national stakeholders.

## SUMMARY AND CONCLUSIONS

- » While the on-the-ground implementation takes time, technical reviews and assessments of pilot industrial parks against the International EIP Framework as well as pre-feasibility assessments outlined in this report show that the development and promotion of pilot industrial parks as Eco-industrial parks will offer better and more resource-efficient industrial parks with lower risks and offering more business opportunities.
- » With the willingness to uptake and upscale EIP approaches in the pilot industry parks based on technical assistance accorded, the efforts underway by each pilot industrial park to take forward implementation of EIP feasibility opportunities, and with national government - Department of Trade Industry and Competition's (*the dtic*) commitment to include EIP approaches in industry revitalization policy. There is a clear demonstration that GEIPP is making headways in demonstrating the viability and benefits of Eco-Industrial Park approaches in scaling up resource productivity and improving the economic, environmental, and social performances of businesses in the country. Continued technical support of the pilot industrial parks will ensure that the project objectives are realized in potential GEIPP-SA II.
- » Based on EIP work done at East London Industrial Development Zone (ELIDZ), the park has demonstrated high level of commitment to implement identified EIP opportunities, so continued support to the park has the potential to improve its performance against the International EIP Framework.
- » Phuthaditjhaba IP has high improvement potential with regard to the International EIP Framework, with a number of medium to large companies operating in the park and a high interest from park management to continue applying EIP approaches exist. Continued support of the park will yield substantial EIP improvement results.
- » Ekandustria continues to demonstrate high improvement potential with regards to the International EIP framework, although implementation progress has been delayed, there is high interest from park management to apply EIP approaches and future plans to develop Ekandustria into a SEZ provides a strategic opportunity for the park to be developed according to EIP international standards. More technical support would contribute to the park achieving its intended improvement potential as per the EIP Frameworks.

# Annex F

Results from GEIPP I Priority Parks in Ukraine





## ANNEX F: RESULTS UKRAINE

The UNIDO Global Eco-Industrial Parks Programme - Country-level intervention: Ukraine (GEIPP Ukraine) started in June 2020. The Ministry of Economy of Ukraine (MinEconomy) is the main project beneficiary. The objective of the project is to improve resource productivity and the economic, environmental, and social performance of businesses in participating developing and transition economies through greening industrial parks (IP).

Three industrial parks were initially chosen for Eco-Industrial Park (EIP) demonstration activities: Bilotserkivskiy Vantazhnyi Aviatsiynyi Kompleks (Bila Tserkva), Patriot IP (Sumy), and Agromash IP (Zaporizhzhia). In 2022, due to the onset of the war, work on the two parks located in the war-affected area became impossible. Consequently, two additional industrial parks in the western part of Ukraine were prioritized by the project. These parks are Kalush (Kalush Industrial HUB) and Teresva (Molfar IP). EIP opportunities have been identified at the Kalush Industrial HUB and Molfar IP, and efforts are underway for the implementation of projects in these locations.

<i>Country</i>	<i>Ukraine</i>
<i>Number of Industrial Parks in the country</i>	65
<i>Number of GEIPP Priority Parks</i>	5
<i>Number of Industrial Parks taking part in the awareness and capacity-building activities of GEIPP</i>	20

According to the Ministry of Economy of Ukraine, since 2013, 70 parks have been included in the national register of industrial parks. Currently, establishing new industrial parks in almost all regions of Ukraine is discussed by local executive authorities, regional government bodies, and private entities.

Today, in Ukraine, industrial parks can be roughly divided into:

- » Newly created, at the design stage;
- » Created a long time ago but not active yet;
- » With some operating companies.

Synergy with the UNIDO/GEF project (Introduction of Energy Management System Standard in Ukrainian Industry<sup>3</sup>) was created. The GEF project contributed to meeting one EIP indicator at IP BVAK and IP Patriot and contributed in-kind with a total expense of 65,700 USD (already implemented) in 2023 for training and 149,300 – 179,300 USD planned until the end of 2023. Thanks to this, 10 companies from IP BVAK, IP Molfar, and IP Patriot have introduced an Energy Management System.

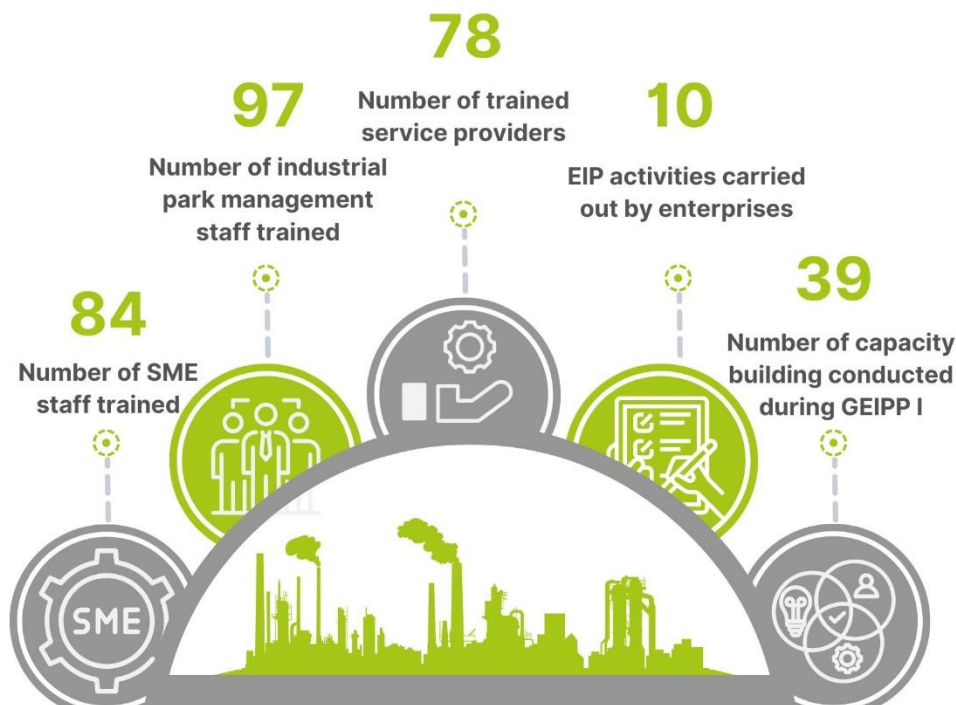
GEIPP Ukraine has offered training to 84 personnel in Small and Medium Enterprises (SMEs), 97 individuals in industrial park management, and 78 service providers. Enterprises have independently

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<sup>3</sup> [Project «Introduction of Energy Management System Standard in Ukrainian Industry» – UNIDO IEE Ukraine program \(ukriee.org.ua\)](http://ukriee.org.ua)



carried out 10 Eco-Industrial Parks (EIP) activities without additional support from GEIPP. This outcome resulted from implementing 39 capacity-building initiatives over the five-year duration of GEIPP I.



### BILOTSEKIVSKYI VANTAZHNYI AVIATSIYNYI KOMPLEKS (IP BVAK)

#### Background of the Park, Initial EIP Scoring, and Areas of Improvement

The Bilotserkivskiy Vantazhnyi Aviatsiynyi Kompleks (IP BVAK) is located in the western part of the town Bila Tserkva (86 km far from Kyiv) based on the Bila Tserkva Aircraft Repair Plant and a military airfield of the Ministry of Defence of Ukraine (the airfield was commissioned in 1952). Founded in 2000, the IP BVAK (a utility municipal company) is the management company of the IP and is subordinate to the Bila Tserkva City Council which is the IP's stakeholder. The IP occupies an area of about 250 hectares and has a well-developed transport infrastructure, including three types of access roads: automobile, air and railway (doesn't function for now).

The IP BVAK consists of two zones: the 1<sup>st</sup> is the park's industrial zone and the 2<sup>nd</sup> is the Class B(4D) airfield with a runway of 2,500x42 m, which is no longer used in the aviation industry, is now being leased or let for business companies. IP BVAK hosts about 70 companies, most of them representing micro and small companies. Among them, there are only a few medium-sized companies with a high level of social responsibility. The situation with environmental responsibility leaves much room for improvement. On the other hand, the structure of industries within the park allows them to obtain a high level of baseline in environmental performance.

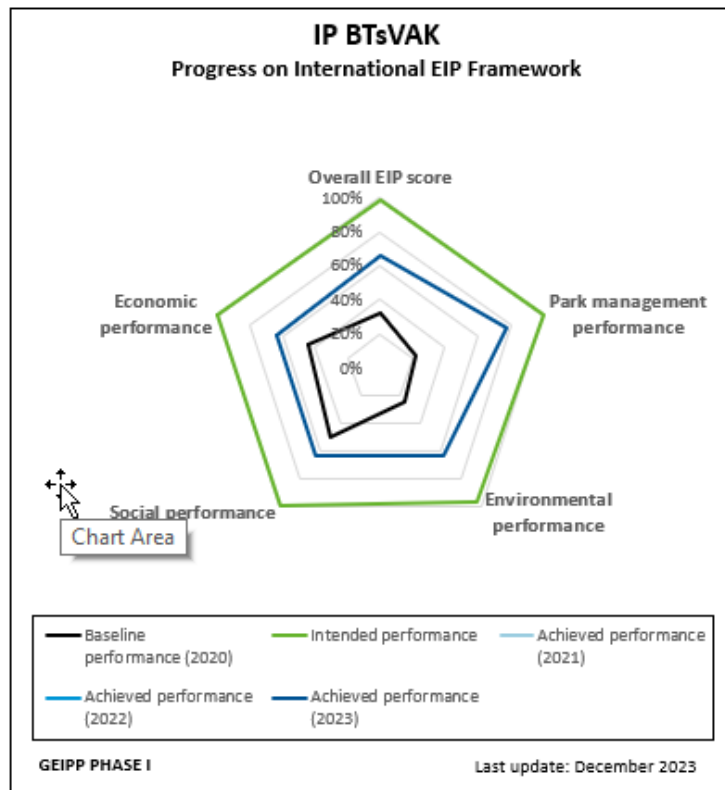
In the Bilotserkivskiy Vantazhnyi Aviatsiynyi Kompleks (IP BVAK), woodworking and furniture companies play a significant role in providing an energy source by utilizing wood waste. The amount of waste generated by these companies is significant, and they can even supply it to neighbouring



companies. It is important to note that some small tenants in the park are not performing well. They rely heavily on manual labour and use outdated equipment and processes. However, this situation allows for a significant share of local resources to be utilized, resulting in a high level of economic performance.



The BVAK's progress against the International EIP Framework is illustrated in the chart below.





### **Initial EIP Scoring and the Identified Area of Improvement**

The assessment of the IP BVAK revealed information about the IP's current compliance level with the international benchmarks and prerequisites applicable to EIPs; the feasible potential in the next few years was assessed as well.

The results illustrate that the park's improvement potential within the EIP context amounts to 34% provided all the prerequisites/benchmarks are achieved. The park achieved the greatest performance in the management and environment categories due to the implementation of a number of EIP measures, such as Monitoring performance and risks; Climate risk assessment; Environmental and Energy Management Systems; etc. Social indicators rose slightly, while Economic indicators were unchanged. The planned indicators to be constantly covered each year (and not covered yet as of September 2023) are Community dialogue; Community outreach. Also, several resident companies went bankrupt and closed their operations because of the military conflict.

### **Capacity Building**

The following EIP training sessions with associated training objectives were organized for IP BVAK and tenant companies.

EIP and Resource Efficiency, Cleaner Production (RECP) Training, and Energy Management System (EnMS) implementation training (as one of the EIP indicators):

- » Learn about approaches and key requirements for the transition of IP into an eco-industrial park;
- » Learn about practical solutions, approaches and key requirements for resource-efficient and cleaner production at an IP level;
- » A better understanding of the current status, challenges and opportunities of resource-efficient and cleaner production in IPs in Ukraine;
- » How the EIP approach can bring concrete business opportunities, economic savings and enhanced competitiveness to waste management and recycling in IPs;
- » Learn about approaches and key requirements for implementation of the Energy Management system at an IP level and a resident company level and its role for IPs during their transition into eco-industrial;
- » Learn about practical solutions, approaches and key requirements for the implementation of the Energy Management system;
- » Better understanding of the current status, challenges and opportunities of Energy management systems in IPs in Ukraine;
- » Learn about the existing incentives for implementation of the Energy Management system at an IP level and a resident company level.



#### Industrial Symbiosis (IS) Training in 4 sessions

- » Learn about the IS analysis, clarifying the main benefits of industrial symbiosis;
- » Learn how to identify synergy options;
- » Learn about the methodology of RECP assessments and IS analysis.

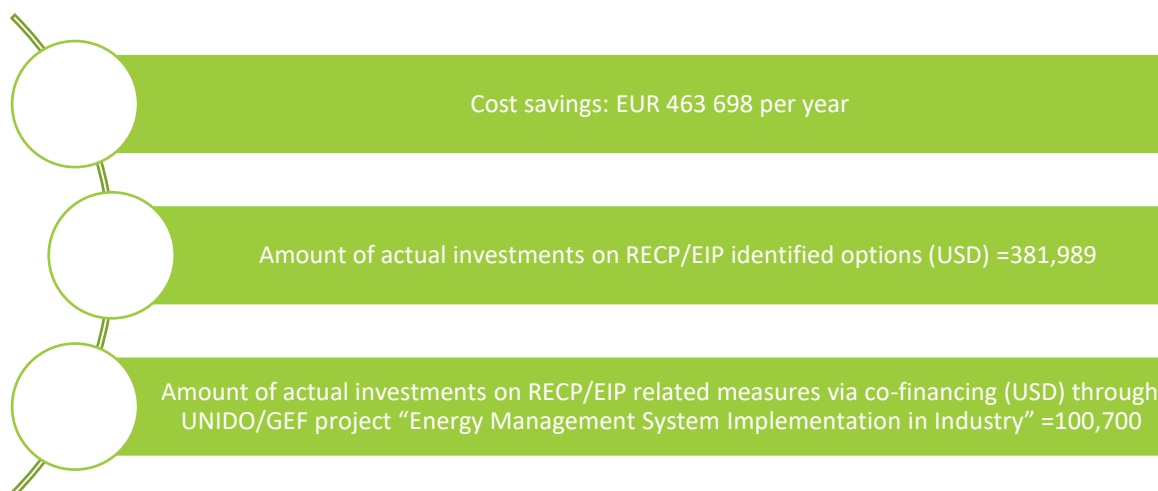
#### Government-to-business (G2B) training session

- » Learn about the methodology of identification the business needs to operate respectively to the EIP International Framework recommendations;
- » Learn how to start a dialog between the government and the community about possible support mechanisms for EIP development.

#### Technical Assistance

20 companies were selected to receive technical support on RECP.

131 RECP measures have been identified. Implementation of RECP options provided various benefits to BVAK industries, such as cost savings, increased competitiveness, improved environmental performance, and enhanced corporate social responsibility.



#### MOLFAR INDUSTRIAL PARK

##### Background of the Park, Initial EIP Scoring, and Areas of Improvement

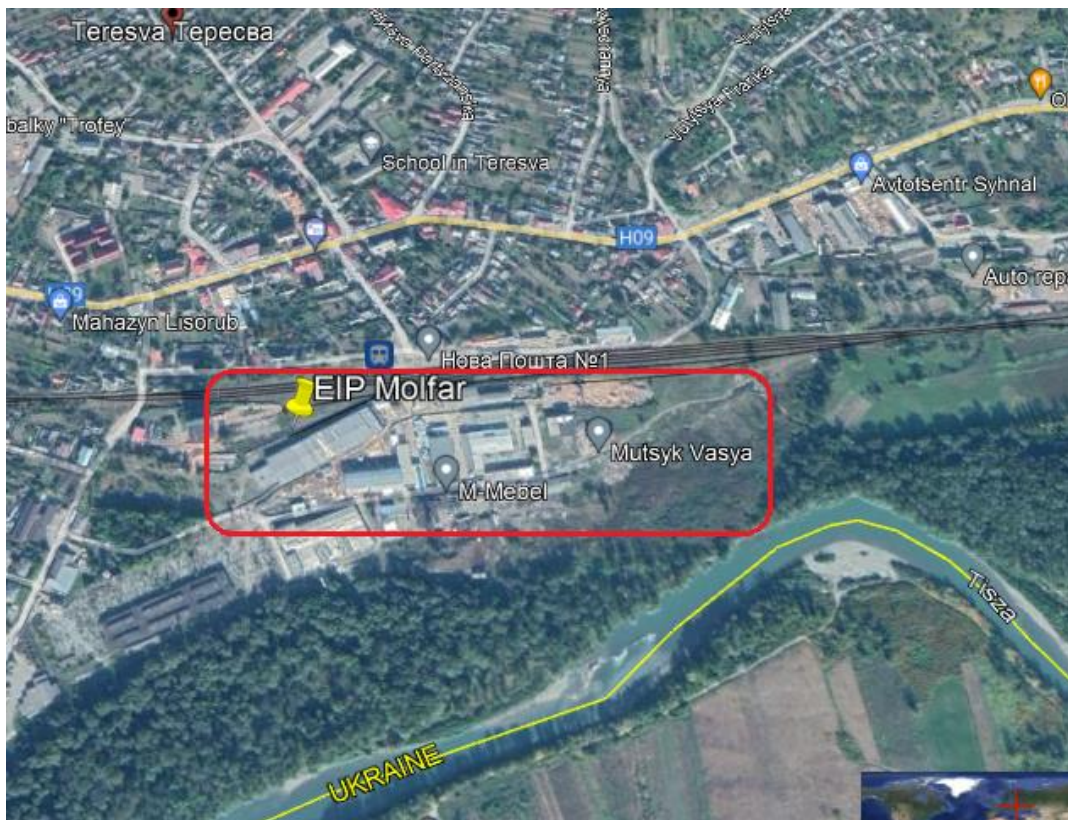
IP Molfar is located on the outskirts of Teresva village in Transcarpathia region, Tiachiv district. The population is 7,585 people. The village is located between the Bedevlya village and Tysa river, on the right bank of the Tysa river. There are the tributaries of Glyniansky and Monastyrsky rivers nearby, and the Brusny, which flows into Tiachivets (a tributary of the Tysa). It is 3 kilometers from the Teresva village to the state border with Romania across the Tysa River. IP Molfar is very conveniently located in terms of transport accessibility. The highway H-09 of state importance runs





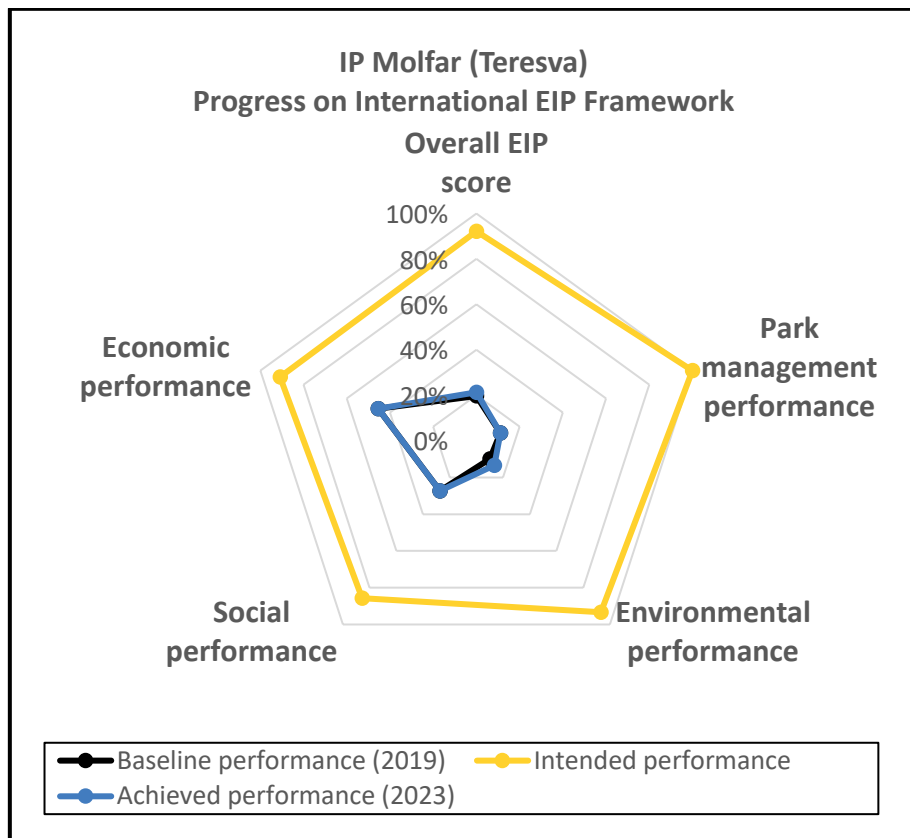
along it. Transport connection with the district center is Tiachiv city and the regional center Mukachevo city, is carried out by the state highway H-09. Highway H-09 is a nationally significant highway. It passes through the territory of Zakarpattia, Ivano-Frankivs'k and Lviv regions. It starts in Mukachevo, passes through Khust, Tiachiv, Rakhiv, Yablunytsky Pass, Yaremche, Nadvirna, Ivano-Frankivs'k, Halych, Burshtyn, Rohatyn, Bibrka, and ends in Lviv.

The assessment demonstrated that IP Molfar meets 12 (1 in park management, 3 in environmental, 3 in social and 5 in economic benchmarks) out of the 64 benchmarks, while 48 benchmarks (8 park in management, 27 in environmental, 8 social and 5 economic benchmarks) are currently not met.



Based on the application of the EIP Assessment Tool, a set of EIP opportunities was identified for consideration by IP Molfar management, covering park management as well as the park's environmental, social and economic performance. In collaboration with IP Molfar management, the EIP opportunities were prioritized based on their likely achievability, potential benefits (economic, environmental and social) and interest from park management and companies. As the park was selected only in Q4 2022, the implementation of the EIP measures was started only in 2023 and will continue until Q3 2024.

IP Molfar scored 20% against the performance benchmarks of the International EIP Framework in 2022 and improved to 21% in 2023 due to the official registration of the management company.



### Short Description of the EIP Opportunity, Results, and Implementation

In the process of transforming IP Molfar into an EIP since January 2023, the project supported the park with the drafting of the following EIP managerial improvements: a Monitoring of EIP compliance, risks, climate risks plan and a Plan for water reuse. The implementation is expected until the end of 2023. The environmental performance was increased because of the participation of tenant companies in the RECP assessments and the capacity-building events on EnMS.

The project supported the park with the implementation of the following EIP managerial improvements: a Monitoring of EIP compliance, risks, climate risks plan and a Plan for water reuse.

Moreover, the IP supports its companies with the energy management system implementation in-line with ISO 50001, more specifically: ME BVAK, IE Rodzin, IE Pryshchepchuk, LLC Trivium Packaging Ukraine participated in the training on "Energy Management Systems" implementation, in line with the EIP requirements under the synergy with the UNIDO/GEF project "Energy Management System Implementation in Industry".

In July 2021, the project conducted assessments on the potential for IS within the enterprises of BVAK IP. Through 20 assessments and a series of industrial symbiosis workshops at BVAK IP, various IS opportunities were identified. However, as a result of armed conflict, IP BVAK was forced to suspend the implementation of most measures. The following companies have **implemented** the following **IS opportunities**:





Energy System Innovation and Metalworking Industry, LTD encountered a nitrogen shortage for their technological needs due to the onset of the Russian invasion of Ukraine. To address this issue, the company has decided to procure a nitrogen station, which has been operational since May 2023.

The **nitrogen station** comes for EUR 240,000 and has a yearly production capacity of 10,000 cylinders. Previously, the company relied on third-party suppliers for nitrogen, which required the transportation of cylinders. This transportation process consumed a considerable amount of diesel fuel. It is estimated that transporting 10,000 cylinders resulted in the consumption of approximately 4,170 liters of diesel fuel, equivalent to 187.65 GJ of energy and 13.9 tons of CO<sub>2</sub>eq emissions. Each cylinder, with a capacity of 40 liters, had a cost of EUR 12, including delivery. However, with the nitrogen station in operation, the company will be able to produce nitrogen internally, eliminating the need for cylinder transportation. The production cost of 1 cylinder is estimated to be EUR 2.75, resulting in annual savings of around EUR 92,500. The investment in the nitrogen station is expected to have a simple payback period of 2.6 years.

### The economic indicators of the nitrogen station installation

<b>Investment</b>	<b>240,000 EUR</b>
<b>Revenue</b>	<b>27,500 EUR</b>
<b>Saving potential</b>	<b>92,500 EUR</b>

Aviaguma LLC participates in IS by **utilizing rubber products** from neighbouring enterprises and its rubber waste as raw materials. The company supplies its products to both the foreign market and other businesses within the park, specifically rubber spare parts for technical equipment. Annually, Aviaguma processes approximately 0.6 tons of rubber waste from the park, leading to reduced logistics costs for waste removal and lower CO<sub>2</sub>eq emissions from burning automotive fuel. The disposal of rubber waste also contributes to a reduction in the release of harmful substances into the atmosphere. Thermal degradation of automotive rubber can release around 20 different groups of toxic substances mostly belonging to the first or third toxicity class.

Kyiv Standart LLC arranges **purchases of glass** and mirrors for other furniture companies within the IP. This practice, this supply chain synergy, enables cost reduction in components, leading to decreased expenses for finished products. Consequently, this contributes to the overall competitiveness of the park's enterprises in the market.

Two additional **IS opportunities** were indicated by the companies as the most promising **for future implementation**:

Reactive power compensation. At present, all companies operating within the IP rely on shared power grids for their electricity needs. It has been observed that most of these companies utilize equipment generating reactive power, which can have an adverse impact on the overall power quality.

Specifically, the plan involves installing a 60 kVAr reactive power compensation unit at TS No. 274 and an 80 kVAr reactive power compensation unit at TS No. 5. These installations aim to mitigate the adverse effects of reactive power and improve the overall power quality within the IP. CAPEX is EUR 3,907. Annual savings EUR 3,360 per year. The simple payback period is 1.16 years. The



compensated reactive energy will be 840,000 kVAr per year. The total bill of resident companies for the flow of reactive energy will decrease by EUR 3,360 per year.

BVAK management is interested in the implementation of this measure and plans to implement it after the military conflict ends.

Trivium Packaging Ukraine LLC is exploring the option of supplying thermal energy to neighbouring enterprises by utilizing flue gas heat. The potential for heat recovery is estimated to be between 750 and 1,500 MWh per year. As part of the IS efforts, this initiative would reduce CO<sub>2</sub>eq emissions by approximately 150 to 300 tons per year. The details of this measure can be found in the report by the RECP Center in July 2021. The company's management plans to implement this measure in 2024, as the allocated financial resources for capital expenditures have already been utilized.

Additionally, the company's management considers using the recovered heat for their own needs, thus significantly reducing the consumption of natural gas for heating production facilities during the winter season.

## Capacity Building

The following EIP training sessions with associated training objectives were organized for IP Molfar and tenant companies:

EIP (incl. on EnMS) and RECP training activities:

- » Learn about approaches and key requirements for a transition of IP into eco-industrial;
- » Learn about practical solutions, approaches and key requirements for resource-efficient and cleaner production at an IP level;
- » A better understanding of the current status, challenges and opportunities of resource-efficient and cleaner production in IPs in Ukraine;
- » How the EIP approach can bring concrete business opportunities, economic savings and enhanced competitiveness to waste management and recycling in IPs;
- » Learn about approaches and key requirements for implementation of the Energy Management system at an IP level and at a resident company level and its role for IPs during their transition into eco-industrial;
- » Learn about practical solutions, approaches and key requirements for the implementation of the Energy Management system;
- » Better understanding the current status, challenges and opportunities of Energy management systems in IPs in Ukraine;
- » Learn about the existing incentives for implementation of the Energy Management system at an IP level and a resident company level.

G2B training session

- » Learn about the methodology of identification the business needs to operate respectively to the EIP International Framework recommendations;



- » Learn how to start a dialog between the government and the community about possible support mechanisms for EIP development.

### Technical Assistance

The main industrial sector in IP Molfar is the wood furniture industry.

The following companies are receiving RECP support:

No	Company Name	Company information
1	"LEVEL", LLC	Production of wooden furniture and carpentry, production of kitchen furniture
2	"M-MEBEL", LLC	Production of wooden furniture and carpentry products, full-cycle production
3	"PAVLYK-M", LLC	Production of wooden furniture and carpentry, production of kitchen furniture
4	PE Mocan	Production of wooden furniture and carpentry products, full-cycle production
5	PE Moldovan	Production of wooden furniture and carpentry, production of kitchen furniture
6	LTL Group, LLC	Supplier of comprehensive technological solutions for woodworking and furniture industry. They specialize in providing a wide range of products, including varnish and paint materials, equipment for varnishing and wood processing, as well as glue and related materials.
7	"MAYR HOLZWAREN", LLC	Woodworking enterprise with foreign investments, founded in 2004 by an Austrian investor. The company specializes in the production of furniture blanks, kitchen accessories, and sports equipment from hardwood species.
8	Marko Mebel, LLC	Production of tables and chairs for various types of institutions and premises. The company was founded in 2002 as a family business, and the total area of production premises is 1950 m <sup>2</sup> .
9	PE Dzhugan	Production of fuel pellets from wood sawdust and shavings.
10	PE Bodor	Sells solid biofuel for European and Ukrainian markets.



## IP PATRIOT

### Background of the Park, Initial EIP Scoring, and Areas of Improvement

Located in the town of Sumy, the IP Patriot is based on a large textile enterprise called ‘Sumy worsted and spinning factory’ built back in 1987. The IP is a complex of buildings, facilities, and communications located on a single plot of land fully equipped with the infrastructure that is necessary to run the industrial activities of the companies-owners and the tenants. Founded in 2008, Patriot LLC. is the IP’s management now. The IP PATRIOT occupies an area of about 8.5 hectares within the town and by the highway. There is one residential building next to the park. The overall IP has the following facilities on its territory:

- » Production and warehouse premises – 55,000 m<sup>2</sup>;
- » Office space – 25,000 m<sup>2</sup>;
- » Commercial premises – 4,000 m<sup>2</sup>.

There are 142 companies representing various industries on the IP’s territory. There are sewing production, manufacturers of non-woven materials, food products, car service stations, production shops for mechanical processing, tenants, etc.



Within all IP companies, the share of manufacturing companies makes up 36% (51 companies). These companies are relatively small and they occupy the production premises of the former carding plant. No significant modernization of the plant’s supply systems has been carried out now. Some enterprises are still using the equipment of the former plant, though it is obsolete with poor automation. The enterprises producing nonwoven materials as well as sewing companies are among the largest IP companies. These production facilities generate lots of waste and there are



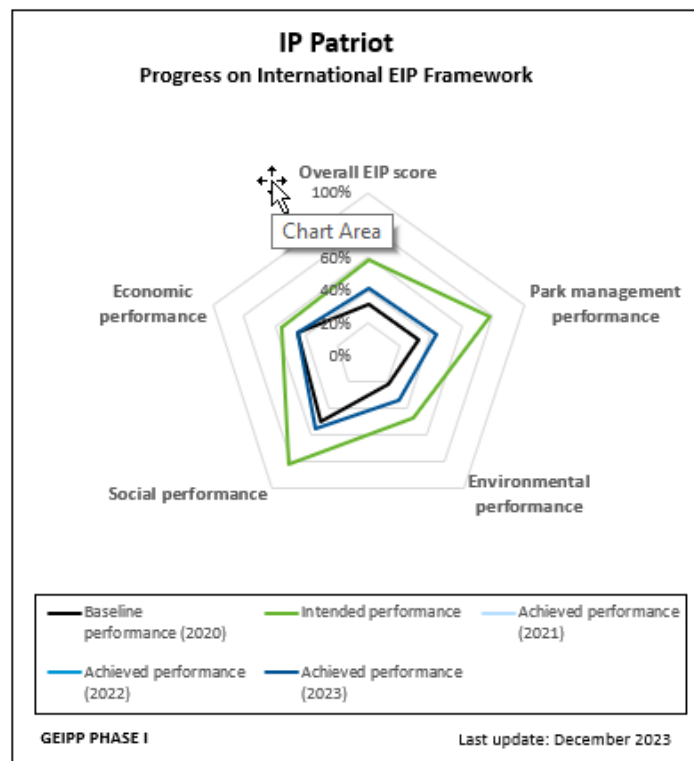
opportunities to use these waste to make other products. The companies also have the potential to improve energy efficiency through the modernization of the lighting systems at the production sites. IP PATRIOT offers various services and the basic ones are given below:

- » Electricity transmission and conversion;
- » Water supply and drainage (own artesian well, own sewage network, connected to the municipal system);
- » Space heating (3 independent boilers);
- » Permit regime services;
- » Territory protection, video surveillance;
- » Telephone connection, Internet;
- » Leasing non-residential premises, facilities and special equipment.

The assessment against the EIP Framework in 2019 showed the following baseline scoring Park Management performance 33%, Environmental performance 21 %, Social performance 50%, Economic performance of 45 % giving an overall EIP score of 32 %.

Despite that the park was damaged in 2022 during the invasion of Ukraine, it achieved the highest performance among all the targeted parks. More specifically, the best performance of the park is in the management and environment categories due to the implementation of many EIP measures, such as Monitoring performance and risks; Climate risk assessment; Environmental and Energy Management Systems.

IP Patriot scored 31% against the performance benchmarks of the INTERNATIONAL EIP FRAMEWORK in 2019, and improved to 44% in 2023, due to the adoption of several plans to improve the management of the park.



## Short Description of the EIP Opportunity, Results, and Implementation

The IP management selected those five EIP initiatives that interested them the most and met the goals of IP development:

- » Development of a system to monitor progress in environmental, social and economic performance at the park level
- » Interviewing the tenants to figure out their satisfaction with the work of the management company.
- » Participation of the tenants in international projects on technical support aiming to draft and implement a Program to enhance energy efficiency
- » Development of an industrial solid waste accounting system to find options for IS

As of August 2023, the IP Patriot adopted a plan to react to possible negative impacts due to climate change and operational plans to increase water reuse in the next five years.

## Capacity Building

The following EIP training sessions with associated training objectives were organized for IP Patriot and tenant companies.

EIP (incl. on EnMS) and RECP training activities:

- » Learn about approaches and key requirements for the transition of IP into eco-industrial;



- » Learn about practical solutions, approaches and key requirements for resource-efficient and cleaner production at an IP level;
- » Better understanding of the current status, challenges and opportunities of resource-efficient and cleaner production in IPs in Ukraine;
- » How the EIP approach can bring concrete business opportunities, economic savings and enhanced competitiveness to waste management and recycling in IPs;
- » Learn about approaches and key requirements for implementation of the Energy Management system at an IP level and at a resident company level and its role for IPs during their transition into eco-industrial;
- » Learn about practical solutions, approaches and key requirements for the implementation of the Energy Management system;
- » A better understanding of the current status, challenges and opportunities of Energy management systems in IPs in Ukraine;
- » Learn about the existing incentives for implementation of the Energy Management system at an IP level and a resident company level.

### Technical Assistance

IP Patriot boasts well-maintained facilities, indicating a strong commitment to creating a conducive environment for industrial activities.

The following companies will participate in RECP Assessments:

Company Name	Company information
Management company of Patriot IP	IP Patriot was created on the basis of a large textile enterprise — Sumy worsted-spinning factory, built in 1987.
ATHLETIC UNION LLC	Manufacturer of modern high-quality sportswear and equipment for active life, mixed martial arts, fitness, yoga, bodybuilding and other sports.
"Sumikamvol" LLC	<p>Processing of sheep's wool and production of wool for</p> <ul style="list-style-type: none"> <li>» felting and knitting;</li> <li>» bast fibers (flax, hemp);</li> <li>» production of fillers and non-woven fabric from natural and synthetic fibers</li> <li>» tailoring of natural textiles for sleep (blankets, pillows, toppers, etc.);</li> <li>» provision of yarn and fiber dyeing services, and any additional processing of yarn (rewinding, twisting, steaming, etc.).</li> </ul>





"Sumiphytopharmacia" LLC	Renowned Ukrainian company that specializes in the cultivation, collection, processing, and distribution of medicinal plant raw materials, spices, and natural ingredients used in tea production. With a strong focus on quality and sustainability, the company has established itself as a leader in providing plant raw materials to the pharmaceutical and food industries in Eastern Europe. Apart from their core activities, "Sumifitopharmatsia" also offers value-added services including grinding, granulation, purification, and the production of powdered medicinal plant raw materials.
"PREMIUM-DESIGN LTD" LLC	The company is engaged in the production and installation of stretch ceilings.
"Food Center" LLC	Manufacturer of paper tableware.
"VULTEKS" LLC	Textile production, wool, hats, bedcovers
Individual entrepreneur "Matveev"	Manufacturer of home textile products (bed linen, blankets).
"Radian" LLC	Production of clothing.
Individual entrepreneur Salai	Production of wooden furniture and carpentry, production of kitchen furniture.
Individual entrepreneur Getta K13	TM "Dobroizh": production of food products, energy bars.

## KALUSH INDUSTRIAL HUB

### Background of the Park, Initial EIP Scoring, and Areas of Improvement

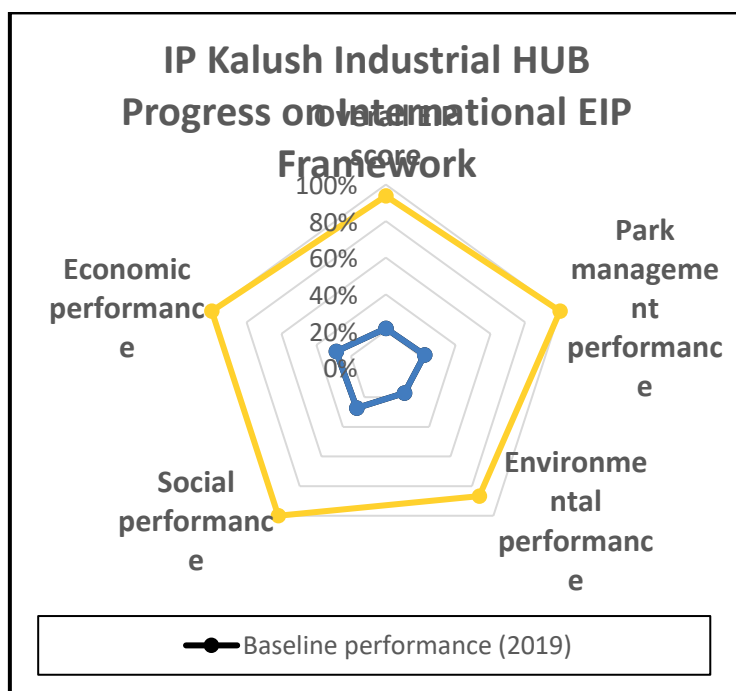
Kalush Industrial HUB is located within the city of Kalush, at a distance of 2 km from the city to the East, at the entrance from Ivano-Frankivs'k. The city of Kalush with its surrounding territories is historically an industrial center in the West of Ukraine. A number of small, medium and large industrial enterprises of the mining, woodworking, machine building, petrochemical and other processing industries are located on the territory of the city. The territory of IP consists of several land plots. All plots together with the objects placed on them are privately owned and used by Ch. A.S LLC.

Ch. A.S LLC, with more than 20 years of experience in managing industrial and warehouse property, is the initiator of this IP. The company has sufficient capabilities, experience and competencies to manage the IP, as well as attract financing for its further development.

Based on the application of the EIP Assessment Tool, the project supported the park with the drafting of the following EIP managerial improvements: a **Monitoring of EIP compliance, risks, climate risks plan** and a **Plan for water reuse**. The implementation is expected until the end of 2023.



Kalush Industrial HUB scored 21% against the performance benchmarks of the International EIP Framework in 2022 and there has been no change as of today.





## Short Description of the EIP Opportunity, Results, and Implementation

In the process of transforming IP Kalush Industrial HUB into an EIP since January 2023, the project supported the park with the drafting of the following EIP managerial improvements: a Monitoring of EIP compliance, risks, climate risks plan and a Plan for water reuse. The implementation is expected until the end of 2023.

### Capacity Building

The following EIP training sessions with associated training objectives were organized for IP Kalush:

EIP and RECP training sessions:

- » Learn about approaches and key requirements for the transition of IP into eco-industrial;
- » Learn about practical solutions, approaches and key requirements for resource-efficient and cleaner production at an IP level;
- » Better understanding of the current status, challenges and opportunities of resource-efficient and cleaner production in IPs in Ukraine;
- » Learn how the EIP approach can bring concrete business opportunities, economic savings and enhanced competitiveness to waste management and recycling in IPs.

G2B training sessions:

- » Learn about the methodology of identification the business needs to operate respectively to the EIP International Framework recommendations;
- » Learn how to start a dialog between the government and the community about possible support mechanisms for EIP development.

### Technical Assistance

The project provides technical assistance to Kalush Industrial HUB to help them improve the energy efficiency of the main building to be able to receive the tenants that will relocate from the East of the country. This work is ongoing.

## AGROMASH INDUSTRIAL PARK

### Background of the Park, Initial EIP Scoring, and Areas of Improvement

The IP Agromash is located in the southern part of Zaporizhzhia town. The IP occupies an area of about 10 hectares and has a transport infrastructure, in particular, two types of access roads: automobile and river. There are 30 enterprises located within the IP.

The IP consists of the following:

- » Industrial site, located on the highway;
- » Warehouse space (mainly in lease);



Industrial premises are mainly leased now or let to business companies. These premises are used for the production of a variety of industrial and domestic products. In particular, there are about 10 manufacturing enterprises presenting such industries as mechanical engineering, metalworking, instrument making, woodworking, furniture, and chemical industry, etc.



The main manufacturing enterprises located in the IP area are mainly engaged in the following activities:

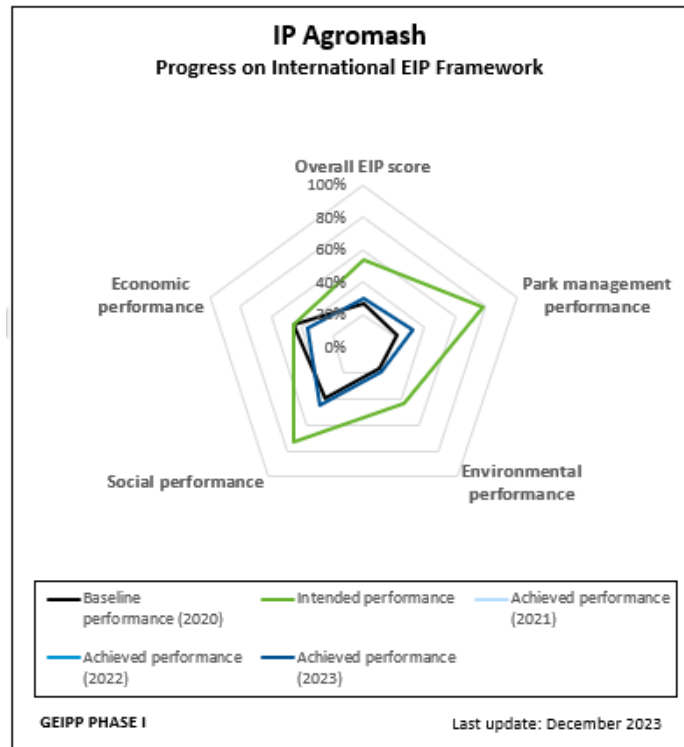
- » production of machinery and equipment for agriculture and forestry;
- » production of other metal tanks, reservoirs, and containers;
- » mechanical processing of metal products;
- » production of fittings, rolled steel, pipes, rods;
- » production of furniture and commercial equipment;
- » wholesale warehouses for the sale of building materials, consumer goods;
- » an enterprise for the purification and sale of drinking water, and others.

The assessment against the EIP Framework in 2019 showed the following baseline scoring Park Management performance 22%, Environmental performance 17 %, Social performance 40%, Economic performance of 45 % giving an overall EIP score of 27 %.

Despite the fact that the collaboration with the park has been on hold since February 2022 (too close to the active military actions zone), it shows great achievements in overall EIP performance.



IP Agromash scored 27% against the performance benchmarks of the INTERNATIONAL EIP FRAMEWORK in 2019 and improved to 38% today, mainly due to the adoption of a system to monitor *IP performance, manage risks and identify climate change adaptation measures*.



### Short Description of the EIP Opportunity, Results, and Implementation

The IP adopted IP monitoring performance, risk management and climate change adaptation measures.

### Capacity Building

The following EIP training sessions with associated training objectives were organized for IP Agromash and tenant companies.

EIP and RECP training sessions:

- » Learn about approaches and key requirements for a transition of IP into eco-industrial;
- » Learn about practical solutions, approaches and key requirements for resource-efficient and cleaner production at an IP level;
- » Better understanding of the current status, challenges and opportunities of resource-efficient and cleaner production in IPs in Ukraine;
- » Learn how the EIP approach can bring concrete business opportunities, economic savings and enhanced competitiveness to waste management and recycling in IPs.



### Technical Assistance

Since the park is at the frontline the project couldn't provide any technical assistance to the resident companies.

### SUMMARY AND CONCLUSION

- » It is encouraging to see that the IPs that have implemented EIP approaches are demonstrating progress in improving resource productivity and business opportunities while also promoting economic, environmental, and social performances.
- » In particular, all the selected parks have shown a high level of commitment (especially the parks which are close to the active military actions zone or were damaged during the first month of the invasion) to implementing identified EIP opportunities, and continued support could lead to further improvements in performance against the INTERNATIONAL EIP FRAMEWORK.
- » Similarly, the industrial parks in the west of Ukraine show promise with regard to the INTERNATIONAL EIP FRAMEWORK, and additional technical support could help them achieve their intended improvement potential as per the EIP Frameworks. They see themselves as a platform for the relocation of enterprises from the east of Ukraine as well as for clusterization.
- » On the other hand, industrial parks (and especially officially registered industrial parks) are not many in Ukraine and they are smaller in size compared with other GEIPP countries. This explains why the impact of RECP and IS implementation is relatively low. A loose definition of IP, to include also "clusters" would be more appropriate to the national context.
- » .
- » It would be beneficial to continue building capacity in non-pilot IPs on specific EIP topics like EIP master planning (including business planning and market research), park management, and industrial synergies, which will help the regions to identify cluster opportunities and support the development of the most promising supply-chains.
- » .EIPs, intended as delimited industrial areas or as industrial clusters, have the potential to serve as a platform for infrastructure development that will help support the country's green recovery. EIP development would contribute to clustering for a greener and more competitive industry, the restoration of broken supply chains, and the creation of new job opportunities, especially for internally displaced people.



# Annex G

Results from GEIPP I Priority Parks in Viet Nam





## ANNEX G: RESULTS VIET NAM

The Global Eco-Industrial Parks Programme in Vietnam (GEIPP-VN) started in May 2020, funded by the Swiss Government through the State Secretariat for Economic Affairs of Switzerland (SECO). GEIPP-VN is implemented in collaboration with the Department of Economic Zones Management of the Ministry of Planning and Investment (MPI).

Country	Vietnam
Number of Industrial Parks in the Country	333 industrial parks
Number of GEIPP Priority Parks	4+1 Industrial Parks
Number of Industrial Parks taking part in awareness and capacity building activities of GEIPP Vietnam	32 Industrial Parks

The objective of the GEIPP-VN is to demonstrate the viability and benefits of Eco-Industrial Park approaches in scaling up resource productivity and improving economic, environmental and social performances of businesses and thereby contribute to inclusive and sustainable industrial development.

333 industrial parks (IPs), out of which 258 are in operation, are located in 61 Vietnamese provinces. Most IZs are located in the main economic areas of the country (Mekong River Delta 51, South East 113 and Red River Delta 89).





In the framework of the awareness raising and training activities, UNIDO organized training programmes for stakeholders involved in the development and transition to the EIP model in Vietnam. The trainings were well-received, attracting active participation from stakeholders such as: industrial park developers, local industrial park authorities, tenant companies, central and local government agencies, and media and communications agencies.

These training sessions helped stakeholders in Vietnam enhance their capacity and understanding of the eco-industrial park model, its associated benefits, and the practical implementation process.

GEIPP Ukraine has offered training to 1334 personnel in Small and Medium Enterprises (SMEs), 818 individuals in industrial park management, and 640 service providers. Enterprises have independently carried out 379 Eco-Industrial Parks (EIP) activities without additional support from GEIPP. This outcome resulted from implementing 63 capacity-building initiatives over the five-year duration of GEIPP I.

## DEEP C INDUSTRIAL PARK



### Background of the Park, Initial EIP Scoring, and Areas of Improvement

The Deep C Hai Phong Industrial Park (also known as Dinh Vu Industrial Park) was established in 1997, with the investor being Dinh Vu Industrial Zone Joint Stock Company. This was the first foreign-invested industrial park project in Hai Phong City. (Dinh Vu Industrial Park Joint Stock Company has 75% foreign shareholders, and 25% of its shares are managed by Hai Phong City People's Committee on behalf of the state capital contribution). The project has a planned total area of 541 hectares and is implemented in two phases:

Phase 1: With an area of 164 hectares, it was approved for investment and construction began in 1997. Deep C Phase 1 had a total investment capital of \$79.93 million with a comprehensive industrial nature (heavy industry, light industry, chemical-petroleum industry) and included the construction of a liquid cargo port and a direct seaport within the industrial zone.

Phase 2: With a planned area of 377 hectares. Deep C Phase 2 had a total investment capital of \$88 million and includes heavy industry, light industry, chemical industry, and petrochemical industry.



Deep C industrial park is one of the industrial park planned within the customs zone of the Dinh Vu-Cat Hai Economic Zone. Being located within the boundaries of the economic zone has allowed Deep C industrial park (Dinh Vu industrial park) to enjoy the best tax incentives, which have facilitated attracting domestic and foreign investment projects.

Deep C has 70 operating companies in the textile, machinery manufacturing, automation equipment, petrochemical, plastics, and other industries, of which 61 businesses are SMEs, accounting for 87% of the total number of companies in the area.

Deep C industrial park performs and compares very favourably against large proportions of the benchmarks in the International EIP Framework. In summary, Deep C Industrial Park fully met 47% of the applicable benchmarks in 2020. With current and upcoming initiatives DEEP C Industrial Park intended the reach a performance of meeting 87% of the international EIP indicators.

The following topics had lower baseline compliance scorings indicating that efforts overall should prioritize these topics:

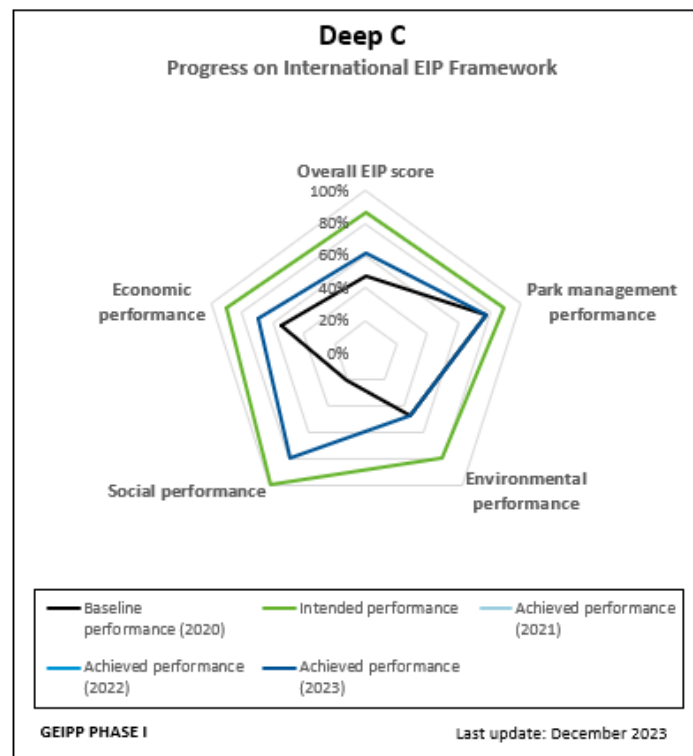
- » Planning and zoning;
- » Management and monitoring;
- » Water;
- » Energy;
- » Waste and material use;
- » Local business & SME promotion
- » Monitoring and risk management;
- » Social infrastructure;
- » Economic value creation;

The following topics had the highest baseline compliance scorings indicating overall that Deep C management and tenant firms need less intensive technical assistance on these topics covered by the International EIP Framework:

- » Park management services;
- » Social management systems;
- » Local community outreach;
- » Employment generation.

A set of practical EIP opportunities were identified and prioritized for Deep C based on the review against the International EIP Framework. These opportunities included: marketing and promotion, resource efficiency, energy, industrial symbiosis and urban-industrial symbiosis.

DEEP C scored 47% against the performance benchmarks of the International EIP framework in 2020 and has achieved 62% performance in 2022 with potential to achieve 87% in the future. The chart below illustrates Deep C's progress against the international EIP framework.



## Short Description of the EIP Opportunity, Results, and Implementation

### Effective Resource and Cleaner Production

The project assessed RECP opportunities for 19 factories in DEEP C Industrial Park, providing technical support to propose a total of 137 RECP solutions related to electricity savings, fuel savings, and delivering economic, environmental, and social benefits for participating businesses in the project.

The assessment results as of July 2023 show that out of a total of 137 solutions identified with support from the project, businesses have implemented 51 solutions (37%), and 40 solutions (29%) are in the planning stage.

Through the implementation of these solutions, businesses at Deep C have achieved the following savings and environmental benefits as table 3 below:

### Industrial Symbiosis and Urban-Industrial Symbiosis

As presented above, the project has supported Deep C Industrial Park to conduct research to identify opportunities for industrial symbiosis between tenant companies within Deep C Industrial Park and between Deep C Industrial Park and nearby residential area. However the implementation of industrial symbiosis and urban-industrial symbiosis opportunities in Vietnam, especially in Deep C Industrial Park, still faces many challenges:

#### Legal barriers:

- » Regulations related to the recycling and reuse of waste and scrap are still scattered in many different legal documents, making it difficult for businesses to understand and apply.



- » Some legal regulations on recycling and reuse of waste and scrap are not yet in line with reality, making it difficult for businesses to implement these activities.
- » According to Vietnamese legal regulations, businesses sometimes have to adjust their production technology, business registration, investment certificate, etc. to implement industrial symbiosis activities. This can cause production disruption, cost for businesses and reduce the attractiveness of implementing opportunities.

#### Technical barriers:

- » Vietnam currently lacks standards related to recycling and reusing treated wastewater and waste, making it difficult for businesses to implement these activities.

#### Economic barriers:

- » For the development of rooftop solar power, businesses must apply for a series of licenses, which is difficult and costly. In addition, according to current regulations, the capacity for rooftop solar power is only allowed to be installed below 1MW, which is unattractive to investors.

#### Awareness barriers:

- » Support policies for industrial symbiosis are still limited. Businesses often have to bear the costs of investing and implementing industrial symbiosis opportunities, sometimes at a large cost. This makes it difficult for businesses to implement these opportunities.

Due to these challenges, the Project, Deep C Industrial Park and relevant stakeholders have organized meetings to discuss the priorities for implementing the opportunities mentioned above. At the meetings, all relevant parties agreed that the 6 industrial support opportunities and 5 urban industrial support opportunities that are easy to implement and have the highest feasibility should be prioritized to improve the feasibility of implementing the opportunities. The remaining opportunities will be implemented at a later stage. The eleven priority opportunities are as follows:

- 1) Deep C has invested in an RO filtration system to treat industrial wastewater after processing it at the wastewater treatment station, providing it as a reclaimed water source for businesses in need
- 2) Deep C develops a shared website platform for all the companies within the industrial park
- 3) Deep C leases the rooftops of companies within the industrial park to develop a rooftop solar power system for sale to businesses within the industrial park
- 4) The energy services company provides highly skilled workers to operate high-capacity boilers for large businesses within Deep C
- 5) Deep C invests in an additional treatment system to treat treated wastewater to make production water for a glass manufacturing company.
- 6) Deep C organizes training sessions for companies within the industrial park
- 7) Sharing wastewater treatment services of Deep C Industrial Park Wastewater Treatment Plant with Hai An District – Hai Phong City
- 8) Sharing oil spill response services between Deep C Industrial Park and Hai Phong City
- 9) Sharing the firefighting forces and means of Deep C Industrial Park with Hai An District





## 10) Developing social housing for workers

### 11) Shuttle Bus Service

Due to various barriers, especially legal and financial issues, to date, eight out of nine industrial symbiosis and urban-industrial symbiosis opportunities described above, despite being assessed as highly feasible by Deep C, the Hai Phong city government, have not yet been implemented.

At present, only one urban-IS opportunity between Deep C industrial park and Hai An has been successfully implemented: the sharing firefighting forces services.

Hai Phong has fire departments that are highly concentrated in the central city, districts, and towns. However, Hai An district still has some high-risk residential areas, which are far from the city center but near the DEEP C Industrial Park. The developer of the DEEP C Industrial Park has a professional fire department. According to the department's operating regulations, it is responsible for responding to fires, rescues, and emergencies at companies in the industrial park, including customers who rent land, warehouses, or factories in the industrial park. Currently, the DEEP C Industrial Park has 3 specialized fire engines and 19 firefighters.

To use the available fire resources and ensure rapid and timely response to minimize the damage caused by possible fires in Hai An district, the project has proposed that DEEP C share personnel, equipment, and facilities to respond to fire accidents in the district. Rapid and timely response is essential to minimize the damage caused by fires.

Specifically, on 12 September 2023, the Hai An district police and Deep C industrial park signed an industrial-urban symbiosis agreement to implement this opportunity. This serves as clear evidence of the project's effective support for Deep C Industrial Park in its transition to an eco-industrial park.



*The signing ceremony for the implementation of urban-industrial symbiosis between Deep C Industrial Park and Hai Phong City*



For the remaining opportunities, the project continues to support Deep C Industrial Park and relevant parties in feasibility studies for potential implementation in the future.

Furthermore, the project has provided support to the Government of Vietnam and relevant stakeholders in carrying out activities aimed at enhancing policies for the development of ecological industrial park models in Vietnam. This support is intended to facilitate the future implementation of these EIP opportunities. (Please refer to A Brief Report on the EIP Policy Development for more details).

#### EIP model in Viet Nam training

- » Ecological Industrial park (EIPs) Model in Vietnam and related policies.
- » Assessment facilities for EIP and Opportunities.
- » Industrial Symbiosis: Concepts and Key Tools.
- » Resource Effective and Cleaner Production (RECP) approaches in industry.
- » Illustrative Examples.

#### Resource efficiency and cleaner production and industrial symbiosis training

- » Benefits and Challenges of Eco-Industrial Parks;
- » Resource Effective and Cleaner Production (RECP) Approaches in Industry;
- » Industrial Symbiosis: Concepts and Key Tools;
- » Methods for Rapid Assessment of Resource Efficiency and Cleaner Production Options for Manufacturing Enterprises;
- » Additional Assessment Methods;
- » Electricity Usage Assessment;
- » Water Assessment.

#### EIP indicators training

- » Introduction to the International EIP Criteria
- » Methodology for Determining the EIP Indicator
- » EIP Methodology
- » Real-life examples

#### Institutional framework and implementation for EIP training

- » New regulations for transforming conventional industrial parks into EIPs and for establishing new EIPs regulations on the circular economy,
- » Sharing international and national experience from EIP demonstration,
- » Technical solutions and financial tools

#### Financial Tools to support companies and IPs in Transforming into Eco-industrial Parks Model in Vietnam training

- » Types of existing financial mechanisms domestically and internationally,





- » Diverse sources of financing for eco-industrial park transformation initiatives,
- » Overview of financial access tools,
- » Detailed guidance and practical application of financial tools (A2F).

#### Industrial Symbiosis in Deep C Industrial Park

- » Key concepts to the identification and implementation of industrial symbiosis;
- » Methods and tools related to the identification and implementation of industrial symbiosis;
- » Information on industrial symbiotic options which have been studied and implemented in Vietnam;
- » International experience.

#### Guidelines for solid waste reuse in Industrial Parks training

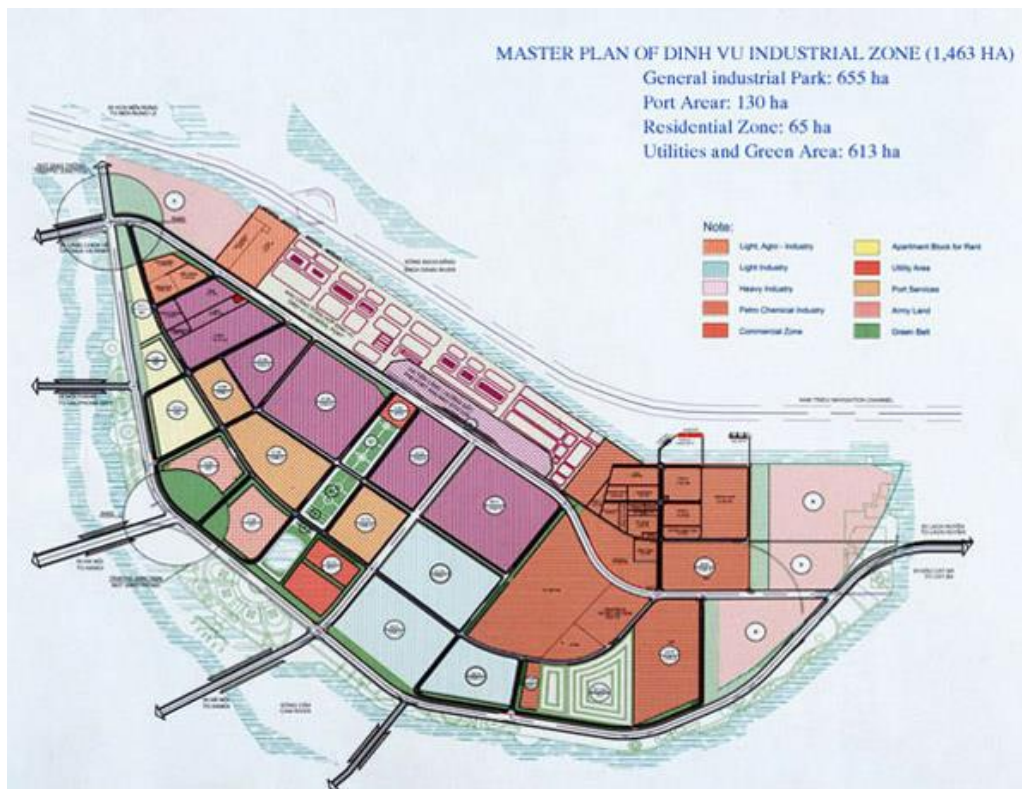
- » International experiences in waste recycling towards a circular economy;
- » Exemplary studies on waste recycling and potential industrial symbiosis opportunities in industrial park;
- » Legal regulations and the current status of solid waste management in industrial park;
- » Introduction of guidelines on waste recycling in industrial park in Vietnam

#### Opportunities for industrial symbiosis

- » EIP and Key Concepts
- » Criteria for EIP as per the regulations of the Vietnamese government
- » Definition of industrial symbiosis
- » Forms of industrial symbiosis
- » Implementation possibilities of industrial symbiosis at Deep C

#### Opportunities for urban-industrial symbiosis

- » EIP and Key Concepts
- » Criteria for EIP as per the regulations of the Vietnamese government
- » Definition of industrial symbiosis
- » Forms of industrial symbiosis
- » Implementation possibilities of urban-industrial symbiosis at Deep C



### Effective Resource and Cleaner Production Assistance

The RECP assessments were conducted in 19 tenant companies at Deep C IP (of which 63% are SMEs). The primary objective of these assessments was to identify RECP and EIP implementable opportunities that would contribute to each company's resource savings in energy, water, waste, and materials. The aim was to achieve more sustainable practices and increased competitiveness through resource-efficient production practices. The project has conducted several activities to support the implementation of RECP solutions at enterprises at Deep C IP as follows:

- » *Identifying potential enterprises to participate in the project:* The project used the list of enterprises in DEEP C Industrial Park to identify manufacturing companies with the potential to participate in the project.
- » *Developing a rapid RECP assessment program:* The project developed a rapid RECP assessment program for potential enterprises to participate in the project. This program aims to identify RECP implementation opportunities at enterprises.
- » *Supporting the establishment and maintenance of RECP teams in enterprises:* The project supported enterprises in establishing and maintaining RECP teams. These RECP teams will be responsible for implementing RECP solutions at enterprises.
- » *Building capacity for employees on RECP implementation:* The project organized technical exchange activities to improve the capacity of employees of enterprises in RECP implementation in practice.



- » *Persuading enterprises to develop plans to implement potential RECP solutions:* The project persuaded enterprises to develop plans to implement potential RECP solutions that the project has identified.
- » *Providing technical assistance and guidance on the implementation of RECP solutions:* The project provided technical assistance and guidance on the implementation of in-depth RECP solutions for enterprises.
- » *Reviewing the implementation of all RECP options:* The project reviewed the implementation of all RECP options and the changes in material/energy/chemical/water consumption, as well as waste generation, to assess the effectiveness of the options.
- » *Proposing new focus areas for RECP assessment at the enterprise:* The project proposed new focus areas for RECP assessment at the enterprise.

As of today, 19 enterprises in the DEEP C Industrial Park underwent the RECP assessment. The project has helped these enterprises identify RECP implementation opportunities, develop plans to implement potential RECP solutions, and support the implementation of RECP solutions while assessing their impacts.

### **Industrial Symbiosis and Urban-Industrial Symbiosis Assistance**

The objective of GEIPP-VN is to demonstrate the feasibility and advantages of EIP approaches in enhancing resource efficiency and improving the economic, environmental, and social performance of businesses, thus contributing to inclusive and sustainable industrial development. To achieve this goal, the project has also provided support to businesses and industrial parks in researching and implementing opportunities for industrial symbiosis and urban industrial symbiosis.

The project has provided technical support to Deep C IP and tenant companies at Deep C IP in conducting pre-feasibility assessments for opportunities related to industrial symbiosis and urban-industrial symbiosis.

Specifically, the project has supported study for 14 industrial symbiosis opportunities and 5 urban-industrial symbiosis opportunities.

14 industrial symbiosis opportunities:

- » Scrap steel collected from companies within the Deep C Industrial Park is transferred to steel company within Deep C IP for processing.
- » Excess steam from a glass manufacturing company is supplied to a tire manufacturing company.
- » Surplus electricity from the co-generation department of a glass manufacturing company is integrated into Deep C Green's power grid for distribution to other companies.
- » Waste plastic collected from companies within the Deep C Industrial Park is transferred to a recycling facility.
- » Heat waste from a steel company is utilized to provide steam to a livestock feed production company.
- » Treated wastewater from the wastewater treatment station in Deep C Industrial Park is used for irrigation.



- » Deep C Industrial Park has developed a shared web platform for industrial park (job recruitment services, supplier directories for materials and equipment, sharing investment attraction information, sharing transportation needs to facilitate collaborative transportation of materials and waste).
- » Deep C Industrial Park provides focused training for companies within the park (legal regulations, environmental, technical, etc.).
- » Development of shared services within the industrial zone (worker laundry, landscaping and maintenance services, industrial maintenance services, industrial catering services, security services, transportation services, waste collection services within the industrial park, implementation of energy-efficient services and energy audits).
- » Deep C Industrial Park develops maintenance services for companies within the industrial zone.
- » Companies within the industrial zone develop renewable energy sources (solar power excess electricity can be integrated into the industrial park and city grid).
- » Energy service companies provide highly skilled boiler operators to large companies with boilers.
- » Deep C Industrial Park provides labor for operating wastewater treatment plants to companies in need.
- » Deep C Industrial Park treats wastewater and then supplies it as reclaimed water to some companies in need.

#### 5 urban-industrial symbiosis opportunities

- » Deep C Industrial Park shares human resources and firefighting equipment to respond to fire incidents in Hai An District and Hai Phong City.
- » Deep C Industrial Park shares human resources and equipment to respond to oil spill incidents with Hai Phong City.
- » Domestic wastewater from Hai An District is directed to Deep C's wastewater treatment station for processing.
- » The city invests in developing social housing for workers in Deep C Industrial Park for purchase or rental.
- » Hai Phong City expands its bus services to transport employees to and from Deep C Industrial Park.

#### The rationale for undertaking the pre-feasibility studies were:

- » Interest and commitment from the Deep C and tenant companies to reduce greenhouse gas emissions and lower the carbon footprint of the Deep C.
- » Utilizing resources such as scrap steel, excess steam, surplus electricity, and waste plastic helps optimize resource usage, reduce waste, minimize hazardous emissions into the environment, and lower production costs as well as waste management expenses for businesses.



- » Activities such as wastewater treatment and plastic recycling help reduce environmental pollution and safeguard Vietnam's natural resources.
- » Developing renewable energy sources will help minimize electricity demand and greenhouse gas emissions, reducing carbon taxes for businesses.
- » Companies can provide services and resources to each other through industrial symbiosis, enhancing competitiveness and business performance.
- » These activities contribute to the development of sustainable industries, improving the quality of life for citizens and contributing to Vietnam's sustainable development goals.
- » Creating shared services and offering training support for businesses can enhance job quality and employment opportunities, simultaneously improving community living standards.
- » Industrial symbiosis activities encourage collaboration among businesses and industrial parks, creating a positive and interactive business environment.
- » Improve the city's readiness, timeliness, and response capacity to large-scale fire and oil spill incidents.
- » Treat domestic wastewater for Hai An District, which currently lacks a treatment plant, in order to meet an unmet need and protect the environment of the surrounding area.
- » Reduce traffic congestion for Hai Phong City and increase revenue and operational efficiency for the city's public bus service.
- » Improve the living conditions of workers and ensure their stable housing, while also promoting local service and socio-economic activities.

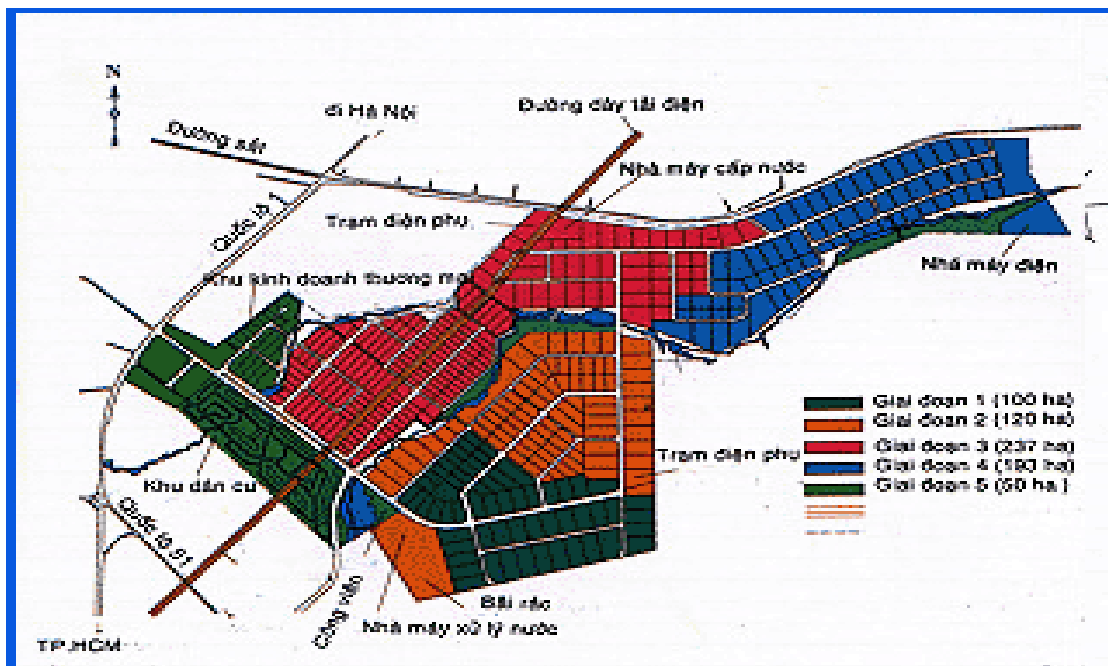
## AMATA INDUSTRIAL PARK





### Background of the Park, Initial EIP Scoring, and Areas of Improvement

Amata is an industrial park located in Bien Hoa City, Dong Nai Province, Vietnam. It was established in 1994 as a joint venture between the Long Binh Industrial Park Development Joint Stock Company (SONADEZI) and Amata Corp. Public Company Limited from Thailand. Amata Industrial Park covers a total area of 410 hectares, with 129 hectares developed in Phase 1, of which 100 hectares are available for lease and fully equipped with quality infrastructure. The occupancy rate of leased land is over 90%. Phase 2 includes the development of 261 hectares and service areas, which are being developed in stages.



The location of Amata Industrial Park is highly advantageous, with a distance of 32 kilometers from the center of Ho Chi Minh City, 32 kilometers from Saigon Railway Station, 4 kilometers from Dong Nai Port, 26 kilometers from Tan Cang Port, 32 kilometers from Saigon Port, and 40 kilometers from Phu My Port.

The technical infrastructure of Amata Industrial Park is comprehensive and modern, including:

- Electricity supply from the Amata power plant with a capacity of 20 MVA and the national grid through a 40 MVA substation.

- Water supply of 2,000 m<sup>3</sup>/day.

- Wastewater treatment plant with a capacity of 1,000 m<sup>3</sup>/day (designed capacity of 4,000 m<sup>3</sup>/day).

- Excellent communication facilities for both domestic and international communication needs.

Amata Industrial Park attracts investments in various sectors such as computer and accessories manufacturing, food processing, electrical and mechanical assembly, electronics, leather and textile products, jewelry, sports equipment, toys, plastic products, industrial products from rubber, ceramics, glass, metal structures, building materials, automotive spare parts, automobile





manufacturing, pharmaceuticals, agrochemicals, insecticides, chemicals, PE fibers, resin pellets, and technological color powders.

Currently, Amata Industrial Park has attracted 170 operation companies, including 48 FDI companies from 12 different countries around the world, with major investments coming from Japan, the United Kingdom, and Singapore.

Amata Industrial Park met 41% of the EIP Indicators. With current and upcoming initiatives Amata Industrial Park intends to reach a performance of meeting 80% of the international benchmarks. All performance aspects have the potential for improvement. Among them, the most significant is Park management performance, followed by Environmental performance, and Economic performance.

The review against the International EIP Framework provided the basis to identify and prioritize a set of practical EIP opportunities which were identified and prioritized for Amata Industrial Park. The opportunities were prioritized based on their anticipated benefits, achievability and interest from Amata IP management.

The following topics had lower baseline compliance scorings indicating that efforts overall should prioritize these topics:

- » Management and monitoring;
- » Water;
- » **Energy;**
- » **Climate change and the natural environment;**
- » **Social management systems;**
- » **Employment generation;**
- » **Local business & SME promotion;**
- » **Employment generation;**
- » Monitoring and risk management;
- » **Economic value creation.**

As for Deep C, a set of practical EIP opportunities were identified and prioritized for Amata IP based on the review against the International EIP Framework. To transition to an eco-industrial park model, Amata needs to focus on low-scoring topics such as management and monitoring, water and energy consumption, climate change mitigation, and social management systems. By focusing on these points, Amata can achieve a balance between resource conservation and enhanced economic competitiveness.

Specifically, Amata can improve low-scoring topics by:

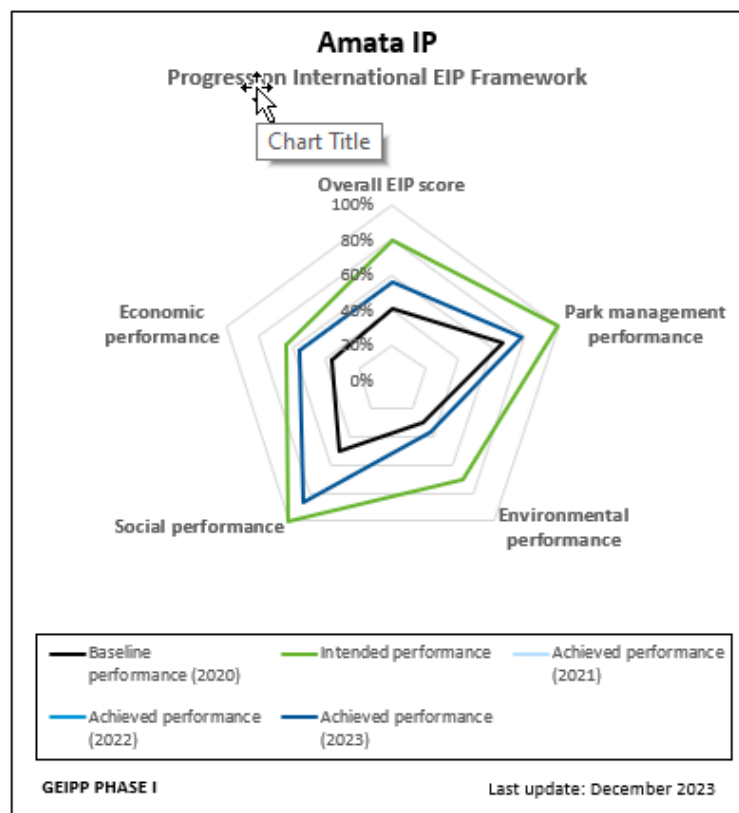
- » Water and energy consumption: Amata can implement water and energy conservation solutions, such as using energy-efficient equipment, reusing wastewater through RECP measures, and deploying industrial symbiosis activities, as well as installing solar panels;





- » Climate change mitigation: Amata can reduce greenhouse gas emissions by using renewable energy and implementing RECP, as well as recycling and reusing waste materials within the industrial park;
- » Social management systems: Amata can improve social management systems by implementing employee training and development programs, supporting local communities, providing training to enhance knowledge and increase income for employees.

Amata Industrial Park scored 41% against the performance benchmarks of the international EIP framework in 2020 and has achieved to 56% performance in 2022 with has potential to improve to 80%. The chart below illustrates Amata's progress against the International EIP Framework.



### Short Description of the EIP Opportunity, Results, and Implementation

#### Effective Resource and Cleaner Production

The project has assessed RECP opportunities for 18 companies in Amata Industrial Park, providing technical support to propose a total of 155 RECP solutions related to electricity savings, fuel savings, and delivering economic, environmental, and social benefits for participating businesses in the project.

The assessment results as of July 2023 show that out of a total of 155 solutions identified with support from the project, businesses have implemented 58 solutions (37%), and 33 solutions (21%) are in the planning stage.



In addition, the implementation of the proposed solution brings environmental benefits, improving the working environment for workers.

#### Industrial Symbiosis and Urban-Industrial Symbiosis

Similarly to what has been discussed regarding Deep C Industrial Park, despite being assessed as highly feasible by relevant parties, urban-industrial symbiosis and industrial symbiosis opportunities face significant legal barriers during implementation. Due to these aforementioned barriers, the Project, Amata IP, and relevant stakeholders have decided to prioritize the implementation of 05 industrial symbiosis opportunities and 4 urban-industrial symbiosis opportunities that are straightforward to execute and have the highest feasibility. The remaining opportunities will be addressed at a later stage.

The 9 priority opportunities are as follows:

- 1) Amata invests in an RO system to reuse wastewater after treatment, which provides some companies with a large demand for water.
- 2) Amata develops a shared website platform for all the companies within the industrial park
- 3) A company in Amata IP collects scrap paper from other companies within the Industrial Park for recycling
- 4) Selling scrap iron and steel for recycling from companies within the Industrial Park
- 5) Plastic company collects scrap plastic for recycling from companies within the Industrial Park.
- 6) Amata Industrial Park shares human resources and firefighting equipment to respond to fires in Bien Hoa City and Dong Nai Province
- 7) Developing renewable energy for companies in the Industrial Park
- 8) Reusing treated wastewater to water plants in the Industrial Park and neighbouring residential
- 9) Amata industrial park development of website foundation for recruitment

The implementation of EIP opportunities, especially urban-industrial symbiosis and industrial symbiosis opportunities still faces numerous barriers, with legal issues related to waste management and wastewater being the most significant hindrances. Additionally, the unclear mechanisms for promoting rooftop solar power development in industrial parks pose challenges in implementing solar energy opportunities. Notably, similar to Deep C, there are currently no industrial symbiosis opportunities implemented in Amata.

Currently, based on the successful experience of implementing urban-industrial symbiosis between Deep C and Hai An District in labor and firefighting services sharing, the project is providing support to AMATA and relevant stakeholders to facilitate the successful implementation of this opportunity in Amata Industrial Park in the near future. Furthermore, to address the challenges in implementing various industrial symbiosis and urban-industrial symbiosis opportunities in Amata Industrial Park, the project is collaborating with relevant government agencies in Vietnam to improve the policies for developing ecological industrial park models, with a specific focus on removing barriers related to waste recycling and reuse within industrial parks. Additionally, the project will continue to



support businesses in Amata in accessing financial resources (if necessary) to enable the practical implementation of these industrial symbiosis opportunities.

### **Capacity Building**

The following Eco-Industrial Parks (EIP) training sessions with associated training objectives were organized for Amata IP and its tenant companies:

Introduction workshop the project “Eco-industrial park intervention in Vietnam – perspective from global eco-industrial parks programme”

- » Introducing the Eco-Industrial Park Model,
- » Benefits of Eco-Industrial Parks and Global Development Trends;
- » Introducing the Updated Legal Framework for the Eco-Industrial Park Model in Vietnam.

EIP model in Viet Nam training

- » Ecological Industrial Park (EIPs) Model in Vietnam and Related Policies.
- » Assessment Facilities for Ecological Industrial Park and Opportunities.
- » Industrial Symbiosis: Concepts and Key Tools.
- » Effective Resource and Cleaner Production (RECP) Approaches in Industry.
- » Illustrative Examples.

Resource efficiency and cleaner production and industrial symbiosis training

- » Benefits and Challenges of Eco-Industrial Parks;
- » Effective Resource and Cleaner Production (RECP) Approaches in Industry;
- » Industrial Symbiosis: Concepts and Key Tools;
- » Methods for Rapid Assessment of Resource Efficiency and Cleaner Production Options for Manufacturing Enterprises;
- » Additional Assessment Methods;
- » Electricity Usage Assessment;
- » Water Assessment.

EIP indicators training

- » Introduction to the International Eco-Industrial Park (EIP) Criteria
- » Methodology for Determining the EIP Indicator
- » EIP Methodology
- » Real-life Examples

Institutional framework and implementation for EIP training

- » New regulations for transforming conventional industrial parks into EIPs and for establishing new EIPs regulations on the circular economy,



- » Sharing international and national experience from EIP demonstration,
- » Technical solutions and financial tools

Financial Tools to support companies and Ips in Transforming into Eco-industrial Parks Model in Vietnam training

- » Types of existing financial mechanisms domestically and internationally,
- » Diverse sources of financing for eco-industrial park transformation initiatives,
- » Overview of financial access tools,
- » Detailed guidance and practical application of financial tools (A2F).

Industrial Symbiosis in Amata Industrial Park

- » Key concepts to the identification and implementation of industrial symbiosis;
- » Methods and tools related to the identification and implementation of industrial symbiosis;
- » Information on industrial symbiotic options which have been studied and implemented in Vietnam;
- » International experience.

Guidelines for solid waste reuse in Industrial parks training

- » International experiences in waste recycling towards a circular economy;
- » Exemplary studies on waste recycling and potential industrial symbiosis opportunities in industrial park;
- » Legal regulations and the current status of solid waste management in industrial park;
- » Introduction of guidelines on waste recycling in industrial park in Vietnam

Opportunities for industrial symbiosis

- » EIP and Key Concepts
- » Criteria for EIP as per the regulations of the Vietnamese government
- » Definition of industrial symbiosis
- » Forms of industrial symbiosis

Implementation possibilities of industrial symbiosis at Amata IP

Opportunities for urban-industrial symbiosis

- » EIP and Key Concepts
- » Criteria for EIP as per the regulations of the Vietnamese government
- » Definition of industrial symbiosis
- » Forms of industrial symbiosis

Implementation possibilities of urban-industrial symbiosis at Amata IP



## Technical assistance

### Effective Resource and Cleaner Production Assistance

Resource Efficient and Cleaner Production assessments were conducted in 18 tenant companies at Amata industrial park aimed at identifying RECP and EIP implementable opportunities that would contribute to each company's resource savings in energy, water waste, and materials to achieve more sustainable practices and increased competitiveness through RECP practices. The assessments consisted of evaluating the company's RECP management practices observing the operations of significant resource users, and evaluating any potential opportunities.

Similarly to Deep C industrial park, the technical assistance steps to support Amata in conducting RECP assessment are as follows:

- » Identifying potential enterprises to participate in the project: The project used the list of enterprises in Amata Industrial Park to identify manufacturing companies with the potential to participate in the project.
- » Developing a rapid RECP assessment program: The project developed a rapid RECP assessment program for potential enterprises to participate in the project. This program aims to identify RECP implementation opportunities at enterprises.
- » Supporting the establishment and maintenance of RECP teams in enterprises: The project supported enterprises in establishing and maintaining RECP teams. These RECP teams will be responsible for implementing RECP solutions at enterprises.
- » Building capacity for employees on RECP implementation: The project organized technical exchange activities to improve the capacity of employees of enterprises in RECP implementation in practice.
- » Persuading enterprises to develop plans to implement potential RECP solutions: The project persuaded enterprises to develop plans to implement potential RECP solutions that the project has identified.
- » Providing technical assistance and guidance on the implementation of RECP solutions: The project provided technical assistance and guidance on the implementation of in-depth RECP solutions for enterprises.
- » Reviewing the implementation of all RECP options: The project reviewed the implementation of all RECP options and the changes in material/energy/chemical/water consumption, as well as waste generation, to assess the effectiveness of the options.
- » Proposing new focus areas for RECP assessment at the enterprise: The project proposed new focus areas for RECP assessment at the enterprise.

As of today, 18 enterprises in Amata Industrial Park underwent RECP assessment. The project has helped these enterprises identify opportunities to implement RECP, develop plans to implement potential RECP solutions, and support the implementation and assessment of RECP solutions.



## Industrial symbiosis and Urban-industrial Symbiosis Assistance

In order to enhance resource efficiency and promote circular economy at Amata industrial park, GEIPP-VN has facilitated exchanges and seminars among relevant parties from Bien Hoa City, Dong Nai Province, and Amata industrial park. Consequently, pre-feasibility assessments of industrial symbiosis and urban-industrial symbiosis activities have been conducted for Amata industrial park to select and implement promising EIP opportunities. Specifically, the opportunities that the project has supported in researching and implementing include:

13 industrial symbiosis opportunities:

- » Collecting waste plastic from companies in the Industrial park for recycling at Vo Song Plastic Co., Ltd, Thanh Tung 2 Co.,Ltd;
- » Collecting scrap iron from companies in the industrial park for recycling at Provision Special Steel Joint Stock Company;
- » Using wastewater after Jovita's RO filtration system to water trees for some neighboring companies;
- » Using treated wastewater to water trees in the industrial park and surrounding urban areas;
- » Collecting scrap paper to supply to Gojo Paper VN Co., Ltd;
- » Companies in the industrial park have a rooftop solar power system connected to the power grid of the industrial park;
- » Development of shared services (Laundry service for workers in industrial park; Cleaning services / taking care of gardens and plants for companies; Sharing industrial maintenance services; Sharing industrial catering services; Sharing the same protection service for industrial parks as well as in enterprises; Sharing heavy transport services (Transporting raw materials, waste); Sharing waste collection service in the industrial park; Implement energy efficiency services at the Industrial zone level; The IP provides energy audit services; Building daycares and kindergartens for the children of workers in the industrial park);
- » Amata Industrial Park Developer building online web platform (Developing recruitment services for companies in IP; Sharing information about opportunities to access investment capital for companies in the IP; Sharing information about transport service providers, waste transporters, suppliers of materials and equipment);
- » Companies with large warehouses can supply or lease them to other companies in the industrial park;
- » Some companies in the industrial park can share fire water tank;
- » Small companies can share the power from transformers of neighbouring companies DY Boiler Vina Co., Ltd. provides boilers and high-quality personnel operating boilers for other companies in the industrial park;
- » Investing in RO system to reuse wastewater after treatment, RO water provides some companies with large water demand.



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#### 4 industrial symbiosis opportunities:

- » Amata Industrial Park shares human resources and firefighting equipment for quick and timely fire response in Bien Hoa City and Dong Nai Province
- » Developing renewable energy for companies in Amata Industrial Park
- » Reusing treated wastewater to water plants in Amata Industrial Park and neighboring residential
- » Amata industrial park development of website foundation for recruitment

The development of EIP opportunities in the Amata Industrial Park aims to optimize resources in the operations of businesses within Amata Industrial Park and bring about numerous economic, environmental, and social benefits. Specifically, these opportunities help:

- » Optimize resource usage: Businesses can share resources and services, reducing resource wastage and cost savings. For example, recycling waste, using treated wastewater, and utilizing renewable energy can help protect the environment and reduce greenhouse gas emissions.
- » Environmental protection: Industrial symbiosis activities typically lead to minimized environmental pollution, including waste treatment and the use of treated wastewater for irrigation. This contributes to environmental protection and reduces greenhouse gas emissions.
- » Cost savings: Companies within the industrial park can share services and resources, reducing operating costs. For instance, sharing human resources, utilizing shared cleaning and security services, or using shared solar energy systems can reduce individual expenses.
- » Social benefits: Industrial symbiosis opportunities can generate social benefits, such as providing employment opportunities, improving the quality of living environments for local residents, and promoting community cooperation.
- » Improved services for businesses: Shared services like cleaning, catering, and landscaping can be provided more efficiently when implemented collectively.





## HIEP PHUOC INDUSTRIAL PARK



### **Background of the Park, Initial EIP Scoring, and Areas of Improvement**

Hiep Phuoc Industrial Park is the largest industrial park in Ho Chi Minh City, located in Nha Be District, Ho Chi Minh City. The park has a total area of 1,686 hectares, divided into 3 phases of development. Phase 1 has been completed and is in operation, phase 2 is under development, and phase 3 is being planned.

Hiep Phuoc Industrial Park has a strategic location, located right at the southern gateway of Ho Chi Minh City, adjacent to Soai Rap River and Nha Be River. The park has convenient connections to major transportation routes such as Ben Luc - Long Thanh Expressway, Ho Chi Minh City - Trung Luong Expressway, National Highway 1A, National Highway 50, etc. In addition, Hiep Phuoc Industrial Park also has an international seaport system within the park, helping businesses save time and transportation costs.

The technical infrastructure system of Hiep Phuoc Industrial Park is invested in a comprehensive and modern manner, including: electricity, water, wastewater treatment, telecommunications, industrial gas network, etc. Social amenities are also invested in focus, including: housing, schools, hospitals, shopping centers, etc.

Hiep Phuoc Industrial Park is attracting domestic and foreign investors in the following industrial sectors:



- » Processing and manufacturing industry: food, beverage, electronics, machinery, etc.
- » Raw materials production industry: chemicals, building materials, etc.
- » Logistics services: warehousing, transportation, etc.

As of September 2023, Hiep Phuoc Industrial Park has attracted 142 investment projects, with a total registered investment of over 11.5 billion USD. The park has created jobs for approximately 8,000 workers.

Hiep Phuoc Industrial Park is playing an important role in the socio-economic development of Ho Chi Minh City and the country. The park helps to generate budget revenue, create jobs for workers, and promote the socio-economic development of the region.

From the EIP baseline assessment, Hiep Phuoc met 44% of the applicable benchmarks. With current and upcoming initiatives they intended to reach a performance of meeting 88% of the international benchmarks.

The following topics had lower baseline compliance scorings indicating that efforts overall should prioritize these topics:

- » Planning and zoning;
- » Management and monitoring
- » Energy
- » Waster
- » Waste and material use;
- » Climate change and the natural environment
- » Social infrastructure
- » Local community outreach;
- » Economic value creation;
- » Water management.

Employment generation, economic value creation, social management systems and local business and SMEs promotion topics had the highest baseline compliance scorings, indicating overall that, Hiep Phuoc management and tenant firms need less intensive technical assistance on these topics.

Based on the review against the International EIP Framework we can see that the topics that need to be improved can be divided into two main groups:

- » Environmental issues: including energy, waste, waste and material use, climate change and the natural environment, water management.
- » Social issues: including social infrastructure, local community outreach, economic value creation.

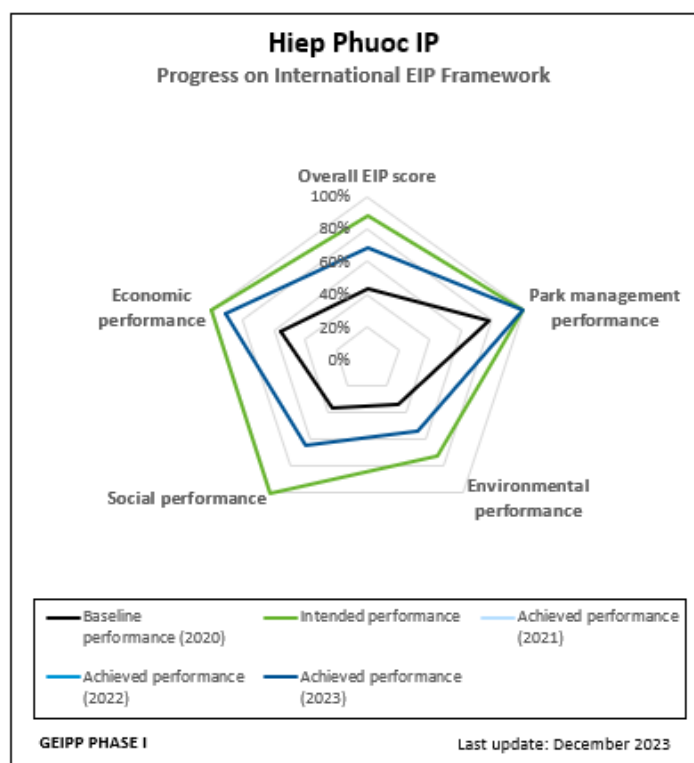


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Specifically, it is necessary to:

- » Focus on developing clean, environmentally friendly technologies, efficient waste collection and treatment systems, and RECP, as well as developing industrial symbiosis opportunities to use resources efficiently and reduce emissions to the environment.
- » Strengthen awareness and responsibility: raise awareness of businesses, workers, and communities about sustainable development and the EIP concept, and take positive actions to reduce environmental impacts.
- » Create supportive mechanisms and policies: developing mechanisms and policies to support businesses and communities in implementing sustainable development activities.

Hiep Phuoc Industrial Park scored 44% against the performance benchmarks of the International EIP Framework in 2020 and has achieved to 66% performance in 2022 with has potential to improve to 87% thanks to improvements in Management and monitoring and Energy performance areas. The chart below illustrates Hiep Phuoc’s progress against the international EIP framework.





## Short Description of the EIP Opportunity, Results, and Implementation

### Effective Resource and Cleaner Production

The project has assessed RECP opportunities for 31 companies in Hiep Phuoc Industrial Park, providing technical support to propose a total of 305 RECP solutions related to electricity savings, fuel savings, and delivering economic, environmental, and social benefits for participating businesses in the project.

The assessment results as of September 2023 show that out of a total of 305 solutions identified with support from the project, businesses have implemented 106 solutions (35%), and 69 solutions (23%) are in the planning stage.

In addition, the project has consulted with factories to implement 23 solutions to improve the working environment, chemical safety and occupational safety. Of these, 11 solutions have been implemented, accounting for 47.83%, and 7 more solutions are being planned.

### Industrial Symbiosis and Urban-Industrial Symbiosis

Hiep Phuoc Industrial Park is implementing industrial symbiosis and urban-industrial symbiosis opportunities in a similar way to Deep C Industrial Park and Amata Industrial Park. Based on the research support provided by the Project, the Project, Amata IP, and relevant stakeholders have decided to prioritize the implementation of 7 industrial symbiosis opportunities and 4 urban-industrial symbiosis opportunities that are easy to implement and have the highest feasibility. The remaining opportunities will be addressed at a later stage. Eleven priority opportunities are as follows:

- 1) The developer of Hiep Phuoc Industrial park invests in a RO system to reuse treated wastewater.
- 2) The developer of Hiep Phuoc Industrial park organizes focused training sessions for companies within the industrial zone.
- 3) Utilizing mud from the dredging process around the port area of the industrial zone for landfill purposes within the zone.
- 4) Reusing waste sand to produce non-fired bricks.
- 5) Reusing scrap wood as fuel for boilers.
- 6) Collecting scrap iron and steel from companies within the industrial zone for recycling at Asia Steel Corporation.
- 7) Collecting scrap paper from companies within the industrial zone for recycling at Xuan Mai Paper Joint Stock Company
- 8) Developing bus service for workers in Hiep Phuoc Industrial Park
- 9) Sharing human resources and firefighting equipment of Hiep Phuoc Industrial Park to respond to fire incidents with Nha Be District and Hai Phong City.
- 10) Additional treatment of treated wastewater for watering plants in Hiep Phuoc Industrial Park campus and surrounding areas.
- 11) Developing social housing for workers in Hiep Phuoc Industrial Park.



Similar to the Deep C and AMATA industrial parks, implementing urban-industrial symbiosis opportunities in Hiep Phuoc is challenging due to legal barriers. Currently, the project continues to support Hiep Phuoc in conducting research to address these challenges, similar to the efforts being made in AMATA and Deep C. Additionally, the project is actively working with relevant parties to facilitate the successful implementation of labor and firefighting services sharing between Hiep Phuoc and Ho Chi Minh City, as successfully implemented in Hai Phong.

### **Capacity Building**

The following EIP training sessions with associated training objectives were organized for Hiep Phuoc and tenant companies:

Introduction workshop the project “Eco-industrial park intervention in Vietnam – perspective from global eco-industrial parks programme”

- » Introducing the Eco-Industrial Park Model,
- » Benefits of Eco-Industrial Parks and Global Development Trends;
- » Introducing the Updated Legal Framework for the Eco-Industrial Park Model in Vietnam.

EIP model in Viet Nam training

- » Ecological Industrial Park (EIPs) Model in Vietnam and Related Policies.
- » Assessment Facilities for Ecological Industrial Park and Opportunities.
- » Industrial Symbiosis: Concepts and Key Tools.
- » Effective Resource and Cleaner Production (RECP) Approaches in Industry.
- » Illustrative Examples.

Resource efficiency and cleaner production and industrial symbiosis training

- » Benefits and Challenges of Eco-Industrial Parks;
- » Effective Resource and Cleaner Production (RECP) Approaches in Industry;
- » Industrial Symbiosis: Concepts and Key Tools;
- » Methods for Rapid Assessment of Resource Efficiency and Cleaner Production Options for Manufacturing Enterprises;
- » Additional Assessment Methods;
- » Electricity Usage Assessment;
- » Water Assessment.

EIP indicators training

- » Introduction to the International Eco-Industrial Park (EIP) Criteria
- » Methodology for Determining the EIP Indicator
- » EIP Methodology
- » Real-life Examples

Institutional framework and implementation for EIP training



- » New regulations for transforming conventional industrial parks into EIPs and for establishing new EIPs regulations on the circular economy,
- » Sharing international and national experience from EIP demonstration,
- » Technical solutions and financial tools

#### Financial tools to support companies and IPs in Transforming into Eco-Industrial Parks Model in Vietnam training

- » Types of existing financial mechanisms domestically and internationally,
- » Diverse sources of financing for eco-industrial park transformation initiatives,
- » Overview of financial access tools,
- » Detailed guidance and practical application of financial tools (A2F).

#### Industrial symbiosis in Hiep Phuoc Industrial Park

- » Key concepts to the identification and implementation of industrial symbiosis;
- » Methods and tools related to the identification and implementation of industrial symbiosis;
- » Information on industrial symbiotic options which have been studied and implemented in Vietnam;
- » International experience.

#### Guidelines for solid waste reuse in Industrial Parks training

- » International experiences in waste recycling towards a circular economy;
- » Exemplary studies on waste recycling and potential industrial symbiosis opportunities in industrial park;
- » Legal regulations and the current status of solid waste management in industrial park;
- » Introduction of guidelines on waste recycling in industrial park in Vietnam

#### Opportunities for industrial symbiosis

- » EIP and Key Concepts
- » Criteria for EIP as per the regulations of the Vietnamese government
- » Definition of industrial symbiosis
- » Forms of industrial symbiosis
- » Implementation possibilities of industrial symbiosis at Hiep Phuoc IP

#### Opportunities for urban-industrial symbiosis

- » EIP and Key Concepts
- » Criteria for EIP as per the regulations of the Vietnamese government
- » Definition of industrial symbiosis
- » Forms of industrial symbiosis
- » Implementation possibilities of urban-industrial symbiosis at Hiep Phuoc



## Technical assistance

### Effective Resource and Cleaner Production Assistance

RECP assessments were conducted in 31 tenant companies at Hiep Phuoc aimed at identifying RECP and EIP implementable opportunities that would contribute to company's resource savings in energy, water waste, and materials and EIP improvement to achieve more sustainable practices and increased competitiveness through RECP and EIP practices. The assessments consisted of evaluating the company's RECP management practices observing the operations of significant resource users, and evaluating any potential opportunities.

The technical support steps for RECP assessment in Hiep Phuoc are similar to those in Deep C and Amata IP, except that the project will organize an additional in-depth technical training session on RECP skills for the company's RECP team. The Technical assistance steps to support Amata in conducting RECP assessment are as follows:

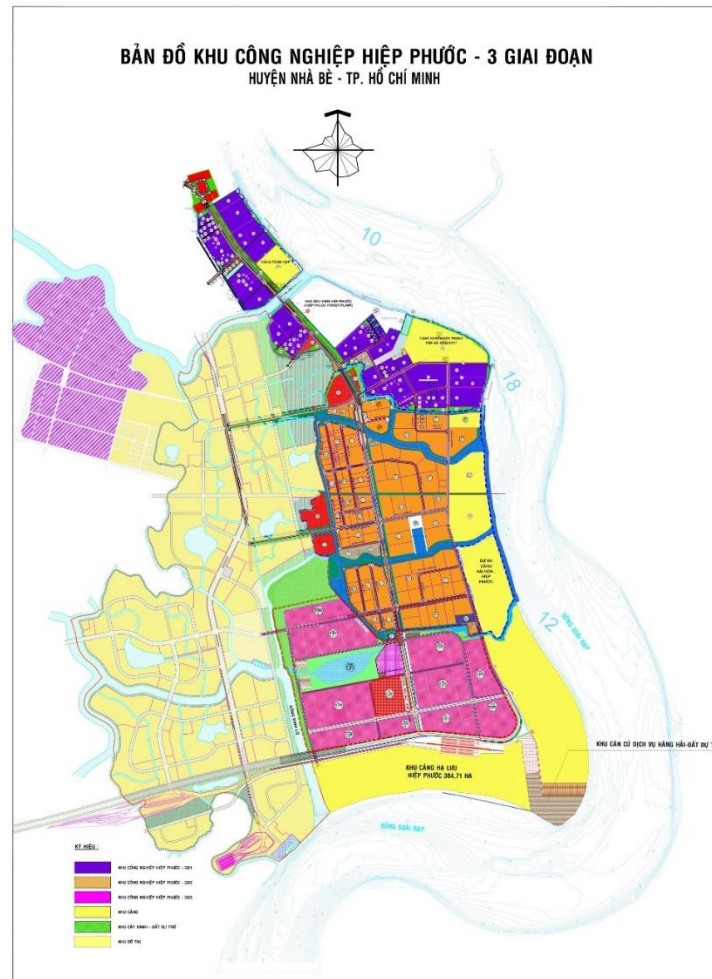
- » Identifying potential enterprises to participate in the project: *The project used the list of enterprises in Hiep Phuoc Industrial Park to identify manufacturing companies with the potential to participate in the project.*
- » Developing a rapid RECP assessment program: *The project developed a rapid RECP assessment program for potential enterprises to participate in the project. This program aims to identify RECP implementation opportunities at enterprises.*
- » Supporting the establishment and maintenance of RECP teams in enterprises: *The project supported enterprises in establishing and maintaining RECP teams. These RECP teams will be responsible for implementing RECP solutions at enterprises.*
- » Building capacity for employees on RECP implementation: *The project organized technical exchange activities to improve the capacity of employees of enterprises in RECP implementation in practice.*
- » A technical training workshop is organized for businesses that register to participate in the project, focusing on in-depth technical training for RECP assessments.
- » Persuading enterprises to develop plans to implement potential RECP solutions: *The project persuaded enterprises to develop plans to implement potential RECP solutions that the project has identified.*
- » Providing technical assistance and guidance on the implementation of RECP solutions: *The project provided technical assistance and guidance on the implementation of in-depth RECP solutions for enterprises.*
- » Reviewing the implementation of all RECP options: *The project reviewed the implementation of all RECP options and the changes in material/energy/chemical/water consumption, as well as waste generation, to assess the effectiveness of the options.*
- » Proposing new focus areas for RECP assessment at the enterprise: *The project proposed new focus areas for RECP assessment at the enterprise.*

As of today, 31 enterprises (93% are SMEs) in Hiep Phuoc Industrial Park have registered for the RECP assessment. The project has helped these enterprises identify opportunities to implement





RECP, develop plans to implement potential RECP solutions, and support the implementation and assessment of RECP solutions.



### Industrial Symbiosis and Urban-Industrial Symbiosis Assistance

To focus on the issues in Hiep Phuoc as mentioned above, apart from supporting RECP assessments, the project also conducts research to assist Hiep Phuoc in implementing EIP opportunities related to industrial symbiosis and urban-industrial symbiosis.

Specifically, the EIP opportunities that the project has supported Hiep Phuoc in researching and implementing include:



#### 14 industrial symbiosis opportunities:

- » Reusing waste sand to produce non-fired bricks
- » Reusing waste sludge for non-fired brick production
- » Collecting and recycling scrap iron and steel waste within Hiep Phuoc Industrial Park
- » Collecting fallen cement, sand, and gypsum for reuse in non-fired brick production
- » Collecting waste gypsum for reuse in non-fired brick production
- » Sharing industrial laundry services with companies in need within Hiep Phuoc Industrial Park
- » Sharing casting, metal surface processing, and galvanization services with companies in need within Hiep Phuoc Industrial Park
- » Reusing waste wood for children's toys
- » Utilizing sand from the dredging process of the port to fill gaps within Hiep Phuoc Industrial Park
- » Reusing treated water from Hiep Phuoc Industrial Park's wastewater treatment plant for irrigation
- » Reusing biological-origin sludge for fertilizer composting for greenery
- » Collecting and recycling plastic waste from businesses within Hiep Phuoc Industrial Park
- » Collecting and reusing packaging materials and paper waste from businesses within Hiep Phuoc Industrial Park
- » Investing in a wastewater treatment system for reusing treated wastewater from Hiep Phuoc Industrial Park's wastewater treatment plant, supplying it to certain companies with high water demands within Hiep Phuoc Industrial Park.

#### 4 urban-industrial symbiosis opportunities:

- » Developing bus service for workers in Hiep Phuoc Industrial Park
- » Sharing human resources and firefighting equipment of Hiep Phuoc Industrial Park to respond to fire incidents with Nha Be District and Hai Phong City.
- » Additional treatment of treated wastewater for watering plants in Hiep Phuoc Industrial Park campus and surrounding areas.
- » Developing social housing for workers in Hiep Phuoc Industrial Park.

As mentioned above, the development of EIP opportunities in Hiep Phuoc should focus on developing clean, environmentally friendly technologies, efficient waste collection and treatment



systems, and RECP, as well as developing industrial symbiosis opportunities to use resources efficiently and reduce emissions to the environment. Specifically, these opportunities help:

- » Optimize resource usage: Businesses can share resources and services, reducing resource wastage and cost savings. For example, recycling waste, using treated wastewater, and utilizing renewable energy can help protect the environment and reduce greenhouse gas emissions.
- » Environmental protection: Industrial symbiosis activities typically lead to minimized environmental pollution, including waste treatment and the use of treated wastewater for irrigation. This contributes to environmental protection and reduces greenhouse gas emissions.
- » Cost savings: Companies within the industrial park can share services and resources, reducing operating costs. For instance, sharing human resources, utilizing shared cleaning and security services, or using shared solar energy systems can reduce individual expenses.
- » Social benefits: Industrial symbiosis opportunities can generate social benefits, such as providing employment opportunities, improving the quality of living environments for local residents, and promoting community cooperation.
- » Improved services for businesses: Shared services like cleaning, catering, and landscaping can be provided more efficiently when implemented collectively.

## SUMMARY AND CONCLUSION

- » With the willingness to become a model for the EIP transformation, each pilot industrial park in Vietnam is striving to implement EIP opportunities. There is currently positive evidence showing that Vietnam is undergoing positive developments in enabling policies to support and implement the EIP model. GEIPP is making progress in demonstrating the feasibility and benefits of EIPs in enhancing resource productivity and improving the economic, environmental, and social efficiency of domestic businesses through capacity building for relevant stakeholders, especially park management authorities, developers, tenants, strengthen waste management and monitoring, and the implementation of EIP intervention such as RECP solutions and urban-IS opportunities. EIP performance of all pilot industrial parks against the performance benchmarks of the International EIP Framework has increased in environmental, economic and park management aspects from 2020 to the present day.
- » In Vietnam, because of the clear economic, social, and environmental benefits of industrial symbiosis and urban symbiosis, there is growing interest in promoting cooperation between industrial parks and surrounding cities. To meet this demand, the project has provided support to pilot industrial parks in Vietnam to explore and implement opportunities for urban symbiosis. Specifically, so far, the project has successfully supported the implementation of an industrial symbiosis between the city of Hai Phong and the Deep C Industrial Zone, sharing firefighting services. The successful implementation of this industrial symbiosis opportunity is a foundation and model for the continued implementation of other urban symbiosis activities in Vietnam. GEIPP-Vietnam will continue supporting these opportunities in the coming phase of the project involving additional surrounding residential areas.



- » Some potential industrial symbiosis opportunities such as investing in reverse osmosis (RO) system to enable the reuse of wastewater after treatment, has attracted interest from developers and tenants, and is being further supported by the project by providing the technical support needed and overcoming the legal barriers to continue demonstrating the EIP model in general and urban-industrial symbiosis in particular in the coming phase.
- » The pilot industrial parks in Vietnam have made significant progress in demonstrating the EIP model, which now needs to be scaled up and replicated with the support of appropriate mechanisms (incl. financing). Pilot industrial parks are moving closer to the goal of transforming into EIPs, with improvements in park management, economic, social, and environmental aspects.
- » The EIP performance assessment reflects that industrial park management is a strength of all pilot industrial parks, while the environment is a common challenge, highlighting the need for concentrated improvement in this area.
- » Overall, although there has been some improvement, no industrial park meets all EIP requirements according to the International Framework. To achieve the goal of becoming an eco-industrial park, all pilot industrial parks need to continue their efforts to improve EIP compliance in all areas.



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