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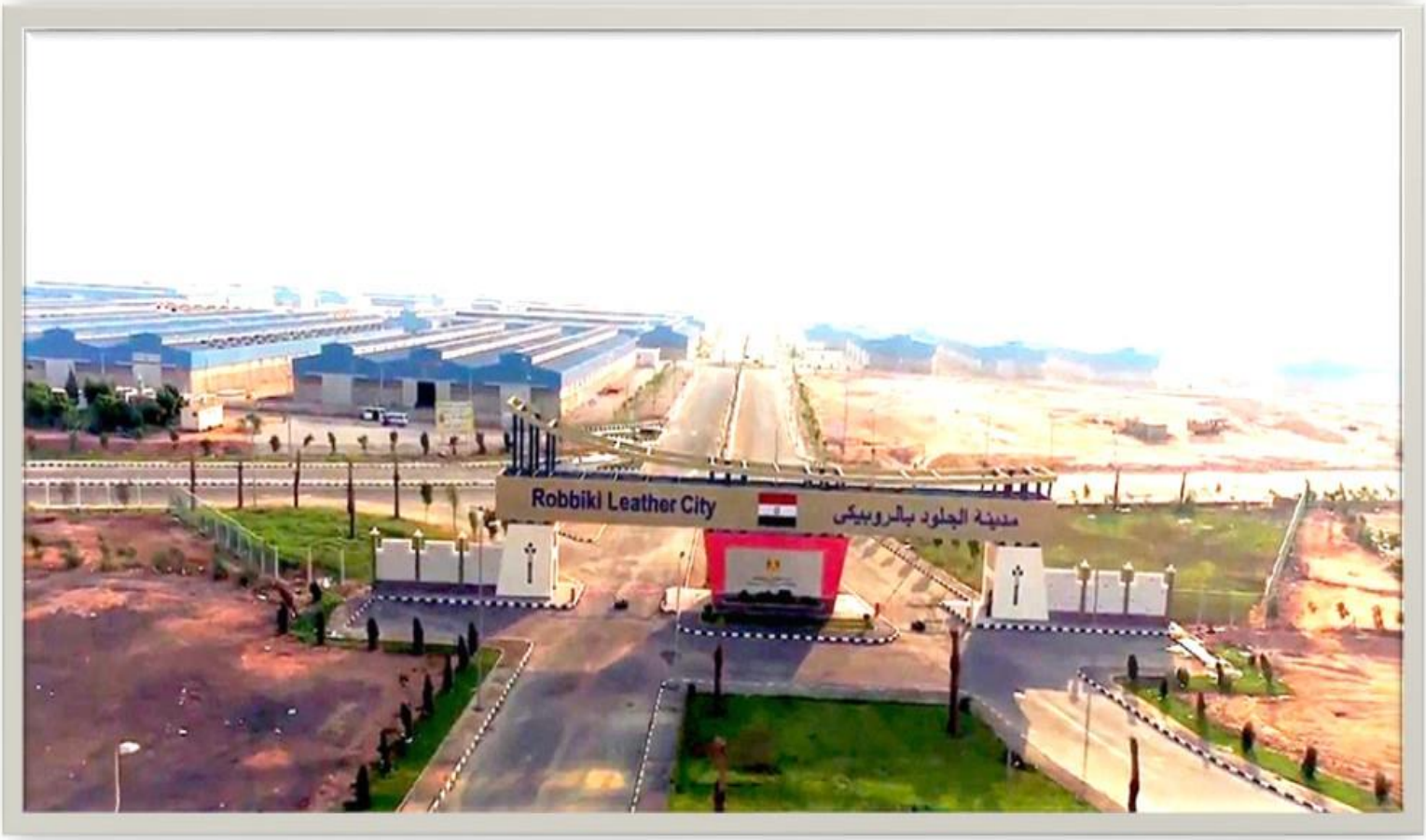
GEIPP
EGYPT
GLOBAL ECO-INDUSTRIAL PARKS PROGRAMME



Capacity Development Workshop "Transforming the Robbiki Leather Park to an EIP"

Workshop materials

December 2022

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Background

UNIDO is currently implementing a Global Eco-Industrial Parks Program (GEIPP) in developing and transition countries. The program is funded by the Swiss State Secretariat for Economic Affair (SECO). By Egypt participation in this program, "GEIPP-Egypt" was established to disseminate eco-industrial parks (EIP) development in Egypt. GEIPP-Egypt was signed by the Minister of Trade and Industry, on 17 January 2022.

The overall objectives of GEIPP-Egypt are to incentivize and mainstream the EIP in relevant policy and regulations leading to an increased role of EIP in environmental, industrial and other relevant policies on the national level.
GEIPP-Egypt aims at improving productivity of natural resources (including energy, water and materials) and reducing pollution and waste intensity of businesses and other organizations.
By completion of the various stages of GEIPP-Egypt Project, with the cooperation of the park and tenant companies, the following will be accomplished:

- Increase of the environmental and technical capacities, geared towards modernization of the leather industry,
- Identification, implementation, and assessment of possible RECP opportunities and savings,
- Strengthen environmental management and compliance,
- Guidance to increase the value added of wastes from tanning and leather industry
- Identification of feasible industrial symbiosis (IS) options at the park,
- Identification of possible industrial- urban synergy options,
- Knowledge of the environmental requirements necessary for exporting leather products and for LWG certificate, and
- Support the creation of an industrial community seeking enhanced performance through collaboration on collective issues with the support of park management
- Knowledge of the environmental requirements of the national/international financing institutions.

The project is sponsored by UNIDO- GEIPP and coordinated with the following entities:

- Robbiki Unit, IDA

- Management of Robbiki Industrial Park represented by Cairo Investment and Development Company (CID)

The project will be implemented by Environics/EWATEC Consortium using a pool of national and international experts and consultants.

This Capacity Building Workshop is the starting point of GEIPP Project in Robbiki Industrial Park.
Following the workshop, interested companies will be selected by UNIDO for implementation of RECP, using specific criteria to be clarified during the workshop. The selected companies will be further guided and technically supported to implement RECP. The implementation stage will be followed up and assessed using scientific tools developed by UNIDO.

Workshop Objectives

This workshop aims to 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.

The workshop also aims at the 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.

The main subjects of the capacity building workshop are:

- Eco industrial parks concepts, opportunities and assessment.
- Resources efficiency and cleaner production (RECP) interventions at the companies.
- Industrial symbiosis and urban synergy options, and legal and economic obstacles.
- Successful case studies on national and international RECP opportunities and IS options.
- Summary of UNIDO assessment tools.

Concept Notes

Subject	Main Topics	Speakers
Day 1: January 3rd, 2023		
Opening & Welcome	Implementation of the project and the role of each firm	– United Nations Industrial Development Organization (UNIDO), Shanenaz Fouad – Ministry of Trade and Industry (MoTI) – Swiss State Secretariat of Economic Affairs (SECO)
Overview on the Global Eco-Industrial Park Programme (GEIPP), EIP indicators The International Framework for Eco-Industrial Parks	• GEIPP- • The international framework for Eco-industrial parks.	Alessandro Flammini, (UNIDO)
Project Overview as Specific to Robbiki IP	• Project steps and interim outputs. • Practical steps for companies • Expected contribution of IP management and tenant companies	– Ghada Mohamed (UNIDO) – Yasser Sherif (Environics-EWATEC Consortium)
EIP Concepts and requirements	• Industrial Parks – Advantages and Disadvantages • Components of Industrial parks • Characteristics of Eco Industrial Parks • Environmental performance indicators and enhancement • Social performance indicators and enhancement • Responsibilities of Tenant Facilities • Benefits to Owners and Workers	Shadia Elshishini (Environics-EWATEC Consortium)
Q&A	• Queries and clarifications	
Break		
RECP Concepts and Benefits	• RECP concepts and benefits in general • Environmental issues of the leather industry (water, wastewater, chemicals, energy, and solid and hazardous wastes)	Shadia Elshishini, (Environics-EWATEC Consortium).

Subject	Main Topics	Speakers
	• Potential RECP opportunities • Vegetable tanning vs Chrome tanning	
Wastewater reuse options	• Characteristics of tanneries' WW • Treatment for Chromium recovery • The main issues	Mehdi Bendi-ouis (International wastewater expert, UNIDO)
Industrial Symbiosis, and Urban Synergies	• International case studies on IS options (textile and meat processing) • How these are related to the leather industry	Prahlad Tewari (Environmental Management Centre Pvt Ltd)
	• Concept and relation to RECP • Difference between IS and urban synergy • Options for long term collaboration of stakeholders • Legal and technical concerns • Specific characteristics and challenges of Robbiki IP • Role of the park management	Yasser Sherif (Environics-EWATEC Consortium)
Eco-Industrial Parks and Resource Efficiency as a way to achieve global requirements and increase export.	• Brief on the purpose and benefits of LWG certificate • Environmental requirements of LWG • LWG & UNIDO requirements	Ola Kamal (Environics-EWATEC Consortium)
World Bank Contribution	• World bank potential support and contribution	World Bank
Q&A	• Queries and clarifications	
Day Wrap up	• Main conclusions of Day-1	UNIDO

Subject	Main Topics	Speakers
Day 2: January 4th, 2023		
Case Studies on RECP	• Successful case studies will be presented focusing on the implemented RECP interventions. • The cases will present large scale and SMEs in Al Max and Quesna. • RECP opportunities with high, low and no costs will be presented.	Nermin Ibrahim (Environics-EWATEC Consortium)
Moderated Discussion: • Environmental performance and common gaps • Required environmental support • Enhancing leather exports • Licensing and compliance action plan	This session will be moderated by the Consortium for discussion of the following: • Water resource is the main issue of concern • Current water consumption and monitoring practices at the companies • Wastewater and chemicals as the main challenges in RECP and IS options • Plans for recycling and resource efficiency • Progress of CAPs and the main issues of concern for licensing process • How RECP opportunities enhance LWG qualifications?	Ola Kamal,–(Environics-EWATEC Consortium)
Break		
Selection Criteria and Questionnaire of Interested Companies	• Benefits to selected companies from RECP implementation and assessment • Clarification of the selection criteria • Main commitments of the selected companies • Selection questionnaire	Ola Kamal, (Environics-EWATEC Consortium)
RECP Assessment Tools and Checklist	• Tool objectives and overview • Mechanism of RECP identification and assessment • Brief of the main input data to the assessment tool and the companies' information • KPIs to be used in the assessment	Rania M. Mohsen, (Environics-EWATEC Consortium)
Closing of the event		UNIDO

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Invitation and Agenda

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Eco-Industrial Parks Egypt

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

3 & 4 January 2023

In the framework of the Global Eco Industrial Parks Project (GEIPP), the United Nations Industrial Development Organization (UNIDO) in cooperation with the Ministry of Trade and Industry (MoTI) is honored to invite you to its first capacity building workshop for the leather cluster in Robbiki Industrial Park.

The workshop will introduce the eco-industrial park (EIP) concept, which aims to create more resource-efficient and cost-effective industrial parks by supporting the park management and companies to improve environmental, economic and social performance.

The workshop will present the eco-industrial park concept and tools to promote:

- Resources efficiency and cleaner production (RECP);
- Industrial symbiosis and industrial-urban synergies;
- Successful international and national case studies.

Following the workshop, interested companies will have the opportunity to join the UNIDO project. Selected companies will be further guided and technically supported to implement EIP, RECP and IS opportunities.

The project is funded by the Swiss State Secretariat for Economic Affairs (SECO), and it is implemented by UNIDO in cooperation with the Ministry of Trade and Industry (MoTI), the Industrial Development Authority (IDA) and the Cairo Investment and Development Company (CID).

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The activities at Robbiki IP will be supported by Environics/EWATEC Consortium using a pool of national and international experts.

The workshop will be held on 3-4 January 2023 from 10:00 am to 2:40 pm, the first day of the workshop 3 January 2023 will be at the IDA premises, New Cairo and the second day 4 January 2023 at Robbiki industrial park.

Transportation from Robbiki IP to IDA (and back) on 3 January will be provided.

For attendance, please register here before 2 January 2023.

For more details on the workshop, please contact: **ola.kamal@environics.org**

Arabic interpretation will be provided.

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

Industrial Development Authority (IDA) Main Hall

3 January 2023

Agenda

Subject	Speaker	Time
Welcome Coffee and Registration		9:30 – 10:00
Opening & Welcome	– United Nations Industrial Development Organization (UNIDO), Shanenaz Fouad – Ministry of Trade and Industry (MoTI) – Swiss State Secretariat of Economic Affairs (SECO)	10:00 – 10:15
Overview on the Global Eco-Industrial Park Programme (GEIPP) The International Framework for Eco-Industrial Parks	Alessandro Flammini (UNIDO)	10:15 – 10:30
Project Overview as Specific to Robbiki IP	- Ghada Mohamed (UNIDO) - Yasser Sherif (Environics-EWATEC Consortium)	10:30- 10:45
EIP Concept and requirements	Shadia Elshishini (Environics-EWATEC Consortium)	10:45 – 11:30
Q&A		11:30 – 12:00
Break		12:00 – 12:25
RECP Concepts and Benefits	Shadia Elshishini, (Environics-EWATEC Consortium).	12:25 – 12:55
Wastewater reuse options	Mehdi Bendi-ouis (International wastewater expert, UNIDO)	12:55 – 1:10
Industrial Symbiosis, and Urban-industrial Synergies	– Prahlad Tewari (Environmental Management Centre Pvt Ltd)	1:10 – 1:50

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Subject	Speaker	Time
	– Yasser Sherif (Environics-EWATEC Consortium)	
Eco-Industrial Parks as a way to achieve global requirements and increase export.	Ola Kamal (Environics-EWATEC Consortium)	1:50 – 2:10
World Bank Contribution	World Bank (tbc)	2:10 – 2:20
Q&A		2.20 – 2:30
Day Wrap-up	UNIDO	2:30 – 2:40
Lunch		

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

Robbiki Leather Cluster Industrial Park

4 January 2023

Agenda

Subject	Speaker	Time
Welcome Coffee and Registration		10:00 – 10:30
Case Studies on RECP	Nermin Ibrahim (Environics-EWATEC Consortium)	10:30 – 11:15
Moderated Discussion: • Environmental performance and common gaps • Required environmental support • Enhancing leather exports • Licensing and compliance action plan	Ola Kamal,-(Environics-EWATEC Consortium)	11:15 – 11:45
Break		11:45– 12:15
Selection Criteria and Questionnaire of Interested Companies	Ola Kamal, (Environics-EWATEC Consortium)	12:15 – 12:45
RECP Assessment Tools and Checklist	Rania M. Mohsen, (Environics-EWATEC Consortium)	12:45 – 1:15
Q&A		1:15 – 1:30
Closing of the event	Shahenaz Fouad, UNIDO	1:30 – 1:45
Lunch		

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Capacity Development Workshop
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Workshop presentations

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INTRODUCTION TO THE GLOBAL ECO-INDUSTRIAL PARKS PROGRAMME (GEIPP)

Alessandro FLAMMINI, UNIDO Project Coordinator

ABOUT GEIPP

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 […].

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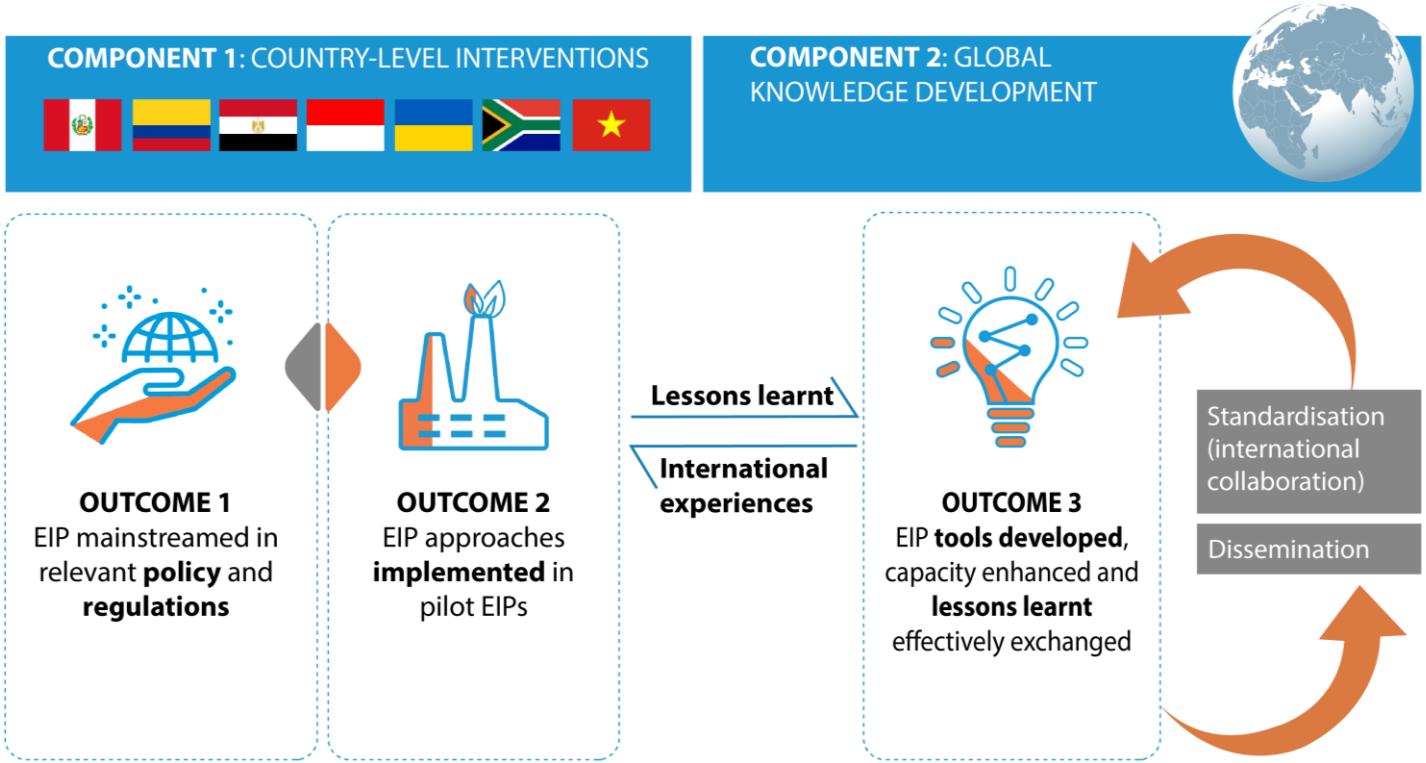
ABOUT GEIPP


COMPONENT 1: COUNTRY-LEVEL INTERVENTIONS
COMPONENT 2: GLOBAL KNOWLEDGE DEVELOPMENT
OUTCOME 1
EIP mainstreamed in relevant policy and regulations
OUTCOME 2
EIP approaches implemented in pilot EIPs
Lessons learnt
International experiences
OUTCOME 3
EIP tools developed, capacity enhanced and lessons learnt effectively exchanged
Standardisation (international collaboration)
Dissemination

WHAT IS AN ECO-INDUSTRIAL PARK?

"A community of manufacturing and service businesses located together on common property. Member businesses seek enhanced environmental, economic, and social performance through collaboration in managing environmental and resource issues.

By working together, the community of businesses seeks a collective benefit that is greater than the sum of individual benefits each company would realize by only optimizing its individual performance." (Lowe, 2001)

In short, the EIP concept is about creating more resource-efficient and cost-effective industrial parks which are more competitive, attractive for investment and risk resilient.

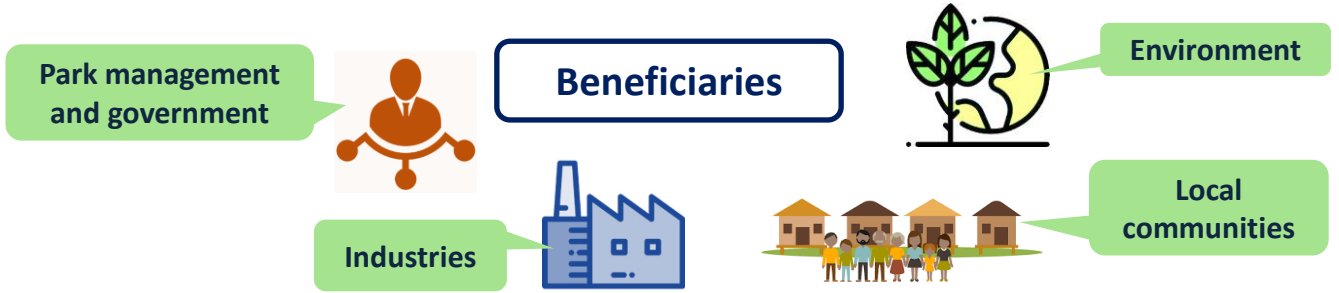
Key benefits of eco-industrial parks

Reduce:

- Use of materials, water, energy
- Procurement costs
- Waste
- Greenhouse gases
- Pollutants
- **Environmental, economic and social risks**

Increase:

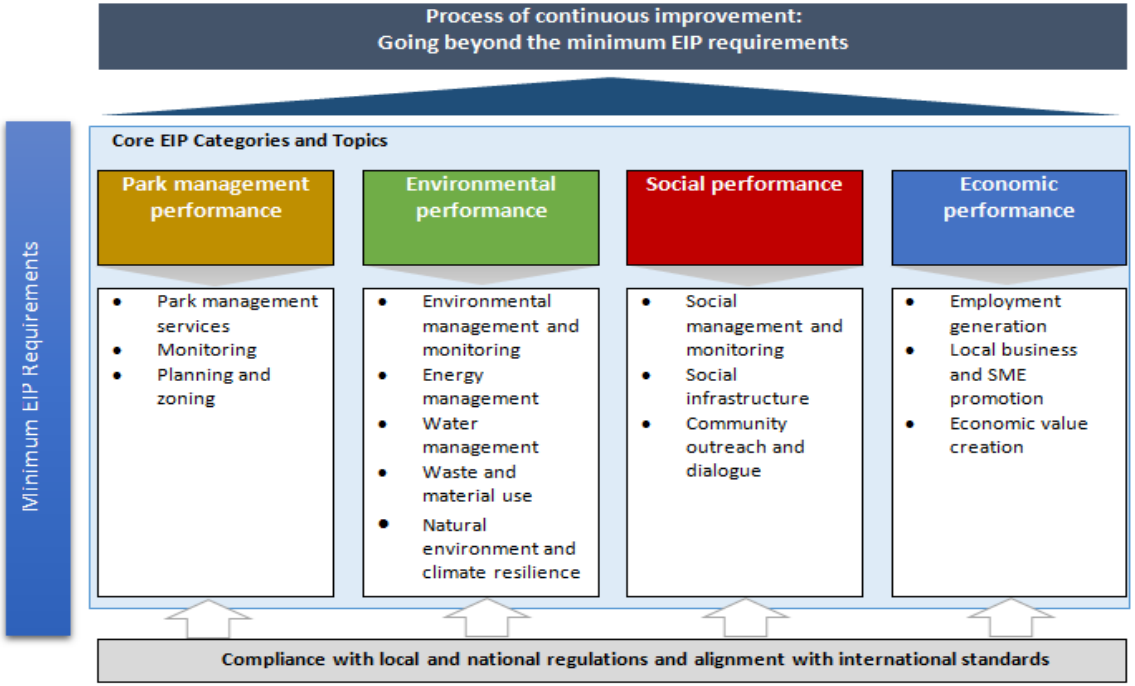
- Competitiveness, profitability and foreign investment
- Good-quality jobs
- Workers health and safety
- Quality of life for communities
- Access to new technologies and finances
- Resilience and business continuity

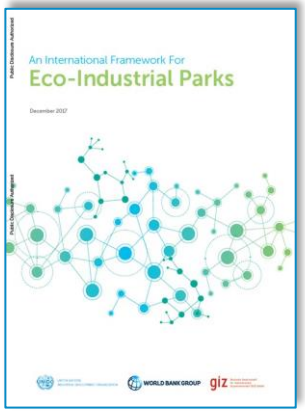


International Framework for Eco-Industrial Parks

WORLD BANK GROUP

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH





UNIDO, World Bank Group, GIZ
An International Framework for Eco-Industrial Parks

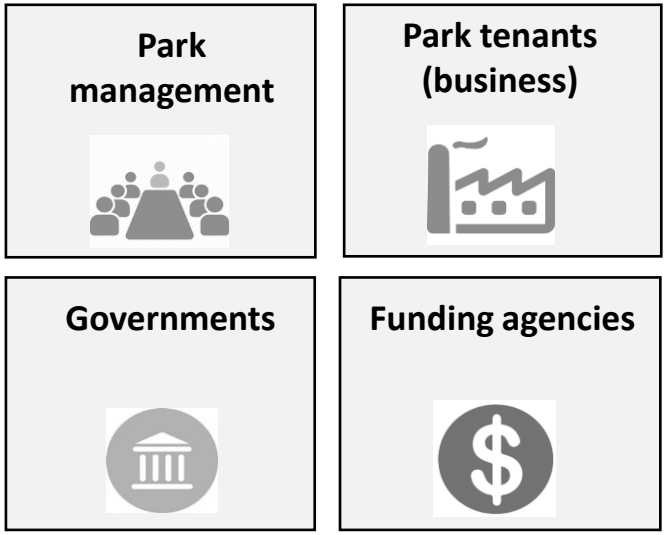
Version 2.0 (February 2021)

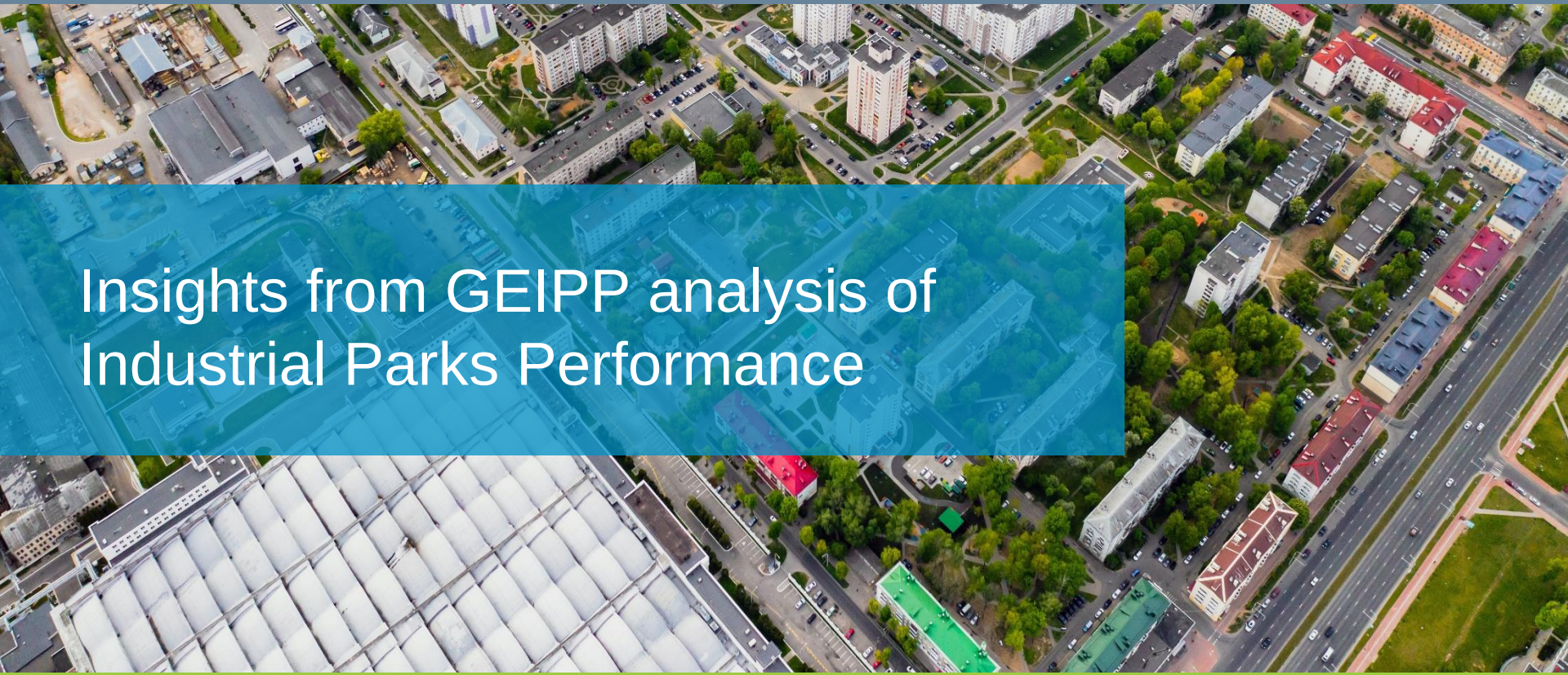
- https://openknowledge.worldbank.org/handle/10986/35110

International Framework for Eco-Industrial Parks

OBJECTIVES

- Create common understanding of Eco-Industrial Parks
- Identify improvement opportunities, optimise existing industrial parks
- Monitor and assess operational performance of existing industrial parks
- Inform investment decisions, funding and due diligence studies
- Value recognition and build market profile





Insights from GEIPP analysis of Industrial Parks Performance

ASSESSING PARKS AGAINST THE EIP FRAMEWORK

EIP SCORE CARD: 50 PARKS IN EIGHT COUNTRIES

COMPLIANCE SCORINGS WITH INTERNATIONAL EIP FRAMEWORK

Average of 50 industrial parks assessed in 8 countries. Compliance formula = Counts "Yes" / (Total number of responses - Counts "Not applicable")

Baseline performance	Improvement potential	Intended performance
49%	16%	65%

PARK MANAGEMENT

	Baseline performance	Improvement potential	Intended performance
Park management overall	55%	25%	80%
Park management services	75%	14%	88%
Monitoring and risk management	31%	28%	59%
Planning and zoning	59%	35%	94%

SOCIAL PERFORMANCE

	Baseline performance	Improvement potential	Intended performance
Social performance overall	44%	11%	55%
Social management systems	54%	8%	62%
Social infrastructure	50%	11%	62%
Local community outreach	28%	15%	43%

ENVIRONMENTAL PERFORMANCE

	Baseline performance	Improvement potential	Intended performance
Environmental performance overall	34%	20%	54%
Management and monitoring	30%	17%	47%
Energy	28%	17%	45%
Water	42%	25%	67%
Waste and material use	32%	18%	50%
Climate change and the natural environment	38%	22%	60%

ECONOMIC PERFORMANCE

	Baseline performance	Improvement potential	Intended performance
Economic performance overall	72%	6%	78%
Employment creation	87%	0%	87%
Local business and SME promotion	58%	6%	65%
Economic value creation	69%	12%	81%

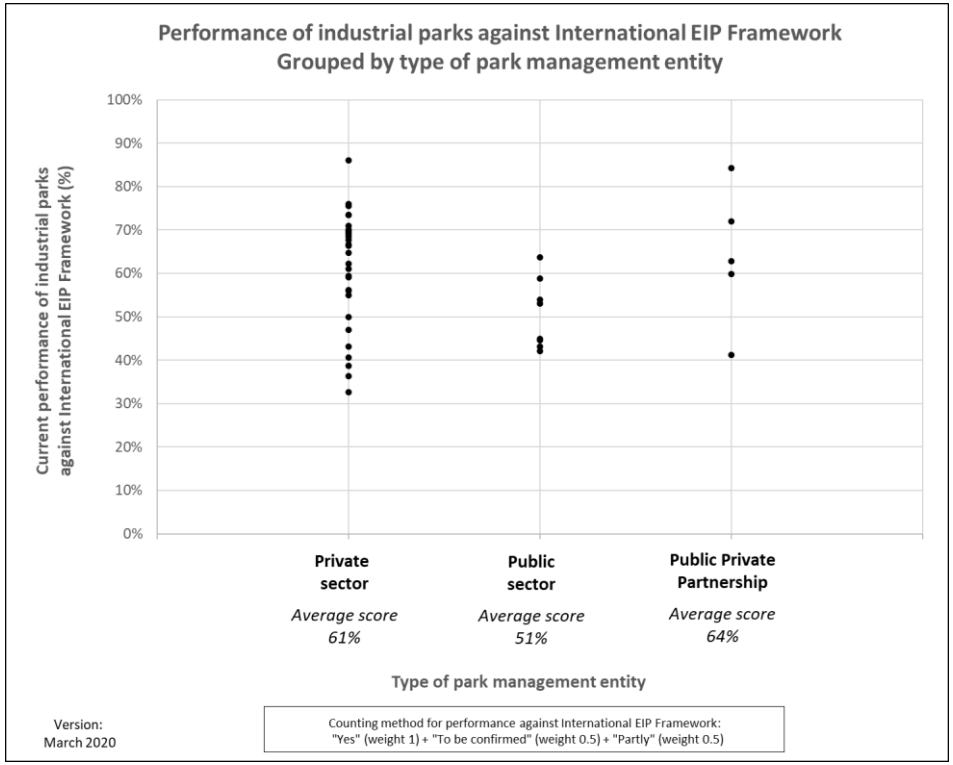
LESSONS LEARNT FROM EIP ASSESSMENTS

INSIGHTS FROM THE ASSESSMENT OF 50 INDUSTRIAL PARKS AGAINST THE INTERNATIONAL EIP FRAMEWORK

Source: UNIDO (2020). Analysis of results from International EIP Framework assessments.

INTERNATIONAL EIP FRAMEWORK	Level of baseline compliance - Analysis of "Yes" ratings - Average per topic Formula = Counts "Yes" / (Total number of responses - Counts "Not applicable").							
Topic	COLOMBIA	EGYPT	INDONESIA	NIGERIA	PERU	SOUTH AFRICA	UKRAINE	VIET NAM
	5 parks	3 parks	11 parks	2 parks	6 parks	11 parks	4 parks	8 parks
PARK MANAGEMENT								
(Basic) park management services	100%	75%	91%	75%	50%	61%	56%	88%
Monitoring and risk management	30%	25%	48%	50%	0%	36%	0%	59%
Planning and zoning	100%	100%	100%	0%	50%	36%	0%	88%
ENVIRONMENT								
Management and monitoring	60%	33%	50%	25%	33%	14%	0%	25%
Energy	33%	22%	20%	17%	36%	27%	21%	46%
Water	60%	17%	47%	25%	63%	25%	44%	56%
Waste and material use	47%	0%	65%	0%	22%	24%	58%	38%
Climate change and the natural environment	52%	40%	45%	30%	30%	40%	25%	43%
SOCIAL								
Social management systems	77%	39%	88%	67%	25%	65%	33%	40%
Social infrastructure	58%	57%	73%	60%	30%	38%	45%	43%
Local community outreach	40%	0%	68%	50%	0%	14%	38%	13%
ECONOMIC								
Employment generation	100%	100%	86%	83%	100%	85%	75%	67%
Local business & SME promotion	73%	44%	45%	67%	33%	67%	100%	38%
Economic value creation	60%	78%	59%	83%	50%	85%	67%	71%

Link between Park Management Type and EIP Performance



Industrial parks managed by PPPs and private sectors have a higher average total EIP score than parks managed by public sector.

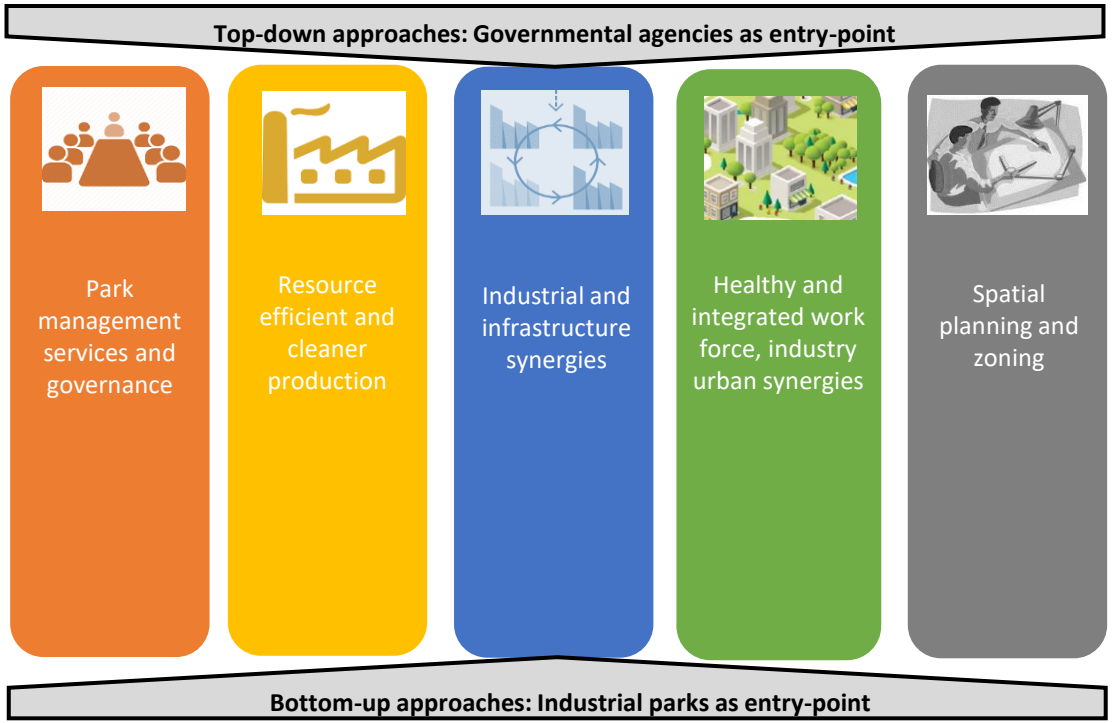
Each dot represents industrial park assessed to date by UNIDO against International EIP Framework.

KEY MESSAGE:
Whatever the park management type, industrial parks should be **"run like a business"**

Source: UNIDO (2020). Analysis of results from International EIP Framework assessments.

GEIPP Programme **Country-level Interventions**

KEY COMPONENTS OF EIPs



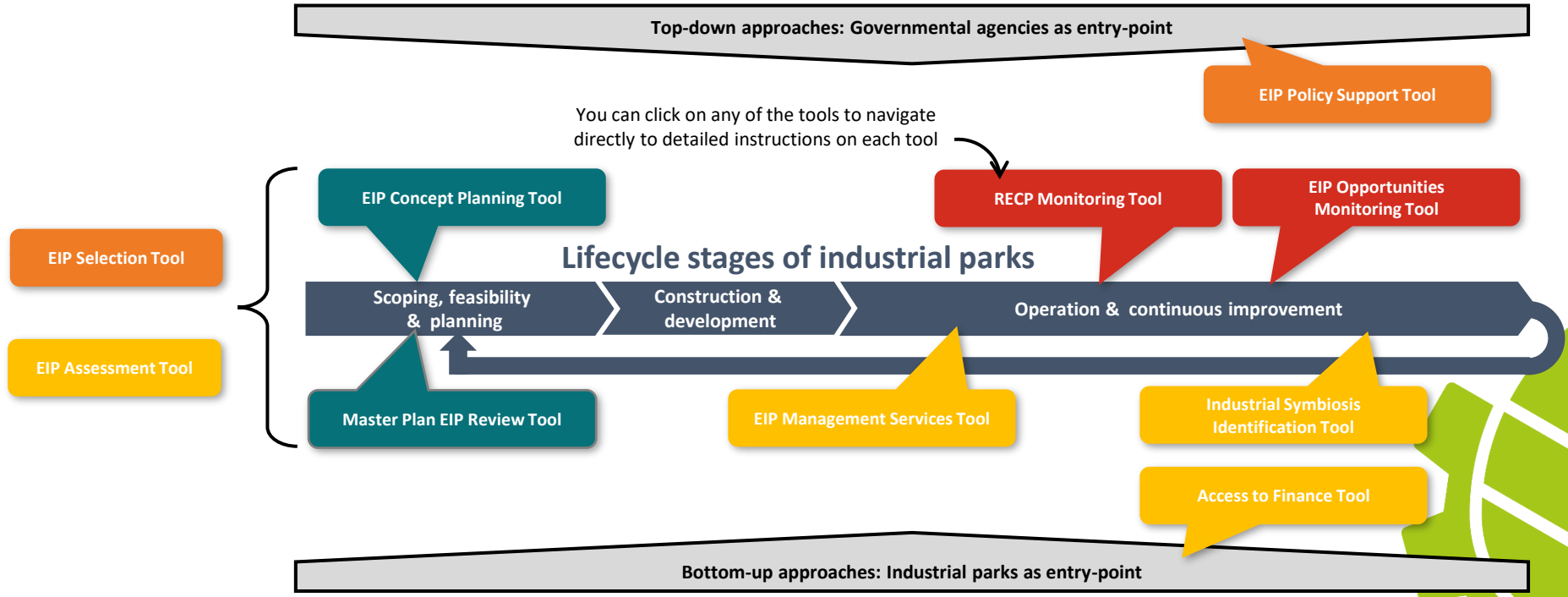
UNIDO Support for EIP Transformation 1/2

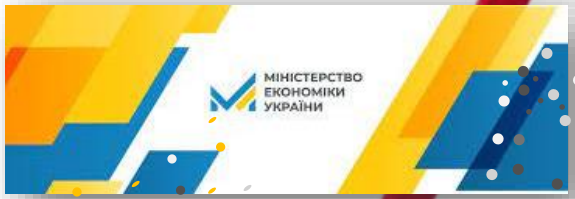
- **SCOPE INTERVENTIONS** to identify and prioritize EIP activities, which are most suitable and most effective for further stakeholder consideration.
- **AWARENESS RAISING** of the benefits and added value of EIPs as well as associated implementation processes amongst key private and public stakeholder groups.
- **PROVIDE POLICY SUPPORT** for translation of EIP concepts and associated practices into national policies and government decision-making processes.
- **DEVELOPMENT AND ADVICE ON PARK MANAGEMENT STRUCTURES** to develop and operate an industrial park sustainably, to attract investments and to provide attractive working conditions; the formalization and sound functioning of a park management structure is a key prerequisite for an EIP.

UNIDO Support for EIP Transformation 2/2

- **PROVIDE TECHNICAL SUPPORT** to upscale resource efficiency and industrial synergies/symbiosis; RECP and industrial synergies increase efficiency and reduce risks to humans and the environment, both at the company and park levels; industrial synergies can be for instance shared infrastructures, services and utilities, or by-product and waste exchanges between companies.
- **UNDERTAKING PERFORMANCE MONITORING AND BENCHMARKING** to track progress of EIPs against set objectives and thus demonstrate environmental, economic and social outcomes in an efficient, transparent and accountable manner.
- **CAPACITY-BUILDING** of key stakeholders throughout the entire development of EIPs (technical and non-technical capacities).

UNIDO EIP Toolkit





2020

- ✓ Stakeholders Mapping
- ✓ Policy Gap Analysis

2021

- ✓ EIP perspective included to Governmantal Economy Strategy to 2030
- ✓ Inter-departmental Working Group on EIP policy established
- ✓ Roadmap on EIP policy implementation

2022

- ✓ EIP Policy Vision and Roadmap, based on international experience
- ✓ EIP financial and non-financial Incentives proposed
- ✓ EIP included in draft IP Strategy to 2030
- ✓ Strategic Ecology Assessment of IP Strategy with EIP perspective
- ✓ Regulatory Impact Assessment of EIP requirements
- ✓ Draft EIP Law (amendments to IP Law and other Laws)
- ✓ National Survey on Market Readiness to EIP model
- ✓ Online EIP training course for decision-makers and practitioners
- ✓ EIP Supply Chains Disruption Report

2023 planned

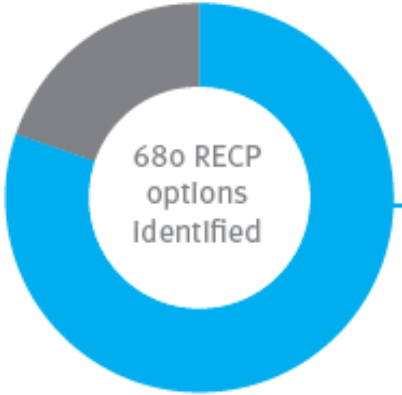
- ✓ Adoption of EIP Law
- ✓ Adoption of sub-laws on EIP (criteria, verification, monitoring)
- ✓ Bringing policies in compliance to EIP International Framework

The Significance of the Park Management Entity

- Park Management plays a critical role as the entry point and driver to achieve EIP objectives
- They connect the Park, Resident Firms, relevant Government Agencies and the wider community.

SUCCESS FACTORS FOR EIP MANAGEMENT	COMMON CHALLENGES FOR EIP MANAGEMENT
▪ **Strong leadership** and commitment	• **Trade-off logic**: Industrial development vs. environment
▪ **Proactive marketing** of EIP features and benefits	• Insufficient inclusion of **social dimensions**
▪ **Proactive facilitation** of stakeholder processes	• Insufficient priority on **shared and integrated infrastructure**
▪ **Effective model** to share and recover park level **costs/benefits**	• Lack of understanding that **environmental/social risks are economic risks**
▪ Creation of **feasible and valuable infrastructure services**	

Firm-level RECP in Vietnam (2017-2019)



546 RECP options implemented in 57 companies

Financial savings: 2.85 million EUR /year

COMPANY INVESTMENT TRIGGERED: EUR 9 Mio

Electricity
19,274 MWh/yr

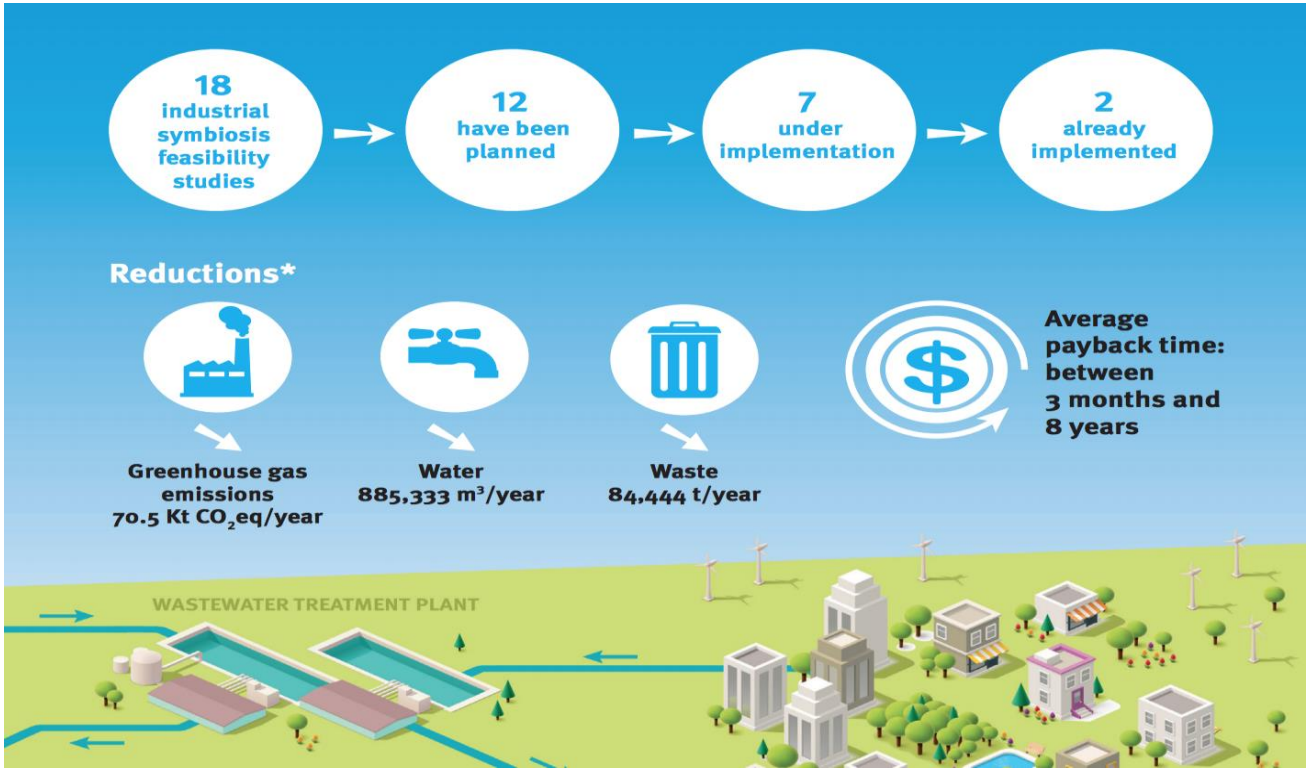
Fossil fuels
142 TJ/year

Greenhouse gas emissions
30.6 Kt CO_2eq/year

Water
606,816 m^3/year

Raw materials and chemicals
4,225 t/year

Industrial Symbiosis in Can Tho and Da Nang IPs (Vietnam) (2018-2019)



UNIDO EIP ONLINE COURSE

COURSE SNAPSHOT

FORMAT: Online
LENGTH: 6-7 Hours
LANGUAGE: English
CERTIFICATE: Yes

7 SELF-PACED INTERACTIVE MODULES

- Introduction to EIPs
- EIP Opportunity Assessment
- EIP Management
- Resource Efficient and Cleaner Production
- Industrial Synergies
- EIP Concept Planning
- Implementation of EIP Opportunities

ACCESS TO THE UNIDO EIP TOOLBOX

To assist with the development and implementation of EIPs and related initiatives

FURTHER CURATED RESOURCES ON EIPS

Key resources and handbooks related to the implementation of EIPs including the International Framework for Eco-Industrial Parks (UNIDO, GIZ and WBG)

LINK TO REGISTER:

https://hub.unido.org/training-modules-eco-Industrial-parks

FOR MORE INFORMATION ON EIPS, VISIT
THE UNIDO KNOWLEDGE HUB
(HUB.UNIDO.ORG)

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Project Overview as Specific to Robbiki IP

Yasser Sherif-Managing director (Environics)

Environics SAE
Environment & Development Advisors

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Contents

- Objectives
- Main Components
- Milestones
- Collaborative Approach
- Agenda

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Objectives

- Supporting the companies to improve the environmental and social performance
- Supporting the park to becoming a successful EIP case study
- Ensuring necessary capacity of Robbiki IP and the leather and tanning companies to improve environmental, social and resource management
- Contributing the development of relevant policy and regulations leading to an increased role of EIP in Egypt

Main Components

- **EIP, RECP capacity development workshop (this event)**
- **Engagement with the interested companies**
- **EIP options (park level)**
  - Identification and assessment of EIP options, leading to
  - Implementation Plan
- **RECP Interventions (company's level)**
  - Identification, implementation, follow up and assessment of RECP interventions
- **IS and urban synergy options**
  - Identification of feasible IS and urban synergy options
- **Support related to LWG certification**
- **Policy briefing**

Milestones

Milestones	Tentative Timeframe
Engagement with interested companies, Preliminary data provision	**Mid January**
Assessment, discussion and agreement on EIP opportunities	End of January
Quick visits to verify data and identify RECP interventions	**February**
Meetings with managers to prioritize RECP at each company	**Early March**
Reporting on possible IS, legal considerations and feasibility	End of May
Identification of possible industrial-urban synergy options	End of April
On-the job training for RECP implementation	**Mid May**
Follow up on RECP implementation at the participating companies	**June - October**
Support tanneries seeking LWG certificate	**August - September**
Development and discussion of policy briefs	November

Collaborative Approach

UNIDO and Consortium role and responsibilities	• Provide advice and technical support to interested companies • Identify and ensure implementability of EIP, RECP and IS opportunities • Review and assess implementation • Support in improving export preparedness
Expected contribution of Robbiki IP management	• Coordinate between all stakeholders • Provide information related to IP • Discuss and take decisions related to EIP, IS and synergy options • Feedback on policy proposals
Responsibilities of the cooperating companies	• Commitment to RECP implementation • Cooperate with Consortium in data provision, visits and discussions • Implement and Manage to Sustain RECP • Eeedback on policy proposals

Agenda

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EIP Concepts and Requirements

Shadia Elshishini, Industry and Cleaner Production Expert

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Contents

- Industrial Parks – Advantages and Disadvantages
- Components of Industrial parks
- Eco Industrial Parks Characteristics
    1. Enhance Performance of IP management
       Park Management Performance Indicators
    2. Enhance Environmental Performance
       Environmental Performance Indicators
    3. Improve Social Performance
       Social Performance Indicators
    4. Increase Economic Performance
       Economic Performance Indicators
- Responsibilities of Tenant Facilities
- Benefits to Owners and Workers

Industrial Parks

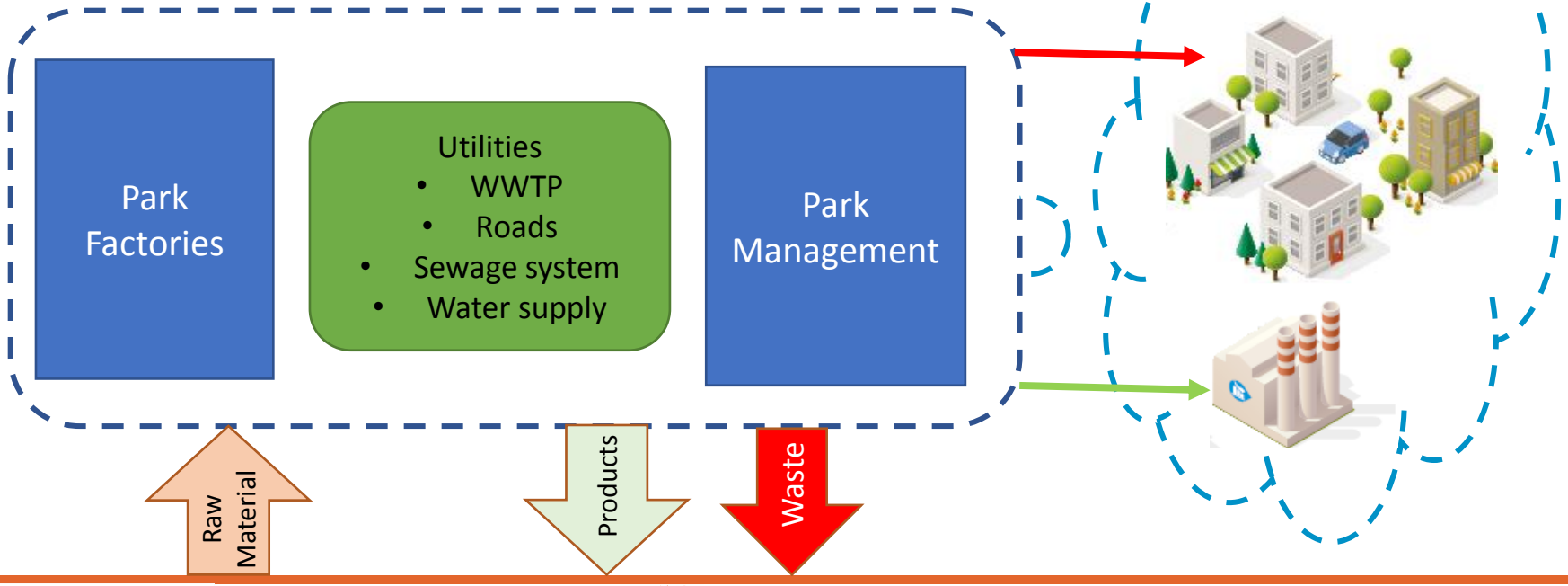
Advantages

- **Existing infrastructure:** park owners provide access to resources required for industrial operations. Water, gas, and electricity supply. Sewage systems will also be suitable for treating high-volume wastewater.
- **Strategic location:** location between multiple major urban center's
- **Access to transport networks:** accessible motor ways
- **Relationship with park owners:** park management can offer lower prices than in urban areas. Others provide financing options for construction. Most park owners offer specialized support to help companies secure permits and industrial licenses.

Disadvantages

- **Pollution island:** industrial parks concentrate pollution produced having several industries in a specific area. Although they are often built away from residential and commercial areas, they are now rapidly approaching residential areas. Establishing an industrial zone can also lead to soil contamination**.**
- **Increased traffic**: parks often result in increased traffic in the industrial area and on nearby highways.
- **Additional costs**: depending on current management, additional costs may be charged every year to maintain the park's roads and infrastructure.

Industrial Park Components



Eco Industrial Parks

1

Increase performance of park management

2

Enhance environmental performance by providing sustainable means to manage water, wastewater, waste, and resources and addressing climate change issues

3

Improve social performance by addressing working conditions, gender, community dialogue, land acquisition and social infrastructure.

4

Increase economic performance by maximizing profit, job creation, and competitiveness, as well as access to additional investment for resident industries.

1 - Enhance Park Management Performance (1)

Energy:

- Coordinate support program to improve energy efficiency of companies
- Provide centralized energy infrastructure: solar energy, co-generation, …

Industrial Synergy:

- Facilitate engagement between tenants and entities outside the park (municipality, agencies, service providers,…)
- Develop Synergies for by-products/waste

Procurements:

- Facilitate joint buying of raw material and chemicals

Resource Efficiency:

- Support companies to access service providers to identify and implement Resource Efficiency and Cleaner production measures.

Transportation

- Facilitate shared transport.
- Provide warehousing facilities
- Provide vehicle maintenance.

Waste

- Support companies to increase waste reuse
- Provide centralized services for WM

Enhance Park Management Performance (2)

Water:

- Support tenants to increase water reuse
- Provide centralized water supply infrastructure
- Provide centralized wastewater treatment

Business development and marketing:

- Recruit new companies that are synergetic and add value to tenants
- Coordinate market assessment studies (e.g. green markets)
- Publicity

Health:

- Provide centralized medical facility

Security

- Operate common security control

Community:

- Facilitate Community engagement “common voice”
- Support formation of tenant association.
- Develop good relationship with municipality
- Organize training for workers

Finance and banking

- Provide banking facilities in Park.

Monitoring and Management System

- Establish and operate Monitoring System at Park level
- Coordinate plan to react to impacts of Climate change risks (heat waves, droughts, …)
- Operate grievances mechanism (complaints)

Park Management Performance Indicators

Park management services	100% of firms in the industrial park have signed a residency contract and additional legally binding arrangements that empower the park management entity to perform its responsibilities and tasks and charge fees for common services. This may include transparent fees for services pertaining to the achievement of EIP performance targets.
	At least 75% of resident firms indicate satisfaction with regard to the provision of services and common infrastructure by the park management's entity
Monitoring and risk management	At least every 6 months, park management entity monitors and prepares reports regarding the achievement of target values to encompass the following: • Environmental performance; • Social performance; • Economic performance; and • Critical risk management at the level of the park.

2 - Enhance environmental performance

Management and monitoring	Park management entity • operates an environmental / energy management system in line with internationally certified standards • monitors park performance • supports resident firms in the maintenance of their own firm-level management systems.
Energy	• Supports programs in place to improve energy efficiency of tenant firms
Water	Park management has plans to increase water reuse in the short and medium term to reuse industrial effluents
Climate change	A program is established to monitor, mitigate GHG emissions, such as carbon dioxide (CO_2), … There is clear evidence of steps taken to introduce mitigation activities.

Environmental Performance Indicators (1)

Management and monitoring	At least 40% of resident firms with more than 250 employees have an environmental / energy management system in place that is in line with internationally certified standards.
Energy	At least 90% of combined park facilities and firm-level energy consumption have metering and monitoring systems in place.
	Total renewable energy use in the industrial
Water	100% of total water demand from firms in industrial park do not have significant negative impacts on local water sources or local communities.
	At least 95% of industrial wastewater generated by industrial park and resident firms is treated to appropriate environmental standards.
	At least 50% of total industrial wastewater is reused.

Environmental Performance Indicators (2)

Waste and Material Use	At least 20% of solid waste generated by firms is reused by other firms, neighbouring communities, or municipalities.
	100% of firms in park appropriately handle, store, transport and dispose of toxic and hazardous materials.
	Less than 50% of wastes generated by firms in the industrial park goes to landfills.
Climate change and Natural Environment	At least 5% of open space in the park is used for native flora and fauna.
	At least 50% of firms in park have pollution prevention and emission reduction strategies to reduce emission below national regulations.
	At least 30% of largest polluters in industrial park have a risk management framework in place that: (a) identifies the aspects which have an impact on the environment and; (b) assign a level of significance to each environmental aspect.

Improve social performance

Social Performance addresses working conditions, gender, community dialogue, land acquisition and social infrastructure.
Social infrastructure refers to community and individual support services and resources such as health, education, early childhood, community support, community development, culture, sport and recreation, parks and emergency services.

Social management systems	Dedicated personnel exist (as part of the park management entity) to plan and manage social quality standards.
Social infrastructure	Essential primary social infrastructure has been adequately provided in the site master plan and is fully operational in the park.

Social Performance Indicators (1)

Social management systems	At least 75% of all firms in the industrial park with more than 250 employees have a well-functioning OH&S management system in place.
	100% of grievances received by the park management entity are addressed within 90 days.
	At least 60% of grievances received by the park management entity are brought to conclusion.
	At least 75% of all firms in the industrial park with more than 250 employees have a code of conduct system in place to deal with grievances.
	At least 75% of all firms in the industrial park with more than 250 employees have a harassment prevention and response system in place.

Social Performance Indicators (2)

Social infrastructure	At least 80% of the surveyed employees report satisfaction with social infrastructure.
	100% of reported security and safety issues are adequately addressed within 30 days.
	75% of all firms in the industrial park with more than 250 employees have a program for training and development.
	At least 20% of female workforce benefit from available supporting infrastructure/programs for skills development.
Local community outreach*	At least 80% of the surveyed employees report satisfaction with social infrastructure.
	At least two outreach activities that are implemented by the park management are regarded as positive by over 80 percent of the surveyed community members.

*Community outreach: providing professional services, or services of a specific expertise, to a group of people who may not otherwise have access to those services.

Increase Economic Performance

Employment generation	Park management entity has plans to generate specific numbers and types of jobs (including diversity and inclusiveness) in line with government targets.
Local business & SME promotion	Park management entity allows and promotes the establishment of SMEs that provide services and add value to park residents.
Economic value creation	A market demand and feasibility study, supported by a business plan, for specific "green" infrastructure and service offerings has been undertaken to justify planning and implementation in the industrial park.
	Tracked by the park management entity, the industrial park fulfils relevant government targets, including domestic, foreign direct investment, and tax revenues.

Economic Performance Indicators

Employment generation	At least 60% of total workers employed in industrial park live within daily commuting distance.
	At least 25% of total firm workers in industrial park are employed through direct employment (that is, not employed on a fee-for-output basis or provided through a labor supply firm) and permanent contracts.
Local business and SME promotion	At least 25% of resident firms use local suppliers or service providers for at least 80 percent of their total procurement value.
	At least 90% of total procurement value of park management entity are supplied by local firms or service providers.
Economic value creation	On average, the occupancy rate of space available for resident firms was >50% over the last 5 years.

Responsibilities of Tenant Facilities

Environmental

- Abide by Environmental laws to minimize environmental pollution
- Implement resource efficiency projects
- Implement Occupational, Health and Safety requirements
- Obtain operation license

Social

- Cooperate with Park Management to fulfill EIP requirements
- Participate in Park Management outreach programs to increase workers skills and awareness
- Actively participate in the tenant association (common voice) to enlarge its scope (common procurement, services, exports…)

Main Benefits of EIP to Tenant Facilities

Benefits to Owners

- Export markets require green products
- Available green finance
- Resource efficiency measures result in financial benefits
- Skilled labor means better product quality
- Value of land increases

Benefits to Workers

- Safe environment
- Potential to increase skills and therefore salaries
- Available common transportation
- Ease to find extra workload

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RECP Concepts and Benefits

Shadia Elshishini, RECP expert

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Resource Efficient Cleaner Production

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

RECP addresses the three sustainability dimensions individually and synergistically:

a) heightened economic performance through improved productive use of resources,

b) environmental protection by conserving resources and minimizing industry's impact on the natural environment,

c) social enhancement by providing jobs and protecting the wellbeing of workers and local communities.

PRODUCTION EFFICIENCY

Improve the productive use of natural resources

ENVIRONMENTAL PROTECTION

Minimize the impact on nature

SOCIAL ENHANCEMENT

Support communities and reduce risks

Resource Efficiency and Cleaner production

Efficiency is a concept that compares the inputs to a system with its outputs; it essentially means achieving “more with less”.

In the case of industry, it refers to a production process producing a product with less inputs.

A resource-efficient manufacturing plant produces and consumes resources in a more sustainable way.

Specific consumption of inputs and Specific generation of waste are indicators of Efficiency.

Energy/water/raw material consumption /t product

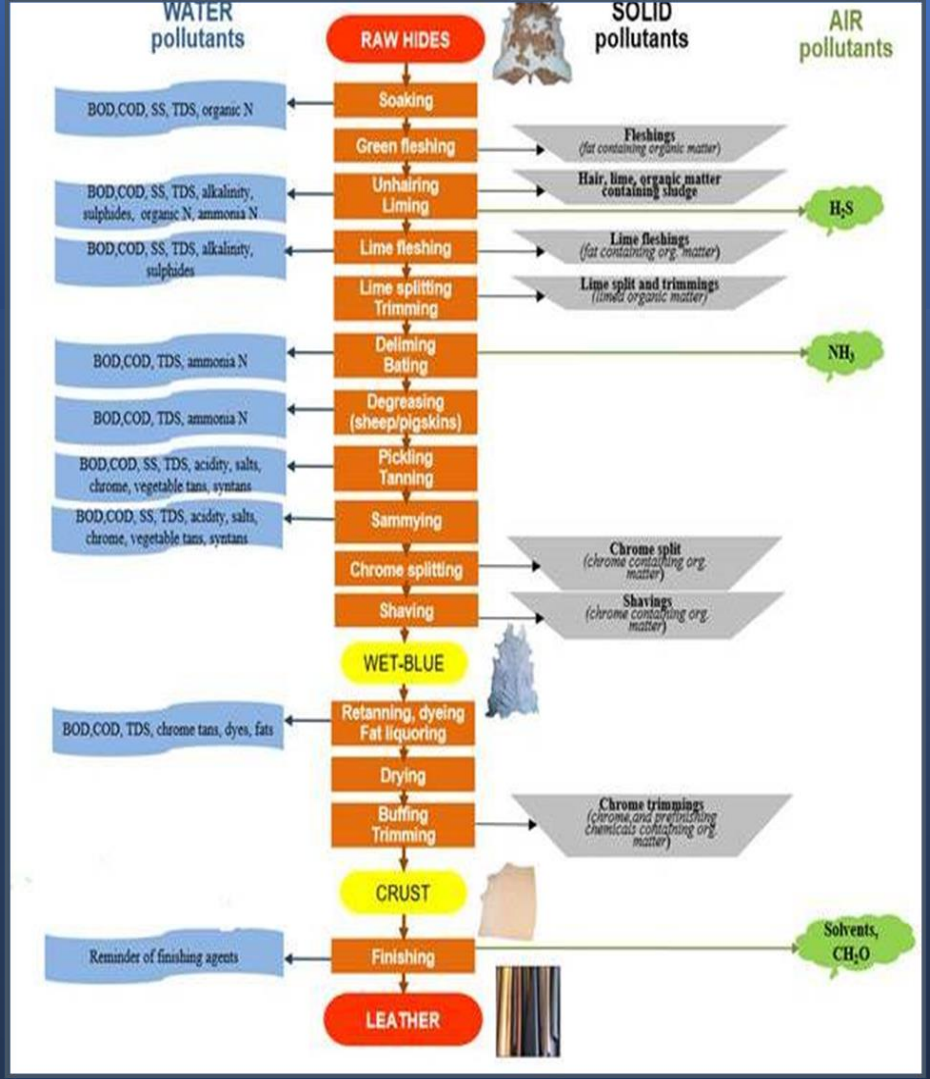
Waste generated / t product

Cleaner production (CP) is a preventive business strategy designed to:

- conserve resources
- mitigate risks to humans and the environment
- promote greater overall efficiency through improved production techniques and technologies.

It involves:

- substituting different materials
- modifying processes
- upgrading equipment
- redesigning products


WATER pollutants
SOLID pollutants
AIR pollutants
RAW HIDES
Soaking
BOD,COD, SS, TDS, organic N
Green fleshing
Fleshings (fat containing organic matter)
Unhairing Liming
BOD,COD, SS, TDS, alkalinity, sulphides, organic N, ammonia N
Hair, lime, organic matter containing sludge
H_2S
Lime fleshing
BOD,COD, SS, TDS, alkalinity, sulphides
Lime fleshings (fat containing org. matter)
Lime splitting Trimming
Lime split and trimmings (limed organic matter)
Deliming Bating
BOD,COD, TDS, ammonia N
NH_3
Degreasing (sheep/pigskins)
BOD,COD, TDS, ammonia N
Pickling Tanning
BOD,COD, SS, TDS, acidity, salts, chrome, vegetable tans, syntans
Sammying
BOD,COD, SS, TDS, acidity, salts, chrome, vegetable tans, syntans
Chrome splitting
Chrome split (chrome containing org. matter)
Shaving
Shavings (chrome containing org. matter)
WET-BLUE
Retanning, dyeing Fat liquoring
BOD,COD, TDS, chrome tans, dyes, fats
Drying
Buffing Trimming
Chrome trimmings (chrome and prefinishing chemicals containing org. matter)
CRUST
Finishing
Remainder of finishing agents
Solvents, CH_2O
LEATHER

Comparison between small and large tanneries

- Tanneries can be divided according to Small, Medium and Large depending on the number of drums. Large > 9 drums; Medium 5-8 drums and small < 4 drums
- The bigger the tannery the more profitable the implemented resource efficiency projects (economy of scale).
- The specific investment of Cleaner Production projects per ton of hides is lower for larger tanneries e.g. cost of chrome recovery/t hides.
- Usually S&M tanneries cannot afford installation of pre-treatment units and lack expertise. They can be eligible for financial and technical support.

RECP for Water

Reduce water consumption

- Reduce water consumption at various stages of production.
- Counter current washing
- Metering the required amount of water
- Using recycled water
- Housekeeping

Reduce environmental Impact

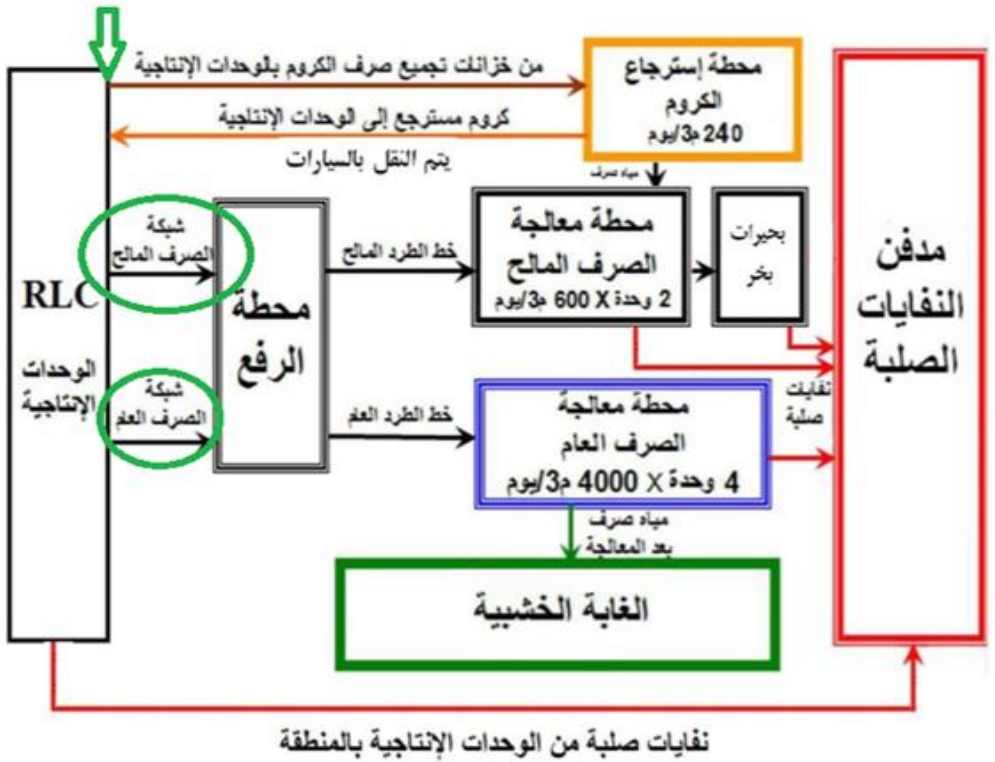
- Segregation of the 3 types of WW
- Pretreatment of suspended solids by sedimentation
- Evacuate Chrome containing WW and deliver to central Chrome treatment and recovery unit
- Minimize use of chemicals

Low-cost Housekeeping measures

- Reuse water from “cleaner” stages of production in “dirtier” stages of the next production cycle. For example, use rinse water from the final stage of production for the initial soaking or washing of the next batch of hides.
- Conserve water by improving production methods.
- Turn off water between batches or while transferring hides between baths.
- Install nozzles on hoses to increase the effectiveness of spraying while decreasing water use.
- Prevent baths from overflowing by monitoring water levels closely or installing an automatic shut-off mechanism.
- Use dry clean-up methods: use brooms or cloth to remove as much solid or semi-solid waste as possible from floors or machinery before rinsing them down with water.

Central Wastewater Treatment Plant –

Effluent Segregation



Effluent Segregation

1

Chrome containing effluent

Use screen to remove coarse material

To central Chrome Recovery unit

2

TDS > 2000, TSS >800 to CWWTP

Use screen to remove coarse material

Sedimentation tank with 30 min residence time

V= effluent flowrate m3/min x 30

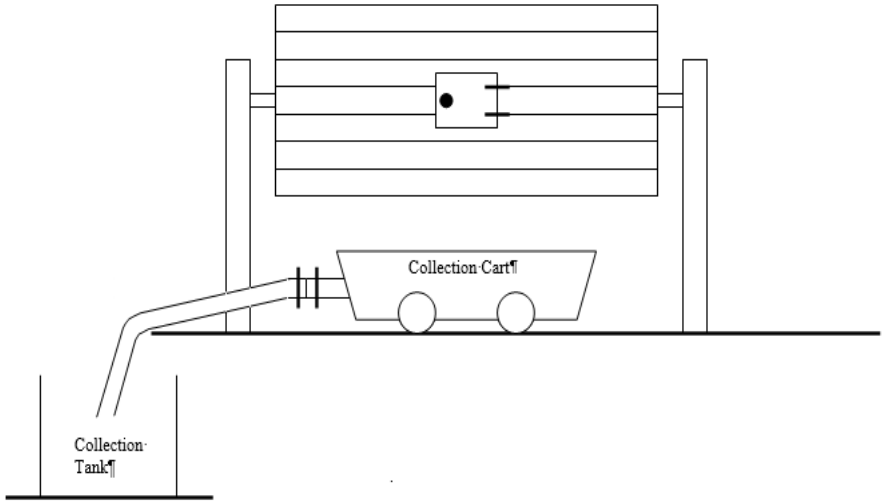
Allow for sludge volume 1.3 X V

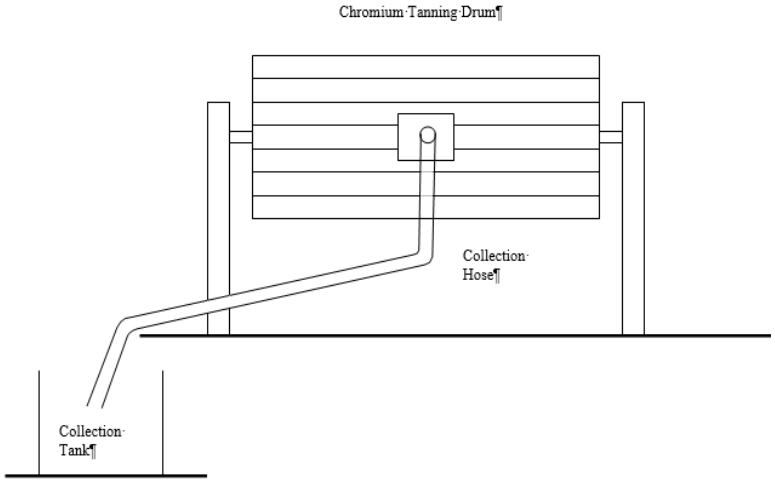
3

Low TDS < 2000

Screen on effluent to remove coarse material

Segregating effluent in small tanneries





Benchmarks for water consumption

Process stage	Waste water discharge
	m^3 per tonne of raw hide
Soaking	2
Liming	4.5
Deliming, bating	2
Tanning	0.5
Post-tanning	3
Finishing	0
Total	12

Source :[84, Ludvik J. 2000].

Low-cost water reduction measures

- Increase flow control using flowmeters and spring valves
- Batch vs running water washes. 50% reduction can be achieved using batch wash.
- Modify equipment to use short floats (مياه التعويم) 40-80% instead of 100-250% (low water content) also reduces process time.
- Prevent leaks from vessels and pipes

Reuse of treated WW

Treated water with high TDS can be re-used in soaking and liming processes resulting in the following reduction. However, there will be a build-up of the salt content and problems for the biological treatment of the effluent.

Parameter	Without water recirculation	With water recirculation
Waste water	~ 12 m^3 per tonne of raw hide	~ 9.5 m^3 per tonne of raw hide
Energy	6.3 GJ per tonne of raw hide	6.3 GJ per tonne of raw hide
Chemicals	~ 450 kg per tonne of raw hide	~ 450 kg per tonne of raw hide

RECP for Chemicals and Hazardous Substances

Reduce Chemicals consumption

- Green fleshing reduces chemicals by 10-20% as it is performed on salted hides after soaking and before liming.
- Reduction of water use, results in reduction of chemicals
- Use cleaner technology (vegetable tanning instead of Chrome tanning)

Reduce environmental Impact

- Substitute NPE (nonyl phenol ethoxylate) restricted under REACH by linear alcohol ethoxylate.
- Substitute halogenated organic compounds used in degreasing and fat liquoring
- Eliminate pesticides from hides and skins
- Use approved biocides used in curing, soaking, pickling, tanning and post-tanning.

Directive 2008/105/EC

Consumption of Chemicals

Chemical consumption	Approx (%)
Standard inorganic chemicals (without salt from curing, acids, bases, sulphides, chemicals containing ammonium)	40
Standard organic, not mentioned below (acids, bases, salts)	7
Tanning chemicals (chromium, vegetable, and alternative tanning agents)	23
Dyeing agents and auxiliaries	4
Fatliquoring agents	8
Finishing chemicals (pigments, special effect chemicals, binders and cross-linking agents)	10
Organic solvents	5
Surfactants	1
Biocides	0.2
Enzymes	1
Others (sequestering agents, wetting agents, complexing agents)	1
Total	100

A practical problem faced by tanneries is that many of the chemicals purchased are proprietary products. Suppliers do not specify the chemical compositions of the products.

Tanneries must seek additional information from the chemical suppliers in order to determine the environmental impact of the products they use.

Material safety data sheets provide some data on the toxicity of the products to humans and environment

Vegetable tanning vs Chrome tanning

Vegetable tanning materials extracted from plant, organic (Chestnut woods, and other tree woods).

Advantages:

- Environmentally friendly
- Develops patina overtime
- Improves with use
- Natural look, shiny
- Timely and skilful

Disadvantages:

- Time consuming
- Nos as soft
- Needs special craftsmanship
- More expensive (special export markets)

Chemicals used in **Chrome tanning** :

- **Chromium (III) sulphate -** widely used as a tanning material, works as a stabilizer and merges the fibres.
- **Chrome alum -** Because of its soluble properties, it reaches the depths of the hide and dissolves in the fibres.
- **Chromium salts -** Due to its anti-corrosive properties, it prevents the hide from deforming and renders it no-fade quality.

Advantages: Softer leather, fast-pace, lower cost

Disadvantages: environmentally unfriendly as it involves hazardous chemicals, less shiny, breaks easily

RECP for Waste

Type of solid waste	Rate of generation	Characteristics	Comments
Salt from mechanical removal	0.1 kg/hide	12% moisture, 45% salt contaminated with blood, dirt and bacteria	Part reused in curing and the rest dumped
Fleshing (flesh material of limes hides)	0.25 kg/hide	24% proteins, 20% fat, 0.3% sulfide	Sold to soap industry or poultry fodder makers
Raw trimmings	0.024 kg/hide	Proteins	Sold to soap industry or poultry fodder makers
Wet trimming / wet shaving after chrome tanning	0.14 kg/hide	24% protein 3% fats, 1.5 % Chromium oxide	Poultry feed makers collet these shavings from tanners
Dry trimming / dry shaving	0.06 kg/hide	30% proteins, 13% fats, 3% chromium oxide	Poultry feed makers

RECP for energy

Reduction of Energy consumption – case study for a Tannery

- Installing power factor correction panel to achieve a standard value in the range of 0.92-0.95
- Installing inverters on motors (drums) to reduce their electricity consumption
- Improving the lighting system by replacing the current incandescent lamps with energy saving lamps.

The implementation of these options saved 62% of total electricity consumption corresponding to 30 MWh/year.

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International case studies of Industrial Symbiosis focusing on Leather Tanning Sector

Prahlad Tewari- Vice President (Environmental Management Centre Pvt Ltd)

Environics SAE
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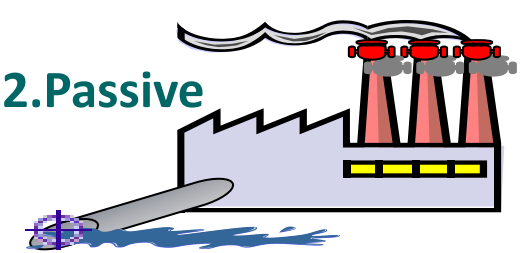
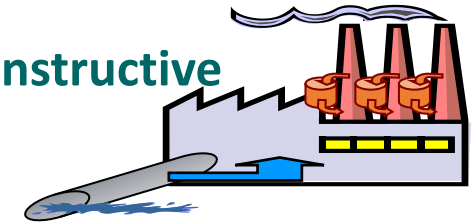
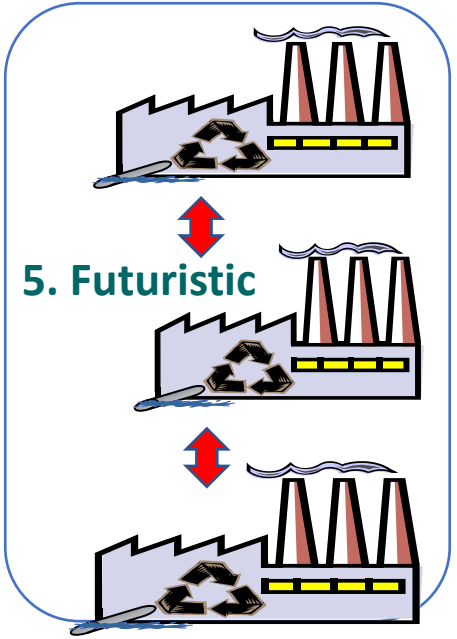
Typical responses of industries towards the pollution problem







RECP Approach: Change of Mindset

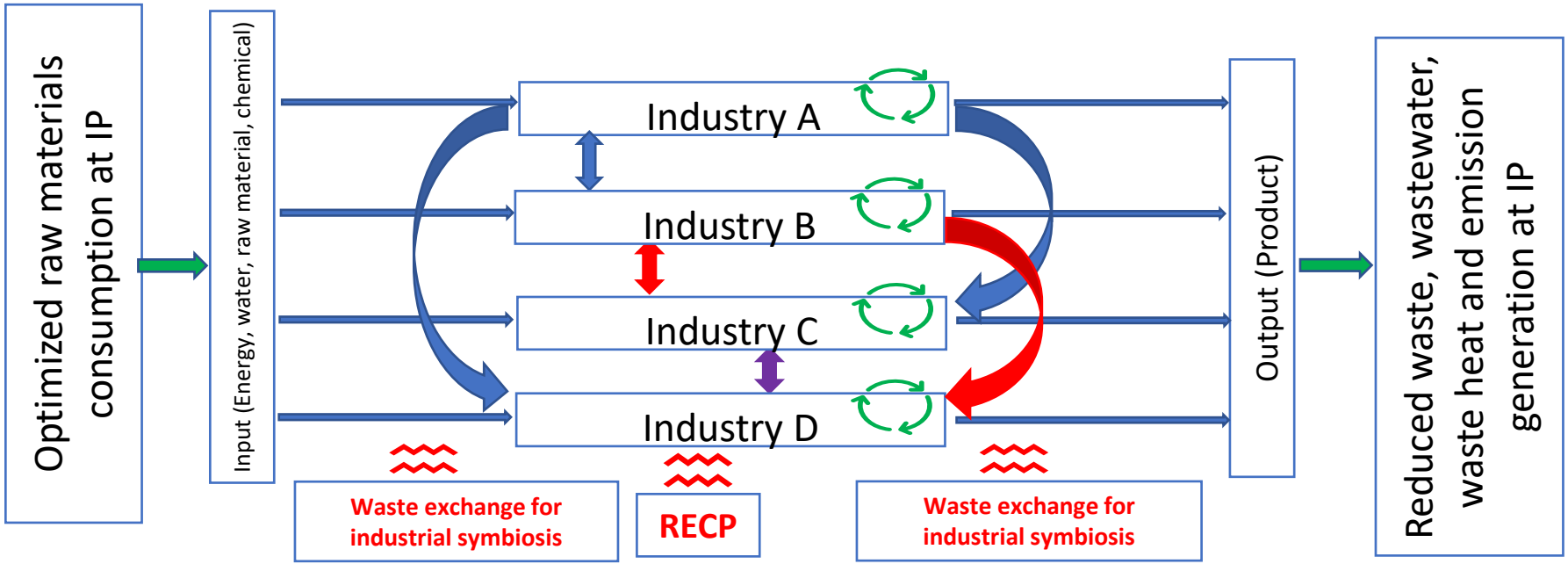
- **Waste is generated!**
- What can be done with it?
- End of Pipe Thinking

- **Waste Treatment Approach**
- **Additional Cost!**

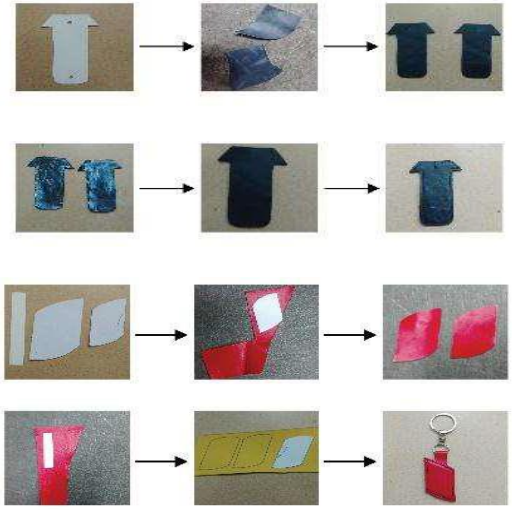
- **Waste is generated!**
- Where does it come from?
- How can it be avoided/reduced?
- How can it be utilized/recovered?
- How can it be recycled/reused?

- **RECP Approach**
- **Saves Money!**

Industrial symbiosis



Industrial Symbiosis – Waste to Value-Added Products



Reference: Hossain, Md & Zami, Syed All. (2021). LEATHER WASTE INTO VALUE ADDED LEATHER PRODUCTS: A WASTE TO WEALTH APPROACH.

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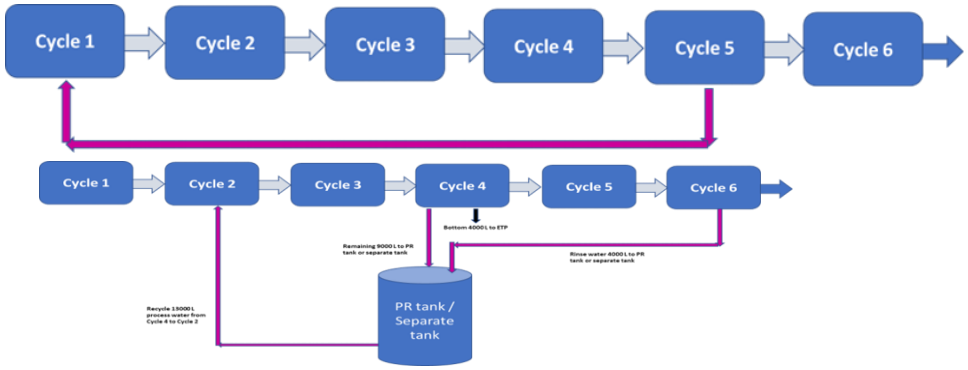
Water saving opportunities in the bleaching section

Resources	Process	Wastewater
Yarn (720 kg) Wetting agent Sequestrating agent Fresh water 13000 L	**Cycle 1: Hot Water Wash** Temp: 90°C by direct steam Time: 35 – 40 minutes pH: 9	Wastewater ≈ 13000 L to ETP at about 90°C temperature
Wetting agent Sequestrating agent Stabilizing agent (Peroxide at 50°C) Water 13000 L Caustic Soda (at 75°C)	**Cycle 2: Caustic 1** Temp: 98°C by direct steam Time: 75 minutes pH: 13-14 Temperature of solution is reduced by water circulations	Wastewater ≈ 13000 L to ETP at about 88°C temperature
Wetting agent Sequestrating agent Stabilizing agent (Peroxide at 50°C) Water 13000 L Caustic Soda (at 75°C)	**Cycle 3: Caustic 2** Temp: 98°C by direct steam Time: 75 minutes pH: 13-14 Temperature of solution is reduced by water circulations	Wastewater ≈ 13000 L to ETP at about 88°C temperature
Water 13000 L	**Cycle 4: Hot Water Wash** Temp: 90°C by direct steam Time: 10 - 30 minutes pH: 9-10	Wastewater ≈ 13000 L to ETP at about 88°C temperature
Water 13000 L Neutralizing agent (Peroxide killer + Acetic acid)	**Cycle 5: Cold Water Wash** Temp: 60°C by cold water circulation Time: 10 - 30 minutes pH: 9-10	Wastewater ≈ 13000 L to ETP at about 60°C temperature
Water 4000 L	**Cycle 6: Rinse washing** Robe Bobin carrier are taken out for next stage processing followed by rinsing (4000 L fresh water)	Wastewater ≈ 4000 L to ETP

Bleaching cycles	Parameters		
	pH	TDS (ppm)	Electrical conductivity (µS)
Cycle 1: Hot water wash	5.37	613	1227
Cycle 2: Caustic 1	9.41	2430	4870
Cycle 3: Caustic 2	11.64	3180	6370
Cycle 4: Hot water wash	10.93	1223	2440
Cycle 5: Cold water wash	5.168	671	1343



Water saving (m³/year)	Wastewater saving (m³/year)	CO_2 reduction (kg CO_2/ year)	Potential saving (Rs/year)	Investment (Rs/year)	Payback (Month)
22,750	19,338	8650	43,53,212	Nil	Immediate

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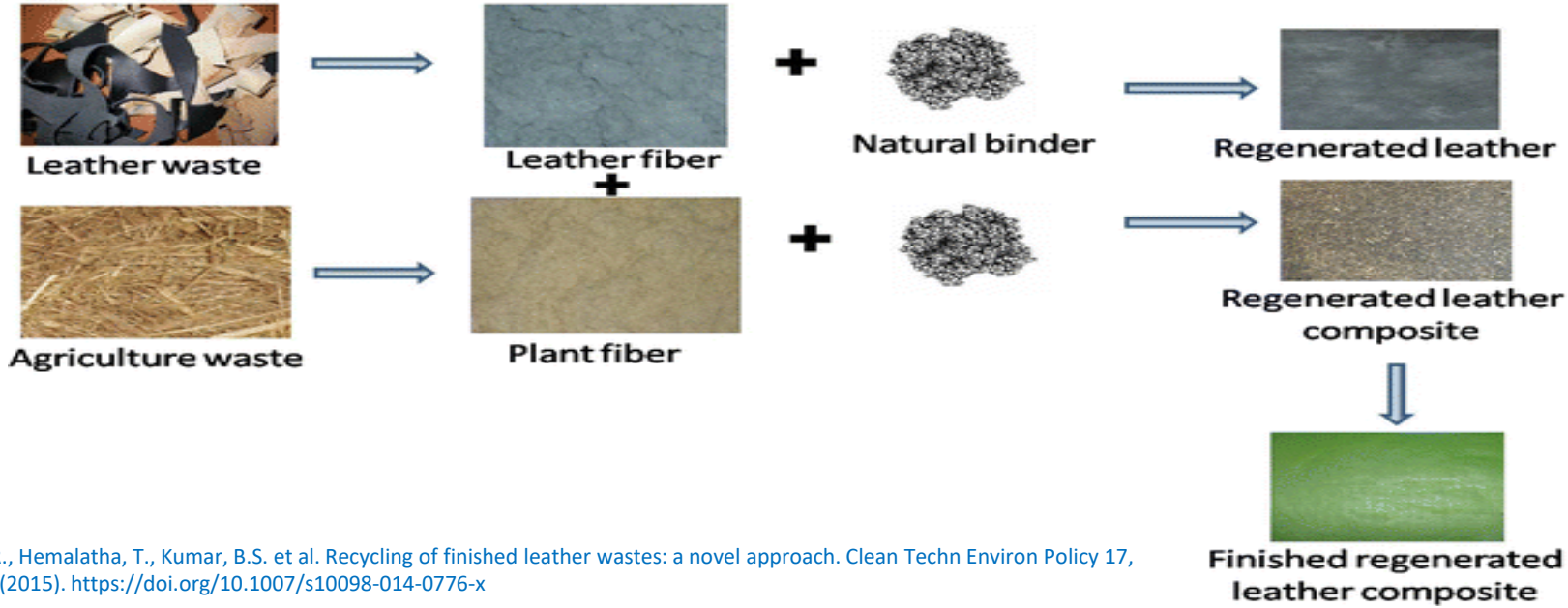
IS – From leather waste to regenerated leather composite



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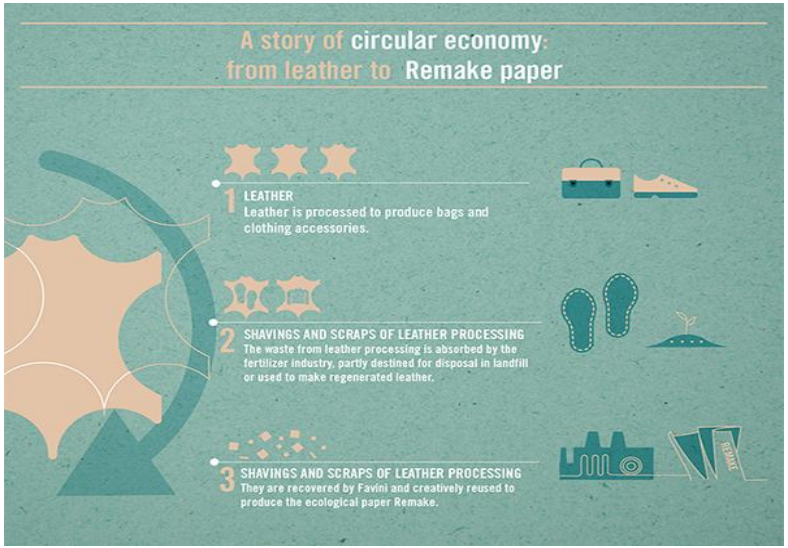
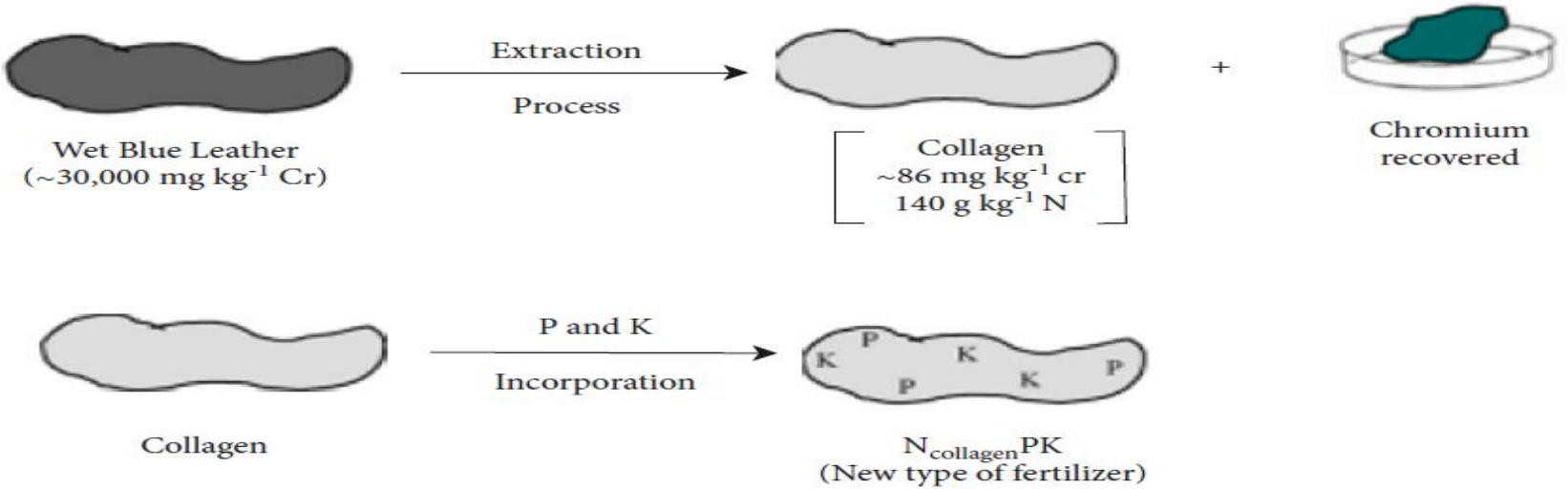
IS– From leather processing to eco-sustainable paper



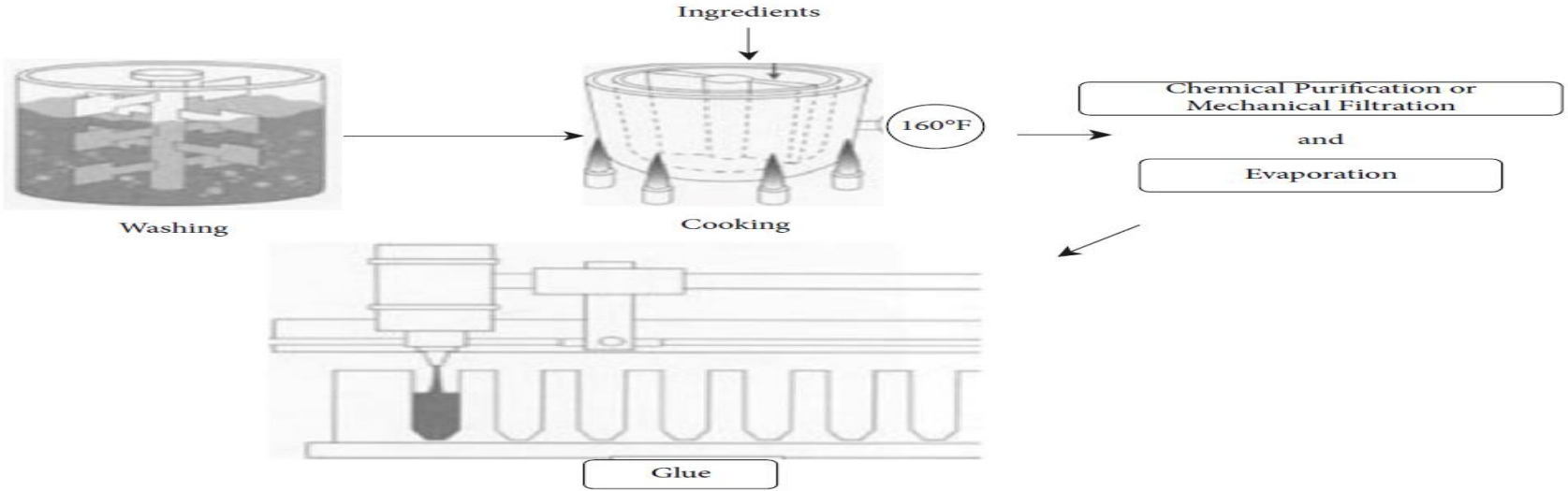
https://www.favini.com/en/news/from-the-manufacturing-of-leather-into-remake/

IS– Leather Biomass for Fertilizer Production



Million Ayele, Derseh Yilie Limeneh, Tamrat Tesfaye, Wassie Mengie, Amare Abuhay, Adane Haile, Gemeda Gebino, "A Review on Utilization Routes of the Leather Industry Biomass", Advances in Materials Science and Engineering, vol. 2021, Article ID 1503524, 15 pages, 2021. https://doi.org/10.1155/2021/1503524

IS - Leather Biomass for Glue Production



Million Ayele, Derseh Yilie Limeneh, Tamrat Tesfaye, Wassie Mengie, Amare Abuhay, Adane Haile, Gemeda Gebino, "A Review on Utilization Routes of the Leather Industry Biomass", Advances in Materials Science and Engineering, vol. 2021, Article ID 1503524, 15 pages, 2021. https://doi.org/10.1155/2021/1503524

IS - Preparation of compost from animal hair waste

Technology	Salient Features	Techno - Economics
• A suitable bacterial species have been identified for the degradation of hair waste followed by the manufacturing of compost using keratin hydrolysate (product of hair degradation) • The whole process could be completed within a time span of 9-10 days	• The compost is organic in nature • The supplementation of compost enhances the yield of paddy crop • The preparation of compost provides a technological solution to the disposal of solid waste, hair	• This technology has been already commercialized • Mineral salts that are locally available in the market will be utilized for the degradation of hair • Capacity: Upto 500 kg

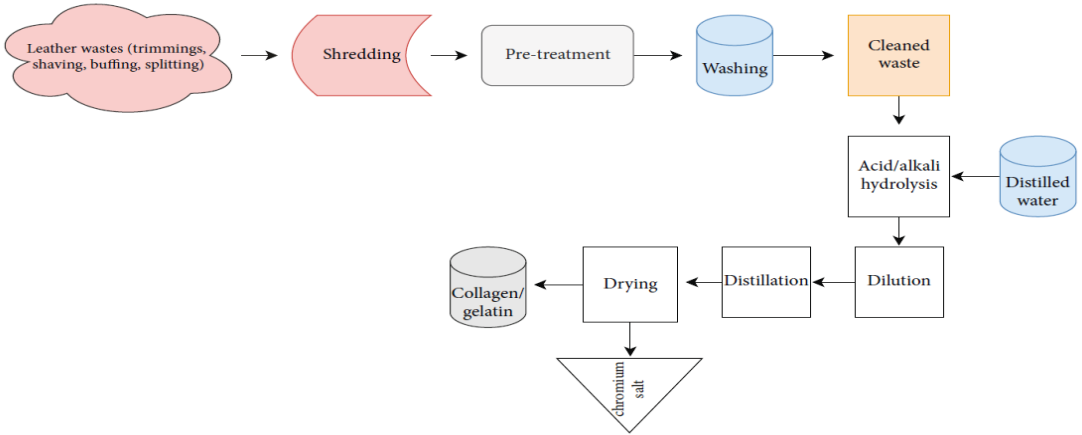
https://clri.org/wastemanagement.aspx

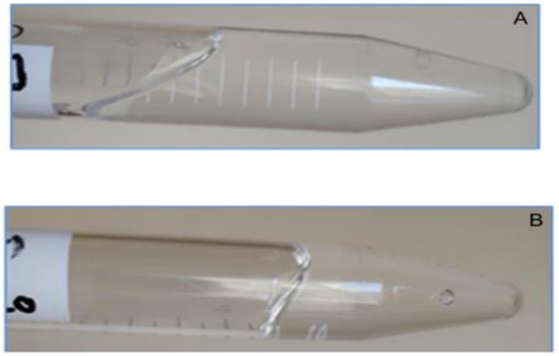
IS - Immobilized Oxidation Reactors (IOR) for WWT

Technology	Salient Features	Techno - Economics
• The technology comprises four components each of which either comprised of immobilized bacteria in nanoporous carbon/iron doped nanoporous carbon/enzyme immobilized nanoporous carbon. • The nanoporous activated carbon generates hydroxyl radicals from molecular oxygen by the carbon matrix at the outer pore surface area. • The fragmented organics are oxidized by the hydroxyl radicals generated at the outer pore surface area of the nanoporous activated carbon matrix.	• Low Footprint requirement • No odour emission • Minimum sludge production compared to conventional technology • The technology can be integrated with membrane separation	• This technology has been already commercialized • Catalyst synthesized from agricultural solid waste • Operational cost is much less than with conventional equivalent technology

https://clri.org/wastemanagement.aspx

IS – Production of gelatine from tannery waste





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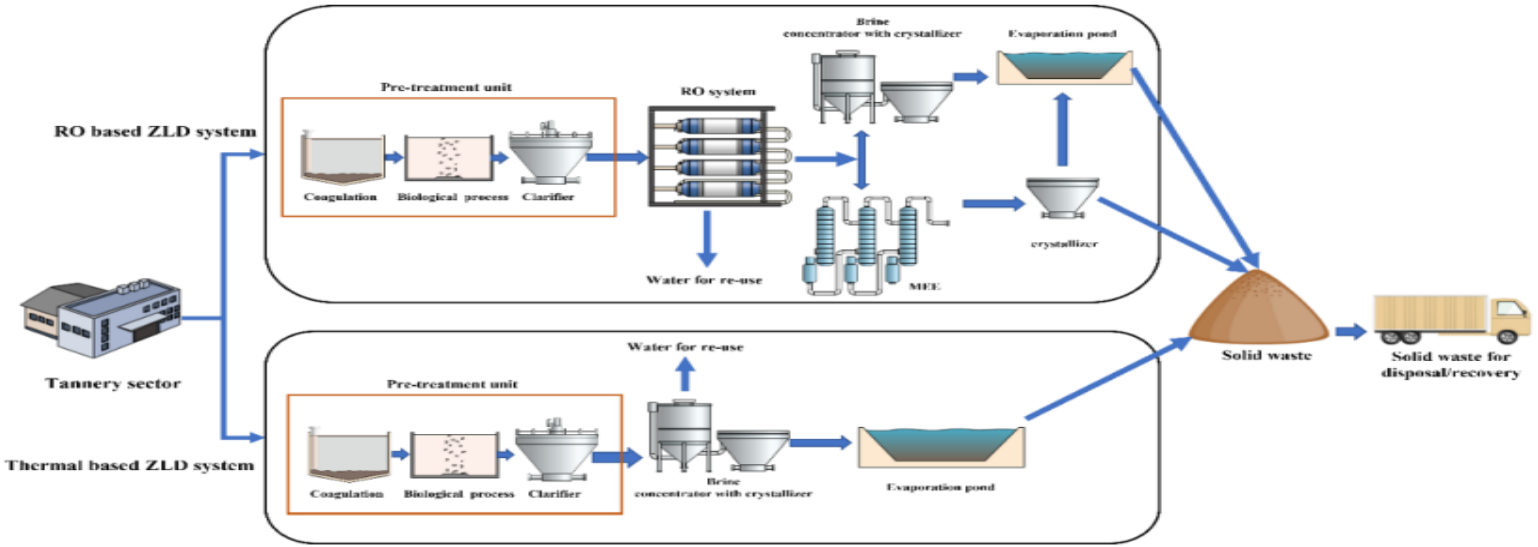
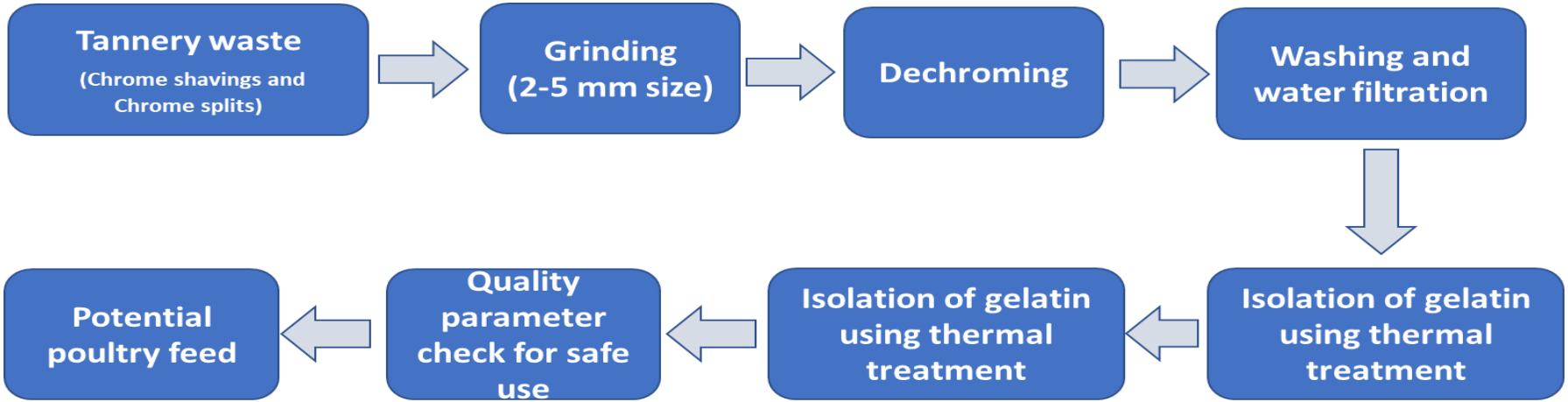
IS – Implementation of Zero Liquid Discharge (ZLD) at cluster



Ricky, R.; Shanthakumar, S.; Ganapathy, G.P.; Chiampo, F. Zero Liquid Discharge System for the Tannery Industry—An Overview of Sustainable Approaches. Recycling 2022, 7, 31. https://doi.org/ 10.3390/recycling7030031

IS – Utilising tannery waste as a protein source for poultry feed



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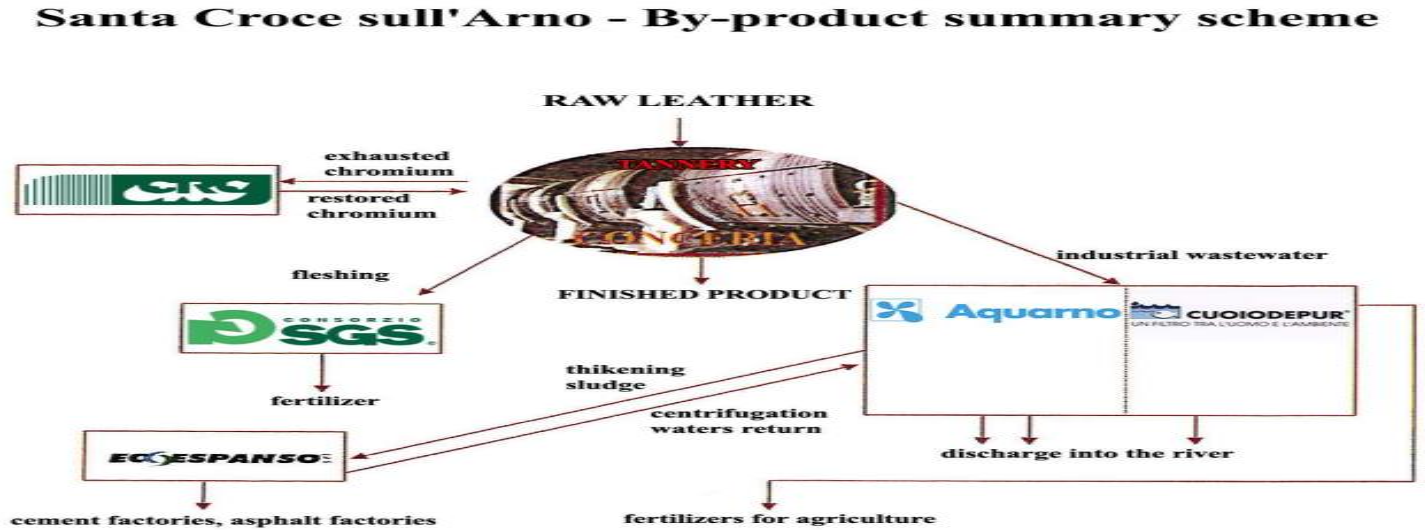
IS – Integrated chrome recovery plants

Location	Chrome recovery plants	Waste utilization
• Bursa Leather Industrial Park, Turkey	• This industrial park has integrated Chrome recovery plant within the CETP	• Currently only a small part of solid waste from the tanning process (fleshing, shaving and buffing) are re-used in the production of gelatin.
• Santa Croce Sull'arno Leather Industrial Park, Italy	• Consorzio Recupero Cromo Spa • This private company is composed of 240 member tanning companies from all over the district. These companies send the exhaust chrome liquor to the consortium for chrome extraction.	• The recovered chrome is returned to the original companies which use it directly in tanning processes. This plant can produce over 21.000 kilos of basic chrome sulphate per day.
• Al-robeky Leather Industrial Park, Egypt	• Proposed Chrome recovery unit	• Residual chrome recovery from the tanning bath, justified from both an economic and environmental point of view.

IS – Integrated chrome recovery plants

Location	Chrome recovery plants	Waste utilization
• Parque Industrial Ecologico, Argentina	• A centralized chrome recovery plant was realized in 1996 (TEA Tratamiento de Effluentes Avellaneda).	• The most representative failure is the Argentinian district of Buenos Aires where the chrome recovery plant, built in 1996 and representative of the first building block of the “Parque Industrial Ecologico di Avellaneda” was actually closed.

IS – At Santa Croce sull' Arno cluster



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Industrial Symbiosis and Urban industrial Synergies

An Action – Oriented Approach

Yasser Sherif-Managing director (Environics)

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Recap on definitions

- **Industrial symbiosis** engages traditionally separate industries in a collective approach involving physical exchange of materials, energy, water, and/or by products.
- **Urban-industrial synergies** are inter-linkages and collaborations beyond a company cluster's physical boundaries with neighboring industries, other industrial parks, communities, and cities or municipalities on the collection, processing and reuse of materials, waste, energy, and water streams.
- Both reduce the intensity of interaction with host environment (extracted material and discharges of wastes).
- Private interests should be compatible with public interests.

Concepts Are Not Totally New

- Beneficial exchange is the overarching guide to human transactions.
- Some industries in Egypt are based on waste valorization (paper – steel – plastics ….) and some have a record of waste valorization (e.g. sugar industry).
- The historical case of Sayyeda Zeinab slaughterhouse.
- What makes exchange occur naturally?

Conducive Conditions

- As related to input
  - Widely available
  - Reasonable quantities
  - Sustained supply
  - Easily checked characteristics
- As related to product
  - Sensitivity to input variation
  - Proven (and simple ?) technology
  - Confirmed demand
  - Feasibility consistent will industry standards
- As related to location
  - Proximity
  - Diversity

  Alternatively, viable transportation

To Expand Opportunities

- Act on Non-conductive conditions
  - Those Preempting process
  - Most importantly ensure demand
  - Resistance to material substitution
- Act on other Constraints
  - Met when embark on process
- Technical Constraints
  - Handing by-products vs waste, RECP
  - Labor skills
  - Performance of IP utilities
- Regulatory Constraints
  - Specifications of products
  - Waste transportation
  - Licensing status
- Economic Constraints
  - Cost of processing/treatment
  - Comparison to virgin material
  - Market conditions and investment capacity

Priorities

- Private interests
  - Financial (Revenue/Saving)
  - Enhance Reputation
  - Expand Market
- Public interests
  - Pollution
  - Resources
  - Employment
  - Value added
- What if none?

	Conductive	Non-conductive
Private Interest	Mostly done	✓ Role for Park management
Public Interest	✓ Policy to reflect on private interests	Longer term

Operational Modalities

- Depend on Context, none is ideal per se
- One-to-one exchange
  - Long term agreements (formal or informal)
  - No need for middlemen
- Central Hub
  - Accountable to specs/availability.
  - Independent (private entity)
  - Affiliated to IP management
  - Collective venture (companies in IP)
- The Pros and Cons of homogeneous industries
- Complementarity of urban synergy

Looking Forward to our Joint Journey

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RECP and International Environmental Requirements and LWG

Ola Kamal- Principal consultant& Technical Manager (Environics)

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Contents

- Leather Working Group (LWG)- Overview
- Benefits of LWG Certificate
- LWG Standards
- LWG- Certification Mechanism
- LWG vs. RECP

Leather Working Group (LWG)- Overview

What is LWG?	LWG objective
• A nonprofit multi-stakeholder organization launched in 2005 • It boasts over 1300 members from across the leather supply chain • It gives the world's leading environmental certification for the leather manufacturing companies	To develop and maintain a protocol that: • Assesses the environmental compliance and performance capabilities of leather manufacturers • Promotes sustainable and appropriate environmental and socially responsible business practices within the leather industry

Benefits of LWG Certificate

- Assessment of the performance of leather and tanning companies against ESG metrics, leading to the following benefits:
  - Helps companies to track their progress on sustainability goals
  - Encourages companies to be more transparent about their E&S performance
  - Can lead to cost savings by identifying operational efficiencies
  - Builds trust with stakeholders and can attract investment
- Good reputation.
- Reaching global markets.

LWG Standards

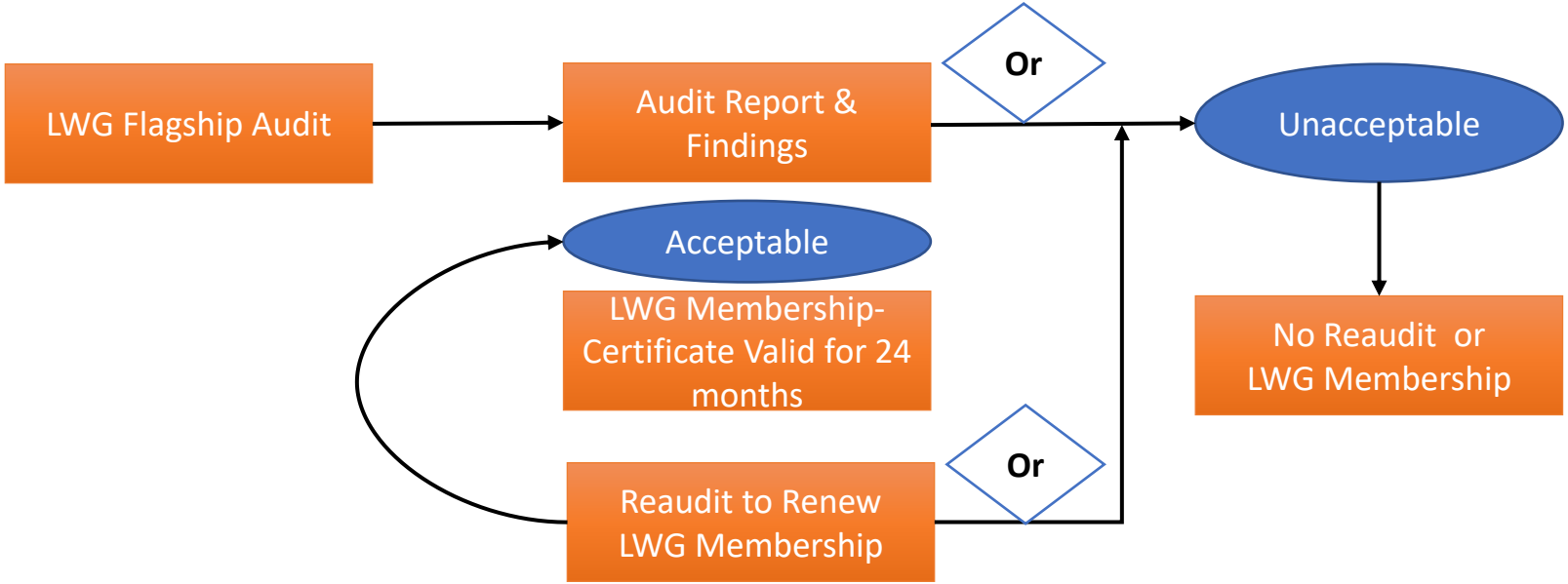
- Flagship audit to assess the performance against environmental, social and governance metrics.
- Version 7.2.2 of the LWG Leather Manufacturer Audit Standard becomes available as of July 1, 2022.
- Promote the best E&S practices
- As a minimum, environmental compliance should be maintained

LWG Standards (continue)

- LWG audit standards covers 17 separate sections:

- General Facility Details
- Subcontracted Operations
- Social Audit
- Operating Permits
- Production Data
- Incoming Material Traceability
- Outgoing Material Traceability
- Environment Management Systems (EMS)
- Restricted Substances, Compliance, and Chromium Management
- Energy Consumption
- Water Usage
- Air & Noise Emissions
- Waste Management
- Effluent Treatment
- Health, Safety, & Emergency Preparedness
- Chemical Management
- Operations Management

LWG- Certification Mechanism



LWG- Certification Mechanism (continue)

- The companies will need to quantify:
  - Environmental: GHG emissions, water consumption, energy use
  - Social: Employee satisfaction, supplier diversity, customer satisfaction
  - Governance: Board diversity, ethical practices
- LWG Scoring:
  - Reduce – the amount of resource used (energy, water, chrome etc.)
  - Reuse – material for the same purpose without additional (or minimal) input (pallets, wastewater etc.)
  - Recycle – material that cannot be reused into other products
  - Recover – raw material (i.e., heat energy for example from oils or solvents that cannot be recycled)
  - Refuse – any material that can only be disposed of (provided disposal is safe and legal).

LWG vs. RECP

The following are the main common subjects between LWG and RECP

- Sharing the company's information (process inputs, production technology and its efficiency, major material and energy flows, licenses/permits, etc.)
- Management of social aspects
- Establishment of an environmental management system (not necessarily to be sophisticated)
- Usage of water and energy
- Safe management of the main environmental aspects (emissions, noise, wastes)
- Safe management of HS aspects
- Traceability
- Safe management of the used chemicals and restricted substances and Chromium VI
- Efficient management of the operations

LWG vs. RECP (continue)

Requirement	LWG	RECP
Declaration of Understanding	Company is required to: • Provide full and accurate data • Present all operating permits, all additional data or documentation • If any data or information is found to have been withheld the entire audit will be reclassified "Automatic Audit Failure"	Company shall: • Participate to EIP on voluntary basis. • A contract or letter of commitment between the company and UNIDO • companies should be committed to share needed data

LWG vs. RECP

Requirement	LWG	RECP
General Information of the Company	– Introductory information regarding the facility. – Data of off-site operations or warehouses	– Information will be required for identifying the participating companies – Facility details should be provided
Subcontracted Operations	– Assessment of the sub-contracted operations. – Full environmental audit, If the range of operations of the subcontractor's facility cover the operations falling within LWG audit category.	– The participated company/location will only be assessed. – Subcontracted operations are not assessed.

LWG vs. RECP

Requirements	LWG	RECP
Social Audit	– To determine if the company can demonstrate social responsibility – The non-conformances revealed by previous social audits must be notified to the auditor. Failure to notify may lead to failure of the audit.	– UNIDO Environmental and Social Safeguards Policies and Procedures (ESSPP) are applied. – ESMP will be developed during the project inception phase and will be maintained throughout the implementation stage.

LWG vs. RECP

Requirements	LWG	RECP
Operating Permits	– Facility's compliance with the applicable licenses and legislation. – Violations, warnings or fines, and what corrective actions must be recorded. – The leather manufacturer may be required to assure the availability of necessary permits. – Air emissions, waste disposal, storm water, boilers, chemical purchase/storage and building stability. – This is a critical section, and the minimum threshold to pass the audit is 50%.	– Permitted companies are prioritized for participation.

LWG vs. RECP

Requirements	LWG	RECP
Production Data	– For those starting from part-processed material, their supplier's engagement with the LWG audit process will be assessed. – Subcontractors may or may not be assessed. – For those leather manufacturers sourcing part-processed material from traders the auditor will need to verify whether the supplying trader is an LWG approved trader. – The production, energy and water consumption aspects of the audit are based on 24 consecutive months' worth of data. – critical section, and the minimum threshold to pass the audit is 25%	– Main process inputs, production technology, major material and energy flows will be required – The project will set up an information system on important materials, water and energy flows.

LWG vs. RECP

Requirements	LWG	RECP
Traceability (Incoming)	– Assesses the company' ability to trace its incoming material back. – Depending on scope of operations subcontractors may or may not be assessed – Processers must be able to present documents that indicate the facility where slaughter occurred. – This is a non-critical, scored section.	– Not required

LWG vs. RECP

Requirements	LWG	RECP
Traceability (Outgoing)	– Assesses the company' ability to trace its material through its own manufacturing processes. – It assesses the manner, in which outgoing material is identified and the extent to which the identifier allows data recorded about each process stage to be retrieved. – A batch of leather is one drum load of leather. This is a new critical section, and the minimum threshold to pass the audit is 25%.	– Not required

LWG vs. RECP

Requirements	LWG	RECP
Environmental Management Systems	– Assesses if the facility has a documented, effective, and active environmental management system. – This is a critical section, and the minimum threshold to pass the audit is 50%.	– EMS is an important issue for RECP implementation. – The project will assist companies to formalize EMS.

LWG vs. RECP

Requirements	LWG	RECP
Restricted Substances, Compliance, Chromium VI Management	– Assesses the extent to which the facility manages, understands and enacts the Restricted Substance requirements of its customers. – Also, assesses the company' measures to minimize Chromium VI formation risk.	– To reduce health and environmental risks by restricting use of toxic materials and encourage using of alternatives, environment friendly and less harmful materials.

LWG vs. RECP

Requirements	LWG	RECP
Water & Energy Consumption	– Assesses the freshwater & energy usage/unit product, including operations that have been subcontracted out. – Scoring rewards water recycling and usage of renewable energy generated on-site. – Energy consumption includes all aspects of site operations. – Includes off-site activities.	– The project will set up an information system on important materials, water and energy flows. – Water & energy consumptions are required for assessing energy management and for the quantification of improvements.

LWG vs. RECP

Requirements	LWG	RECP
Air Emissions, Noise, Waste Management and Effluent Treatment	– Assesses the management and control of these aspects. – Requires: • Detailed inventories, management and monitoring • Categorization of wastes and appropriate storage and disposal. • Legal discharge of the wastewater.	– These aspects must be identified, quantified, minimized/prevented, monitored and safely managed during RECP implementation. – RECP will improve environmental performance and reduce operational and compliance costs. – Waste management system, effluent treatment are required to achieve compliance.

LWG vs. RECP

Requirements	LWG	RECP
Heath, Safety, Emergency preparedness	– Assesses the company's ability to manage a range of emergency and health and safety risks. – It also requires an assessment of risk and management in relation to the creation of H2S onsite.	– The project aims to prevent/reduce HS risk and protect workers and community' health and safety.

LWG vs. RECP

Requirements	LWG	RECP
Chemicals Management	– Assesses awareness, understanding and management of chemicals used. – Makes references to Manufacturing Restricted Substances List (MRSL) commodity products (such as formic acid and sodium sulfide).	– The project aims to reduce health and environmental risk by restricting use of toxic materials and encourage using of alternatives, environment friendly and less harmful materials.

LWG vs. RECP

Requirements	LWG	RECP
Operations Management	– Assesses the Company's ability to control its manufacturing processes, reviewing best practices, measuring equipment use and calibrations, etc. – For housekeeping related issues, the organizations in relation to manufacturing sections will be assessed. – Assesses the external areas of the leather company.	– RECP implementation is expected to assist companies to manage operations to elaborate internal procedures

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Swiss Confederation

Federal Department of Economic Affairs,
Education and Research EAER
State Secretariat for Economic Affairs SECO

Case Studies on RECP

Nermin Ibrahim - Environmental Consultant (Ewatech)

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Environment & Development Advisors

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Case Study (I)

Tannery in Al-Max- Alexandria

Overview:

- **Company Production:**

Wet Blue and Crust leather with a total production of 231 ton/yr.

Start up Conditions:

- Before RECP implementation, there was no formalized management system in place due to:
  1. Lacking knowledge of applicable environmental laws.
  2. All materials and chemicals handling and products packaging are carried out manually, which causes losses in the product.

Motivation to join Technical Support Project:

1. Identify opportunities for increasing resource efficiency & productivity for (chemicals, raw materials, energy losses and water consumption).
2. Reduce pollution loads to comply with environmental legislation and minimize investment/operational costs of the planned wastewater treatment plant.
3. Apply cleaner production options.

Implemented RECP Options

1- Good Housekeeping & Preventive Maintenance:

Procedures:

- Close control over facility operations to avoid accidental loss of process chemical batch, checking network leakage & making necessary repairs & regular maintenance.
- Ensure dirt reduction & effective cleanliness in production areas to avoid excessive floor & equipment washing.
- Take measures to avoid wastewater system blocking resulting from sludge by using a separation system & regular maintenance.

Investment : Low cost
Annual savings: 1,119 USD
Payback Period: 0.7 years
Materials/energy savings: 149 m^3 water,
25 ton materials

2- Replacement of deteriorated machines:

Replacing old & deteriorated machines with new ones (toggling machine, measuring machine, ironing machine, overhead conveyor for drying the leather, spraying machine, sammying & setting out machine)

Investment : 402,667 USD
Annual savings: 88,750 USD
Payback Period: 4.5 years
Materials/energy savings: 5.8 ton product,

- Reducing amount of off-specs product.
- Safe working environment
- Time saving.

3- Recycling of the Pickle Bath:

Needs a vessel with a filter for keeping and reusing of the Pickle Bath.

Investment : 8,333 USD
Annual savings: 3,925 USD
Payback Period: 2.1 years
Materials/energy savings: 220 m^3 water,
23 ton chemicals

- Reduction of pollution load (salinity) in the wastewater effluent to be discharged to public sewer.

4- Utilization of Enzymes in Unhairing process instead of chemicals:

Enzymes can be used instead of Sodium Sulfide in unhairing process in order to reduce concentration of sulfides in the wastewater effluent.

Investment : 500,000 EGP
Annual savings: 26,000 EGP
Payback Period: 19.2 years
Materials/energy savings:

- Less polluting than using unhairing chemicals.
- Reduction of off-specs due to reduction in deterioration by bacterial action.

5- Energy Saving Options:

Procedures:

- Installing power factor correction panel to achieve a standard value (Range: 0.92 – 0.95).
- Measuring harmonics for checking distortion in the electrical feeder & protecting capacitors from damage.
- Installation of soft starters & inverters on motors to reduce their electricity consumption.
- Improving lighting system.

Investment : 5,083 USD
Annual savings: 3,583 USD
Payback Period: 1.4 Years
Materials/energy savings: 30 MWh

Project's Impact on Company Performance & Culture

- The company established a management system for Quality in accordance with ISO 9001.
- Company employees were trained on EMS in accordance with ISO 14001:2005 during the project to be able to integrate CP into the internal quality procedures.
- Experience gained through the project encouraged the company to implement new project ideas proposed during this program.

Case Study (II)

Tannery in Quesna

Overview:

- **Company Production:**

  Wet Blue, Crust & finished leather with a total production of 36,360 ton/yr and Gelatin with a total production of 720 ton/yr.

- **The company has the LWG Certification.**

Start up Conditions:

- Before RECP implementation, the industrial effluent discharged from the tannery was not in compliance with allowable law limits (law no. 93/1962 and decree 44/2000 for discharging wastewater to the public sewer) specifically for: COD, BOD, TSS, TDS, Cr, O&G and Sulfides.

Motivation to join the financing Program:

1. Reducing pollution loads to comply with environmental legislations and minimize investment/operational costs of the planned wastewater treatment plant.

2. Applying cleaner production options.

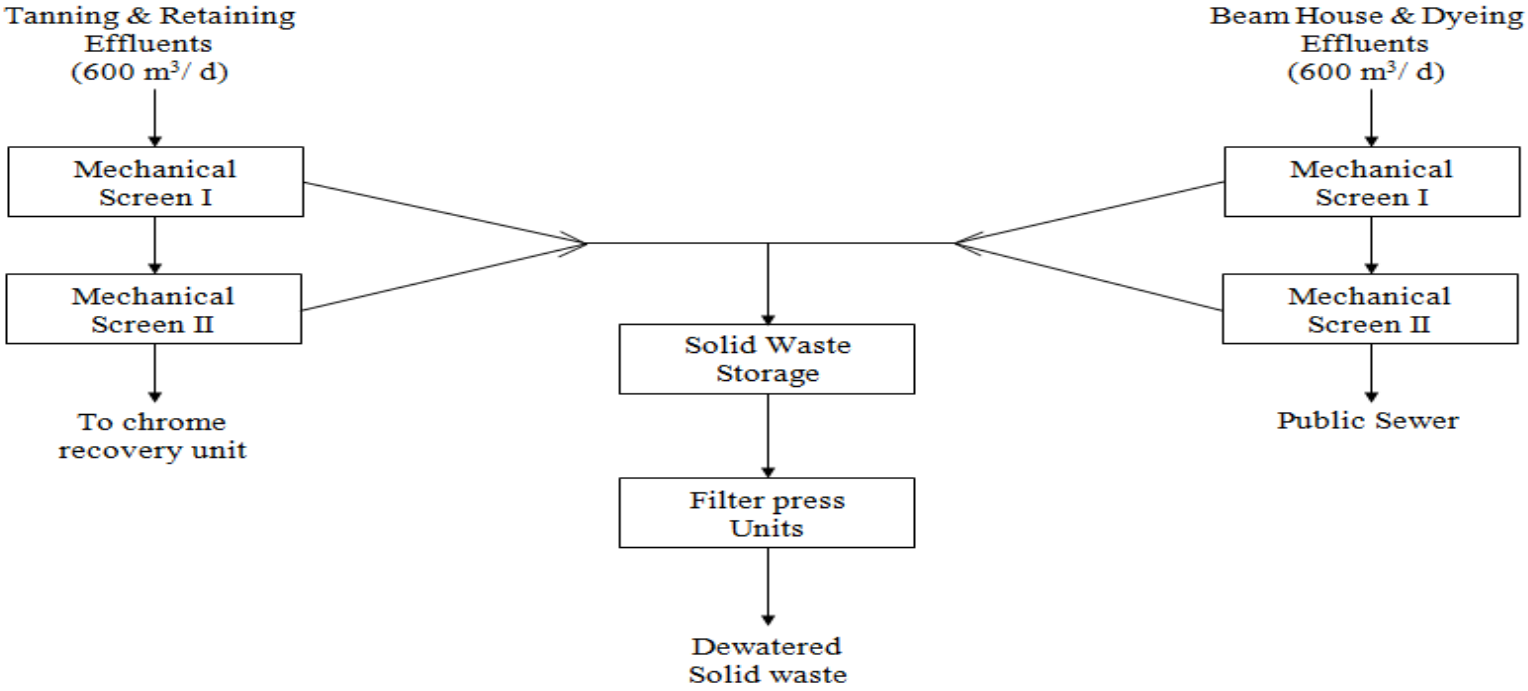
Implemented RECP Projects

1- Installation of IWWTP (Capacity: 3000 m^3/day) which consists of:

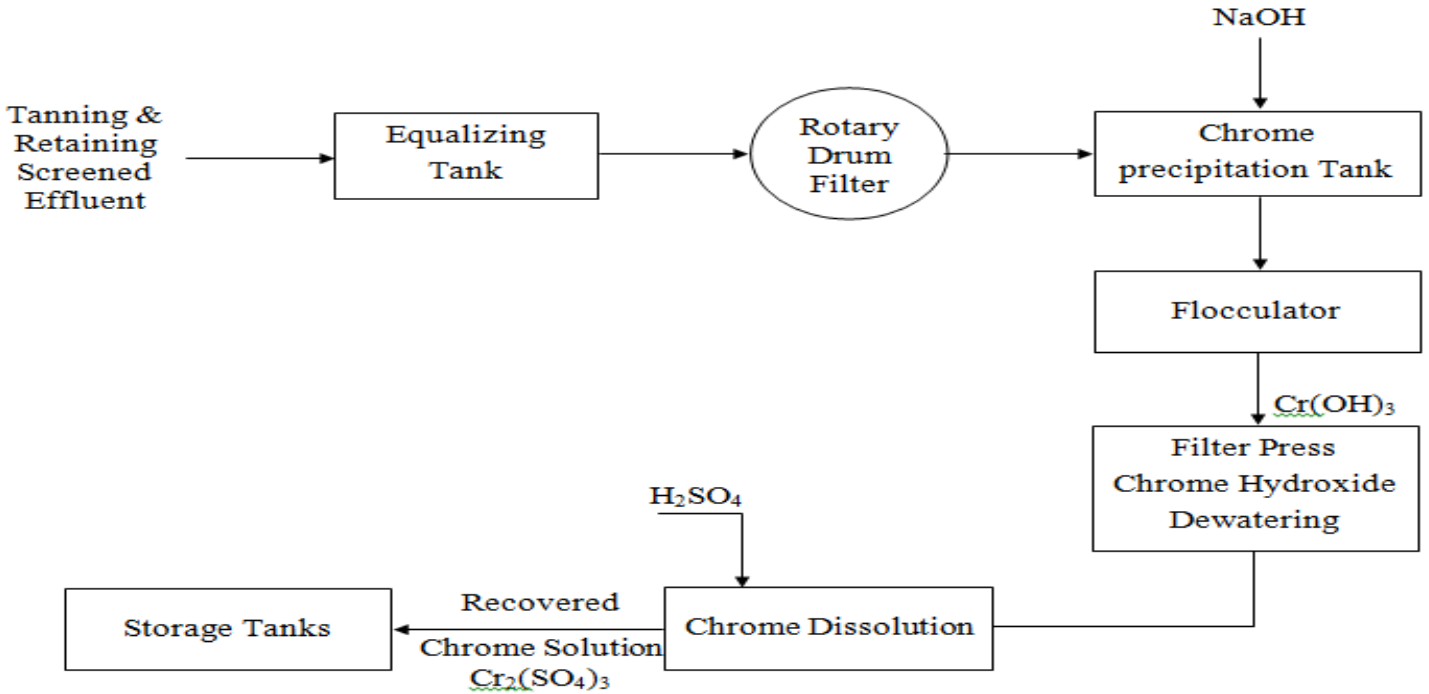
- 3 screening systems, one for each effluent generated from chrome tanning, re-tanning & beam house sections (Solid waste management unit).
- Chrome recovery system for effluent generated from chrome tanning section.
- Two chemical treatment systems for each effluent generated from re-tanning & beam house sections.

Investment : 2,856,563 Euro
Annual savings: 446,392 EGP
Payback Period: 24 years
Materials/energy savings:

- Amount of Chrome recovered: 162 ton/yr
- Reduce pollution load in the discharged wastewater effluent & achieve compliance with law limits.



Block Diagram for Solid Waste Management Unit



Block Diagram for Chrome Recovery System

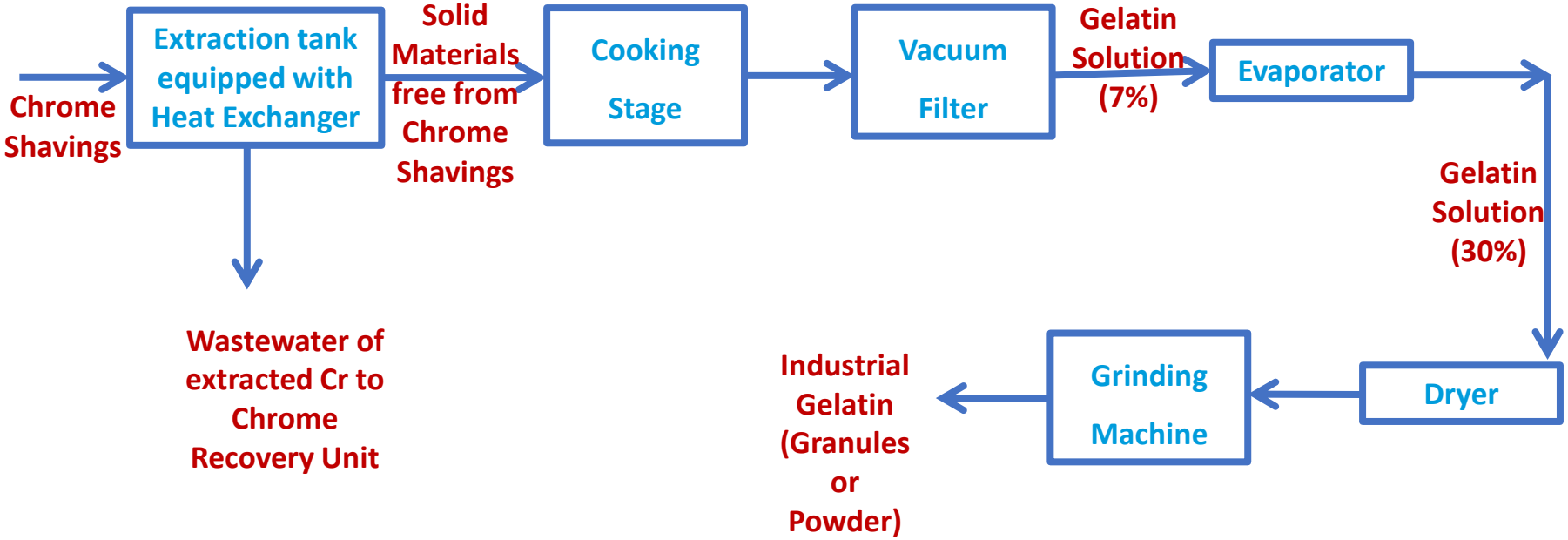
Parameter	Conc. (before treatment) mg/l	Conc. (after treatment) mg/l	Decree 44/2000 limits (mg/l)
pH	3.5 – 11*	6.5 - 8	6.5 - 9
COD	5512*	856	1100
BOD	3413*	568	600
TSS	1604*	56	800
O&G	903*	82	100
Cr^{+3}	508*	1	5

2- Extraction of Chrome & recovery of Gelatin in the Chrome Shaving Unit (E.O.P Treatment & In-Process modifications):

- Chrome shavings & trimmings are collected & sent to extraction columns equipped with a heat exchanger to raise the temp to 90°C.
- Wastewater discharged from the extraction process is sent to the Chrome recovery unit for extraction of chromium.
- Shavings & trimmings are cooked using steam to produce the Gelatin solution (7% concentration).
- Gelatin solution is filtered for the removal of fats and then passes through an evaporator to increase its concentration to 30%
- The gelatin solution (30%) is directed to the dryer to get granulated gelatin and then grinded to produce powdered Gelatin.

Investment : 967,600 Euro
Annual savings: 4,364,960 EGP
Payback Period: 2 years
Materials/energy savings:

- Amount of Gelatin recovered: 540 ton/yr
- Reduce solid & hazardous waste generation in wastewater effluent (as splitting & trimmings contain Cr). Therefore, reducing the operational costs for the WWTP.


Chrome Shavings
Extraction tank equipped with Heat Exchanger
Wastewater of extracted Cr to Chrome Recovery Unit
Solid Materials free from Chrome Shavings
Cooking Stage
Vacuum Filter
Gelatin Solution (7%)
Evaporator
Gelatin Solution (30%)
Dryer
Grinding Machine
Industrial Gelatin (Granules or Powder)

3- Installation of Salt shaker for dry desalting of raw hides before soaking stage (E.O.P Treatment & In-Process modifications):

- Raw hides are shaken in a rotating drum with open slots to allow the salt to be thrown out in a solid form.

Investment : 992,000 Euro
Annual savings: 3,546,200 EGP
Payback Period: 4 months
Materials/energy savings:

- Reduction of chemicals used in beam house & consequent reduction in pollution load in wastewater effluent. Therefore, reducing the operational costs for the WWTP.
- Significant reduction in TDS in the effluent due to separation of salt from raw hides.

4- Automatic loading system for Chrome tanning drums (E.O.P Treatment & In-Process modifications):

- Reduction of Sulfide pollution load in the effluent of tanning section due to prevention of squeezing of tanned hides & sweeping out of sulfide with water tipping from hide layers (as in case of Automatic loading hides accumulation is avoided so friction between hides causing sweeping out of sulfides is avoided)

Investment : 290,000 Euro
Payback Period: 6 months
Materials/energy savings:
- Reduction of Sulfides pollution load in the effluent by about 20% which consequently reduces the operational costs for the WWTP.

Manual Loading System

Automatic Loading System

5- Automatic loading system for Chrome re-tanning drums

(E.O.P Treatment & In-Process modifications):

- Reduction of Chromium pollution load in the effluent of re-tanning section due to prevention of squeezing of tanned hides & sweeping out of Chromium with water tipping from hide layers (as in case of Automatic loading hides accumulation is avoided so friction between hides causing sweeping out of Chromium is avoided).

Investment : 634,000 Euro
Payback Period: 6 months
Materials/energy savings:

- Reduction of chromium pollution load in the effluent by about 20% which consequently reduces operational costs of the WWTP.

6- Automatic system for handling & loading hides to & from fleshing machines (E.O.P Treatment & In-Process modifications):

- Automatic handling for the raw hides during fleshing stage using a series of inclined and flat belts.

Investment : 153,000 Euro
Payback Period: 6 months
Materials/energy savings:

- Reduction of solid wastes (resulting from cutting & tearing of raw hides during manual loading) in wastewater effluent.

Manual Loading System

Automatic Loading System

7- Bridge conveyor from Chrome tanning drums to wet blue selection department (Improve workplace environment):

- Hides are hanged over a movable conveyor to transfer them from chrome tanning drums to wet blue section without workers interference.

Investment : 138,000 Euro
Payback Period: 6 months
Materials/energy savings:
- Improve workplace environment through reducing workers exposure to hazardous materials (such as Cr), avoid workers injuries from lifting & twisting of hides or slipping & falling down.

Manual Loading System

Automatic Loading System

8- Air improvement & increasing air exchangers (Aeration systems) in the tannery (Improve workplace environment):

- As heat stress values in some areas of the tannery exceed the allowable law limits as in the Finishing & Gelatin factories, Humidity Control & Management systems were installed.

Investment : 165,500 Euro
Payback Period: 6 months
Materials/energy savings:
- Improve workplace environment through increasing ventilation in areas with high heat stress values.

Case Study (III)

Tanneries Complex in Al Max, Alexandria

Overview:

- Distribution of Tanneries in Alexandria can be summarized as follows:

  Private tanneries 50

  Public tanneries 1

- Total Manpower:

  - 2500 employees

- Wastewater Effluent:

  - Max flow: 3500 m^3/ d

Proposed RECP Projects

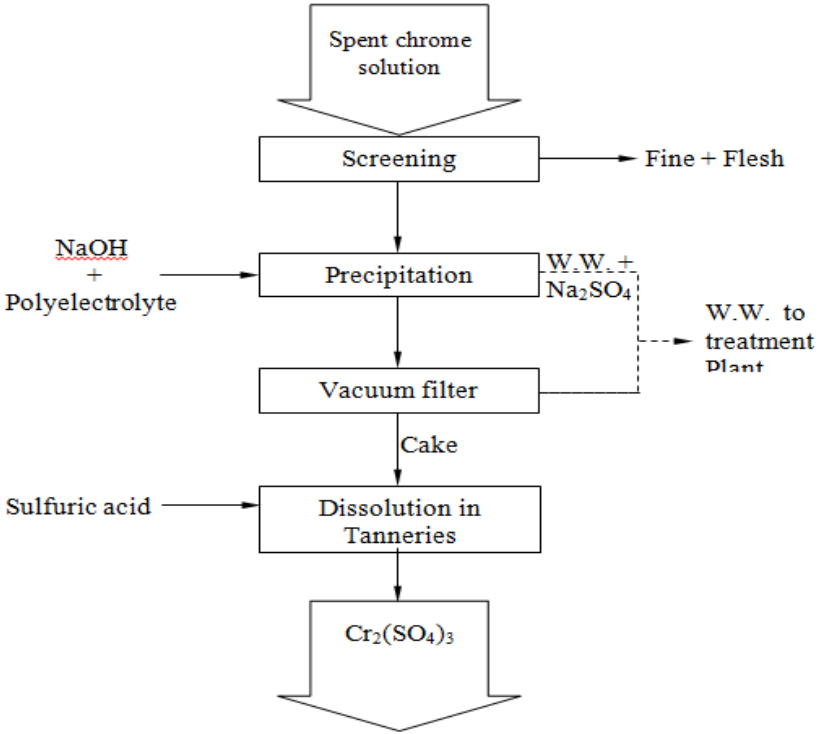
❑ Installation of IWWTP (Capacity: 3500 m^3/day) which consists of:

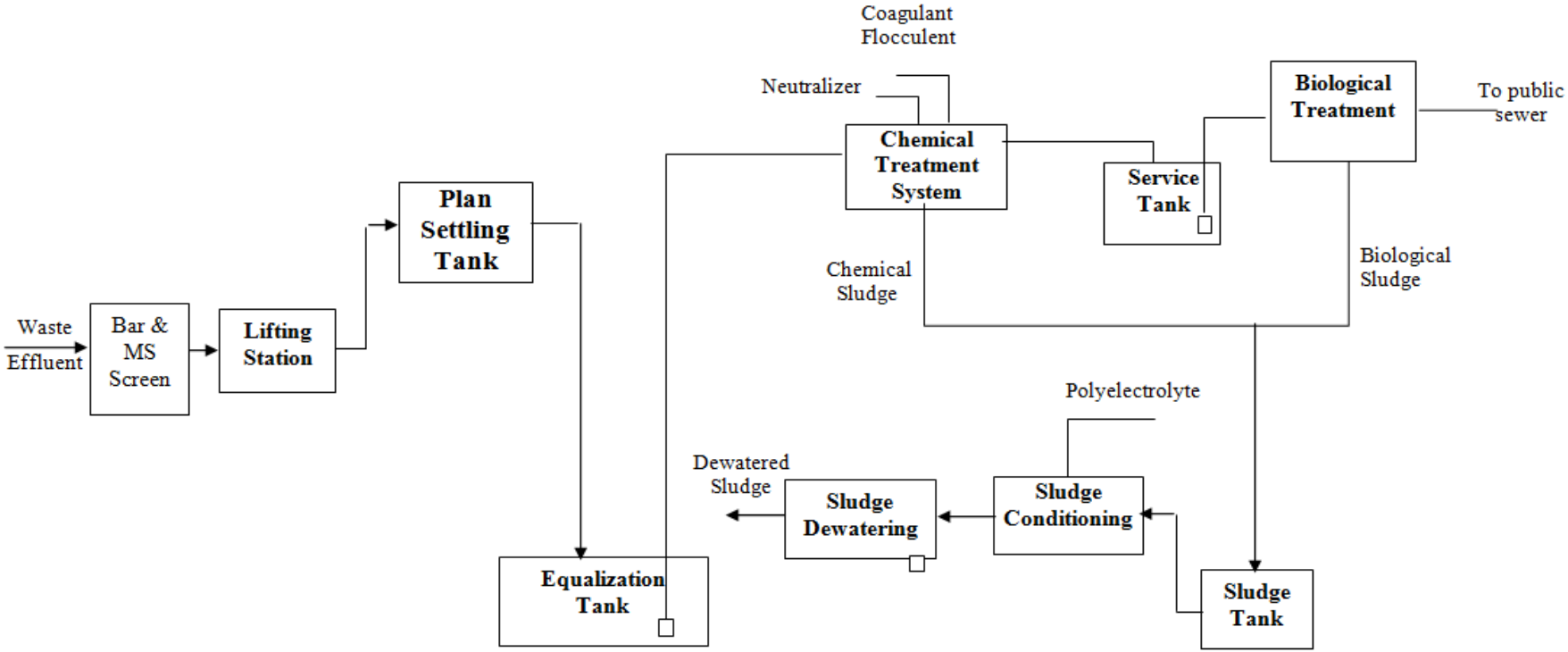
- **Design of two external sewer networks for:**
  a- Collection and transfer of Cr. effluents from tanneries to treatment site with total length of 2340 m made of PVC.
  b- Collection and transfer of remaining effluents to treatment site with total length of 2600 m made of PVC.
- **Design of Cr Recovery System capacity: 250 m^3/day**
- **Design of Treatment system for combined waste effluents (capacity: 3500 m^3/day).**

Investment : 100,000,000 EGP

Materials/energy savings:

- Recovery of Chrome.
- Reduction of pollution load in the discharged wastewater effluent & achieve compliance with law limits.


Spent chrome solution
Screening
Fine + Flesh
NaOH
+
Polyelectrolyte
Precipitation
W.W. + Na_2SO_4
W.W. to treatment Plant
Vacuum filter
Cake
Sulfuric acid
Dissolution in Tanneries
$Cr_2(SO_4)_3$


Coagulant
Flocculent
Neutralizer
Chemical Treatment System
Biological Treatment
To public sewer
Service Tank
Plan Settling Tank
Chemical Sludge
Biological Sludge
Waste Effluent
Bar & MS Screen
Lifting Station
Polyelectrolyte
Dewatered Sludge
Sludge Dewatering
Sludge Conditioning
Equalization Tank
Sludge Tank

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Moderated Discussion

Yasser Sherif-Managing director (Environics)

Environics SAE
Environment & Development Advisors

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Discussion Aim and Topics

- Aim of this session
  - Highlighting the main issues of concern at Robbiki Leather Cluster
  - Reaching a common understanding of issues, causes and potential solutions
- Discussion topics
  - Importance, root causes, and how to address the following issues:
    - Water consumption
    - Wastewater load and contamination
    - Hazardous wastes
    - Chemicals
- The RECP advantages

Water Consumption - importance

- Actual consumption: 35- 40 m3/ton salted hide (average as reported)
- Benchmark (2013/84/EU): 19-28 m3/ton salted hide
- Water price (high OPEX)
- Water scarcity (national concern)
- High water consumption generates high wastewater amount and affects the central WWTP with high hydraulic and contamination loads

Water Consumption- root causes

- Small plots allocated to some tanneries

  Higher specific consumption in small and micro facilities
- Water management (labor practices, technology, …)

Water Consumption – possible actions

- Good practices:
  - Reuse of low contaminated streams inside the facility
  - Treatment of highly contaminated streams for recycling

- Efficient management
  - Spill prevention/minimization
  - Monitoring
  - Labor training and awareness

Wastewater – importance

- Discussion of the main problems:
  - Sewers' blockage due to the reactions causing solids precipitation
  - High contamination loads (mainly TDS, TSS, BOD, COD)
  - High hydraulic loads exceeding the capacity of central WWTP
- Compliance with legal requirements (decree 44/2000)
- High potential for valuable Chromium recovery and recycling

Wastewater- root causes

- High water consumption leads to high hydraulic load (15000 m3/d) while the WWTP capacity is about 8000 m3/d
- As many tanneries do not have preliminary treatment (such as screening and precipitation), TSS is significantly increased
- Mixed waste streams
  - Precipitation due to reactions (low pH/hide liming and high pH/Cr Tanning)
  - High TDS reduces the efficiency of biological treatment

Wastewater- possible actions

- Precipitation tanks in facilities – Space Constraints?
- Separation of wastewater streams (high TDS, low TDS, Cr streams)
- Screening of the final effluent to reduce TSS
- Oil and grease collection at source (e.g., sumps below the lubed belts)
- Water recycling inside the tannery

Chemicals - importance

- Types
  - Lime, formic and other acids, alkalis, dyes, trivalent Chromium, sodium and magnesium salts, enzymes, ammonium salts, solvents, etc.
- Labor safety
- High cost
- Import limitations
- International market requirements

Chemicals- root causes

- Low capacity (financial or HR)
- Availability of Alternatives
- Dominant demand of the local market (low-moderate quality)
- Small size does not enable:
  - Automated process for chemical control
  - Sufficient space for good management
- Exposure
  - Manual process in small tanneries
  - Poor management (labeling, lacking MSDSs and records, spill prevention/minimization, etc.)

Chemicals- possible actions

- Use enzymes for hair removal
- Use water-based chemicals instead of oil-based chemicals, as possible and feasible
- Chemical substitution options
- Move to vegetable tanning
- Efficient management as possible:
  - Record keeping and monitoring
  - Labor training and awareness
  - MSDS and PPEs
  - Maintenance to prevent oil and chemicals spills

Wastes - importance

- Main Types
  - Residual fats and hair,
  - Chromium waste,
  - Polishing dust containing Cr
  - Others
- Legal commitments (transportation, landfilling, permits)
- Some waste streams are valuable

Wastes- root causes

- HW requires transportation and disposal/recycling permits and contracts
- Mismanagement (poor storage conditions, no records/monitoring and labeling)
- Small size does not support good management practices
- Disposal through multiple unlicensed contractors
- Open burning of the waste

Hazardous Wastes – possible actions

- Efficient operation leads to waste minimization
- Industrial symbiosis - glue and gelatin industry
- Management of waste collectors (unified licensed contractor is preferrable)
- Use low toxicity chemicals
  - reduces waste toxicity and
  - improves recycling opportunities

Confirmed RECP Advantages

- Savings (lower OPEX)
- Labor health and safety
- Environmental compliance and CAP completion for smooth licensing
- International clarification (e.g. LWG)

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Participation Criteria

Ola Kamal- Principal consultant& Technical Manager (Environics)

Environics SAE
Environment & Development Advisors

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How the leather cluster will be supported?

- Practical support (preliminary investigation, tailored RECP opportunities, ground trothing)
- A number of 35 companies will be selected
- UNIDO and Consortium role (capacity building, guidance, identification of the possible RECP interventions and provide technical support for free, training companies to implement, assess and monitor their performance)

Participation Criteria

- Scoring based on the following:
  - Availability of licenses (if not licensed, lower score will be given)
  - Size of the company (SMEs)
  - Status of exports
  - Reputation (for commitment)
  - Creditworthiness
  - Current (or planed) international certificates
- Evaluation and selection
- Discussion with IDA and CID
- Communication with the participated companies

Responsibilities of Participated Companies

- Commitment to implementation plan and collaboration with UNIDO, and Consortium team
- Establishment of the necessary management system (simple organizational structure, with roles and responsibilities)
- Contribute to discussions and meetings

Questionnaire in Brief

The questionnaire will address the following.

- General information of the company (name, contact, products, area, labor, export, expansion plans, …)
- Technology (chromium tanning/vegetable tanning/mixed)
- Company current and planned certification (LWG, ISO or else)
- Is the company a member of any technical associations? For example, the Union For leather, Chamber of leather industries, etc.
- Waste management and disposal
- Resources management
- Plans seeking finance
- What are the services provided by the industrial park administration concerning the following?
  - Waste disposal/recycle
  - Marketing of products
  - Development of tanneries
  - Technical support
- Company's interest in joining the program.

Selection Questionnaire

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GLOBAL ECO-INDUSTRIAL PARKS PROGRAMME

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Environics SAE
Environment & Development Advisors

EMATEC CONSULTANTS

environmental management centre Pvt. Ltd
emc

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RECP Assessment Tools and Checklist

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EMATEC CONSULTANTS

environmental management centre Pvt. Ltd
emc

Contents

1. UNIDO RECP Toolkit objectives and overview
2. Mechanism of RECP identification and assessment
3. KPIs to be used in the assessment
4. Brief of the main input data to the assessment tool and the companies' information

UNIDO RECP Toolkit objectives and overview

The primary objectives of the Toolkit is to:

- Assess the company's implementation of RECP opportunities against the GEIP-Egypt requirements.
- Helps the company and consultant to systematically review the inputs, resources, processes, technology, HS and environmental aspects, and environmental management for the scientific identification of possible RECP interventions.
- Supports decision-making based on a solid base and calculated benefits and savings.

UNIDO RECP Toolkit objectives and overview

UNIDO RECP Toolkit a training toolkit is including 12 volumes as follows

- Introduction to cleaner production (CP)
- Team, Policy and Motivation
- Material Flow analysis
- Energy analysis
- Innovation, creativity and option generation
- Green procurement and hazardous materials
- Indicators and environmental controlling
- Waste management and recycling
- Audits
- Networking at national and international level
- From CP to EMS
- Hazard Analysis and critical control points

Each volume has the following structure:

- ***Textbook*** Textbook with important background information;
- ***Examples*** Examples with photos, and diagrams;
- ***Exercises*** Interactive training units with solutions and instructions;
- ***Slides*** Presentation includes explanations and examples;
- ***Worksheets*** Worksheets for calculations and identify opportunities;
- ***Checklist*** Questions help in assessment process;
- ***Questions*** Evaluating the knowledge of the participants.

Volume 1: Introduction to cleaner production (CP)

The potential reduction in quantities and costs and the feasibility of the identified measures can only be evaluated after a more detailed input-output analysis.

What does the company produce?

What percentage of the raw and process materials is used for production?

Energy data

Main types of waste and emissions

Worksheet 1-1: Main products/services

Company: Responsible: Page:

No.	Product or service/purpose	Annual quantity	Unit
1			
2			
3			
4			

Worksheet 1-2: Main raw and process materials

Company: Responsible: Page:

No.	Material	Annual quantity	Unit	Specific costs in	Total costs in	Purpose/use	% inocorporated into the product
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

Worksheet 1-3: Energy data

Company: Responsible: Page:

No.	Energy	Annual amount	Unit	Spec. costs	Conversion into kWh	Consumption in kWh	Share in %	Total costs in	Share in %
1	Electricity Peak load		kWh kW						
2	District heating Peak load		GJ kW		x 277.8				
3	Oil		kg		x 11.4				
4	Gas		Nm^3		x 10.0				
5	[2].....								
6	.....								
7	.....								
8	.....								
9	Fuels: Diesel Petrol		Litre Litre		x 10.0 x 9.0				
10	.....								
	Total:						100 %		100 %

Worksheet 1-4: Main types of waste and emissions

Company: Responsible: Page:

No.	Waste or liquid or gaseous emissions	Annual quantity	Unit	Spec. disp. costs	Purchasing costs	Disposal costs	Total costs
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							

What are the goals of Volume 1 “Introduction to CP”?

- Identify materials, resources, waste and emissions in a company.
- Define possibilities of avoiding wastes.
- Recognize the economic benefits of minimization.

Volume 2: Team, Policy and Motivation

- **Environmental team**
  Company to set up a team committed to planning and implementing the environmental program.
  A project, such as CP, can only succeed if it is driven by truly committed staff.

- **Environmental Policy**
  The environmental policy is a clear indication of the company's environmental commitment.
  The environmental policy is proof of the many parallels between CP and the EMS

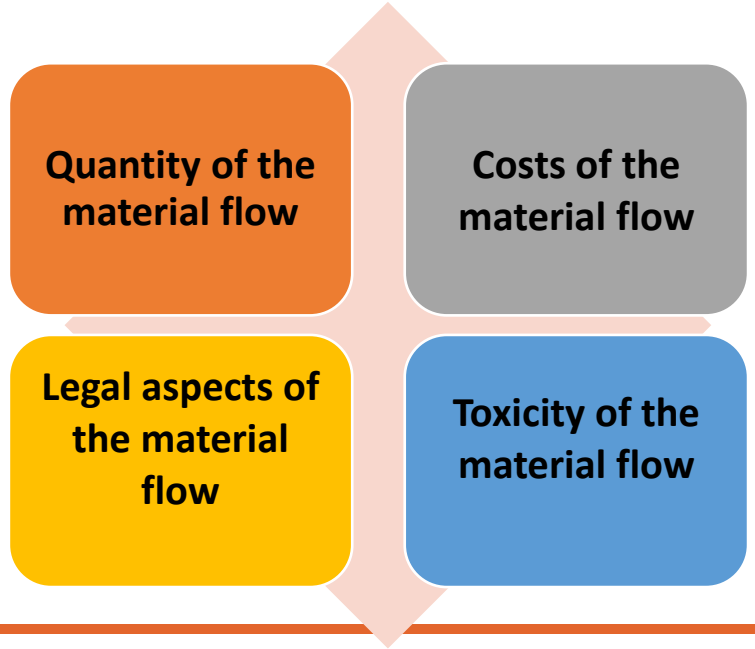
- **Motivation of the management and staff**
  Management's clear commitment to the CP project will motivate the workforce because it shows that management "values" environmental awareness and is not just ordering.
  The style of leadership in each company directly affects the environmental team.

Volume 3: Material Flow analysis

Works for tracing both:

- Raw materials, and
- Water resource

Criteria for the selection of a material



Worksheet 3-3: Material tracing sheet

Material: Company:

Balance scope: Balance period:

No. [1]	Material input	Quantity	Unit [2]	Data source [3]/notes

No. [1]		Quantity	Unit [2]	Data source [3]/notes

No. [1]	Material output	Quantity	Unit [2]	Data source [3]/notes

[1] = Position no. from flowchart 3-1 [2] = Balance should be drawn up in kg
[3] = EDP, books, routine measurement, own measurement, information from production, documentation of equipment, calculation, estimate, etc.

Worksheet 3-2: Water data sheet

Balance scope: Balance period: Company:

No. [1]	Water input	Quantity	Unit [2]	Data source [3]/notes
			m³	
			m³	

No. [1]	Water consumer	Quantity	Unit [2]	%	Data source [3]/notes
			m³		
			m³		
			m³		
			m³		
			m³		

No. [1]	Water output	Quantity	Unit [2]	Notes
	Wastewater discharge O direct O indirect		m³	Important materials: Important limit values: Description of on-site wastewater treatment:
			m³	
			m³	

[1] = Position no. from flowchart 3-1 [2] = Balance in m³ not precise (general assumption: density 1 kg/l)
[3] = EDP, books, routine measurement, own measurement, information from production, documentation of equipment, calculation, estimate, etc.

Volume 4: Energy analysis

The establishment of an energy management system involves the following activities:

- Collection and documentation of data on energy supply and utilization in the company;
- Description of the energy;
- Elaboration of energy benchmarks as a monitoring and decision-making tool;
- Identification of options to save energy and reduce costs

Typical areas of improvement

- Cooling/Heating
- Insulation
- Heat recovery
- Lighting
- Leak elimination,
- The use of more energy-efficient demand-side equipment (e.g., electric motors, pumps, etc.).

Worksheet 4-1: Energy data

Company: Responsible: Page:

Reference values: Product: Heated area:
Mileage: .....:

No.	Energy	Annual consumption	Unit	Spec. costs	Conversion into kWh	Consumption in kWh	Share in %	Specific consumption	Unit
1	Electricity		kWh	0.10					
	Peak load		kW	135.00					
2	District heating		GJ		x 277.8				
	Peak load		kW						
3	Oil		kg	0.50	x 11.4				
4	Gas		Nm³		x 10.0				
5	[2].....								
6	.....								
7	.....								
8	Fuels: Diesel		litre	0.80	x 10.0				
9	Gasoline		litre		x 9.0				
10	.....								
	Total						100%		

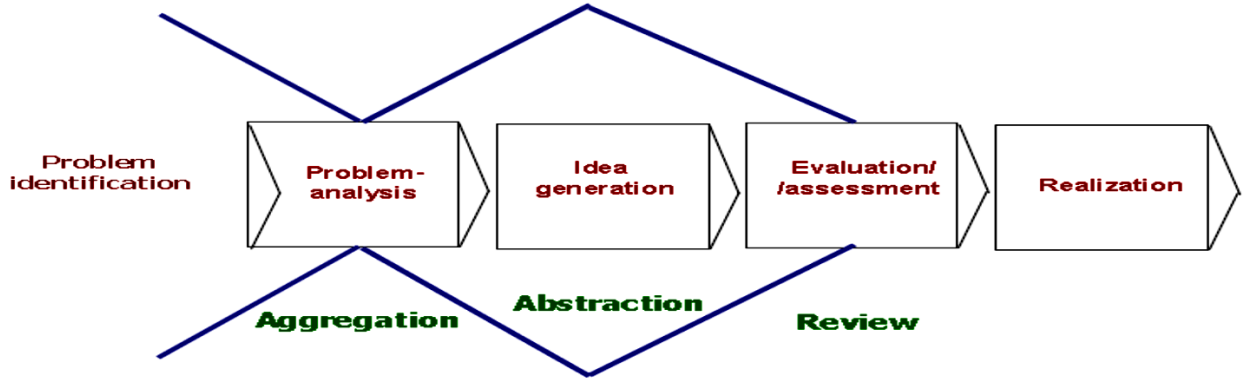
[2] Other energy carrier such as: coal, liquid gas, wood, pellets, solar energy, etc.

Volume 5: Innovation, creativity and option generation

- **Creativity** can be defined as the ability to generate new ideas to find the most feasible solution for technical, environmental, and economic problems.

Every innovation requires a creative strategy.

Stages of creative problem solving:



Volume 6: Green procurement and hazardous materials

What is green procurement?

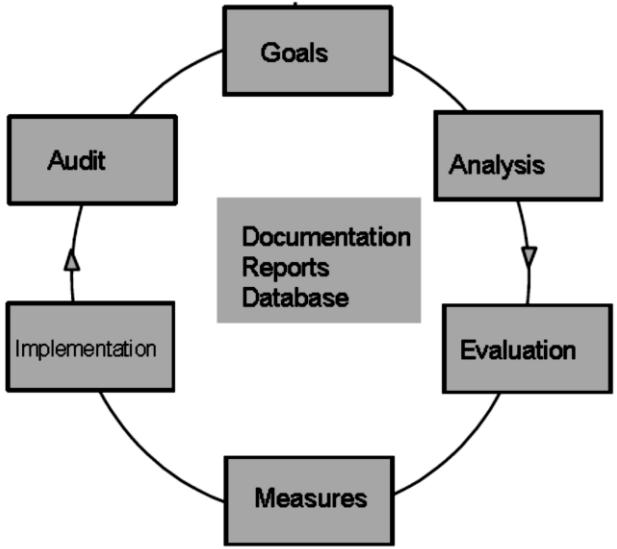
- **Green Procurement** means purchasing products that cause minimal adverse environmental impacts.

Volume 7: Indicators and environmental controlling

- What does "environmental controlling" mean?

Controlling means planning and monitoring the production process for continuous improvement.

Elements of environmental controlling



Volume 8: Waste management and recycling

Why do companies optimize their waste management?

- Legal compliance
- Detailed information on waste quantities and costs will identify the savings opportunities
- Environmental management

Volume 9: Audits

What is a cleaner production audit?

- A cleaner production audit is often the first step towards managing, controlling, and improving the Company's environmental performance. The audit is the best method to verify the actual status and determine the best approach to reducing waste, wastewater, and emissions.

Objectives of a cleaner production audit

- Reducing waste and emissions;
- Saving materials, energy and water;
- Minimizing safety and health risks;
- Improving quality by minimizing off-specification products;
- Reducing environmental impacts;
- Reducing operational costs.

Volume 10: Networking at national and international level

Influences on CP programs

- Legislations
- Socio-economic factors
- Culture
- Environmental situation
- Global environmental problems and how they effect on local level.
- Local environmental problems
- Environmental problems at the sector and company level

Volume 11: From CP to EMS

Cleaner production programmes and environmental management systems according to ISO 14001:2004 have common objectives.

Volume 12: Hazard Analysis and critical control points (HACCP)

- The concept of Hazard Analysis and Critical Control Points (HACCP) is a preventive system to guarantee the safety of food for the consumer. It focuses on the prevention of physical, chemical, and biological hazards rather than on carrying out an inspection of the finished products.

Not applicable to Robbiki Leather Cluster

Mechanism of RECP identification and assessment

First Visits to the selected companies	• Identifications for RECP interventions
Second Visit to Companies	• Discussion of RECP priorities with companies
Planning	• Developing RECP implementation plan by Consultants and Companies
Implementation	• implementation of RECP plan by the companies
Follow up by the Consultants	• Follow up and monitor RECP implementation by the Consultants

KPIs to be used in the assessment

- Electricity savings
- Fossil fuel savings
- Water savings
- Effluent quality
- Materials, chemicals and wastes
- Financial savings
- Social benefits

Brief of the main input data to the assessment tool and the companies' information

- General Information of the Company
- Environmental Management System
- Resources Consumption

  (Electricity, Water, Gas, Fuel)
- Types and Quantity of Products and Raw materials
- Types, Quantity, Disposal Method and frequency of Generated Waste

  (Hazardous, non-hazardous, Effluents)
- Equipment Power and Maintenance Frequency
- Environmental Measurements

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Participation Questionnaire

Questionnaire

This Questionnaire is designed to explore the general features and interests of the companies.

Please complete this questionnaire to assist UNIDO to identify the participating companies, which will commit to the implementation of RECP interventions inside their facilities, with the free support of the GEIPP- Egypt Project team.

Name: ……
Title: ……
Telephone number/ mobile: ……
Email: ……
Company Name: ……
Website: ……
Does the company have branches inside or outside Robbiki IP? ☐ Yes ☐ No ***If yes, please mention the name and specialization of the branch company***. ……
Total area of the company: ……
Total workforce: ……
Number of female labors: …… **Job: (admin, operation, other (specify) ----------)**
Workforce below 15 years old: …… **Nature of work:** …… **Work duration: (fulltime – parttime- seasonal)**
Max. production capacity: ……
Does the company export any products to international markets? ☐ Yes ☐ No ***If No, does the company have future plans to export:*** ……

Is the company certified by LWG or other national or international firm?

☐ Yes ☐ No

If yes, please specify the national/international firm other than LWG:

……..……..

If No, does the company have future plans to have LWG or other certification:

☐ Yes ☐ No

Planned timeframe ……..…….

Is the company a member of any leather associations? For example, the Federation of Egyptian Industries, Chamber of leather industry, etc.

☐ Yes ☐ No

Please specify the association name: ……

Please identify the used technology in your company

☐ Chromium tanning ☐ vegetable tanning ☐ mixed

How many barrels exist in your company?

……..……..

Please select the waste disposal mean, as implemented in your company.

☐ External contractor

☐ Through park management

☐ Else, specify .....

What type of waste or resource is recycled at your company, and how?

……..
……..
……..

Does the company have resources conservation plans?

☐ Yes ☐ No

Does the company have plans seeking national or international finance?

☐ Yes ☐ No

Is your company interested in participating in and committing to implementing RECP interventions under the umbrella of UNIDO project?

☐ Yes ☐ No

From the following, please select the reasons for your interest in implementing RECP interventions in your company:

☐ To accomplish environmental compliance

☐ To enable the company to export to international markets

☐ To conserve the valuable water and energy resources

☐ To reduce the chemicals consumption in the company

☐ To reduce the operation costs and get benefits

☐ Another reason, please specify ……..……..

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Evaluation Questionnaires

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

3-4 January 2023

Evaluation of Trainees' Knowledge

Name .....
Company / Entity name.....
Current position.....
Phone number.....
Email.....

Please answer the following questions and return the completed form to UNIDO before the end of the workshop

1. **Please rate your background/ knowledge about the following subjects?**

»

	1 *(I have no background)*	**2** *(General background)*	**3** *(Good background)*	**4** *(Excellent knowledge)*
Eco-industrial parks				
Water and energy conservation				
Industrial Symbiosis (IS)				
Industrial-Urban Synergy				

2. **In your opinion, how water consumption could be reduced in tanneries (please select one or more of the following options:**

□ Usage of modern technology

□ Monitoring using water meters or other means such as recording the consumption

□ Reduce the manual work and increase automatic and controlled technology

3. **Please select the best option for disposal of the solid and hazardous wastes of the tanneries:**

- □ Dumping
- □ Safe landfilling
- □ Recycling through other industry
- □ Reduction at the source (inside the company)
- □ Comparison with international or national benchmarks
- □ Other, specify ……

4. **Please select one or more of the following best options for good management of wastewater:**

- □ Reduction at the source
- □ Comparison with the international or national benchmark
- □ Separation of wastewater streams/types, for further recycling as possible
- □ Reuse of the lowest contaminated wastewater in other processes inside the tannery
- □ Other, specify …….

Thank you!

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

Workshop Evaluation

Please evaluate the training components using the following tables, knowing that (1 = poor, 5 = excellent)

Content of the training sessions

1	2	3	4	5

Discussions and interaction

1	2	3	4	5

Effectiveness of the trainer/moderators

1	2	3	4	5

How was the program relevant to your needs?

1	2	3	4	5

Level of understanding

1	2	3	4	5

Time of the sessions

1	2	3	4	5

Please put (√) in front of the session that you liked most in the training program.

Day 1	
EIP Concept and requirements	
RECP Concepts and Benefits	
Wastewater reuse options	
Industrial Symbiosis, and Urban-industrial Synergies	
Eco-Industrial Parks as a way to achieve global requirements and increase export.	
Day 2	
Case Studies on RECP	
Selection Criteria and Questionnaire of Interested Companies	
RECP Assessment Tools	

What is your overall rating of Day-1?

1	2	3	4	5

What is your overall rating of Day-2?

1	2	3	4	5

Facilities (sound, screen, microphones)

1	2	3	4	5

Hospitality

1	2	3	4	5

What are your recommendations for future training programs?

Thank you!

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