BUILDING CAPACITIES FOR A COMPETITIVE CIRCULAR ECONOMY – THE CASE OF WASTEWATER IN COLOMBIA

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Background of industrial wastewater in Colombia

Water supply
- Water scarcity more or less acute depending on region
- Competition between industries, municipalities, and agriculture

Industry
- Inefficiencies in water use
- Unnecessary high costs
- Potential for treatment technological upgrade
- New legislation since 2015
  - Decree 1076: mandatory water discharge permit
  - Resolution 631: maximum levels for wastewater discharges into surface water and sewage systems

Receiving water bodies
- Health risks
  - E.g., indirect reuse
- Threat to ecosystem services
  - Fishery
  - Agriculture
  - Tourism
  - Leisure
  - ...
**Tangible goals**
- Train local engineers (CNPML, the NCPC in Colombia) to state-of-the-art wastewater technologies and systems and build capacities in consulting for a new business model
- Focus on key Colombian sectors
- Allow for networking between CNPML, Colombian companies, and Swiss wastewater technology providers
- Develop replicable training program for other sectors and countries

**Overarching aim**
- Assist local companies in complying with new wastewater legislation while boosting their economic competitiveness (win-win)

**WASTEWATER AS RESOURCE:**
- Water
- Energy
- Biological nutrients
- Technical nutrients
Module 1
Wastewater Fundamentals 1

1.1 EAWAG-MOOC
Online Course

Topics Covered:
• Acquire practical business and managerial knowledge
• Address the wastewater remediation and reuse needs in a business context
• Receive necessary tools to competitively conduct feasibility and case studies
• Understand the mechanisms of a P&L Statement in a wastewater remediation / reuse context

1.2 Experts
Distance Learning

Topics Covered:
• Climate Change
• Urbanization
• Wastewater Governance
• Energy Efficiency (Municipal)
• Maintenance / Networks
• Energy Efficiency (Industrial)
• Minimization (Industry)
• Reuse (Municipal)
• Reuse (Industrial)

Module 2
Wastewater Fundamentals 2

Topics Covered:
• Food & Beverage:
  • Anaerobic Digestion
  • Oil Separation
  • Membrane Technologies
• Gas & Oil:
  • Membrane Technologies
  • Activated Carbon Filtration
  • Dewatering
  • Ozonation
• Municipal:
  • Activated Carbon Filtration
  • UV Filtering
  • Ozonation

Module 3
Study Trip to Switzerland

• Acquire practical business and managerial knowledge
• Address the wastewater remediation and reuse needs in a business context
• Receive necessary tools to competitively conduct feasibility and case studies
• Understand the mechanisms of a P&L Statement in a wastewater remediation / reuse context
• Put into practice the acquired skills in a feasibility study
• Develop consulting and problem-solving skills in the framework of wastewater treatment
• Interact with companies (also C-level)

Module 4
Business Module

Topics Covered:
• Introduction to Business
• Marketing (Offline & Online)
• Offering Writing
• Finance & Feasibility
• Public Speaking
• Project ROI Calculations
• Corporate Strategy
• Project Management
• Negotiation
• Accounting
• Evaluation

Module 5
Case Study
Two concrete business opportunities as a result of the capacity building project!

**PIMSA case study (Module 5)**

| Who? | Industrial park of Malambo (PIMSA), Atlántico Department near Barranquilla |
| Problem | Obsolete wastewater treatment plant (constructed wetland), costly off-site wastewater treatment for some park companies |
| Opportunity | Upgrade to moving bed biofilm reactor (MBBR) allows increasing on-site treatment, thereby creating new revenue streams for park operator |
| Current status | Park operator requested an offer from Swiss wastewater technology provider |

**Answer to EPM’s request for information on feasibility study (Refresher Course after Module 5)**

| Who? | Empresas Públicas de Medellín (EPM), large public utilities company |
| Problem | Cost of municipal wastewater treatment |
| Opportunity | Industrial reuse of treated wastewater (with tertiary treatment) |
| Current status | Based on CNPML answer, EPM will issue a request for proposals |
## Capacities built at CNPML and elsewhere...

![CNPML logo](image)

## Systematic approach for identifying opportunities for circular business models...

<table>
<thead>
<tr>
<th>Supplying material resources to manufacturing</th>
<th>Supplying energetic resources to manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ Waste becomes a valuable raw material</td>
<td>➢ Waste becomes a source of energy</td>
</tr>
<tr>
<td>Example: Alternative raw materials for the cement industry</td>
<td>Example: waste solvents become a source of energy for the chemical industry</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Providing an environmental service</th>
<th>Providing a material resource to environmental services</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ Treating wastewater</td>
<td>➢ For water treatment</td>
</tr>
<tr>
<td>➢ Purifying air</td>
<td>➢ For water treatment</td>
</tr>
<tr>
<td>Example: PIMSA treats additional wastewater</td>
<td>Example: membrane based on whey protein for wastewater treatment</td>
</tr>
</tbody>
</table>
Capacity building approach with double-aim works!
- Trained engineers plan to replicate the PIMSA case study for EPM
- Local companies highly appreciated the training and consultancy
- Swiss technology providers understand the potential of such an approach in creating new business opportunities

Lessons learned
- Promote mutual understanding of learning goals
- Train more engineers to increase impact
- Involve local companies even earlier to prepare case studies

 Outlook on Peru
- Similar project in preparation in the field of industrial solid waste following new legislation
- Promising opportunities, e.g., the Peruvian cement industry relies exclusively on coal as kiln fuel
Renewable Energy, Energy and Resource Efficiency Promotion in Developing and Transition Countries

- Transfer of knowledge and technology to develop renewable energy, energy and resource efficiency in such countries
- Strong involvement of the private sector
- Market-oriented competence center
- Multiple agencies of the Swiss government
  - High-impact projects with strong participation of Swiss and foreign stakeholders

- REPIC’s mantra is **replicability**
  - Projects should have a multiplier effect
  - Scaling-up to be planned in early stages of project