



School of
Management and Law

KNOW-HOW TRANSFER FOR WASTEWATER PURIFICATION COLOMBIA

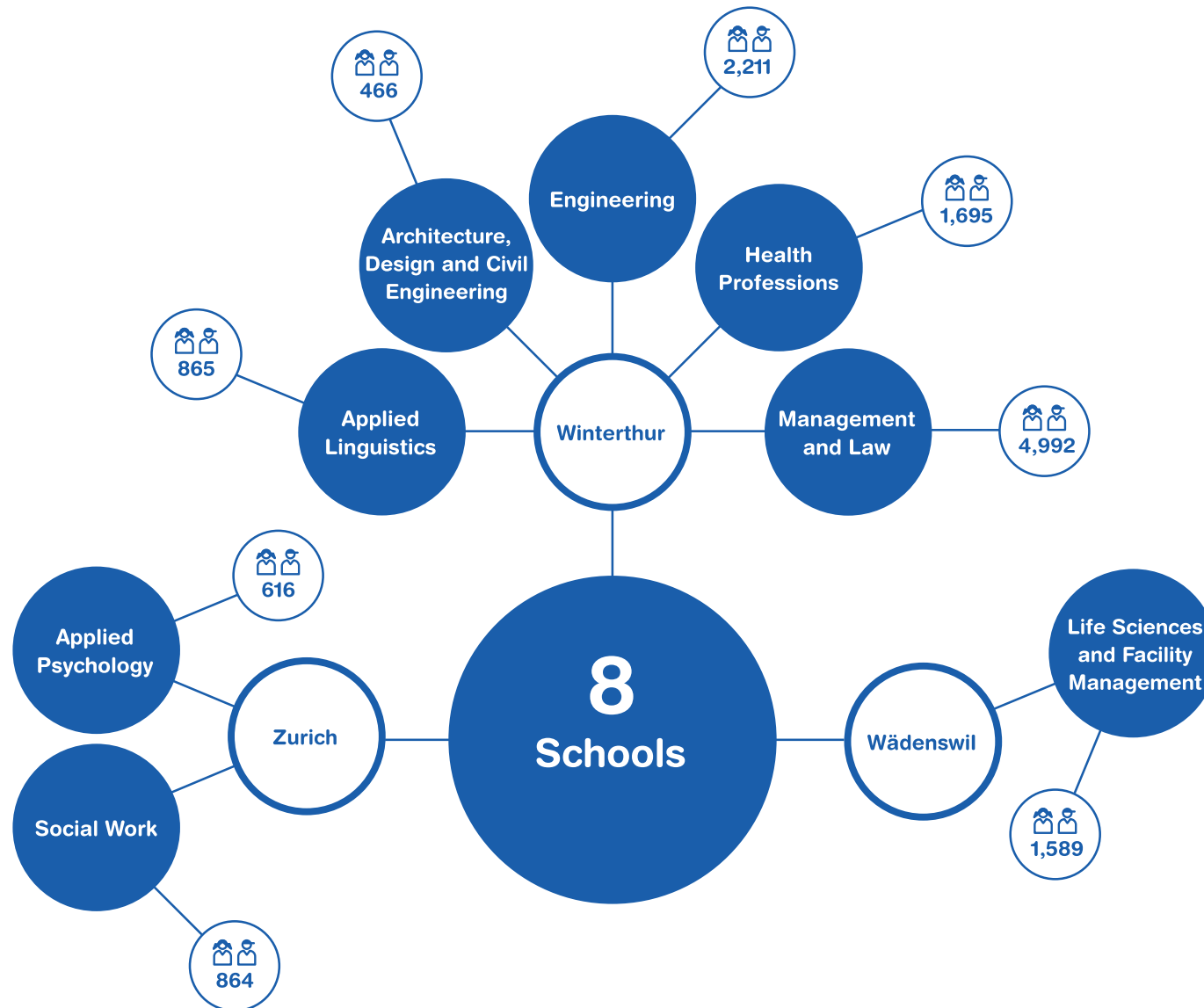
Peter Qvist-Sørensen, Grégoire Meylan



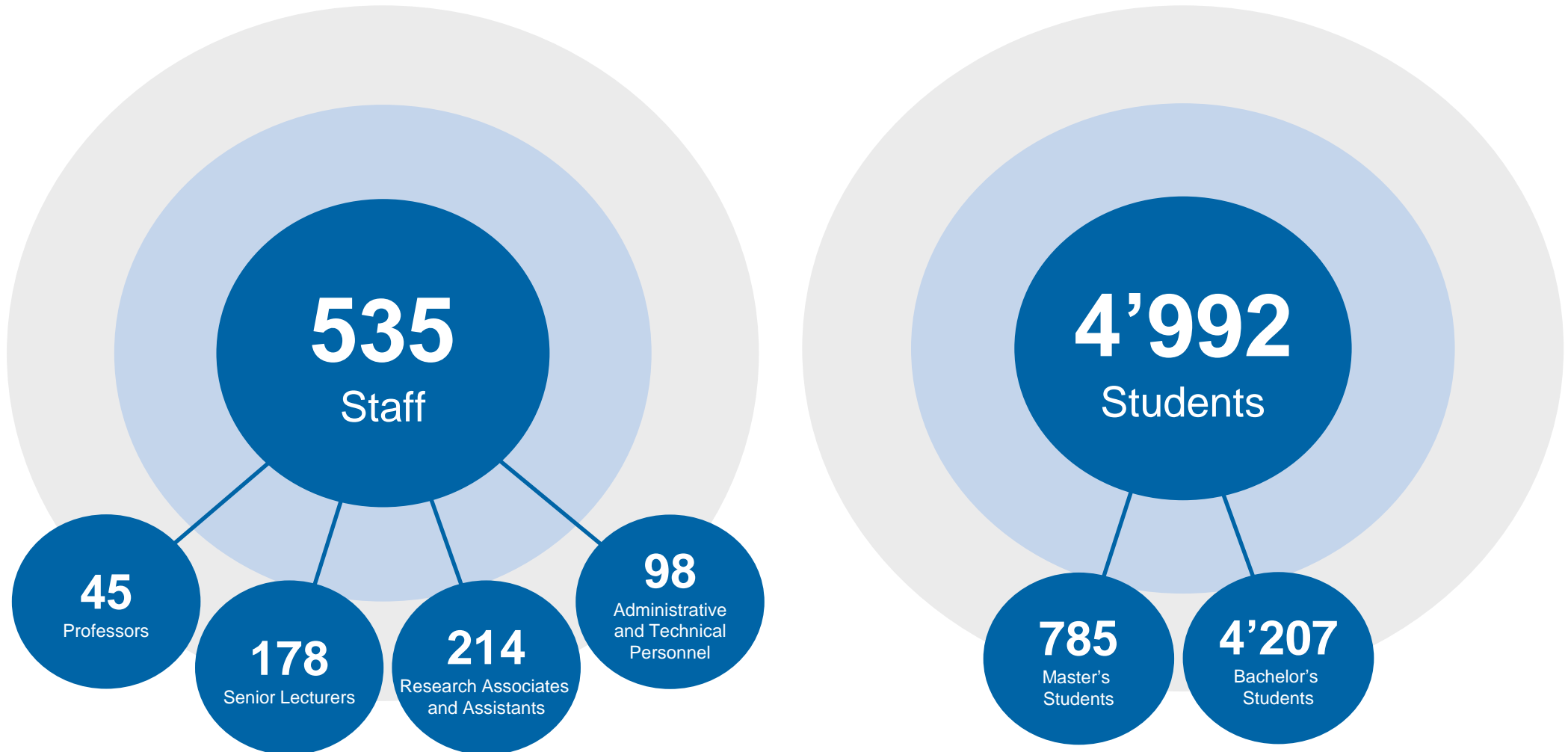
ZHAW Zurich University of Applied Sciences
CIIS Center for International Industrial Solutions

Content

- 0** ZHAW and CIIS
- 1** Project Description, Results and Conclusions
- 2** Lessons Learned
- 3** Acknowledgements
- 4** Outlook



ZHAW School of Management and Law - Numbers



ZHAW School of Management and Law



AACSB (The Association to Advance Collegiate Schools of Business) is the most important accreditation body for business schools.

Five percent of all university business schools worldwide.

In May 2015, the ZHAW School of Management and Law (SML) became the first business school of a Swiss university of applied sciences to be accredited by AACSB.

The SML was also the first business school of a university of applied sciences in Switzerland to voluntarily apply for the FIBAA (International Business Administration Accreditation) and achieve program accreditation (2003).



Continuous
Development

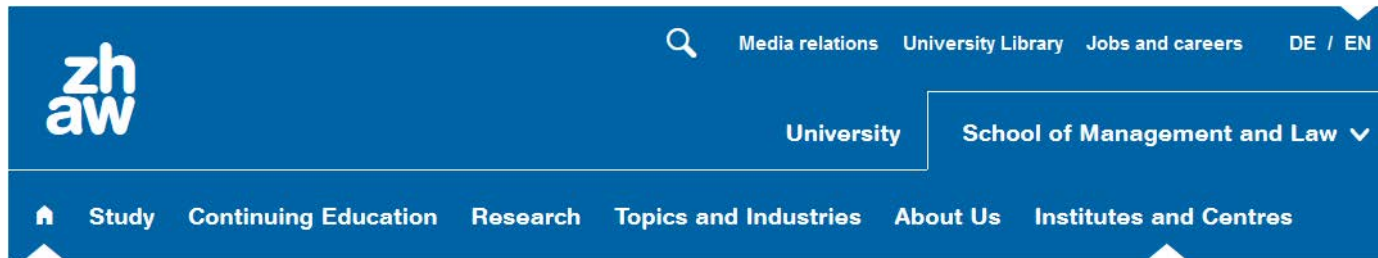


Closer Ties to the
Business World



International
Partnerships

Center for International Industrial Solutions (CIIS)



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Center for International Industrial Solutions



MACHINERY INDUSTRY

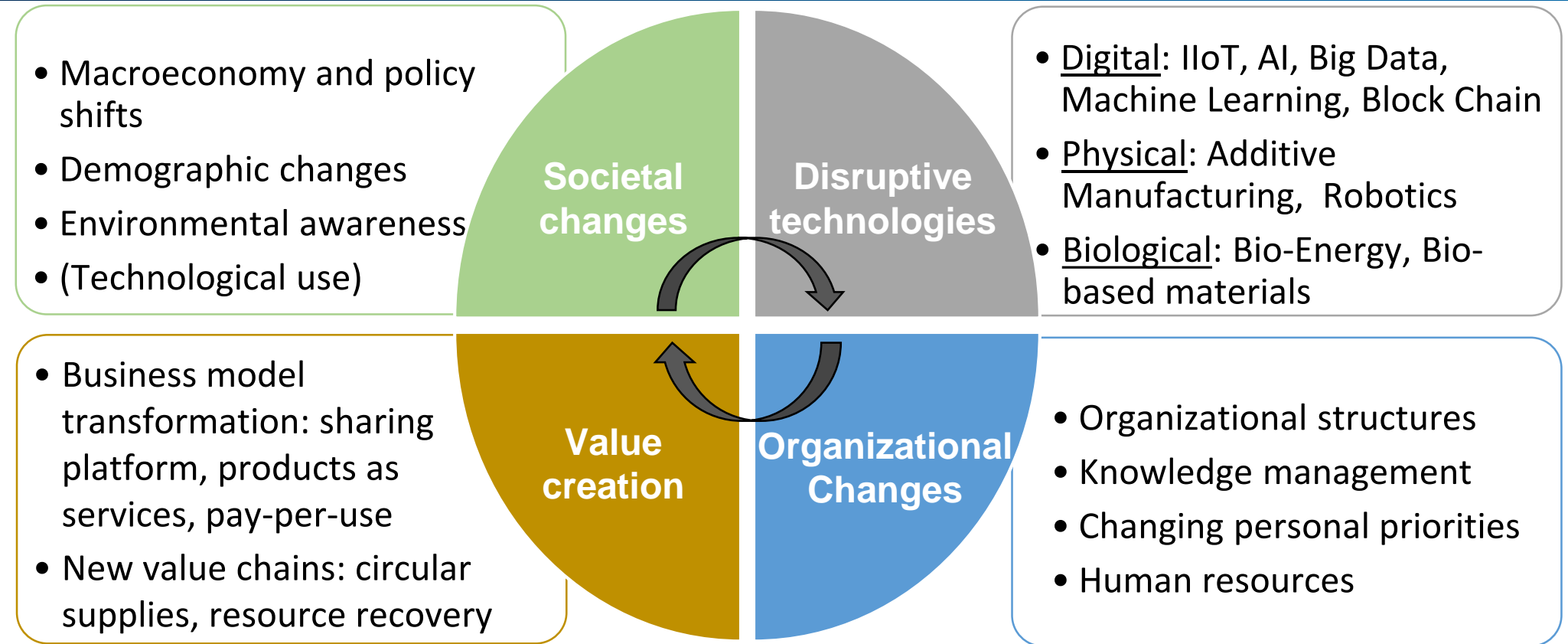
Aerospace, Automobile, Chemicals, Construction, Food & Beverage, Textiles



CLEANTECH INDUSTRY

Management of Waste Water & Solid Waste, E-Waste, Hazardous Waste.
Pump Storage

Center for International Industrial Solutions (CIIS)



<p>Approach</p>	<p><u>Analysis</u> of current business model & end-to-end value chain</p> <p><u>Identification</u> of key customers' requirements & external business factors</p> <p><u>Support</u> in defining and prioritizing each business model dimension</p> <p><u>Proposal</u> for relevant technologies & design & required organizational structures</p> <p><u>Guidance</u> to implement new business model & proof of concept</p>
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Selected References



Market Entry and Business Model

Renewable Energy Solutions in an Emerging Country



Emerging Market Access

Opening up Cleantech market opportunities in Colombia through academic and business collaboration – Business Workshops



Market Entry

Colombia waste deposits and pump storage



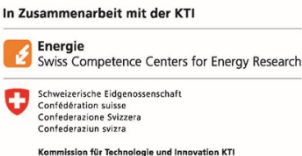
REPIC

Swiss Know-how and Technology Transfer for Wastewater Treatment in Colombia



Study

Review, outlook, future vision: Working environment 4.0 in the Swiss MEM sector



Study

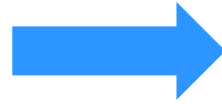
Switzerland renewable energy position in international benchmark



Study

Whitepaper Mexico Cleantech

1 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 new business models
- Focus on key Colombian business 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 commercializing their wastewater treatment technologies, thus boosting their economic competitiveness (win-win)

WASTEWATER AS RESOURCE:

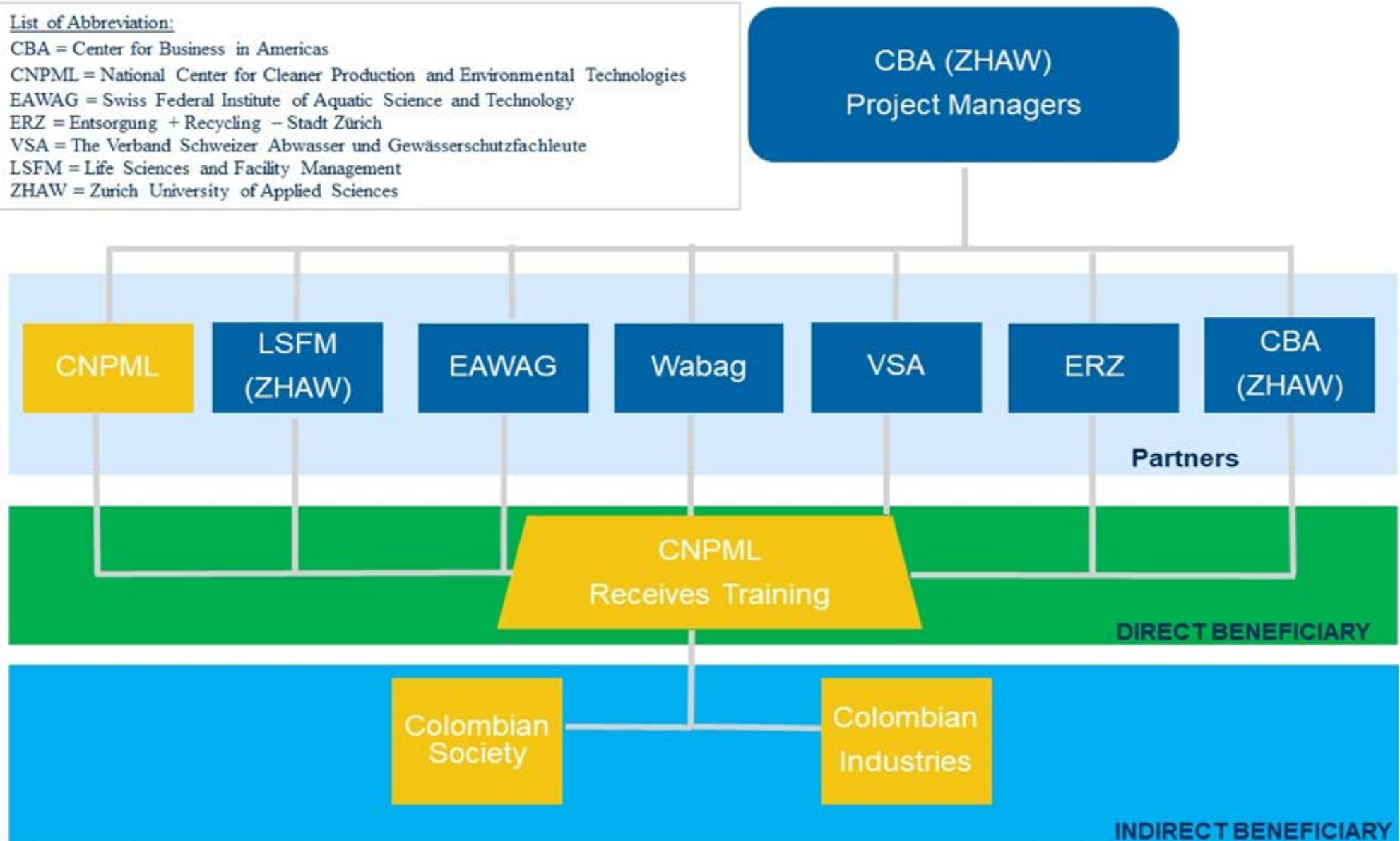
- Water
- Energy
- Biological nutrients
- Technical nutrients

1

Stakeholders

List of Abbreviation:

CBA = Center for Business in Americas
 CNPML = National Center for Cleaner Production and Environmental Technologies
 EAWAG = Swiss Federal Institute of Aquatic Science and Technology
 ERZ = Entsorgung + Recycling – Stadt Zürich
 VSA = The Verband Schweizer Abwasser und Gewässerschutzfachleute
 LSFM = Life Sciences and Facility Management
 ZHAW = Zurich University of Applied Sciences



Module 1

Wastewater Fundamentals 1

1.1 EAWAG-MOOC

Online Course

1

- 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
- Climate Change
- Wastewater Quality
- Energy Efficiency (Municipal)
- Maintenance / Networks
- Energy Efficiency (Industrial)
- Minimization (Industry)
- Reuse (Municipal)
- Reuse (Industry)

Module 2

Wastewater Fundamentals 2

- Activated Carbon Filtration
- UV Filtering
- Ozonation

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

- 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)

Capacities built at CNPML and elsewhere...



Centro Nacional de
Producción Más Limpia



Systematic approach for identifying opportunities for increased resource efficiency...

Supplying material resources to manufacturing

- Waste becomes a valuable raw material
- Example: Alternative raw materials for the cement industry

Providing an environmental service

- Treating wastewater
 - Purifying air
- Example: PIMSA treats additional wastewater

Supplying energetic resources to manufacturing

- Waste becomes a source of energy
- Example: waste solvents become a source of energy for the chemical industry

Providing a material resource to environmental services

- For water treatment
- Example: membrane based on whey protein for wastewater treatment

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 proposal



Capacity building approach with double-aim works!

- Trained engineers plan to replicate the PIMSA case study for EPM
- Swiss technology providers understand the potential of such an approach in creating new business opportunities
- Local companies highly appreciated the training and consultancy

Testimonials...

Carlos Arango, Head of CNPML, Email of 6. May 2019

«[...] Queremos agradecer a ti y a todo el equipo de ZHAW y WABAG por todo el apoyo. Esperamos seguir cooperando conjuntamente, tanto para terminar este proyecto de Wastewater, como para fortalecer relaciones futuras en este tema y en otros nuevos a discutir. [...]»

Alfrédo Caballero Villa, Manager of PIMSA, Email of 8 May 2019

«[...] En nombre del Parque Industrial Malambo SA (PIMSA), queremos agradecer a Usted y a todo el equipo de la Universidad de Zúrich - ZHAW, WABAG, ONUDI y el CNPML todo el apoyo brindado, en el desarrollo del proyecto REPIC y el caso de estudio para el proyecto de tratamiento de aguas residuales en el Parque Industrial Malambo.

CNPML and CIIS had initially different understandings on project goals

- Promote open discussion on and mutual understanding of learning goals
- Foster buy-in to local benefits

Deadlines were not always met (6 months delay against original plan)

- Close project management (e.g., with project planning software)
- Foster local ownership

Participation in lectures was not always complete (case study was much better!)

- Give value to education
- Take cultural aspects into consideration (what does lecturing mean in Colombia?)

Only training programme for one organization (CNPML) + companies voluntarily

- Open training program to other local consultants and companies (against participation fee)

Recruiting local companies turned out to be a tedious task, until ZHAW came on-site

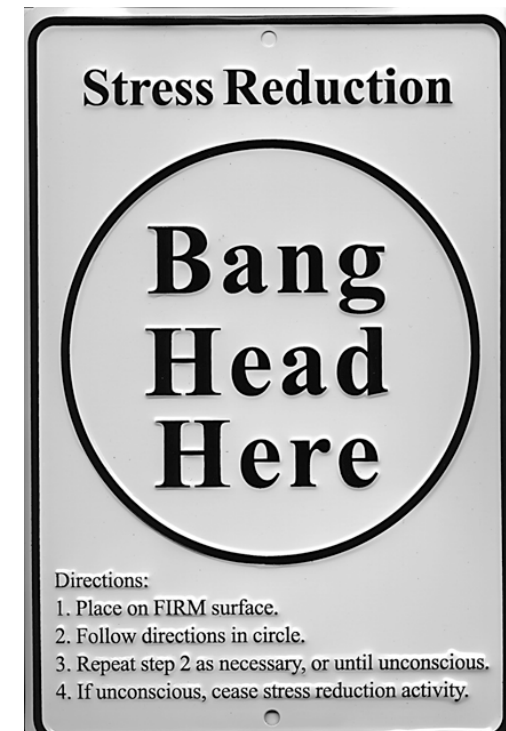
- Commit companies with letters of intent
- Involve local companies even earlier to prepare case studies (before project launch)
- Aim for more than one case study

Only one Swiss cleantech company involved, which increases project vulnerability to company dynamics

- Recruit further Swiss cleantech companies, e.g., representing different technologies or different stages on value/supply chain

REPIC's support goes beyond funding...

- Flexibility with respect to deadlines for reporting
- Openness to adapt project content to new developments
- Constructive and efficient advice to deal with concrete threats to project success



Linking Stakeholder Needs to Stakeholder Economic Incentives

Replication in Peru

Waste situation

- Mounting economic and environmental impacts of poor waste management
- Resource inefficiency impairing Peruvian manufacturing sector
- New legislation on solid waste offering new opportunities e.g., in industrial symbiosis



Needs

- Competences to conduct feasibility studies
- Link between technological solutions and business models

CIIS contribution

- Capacity building based on Colombia – Value chain, technologies, business aspects
- NEW! Training of local consultants beyond National Cleaner Production Center
- NEW! Integration of a module on Life Cycle Assessment in Waste Management

Benefits expected for Peru and Swiss cleantechs!



Last Words



Source: <https://www.slideshare.net/NaNwe/environmental-management-syatem>