Cleaner Production in the Americas: Education Challenges and Outlook

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Background

- **US Department of State** initiated the **Pathways to Prosperity in the Americas**, a policy-level dialogue where countries share lessons about how to spread the benefits of economic growth to all citizens.

- They identified two priority areas related to cleaner production in 2011:
  - the education of professionals capable of implementing CP in the private sector, and
  - the importance of targeting Micro, Small and Medium Enterprises (MSMEs) for CP implementation

- **Pathways to Cleaner Production in the Americas** was envisioned as a multidisciplinary educational approach (incorporating business, engineering and environment) to collectively respond to the need for awareness of sustainability, technical competencies and innovative skills in industry across the Americas, with focus on **CAFTA-DR**.
Pathways to Cleaner Production in the Americas

Three-year project funded by US Dept of State (DoS)

Academic partners - Higher Education for Development (HED) & 9 universities
- US: Illinois Institute of Technology (IIT) and New York Institute of Technology (NYIT)
- Costa Rica: Instituto Tecnológico de CR (ITCR)
- Dominican Republic: Instituto Tecnológico de Santo Domingo (INTEC)
- El Salvador: Universidad Centroamericana (UCA)
- Guatemala: Universidad Rafael Landivar (URL)
- Honduras: Universidad Nacional Autónoma de Honduras (UNAH)
- Nicaragua: Universidad Nacional De Ingeniería (UNI)
- Peru: Universidad San Ignacio de Loyola (USIL)

Business - World Environment Center (WEC) & National Cleaner Production Centers (NCPCs)
Sustainable Industrial Development Approach

- Within enterprise
- Within facility operations
- Cleaner production projects
- Environmental management systems
- Strategic sustainability planning
- With other businesses in supply chain or local network
- Industrial ecology
Partnership Goals

• Strengthening academic training related to sustainable industrial development through faculty capacity building for delivering new content, curricular design and modification, and training environmental professionals in partner countries.

• Increasing adoption of cleaner production and sustainability practices in Micro, Small and Medium Enterprises (MSMEs) through increased interaction with academia, especially through experiential learning projects where students work directly with MSMEs.

• Create a virtual forum to promote systemic collaboration and information sharing on sustainable industrial development education and application among the partner institutions and others in the region.
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326 faculty members trained in Cleaner Production, Environmental Management and Industrial Ecology topics (introductory and advanced)
16 curricular changes implemented incorporating CP and experiential learning
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Industry-University Practicum & Collaboration

Faculty & consultants recruit companies

Students visit companies to conduct environmental diagnostics

Students present final reports to companies

Consultants & interns provide follow-up in companies

Companies implement recommendations

Consultants measure results

Minimum on-site time 20 hours
Example of students’ project from Rep Dominicana

1. Objetivos del proyecto

1. Conocer la empresa y las actividades a las que se dedica.

2. Identificar posibles oportunidades de producción más limpia

3. Elaborar propuestas alcanzables y factibles para la empresa que ayuden a resolver los principales problemas detectados.
Example of students’ project from Rep Dominicana

Diagrama de flujo de proceso

Balanceo de materiales

<table>
<thead>
<tr>
<th>Balance de Materiales</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Entrada</strong></td>
</tr>
<tr>
<td><strong>Unidad (pies)</strong></td>
</tr>
<tr>
<td>MP</td>
</tr>
<tr>
<td>Madera de pino</td>
</tr>
<tr>
<td>Clavos</td>
</tr>
<tr>
<td>Nozar (0.46)</td>
</tr>
<tr>
<td>Espumas</td>
</tr>
<tr>
<td>Resortes</td>
</tr>
<tr>
<td>Goma</td>
</tr>
<tr>
<td>Grapas</td>
</tr>
<tr>
<td>Telas</td>
</tr>
<tr>
<td>Pata</td>
</tr>
<tr>
<td>Total de entradas</td>
</tr>
</tbody>
</table>
Example of students’ project from Rep Dominicana

Propuesta #1 “Rocolección y venta de aserrín”

Descripción de la oportunidad

- Actualmente, en ninguna de las áreas de trabajo se cuenta con contenedores donde puedan depositar y clasificar los residuos de los muebles trabajados, Esta situación provoca que dicho aserrín y trozos de madera se vayan acumulando dentro de la zona de producción, conllevando a dificultar la movilidad de los operarios dentro de la misma, además de esto puede afectar tanto al medio ambiente como a los mismos operarios.

Descripción de la propuesta

- La propuesta consistiría en colocar dos contenedores estratégicamente en el área de trabajo para recolectar todo el aserrín que se genera debido a los cortes de madera, todo esto con la finalidad de poder vender dichos residuos (aserrín). Se tendría un acuerdo con Maderera del Cibao que es una industria que se dedica a la venta de maderas y sus derivados.
Example of students’ project from Rep Dominicana

| Propuesta #1 “Recolección y venta de aserrín”

Viabilidad ambiental

Evitar que los residuos de aserrín sean depositados en vertederos al aire libre.

Menor contaminación dentro del área de trabajo.

| Retorno de la inversión

<table>
<thead>
<tr>
<th>Meses</th>
<th>Costos</th>
<th>Ganancias</th>
<th>Beneficios</th>
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<tbody>
<tr>
<td>1</td>
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<td>$286.53</td>
<td>$(823.47)</td>
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<tr>
<td>2</td>
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<td>$(536.94)</td>
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<td>4</td>
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<td>$322.65</td>
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<tr>
<td>12</td>
<td>$-</td>
<td>$286.53</td>
<td>$2,328.36</td>
</tr>
</tbody>
</table>

Flujo de efectivo propuesta #1
485 students trained through practicum course and/or internships
Participating Companies

Agroindustry
Automotive
Ceramics
Chemical
Construction
Food
Furniture
Hotel
Metallurgy
Packaging
Paper Industry
Plastic Industry
Printing & Engraving
Recycling
Service
Textile

113 companies received students in project courses and internships
## Benefits realized in companies

<table>
<thead>
<tr>
<th>Economic benefits</th>
<th>Environmental benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment (USD)</td>
<td>Raw materials savings (ton/yr)</td>
</tr>
<tr>
<td>$81,978</td>
<td>Solid waste reduction (ton/yr)</td>
</tr>
<tr>
<td></td>
<td>0.73</td>
</tr>
<tr>
<td></td>
<td>3.51</td>
</tr>
<tr>
<td>Savings realized in 2014 (USD/yr)</td>
<td></td>
</tr>
<tr>
<td>$113,128</td>
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Approximately half of the companies engaged have implemented some of the recommendations (typically the least cost initiatives)
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Academic Exchange Activities

- Several US partners visits to all other partners in LAC
- Capacity Training ITCR-UCA
- CP Workshop USIL - ITCR
- Academic Exchanges: Faculty and Students UCA-URL
- Academic Exchange Students INTEC-ITCR
- Faculty training ITCR - UNAH
Education Challenges

• Institutional inertia and politics can inhibit adoption and spread of CP within university
  – Importance of having buy-in from top administrators and multidisciplinary representation on teams

• Diversity in programs has prevented creating a standard CP practicum
  – Embrace diversity by creating a standard manual that each team modifies according to technical focus of their programs
Broader Education Challenges

• Connection to the social dimension of sustainability - people and communities?

• Tension between education vs implementation
  – Student versus company needs

• Limited resources to continue and deepen practicum courses and research
Future Outlook

- **Experiential learning and multidisciplinary teams** give students the opportunity to understand real market needs, and gain technical competencies as well as soft skills that are required of CP professionals.

- **Trends:** cross-country exchange, and link to corporate social responsibility and industrial ecology research.
Thank you

Email: washton@iit.edu or cleanerproduction.la@gmail.com
Website: http://cleanerproduction-la.org
Facebook: https://www.facebook.com/PathwaysToCleanerProduction

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