

# UNIVERSIDAD DE LA HABANA

## Experiences in environmental education at Havana University:

### The case of the Bachelor in Chemistry

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***Cuba Conference***

*University of Rutgers*

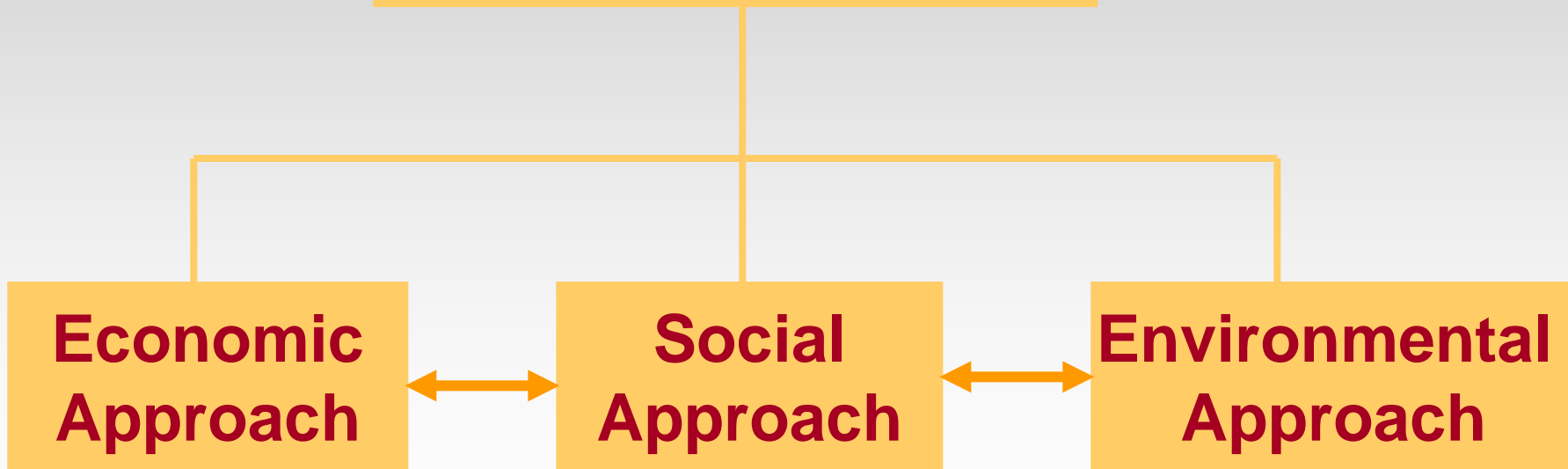
*Camden, N.J.*

*October-November 2016*



**From: Bruntland Report, 1987  
To: Paris, 2015**

## **Sustainable Development**



**“Education for everyone is still the fundamental issue in the search of Sustainable Human Development.”**

**Federico Mayor, UNESCO, 1997.**

**“Higher Education has a catalyzing role in the education for Sustainable Development and the construction of the Society of Knowledge....”**

**Lüneburg Declaration on “Higher Education for Sustainable Development”,  
Lüneburg, Germany. October 2001.**

# UNIVERSITIES



What is their role as development agents  
in the creation of an environmental culture  
and in the management  
of environmental risks??????????????

**UNIVERSITIES**



**NEW KNOWLEDGE**

Epistemological  
revolution

Environmental  
holism

Complexity

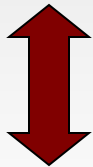
Bioethics

# Cuban Higher Education

Design of Educational Strategy



Formation of professionals with a solid  
Environmental Culture



Communities



Local governments  
and administrative  
boards



Corporate  
sector

# Institutionalization in Cuba

•**1992, Article 27, The Constitution establishes:** *“The State protects the Environment and the natural resources of the country. It recognizes its strong link with the economic and social sustainable development to make human life more rational and to assure the survival, the welfare and the safety of the present and future generations.....”*.

•**NATIONAL ENVIRONMENTAL STRATEGY, 1997, 2006, 2010, 2015.** *Ministry of Science, Technology and Environment.*

•**NATIONAL STRATEGY FOR ENVIRONMENTAL EDUCATION, 1997, systematic updating.** *Ministry of Science, Technology and Environment.*

# Some of the main tools for implementing the environmental policy in Cuba:

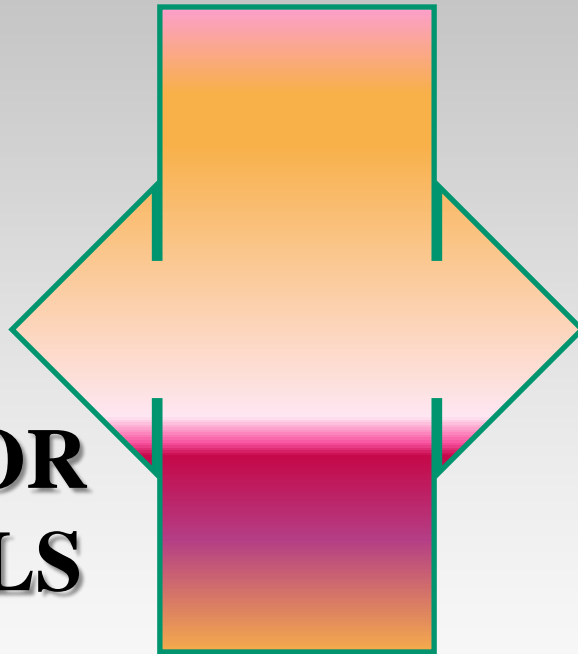
- ***Scientific research and technological innovation***
- ***Environmental Education and Promotion***
- *Environmental legislation (Law 81/1997)*
- *Tools for economic regulation*
- *Assesment of environmental impact*
- *International environmental policy*



# **NATIONAL STRATEGY FOR ENVIRONMENTAL EDUCATION**

**SPECIFIC  
EDUCATION FOR  
PROFESSIONALS**

**II**



**EDUCATION  
FOR ALL  
CITIZENS**

**I**

# MAIN PROBLEMS in Universities II

1. Shortcomings in the environmental culture of students, teachers and workers, with an integrated approach.
2. Lack of knowledge about environmental issues in decision makers.
3. Limited influence of universities in the education of environmental management in the communities.
4. Problems in the infrastructure and the physical environment of several universities.

# Basis of the environmental strategy of Havana University

1. Emphasis in the **ETHICAL** component of environmental problems.

2. Undergraduate level:

Central role of students

Use the existing curricula in each major



'Environmentalize' the curriculum

- Teaching activities
- Research projects
- Extracurricular activities

Introducing a multidisciplinary approach in these activities.

# Basis of the strategy (Cont.)

## 3. Postgraduate level:

Central role of the  
problem under study.



Integrated approach.

Emphasis on INTERDISCIPLINARITY



REAL solutions to REAL problems

# Main environmental problems (National Environmental Strategy 2010– 2015)

- Degradation of soils (erosion, bad drainage, salinity, compaction, etc.)
- Damages in forest coverage
- Pollution: liquid wastes, solid wastes, atmospheric emissions and acoustic pollution, chemicals and dangerous wastes.
- Lack of water and problems with its availability and quality
- Loss of biodiversity
- Impacts of climate change

# General Actions in UH

**Explicit inclusion of the environmental approach in the Educational Strategies of each Faculty or School.**

**Preparation of the Environmental Strategy of each Faculty, School or Research Center.**

**Optional or Elective subjects to be selected by students of any Faculty:** Chemistry and Environment, Environmental Sociology, Environmental Law, Cuban Biodiversity, Communication and Environment, etc.

**Subject: 'National Security': Includes Risk Management**

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## General Actions (Cont.)

**Master's Program in Integrated Coastal Zone Management** (strong interdisciplinary and integrated approach).

**Master's Program in Environment and Development.**

**Master's Program in Population, Environment and Local Development.**

**Master's Program in Caribbean Studies**  
(includes climate change, communities and environment in the Caribbean)

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# Postgraduate (Cont.)

Qualification of government officials and management of the city of Havana in environmental issues



**Environmental Governability**



- **Master's Program in Public Administration.**
- **Workshops on improvement of the Environmental Strategy of the province of Havana.**



# EXAMPLES

## Bachelor in Chemistry:

1. Subject: 'Environmental Chemistry' (5th year, with an integrating and interdisciplinary approach).

2. Proposals for treatment of wastes generated in some of the labs. Studies on the substitution of the most toxic and dangerous chemicals used in the laboratories.

This work is done by the students themselves.

3. 'Environment' Section in the Student's Annual Scientific Meeting.

4. Publication of the textbook "Safety and Protection in chemistry laboratories"

# OTHER EXAMPLES

## 5. Environmental issues included in other subjects:

### General Chemistry (1st year)

- **At the beginning of the academic course:** debate about the environmental responsibility the students assume selecting the Chemistry major and the ethics they must follow in their future professional work concerning the environment.
- **Laboratories:** Practical work is designed with an ecological approach considering protection requirements, toxicity of chemicals and products and the treatment of wastes. Use of pictograms, security cards, etc.

# OTHER EXAMPLES

## Inorganic Chemistry (2nd year)

- **Radioactive elements:** Effects on living organisms, pacific and military uses. Risk of radioactive pollution due to accidents or malfunction of electronuclear plants.
- **Free radicals:** Effects of its abnormal presence in living organisms, formation of free radicals by ionizing, nuclear, UV and X radiation. Dangers associated with exposure to these radiations.
- Dangerous effects and toxicity of fine particles of highly reactive solid substances.

# OTHER EXAMPLES

## Inorganic Chemistry (2nd year) Cont.

- Clean energies. Hydrogen combustion cells. Lithium batteries with Li-graphite anode.
- Influence of water and air pollutants in the atmospheric corrosion of Fe and ferric materials.
- Study of peroxide and superoxide reactions for the regeneration of breathable atmospheres in closed and polluted spaces.

# OTHER EXAMPLES

## Analytical Chemistry (2nd year)

**Lectures:** In the study of the different analytical methods, the determination of pollutants in environmental samples is included, mostly related with concrete cases to be solved.

**Laboratories:** The students determine substances that could be potential pollutants, and are trained in the proper handling of toxic or dangerous chemicals. A work session is included, “Analytical Chemistry and Environment”, where videos are used and security cards are prepared.



# OTHER EXAMPLES

## Analytical Chemistry (2nd year) Cont.

**Seminars:** Different analytical situations related with environmental problems are given to the students. They must make decisions and propose solutions.

The theme “**Safe work in chemistry laboratories**” is emphasized.

Didactic game: **LotoEducAmb.quim.** Debate about the results.



# OTHER EXAMPLES

## Organic Chemistry (3rd and 4th year)

### Laboratories

Main effects on human health and ecosystems of the organic chemicals used.

Protection against toxic substances of interest.

### Seminars

Chemical War: Use of the “rainbow agents” in the Viet Nam war. Short and long term effects.

Pesticides: Debate about their present use and future consequences. Alternatives.

Chemical Accidents: Origins, consequences and the role of organic compounds in the most important accidents that have occurred.

## EXAMPLES

### Main lines of research :

- Undergraduate and postgraduate students.
- Network of collaborating centers

Quality assessment of water in marine and freshwater ecosystems.

Bioregulators of vegetal growth

Development of materials for the purification of fresh water

Modification of natural materials for decontamination of waste water



## EXAMPLES

### Main lines of research : (Cont.)

- Undergraduate and postgraduate students.
- Network of collaborating centers

Development of biosensors for the detection and determination of pollutants, drugs and other pharmaceuticals.

Methodologies for the determination of metals, pesticides and other pollutants in environmental samples and biological fluids.

Renewable sources of energy (H<sub>2</sub>, solar cells)

**Methodologies and techniques to monitor quality of water resources.**

**Studies on the management of ecosystems.**





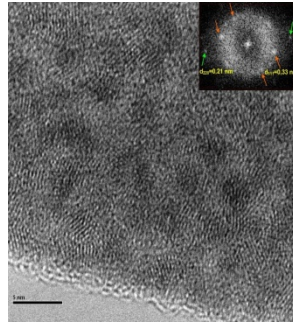
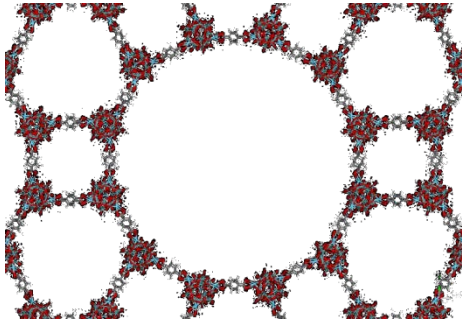
## Products for plant growth and yield

- Biobras 16

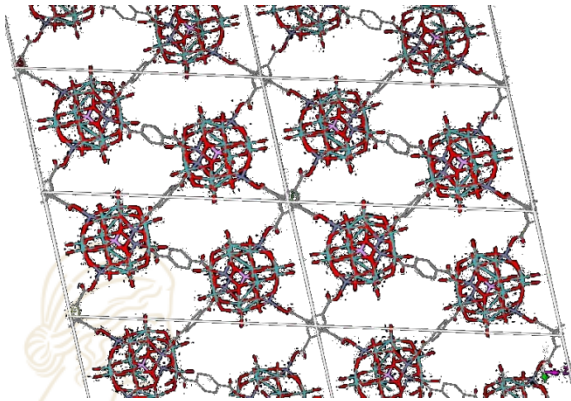
Reducing the use of chemical fertilizers.



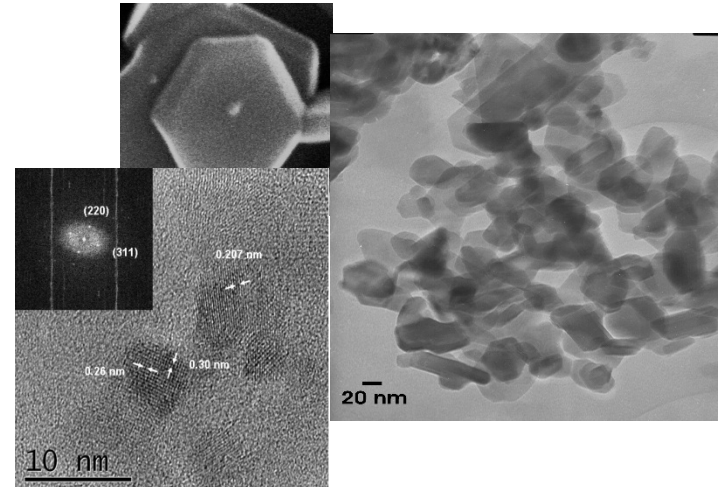
# NANOTECHNOLOGIES-CURRENT PROJECTS



## Quantum wells



## H<sub>2</sub> and CO<sub>2</sub> storage



## Magnetic nanoparticles

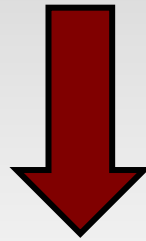
**Pollution**



**complex social problem**

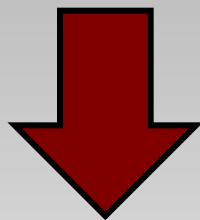


**Collective decisions**



**SOCIAL IMPACT OF POLLUTION**

**Course of Environmental Chemistry**  **Holistic**



**Dr. Ellen Spears, professor of Environmental History in the New College and American Studies, University of Alabama.**

**Author of the book “Baptized in PCBs”: Race, pollution and civil rights in Anniston, Alabama”**

**Dr. Spears gave the lecture “Social costs of the environmental pollution: The case of Anniston, Alabama” to the students of Environmental Chemistry of Havana University.**



**GRACIAS!!!!**



**THANK YOU!!!!**