



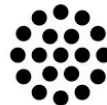
**HIGH-LEVEL POLITICAL FORUM  
ON SUSTAINABLE DEVELOPMENT**

# **Session #6: Practices and Approaches on quality education towards environment and climate action**

**International Federation of Social Workers  
International Science Council (ISC/ICSU) via TROP-ICSU  
Harvard University Zofnass Program for Sustainable Infrastructure**



**SDG LEARNING, TRAINING AND  
PRACTICE CAPACITY-BUILDING  
WORKSHOPS**



**International  
Science Council**



# Session roadmap

## Learning objectives

### Part 1. Introduction to the session

Introduction of the panelists

Learning more about the audience

### Part 2. Presentations by the representing institutions

- International Federation of Social Workers
- Harvard University Zofnass Program for Sustainable Infrastructure
- International Science Council (ISC/ICSU) via TROP-ICSU, WCRP - by *L.Spini (ISC) and B. Lee (WMO)*

### Part 3. Case study from Uganda

**Grow, Train, Make, Sustain: Social Work Innovation in East Africa via Bamboo for Good (B4G)**

**B4G project**, presented by IFSW

**Sustainability Framework and SDGs**, presented by Harvard University

**Applicability for Education**, presented by TROP ICSU , WCRP, ISC (*by LS Shashidhara*)

### Part 4. Q&A

### Part 5. Conclusions and key lessons learned



# Learning objectives

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- Identify opportunities and good practices for **integration of environmentally just sustainable development education** regarding climate change.
- Present the role of **infrastructure as a driver of economic growth**, and to achieve climate action.
- **Identify synergies** between **sustainable infrastructure criteria and the SDGs**.
- **Examples of curricular and pedagogical interventions** to promote knowledge and skills needed to achieve SDGs globally.

# **PART 1: Introductions**

# International Federation of Social Workers



**Michael Cronin, PhD,  
LCSW**  
Main Representative to  
the UN, IFSW  
Associate Professor  
Monmouth University  
School of Social Work  
West Long Branch, NJ  
USA



**Elaine Congress, DSW,  
MSSW**  
Representative to the  
UN, IFSW  
Associate Dean &  
Professor  
Fordham University  
Graduate School of  
Social Service



**Anne Deepak, PhD**  
Representative to the  
UN, IFSW  
Associate Professor  
Monmouth University  
School of Social Work  
West Long Branch, NJ  
USA



**Priska Fleischlin, MS**  
IFSW UN Commissioner  
(Geneva)  
CEO , WoBe AG, Care  
Farming for people  
with disabilities or  
mental illness

# Harvard University Zofnass Program for Sustainable Infrastructure



**Cristina Contreras Casado**

Research Associate  
Harvard University Zofnass Program (ZP)  
ccontrerascasado@fas.harvard.edu



**HARVARD**  
UNIVERSITY



**Judith Rodriguez**

Research Associate & Program Administrator  
Harvard University Zofnass Program (ZP)  
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**ZOFNASS PROGRAM**  
FOR SUSTAINABLE INFRASTRUCTURE



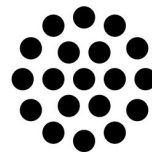
Graduate School of Design  
Harvard University

# International Science Council (ISC/ICSU) via TROP-ICSU, WCRP



**Dr Lucilla Spini**

Senior Science and Policy Officer  
International Science Council (ISC)



**International  
Science Council**



**L S Shashidhara**

Professor, Indian Institute of Science Education and  
Research (IISER), Pune, India



General Secretary, International Union of Biological  
Sciences (IUBS)



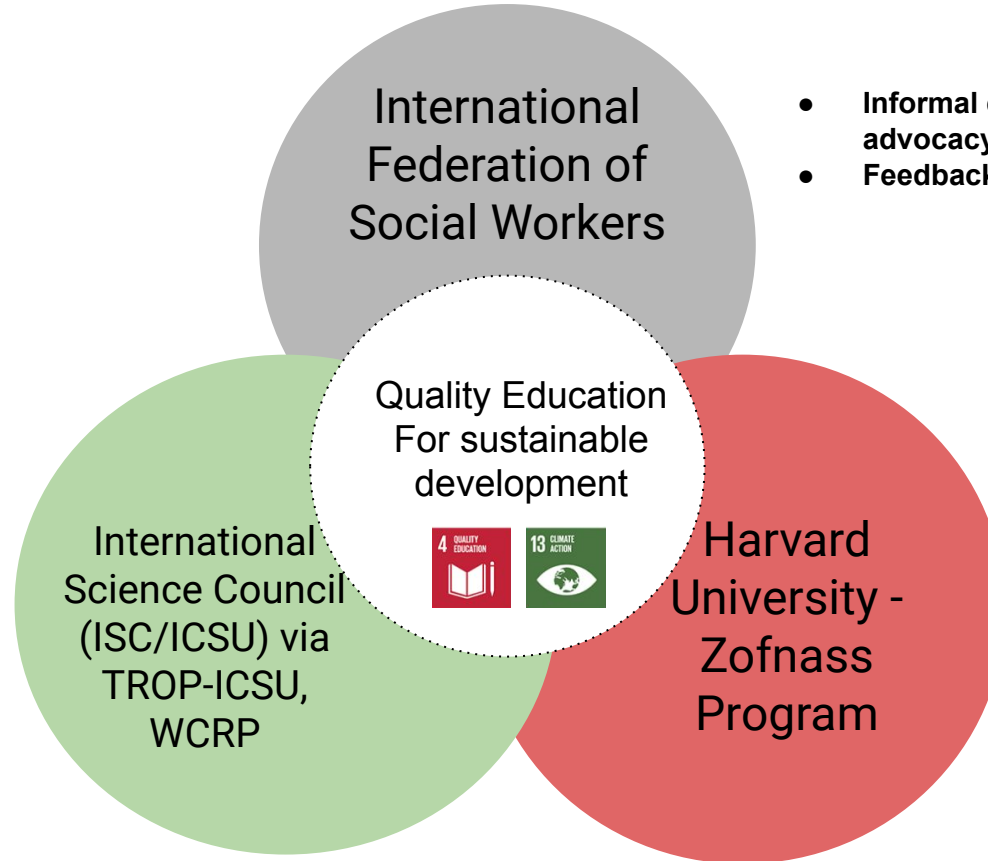
**Dr Boram Lee**

Senior Scientific Officer  
World Climate Research Programme (WCRP)  
World Meteorological Organization (WMO)



# What do we have in common?

- TROP ICSU represents **formal education** system
- Academic setting



- **Informal education, training and advocacy** at grass-root levels
- **Feedback** from local communities

- Identification of **synergies** on the field of sustainability
- **Benchmarks and standards** for professional and academic purposes

# Learning more about the audience!

(4 questions to answer by raising your hand)



## Learning more about the audience

---

### What is your professional profile?

1. Educator high school
2. Higher education
3. NGO representative
4. Government
5. Industry /business
6. Student
7. UN body representative
8. Other





## Learning more about the audience

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### What is your geographic location? (6 regions)

1. Africa
2. Asia
3. Europe
4. North America
5. South America
6. Oceania



## Learning more about the audience

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### What is your age group?

1. Under 18
2. 19 to 35
3. 36 to 65
4. 65 and above



## Learning more about the audience

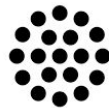
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**Have you been involved in any climate change/  
sustainability project?**

1. Yes
2. No



# PART 2: Representing institutions



**International  
Science Council**



**International Federation of Social Workers (IFSW)** is a global organization striving for social justice, human rights and social development through the promotion of social work, best practice models and the facilitation of international cooperation.



- IFSW supports over 124 country members by providing a global voice for the profession, representing over 3 million social workers.
- IFSW has been granted Special Consultative Status by the Economic and Social Council (ECOSOC) of the United Nations and the United Nations Children's Fund (UNICEF).
- It is also on International Labour Organization's Special list of Non-Governmental Organizations.

# Global Definition of the Social Work Profession

- Social work is a **practice-based profession** and an academic discipline that **promotes social change and development, social cohesion, and the empowerment and liberation of people.**
- Principles of social justice, human rights, collective responsibility and respect for diversities are central to social work.
- Underpinned by theories of social work, social sciences, humanities and indigenous knowledge, social work engages people and structures to address life challenges and enhance wellbeing.

*The above definition may be amplified at national and/or regional levels.*



# The Global Agenda for Social Work and Social Development

Commitment to:

- support, influence and enable structures and systems that allow people to have power over their own lives
- support, influence and enable structures and systems that positively address the root causes of oppression and inequality
- work together with people who use services and with others who share our objectives and aspirations, to create a more socially-just and fair world that we will be proud to leave to future generations.



IASSW AIETS



# The Global Agenda for Social Work and Social Development 2012-2020

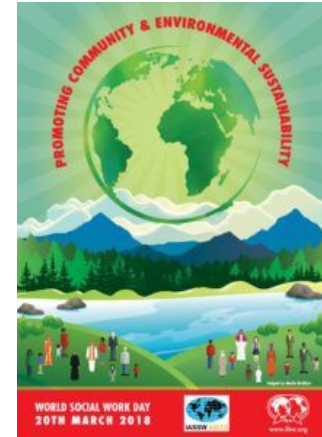
1. Promoting social and economic equalities
2. Promoting the dignity and worth of peoples
3. ***Working toward environmental sustainability***
4. Strengthening recognition of the importance of human relationships



## Global Agenda for Social Work and Social Development

### Third Pillar: Promoting Community and Environmental Sustainability

- Regional Observatories reports of best practices at grassroots level
- Educational resources disseminated via IFSW and available to social work educators and practitioners at no cost
- World Social Work Day
- SW Day at the UN (New York & Geneva)
- New [Climate Justice Program](#)
  - Educate
  - Advocate
  - Be the change we wish to see



### IFSW Climate Justice Program



Over to  
Cristina Contreras Casado  
And  
Judith Rodriguez

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**Zofnass Program for Sustainable  
Infrastructure  
at Harvard University**



# Zofnass Program for Sustainable Infrastructure at Harvard University

**Cristina Contreras Casado**  
Research Associate

**Judith Rodriguez**  
Research Associate & Program Administrator



Harvard University  
Graduate School of Design



**HARVARD**  
UNIVERSITY

# Zofnass Program for Sustainable Infrastructure at Harvard University



**Our mission:** Develop and promote methods, processes, and tools for sustainable infrastructure.

**Our goal:** Expand the body of knowledge for **sustainable infrastructure**, promote best practices and facilitate the adoption of solutions for infrastructure projects and systems.

## Sustainable Infrastructure Advisory Board

ARUP AUTODESK. **BARCLAYS** **Bentley** **CDM Smith**

**Golder Associates**

**HNTB**

**IDB**

Inter-American  
Development Bank

**Kiewit**

LA Metro

**Louis Berger**

**Otak**

The Nature  
Conservancy

**NV5**

**POWER ENGINEERS**

**Stantec**



**TRC**



The Zofnass Program is supported by a unique alliance with the Industry.

The **Sustainable Industry Advisory Board** is comprised of senior executives from leading global firms.



# Development of the Envision Rating System



Harvard University  
Graduate School of Design



Harvard University  
Center for the Environment



**HARVARD**  
**T.H. CHAN**  
SCHOOL OF PUBLIC HEALTH



**HARVARD**  
UNIVERSITY



**ZOFNASS PROGRAM**  
FOR SUSTAINABLE INFRASTRUCTURE



Representing  
Engineering bodies



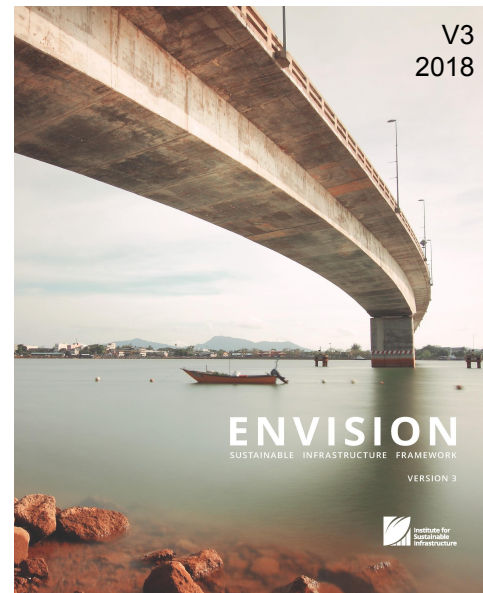
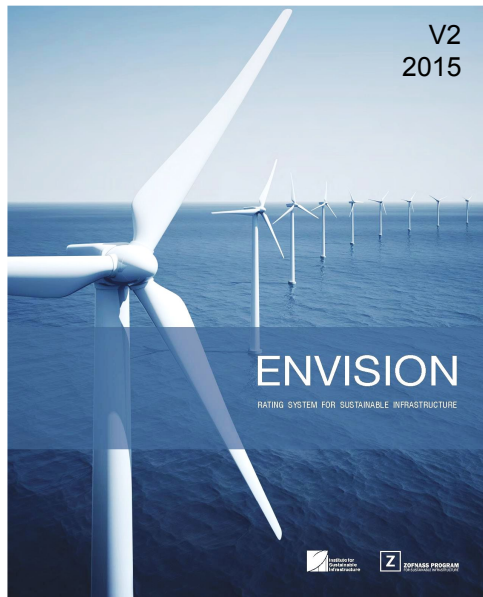
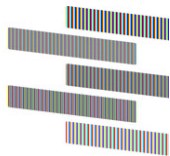
**Institute for  
Sustainable  
Infrastructure**



AMERICAN COUNCIL OF ENGINEERING COMPANIES

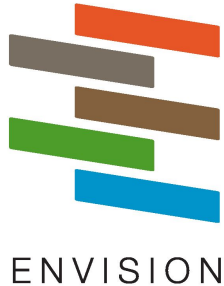


# ENVISION<sup>®</sup> Rating System for Sustainable Infrastructure



**Provides a holistic framework** for evaluating and rating the community, environmental, and economic benefits of all types and sizes of infrastructure projects.

## What is the Envision sustainability framework?



- Tool focused on the **integration of more sustainable solutions**
- Implement a systematic **way of thinking** about sustainability
- **Create awareness and develop capabilities**
- Distribution **64 credits** in **5 categories**
- **5 levels of evaluation**
- The score is awarded for **actions that exceed current regulations**
- Reward **innovative initiatives** with additional points
- Recognition of **awards**: Bronze, Silver, Gold and Platinum



## Envision Goals by Categories



### Quality Of Life

14 Credits



Enhance health  
& quality of life

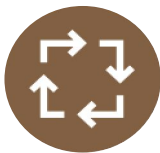


### Leadership

12 Credits



Plan Long-Term  
Maintenance  
& Monitoring



### Resource Allocation

14 Credits



Optimal allocation  
& use of resources



### Natural World

14 Credits



Preserve & enhance  
the ecological  
systems



### Climate and Resilience

10 Credits



Address long-term  
climate change

# Sustainability and Resilience Criteria



## Quality Of Life

14 Credits



## Leadership

12 Credits



## Resource Allocation

14 Credits



## Natural World

14 Credits



## Climate and Resilience

10 Credits

### WELLBEING

- QL1.1 Improve Community Quality of Life
- QL1.2 Enhance Public Health & Safety
- QL1.3 Improve Construction Safety
- QL1.4 Minimize Noise & Vibration
- QL1.5 Minimize Light Pollution
- QL1.6 Minimize Construction Impacts

### MOBILITY

- QL2.1 Improve Community Mobility & Access
- QL2.2 Encourage Sustainable Transportation
- QL2.3 Improve Access & Wayfinding

### COMMUNITY

- QL2.1 Advance Equity & Social Justice
- QL2.2 Preserve Historic & Cultural Resources
- QL2.3 Enhance Views & Local Character
- QL2.4 Enhance Public Space & Amenities

QL0.0 Innovate or Exceed Credit Requirement

### COLLABORATION

- LD1.1 Provide Effective Leadership & Commitment
- LD1.2 Foster Collaboration & Teamwork
- LD1.3 Provide for Stakeholder Involvement
- LD1.4 Pursue Byproduct Synergies

### PLANNING

- LD2.1 Establish a Sustainability Management Plan
- LD2.2 Plan for Sustainable Communities
- LD2.3 Plan for Long-Term Monitoring & Maintenance
- LD2.4 Plan for End-of-Life

### ECONOMY

- LD3.1 Stimulate Economic Prosperity & Development
- LD3.2 Develop Local Skills & Capabilities
- LD3.3 Conduct a Life-Cycle Economic Evaluation
- LD0.0 Innovate or Exceed Credit Requirements

### MATERIALS

- RA1.1 Support Sustainable Procurement Practices
- RA1.2 Use Recycled Materials
- RA1.3 Reduce Operational Waste
- RA1.4 Reduce Construction Waste
- RA1.5 Balance Earthwork On Site

### ENERGY

- RA2.1 Reduce Operational Energy Consumption
- RA2.2 Reduce Construction Energy Consumption
- RA2.3 Use Renewable Energy
- RA2.4 Commission & Monitor Energy Systems

### WATER

- RA3.1 Preserve Water Resources
- RA3.2 Reduce Operational Water Consumption
- RA3.3 Reduce Construction Water Consumption
- RA3.4 Monitor Water Systems

RA0.0 Innovate or Exceed Credit Requirements

### SITING

- NW1.1 Preserve Sites of High Ecological Value
- NW1.2 Provide Wetland & Surface Water Buffers
- NW1.3 Preserve Prime Farmland
- NW1.4 Preserve Undeveloped Land

### CONSERVATION

- NW2.1 Reclaim Brownfields
- NW2.2 Manage Stormwater
- NW2.3 Reduce Pesticide & Fertilizer Impacts
- NW2.4 Protect Surface & Groundwater Quality

### ECOLOGY

- NW3.1 Enhance Functional Habitats
- NW3.2 Enhance Wetland & Surface Water Functions
- NW3.3 Maintain Floodplain Functions
- NW3.4 Control Invasive Species
- NW3.5 Protect Soil Health

NW0.0 Innovate or Exceed Credit Requirements

### EMISSIONS

- CR1.1 Reduce Net Embodied Carbon
- CR1.2 Reduce Greenhouse Gas Emissions
- CR1.3 Reduce Air Pollutant Emissions

### RESILIENCE

- CR2.1 Avoid Unsuitable Development
- CR2.2 Assess Climate Change Vulnerability
- CR2.3 Evaluate Risk & Resilience
- CR2.4 Establish Resilience Goals and Strategies
- CR2.5 Maximize Resilience
- CR2.6 Improve Infrastructure Integration




















CR0.0 Innovate or Exceed Credit Requirements

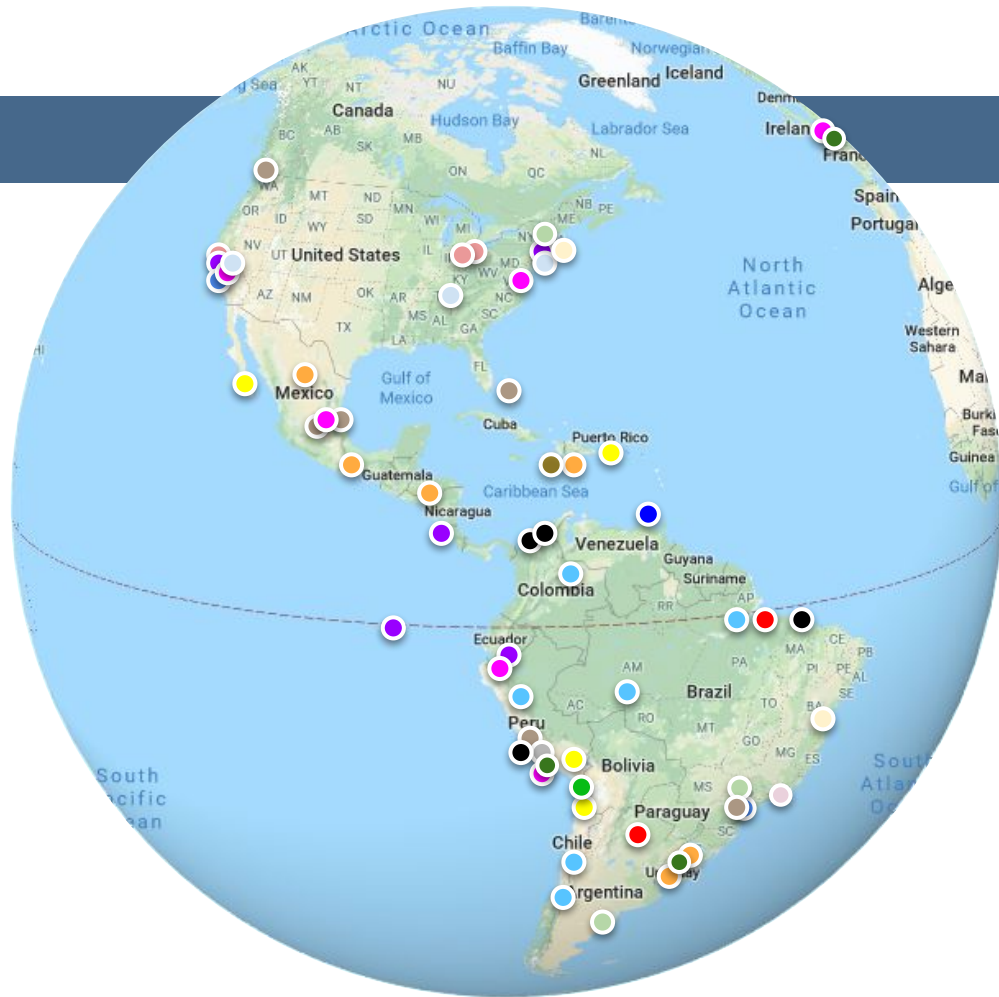
# Envision Categories and the SDGs



# Case Studies

## Infrastructure Typologies:

- Urban Development 
- Airport 
- Port 
- Metro Line 
- Highway 
- Electric Vehicles 
- Transmission Line 
- Wind Farm 
- Photovoltaic Plant 
- Solar Concentration Plant 
- Waste-to-Energy/Biogas 
- Combined Cycle Plant 
- Hydroelectric Plant 
- Landfill 
- Water Treatment Plant 
- Desalination Plant 
- Water Reuse Plant 
- Green Infrastructure 
- Environmental Restoration 



# Sustainable Infrastructure and the SDGs

## Sustainable Infrastructure:

- Enhances **access to basic services**.
- Promotes **environmental sustainability**.
- Supports **inclusive growth**.



Over to  
Lucilla Spini (ISC)

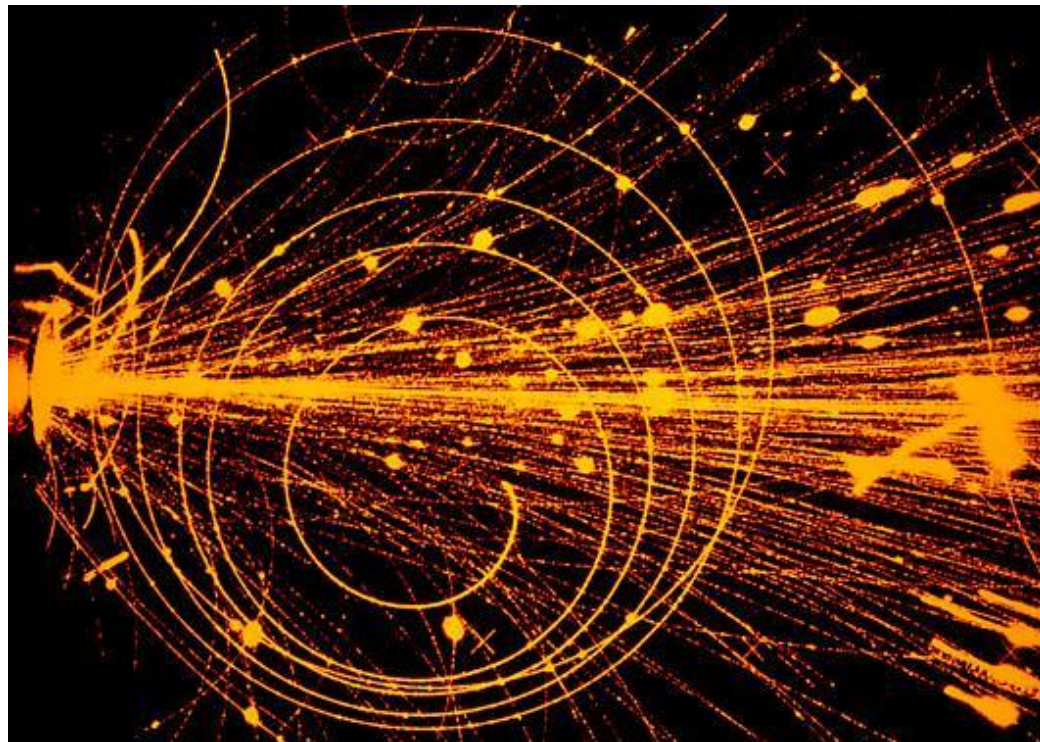
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**ISC via TROP ICSU, WCRP**





International  
Science Council



## ***The International Science Council (ISC) & the TROP- ICSU project***

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**Lucilla Spini, D.Phil.**

ISC, Directrice des Programmes Scientifiques  
Senior Science and Policy Officer

**SDG Learning Lab, UN HQ, 11 July 2019**





# International Science Council (ISC)

## VISION:

**To advance Science as a  
Global Public Good**

## MISSION:

**To be the Global Voice for  
Science**







## International Science Council (ISC): Members

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The International Science Council currently has 135 Member Organizations, 40 Member Unions and Associations and 30 Affiliated Members.

HQ in Paris, France and Regional Offices in South Africa, El Salvador, and Malaysia

ISC members provide the essential **enabling capacity** that allows the Council to achieve its **vision** and **mission**.



# The ISC's Four Domains of Impact

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## Science in Policy and Public Discourse

Science advice, open science, trans-disciplinarity, the post-truth/post-trust dynamic, science communication, etc.



## The 2030 Agenda for Sustainable Development

Synergies and trade-offs; SDG implementation, transformations to sustainability; etc.



## The Digital Revolution

Big, broad, linked and open data, AI, transformation of the human, reproducibility of scientific results, etc.



## The Evolution of Science and Science Systems

Inequalities in science, the industrialization of science, critical capacities, funding, etc.



# International Science Council (ISC): the UN System



- Co-organizing, with the World Federation of Engineering Organizations (WFEO), the Scientific & Technological Community Major Group (STC MG)
- *Ad hoc* reports and briefs (e.g., SDG interactions)
- Responding to request for review of UN reports (e.g., review of 2019 GSDR) and processes (e.g., review of IPBES)
- Fostering and implementing partnership with UN bodies and agencies on specific issues (e.g., climate change, disaster risk reduction, and ocean).





# International Science Council (ISC): International Initiatives





# The TROP-ICSU Project

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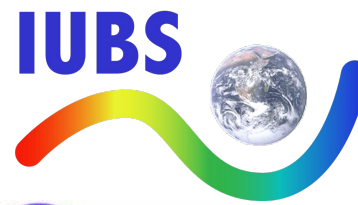
## Climate Change Education Across the Curriculum

Trans-disciplinary Research Oriented  
Pedagogy for Improving Climate Studies  
and Understanding (TROP ICSU)

[www.tropicsu.org](http://www.tropicsu.org)

## Partners

International Union of Biological Sciences IUBS  
International Union for Quaternary Research INQUA  
International Union of Soil Sciences IUSS  
International Mathematical Union IMU  
International Union of Geological Sciences IUGS  
International Union of Geodesy and Geophysics IUGG  
International Union of History and Philosophy of Science and Technology IUHPST  
International Union of Forest Research Organizations IUFRO  
African Union of Conservationists AUC  
IMAGINARY  
Committee on Data for Science and Technology CODATA  
International Council for Science- Regional Office for Africa



INQUA

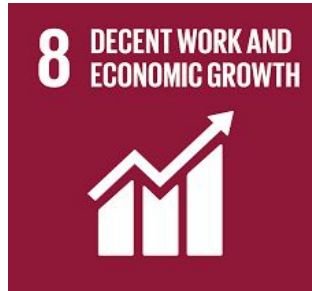
International Union for Quaternary Research



National academies of Australia, India,  
Egypt, Mongolia, South Africa, Ecuador,  
WCRP, WMO, UN CC Learn



# TROP ICSU and UN SUSTAINABLE DEVELOPMENT GOALS (SDG)



**Project directly aligns with UN SDG 4 (Quality Education) and UN SDG 13 (Climate Action) and also with UN SDGs 8, 16, 17**



# The TROP-ICSU Project



**Resources designed to integrate climate science with core curriculum of high school and undergraduate college syllabi across the world**

**Developed educational resources (Teaching Tools and Lesson Plans) that bring climate studies into the mainstream education**

***Idea is not to make climate change education a stand-alone topic rather bring it to the core of all curriculum***

**Allows educators to teach topics of their discipline (*without deviating from prescribed syllabus*) so opportunity for significant impact**







# The TROP-ICSU Project

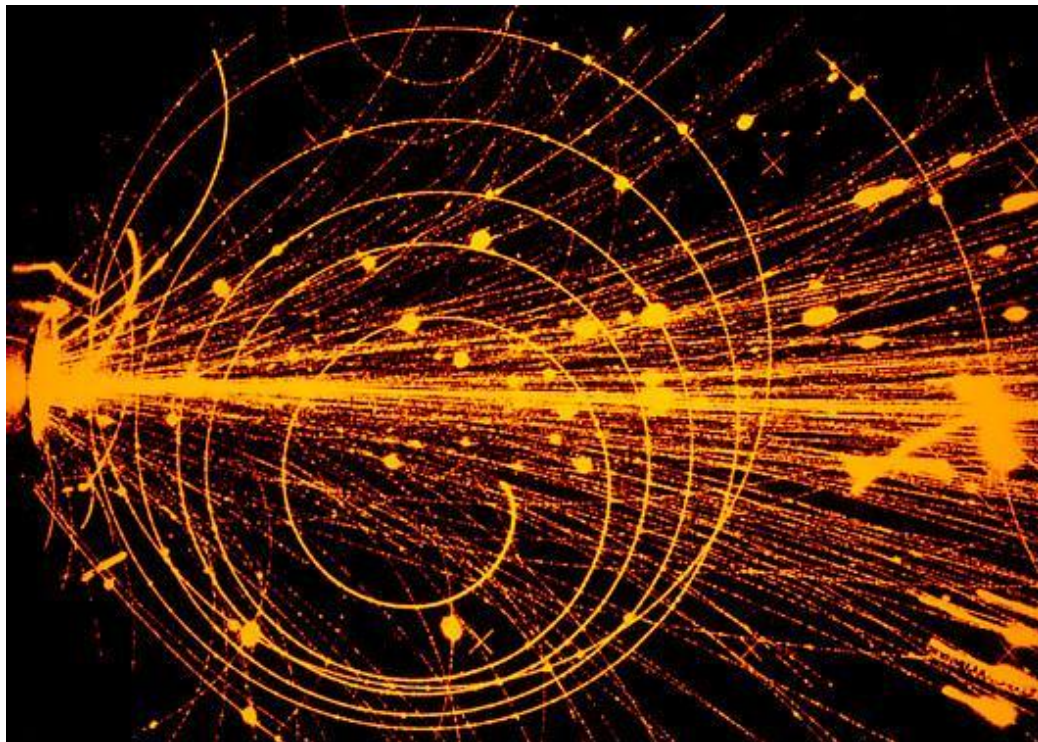
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**We have developed model teaching and learning modules as proof of concept of integrating climate change-related topics across the curriculum.**

**They are designed and packaged such that teachers across the world can use them to impart trans-disciplinary training that is essential for addressing the problems of climate change.**

***All educational resources are reviewed and validated by subject and educational experts before making it available for their use.***



For further information on ISC:  
[lucilla.spini@council.science](mailto:lucilla.spini@council.science)

For further information on TROP-ICSU:  
[aparnajoshi@iiserpune.ac.in](mailto:aparnajoshi@iiserpune.ac.in)

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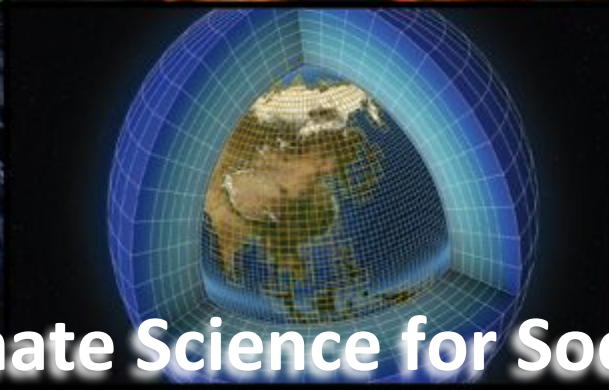
**International  
Science Council**



Over to  
Boram Lee

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ISC via TROP ICSU, WCRP



Climate Science for Society

# TROP ICSU for Research-Education-Action

Boram Lee (blee@wmo.int)

World Climate Research Programme

11 July 2019, UNHQ / New York, USA



International  
Science Council





# World Climate Research Programme



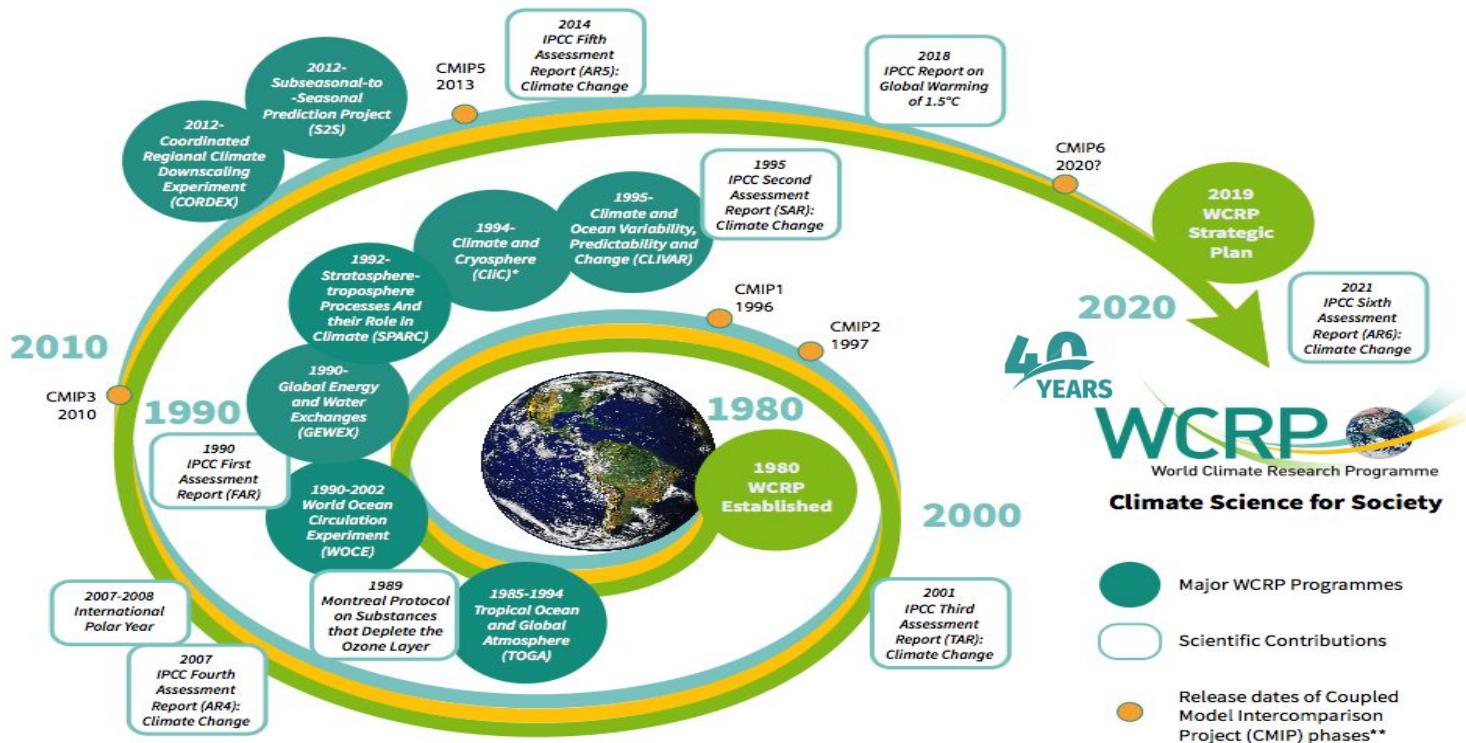
www.wcrp-climate.org



@WCRP\_climate



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International Science Council



# Major achievements in Research



www.wcrp-climate.org



@WCRP\_climate



@WCRP.climate



UN World Conference on  
Disaster Risk Reduction  
2015 Sendai Japan



International  
Science Council





# Can we achieve the Paris target?



www.wcrp-climate.org



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@WCRP.climate

- Need to understand, assess, quantify and predict changes:



**Where does the carbon go?**

**How climate influence the habitability?**

...

- The real-world action requires all levels of society - including individuals, organizations, businesses, local, state, national governments, and international bodies. **Bridging climate science and society**



**Preparing future leaders to build and protect a sustainable society ...**



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# TROP ICSU: Understanding & sharing problems



www.wcrp-climate.org



@WCRP\_climate



@WCRP.climate

Search Results for "carbon" - X


https://tropicsu.org/info-grade-level/under-grad/tool-type/e-learning-courses/teaching-modules/carbonpost\_types-post

EDUCATIONAL RESOURCES  
for TEACHERS  
to INTEGRATE CLIMATE TOPICS  
across THE CURRICULUM

TROP ICSU


HOME PROJECT TEACHING TOOLS LESSON PLANS LN-RESOURCES RELATED RESOURCES NEWS EDUCATORS SURVEY PEOPLE CONTACT

### Classroom/Laboratory Activity, Teaching Module: Cost-Benefit Analysis for Carbon Emissions Abatement




A classroom/laboratory activity or teaching module to perform cost-benefit analysis for carbon emissions abatement, considered to be an action that will mitigate climate change.

### Teaching Module: Orbital Forcing and Earth's Climate



A set of classroom/laboratory activities to reconstruct Earth's past climate using isotopic composition data from ice cores and to highlight the influence of orbital forcing and atmospheric carbon dioxide feedback on Earth's climate.

### E-learning Course: The Earth's Climate



An e-learning course to learn about the Earth's climate system, climate change in the past and present, the impact of climate change, and measures for adaptation and mitigation.

### E-learning Course: The Science and Modeling of Climate Change

An e-learning course to learn about the science of climate change, simple climate models, natural factors and human activities that influence climate, and options to mitigate climate change.

SEARCH AND FILTER RESOURCES

Search: carbon

Category:

- ☐ Biological Sciences
- ☐ Chemistry
- ☐ Earth Science
- ☐ Economics
- ☐ Environmental Science
- ☐ General
- ☐ Geography
- ☐ Humanities
- ☐ Lesson Plan
- ☐ Mathematics
- ☐ Media and Communication
- ☐ Physics
- ☐ Social Sciences
- ☐ Statistics

Grade Level:

- ☐ Highschool
- ☒ Undergraduate

Climate Topic:

- ☐ Climate and Agriculture
- ☐ Climate and Health
- ☐ Climate and Society
- ☐ Climate and the Anthroposphere
- ☐ Climate and the Atmosphere
- ☐ Climate and the Biosphere
- ☐ Climate and the Cryosphere
- ☐ Climate and the Hydrosphere
- ☐ Climate and the Lithosphere
- ☐ Climate Change and Food Security
- ☐ Climate Literacy
- ☐ Climate Mitigation and Adaptation
- ☐ Climate Variability Record
- ☐ Disasters and Hazards
- ☐ Earth's Orbital Parameters
- ☐ Energy, Economics and Climate Change
- ☐ Greenhouse Effect
- ☐ Long-term Cycles and Feedback Mechanisms
- ☐ Planetary Climate
- ☐ Planetary Energy Balance
- ☐ Policies, Politics and Environmental Governance

Resource Type:

- ☐ Audio
- ☐ Collection of Educational Resources

Where does the carbon go?

Climate science and society



International  
Science Council



# TROP ICSU: Understanding & sharing problems



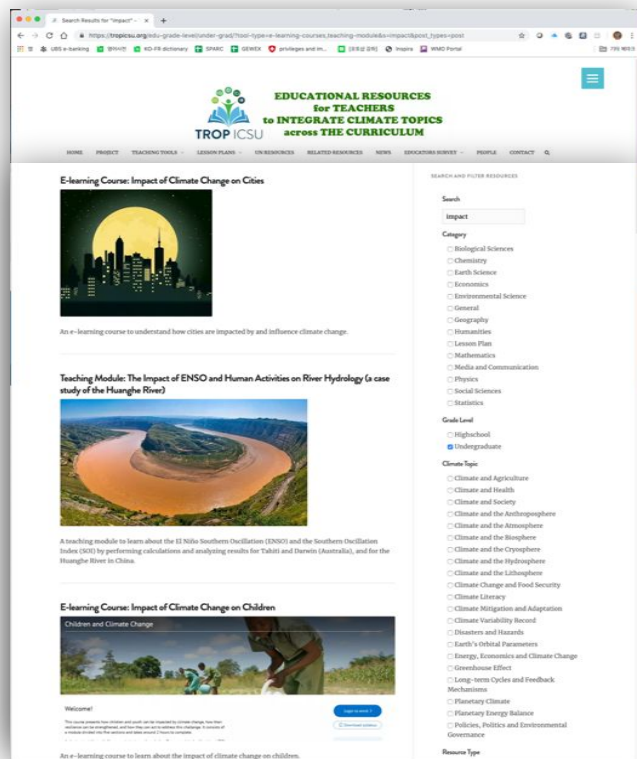
www.wcrp-climate.org



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How climate influence the habitability?

...

Preparing future leaders to build and protect a sustainable society ...



International  
Science Council



# TROP ICSU: Integrate Across Disciplines



[www.wcrp-climate.org](http://www.wcrp-climate.org)



@WCRP\_climate



@WCRP.climate





## Institutional, scientific, technical collaboration

- Addressing interdisciplinary nature of Earth system science and its relevance in their lives.
- Moving beyond - to the transdisciplinary nature of creating a society and a workforce.
- Stimulating students to apply the knowledge and skills they gain to effectively contribute to society.



## Institutional, scientific, technical collaboration

- The TROP ICSU teaching resources are carefully reviewed by the experts of relevant areas identified through the WCRP and relevant scientific programmes.
- Those teaching resources offer a powerful communication tool for climate science to be effectively integrated into the wide academic and societal areas.

# TROP ICSU: Leverage CC Education Activities



www.wcrp-climate.org

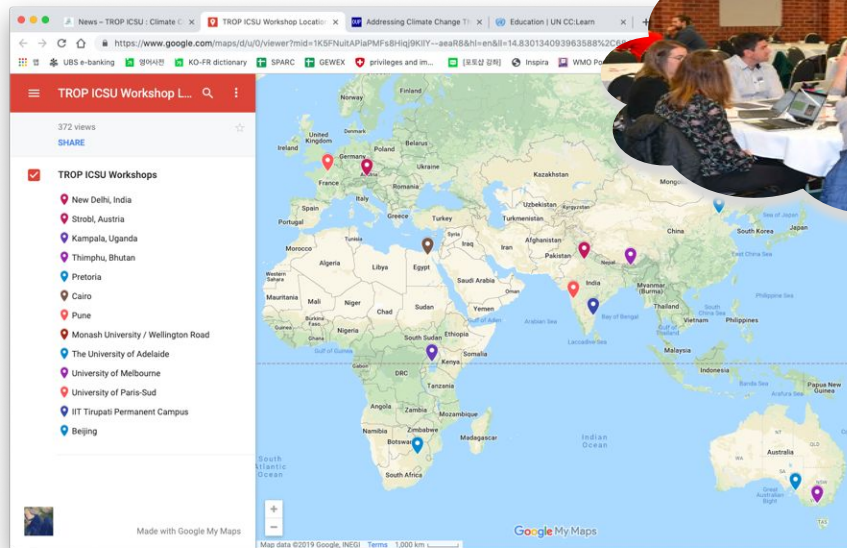


@WCRP\_climate



@WCRP.climate

- Facilitate the integration of climate change in the formal and informal education systems (e.g. inclusion of the subject in the curricula)
- Facilitate the training of teachers





# TROP ICSU: Leverage CC Education Activities



www.wcrp-climate.org



@WCRP\_climate



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- Collaborative initiative of more than 30 multilateral organizations, pioneering climate change education and training - Main international mechanism responding to the Doha Work Programme
- Support for the global/international process: Action for Climate Empowerment (ACE), Collaboration with the NDC Partnerships
- Empowering youth on climate change



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# TROP ICSU: Leverage CC Education Activities



www.wcrp-climate.org



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## : Promoting global climate literacy

- Acquiring & sharing locally rooted but globally relevant context
- Synergies to develop learning products, affiliation of existing resources.
- Enhancing the dissemination.
- Reaching out to a broader audience.



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# **PART 3: Case Study from Uganda**

Grow, Train, Make, Sustain: Social Work Innovation in East Africa via Bamboo for Good (B4G)

# Grow, Train, Make, Sustain: Social Work Innovation in East Africa Bamboo for Good (B4G)

## Context:

B4G is located near the Bwindi-Mgahinga National Park (BMNP) in South Western Uganda. The BMNP rainforest is home to more than half of the Mountain Gorillas in the world, and also is the source of livelihood of neighboring communities.

## Project:

Building capacity in *Arundinaria bamboo* propagation and processing, as an alternative livelihood for the communities surrounding BMNP.





# Case Overview: Bamboo for Good in Uganda



## Problem

National Park threatened by human development

## Strengths

1. Many natural resources
2. Indigenous knowledge about bamboo growing
3. Public and private resources

## Challenges

1. High population density (331 people per square /km)
2. Diminishing natural resources
3. Forming partnerships between disparate entities
  - public and private
  - different groups of people



# Envision-based Sustainability Assessment





# QUALITY OF LIFE

## a) Quality of life improvements.

B4G is building the capacity of communities for bamboo propagation and processing thereby enhancing livelihoods while at the same time protecting the environment.

## b) Enhances health and safety.

Avoids extraction of resources from the conservation area.

## c) Advance equity and social justice.

B4G works with partner community-based organizations, using a train the trainer model, to grow, train, make and sustain. Bamboo is grown outside the national park and used for handmade products to sell in addition to the traditional uses of the bamboo.

## d) Preserves cultural knowledge and local character.

B4G capacity building is using indigenous knowledge on Arundinaria bamboo from the community.

(wellbeing,  
mobility,  
community)





# QUALITY OF LIFE

## a) Quality of life improvements.

B4G is building the capacity of communities for bamboo propagation and processing thereby enhancing livelihoods while at the same time protecting the environment.

TARGET 2-4



SUSTAINABLE FOOD PRODUCTION AND RESILIENT AGRICULTURAL PRACTICES

TARGET 2-1



UNIVERSAL ACCESS TO SAFE AND NUTRITIOUS FOOD

TARGET 4-4



INCREASE THE NUMBER OF PEOPLE WITH RELEVANT SKILLS FOR FINANCIAL SUCCESS

TARGET 8-1

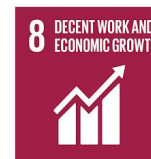


SUSTAINABLE ECONOMIC GROWTH

TARGET 8-4



IMPROVE RESOURCE EFFICIENCY IN CONSUMPTION AND PRODUCTION





(collaboration,  
planning,  
economy)

# LEADERSHIP

## a) Provision of skill & training on sustainable

**cultivation.** Growing and harvesting bamboo to complement existing agriculture and agroforestry efforts among communities in fragile environments

## b) Workforce development.

B4G reflects innovative partnerships among public and private institutions working together to mobilize bamboo resources to address critical social needs.

## c) B4G provides alternative livelihoods

promoting economic prosperity and community sustainability while at the same time preserving the physical environment essential for wildlife and the whole ecosystem.

## d) Stakeholder involvement and community buy in.

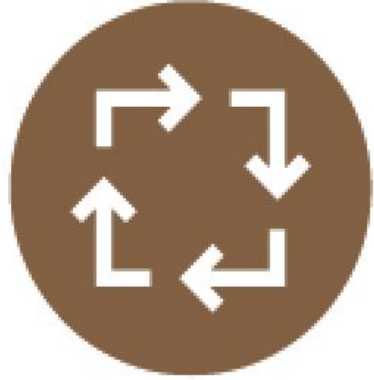
B4G is an initiative of Makerere University Department of Social Work and Social Administration (Uganda), Rwanda Bamboo organization, and Pacific Bamboo Resources (USA). B4G partners with local community organisations: the Mgahinga Bamboo Conservation Programme, Uganda Wildlife Authority, National Forestry Authority, district and sub-county administration and Change a Life.

## e) Planning sustainable communities and income, based on bamboo cultivation.





# RESOURCE ALLOCATION



(materials,  
energy,  
water)

## a) Sustainable procurement practices in the use and cultivation of bamboo.

With B4G there is less extraction of raw materials from the park.

## b) New bamboo sustainable product creation & industries.

It helps meet communities' critical needs, which B4G aligns through strategic planning to sustain programs and partner relationships for durable beneficial impacts.

## c) Bamboo products help reduce waste.

100% of the bamboo resource can be used for food, products, and industries. Bamboo is an organic product, which reduces waste and minimizes the use of other polluting materials (i.e. plastic containers)

## d) Helps preserve water resources.

Bamboo preventing erosion and protecting water replenishment areas inside the BMNP conservation area.



# NATURAL WORLD



(siting,  
conservation,  
ecology)

## a) Preserve sites of high ecological value.

B4G helps reduce resource extraction pressure on one of the most biodiverse areas in the world.

## b) Bamboo cultivated areas help protect water replenishment areas through forest conservation.

Helps reduce resource extraction in the conservation areas, which helps preserve the key ecosystem benefits from the forest providing include water catchment protection, as well as tourism, medicinal, and cultural values.

## c) Bamboo phytoremediation helps reclaim brownfields.

The bamboo rhizomes and high biomass to eliminate pollutants from soil, which help remediate brownfields from mining.

## d) Bamboo cultivated areas help manage stormwater.

The BMNP conservation areas provide water catchment protection which helps ensure water availability downstream from the park.

## e) Bamboo protects soil health.

B4G helps minimize erosion and protect the soils. The bamboo rhizomes help in plant nourishment and enhance the activity in the soil, improving its health.



# CLIMATE AND RESILIENCE



(emissions,  
resilience)

## a) Bamboo cultivation reduces air pollutant emissions by avoiding deforestation.

B4G helps conserve the forest in the park, as well as contributes to clean air as the bamboo cultivation area helps to reduce air pollutant emissions in the community.

## b) Bamboo cultivation reduces GHG emissions by avoided deforestation and carbon sequestration.

B4G helps communities to sequester carbon through indirect protection of the primeval forest in BMNP and through direct carbon sequestration from the fast growing bamboo biomass in the cultivation areas, and bamboo products.

## c) B4G is a resilience strategy for the communities Near BMNP.

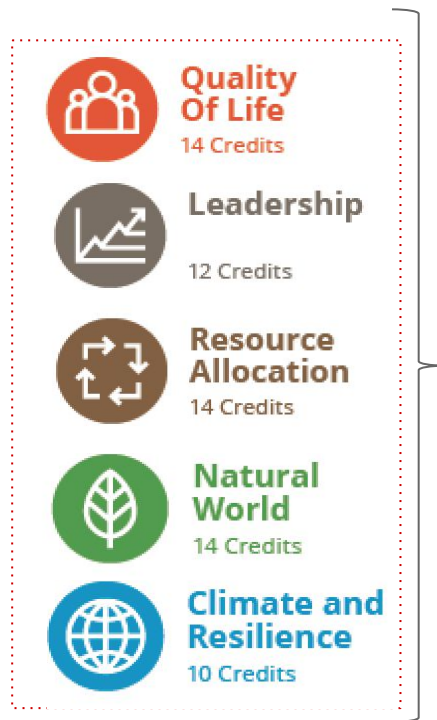
B4G helps minimize climate change impacts in the communities. B4G project strategy helps to reduce pressure on the fragile BMNP ecosystem while it improves relationships between communities and park management, and conserving biodiversity.



# Sustainable Infrastructure and the SDGs

## Application of SI framework:

- Help anticipate “unsustainable” practices.
- Understand the tradeoffs among outcomes.
- Ensure a more social and environmental project.
- Help prepare for more SDG-ready infrastructure projects.
- Helps communicate the value of sustainability.



**TOOLS**



**GOALS**

# **How would a Lesson Plan on the Bamboo for Good (B4G) case study would look like?**

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Over to L S Shashidhara



## Climate Change Education Across the Curriculum

Trans-disciplinary Research Oriented  
Pedagogy for Improving Climate Studies  
and Understanding (TROP ICSU)

**[www.tropicsu.org](http://www.tropicsu.org)**



# The TROP-ICSU Project



Australia



Bhutan

*Democratization of knowledge helps all of humanity to invest their talent, skills and ambition in a focused way to address the problems of climate change, which requires locally-rooted solutions, but based on global science.*

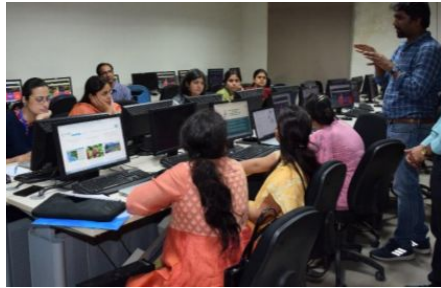






# The TROP-ICSU Project

Egypt



India

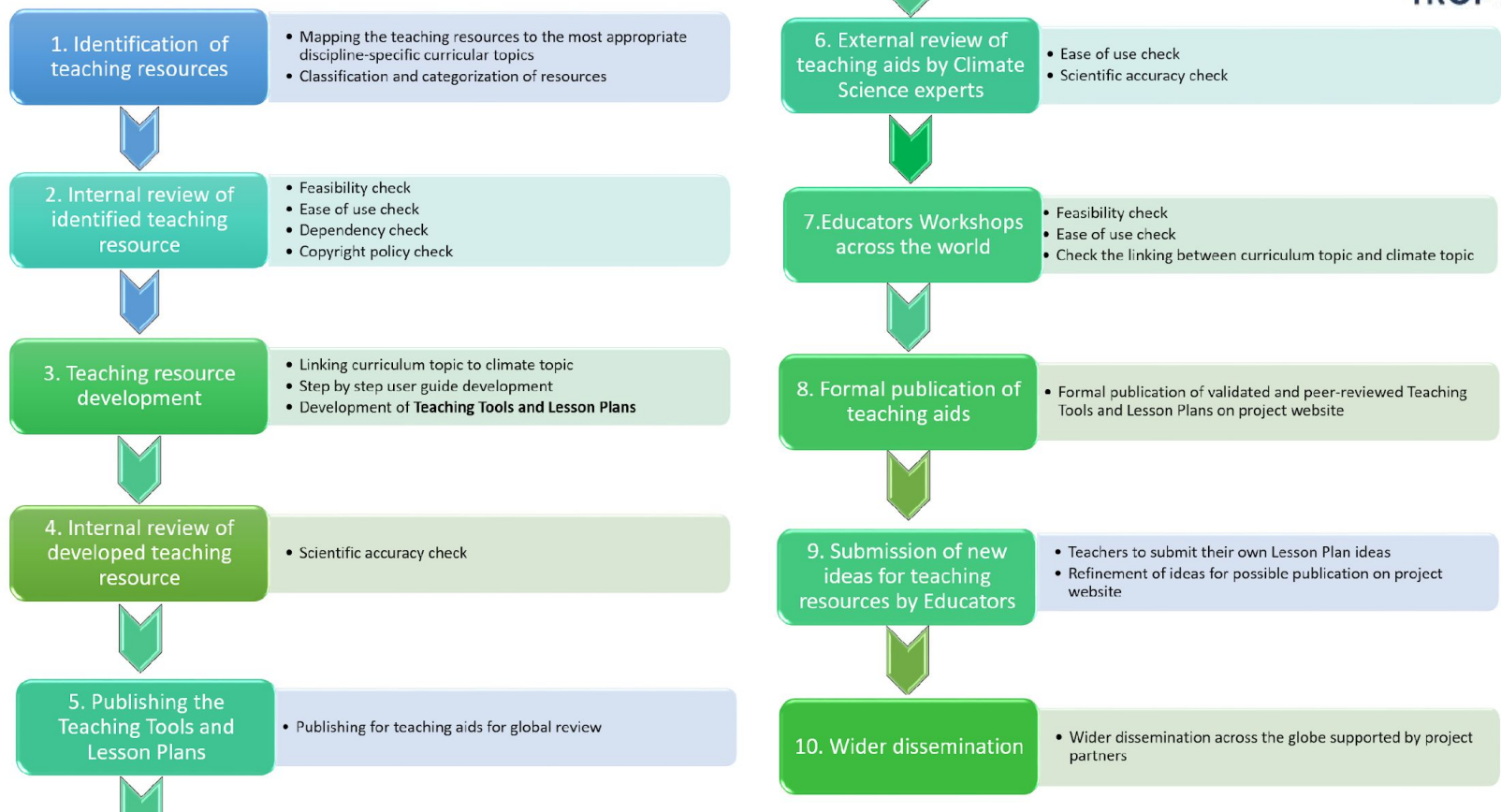
- ❑ *Idea is not to make climate change education a stand-alone topic rather bring it to the core of all curriculum*
- ❑ Developed educational resources (Teaching Tools and Lesson Plans) that bring climate studies into the mainstream education
- ❑ Resources designed to integrate climate science with core curriculum of high school and undergraduate college syllabi across the world
- ❑ Allows educators to teach topics of their discipline



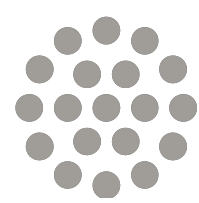
# The TROP-ICSU Project



## Detailed Methodology



Internal Review    Review by Climate Experts for Scientific Accuracy    Review by teachers for ease of use in classrooms



The quality of life of future generations is largely dependent on the quality of education that we impart to today's students. Educational methods are more effective when students are challenged to identify the cause and effect of a problem that they can relate to their life.

**Climate change** is considered to be the most critical factor affecting sustainable and equitable development, increasing conflicts, and causing massive extinction of species. Addressing the climate change issue is an essential step toward achieving the Sustainable Development Goals (SDGs). As the impact of climate change is inseparable from our day-to-day life, now and in future, it is both a problem to be addressed and a problem that can be adopted for more effective teaching.



## Vision

We aim to integrate relevant education and science communication modules in the education system to help future citizens across the globe in improving their understanding of the science of climate change and in developing necessary skills to mitigate its impact.



## Project

TROP ICSU (“Trans-disciplinary Research Oriented Pedagogy for Improving Climate Studies and Understanding”) is a global project funded by the International Council of Science. The project is led by International Union of Biological Sciences (IUBS) and co-led by International Union For Quaternary Research (INQUA).



## Strategy

We collate and curate digital/ICT-based teaching resources that integrate climate studies across the curriculum of Science, Mathematics, Social Sciences and Humanities. These teaching resources are locally rooted in their context, but globally relevant for their science.



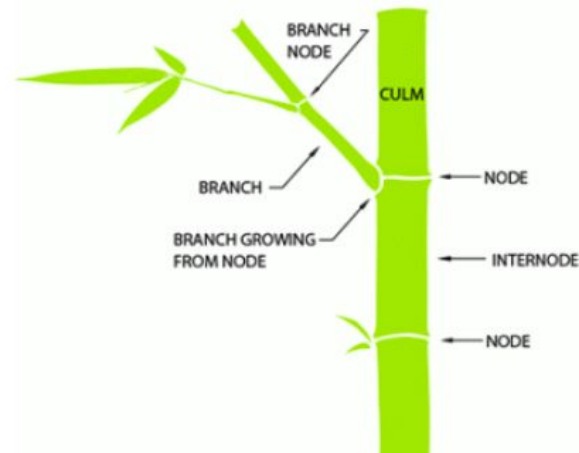
# TROP ICSU: A LESSON PLAN DESIGNED AROUND THE CASE STUDY: Bamboo For Good.

## Lesson Plan: Photosynthetic Pathways and Physiological Responses to Climate Change

As an undergraduate Biological Sciences teacher, you can use this set of computer-based tools to teach about differences in photosynthesis in different types of plants ( $C_3$ ,  $C_4$  and CAM) and how they are affected by climate change: which is more resilient or less resilient. You can discuss all these basic concepts in plant physiology using the case study: Uganda's massive expansion of Bamboo, a  $C_3$  plant, to address the issue of heavy deforestation, under changing climatic conditions.

This lesson plan includes resources that teach about the  $C_3$ ,  $C_4$  photosynthetic pathways in plants and describes the differences in their physiological responses to changing environmental conditions like rising atmospheric concentrations of  $CO_2$  and temperatures. You can also use these resources to teach photorespiration, nutrient and water uptake, stomatal conductance, carbon-fixation and, more importantly, homeostasis for photosynthetic efficiency under these varying conditions. Use this lesson plan to explain how this understanding can be applied to devise climate adaptation strategies by using the example of large-scale Bamboo plantation in Uganda.

Thus, the use of this lesson plan allows you to integrate the teaching of a climate science topic with a core topic in Biological Sciences (specifically Plant Physiology).



<https://tropicsu.org/lesson-plan-plant-physiology/>





# TROP ICSU: A LESSON PLAN DESIGNED AROUND THE CASE STUDY: Bamboo For Good.

## Questions

Use this lesson plan to help your students find answers to:

1. What are C<sub>3</sub>, C<sub>4</sub>, and CAM plants? Describe the differences in their photosynthetic pathways?
2. Describe what factors have the most impact on the photosynthetic efficiencies of C<sub>3</sub>, C<sub>4</sub> and CAM plants.
3. How global warming and higher CO<sub>2</sub> concentrations may affect the growth and development of C<sub>3</sub>, C<sub>4</sub> and CAM plants?
4. Explain physiological limitations in C<sub>3</sub>, C<sub>4</sub> and CAM plants to adapt to climate change.
5. How is a C<sub>3</sub> plant Bamboo, suited to restore the fractured forest ecosystems of Uganda?





## About Lesson Plan

Grade Level	Undergraduate
Discipline	Biological Sciences
Topic(s) in Discipline	<ul style="list-style-type: none"><li>Plant Physiology, Photosynthetic Pathways, C<sub>3</sub>, C<sub>4</sub>, and CAM Plants</li><li>Photorespiration, Stomatal Conductance, Photosynthetic Efficiency</li><li>Temperature Adaptation, Temperature Acclimation, Homoeostasis</li></ul>
Climate Topic	Climate and the Biosphere Climate Mitigation and Adaptation
Location	Global
Language(s)	English
Access	Online, Offline
Approximate Time Required	80 min

## Contents

Video micro-lecture (~12 min)	A micro-lecture that introduces the topic of photosynthesis and describe the differences in C <sub>3</sub> , C <sub>4</sub> and CAM photosynthetic pathways in plants. <a href="#">Video: Photosynthesis</a>
Video micro-lecture (7.5 min)	A video micro-lecture that introduces the C <sub>3</sub> , C <sub>4</sub> photosynthetic pathways and explains how plants have evolved to respond differently to changing climatic conditions. <a href="#">Video : Plant Response to Climate Change</a>
Readings (~40 min)	Two readings that describe the photosynthetic responses of plants to factors of climate change: <ol style="list-style-type: none"><li>1. A <a href="#">reading</a> to discuss the difference in the responses of C<sub>3</sub> and C<sub>4</sub> plants to rising levels of atmospheric CO<sub>2</sub>.</li><li>2. A <a href="#">reading</a> to describe the differences in temperature adaptation and acclimation for the C<sub>3</sub>, C<sub>4</sub> photosynthetic pathways.</li></ol>
Readings (10 min)	Two readings to discuss the extensive planting of a C <sub>3</sub> plant Bamboo, in Uganda: <ol style="list-style-type: none"><li>1) A case study of Bamboo For Good (B4G) initiative that has program partnerships in Uganda and other East African Countries for growing Bamboo to address 'critical social, economic, environmental, and wildlife habitat needs'.</li></ol> <p>Case study: <a href="#">Bamboo For Good (B4G)</a></p> <ol style="list-style-type: none"><li>2) A tabular representation of the attributes of planting Bamboo as a climate adaptation strategy against human-induced large-scale deforestation.</li></ol> <p>Reading: "<a href="#">The poor man's carbon sink: Bamboo in climate change and poverty alleviation</a>" (page 28, Table 3)</p>



Here is a step-by-step guide to using this lesson plan in the classroom/laboratory. We have suggested these steps as a possible plan of action. You may customize the lesson plan according to your preferences and requirements.

**Step 1: Topic introduction and discussion ([Go to the Video](#))**

1. Introduce the topic by playing the video micro-lecture, "[Photosynthesis](#)" from bozemanscience. This video explains the process of photosynthesis, chloroplasts and photoreceptors, the light reaction and the Calvin cycle, and gives an overview of photosynthetic pathways in C<sub>3</sub>, C<sub>4</sub>, and CAM plants.
2. Use the video to explain how these pathways are affected by stomatal conductance, which in turn affects nutrient and water uptake by the plants.
3. Further, explain the influence of photorespiration on photosynthetic efficiencies and thereby, carbon fixation in C<sub>3</sub>, C<sub>4</sub> plants- use the resource, 'C<sub>3</sub>, C<sub>4</sub>, and CAM plants. How the C<sub>4</sub> and CAM pathways help minimize photorespiration.' by Khan Academy, from the additional resources section, to explain this in detail.

**Step 2: Extend discussion to explain how the C<sub>4</sub>/CAM plants have evolved in response to climate change ([Go to the Video](#))**

1. Play the video micro-lecture, '[Plant Response to Climate Change](#)' by Prof. Raghu Murtugudde (content developed at Science Media Centre, IISER Pune), to explain that C<sub>3</sub> and C<sub>4</sub> type plants evolved differently as a response to changes in temperature and CO<sub>2</sub>
2. This micro-lecture explains the possible influence of CO<sub>2</sub> levels and climate change on the growth of plants and consequently on vegetation and crop productivity.

**Step 3: Further the understanding of the effect of climate change on the photosynthetic efficiencies of plants**

Reading "[Effects of Rising Atmospheric Concentrations of Carbon Dioxide on Plants](#)"

Reading "[Temperature response of photosynthesis in C<sub>3</sub>, C<sub>4</sub>, and CAM plants: temperature acclimation and temperature adaptation](#)"

1. Provide your students with printouts of the following readings to discuss the influence of climate change related factors- increased atmospheric CO<sub>2</sub> and rising global temperatures-on the photosynthetic efficiencies of C<sub>3</sub> and C<sub>4</sub> plants.





# TROP ICSU: A LESSON PLAN DESIGNED AROUND THE CASE STUDY: Bamboo For Good.



Step-by-Step User Guide

Questions/Assignments

Learning Outcomes

Additional Resources

Credits

The tools in this lesson plan will enable students to:

1. discuss the differences in C<sub>3</sub>, C<sub>4</sub> and CAM plants
2. explain the evolution of C<sub>4</sub>, CAM plants in response to climate change
3. explain the impact of environmental variations on photosynthetic efficiencies in C<sub>3</sub>, C<sub>4</sub> plants
4. describe how climate related factors affect photosynthesis in plants
5. discuss the role of Bamboo in restoring the denuded forest vegetation in Uganda



# TROP ICSU: 2<sup>nd</sup> LESSON PLAN DESIGNED AROUND THE CASE STUDY: Bamboo For Good.

## Lesson Plan: Ecological Niches and Biogeography: Mountain Gorillas, Bamboo and Climate

As an Undergraduate Environmental Sciences or Biological Sciences teacher, you can use this set of computer-based tools to teach about ecological niches- their characteristics and the factors that affect them- and the biogeography of a species. More specifically, this lesson plan will teach your students about the implications of climate-induced disturbed ecosystems on the ecological niches and the biogeographical distribution of Mountain Gorillas; and about the scientific strategies employed to prevent this and thereby, aid in their conservation.

<https://tropicsu.org/lesson-plan-gorillas-bamboo-climate/>

Mountain Gorillas inhabit sub-montane and montane habitats in two regions of Central Africa- the Republic of Congo (DRC) and the Democratic Republic of Congo (DRC). These gorillas are severely affected by climate change, which is affecting their habitat and thereby endangering these species.

The lesson plan provides information on their diet and how human activities are affecting their habitat. It also provides information on the conservation of Mountain Gorillas.

This lesson plan, thus, allows you to integrate the teaching of a climate science topic with a core topic in Environmental Sciences or Biological Sciences (Conservation of Endangered Species).



A Teacher contributed lesson plan by Lukato Denis and Nandala Isaac Fred (Nyabyeya Forestry College); Dr Catherine A Masao (Institute of Resource Assessment, University of Dar es Salaam); Marceline Kabanzira (AUC); Sheba Ndagire (UAIA); and Rashedah Agero (Msimu Institute, Uganda).





# TROP ICSU: 2<sup>nd</sup> LESSON PLAN DESIGNED AROUND THE CASE STUDY: Bamboo For Good.



## About Lesson Plan

Grade Level	Undergraduate
Discipline	Environmental Sciences, Biological Sciences
Topic(s) in Discipline	Ecological Niche, Biogeography, Habitat Use Species Distribution, Dietary Habits, Ranging Patterns Group Sizes, Feeding Competition, Reproductive Strategies Habitat Degradation, Bamboo Plantation, Mountain Gorillas, Conservation
Climate Topic	Climate and the Biosphere Climate and the Anthroposphere
Location	Global
Language(s)	English
Access	Online, Offline
Approximate Time Required	70 min

## Contents

Reading (~15 min)	A reading to define and introduce the topic of ecological niches and the biogeography of a species. It also explains how ecological niches determine the stability of ecosystems and the biodiversity of a region. <a href="#">Go to the Reading</a>
Reading (25 min)	A reading that describes how climatic and non-climatic anthropogenic factors can affect the natural ecosystems and biodiversity of Uganda. <a href="#">Go to the Reading</a> page 10, 11, 12, section 2.2 & 2.3
Readings (~15 min)	A case study of climate-induced habitat changes for Mountain Gorillas in Uganda that is putting their survival at risk. <a href="#">Go to the Reading</a> Page 21, Box 5
Reading (~10 min)	A reading to describe the climate adaptation strategies outlined for Mountain Gorilla conservation, ecosystems restoration, and the provision of livelihoods in Uganda, Rwanda and DRC. <a href="#">Go to the Reading</a> page 45, 46 & 47, section 9.8



# TROP ICSU: 2<sup>nd</sup> LESSON PLAN DESIGNED AROUND THE CASE STUDY: Bamboo For Good.

Step-by-Step User Guide

Questions/Assignments

Learning Outcomes

Additional Resources

Credits

Suggested questions/assignments for learning evaluation :

1. What is an ecological niche? Describe the factors affecting it.
2. What is the biogeography of a species? Explain how it can be affected by climate related factors.
3. Describe the ecological niche occupied by Mountain Gorillas in Central Africa.
4. How can the Mountain Gorillas of Central Africa be affected by climate change?
5. Explain how extensive planting of Bamboo in Uganda can contribute towards Mountain Gorilla Conservation in Africa.
6. Using the example of integrated Bamboo planting as a supplement to natural resources, explain how a scientifically well-planned program could help achieve the United Nations defined Sustainable Developmental Goals (SDGs).

Step-by-Step User Guide

Questions/Assignments

Learning Outcomes

Additional Resources

Credits

The tools in this lesson plan will enable students to:

1. learn about ecological niches and the biogeography of a species
2. describe the effects of climate related factors on natural ecosystems and biodiversity of a region
3. discuss the possible impacts of climate change on the Mountain Gorillas of Central Africa
4. explain the importance of growing Bamboo in Africa to restore degraded natural habitats, provide a renewable natural resource, and help conserve Mountain Gorillas.





**International  
Science Council**



## Partners

**International Union of Biological Sciences IUBS**

**International Union for Quaternary Research INQUA**

**International Union of Soil Sciences IUSS**

**International Mathematical Union IMU**

**International Union of Geological Sciences IUGS**

**International Union of Geodesy and Geophysics IUGG**

**International Union of History and Philosophy of Science and  
Technology IUHPST**

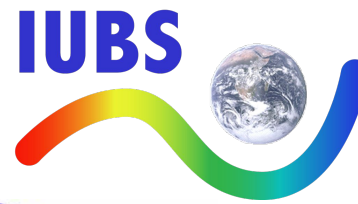
**International Union of Forest Research Organizations IUFRO**

**African Union of Conservationists AUC**

**IMAGINARY**

**Committee on Data for Science and Technology CODATA**

**International Council for Science- Regional Office for Africa**



**INQUA**

**International Union for Quaternary Research**



**National academies of Australia, India,  
Mongolia, South Africa, Ecuador & Egypt  
World Climate Research Programme (WCRP)  
World Meteorological Organization (WMO)  
UN CC Learn**

# **Lessons learned from the social work perspective**

---

Over to Michael Cronin

# B4G: Social Work Perspective

- **Critical issues**

- social and environmental justice
- poverty alleviation and economic empowerment
- sustainable community development





# Solutions – Social work perspective

## Person in Environment

### Focus on person

1. Offer alternative ways to promote well being of people
2. Involve people in developing solutions – Respect for all voices
3. Provide education and job opportunities
4. Build partnerships between and among people and organizations

### Focus on environment - Promoting social, economic, and environmental justice

1. Understanding environmental needs
2. Assessment

Bamboo essential for well being of people, agriculture and animals in park

3. Preserve the environment for people, plants, and animals to live in harmony

# B4G: Social Work Perspective

## Bamboo for Community Infrastructure

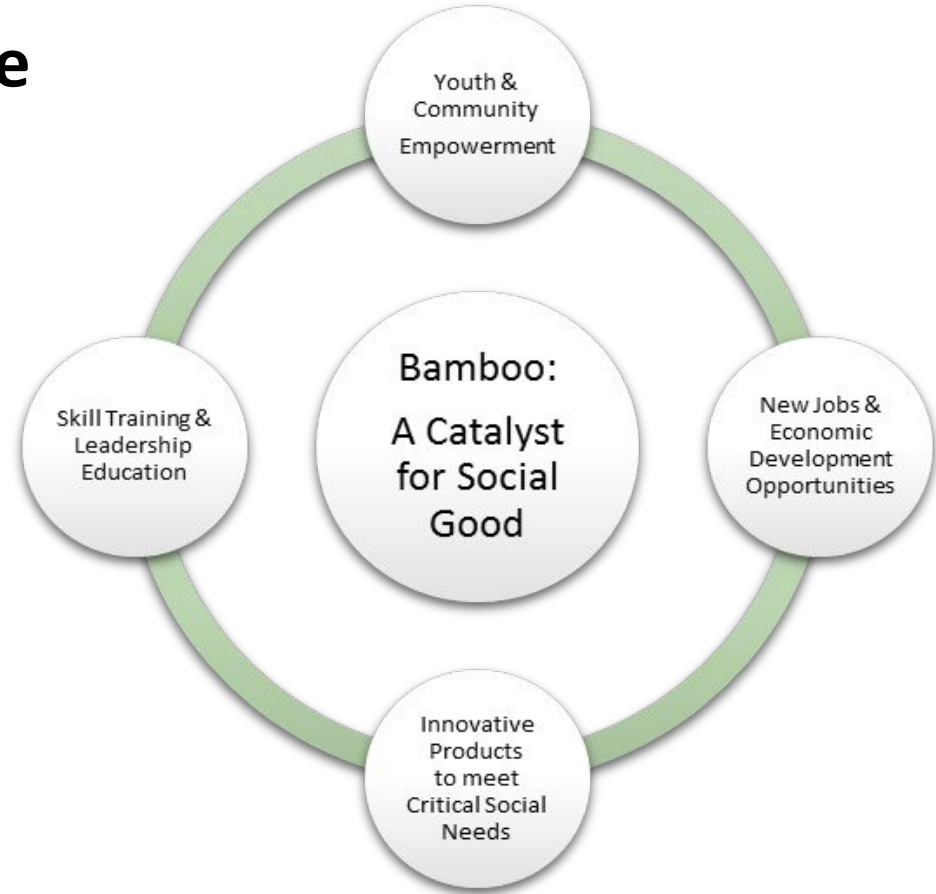
- To utilize bamboo products for critical community needs, such as roofing sheets, park benches, bus shelters, water stations, hand washing stations, etc.

## Bamboo for Health & Medical Resources (B4H)

- To enlist bamboo resources for new innovative healthcare products and technologies, new jobs, and new economic development, like bamboo hand washing stations, toilets, braces, crutches and medical disposables.

## Bamboo for Youth Empowerment (B4YOU)

- To design and deliver youth training and leadership programs towards new jobs, careers and public service across Uganda and the region.



# **PART 4: Q&A**

## Questions for discussion:

### Question 1

Could the identification of synergies between sustainability tools (Envision) and the SDGs help you in your work?

How? e.g. communication, education...

### Question 2

Would you try to teach topics in your discipline using climate-related examples if relevant teaching resources are available?

### Question 3

What are the relevant social, economic, and environmental justice challenges and possible solutions?



## Questions for discussion:

---

Could the identification of synergies between sustainability tools (Envision) and the SDGs help you in your work?

How? e.g. communication, education...



## Questions for discussion:

---

Would you try to teach topics in your discipline using climate-related examples if relevant teaching resources are available?





## Questions for discussion:

---

What are the relevant social, economic, and environmental justice challenges and possible solutions?



## Questions for discussion:

---

What would you have added that was not presented in the case study?



# **PART 5: Conclusions and key lessons learned**

# Key lessons learned / contributions to SDG 4

1. Using a **case study (CS)** as **learning tool** to teach sustainable practices in developing contexts as a **positive example**.
2. Having a **Sustainability Framework** helped organize the CS knowledge, showing how a project helps achieving the SDGs.
3. CS served as an **integration strategy** between institutions not typically working together (SDG17).
4. Having the CS integrated into a **Lesson Plan facilitates teaching** to educators globally, **contributing to quality education towards environment and climate action**.

TARGET

4.7

EDUCATION FOR  
SUSTAINABLE  
DEVELOPMENT AND  
GLOBAL CITIZENSHIP





# Thanks Questions?

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**More information about B4G:** <https://pacificbamboo.org/bamboo-for-good/>

