Natural Sciences Sector

United Nations Educational, Scientific and Cultural Organization

UNESCO Science for Sustainable Development

UNESCO perspective and actions on Capacity Building for the development, adoption and use of environmentally sound technologies in developing countries

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Consultative Workshops on development, transfer and dissemination of clean and environmentally sound technologies in developing countries.
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30th of November 2013

The World Today

1. Local decisions-global impact- **Globalized**
2. Facing climate changes: unexpected and probability of more extreme events - **Uncertainty**
3. Population increase - **Pressure**
4. Global crisis: food, energy and financial - **Poverty**
5. Where knowledge and technology is more and more important- **Inequalities**

New realities need paradigm shift

- This rapid economic growth and increasing youth population pose challenges on already fragile environment, stressed basic needs and lifestyle
- Humanity will need more energy, water, nutritious food, create more jobs and opportunities and reduce poverty
- Investment in science technology and innovation is key especially to enhance food security, energy access, clean drinking water, job creation and poverty reduction
- Capacity building and Skills development in STI is a wise investment because it is vital to reduce unemployment, inequity, and poverty and increase economic growth and social cohesion.
- Invest in eco-friendly infrastructure with maintenance schedule is crucial for success

Implications of technology transfer/acquisition?

- Technology transfer has often been donor-driven, de-linked from local context, and based on a R&D-centred linear model of innovation rather than responding to local demands ignoring the contribution of local knowledge and importance of local context.
- The transfer of technology/knowledge with LDCs faces the challenge of needing to respond to the specific situation of the different recipient countries with regard to the efficient diffusion and assimilation of new technologies.
- If innovation has to be adopted successfully, then knowledge has to be contextually adapted.

Innovation issues in developing countries (1)

- ***Fragmented businesses;***
- ***Inexistence of research centers or a very limited research facilities***:
- ***Low educational levels***: it is a significant barrier to the development and diffusion of innovation in these countries.;
- ***Weak infrastructure***: telecommunication and transportation infrastructure;
- ***Poor system of governance***: not participatory and integrative.
- ***Almost inexistent innovation policies, programmes and mechanisms.***

Possible interventions and existing initiatives

1. Promoting a culture of Innovation

- “Innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations” (OECD, 2005).

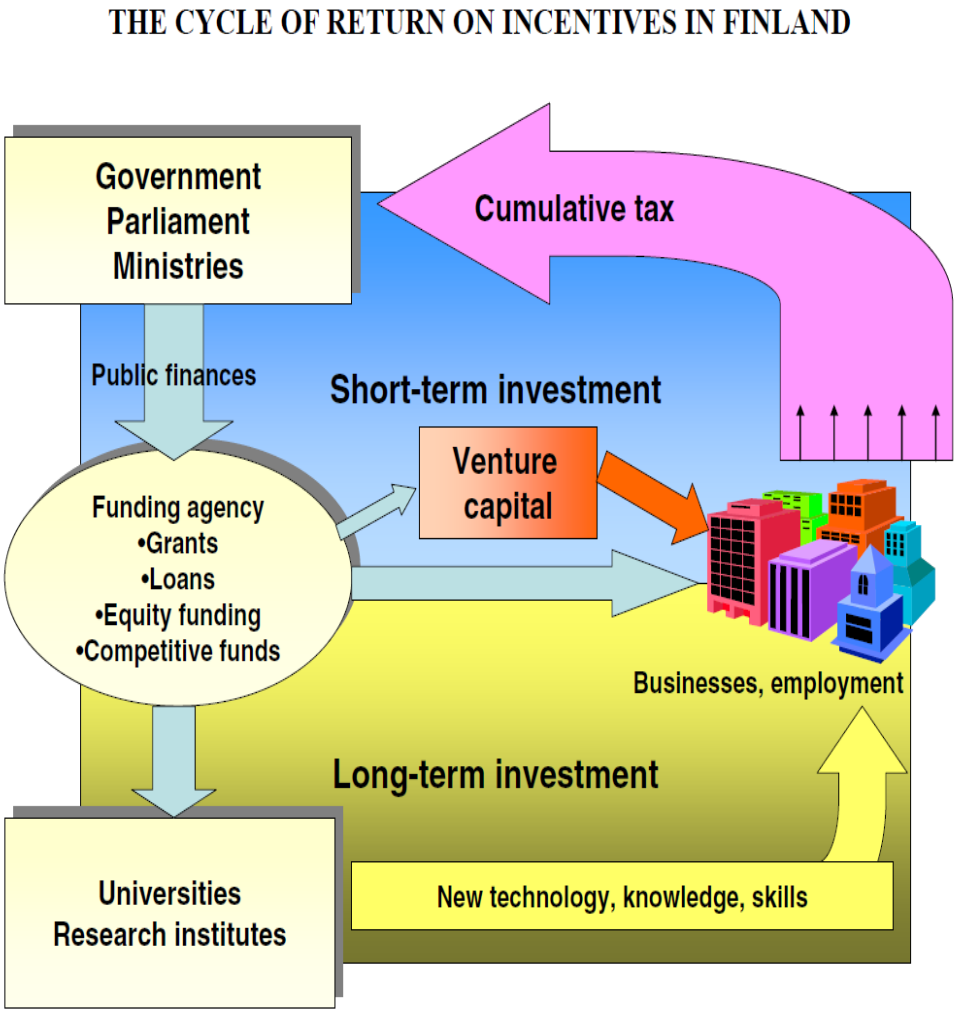
- Innovation is a critical factor for enhancing economic growth and competitiveness but is also crucial for social cohesion, equality and poverty alleviation.

Solar water bulb made from a plastic bottle, which disperses about 55 Watts of light. The bottle is filled with water that has been treated with ammonia to eliminate fungal growth. It is then sealed. The top half of the bottle protrudes through the roof, catching sunlight which the water then scatters around the room. A World of **SCIENCE, Vol. 11, No. 2, April–June 2013**

1.1 . Strong investment in research infrastructure and institutions

- Critical mass to develop alternative solutions
- More differentiated approaches, better adapted to local setting and development needs and priorities that may vary from one country to another
- Science and technology based Industries
- University-Industry Partnerships: triple helix concept
- Venture Capital

Research not about the poor, but research for the poor and with the poor?



UNESCO Chairs and Category 2 centers

UNESCO Chair on Transfer of Technology (UNESCOTT), established at The Industrial Research and Consultancy Centre in Khartoum (Sudan). The chair's principle activities include; the reinforcement of research capacities; *training programmes in technology transfer*; encouraging public awareness of technology transfer

International UNESCO Chair / Network on Transfer of Technologies for Sustainable Development (TTSD), established at the International Centre for Educational Systems (Russian Federation). The chair focuses on issues relating to Engineering and Technology; Energy and Sustainable development.

UNESCO Chair on Climate Technology in Beijing - the UNESCO Chair at the Beijing Institute of Technology and the China Science and Technology Exchange Centre aims to promote knowledge dissemination, *technology development and transfer*, and information sharing among developing countries on applicable technology for climate change.

UNESCO Chairs and Category 2 centers

UNESCO Chair in Technologies for Development -The UNESCO Chair in Technologies for Development was established at The École Polytechnique Fédérale de Lausanne (EPFL). In collaboration with partners in emerging and developing countries, *it aims to find adapted technology solutions to facilitate sustainable development*.

UNESCO Chairs in Renewable Energy - Fifteen UNESCO Chairs on renewable energy have been established in the different world regions. The main objectives of the Chairs are to help addressing the development of scientific capacity and knowledge base to use and better manage the locally available renewable energy resources that help addressing the sustainable development targets.

The International Science, Technology and Innovation Centre for South-South Cooperation under the Auspices of UNESCO (ISTIC) - The center aims to promote South-South cooperation in science and technology with the objective of facilitating the integration of a developmental approach into national science and technology and innovation policies, capacity building in science and technology.

UNESCO Chairs and Category 2 centers

International Research and Training Centre for Science and Technology Strategy (CISTRAT) - The new centre aims to design and conduct international cooperative research programmes, offer professional training programmes, provide *technical assistance, develop effective policy tools and foster networking and cooperation between governments*, academia and industry.

The **International Sustainable Energy Development Centre (ISEDC)** in Moscow and the **Regional Center for Renewable Energy and Energy Efficiency** in Marrakech. Both centres serve as instruments in implementing UNESCO's renewable energy strategy for capacity building, dissemination of scientific knowledge and best practices, and definition of appropriate energy policies.

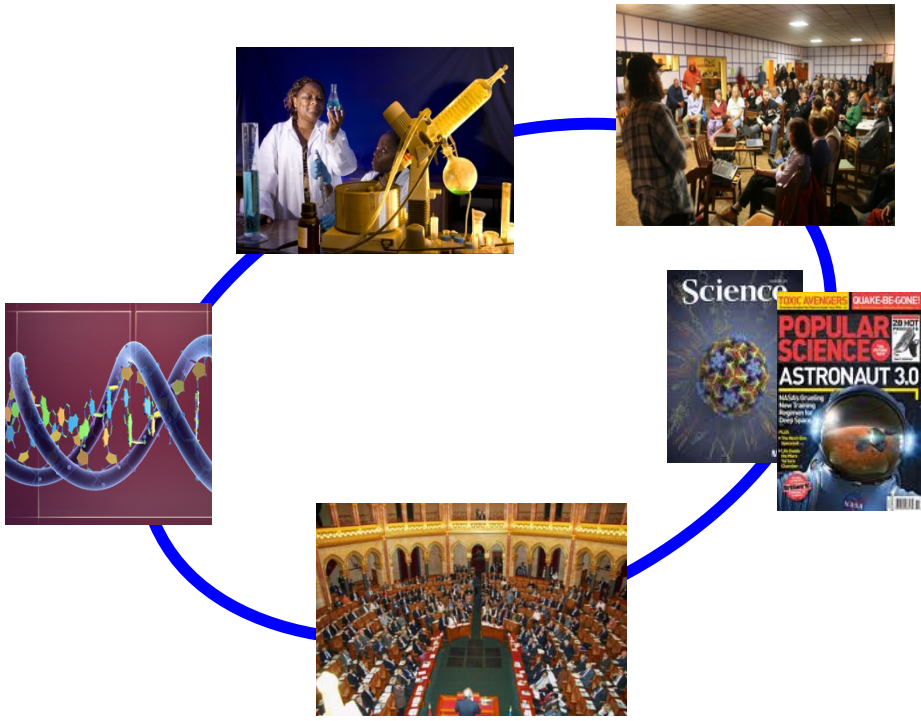
International Center on Qanats and Historic Hydraulic Structures (ICQHS) - this centre facilitates research, training, technology transfer and cooperation in hydrology. these systems.

1.2. Promoting firm-based innovation – Supporting the development of science parks and technology incubators

- In 1993, UNESCO launched the *University-Industry Science Partnership Programme* (UNISPAR). Its objective is to create synergy between research in universities and in the productive sector.

- Supporting science parks and technology business incubators by providing technical assistance, organizing capacity building activities and developing pilot projects.

- The ultimate goal is to develop national capacity in creating, nurturing and managing knowledge-based SMEs

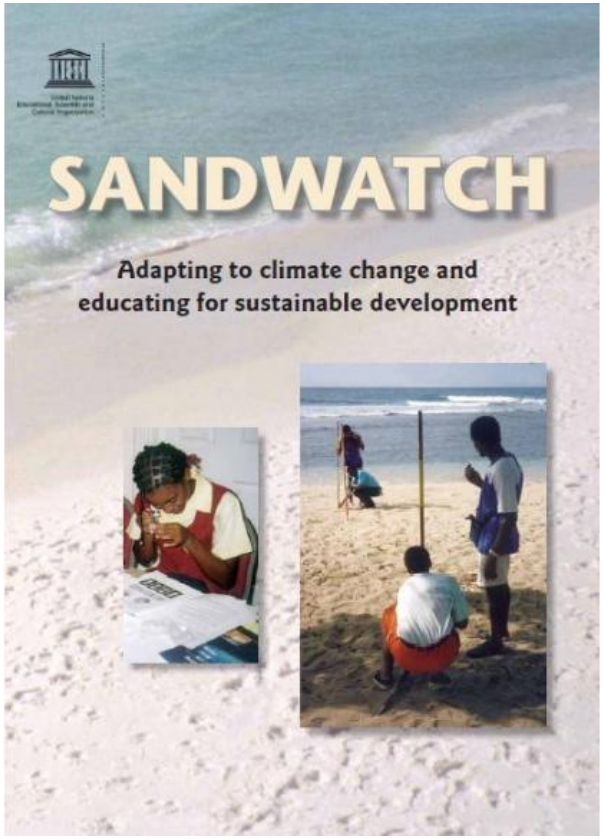


2. Science and Engineering Education

Human Capital for Development:

- Provide access to education to harness the talents of young people and ensure safe and peaceful societies
- Curiosity and scientific mind
- Investment in Science teachers and school infrastructure
- Innovative University curricula
- Culture of Science in Society

Can we speak of Science for All?



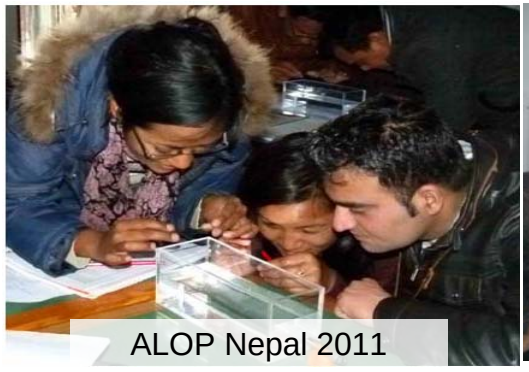
UNESCO's Capacity-Building in Physics as a Tool for Development

Active Learning in Optics and Photonics (ALOP)

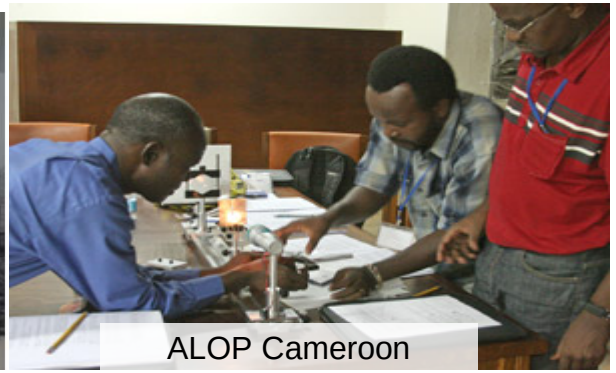
- Annual workshop organised by UNESCO's International Basic Sciences Program in developing countries
- 'Training of Trainers' in hands-on Physics experiments
- Makes use of simple, inexpensive materials that can be fabricated locally

End Result

Since its commencement in 2004, there has been a significant increase in the number of teachers with a better understanding of science, and an even larger number of students who are better equipped with practical science knowledge.


ALOP Nepal 2011


ALOP Tunisia 2012


ALOP Cameroon

Mathematics and Poverty Alleviation in Africa

Mathematical sciences can be harnessed as tools for the development of the world's most impoverished regions

*Mathematics of the Planet Earth 2013 is an on-going initiative, **under the patronage of UNESCO**, pioneered by the International Mathematical Union (IMU), to increase mathematics knowledge among public and decision-makers, and to mobilize available resources (human and other) on its application in addressing world problems.*

<u>UNESCO's actions</u> in the framework of the "Mathematics of Planet Earth 2013" focus on mathematics research and education in managing societal concerns:

•The management and **eradication of infectious diseases increasingly** relies on mathematical modelling and statistics.

•**Sustainable management and exploitation of natural resources** is possible through reliable forecasting and modelling

•Secure data transfer through the **internet and mobile telecommunications** are dependent on efficient models and mathematical algorithms

•Desperately-needed solutions in the **supply of energy** in impoverished regions of the world are possible through innovations in physics and mathematics.

Extension of Avicenna Virtual Campus 2013

The African Virtual Campus based on the Avicenna Model has been officially approved by the UNESCO Executive Board and General Conference (2007) as Flagship Project for the development for *Science and Technology for Africa*.

AFRICA

African Virtual Campus

IRAQ

Avicenna Virtual Campus in Iraq

Soon in

Central Asian Countries

Avicenna Virtual Campus II

28- 05-2013 UNESCO SC/PCB

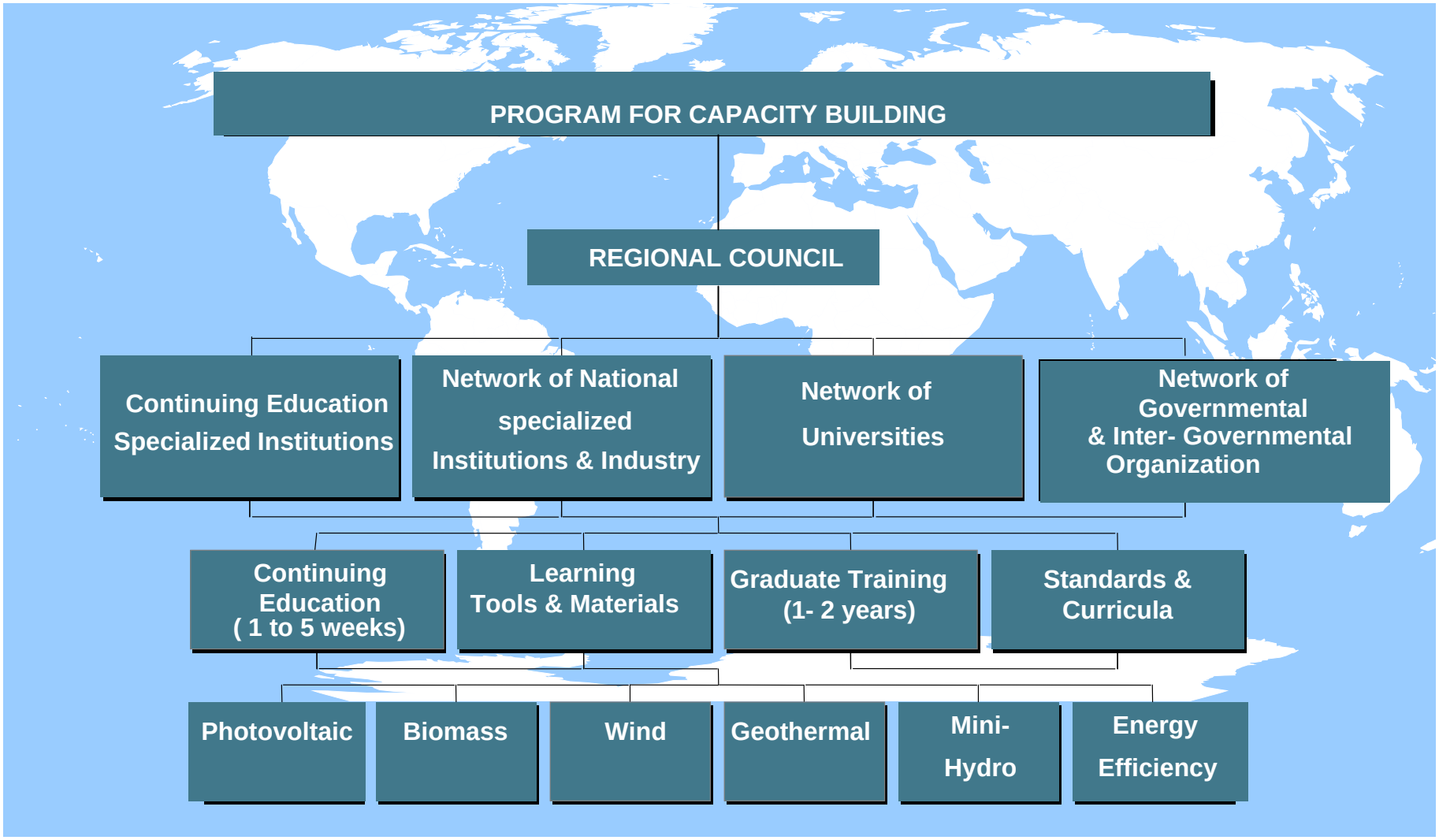
3. Affordable Green Technology

- Technology for the poor
- New technologies, creative industries and innovative financing should be provided as incentives to extend and strengthen the basis of scientific knowledge and creativity
- Sustainable alternatives to existing development challenges

Capacity to acquire and produce new knowledge and technology

A nursery worker inspects rows of cypress and Senegalese mahogany trees in Ismailiya Governorate, within a National Tree Planting and Development of Peri-Urban Forestry project being executed by the Egyptian Ministry of Agriculture. **A World of SCIENCE, Vol. 11, No. 2, April–June 2013**

GREET PROGRAMME STRUCTURE



UNESCO's Regional Annual Summer Schools

UNESCO summers schools are organised on an annual base in three regions:

- Africa
- South East Asia and
- Central Europe

The course covers the different aspects of the renewable energy

- Scientific aspects of the renewable energy conversion,
- Renewable energy technologies
- Applications and
- Economies

It also includes practical field work and technical visits.

It addresses the different concerned public such as

- Researchers,
- Engineers,
- Technicians,
- Policy makers and
- Government representatives

Biotechnology Contributing to Development

Biotechnology is recognized globally as a tool contributing to sustainable development

Biotechnology policy plays a crucial role in tackling the most pressing global problems : health, food security, water, climate change and energy

UNESCO's International Basic Sciences Programme (IBSP) has had a considerable history in developing and implementing activities in biotechnology in collaboration with specialized partners

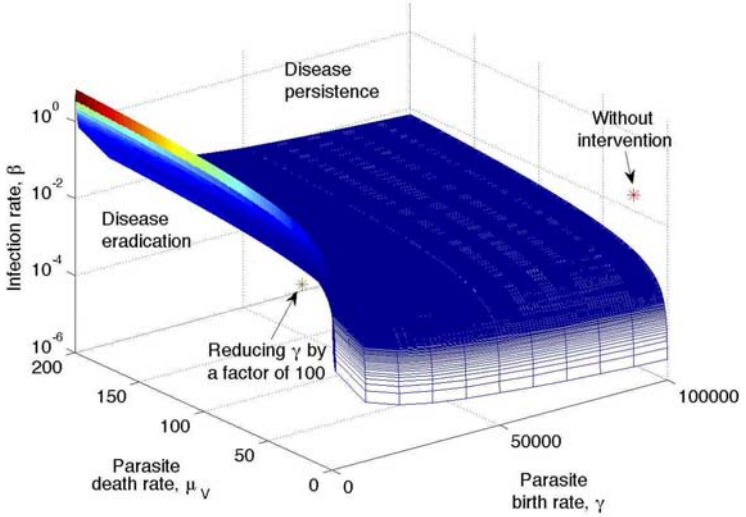
Biotechnology contributes to emerging areas, including genomics, bioinformatics, synthetic biology, and nanobiotechnology

- Capacity building in Genomic and Bioinformatics (potential to improve food and agriculture productivity, healthcare, increase income and reduce poverty)

Using Mathematics to Eradicate Disease:

the need to induce policy-makers to utilize available mathematical assets

Example: Dracunculiasis, or Guinea Worm Disease

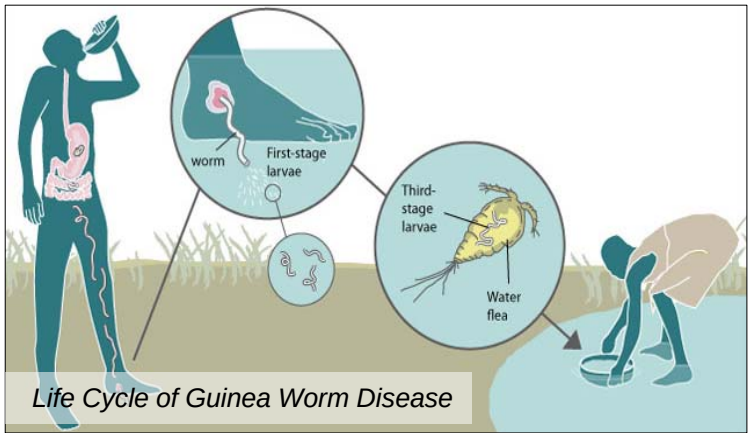


Mathematical model of infectious disease

- A neglected tropical disease caused by ingesting contaminated water.
- There is no cure or vaccine and the disease remains endemic in some of the poorest regions in Africa.
- Mathematical models have served a crucial role in understanding this disease and global permanent eradication is now in sight.
- Such models can be extended to the understanding of other diseases such as HIV/ AIDS.

All pictures provided by Carter Center

Guinea Worm



Life Cycle of Guinea Worm Disease

4. International Cooperation: across scales

- Local challenges, global solutions and vice-versa;
- Different perspectives and more capacity;
- Developmental focus
- Co-design and co-production

Networks of Excellence linking Research Centers across regions?

Future Earth: A new contracct between science and society

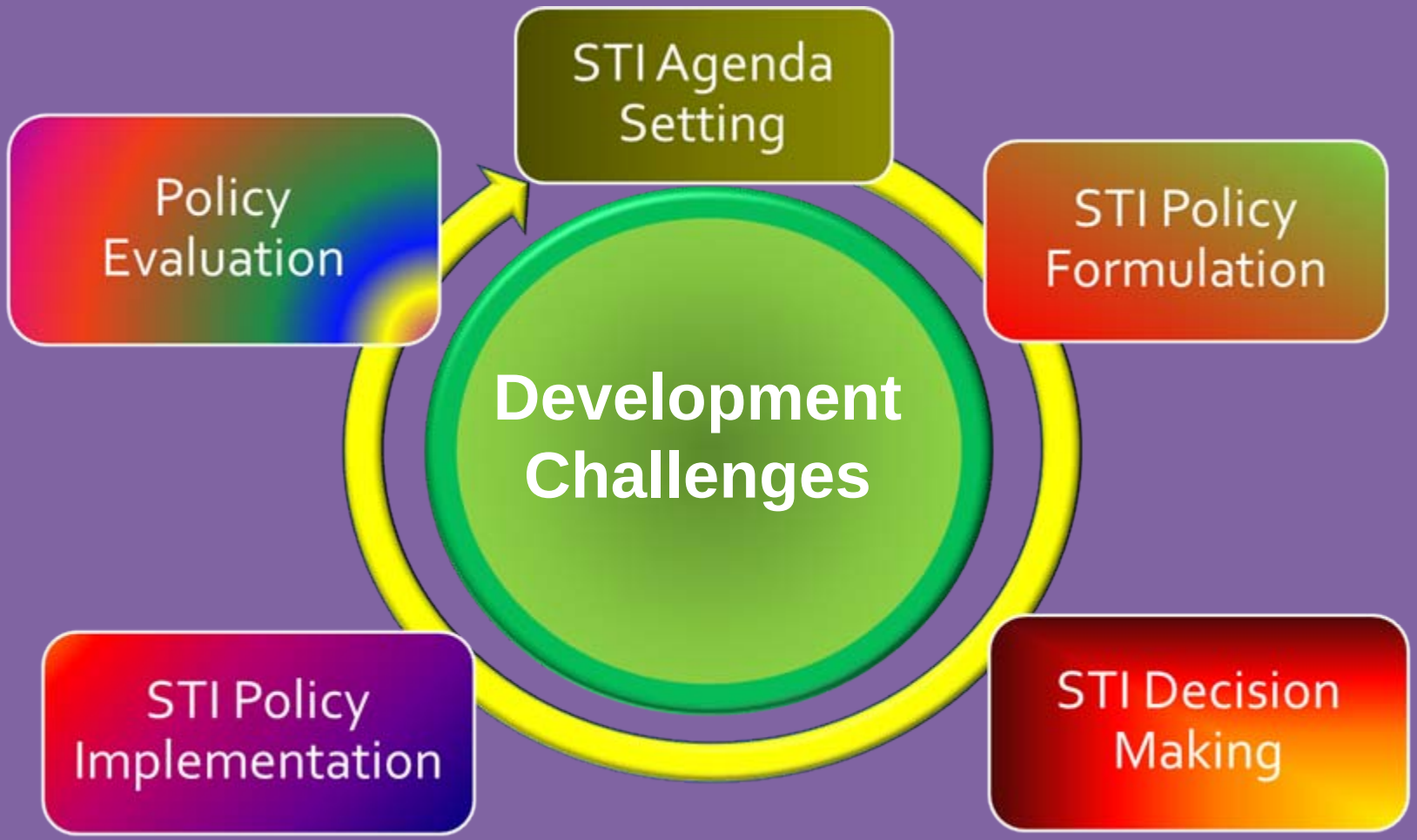
University Twinning and Networking- 766 UNESCO Chairs and 69 UNITWIN Networks involving over 850 institutions in 134 countries estabished in 1992 to advance research, training and programme development in Education, Science, Culture and Communication by building university networks and encouraging inter-university cooperation through the transfer of knowledge across borders. They also serve as “think tanks” and “bridge builders” between the academic world, civil society, local communities, research and policy-making.

Main Strategy

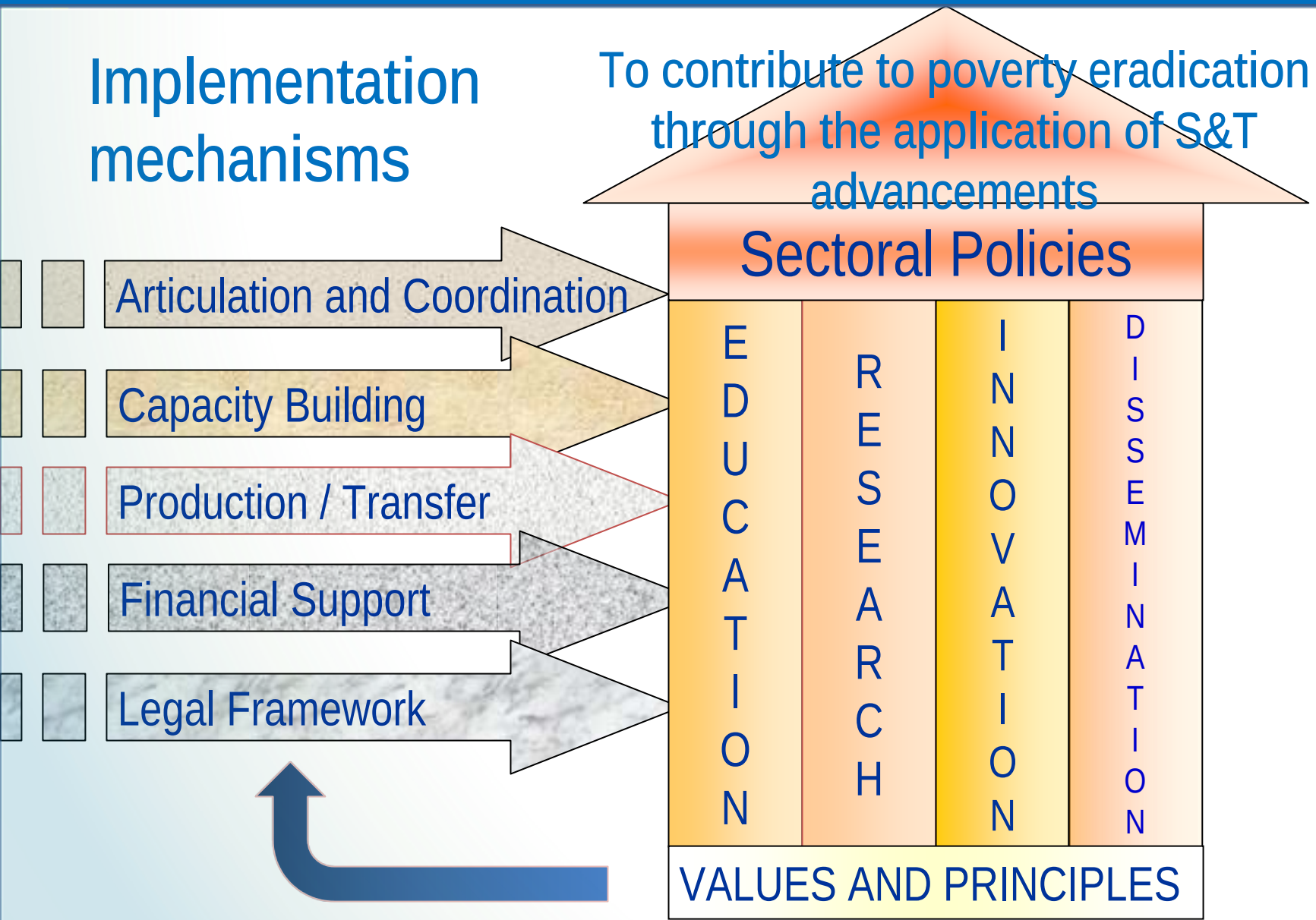
-Stimulate triangular North-South-South cooperation;

--Creation of regional or sub-regional poles of innovation and excellence;

It is all about sound STI policies



STI policies and their link to *SUSTAINABLE DEVELOPMENT:* transversal and structural?



Strategic and visionary Leadership

Final Remarks

- Whatever STI we invest in today must look beyond 2020 where agility is more important than strength
- Knowledge alone is not a definer of value but its ability to turn knowledge into intelligence and creativity. INNOVATION is key.
- Invest in STI in response to huge demand for food, water, health, bio- and nanotechnology propelled by indigenous knowledge has potential to create new jobs and reduce poverty
- Harness STI **to create and recreate human capital** which has the agility and innovative power to see beyond 2020 through networking, collaboration, cooperation and partnerships.

Thank you