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Policy Recommendations from the African Development Perspectives Yearbook and Policy Reforms in Africa

Highlights of Volume 20: Science, Technology and Innovation Policies for Inclusive Growth in Africa

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United Nations
Economic Commission for Africa



Universität Bremen*





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Overview



- ❑ **STI Policies: a necessary condition for sustainable development**
- ❑ **The Policy-Making Cycle**
 - Ineffectiveness of STI policies in developing countries: Why?
 - **Typical STI Policy Document in DCs;**
 - **Formulation of STI Agendas for successful structural transformation in Africa: How?**
 - **Plausible Policy Recommendations**
- ❑ **Highlights of the Contributions of Volume 20 of the Yearbook: STI Policies for inclusive development in Africa**
 - ~~A chronicle review of UNESCO engagement in the STI sphere in developing countries~~
 - **Case Studies from North Africa: (Algeria, Egypt, Mauritania, and Sudan);**



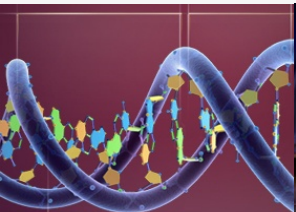


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STI Policies: a necessary condition for development

- Discoveries in life sciences and innovative technologies offer developing countries a golden opportunity to improve social welfare and productivity.
- By ensuring DCs possess sufficient absorptive capacity to build on the backlog of unexploited technologies and benefit from the associated lower risks, these countries can now leapfrog over the expensive investment in infrastructure.
- Value creation nowadays depends increasingly on a better use of knowledge, whatever its form and whatever its origin, whether the process technologies used are developed domestically or not.
- STI policies are basically enablers for the implementation of a well-designed STI agenda for development, and they are meant to remove all anticipated institutional, regulatory, technical and financial impediments, identify and close all related implementation gaps and create the necessary synergy utilizing an integrated approach in achieving the multi-objective developmental plan any govt. is trying to implement;





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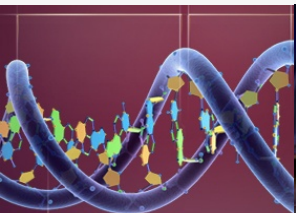
STI Policies: a necessary condition for development

Motives for Forging STI Policies

- Harness STI for national development : economic; socio - political

SCIENCE for TECHNOLOGY for DEVELOPMENT

- Must be an **integral part** of the National Development Strategy Agenda;
- **Should provide the basis for informed decision** in managing an important instrument of **socio-economic transformation** towards **Green Economies**



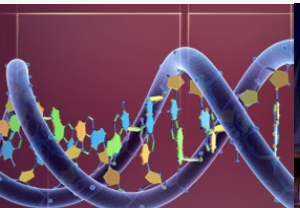


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STI Policies: a necessary condition for development

- Policy for Science: important in promoting “progress of science” and associated scientific activities as such, and hence strengthen the infrastructure of R&D and S&T;
- Science in Policy: focuses on measures that facilitate the process of harnessing the results of science for development and utilizing scientific and technological knowledge towards technological innovation;
- Innovation policy: identifies mechanisms to implement measures aimed at promoting technological innovation and produces economic activities that usually lead to opening new markets with new and innovative products.
- **Not just a blue print, it is a dynamic document, and there is no one-size fit all;**
- **Integrated Approach (multi-objective/sectoral) - Participatory – Practical (modular) - Time bound.**





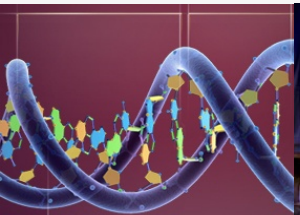
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STI Policies: a necessary condition for development

STI Policy Evolution across time:

- 1. Science Policy identifying the need to do good science;***
- 2. Science & Technology (S&T) policy linking knowledge (science) to its application (technology);***
- 3. Science for technology for development policy focusing on harnessing S&T for national development. This gave rise to S&T for development and development of science (measures to strengthen S&T capacity;***
- 4. Science, technology and innovation (Good science is not good enough) policy focusing on modalities to translate science into innovative technologies in the marketplace, i.e. STI as part of the economic transformation process/programme and part of the economic system;***
- 5. Therefore, Science for Policy and Policy for Science (strengthened to deliver the goods) notions.***





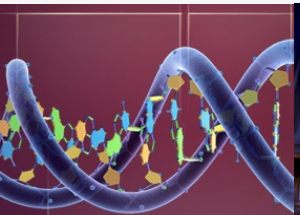
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The Policy-Making Cycle

The STI Policy is an integral part of a national socio-economic transformation programme (NSTP) with six basic components:

- **STI for Policy:** most important & must be customized to the needs of **a country's STI agenda** in support of its NSTP & its anticipated future needs for continued growth and competitiveness;
- **Policy for STI:** strengthen the nation's STI capacity and capability in terms of institutions, mandates, personnel, management, funding and linkages. This needs measures to strengthen education and research for capacity building in the sciences relevant to the needs of policy and for the public good;
- **STI and Private Sector:** a national economic transformation programme cannot be successful without the full commitment and participation of the private sector;



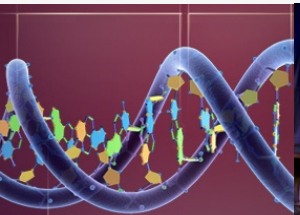


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The Policy-Making Cycle

- **STI and the Community:** calls for an education system that includes “science for all”; promotes creativity, innovativeness & entrepreneurship towards a supportive & science literate community that appreciates the scientific method to understand issues and solve problems in general, not just in science;
- **International Collaboration in STI:** An effective framework and mechanism of partnering is required, especially with increasing need for science diplomacy, since international relation and cross border issues are becoming more complex; and
- **STI and Governance:** with two components, Governance for STI (parliament committee on STI, Inter-ministry agency for periodic review of legitimacy, authority and mandates of existing institutions and agencies & mechanism for Int’l collaboration) and STI for Governance (enhanced Tech. appl.)





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The Policy-Making Cycle

The Policy-Making Cycle is indeed dynamic and usually involves 4 main stages:

- **Developmental Agenda-setting:** refers to the process by which STI related problems and the linkages between STI and both society and the economy come to the government's attention;
- **Policy formulation:** refers to the process by which STI policy options are formulated by the government and all associated stakeholders;
- **Policy Implementation:** refers to the process by which governments and its partners put STI policies into effect, and;
- **Policy evaluation:** refers to the process by which the results of STI policies are monitored by both the State and societal actors. The result may be a re-conceptualization of policy problems and solutions, in which the effectiveness, efficiency and continuing appropriateness of policies and policy instruments are assessed and the results fed back into another round of agenda-setting.



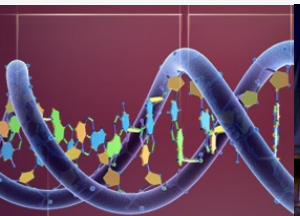


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Ineffectiveness of STI policies in DCs: Why?

- Lack of in-depth analysis of status quo versus required development strides to develop the national developmental strategy/agenda (NDS/NDA); **First item previous slide**
- **Creation of the NDS/NDA: politically controlled process versus high-level political coordination process:**
 - Lack of coordination between different govt. sectors and institutions to ensure coherence between the NDS/NDA and the rest of the policies of the different economic sectors;
 - Lack of consultations with various stakeholder groups especially scientific experts;
 - Lack of coordination between Govt. and Private Sector Stakeholders;
- Development path envisioned: effectiveness of particular set of solutions adopted;
- **Sectoral Priorities Setting and practicality of their achievement;** and;
- **Transformation Mechanisms: who (organizational), what, how and when?**





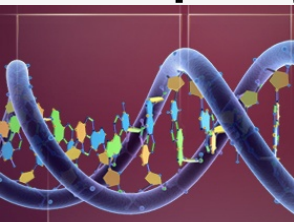
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Typical STI Policy Document in DCs

The typical STI policy document will contain:

- No policy mission nor policy goals (building Total National Capacity);
- No normative planning strategies (there are no explicit STI goals to be achieved in any specific time in the future) i.e. no SMART Goals;
- No policy-interventions to address the STI supply side (there is neither a funding plan nor a human resources plan for R&D and/or STI);
- No policy interventions to create incentives for R&D within the private sector; and
- No policy for international and regional cooperation.





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Achieving Total National Capacity (TNC) in an STI Agenda (University – Research – Industry/PS – Government)

- Doing good Science and Research is **not** good enough, and must translate into innovative technologies at the **marketplace**
- TNC in STI therefore requires an STI Policy encompassing
 - ✓ Capacity to **acquire technology** (technology transfer) and to **develop it** (R&D)
 - ✓ Capacity to **apply, utilize and localize** technology (technology diffusion)
 - ✓ Management of the interface between the two (in both Government & Industry)
- **Small and Medium Business Administration (SMBA) / Innovation Funding Agency (IFA)** mainly for innovation management and investment

The above are the **Core Elements** of STI Policy for an **Innovation Economy**





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Total National Capacity (TNC) in STI: Critical Mass 1200 per Million

Human Capital Development comprises:

- **Intellectual Capital** – Nurtured through formal and informal education – logical, strategic thought processes.
- **Skills Capital** – Codified and tacit knowledge; technical skills from training or thru' experience.
- **Social Capital** – Social skills, communication, cooperativeness, networking, smart partnership principles enhances social capital.
- **Entrepreneurial Capital** – Creativity, innovativeness and entrepreneurship.
- **Psychological Capital** – Commitment, passion, dedication, confidence, belief in self (Malaysia feature).
- **Spiritual Capital** –
 - Ethical values and principles.
 - Right and wrong.
 - Smart partnership ethos.

BY DESIGN AND/OR BY DIFFUSION





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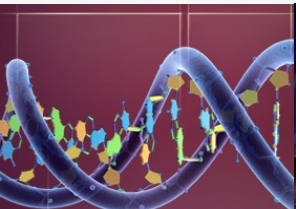
China's Secret to Economic Success

Diversified MANUFACTURING, THE BACKBONE OF DEVELOPED ECONOMIES

The production of modern manufactured goods and related services is the essence of the Knowledge-driven or the Innovation Economy and is dependent on the **Total National Capacity (TNC)** in Science, Technology and Innovation (STI)

Another Example: EUROPE

- Manufacturing employs more than 35 million people in 2+ million enterprises in 20+ industrial sectors; another 60+ million people in related service areas for manufacturing.
- Manufacturing : about 55% of European GDP.





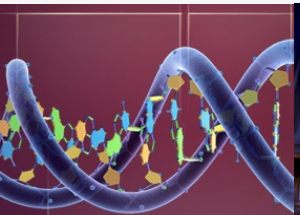
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Total National Capacity (TNC) in STI: Critical Mass 1200 per Million

- China alone has 19.1% of the global research labour force in 2013, almost equivalent to **China's share of the global population: 19.3%**.
- As of 2012, **China** has 58 492 doctoral students living abroad, **India** (30 291), offering a strong impetus for future int'l scientific co-operation;
- As of 2012, 29% of international PhD students were completing a degree in a field of natural sciences, with 24% and 16% shares respectively for **engineering and manufacturing**;
- **China's** share of world GERD rose from 10.2% in 2007 to 19.6% in 2013. Some 84.6% of research spending in China consists of experimental development (2013), compared to 64.3% in the USA (2012).
- The **acquisition of machinery and software is more widespread as a method of innovation** (64% and 85% of manufacturing firms) than in-house R&D in Brazil, Russia, India, **China** and South Africa (BRICS countries).





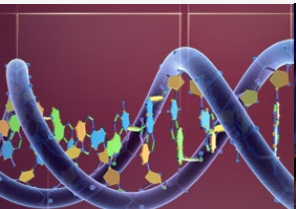
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Formulation of Successful STI Agendas

The first Phase of the STI Engagement Process will be optimally done through:

- Sensitization, commitment and preliminary assessment (strong science community engagement); **(role of science academies!)**
- Review priorities of needs in government and industry;
- Status review of selected priority areas (SWOT analysis);
- Development of the NDS/NDA;
- Development of an Integrated Multi-Sectoral National Developmental Action Plan (including required finance), utilizing some scientific approach (e.g. Combinatorial Optimization & DSF); again **(strong science community involvement)**
- Drafting of an STI Policy to support the implementation of the Multi-Sectoral National Developmental Action Plan



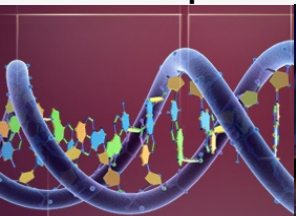


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STI Policy Recommendations

- **STI Agenda based on the Total National Capacity (TNC) Approach:**
 - Focuses on building the STI national capacities to the critical mass levels to support development in **all national priority areas**;
 - Success stories mainly in developed countries and in Malaysia!
- **STI Agenda based on the Mega Projects Direct Implementation (MPDI) Approach:**
 - Focuses on building the STI national capacities to implement a number of specific national Mega project(s) (few economic sectors tackled => a good match for economies with limited resources);
 - Sending man-to-the moon project; auto industry in many countries; Jet aeroplanes building in Brazil; diversified manufacturing in China;





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STI Policy Recommendations

Sustainable Development Goals Framework

The 2030 Agenda for Sustainable Development together with the Addis Ababa Action Agenda successfully defines “What” needs to be done over the next fifteen years. (**Think the Nexus Approach**)

SDG 1: Poverty Eradication

SDG 2: Hunger Eradication (Food Security)

SDG 4: Education

SDG 6: Water Security

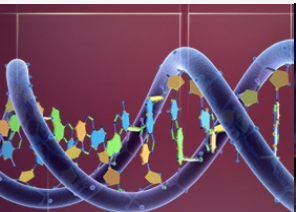
SDG 7: Energy Security

SDG 9: Industry & Infrastructure build-up (GREEN)

SDG 12: Sustainable Consumption & Production (GREEN SCP)

SDG 13: Climate Action & Environmental Security

SDG 17: Partnership Build-up and Projects Implementation





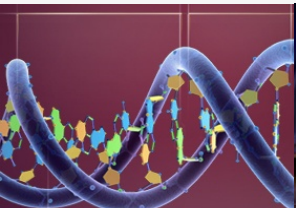
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STI Policy Recommendations

Four Critical Groups of Technologies (MPDI Approach):

- 1. Technologies for meeting basic needs and services such as food, water, shelter and energy.***
- 2. Technologies for improving quality of life, e.g. education, healthcare, environmental sustainability, etc.;***
- 3. Technologies for wealth creation to support economic growth and competitiveness;***
- 4. Technologies for creating and maintaining good governance in both Public & Private Sector.***





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STI Policy Recommendations

Four Critical Groups of Technologies:

(how many feasible projects using the MPDI Approach)

- 1. The needs vary from one nation to another regarding these 4 sets of technologies according to its development stage (national priorities);**
- 2. The national STI Agenda, which STI policy must identify and deliver, is hence the optimal acquisition & management of the sum of total sciences, technologies & innovations required to achieve socio-economic transformation;**
- 3. Because of above, STI policy should embrace the whole system towards knowledge-based or innovation economy (*integrated approach*)**





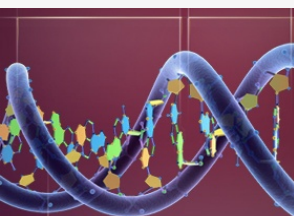
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Highlights of Contribution of Volume 20 of the African Development Perspectives Yearbook

● UNESCO Perspectives (North Africa - regional model):

- Failure to catalyze knowledge production effectively or add value to products & services;
- Insufficient government commitments for STI and research, including financing, technology and capacity build up (brain drain);
- A disconnect between policymakers, scientists and society in generating, sharing and utilizing scientific knowledge;
- Marginalization of the science communities;
- Poorly designed national STI policies and/or lack of adequate organizational capacities to implement policies, and
- Ineffective government to ease doing business





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Highlights of Contribution of Volume 20 of the African Development Perspectives Yearbook

● UNESCO Perspectives (North Africa - regional model):

- Little attention is given to the fact that there exists a strong complimentary relationship between “STI for Policy” and “Policy of STI”:
- STI for Policy indicates that without STI capabilities, it will not be possible to establish a prosperous society, with an economy that is fully competitive, dynamic, robust and resilient;
- Policy for STI is the means of building STI capabilities through establishing a scientific and progressive society, a society that is innovative and forward looking, one that is not only a consumer of technology but also a contributor to the scientific and technological civilization of the future;

(Omar Abdul Rahman)





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Highlights of Contribution of Volume 20 of the African Development Perspectives Yearbook

UNESCO perspectives (Case Studies from North Africa):

- **Algeria: The effectiveness of the university-industry partnership program that was launched in Algeria in 2004-2005 and re-assessed in 2014-2015.**
 - **This brought forward the employability of graduates as the main indicator in higher education in terms of its quality, its relevance and its socio-economic purpose in Algeria;**
 - **Encouraging students to move from SHS towards technological disciplines and their increased access to technological institutes and technical training center of excellence for business;**



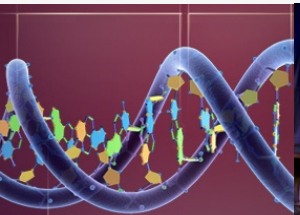


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- **Egypt: has all the necessary pillars in terms of governance, an STI observatory, a good number of public universities and research institutes and a national funding agency, in order to achieve the sought level of innovation and technological wealth!**
 - **There is more to it than putting in place material institutions. Advocating for a range of values, mindsets and introducing strategic processes is crucial and perhaps in Egypt in particular;**
 - **Absence of partnerships with Industry and closing the innovation cycle to translate R&D results into wealth!**





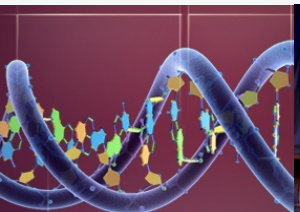
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● Mauritania:

- Need to develop its technical workforce if it were to exploit its riches of natural resources which range from grand animal resources including fish, cattle, camel and sheep together with its large deposits of metals and reserves of oil and natural gas;
- Only about 14% of students sitting for the entry baccalaureate exam to college do pass!





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● Sudan;

- Frequent droughts coupled with government neglect of the agricultural sector for decades while focusing on oil production have led the sector to contribute directly to an unprecedented level of poverty and food insecurity in Sudan;
- Very few scientific research results have been put into practice to improve the agricultural output/yield of the sector;
- With a “knowledge to economy” index (KEI) of about 1.78 on a scale of 10 in Sudan (2010), agric research cannot be solely responsible for its lack of contribution to the productivity increase of the agricultural sector;
- A number of other impediments are stifling innovation and the entrepreneurial agricultural culture in Sudan, such as lack of adequate innovation policies, lack of adequate “knowledge to economy” mechanisms and underfunding.





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Highlights of Contribution of Volume 20 of the African Development Perspectives Yearbook

Stay Tuned for a number of innovative ideas for STI Policy Reform in Africa and other developing countries

THANK YOU





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☺THANK YOU☺

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