Nanotechnology Governance: Essential Building Blocks

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Can Africa fund/participate (in) nanosciences and nanotechnology applications (race) ... as well as address associated risks adequately?? Or what is regarded as Africa in nano is a handful of countries....
HOW BIG IS AFRICA?

Approximate Area in Square Miles

- Africa: 11,668,545 (30,231,532 sq. km)
- China: 3,681,089
- Europe: 3,979,405
- USA: 3,678,235
- Total: 11,338,729 (29,367,008 sq. km)

(Europe includes Alaska)
[1] Governance: What is it?

- Governance: entails how actors through processes, conventions, and institutions determines:
  - Identification of most critical needs/problems
  - How power is exercised to manage resources and interests
  - How important decisions are made and conflicts resolved
  - How interactions among and between key actors are organized and structured
  - How resources, skills and capabilities are developed and mobilized to reach desired outcomes, and
  - How diverse set of stakeholders are accorded participation in these processes
[2] Governance: why is it necessary?

• **Why is it necessary?**
  – Aids to optimize use of
    (i) Resources
    (ii) Skills, and
    (iii) capabilities to achieve higher specific goals, purposes, and/or ends
  – Offers permeable and flexible framework (boundaries) that facilitates communication and support achievement of higher goals
Stick...

Leadership & Management

Carrots...

The Fable of the Dangling Carrot

Law
Governance deficits posed by nanotechnology: categories

• **Environmental, health and safety deficits (EHS)** – Are the risks of nanotech novel? Complex, uncertainties and ambiguous nature of data confounds the challenge

• **Societal infrastructure deficits**: single event approach for products – no life cycle or secondary effects evaluation – fragmented jurisdictions, complex legislative regulations, lack of harmonized national and international systems

=> Need for anticipatory and corrective frameworks
• **Challenges:**

(i) Diverse set of educational and knowledge dissemination mechanisms within countries and across countries (e.g. for products, waste management, etc.).

(ii) Overlaps from local to global levels of governance (3 SA)

(iii) Lack of budgets for nanotech risks (wait and see approach)

(iv) Use of nanotech for armoury (military)

(v) Questions on appropriateness of current nanotech applications appropriate to developing countries needs (e.g. water, food, energy, health)

(vi) Skewed power and control on promotion, implementation and consumers (affected countries by nanotech)
• **Suggestions/recommendations:**

(i) Adaptive management and collaborative governance

(ii) Strengthen coordination among various players (some regulate product (e.g. USA) and others processes (e.g. Europe)

(iii) Close communication gaps (scientists, regulators, decision/policy makers, media, industry etc.)

(iv) Set budgets to address nanotech risks, skills development to estimate real risks of nanotech

(v) Set appropriate nanotech applications relevant to the developing countries needs

(vi) Set infrastructure that aids all countries to harmonize measurements (regulations), etc.

(vii) Development and implementation of national, regional and global governance structures, etc. (under ISO, OECD, etc.)
Social and political deficits:
(i) Policy coordination challenged by different mandates of departments w.r.t. nanotech
(ii) Disproportional investments (needs vs. wants)
(iii) Differences in regulations leads to none standardized product
(iv) Likely to raise equity issues for certain applications e.g. in medicine (specific drugs for individuals),
(v) Political and security risks which has implications to global/regional economic and military balance (with possibility for terrorism uses)

=> Proactive approach to technological changes…
• **Risk communication deficits: many gaps in:**

(i) Communicating interdisciplinary research findings within different learnt communities (e.g. media, natural, technical, medical, ecological to social, humanities, etc.)

(ii) Communicating state of art (scientists and regulars) – speculations likely to cause disastrous outcomes

(iii) Communication between risk management agencies to the public w.r.t. regulation and control (likely to cause mistrusts) – what is being done and to be done needs to be clearly communicated (ineffective and insufficient… in most times)

(iv) Lagging of risk communication and technological advancement – *a million dollar conundrum* …
1. Policy Framework: Defined Outcomes

- National Nanotechnology Strategy (DST)
- Nano Ethics Committee (DST)
- Nano HSE South Africa Research Platform (DST)
- Sector specific: water (WRC)
2a. Research Collaborations: South Africa

- Tshwane University of Technology (2 MScs)
- University of Johannesburg (1 MSc, 3 PhDs)
- University of Stellenbosch (1 PhD)
- MINTEK (Directed Research)
- CSIR (2 PhDs, 2 Postdocs, directed research)
2b. Potential Collaborations: Africa?

• Are there collaborations within Africa?

• If not, can they be supported/established?

• Challenges/opportunities…

• What can this meeting aid to foster collaborations in Africa?
2c. Research collaborations: Global

Clemson University

Curtin University
Partnerships on Nanoeotoxicology Research

Funding Partners

Scientific Partners
Infrastructure: essential for testing and limits setting
Stakeholders

Industry, Academia, Government, NGOs, Professional associations, Researchers, etc.
The NEIRG holds its first Nano HSE HCD Workshop, 13 August 2013.

First Human Capital Development Workshop for Nanotechnologies and Nanosciences Risk Assessment

August 13, 2013
Knowledge Commons, Building 50
CSIR Campus, Pretoria

Invited speakers:
Joseph Molapisi (DST), Pete Ashton (CSIR), Lucky Sikwikhulu (MINTEK), Harrison Piennaar (CSIR), Valie Naidoo (WRC)

Workshop organizing committee:
Ndeke Masee (CSIR), Melani Thwala (CSIR) and Chantelle Macrow (CSIR)
Dedicated research funding can offer **sustainable** & **fast progress** via:

- Highly skilled staff (Do South Africa/Africa have them currently?);
- Brilliant students (Post-docs, PhDs, Masters, Honors, etc.);
- Knowledge transfer (Government, industry, NGOs, Regulators, etc.)
- Infrastructures (laboratories, specialized software, etc.)
- Instruments (microscopy, …);
- Multi-, inter-, and trans-disciplinary approach: lone rangers will have no impact in such high complex arena;
- Specialized curricula at Universities (none in many countries with economics in transition yet…);
- Open and honest partnership with multi-stakeholders… do rest of society understand our mission?
Stakeholders interactions/collaborations

- Universities (HEIs)
- Councils
- Industry
- State agencies
- Gov. departments
- Civil societies
- Laboratories
- Instruments
- Models

Risk Management

Capabilities

Institutional/governance

Expertise

Detection/identification
Stakeholder Participation

- Academics
- Industry
- Researchers
- Government

- NGOs
- Rights groups
- Social/ethical researchers

Highly heterogeneous stakeholder profile
Expectations/definitive actions

• **Well defined research questions:** What are the most relevant/immediate priority research themes/policy questions of greatest impact to Africa wrt. nanosafety?

• **Network:** Collaborations (national, regional, global), Sharing of infrastructure – an inventory of equipment available, Skills matrixes in organizations, etc…;

• **Information sharing:** Status quo on nanotechnology risk assessment research in developing countries, for example, current global viewpoint, raising of awareness among diverse stakeholders, risk communication, etc.;
Expectations/definitive actions…continued

• **Broadly supported/agreed approach:** Studentships, funding mechanisms (c, equipment sharing, evaluation/quality control/quality assurance of activities/research/policy formulations, and

• **Roadmap blueprint:** An outline on the agreed implementation mechanisms and action plan for nanosafety - taking into account Africa’s opportunities and challenges *(TALK IS CHEAP ... THERE IS A LARGE BOTTOM TO FILL...)*
Inputs, outputs, and outcomes (defined timeline)

**INPUTS**
- Researchers
- Administrators/stakeholders
- Functional labs
- Collaborators and strategic partnerships (stakeholders)
- Students
- Funding
- Political will

**ACTIVITIES**
- Training/education
- Modeling
- Laboratory experiments
- Attending conferences
- Providing risk data to industry
- Developing manuals/guidelines
- Provision of expertise to public and private sectors
- Public awareness

**OUTPUTS**
- Journal articles
- Presentations
- MScs degrees
- PhDs degrees
- Post docs
- Books/book chapters
- Policy/guidelines documents

**OUTCOMES**
- Knowledge transfer and skilled capacity
- Human capital transformation
- Data application in shaping risk framework of ENMs in SA
- Establishment of ENMs assessment in SA
- Contributes to CSIR growth and impact strategy

**IMPACT**
- Adoption of findings in guidelines/policies nationally/internationally
- Design for safe nanotech products and applications
- Highly skilled expertise and standardization of products and nanowaste
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