

Nanotechnologies – new technological hype with uncertain consequences for society?

How choices of technologies impact on the development of society

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IFCS

Intergovernmental Forum on Chemical Safety

Global Partnerships for Chemical Safety

Beginning of 20st century

Beginning of 21st century



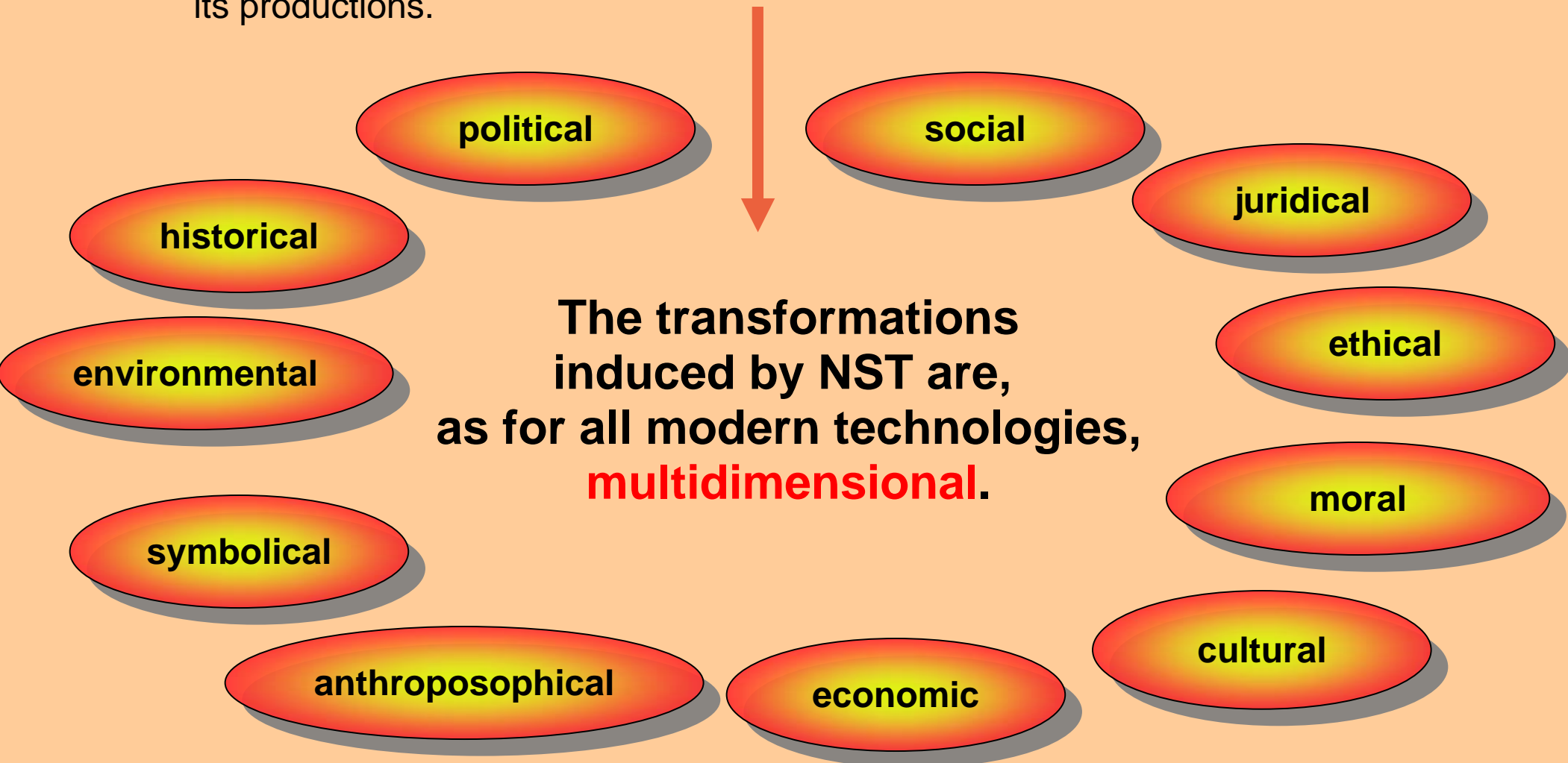
« Science created Tho-Radia to embellish women. It's up to them to benefit from it – or to stay ugly. »

→ 22nd century ?

Technology does not have a pre-ordained trajectory, we shape it through government, corporate and military choices, research funding, governance decisions, regulation, etc.

Technoscientific knowledge **is not neutral** nor are the conditions of its productions.

Technoscientific knowledge is a **transmitter of visions** of how to **shape future society**.



TO REMEMBER 1

MONEY FOR NANOSCIENCES AND NANOTECHNOLOGIES

➤ The world public budget spent on NST raised up to **\$3.5 billion in 2003**, with a yearly growth rate of 40% and with a world turnover estimated to **1000 billion dollar in 2015** (EC, 2006).

➤ The 2008 budget provides nearly **\$1.5 billion** for the National Nanotechnology Initiative (NNI, USA), **more than triple** the estimated \$464 million spent in 2001.

➤ The European Union puts **3.5 billion €** into nanotechnology research between 2007 and 2013 (FP7 R&D) on top of private sector investment and national research budgets.

➤ There exists an important **imbalance between budgets** for **commercial and military applications** of nanotechnology and those spent for research into their **potential impacts** on human health and the environment (**estimated to 3 to 5%**), and quite no investments are allocated on potential impacts on societies.

TO REMEMBER 2


SOME INFORMATION FROM RECENT REPORTS CONCERNING THE STATE OF POPULATIONS AND OF OUR PLANET

Millennium Ecosystem Assessment Reports, UN, 2005 (more than 1300 experts worldwide):

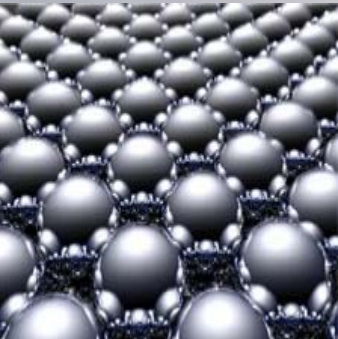
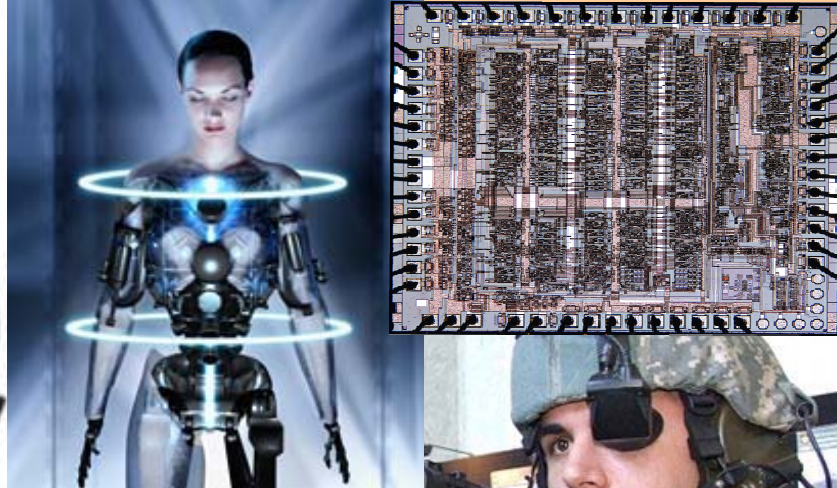
- Due to human activity the ability of the **planet's ecosystem** to sustain future generations **can no longer be taken for granted.**
- **Two thirds** of the services provided by nature to humankind are in **decline worldwide.**
- **2 billion people** suffer from **insufficient water supply** and more than **800 million people** suffer of **malnutrition or starvation**
- The loss of services derived from ecosystems is a **significant barrier** to the achievement of the Millenium Development Goals to **reduce poverty, hunger, and disease.**
- Human activity has accelerated the rhythm of **extinction of species** that is now **100 times higher** than the natural rhythm.

IAASTD Report, approved by numerous governments in April 2008 (400 experts worldwide):

- Agricultural productivity: we have been less attentive to some of the **unintended social and environmental consequences** of our achievements.
- Assessment of modern biotechnology is lagging behind development; information can be anecdotal and contradictory, and uncertainty on benefits and harms is unavoidable.
There is a wide range of perspectives on the environmental, human health and economic risks and benefits of modern biotechnology; **many of these risks are as yet unknown.**
- **Traditional and local knowledge** ... is needed if sustainability and development goals are to be reached.



***WHAT DO
NANOSCIENCES AND
NANOTECHNOLOGIES
PROPOSE ?***



NANOINDUSTRIAL APPLICATIONS TODAY

Military: Future Warrior: equipments, uniforms, nanomuscles;
Human performance enhancement

Control technologies: Surveillance nano-sensors, highly miniaturized cameras; human implanted microchips, RFID

Cosmetics: sunscreens, lip sticks, hair products, anti-aging products

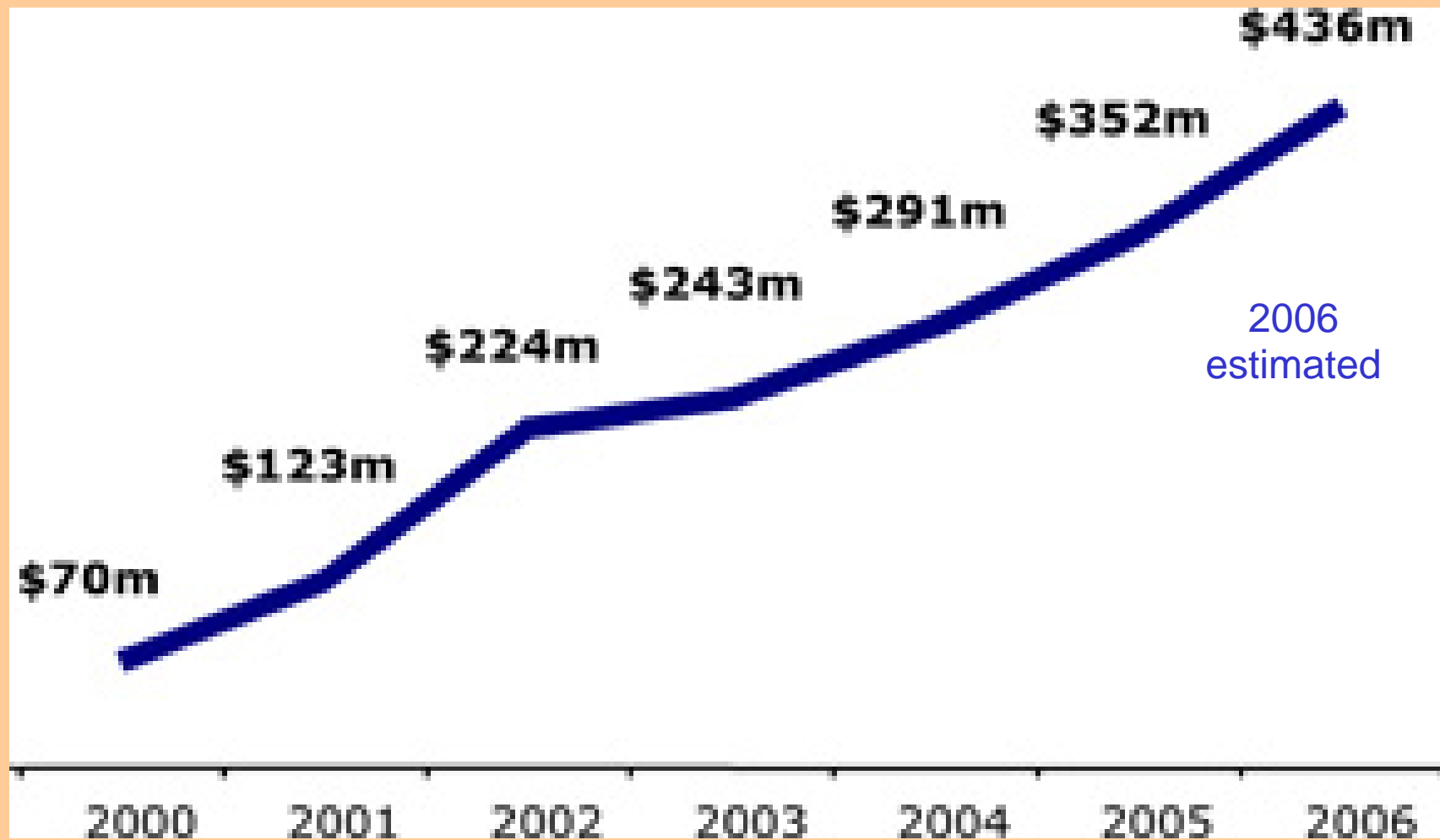
Sporting goods: tennis balls, golf balls, tennis rackets

Car industry: self cleaning windscreens and paints, rear-view mirrors

Textiles: self cleaning, antibacterial, bullet proof vests

Food: processing, storage, functional material

Annual US Department of Defense investment in nanotechnology



(Source data: DoD "Defense Nanotechnology Research and Development Programs", May 8, 2006) (Nanowerk)

About half of the DoD's nanotech investment goes to **DARPA** (Defense Advanced Research Projects Agency), with the rest roughly evenly **split between Army, Navy and Air Force**.

LEGAL and SOCIAL IMPLICATIONS of NST

New applications from NST will entail new health and environmental risks, which will pose costly regulatory challenges and which will have social implications.

- **for human health:** exposure of people along the production and consumption chain (researchers, workers, consumers), accumulation of nanoparticles in human tissues (inflammation processes, interaction with DNA), sanitary safety et precaution
- **for the environment and the planet:** longterm and irreversible pollution of air, water and soils (release from matrices) environmental safety, life cycle assessment (waste, treatment), remediation of environmental damage, precaution
- **for societies:** military and war (e.g. myth of invincible soldier), gap between rich and poor, relation between the living and the unenlivened, public information, labelling of products, traceability, liability, civil liberties, privacy violation, artificial construction of life (synthetic biology), BANG, transhumanism, neglect of alternative technologies

DIFFERENT TYPES of RISKS of NST as described in recent reports

Royal Academy of Science, UK, 2004

*“We are keen that the release of nano-particles and nanotubes to the **environment** is avoided as far as possible.*

*Specifically we recommend as a **precautionary measure** that factories and research laboratories treat manufacture nanoparticles and nanotubes as if they were hazardous waste streams and that the use of free nanoparticles in environmental applications such as remediation of groundwater be prohibited.”*

NATO study group, 2005

*“the potential for nanotech-driven innovations in chemical and biological weapons are particularly disquieting as they can considerably enhance the delivery mechanisms of agents or toxic substances. The ability of nanoparticles to penetrate the human body and its cells **could make biological and chemical warfare much more feasible, easier to manage and to direct against specific groups or individuals.**”*

(NATO, committee report, 179 STCMT 05 E, 2005)

Converging Technologies (CTs), report to the EC, 2004

One can expect that for every problem, someone may propose a more or less creative, viable or desirable technological fix. However, complacency induced by the fix-all potential of technology could be dangerous in the extreme. ...

*CTs may have a **socially destabilizing effect** ..., as CTs **exacerbate the divide between the rich and the poor**, between technologically advanced and traditional cultures.*

Code of Conduct for responsible Nano research, EC, 2008

- sustainability: N&N research activities should be safe, ethical and contribute to sustainable development. They should not harm or threaten people, animals, plants or the environment, at present or in the future;*
- precaution: N&N research activities should be conducted in accordance with the precautionary principle, anticipating potential environmental, health and safety impacts of N&N outcomes and taking due precautions, proportional to the level of protection, while encouraging progress for the benefit of society and the environment;*
- inclusiveness: governance of N&N research activities should be guided by the principles of openness to all stakeholders, transparency and respect for the legitimate right of access to information. It should allow participation in the decision-making processes of all stakeholders involved in or concerned by N&N research activities;*

*... And yet there have been few systematic attempts to explore what it would take for **systems of science to better meet human needs.***

Technical solutions:

high-tech

medium or low-tech, no-tech

Scale:

Global

regional, local

Knowledge:

Technoscientific

**Professional, traditional,
local, empirical, indigenious**

**Appropriation
scheme:**

**Intellectual property
rights, private**

public goods, open source

**Social & env.
policies:**

long lasting injustices

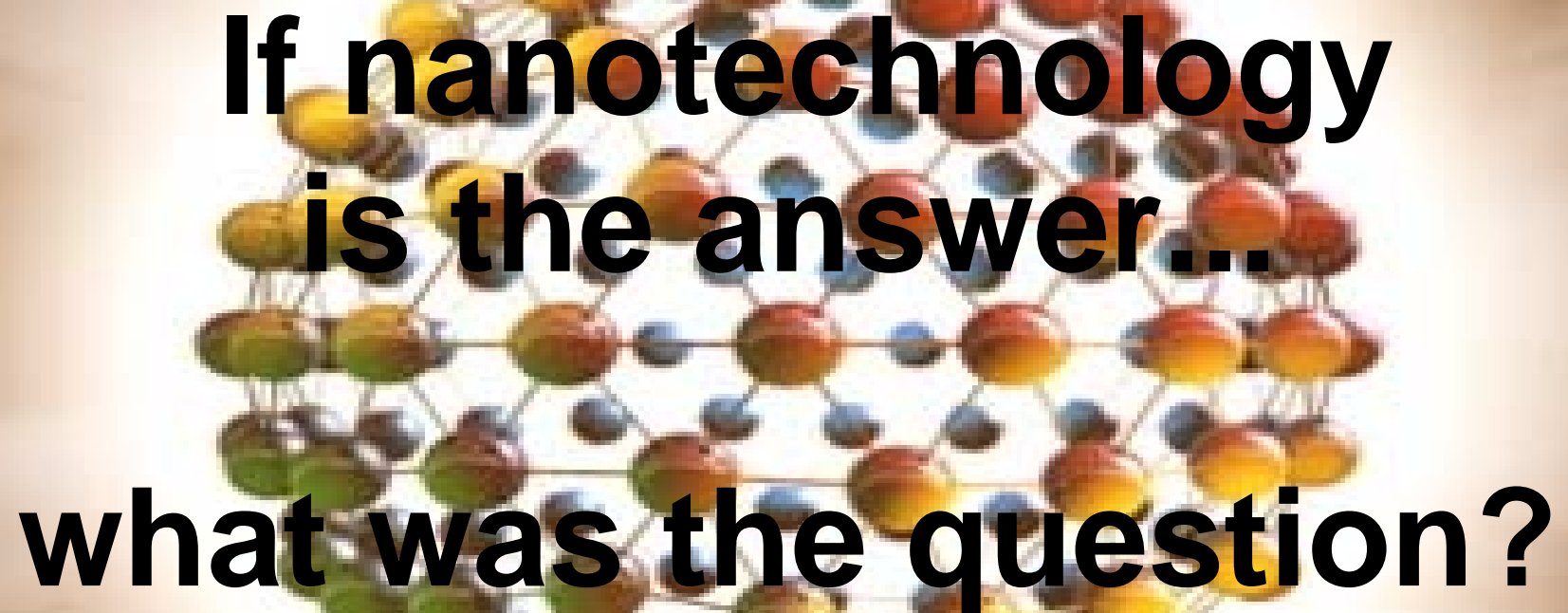
**social and environmental
justice**

Economical drivers:

**competitiveness,
economy of**

needs of populations

promise



**If nanotechnology
is the answer...**

what was the question?

Design Criteria for Democratic Technologies

Richard Sclove, "Democracy and Technology", 1995

- => Seek balance between communitarian, individual, and transcommunity technologies. Avoid technologies that establish authoritarian relationships.
- => Seek creative, flexibly schedulable, technological practices. Avoid meaningless or debilitating technological practices.
- => Seek technologies that support democratic knowledge production and dissemination. Avoid technologies that promote impoverished or ideologically distorted understanding.
- => Seek technologies that enable disadvantaged people & groups to participate fully in social life. Avoid technologies that support illegitimate hierarchy between groups, organizations, or polities.
- => Restrict the distribution of adverse consequences (e.g., environmental and social harms) to within local political jurisdictions.
- => Seek relative local economic self-reliance.
- => Seek ecological sustainability.
- => Seek "local" technological flexibility and "global" technological pluralism.
- => Avoid technologies that are vulnerable to catastrophic sabotage and to the attendant risks of civil liberties abridgement.
- => Seek technologies (including an architecture of public space) compatible with globally-aware, egalitarian political decentralization and federation.