

# Governance of Emerging Technologies

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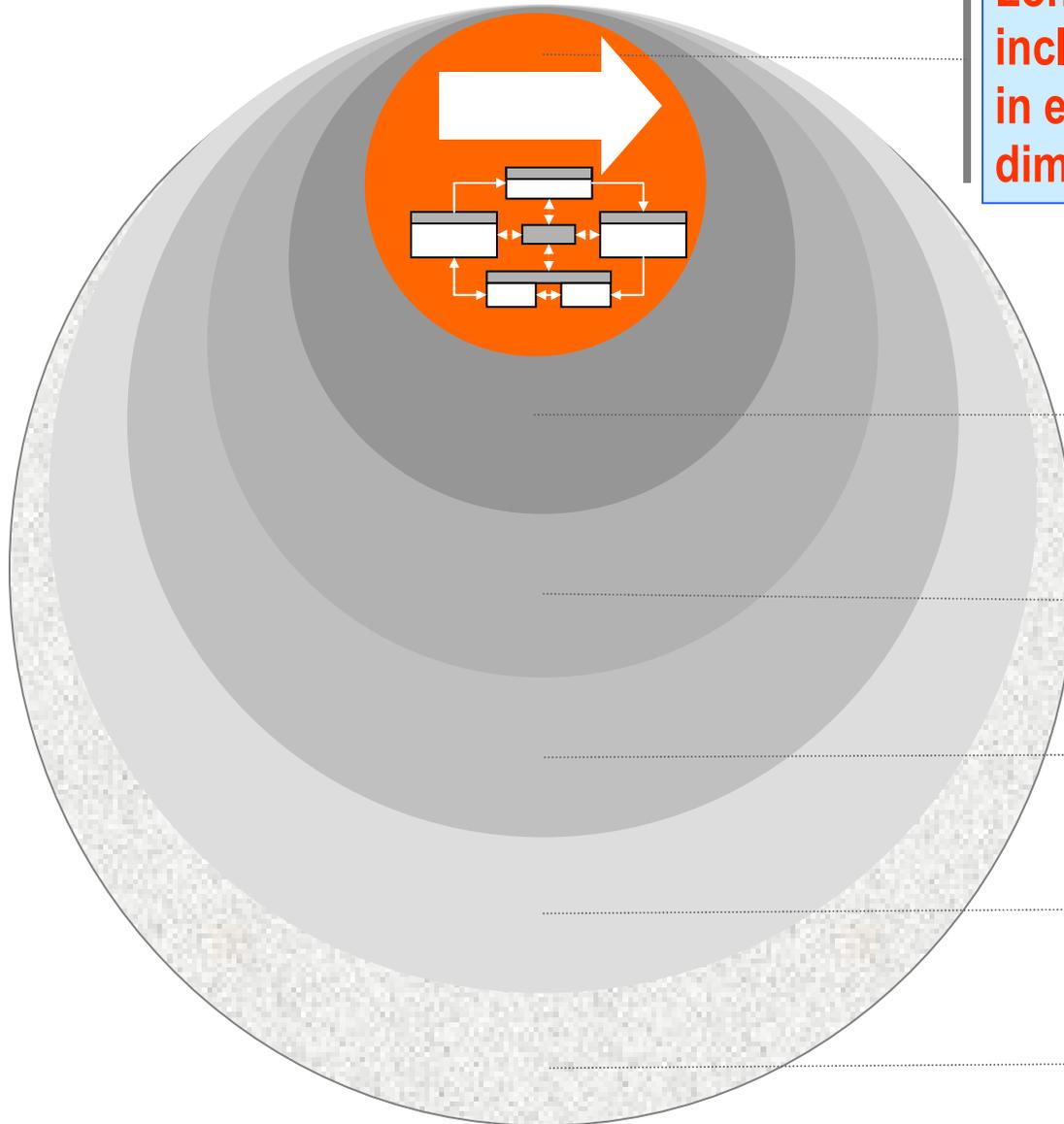
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# Emerging Technologies GOVERNANCE OVERVIEW

**Core Governance Process:**  
Long-term view, transforming,  
inclusive, horizontal/vertical, priority  
in education, addressing societal  
dimensions, risk governance



## **Main Actors:**

### **R&D Organizations**

(Academe, industry, gov.)

### **Implementation Network**

(Regulators, business,  
NGOs, media, public)

### **Social Climate**

(Perceived authority of  
science, civil involvement)

### **National Political Context**

### **International Interactions**

# Role of Governance in ET development and Corresponding Organizations

- **Transformative**

investment policy, S&T policy, **support innovation**, prepare pipeline in education, transformative tools

- **Responsible development**

EHS, ELSI+, risk governance, communication and participation, **regulations and oversight**

- **Visionary**

**Long-term and global view in planning**, including human development/progress

- **Inclusive, collaborative**

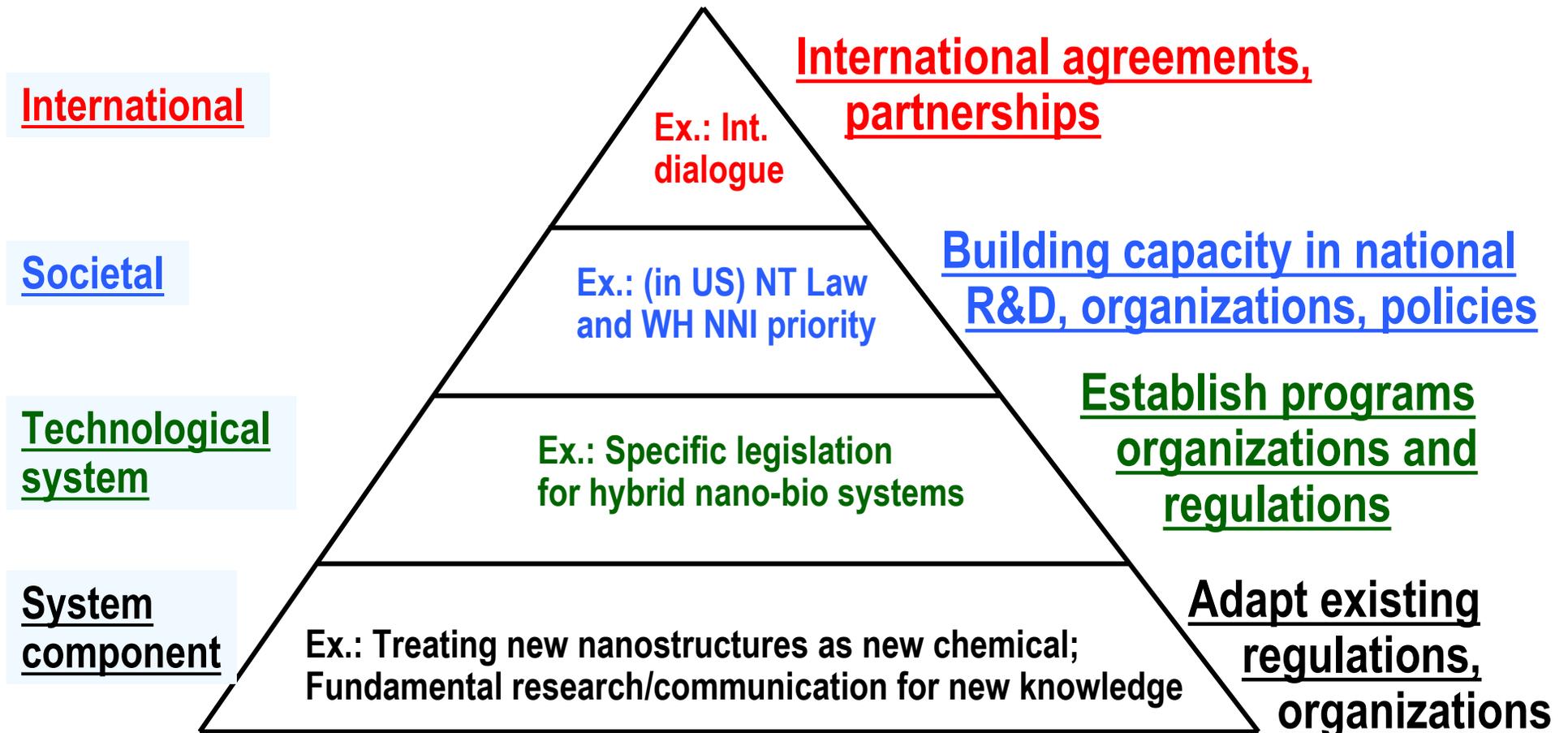
**Building organizational capacity**, national and international structure and leveraging

Regulation may be an enabling or constraint  
of technological innovation  
– these are two sides of the same coin

Illustrations in

- Nanotechnology (nano-EHS regulations)
- Life sciences (ex. synthetic biology)
- Information technology (role of incentives in regulations)

# The principles of good governance are applied to four governance levels



Examples from nanotechnology

# Possibilities for improving the ET governance and organizations

Using **open-source and incentive-based** mechanisms in the global self - regulating ecosystem

Establishing corresponding science and engineering **platforms** with multiple applications

Developing **institutional capacity** to address uncertainty and unexpected consequences of ET

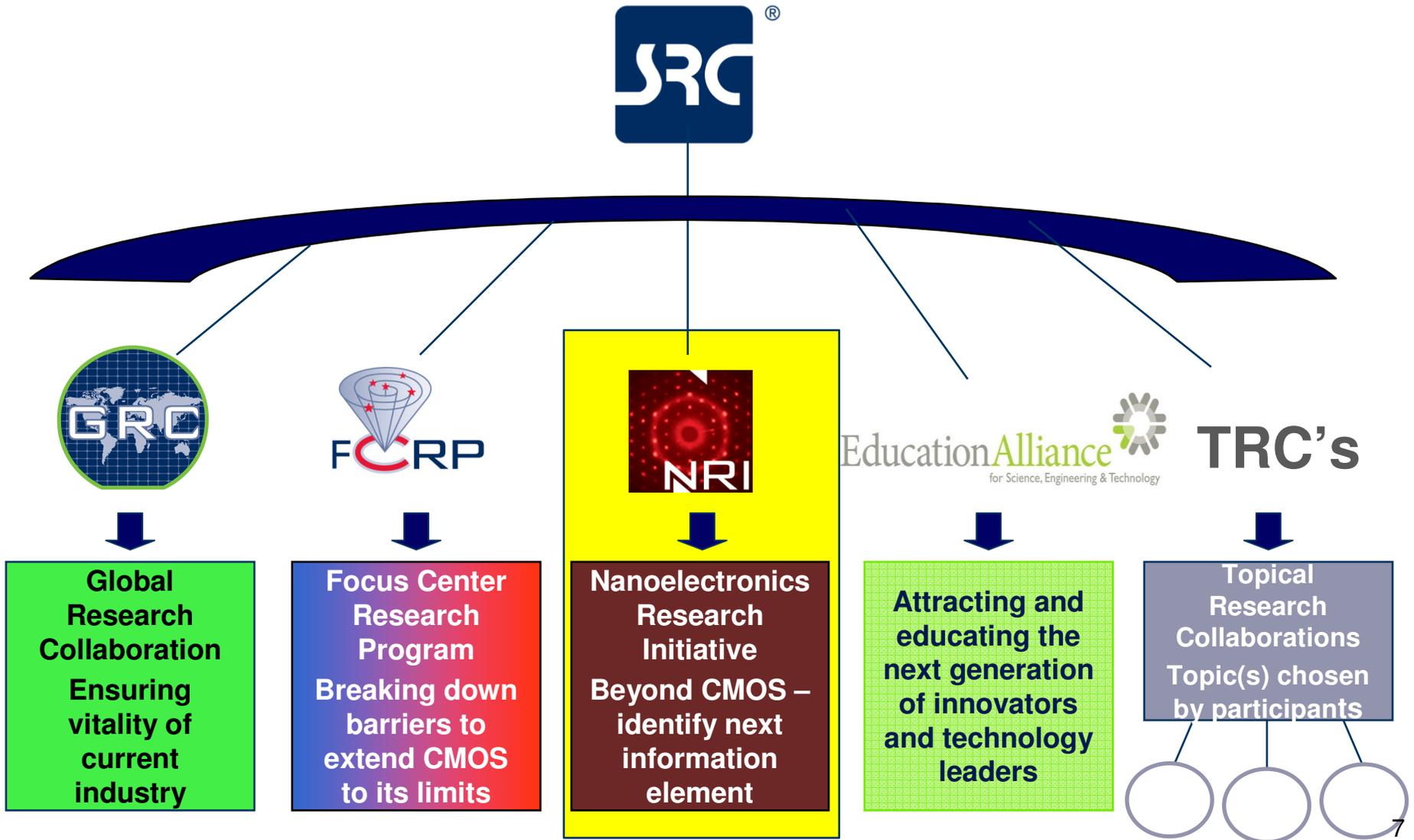
Institute **voluntary and science-based measures** for risk management before anticipatory, adaptive **regulations**

Implementing **long-term planning**



Example of EM organization:

# Semiconductor Research Corporation



# Several references

(M. Roco and co-authors)

“Co-evolution of Human Potential and Converging Technologies” Annals of the NY Acad. of Sciences, 2004

“Managing Nano-Bio-Info-Cogno Innovations”, Springer, Nov. 2006

“Possibilities for Global Governance of Emerging and Converging Technologies”, J. of Nanoparticle Research, Springer, 2008, Vol. 10, 11-29