The risk management related to nanomaterials. An occupational dynamics between science and law

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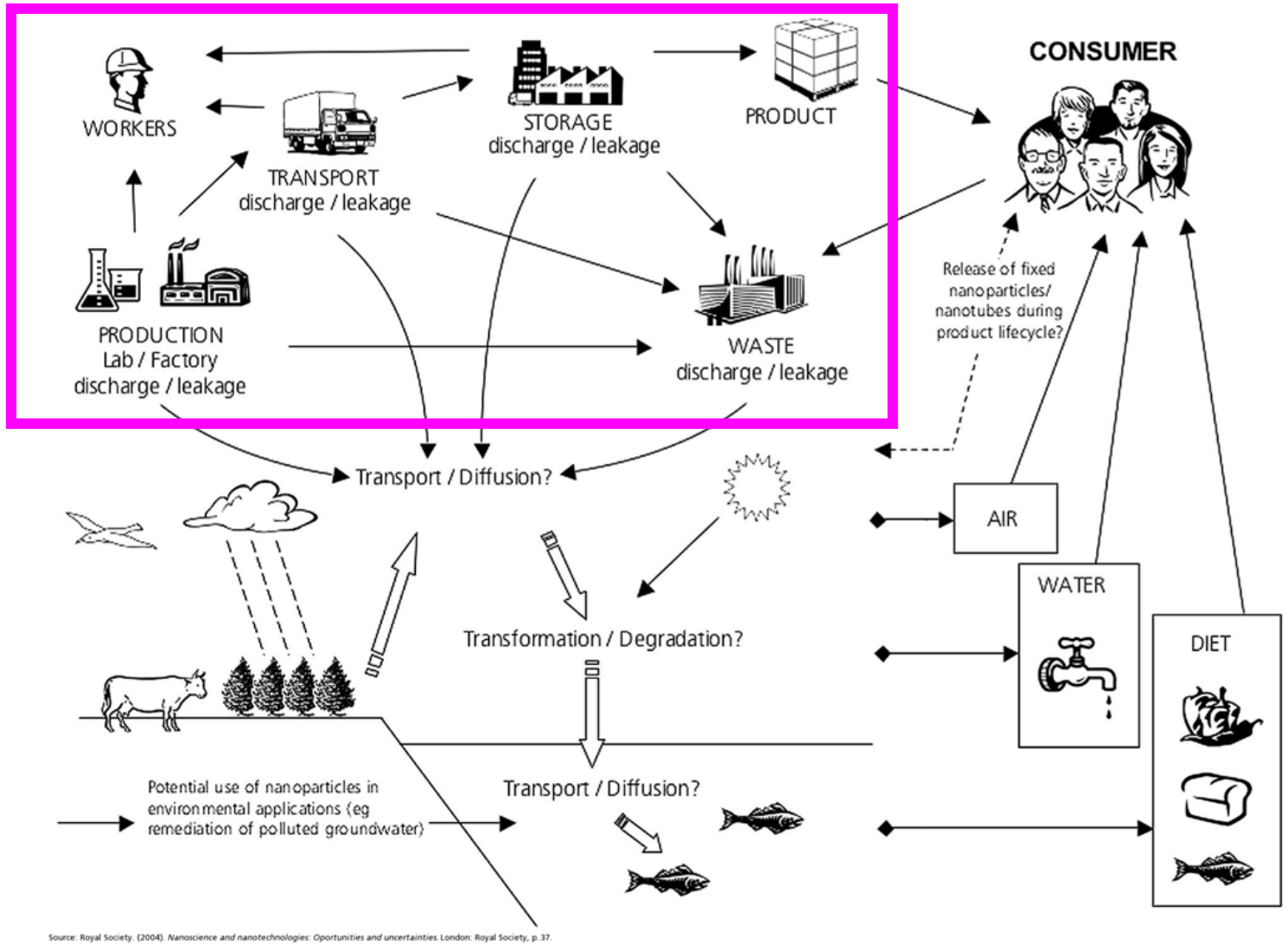
Content

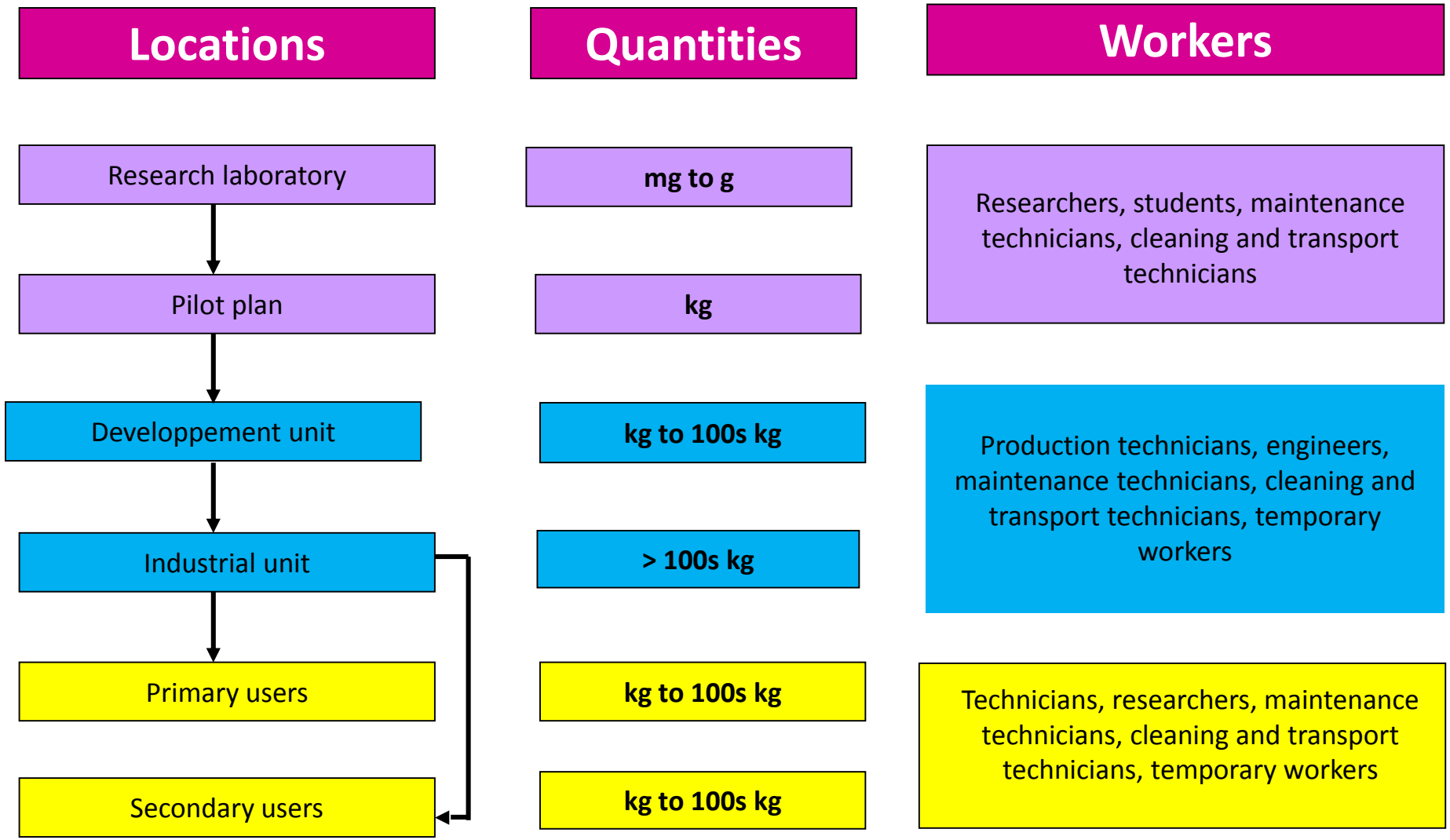
Background

Occupational exposures as a priority goal

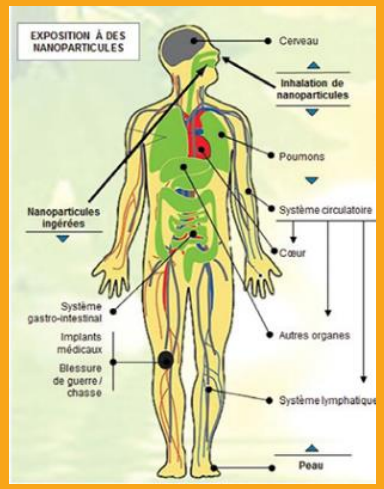


Source: Royal Society. (2004). *Nanoscience and nanotechnologies: Opportunities and uncertainties*. London: Royal Society, p. 37.

Plenty of nanomaterials exposures at the workplace



Main challenges towards nanomaterials risk management



HAZARDS

EXPOSURES

PREVENTION

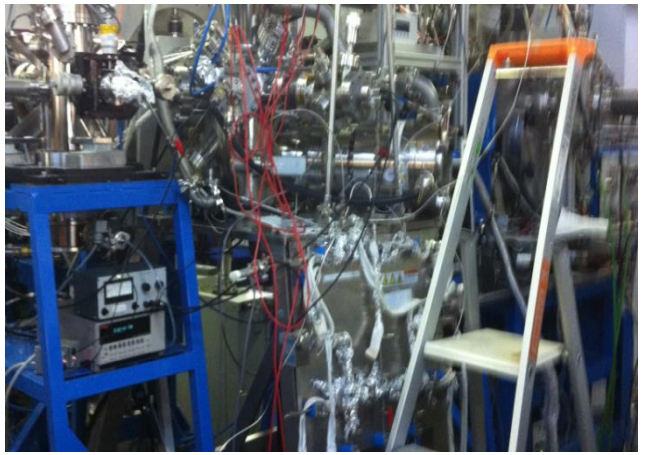
Needs in datas

Guidances, standards and regulations increase

- Definitions : ISO, Scenhir, etc.
- Registries : R-Nano, etc.
- Occupational Exposures Limits : NIOSH, INRS, etc.
- Risk assessment methods : CB, NanoSafer, etc.

Key issue

Approaches in risk management remain dispersed



Risk management: permanent redesigning and tinkering

Measurement

Identification

Characterisation

Quantitative valuation

Management

Evaluation

Programs

Acceptability

Decision making

Communication

Policy

Rules

Trust

Powers

Controversies

Many alternatives in risk management: an example

- ☑ Control banding (ANSES)
- ☑ Decision tree
- ☑ NanoSafer
- ☑ Etc…

Bandes de maîtrise :
BM1 : ventilation générale
BM2 : ventilation locale
BM3 : vase clos
BM4 : consulter un spécialiste

- → +

		Bandes de potentiel d'exposition			
		BE1	BE2	BE3	BE4
Bandes de danger (- → +)	BD1	BM1	BM1	BM1	BM2
	BD2	BM1	BM1	BM2	BM3
	BD3	BM2	BM2	BM3	BM4
	BD4	BM3	BM3	BM4	BM4

Hybridization between precaution and prevention principles

Precaution	Prevention
Environnemental law	Labor law
Public health	Occupational health
Public authority responsability	Employer responsability
Research process	Evaluation process
Obligation of means	Obligation of results
Temporary	Permanent

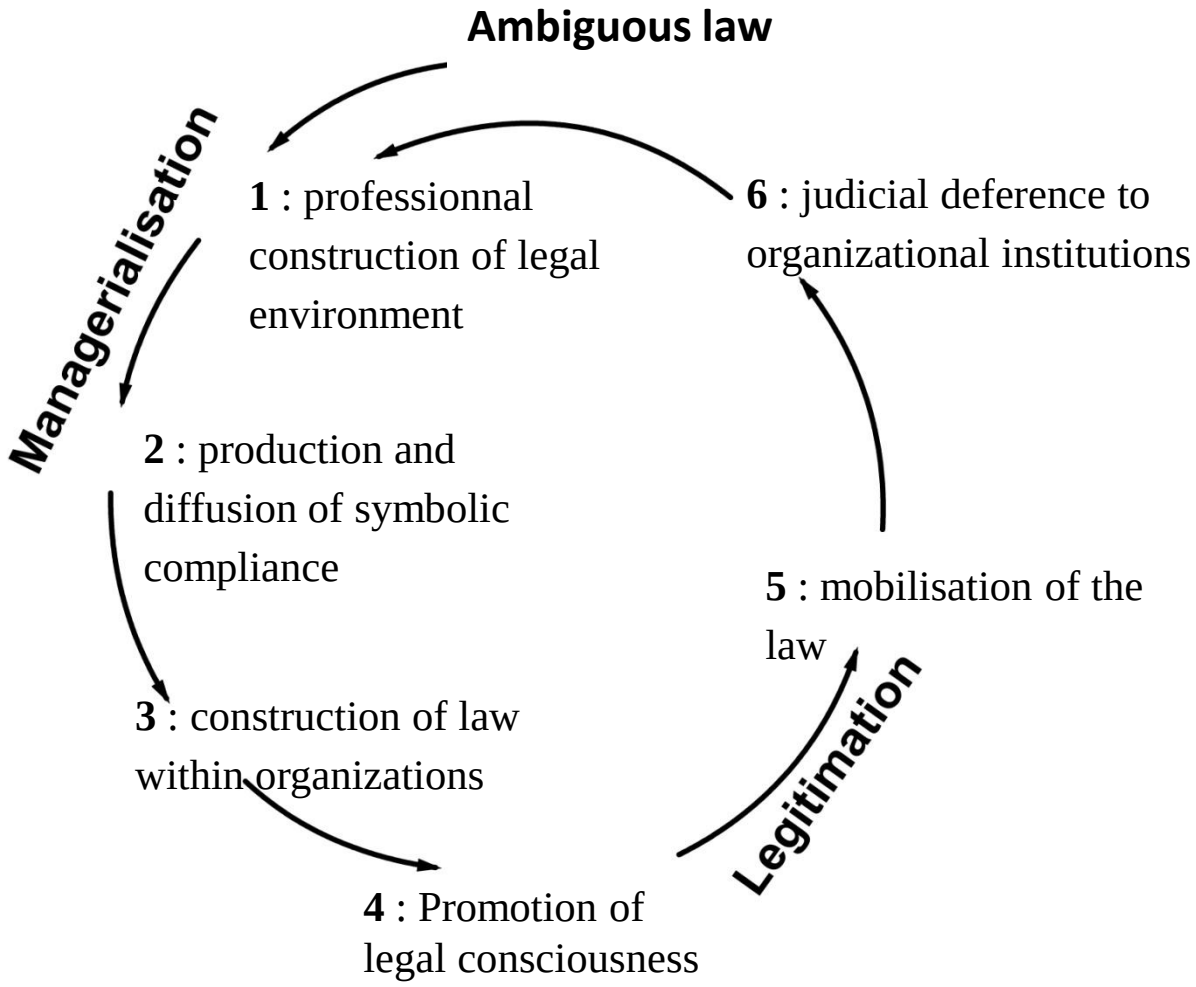
Hybridization between precaution and prevention principles

EHS policies :

« X is supporting a risk management based on case-by-case approach where the precautionary principle is adjusted according to experts advice »

« Y manage a multidisciplinary community to assess the safety of potential exposed workers and to deliver reasonable measures in case of suspected risks »

The endogeneity of Law (L.B.Edelman)



A prevention role for scientists in innovation process

Prevention cultures as negociated process

A comparative study between french and american labs

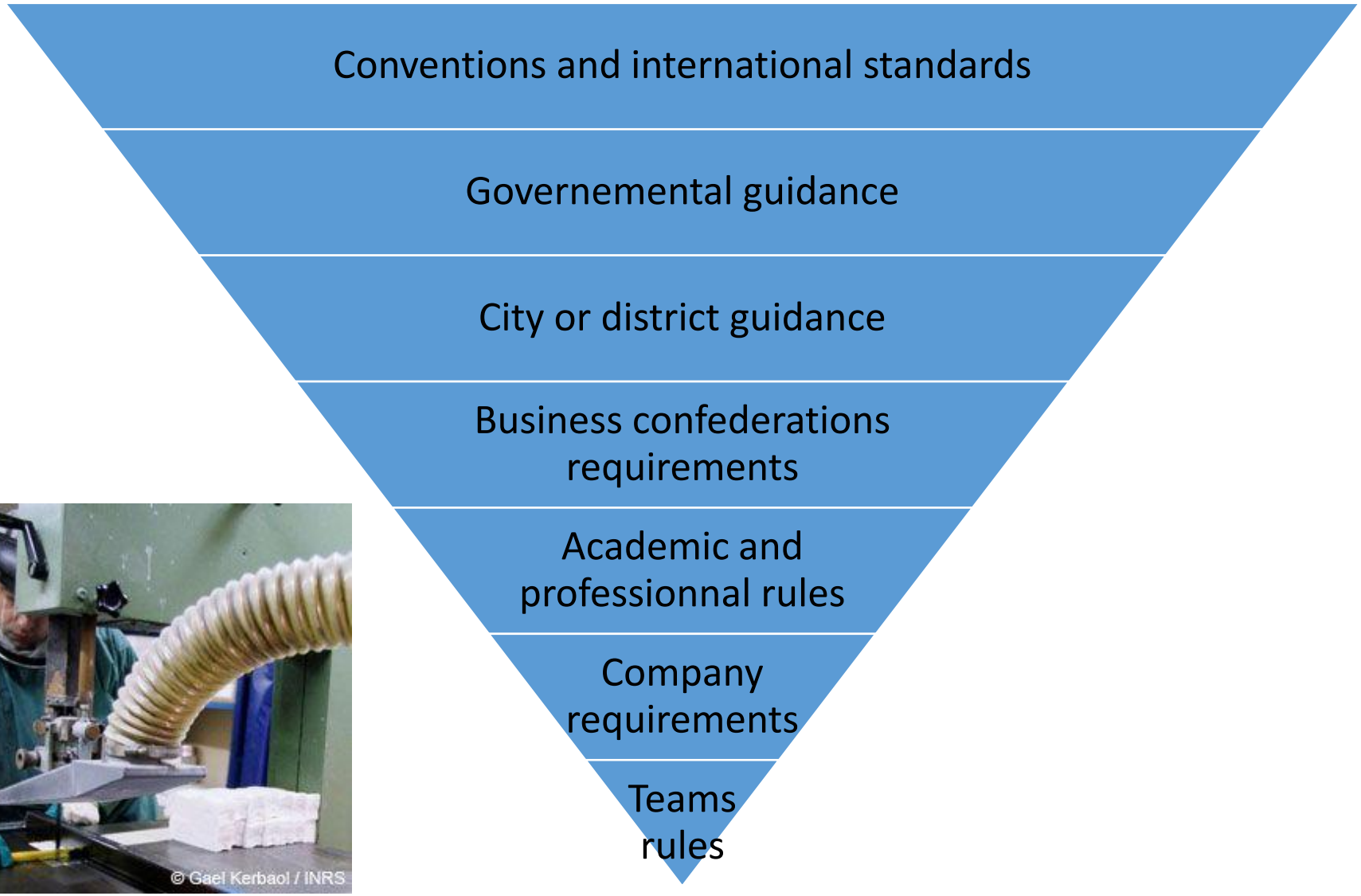
IDEX Paris-Saclay, ANR-11-IDEX-0003-02 + PEPS CNRS

Thanks to Susan SILBEY (MIT) and Jérôme PELISSE (Sciences Po Paris)

Four laboratories observed

Fields	France	United States (MA)
Nanomedecine **Translational and applied focus, organic materials in large labs**	**Nanocap Laboratory** (Saclay, CNRS-University) Liposomes, polymers 120 members	**BS Laboratory** (MIT) Polymers 170 members
Nanoelectronic **Basic and more fundamental focus, mineral materials in smaller labs**	**Carbon Lab** (Saclay, CNRS) Carbon nanotubes and metallic particles 30 members	**Cristal Group** (MIT) Cadmium and heavy metals. Quantum Dots 25 members

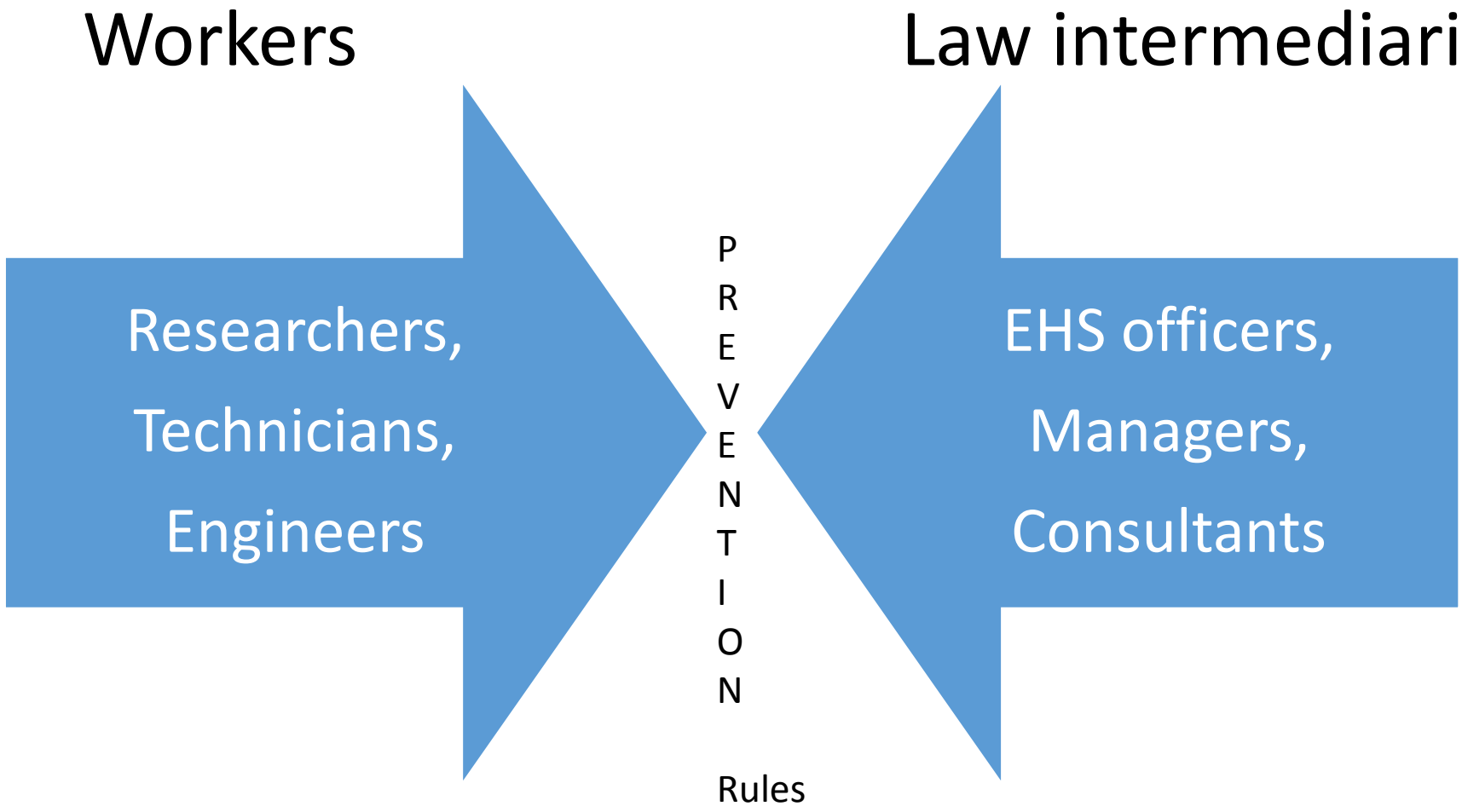
A same risk management framework



Typical organizational prevention cultures

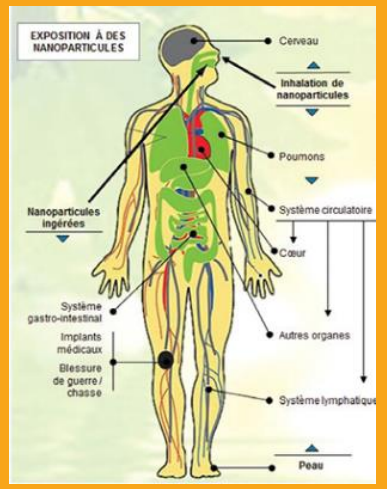
Safety conditions	France	USA
Resources	**Nanocap Laboratory** EHS guidelines EHS officers Regular safety training	**BS Laboratory** Strong EHS management system MIT dedicated EHS officers for nanohazards EHS representative in labs Biosafety training before entry
Work division		Strong work division between graduates and PI and between different research fields Many temporary workers (graduates, etc.) with high turnover
Control	Control by peer	Control by principal investigators (PI) and lab' administrators
Results	Compliance	Potential safety drifts and failures
Safety culture	Safety as per professional rule	Safety as obligation
	Carbon Lab EHS guidelines EHS officers	**Cristal Group** MIT management system
		Few graduates with low turnover (graduate thesis duration=4 years) Safety rotating responsabilities
	Control by peer	Informal neighborhood team control
	Compliance	High safety level
	Safety as per professional rule	Safety as ethical imperative

Risk management: permanent compromises



Conclusion

Clarifying priorities and values for risk management



HAZARDS

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Judgment criteria…

Organizing effective consultation and participation about risks

- Representation of the various recipients
- Sufficient time
- Debate rules
  - Free participation
  - Possible controversies
  - Decision mode commonly agreed
    - Consensus
    - Vote
    - …
  - Etc.

Outlook

The scientist and the reflective work: from science to law

Institut National de Recherche et de Sécurité

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Thank you for your attention

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