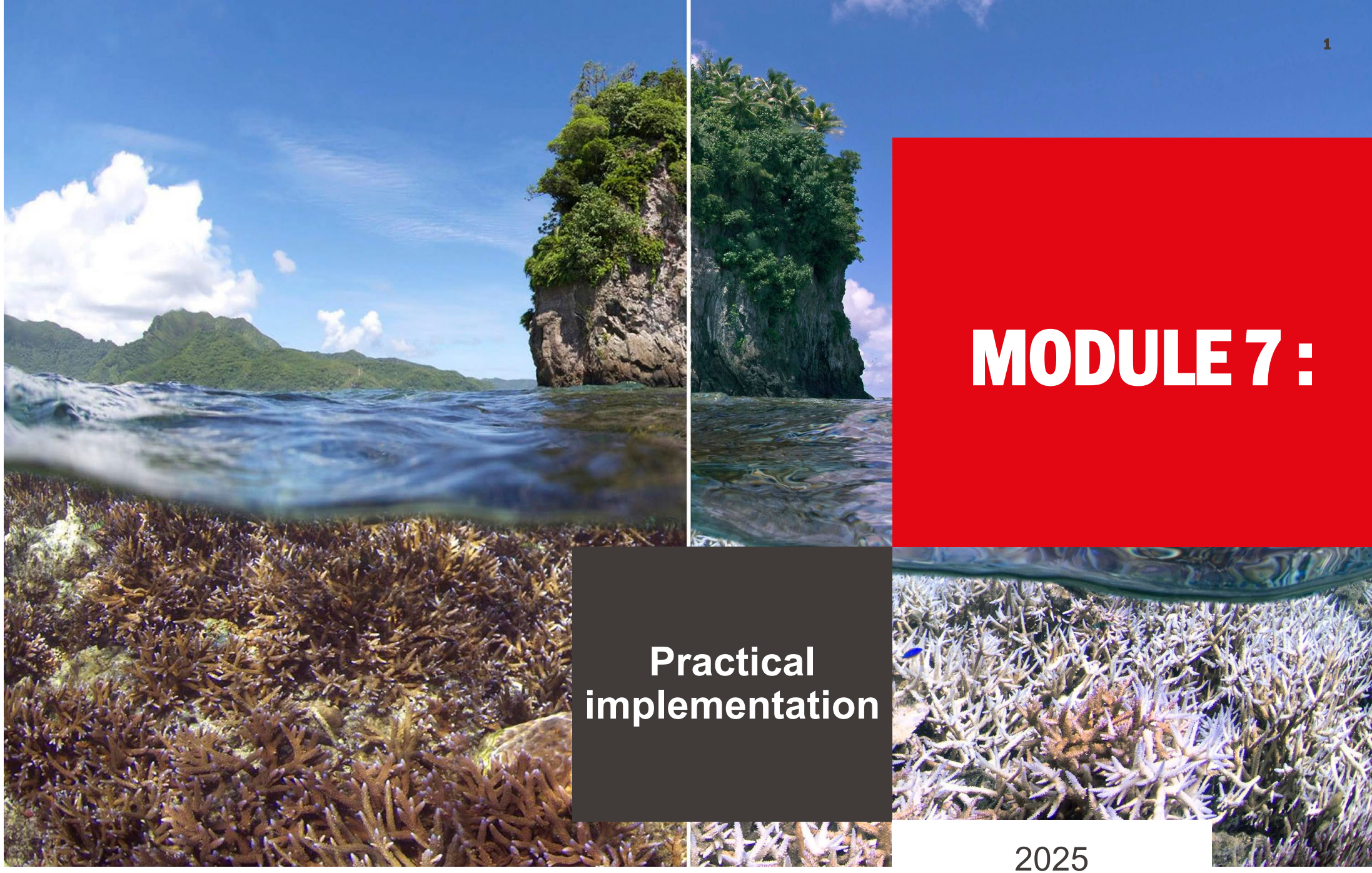
MODULE 7 :

Practical implementation



2025

ISIC-GSCP
Group of Chemical and Physical Safety

Source: https://news.mongabay.com/2015/10/massive-bleaching-event-puts-worlds-coral-reefs-at-risk/

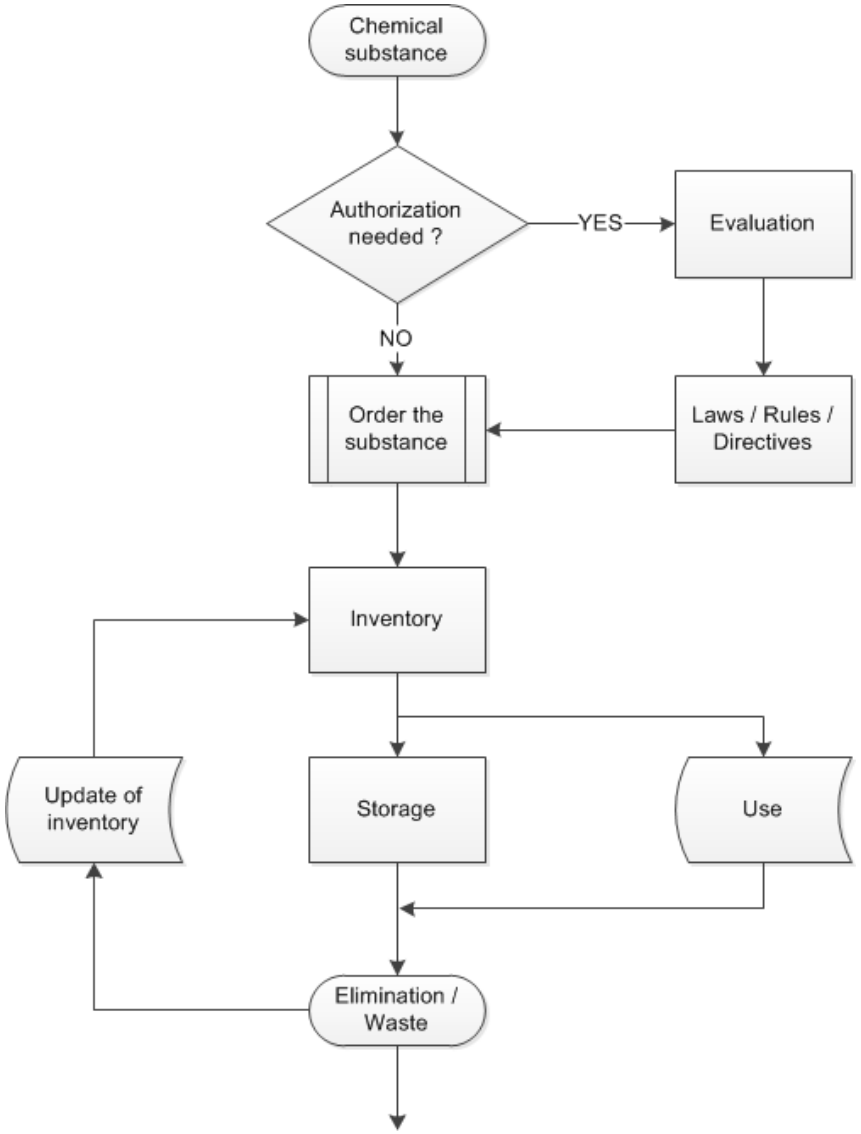
Source: https://www.holisticcharlotte.com/common-household-chemicals-are-toxic-to-your-health/

Example I : Dangerous substances

How to protect researchers and students from highly dangerous substances ?

Cat. 1

Example I : Dangerous substances (2)



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Source: https://starwars.fandom.com/fr/wiki/Carbonite

Example II : Cryogenic liquids

My neighbour said … The only hazard with cryogenics is easy to understand… it's very cold !

Is she/he right ?

Example II : Cryogenic liquids (2)

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In case of leak or spill, the major risk is death by asphyxia. A detection is needed when the quantity of cryogenic liquid for a container is:

a) Non-ventilated area: up to 0.3 l/m^3 of room.
b) Ventilated area: up to 0.4 l/m^3 of room.

How do we know this ?

Personal protective equipment

How to determine a threshold value?

Time 10``

How to determine a threshold value?

The alarm is triggered 50 seconds after the spill

Time 10``

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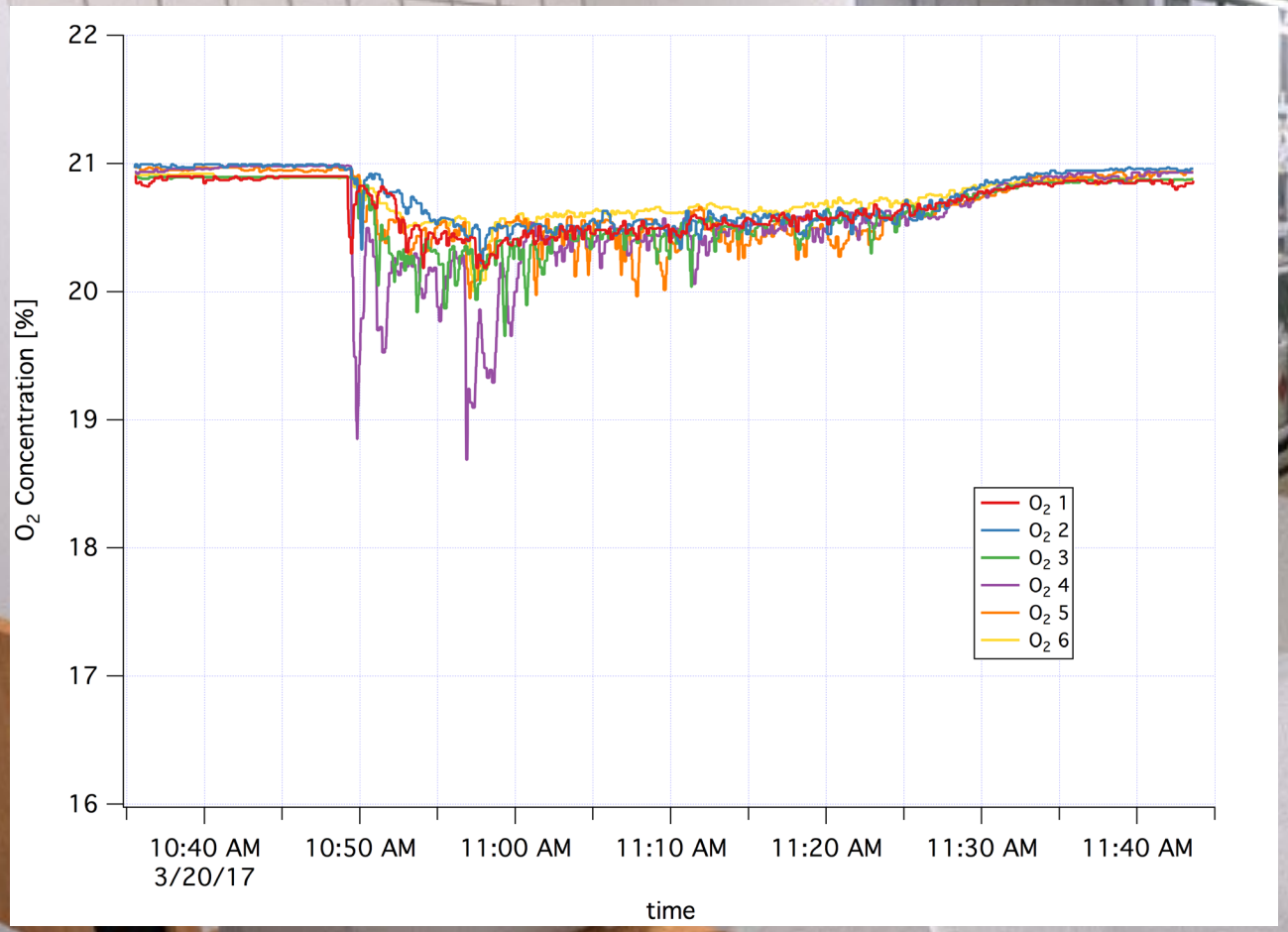
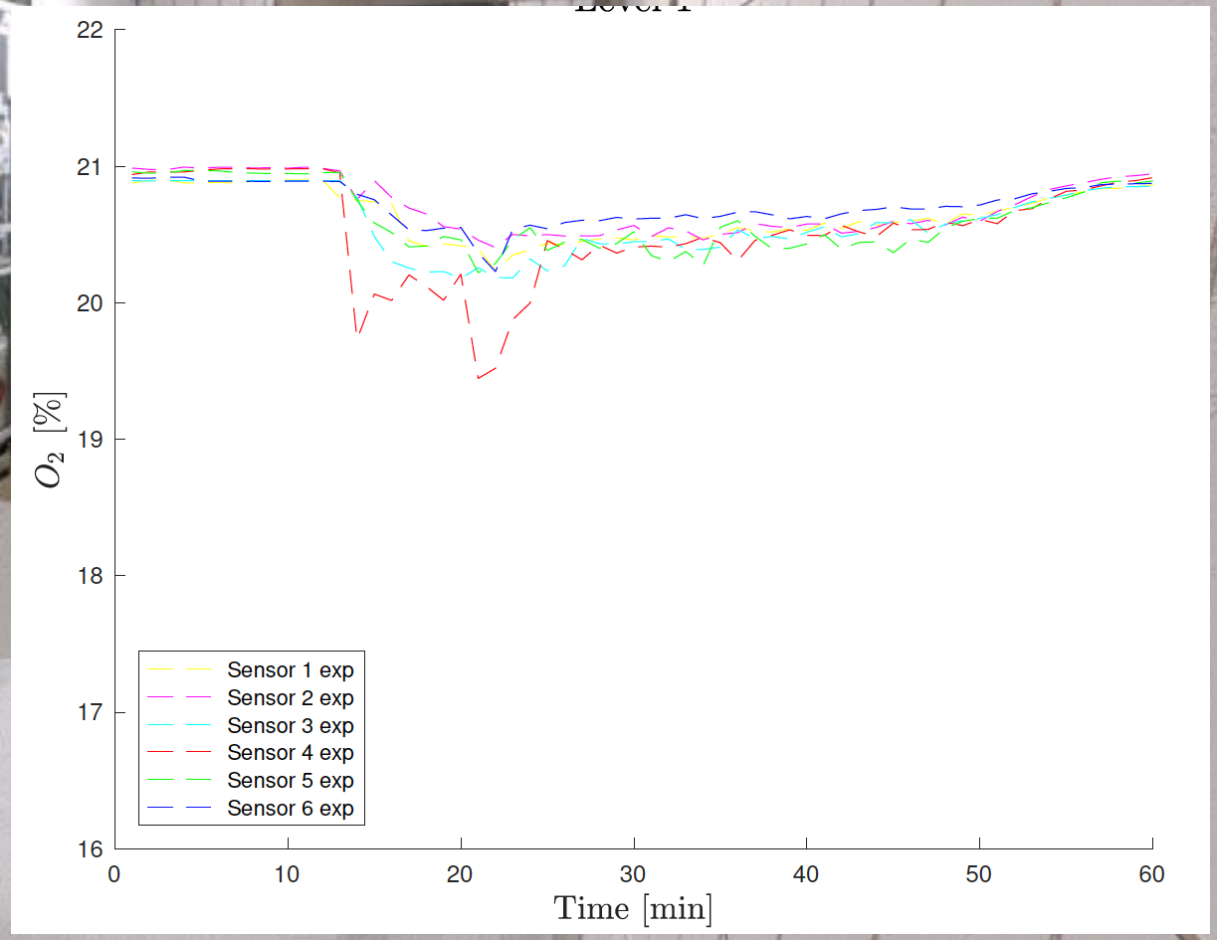
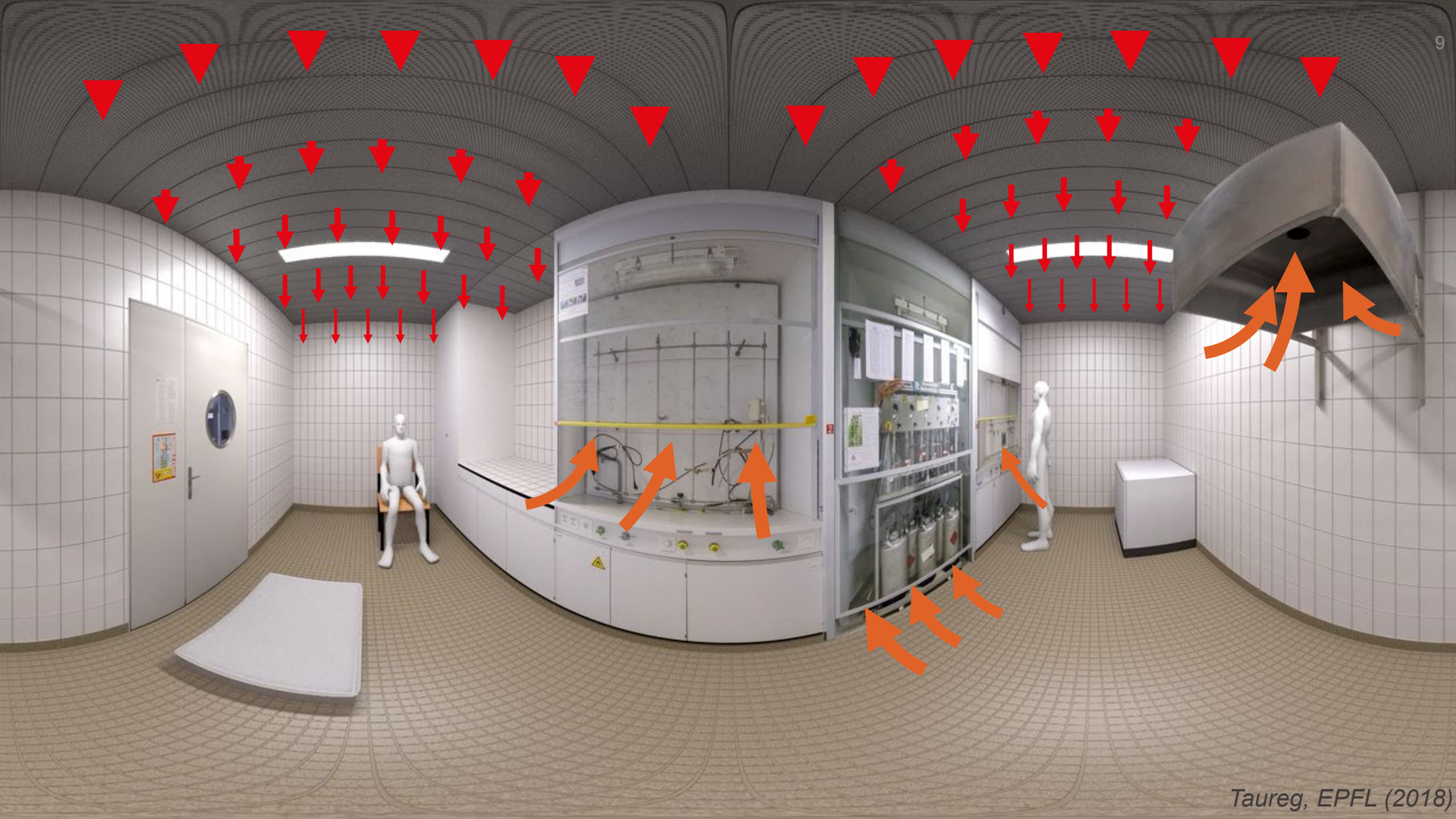
How to determine a threshold value?

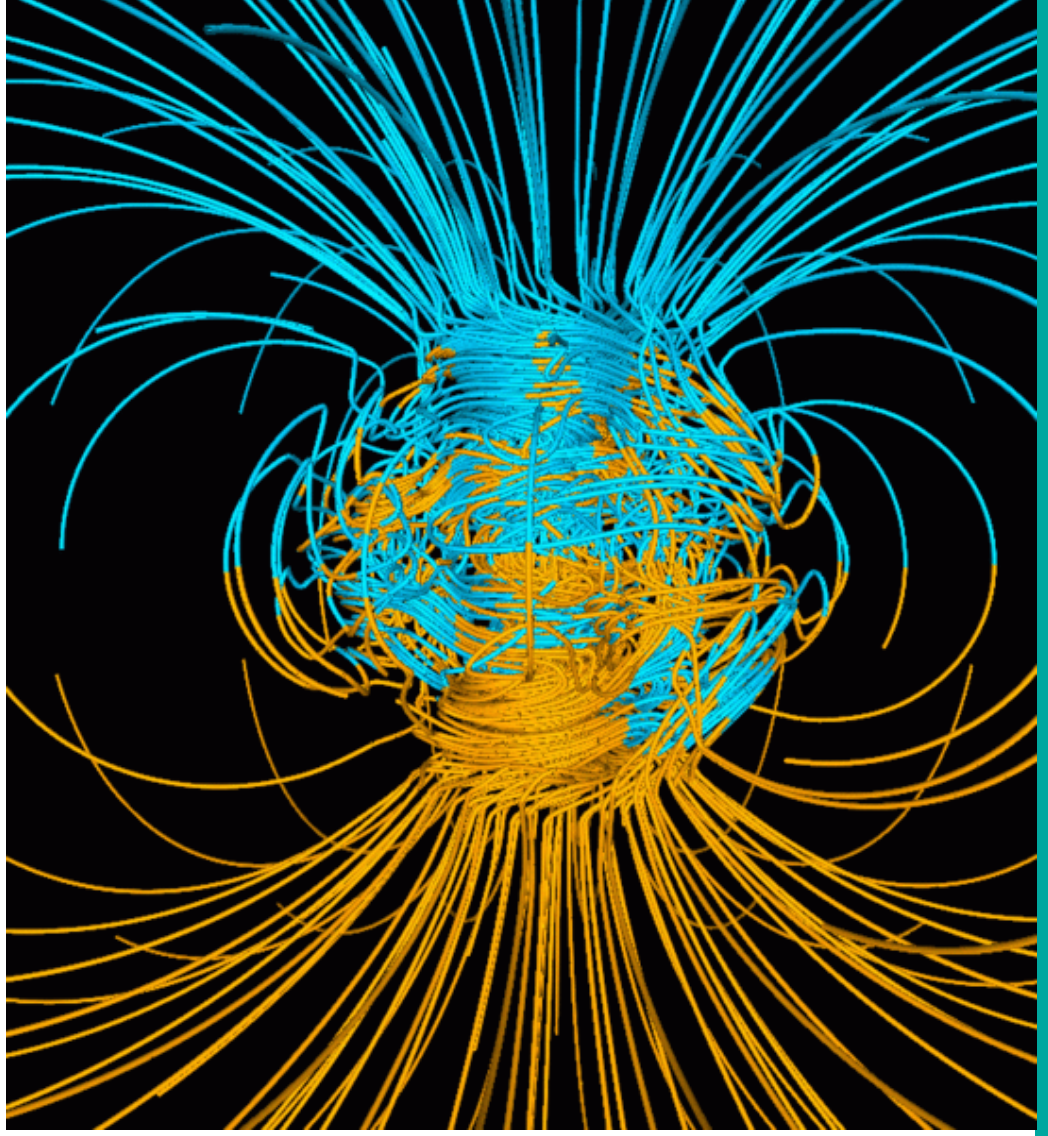






Taureg, EPFL (2018)

Example III : Magnetic fields



A snapshot of the earth 3D magnetic field structure simulated with the Glatzmaier-Roberts geodynamo model.

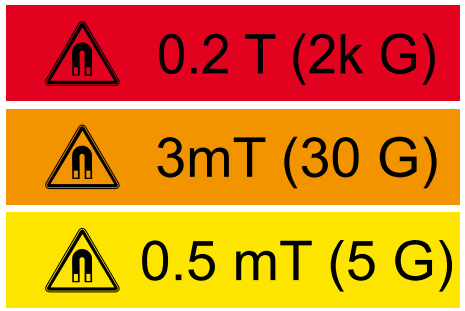
The University of California
http://www.es.ucsc.edu/~glatz/geodynamo.html

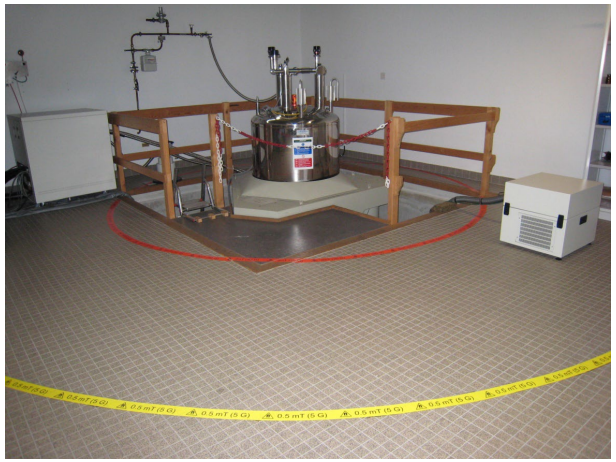
Why should I care about magnetic fields, they are everywhere?

Example III : Magnetic fields (2)

Field intensity	Description of the restrictions	Entrance Forbidden
0.5 mT (5 G)	Maximum field authorized for public, pacemakers wearers, pregnant women.	- Public - Pacemakers wearers - Pregnant women - Non-authorized people
3 mT (30 G)	Field starting from which ferromagnetic objects can be dragged by the field itself.	- Ferromagnetic objects
0.2 T (2 kG)	Field starting from which access is unauthorized without medical recommendation.	- Everyone, except those with medical recommendation

25-60 μT = value of earth's magnetic field





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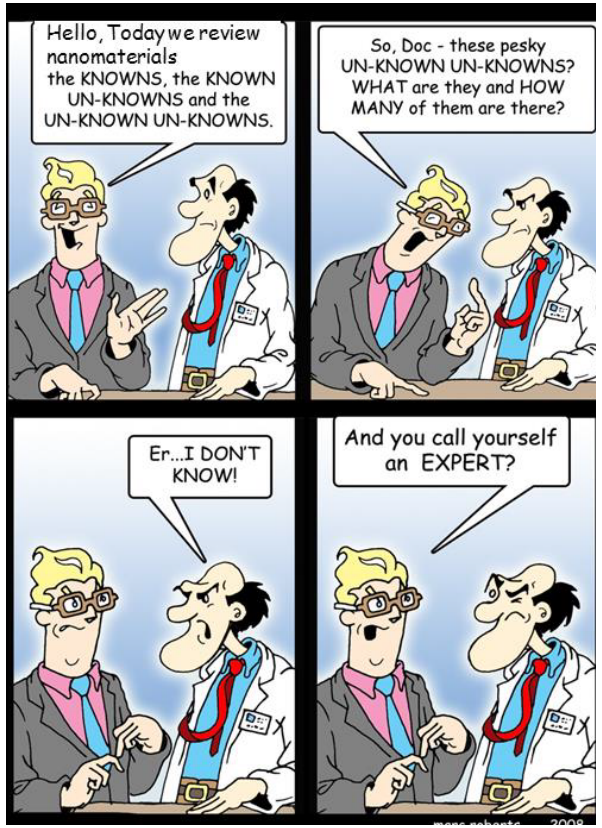
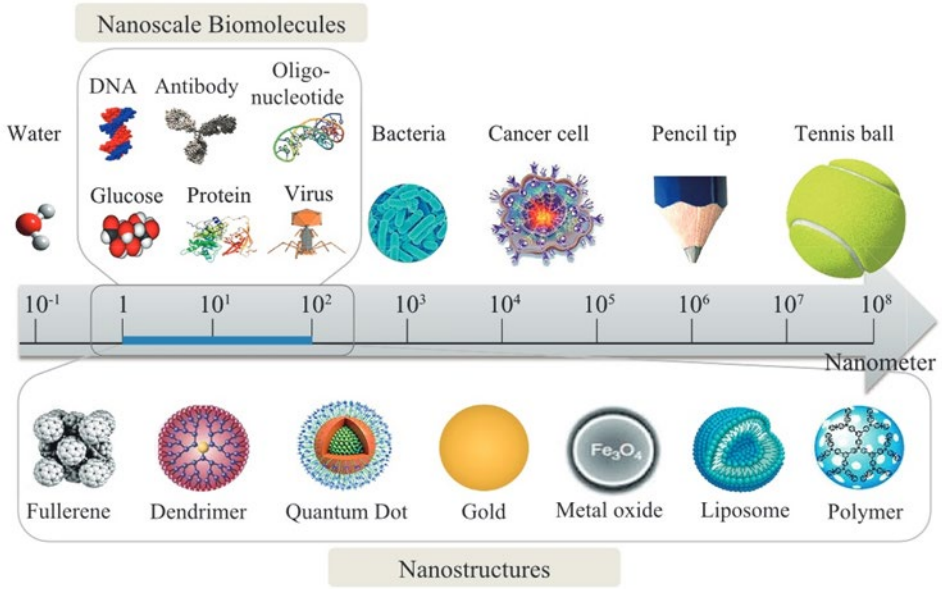
Example IV : Nanoparticles



Source: Saallah, Suryani & Lenggoro, Wuled. Recent Advances and Applications. KONA Powder and Particle Journal. 2018.



Nanoparticles …. They are so small … How could they be harmful ?

Example IV : Nanoparticles (2)

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- Presently, regarding risk management, our knowledge about the influence of ENPs on health and the environment remains quite limited.

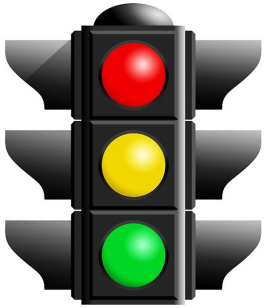
- Use of the precautionary principle (Rio declaration 1992).

  - *“The lack of certainty, given the scientific and technical knowledge at the time, should not delay the adoption of effective and proportionate measures to prevent a risk of serious and irreversible damage to the environment at an economically acceptable cost”.*

- Numerous approaches are documented in the literature, yet what methods are suitable for research involving ENPs (engineered nanoparticles)?

Example IV : Nanoparticles (3) - Decision tree for hazard classification

NANO hazard Laboratory classification on a three levels scale (inspired by ISO/TS 12901-2:2014):



Nano 1 – Green potential exposure category

Nano 2 – Orange potential exposure category

Nano 3 – Red potential exposure category

- **Engineered nanomaterials: toward effective safety management in research laboratories**
  Groso A., Petri-Fink A, Rothen-Rutishauser B., Hofmann H. and T. Meyer. Journal of Nanobiotechnology, 14, 2016
- **NanoSafe III: A User Friendly Safety Management System for Nanomaterials in Laboratories and Small Facilities**
  Buitrago E., Novello A.M., Fink A., Riediker M., Rothen-Rutishauser B., and Meyer T., Nanomaterials, 11(10) 2021

Example IV : Nanoparticles (4) – EPFL Method

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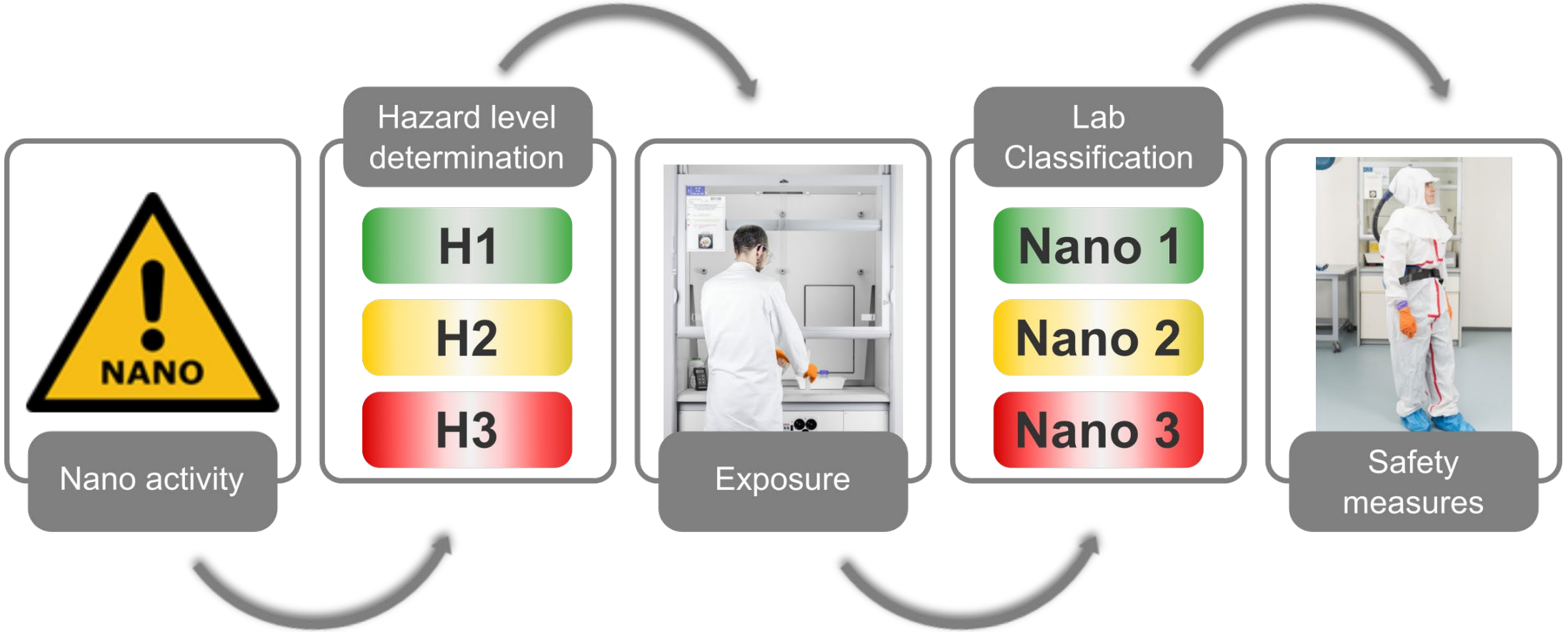

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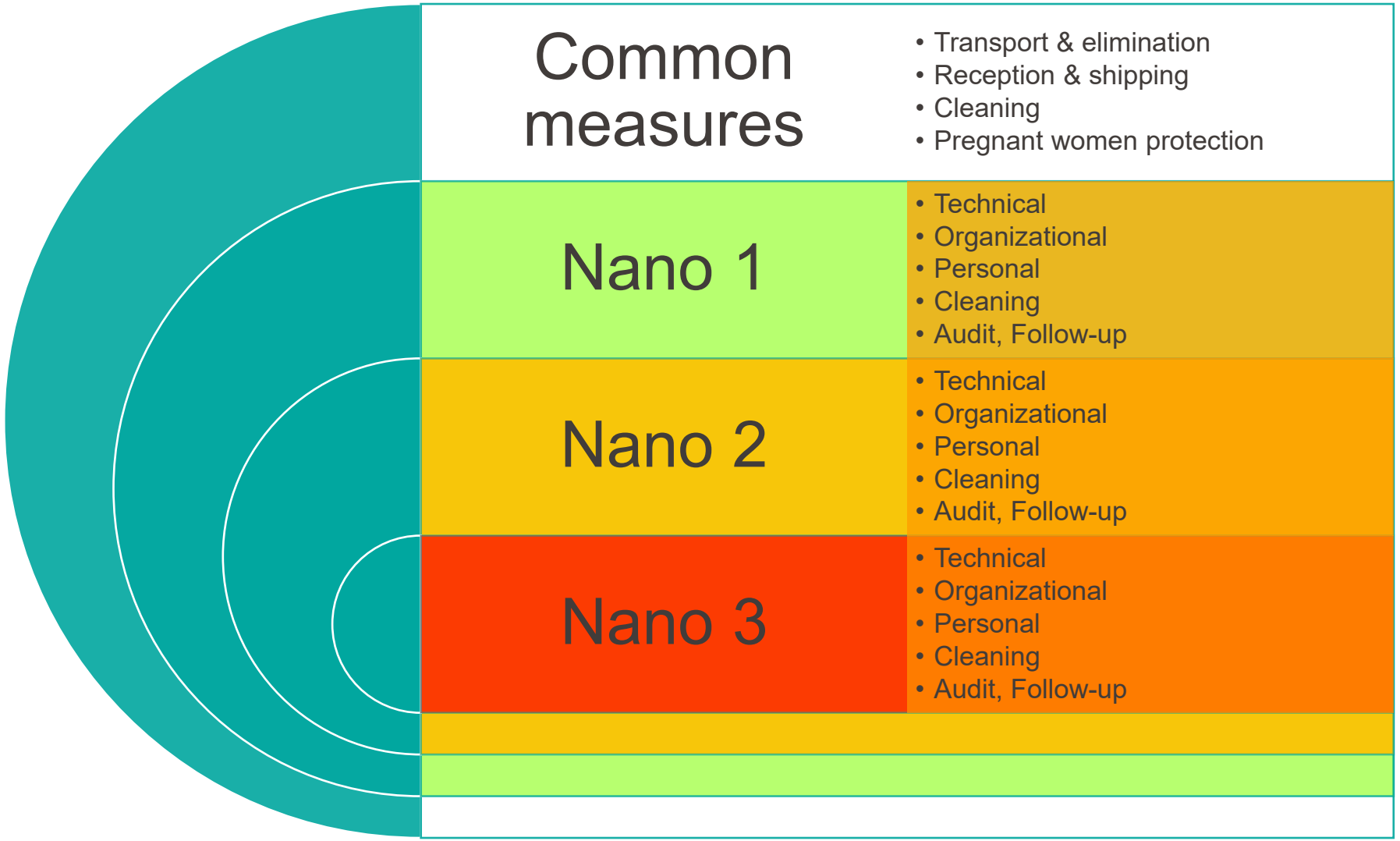
Example IV : Nanoparticles (5) - Measures



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Example IV : Nanoparticles (6) – Common prevention and protection measures

Measures applied to all Nano laboratory levels	
Transport and disposal	
Conditioning of ENM contaminated materials	Toxic (trash bin for toxic chemical waste)
	Double bag for toxic waste (100 microns thickness)
	Storage in a sealed container
Disposal of nano-substances and products	Double packaging for both, solid and liquid waste
Waste and PPE disposal	Special waste treatment channel
Transportation of "nano-objects"	Double packaging
Reception & shipping	
Organization	Receiving point: nano lab or chemical shop
Procedure	Reception procedure
Storage	Ventilated cabinet or storage room
Cleaning	
How?	By wet process only
	Asbestos category (dust class H with asbestos specification according to EN 779)
Pregnant woman	
Work authorization	Obligatory workplace audit by occupational physician

Example IV : Nanoparticles (6) – Measures for Nano 2

Measures applied to Nano 2 laboratory		
Technical	Ventilation	Renewal rate without recycling , 8 h^{-1}
		Negative pressure between the room and the corridor, 10-15 Pa
		Capture at source
	Floor	Sealed floor
	Manipulation under fume hood	Mandatory
Organizational	Restricted access	Control access system (authorized people only)
	Lab training	Written working procedures
		Basic laboratory course
		Specific nano safety training
Personal	Eyes protection	Safety glasses
	Body protection	Non-woven laboratory coat (Tyvek)
		Overshoes
	Hands protection	1 pair of adapted gloves
Cleaning	Who	External staff with nano lab hazard training
	Protective equipment	Same as for laboratory staff
	Supervision	Responsible of the laboratory
Audit & follow-up	Audit	Only by Occupational Safety Specialists
	Medical survey	Only regular laboratory staff
Maintenance	With possible contact with nanos	Protection equivalent to nano III level
	Glove box	Possibility to put a minimum filter H13 on the ventilation of the glovebox
	Waste	Identical disposal of "nano-waste"
	Presence of lab staff	
	Contactless with nano (simple repair)	PPE protection of the corresponding lab level
	Maintenance procedures	Established and available procedures
	Maintenance protocols	Protocols established and archived

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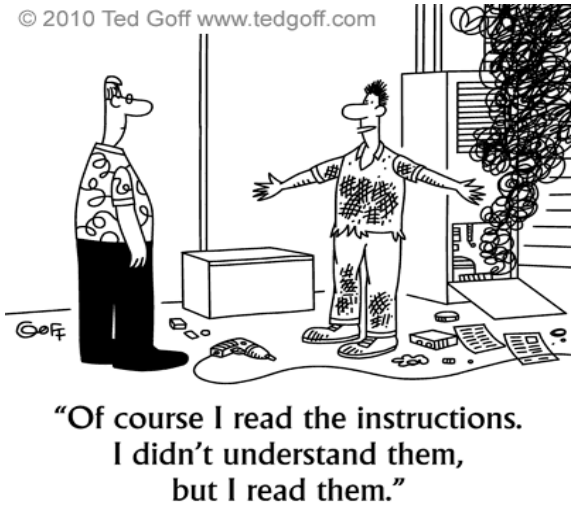
Example V : This will be your project (1)

What you have learned can be expressed in your small project:

Be smart

Be creative



Be efficient

Use humor when necessary

Example V : This will be your project (2)

Length of the document: 5-6 pages

Objective: Conduct a risk assessment of a situation based on an illustrative image.
Please write it as an executive summary, excluding any superfluous details.

Content:

1. Objective: Clearly state the purpose of the assessment.
2. Situation Description: Briefly describe the situation and identify potential hazards.
3. Risk Analysis: Analyze the identified risks.
4. Risk Reduction Measures: Propose and discuss measures to mitigate these risks.
5. Economic Analysis: Evaluate the economic aspects, including cost-benefit analysis and the rationale for investing or not.
6. Recommendations: Provide personal recommendations based on your analysis.
7. Conclusions: Summarize the key findings and outcomes

Example V : This will be your project (3)

General remarks:

- Literature Review: Utilize only pertinent information for your project. Avoid adding extraneous details, ensuring it resembles a management-level executive summary.
- Avoid Plagiarism: Do not copy content from web pages or similar sources. Your work will be assessed for originality.
- Depth and Quality: You are responsible for determining the depth of your analysis and the overall quality.
- Font Size: Use a font size no smaller than 10, preferably 11. If the document exceeds the maximum page limit, provide a justification in the preface.
- Language: You may write the document in either English or French.

My objective is to assess your understanding of the concept of risk management as evidenced in your project.

Final conclusion : How to perform an effective risk assessment?

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1. Make sure you have the necessary resources available

Have a competent person undertake your risk assessments. Set aside the time and resources to implement the findings.

2. Know the scope of the risk assessment

Before starting any risk assessment, agree what will be covered. I.e. specific task, one particular piece of equipment, or a work area.

3. Use all sources of information

As well as observing what is going on, read through any related procedures or operating instructions and speak to the individuals doing the work.

4. Identify all hazards and risks

Write a list of the hazards & risks you find. Have a look through the list and identify the more significant risks rather than the trivial ones to focus on.

5. Determine who might be harmed

Other than the individuals undertaking the work, make sure all other affected groups are considered. E.g. people nearby, youg or inexperienced workers, ...

6. Identify the controls to manage your risk

Record the existing controls and decide if they are sufficient. Consider if improvements can be made to existing controls or if new ones are required.

7. Complete the assessment and communicate it

Make sure alle the information is recorded in a suitable format and then communicate the findings to all relevant persons. E.g. your employees and visitors.

8. Regularly review your risk assessments

Keep your risk assessments current by reviewing each one at least once a year or when changes happen. E.g. new processes, new people or new equipment.

Take-home message

- Risk management identifies, assesses, and addresses risks to mitigate their impact.
- An effective RM plan includes identification, assessment, treatment, monitoring, and communication.
- By applying these practices, organizations can protect their reputation, assets, and stakeholder interests.

The end

Thierry Meyer

Source: *https://funnyjunk.com/*

Life is inherently risky. There is only one big risk you should avoid at all costs, and that is the risk of doing nothing. *Denis Waitley*

The end

Thank you for your participation
and stay healthy