

# Environmental Protection

**Waste Safety Section,  
Division of Radiation, Transport and Waste Safety  
Department of Nuclear Safety and Security**



**IAEA**

International Atomic Energy Agency

# OBJECTIVES

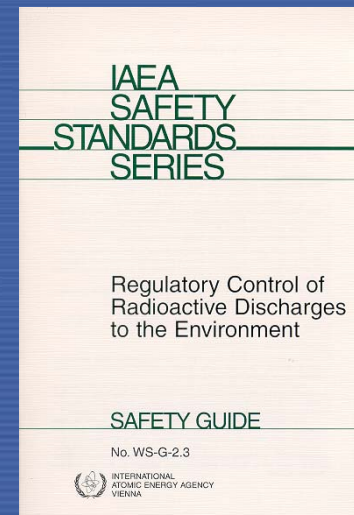
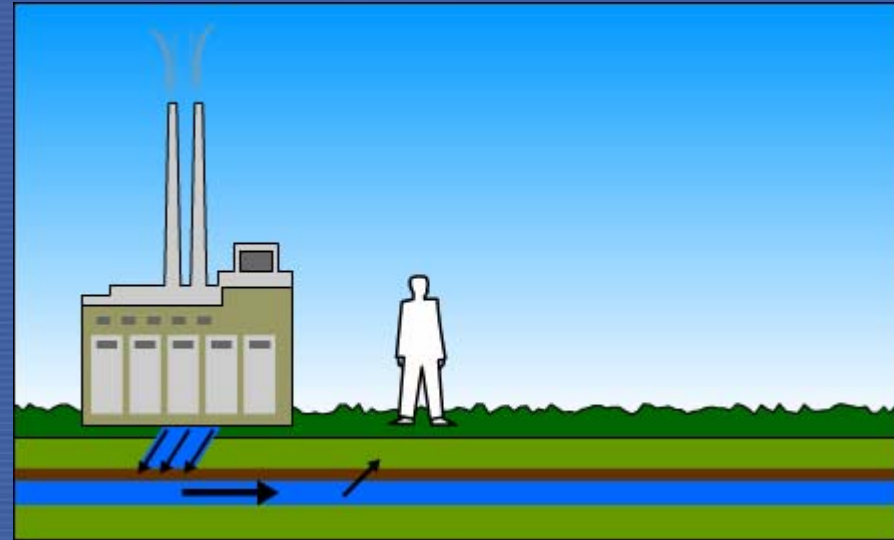
- 1. Some definitions**
- 2. Sources**
- 3. Safety Principles**
- 4. Assessment of the impact**
- 5. Environmental control**
- 6. International instruments**

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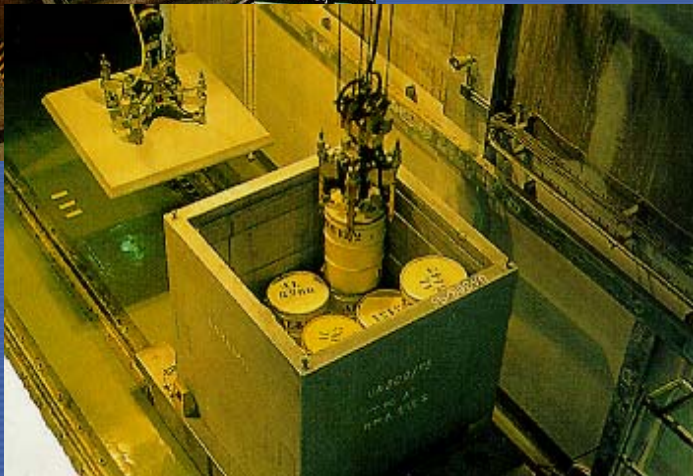
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# Some definitions

- ✓ **"discharges"** means planned and **controlled releases** into the environment, as a **legitimate practice**, within limits **authorized by the regulatory body**, of liquid or gaseous radioactive materials that originate **from regulated nuclear facilities** during normal operation (JC)



# Some definitions



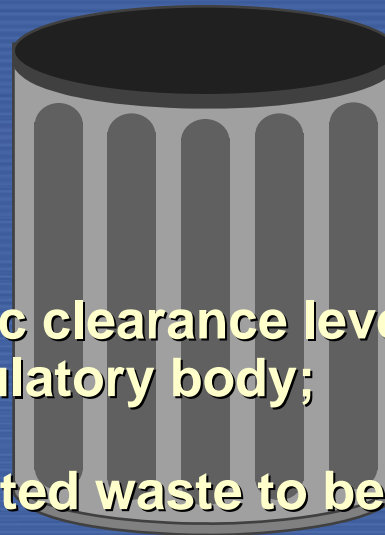
✓ *“radioactive waste” radioactive material* in gaseous, liquid or solid form for which no further use is foreseen by a natural or legal person, and which is controlled as *radioactive waste* by a regulatory body under the legislative and regulatory framework. (JC)

# Clearance

**“Clearance”**. Removal of *radioactive material* or *radioactive objects* within *authorized practices* from any further *regulatory control* by the *regulatory body*.



- According to radionuclide specific clearance levels derived and approved by the regulatory body;
- To minimize the volume of untreated waste to be stored.

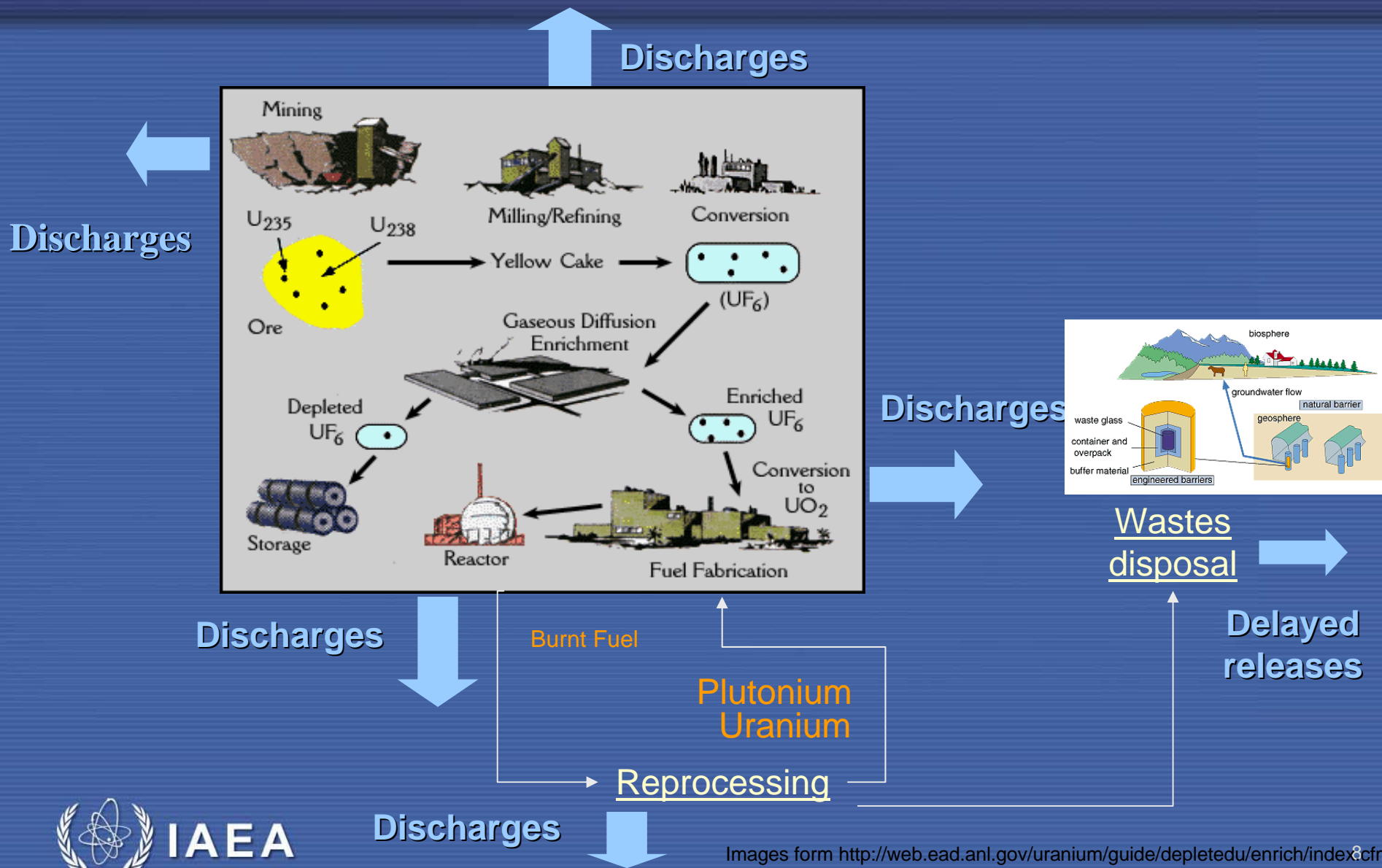




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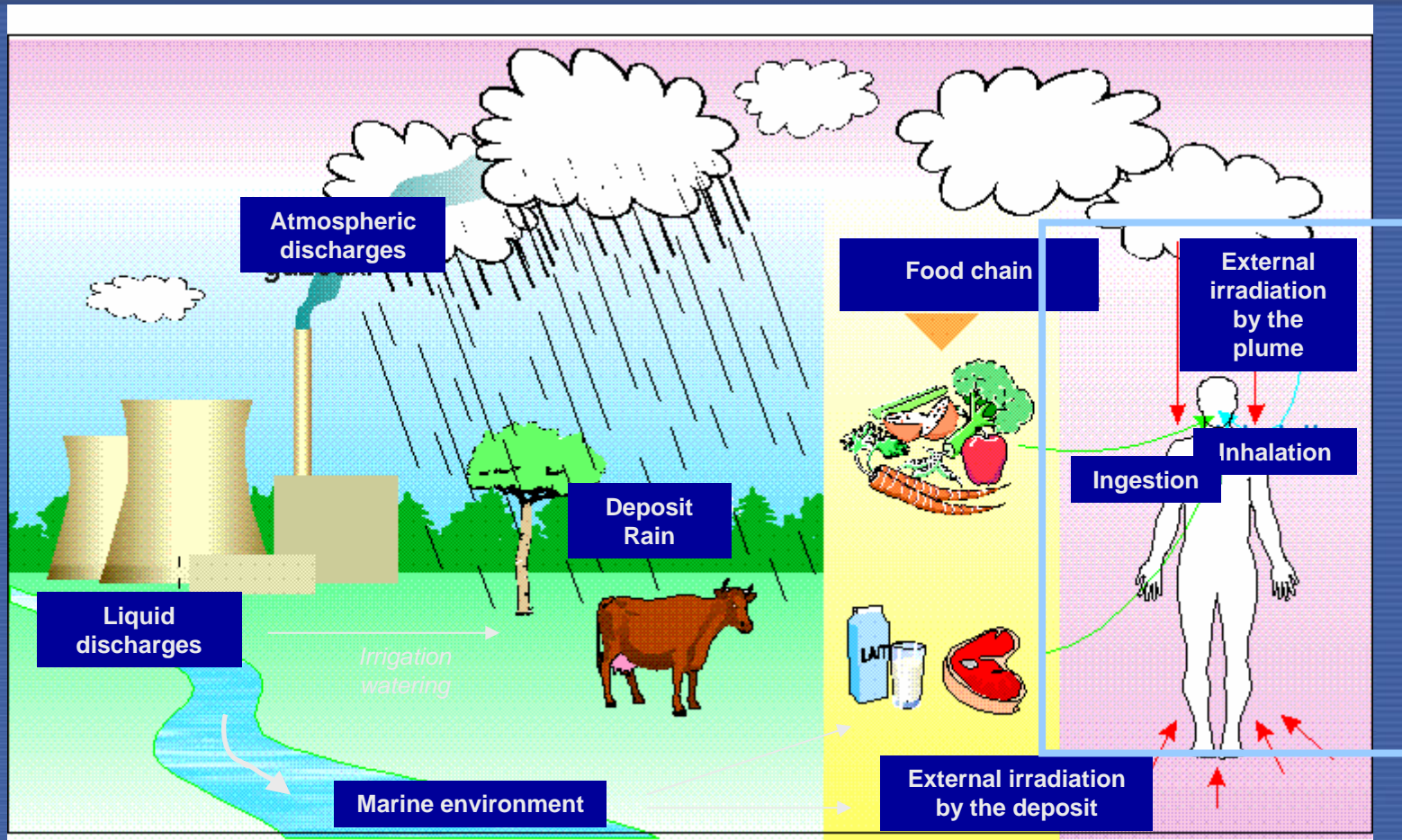
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# Potential sources of discharges to the environment associated to the Nuclear Power Generation

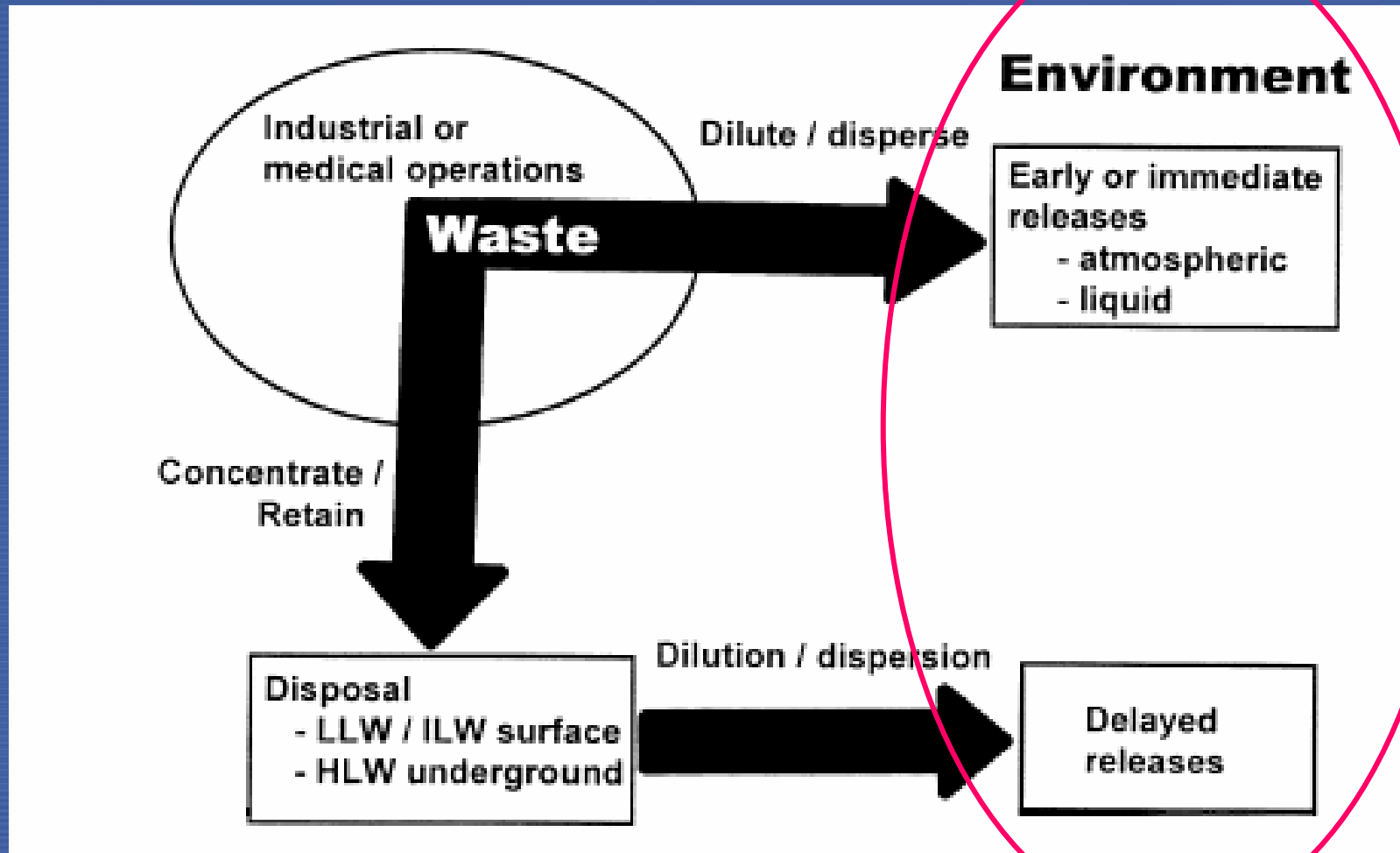




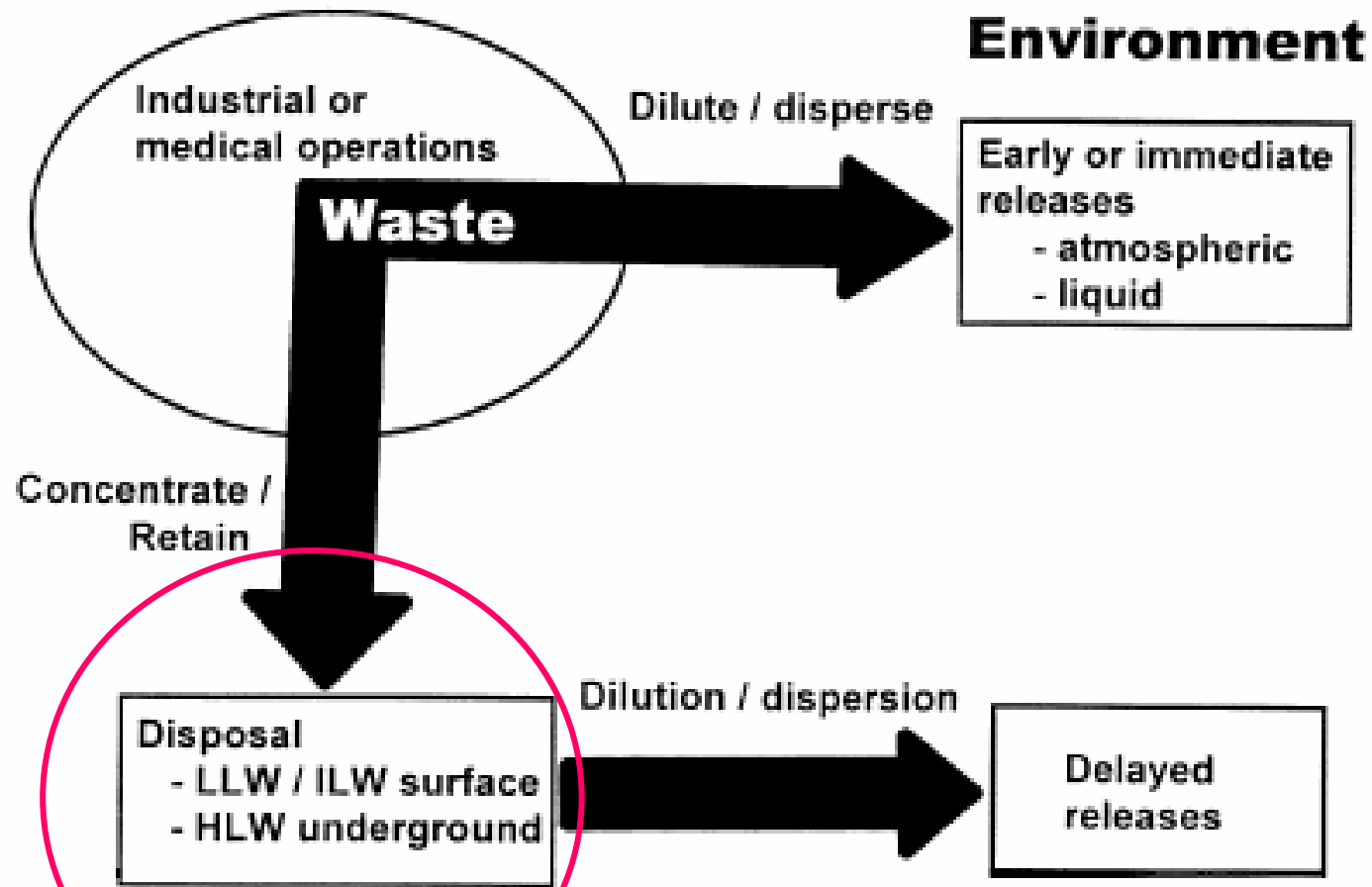
# Impact on the environment



# Waste Management Options

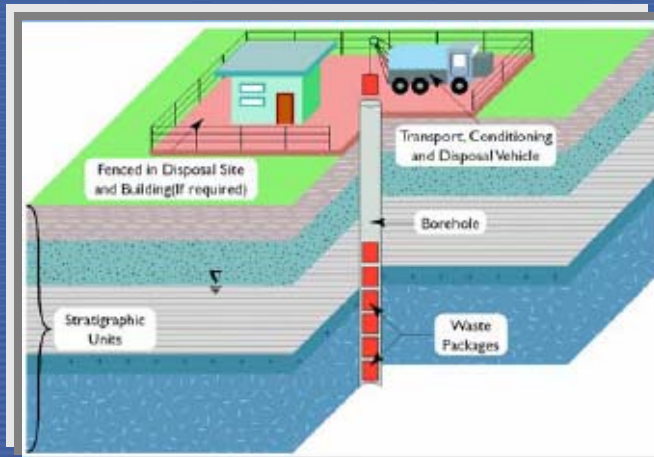


# Waste Management Options



# Storage of radioactive waste

Storage is not an end in itself,  
only a means to an end





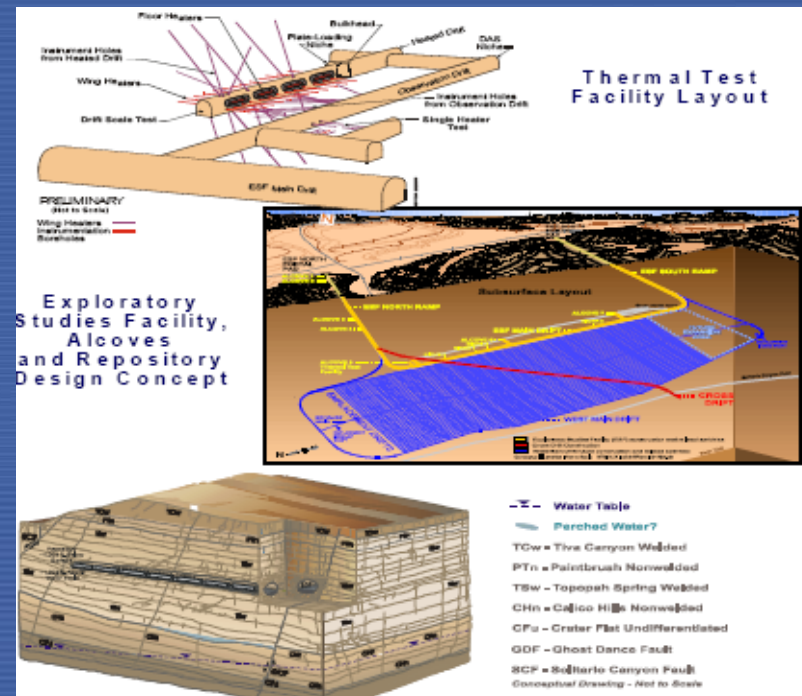
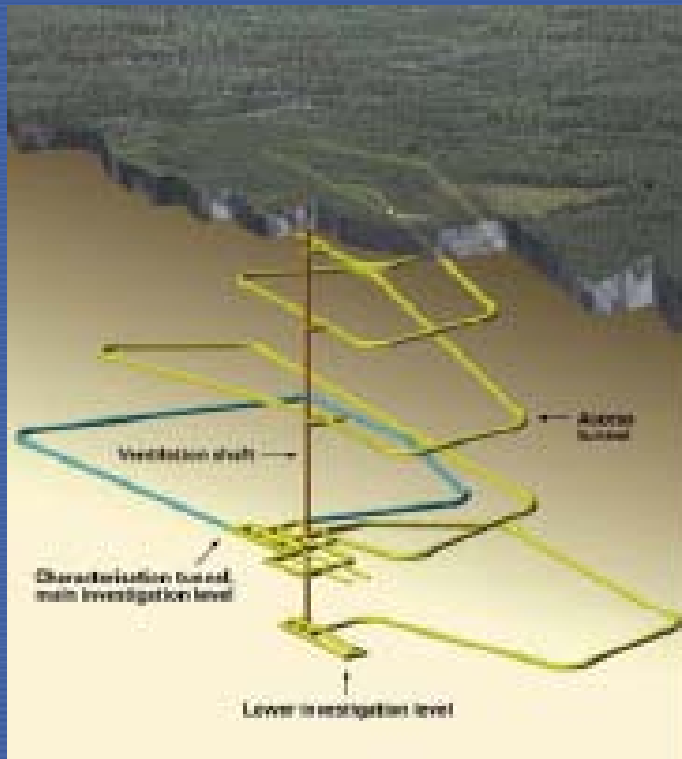
# Waste Disposal

## Near surface disposal facilities



# Waste Disposal

## Geological disposal





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# Principles in force to protect the Environment

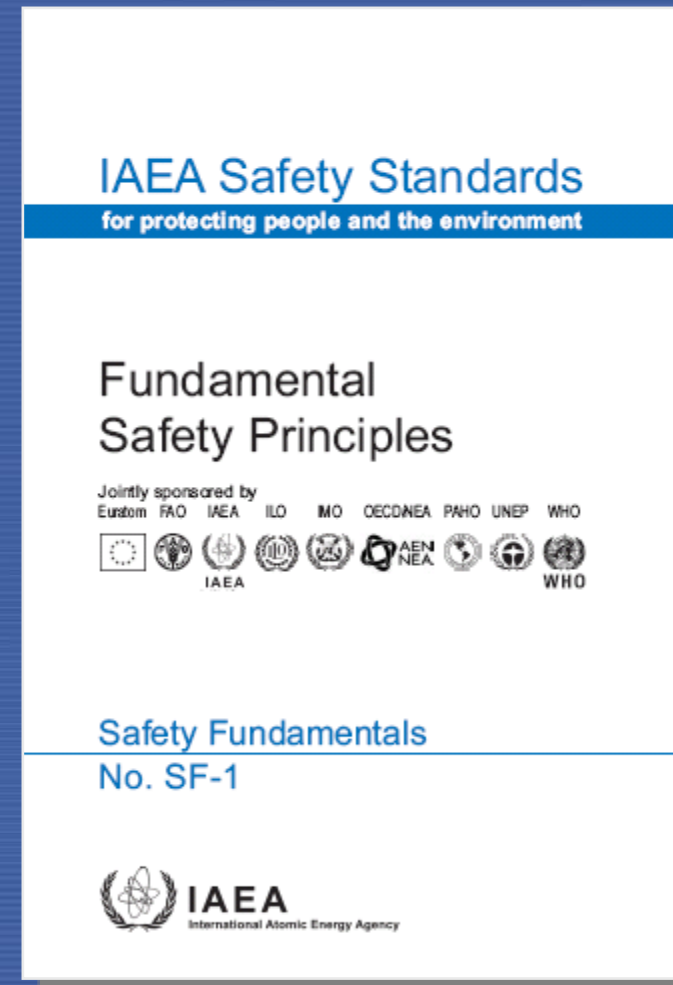
- ✓ “...the standard of environmental control needed to protect man to the degree currently thought desirable will ensure that other species are not **put at risk.**” (International Commission on Radiological Protection ICRP Publication No 60, 1990)
- ✓ “...is necessary to consider a wider range of environmental situations, irrespective of any human connection with them. The Commission is also aware of the needs of some national authorities to demonstrate, directly and explicitly, that the environment is being protected, even **under planned situations...**” (International Commission on Radiological Protection, Draft New Recommendations, 2007)



# Fundamental Safety Principles

## SAFETY OBJECTIVE

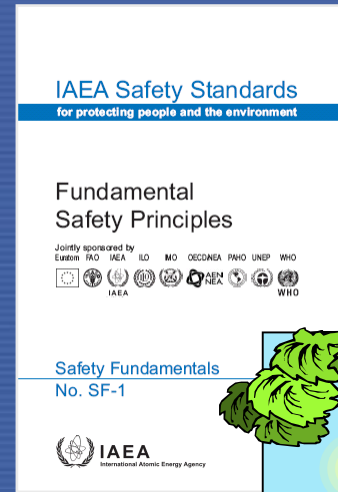
The fundamental safety objective is to protect people and the environment from harmful effects of ionizing radiation



# Principle in force to protect the Environment

***Principle 7:  
Protection of  
present and future  
generations.***

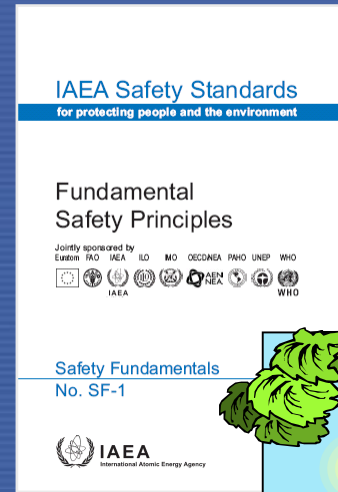
**People and the  
environment,  
present and future,  
must be protected  
against radiation  
risks.**



# Principle in force to protect the Environment

*Principle 7: Protection of present and future generations.*

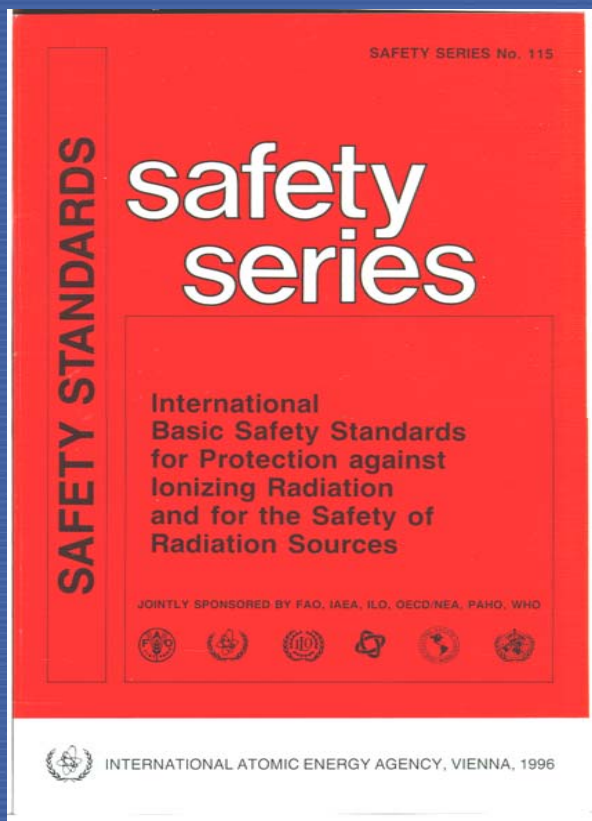
**Radiation risks may transcend national borders and may persist for long periods of time.** The possible consequences, now and in the future, of current actions have to be taken into account in judging the adequacy of measures to control radiation risks.





# Principles in force to protect the Environment

- International radiation standards for the purpose of protecting human beings... 'will also ensure that no other species is threatened as a population, even if individuals of the species may be harmed.'



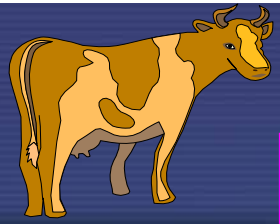
IAEA Requirements, BSS, International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (Safety Series 115, 1996)



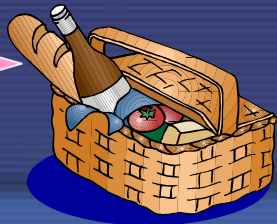
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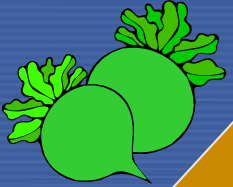
**Agricultural products**  
Interception  
Yield  
Translocation  
Biological period  
Fodder rates  
Herds control  
...



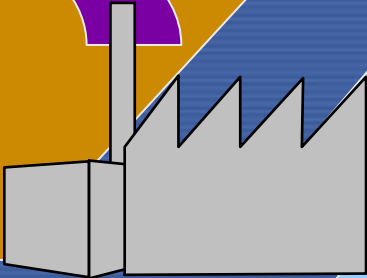
**Feeding**  
Food rates  
Subsistence farming



**Deposition**  
Washout ratio  
Kind of rains



**Soils**  
Migration rate  
Kind of soils  
soil/plant transfer



**River migration**  
Flow rate  
Rate of MES  
Time period...

**Erosion**  
Slope  
Rain  
Land cover  
Kind of soil

**River banks**  
Slope  
River bank vegetation  
Type of soil

# Environmental Impact

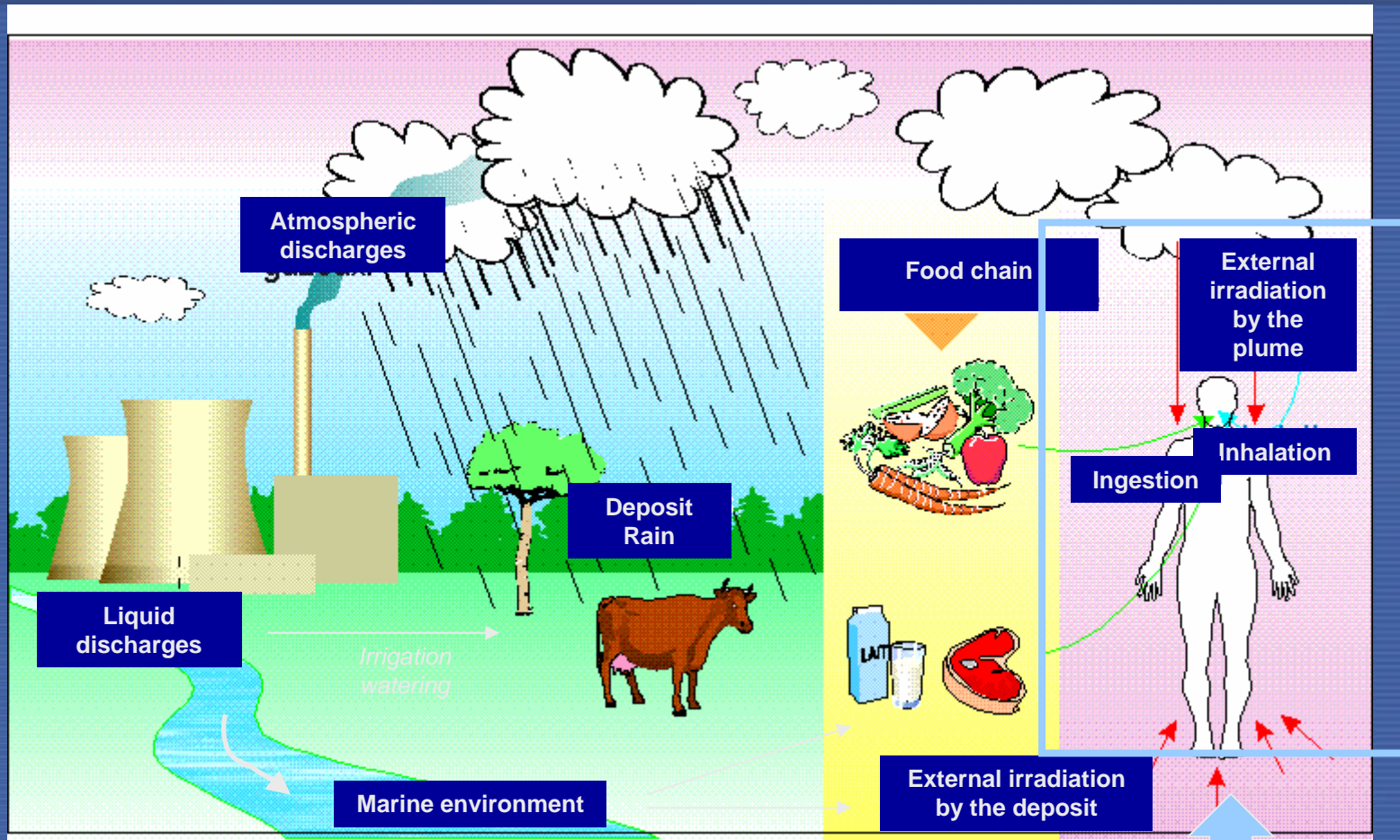


**Coastal areas**  
Dilution rates  
Concentration factors  
Biological yield...

# Environmental impact assessment

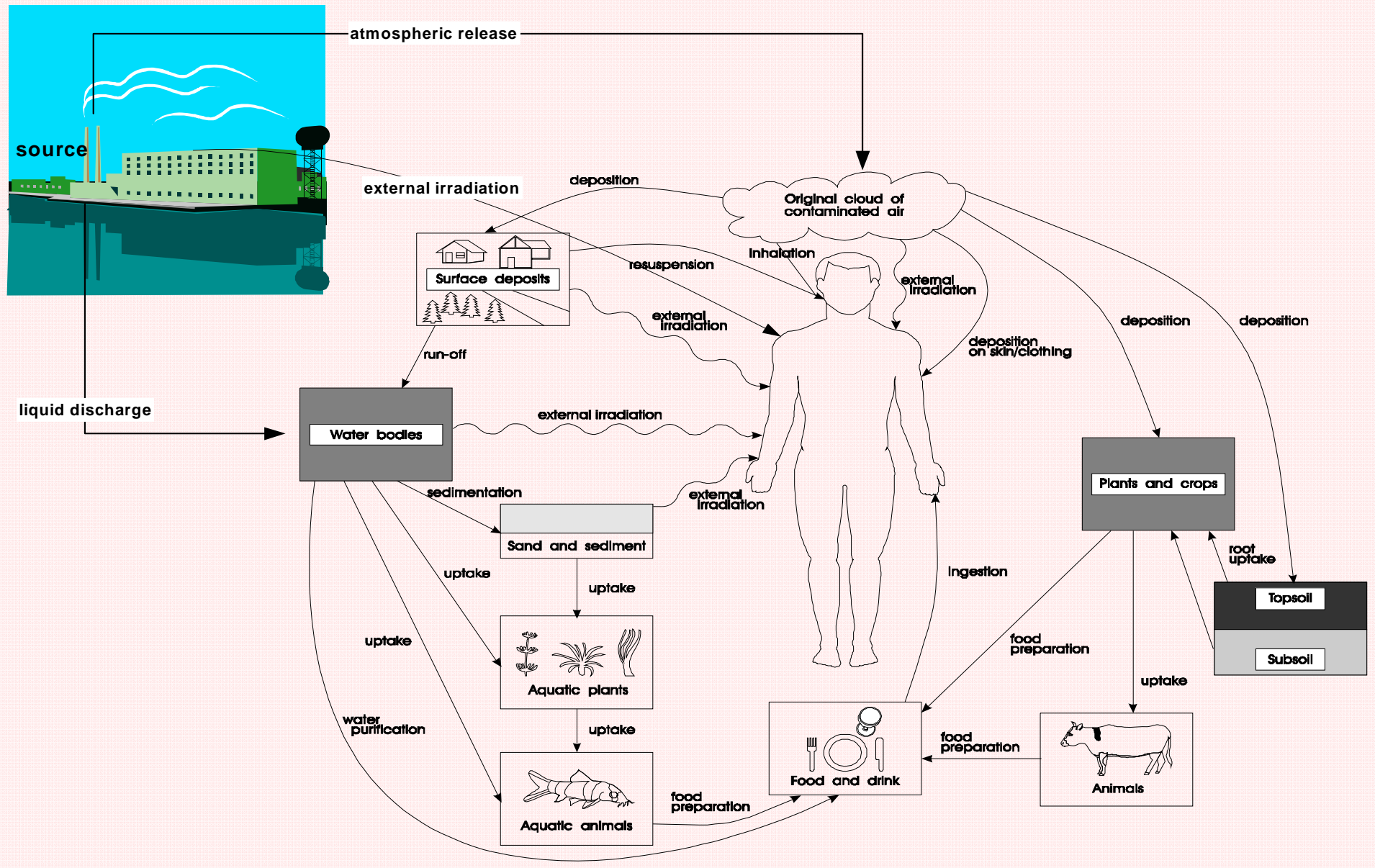
- ✓ "**Environmental impact assessment**" means a national procedure for evaluating the likely impact of a proposed activity on the environment. (ESPOO)
- ✓ "The Party of origin shall ensure that in accordance with the provisions of this Convention an **environmental impact assessment** is undertaken prior to a decision to authorize or undertake a proposed activity listed in Appendix I that is likely to cause a significant adverse transboundary impact." (ESPOO)
- ✓ "...before construction of a radioactive waste management facility, a systematic safety assessment and an **environmental assessment** appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out." (JC)
- ✓ "...to ensure that appropriate procedures are established and implemented for **evaluating the likely safety impact of a proposed nuclear installation on individuals, society and the environment...**" (NC)

# ASSESSMENT OF THE IMPACT – A highly complicated problem



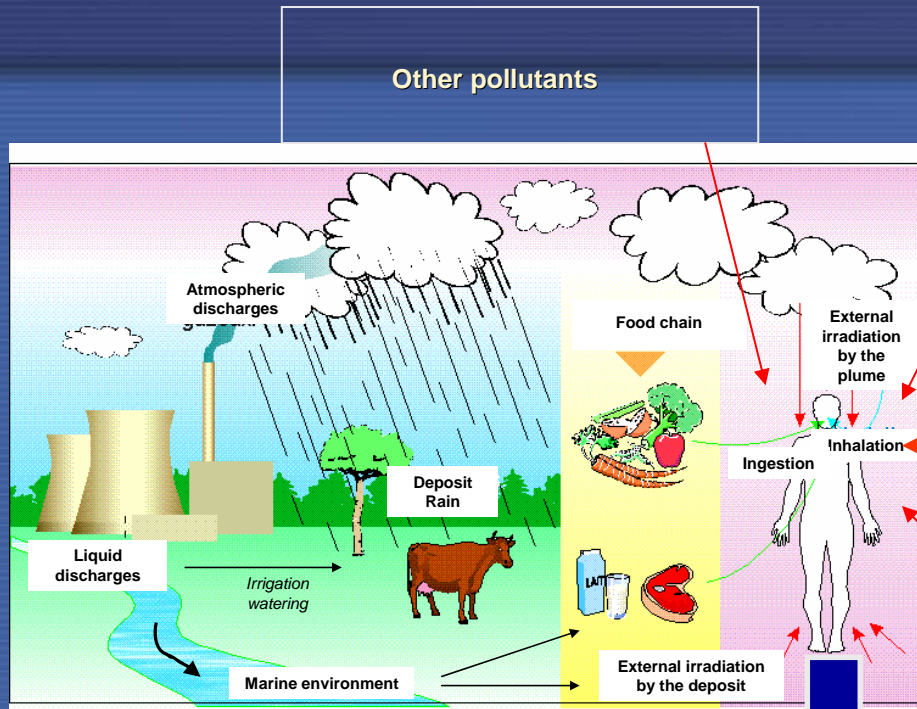
At the present time, the criteria are mainly governed by the dose to the human been.

# Pathways of radiation to man

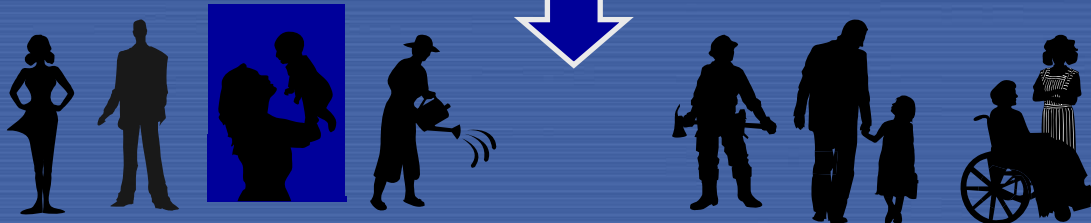




# And radioprotection is only a part of the problem



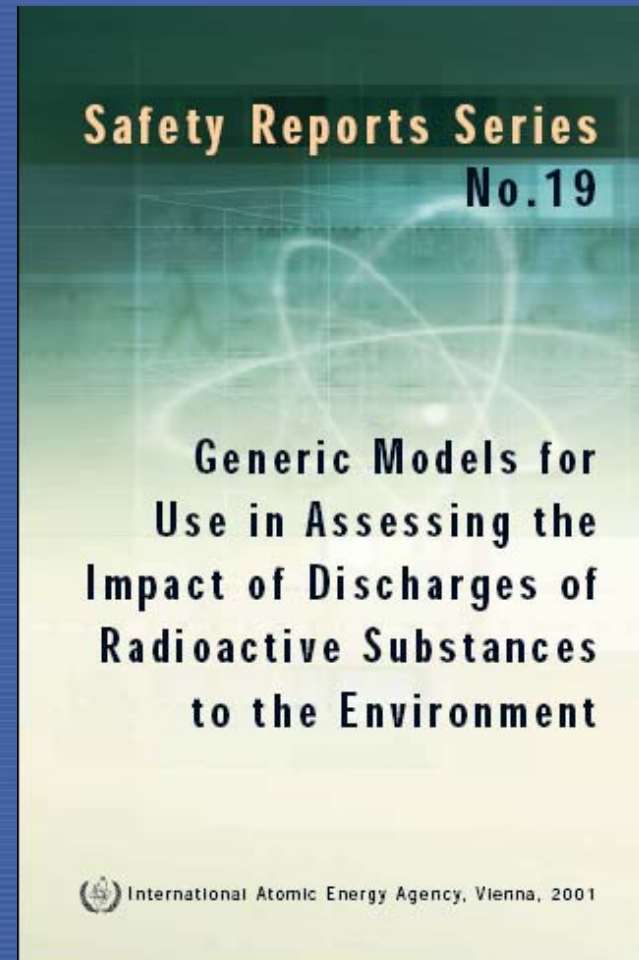
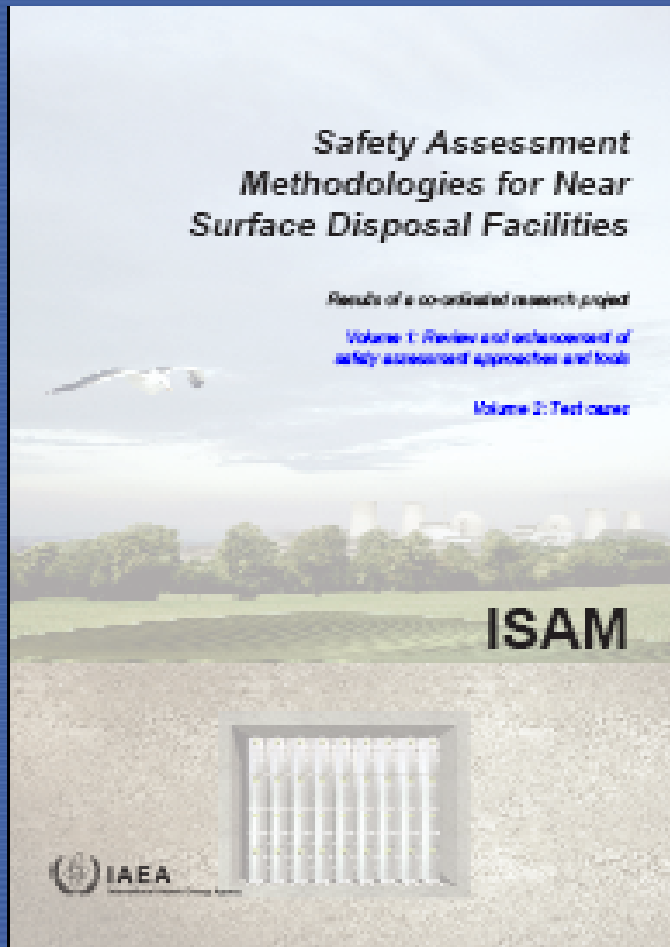
	<b>Economical aspect</b>	Employment Home monetary value Kitchen garden availability ...
	<b>Patrimonial aspect</b>	History Cultural habits Level of acceptability for changes ...
	<b>Familial aspect</b>	Family structure Reactions from the family ...



People are not “reference man” ... so there are different ways of assessing the priorities between all these interested parties



# Assessment methods



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# MONITORING IN PRACTICES

**MONITORING  
DURING  
OPERATION**

SOURCE

ENVIRONMENT

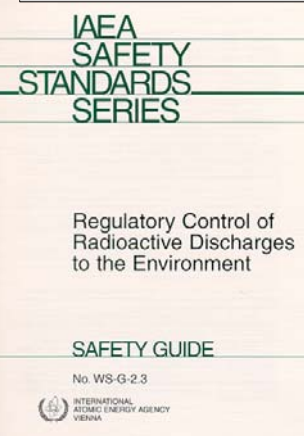
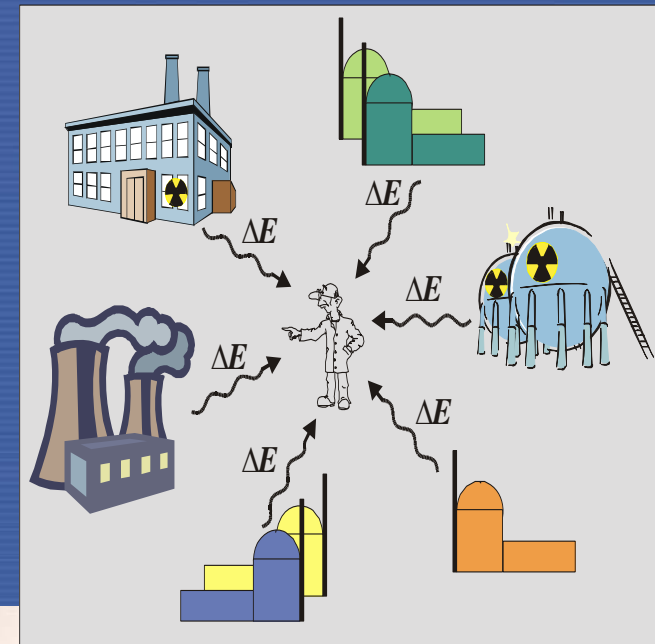


# Control of Discharges

To ensure that:

- ✓ adequate **criteria** for discharges are established by the Regulatory Body.
- ✓ discharges into the environment from authorized sources are **properly controlled**
- ✓ in addition, **optimized** within public dose constraints, and
- ✓ an environmental monitoring programme is established. **To provide information for the public.**

(IAEA Safety Standards Series No. WS-G-2.3)



# MONITORING PROGRAMMES

## Different at various stages:

- ✓ Pre-operational stage,
- ✓ Operational stage,
- ✓ Decommissioning (or closure),
- ✓ Post-closure.



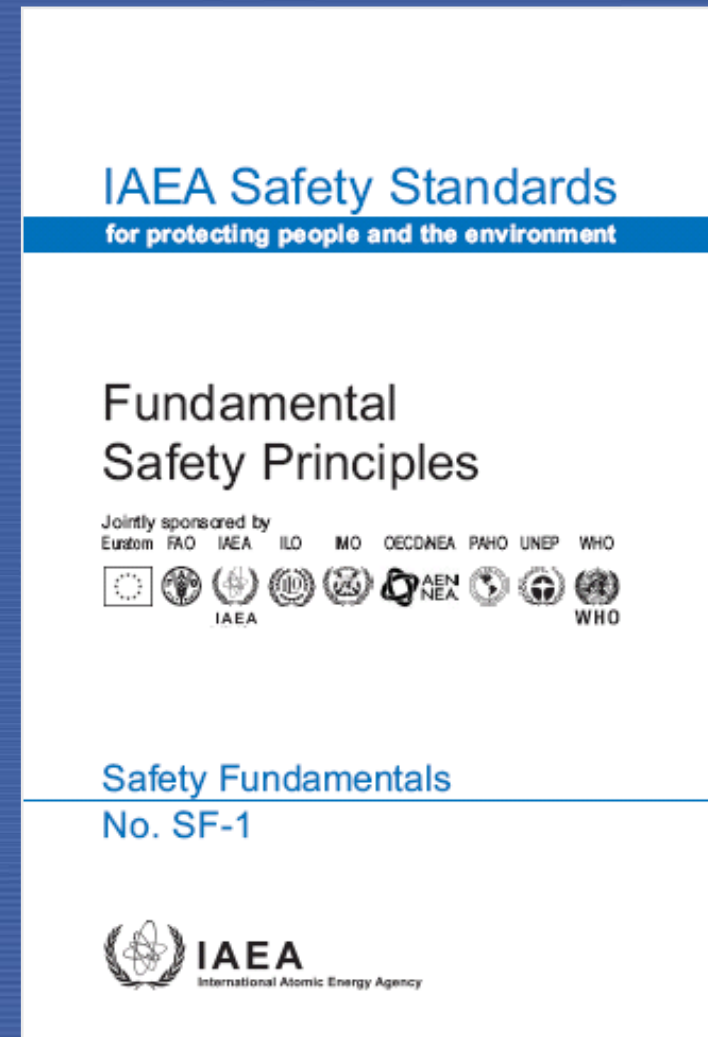
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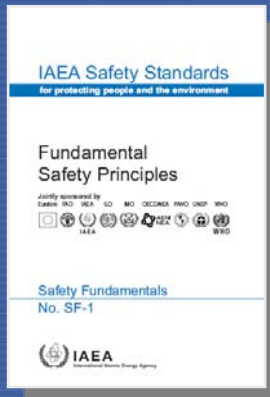
# Internationally Endorsed Fundamental Safety Principles

Coherent basis for international safety standards



# IAEA Safety Standards

## Hierarchical Corpus of the IAEA International Safety Standards



Fundamentals

Requirements

Guides



- Principles

- Regulatory Imperatives

- Best practices

# Binding International Legal Instruments

## ✓ Convention on Nuclear Safety

- to establish and maintain **effective defenses** in nuclear installations against potential radiological hazards in order **to protect individuals, society and the environment** from harmful effects of ionizing radiation from such installations

# Binding International Legal Instruments

- ✓ **Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management**
  - to ensure that during all stages of spent fuel and radioactive waste management there are effective defenses against potential hazards so that **individuals, society and the environment are protected from harmful effects of ionizing radiation**, now and in the future, in such a way that the needs and aspirations of the present generation are met without compromising the ability of future generations to meet their needs and aspirations.

## Other related environment convention

- ✓ **London Convention (forbid waste disposal at sea)**
- ✓ **OSPAR Convention (discharges control)**
- ✓ **HELCON Convention (reduction of pollution)**
- ✓ **ESPOO Convention (EIA)**



A photograph of the International Atomic Energy Agency (IAEA) headquarters in Vienna, Austria. The image shows a large, modern, curved building with a grid of windows. In the foreground, a large number of international flags are flying on tall poles. The sky is overcast. The word "Thanks" is written in red, handwritten-style text across the middle of the image.

Thanks

*Luis Jova Sed*  
*International Atomic Energy Agency*  
*Tel: (+43) 1 2600 22550*  
*e-mail: [L.Jova-Sed@iaea.org](mailto:L.Jova-Sed@iaea.org)*