IAEA
International Atomic Energy Agency
Atoms for Peace and Development

Applying Science for Development: *Atoms for Life*

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1. The Science Behind the Scenes

What is ‘radiation’ really?

In physics, radiation is the **emission or transmission of energy** in the form of waves or particles through space or through a material medium *(Wikipedia)*

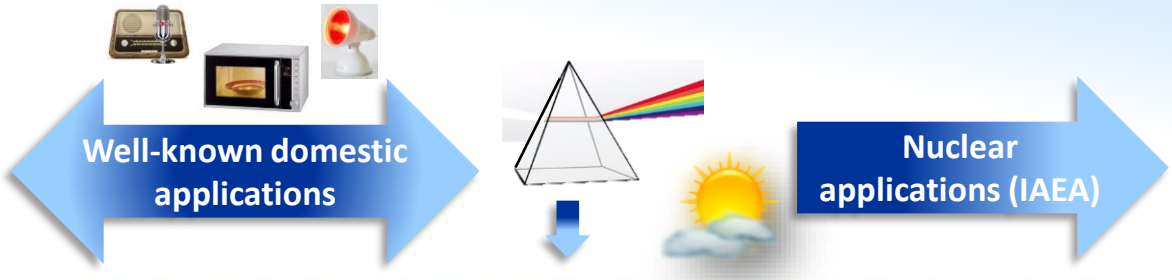
The combined processes of emission, transmission, and absorption of **radiant energy** *(Merriam-Webster Dictionary)*

The **emission of energy** as electromagnetic waves or as moving subatomic particles, especially high-energy particles which **cause ionization** *(Oxford Dictionary)*

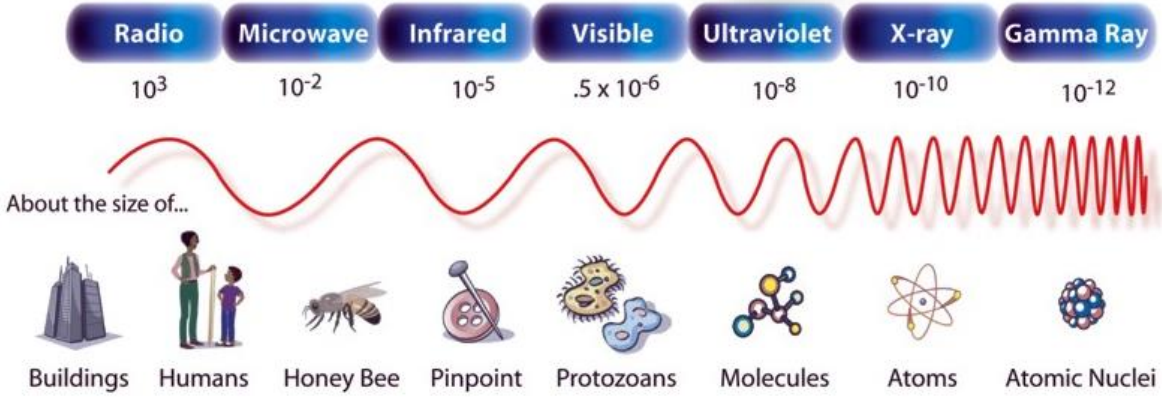
A form of energy that comes from a **nuclear reaction** and that can be **very dangerous** to **health** *(Cambridge Dictionary)*

The electromagnetic spectrum

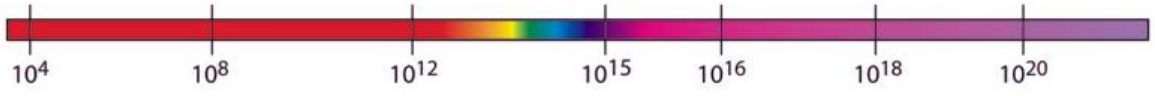
What do people generally know about?



Wavelength *(metres)*

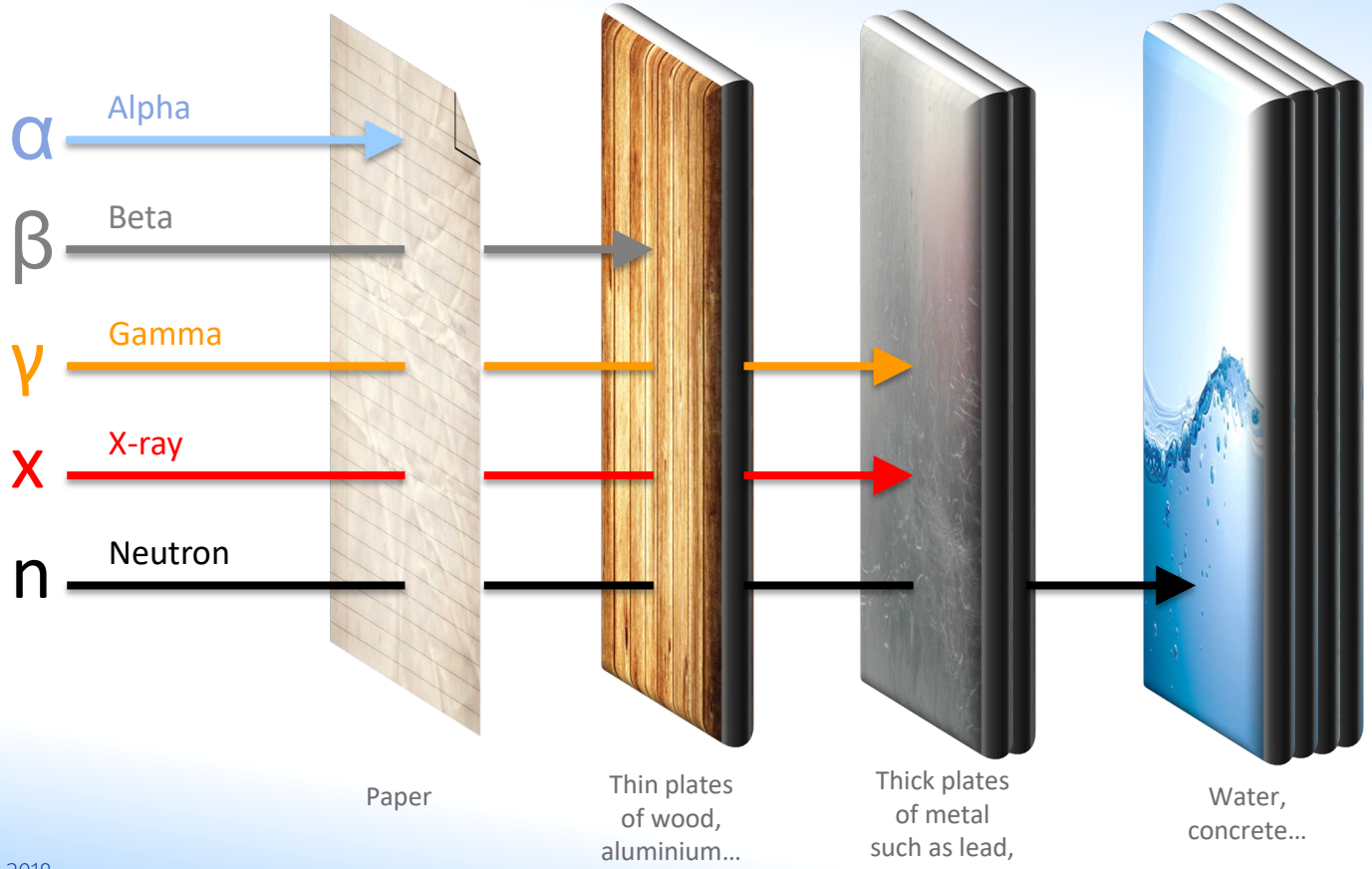


Frequency *(Hz)*



Source: NASA

Alpha (α), Beta (β), Gamma (γ), X-ray and Neutron radiation



Source: UNSCEAR, 2018

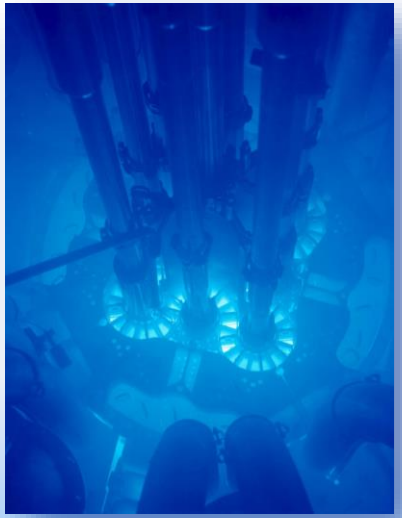
‘Irradiated’ or ‘Radioactive’?

IRRADIATED:

Exposed to radiation from man-made or natural sources

Ex: Cables are irradiated to enhance their resistance to chemicals and heat

© IAEA



© US-NRC

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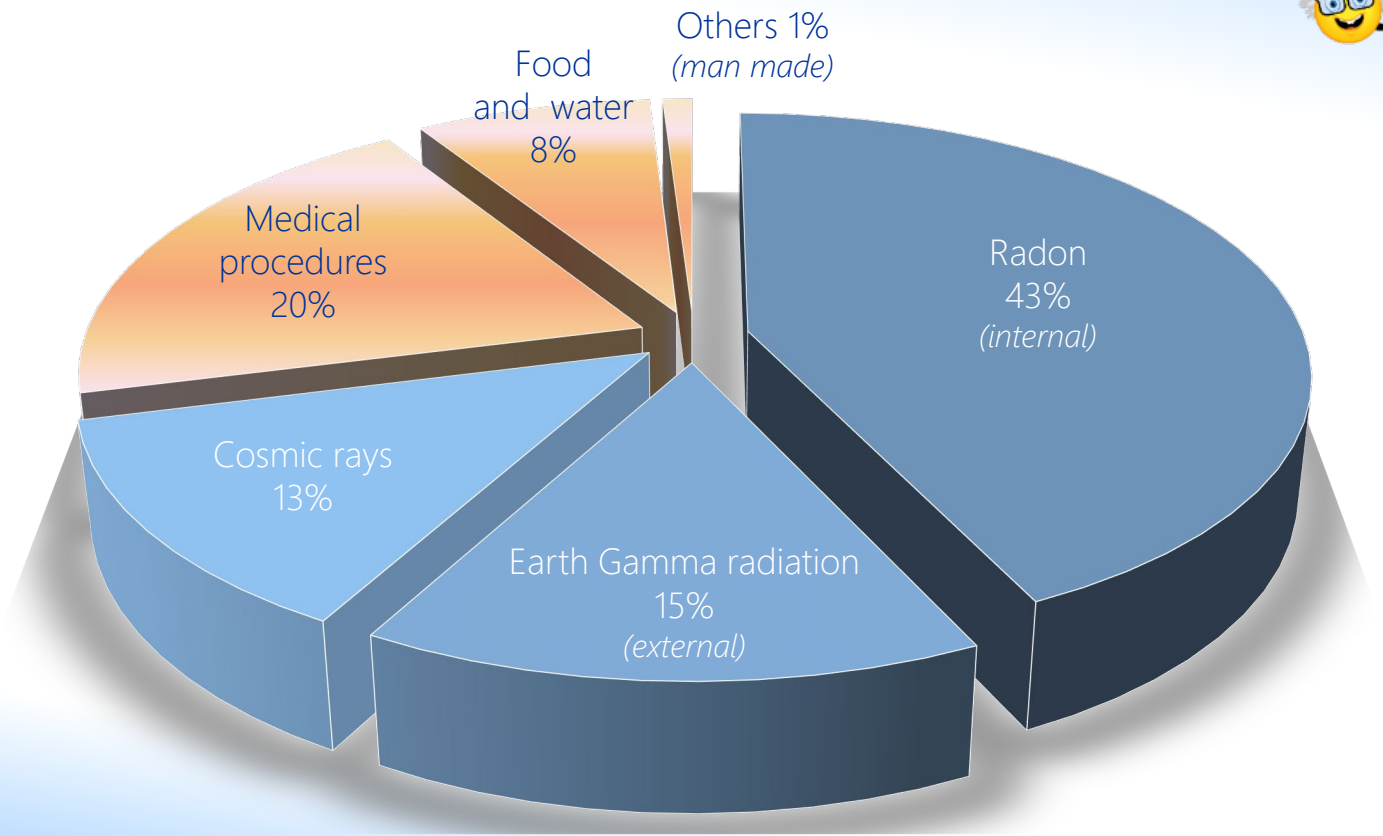
RADIOACTIVE:

Emits ionizing radiation or particles

Ex: Uranium and Plutonium are two of the most widely known radioactive materials

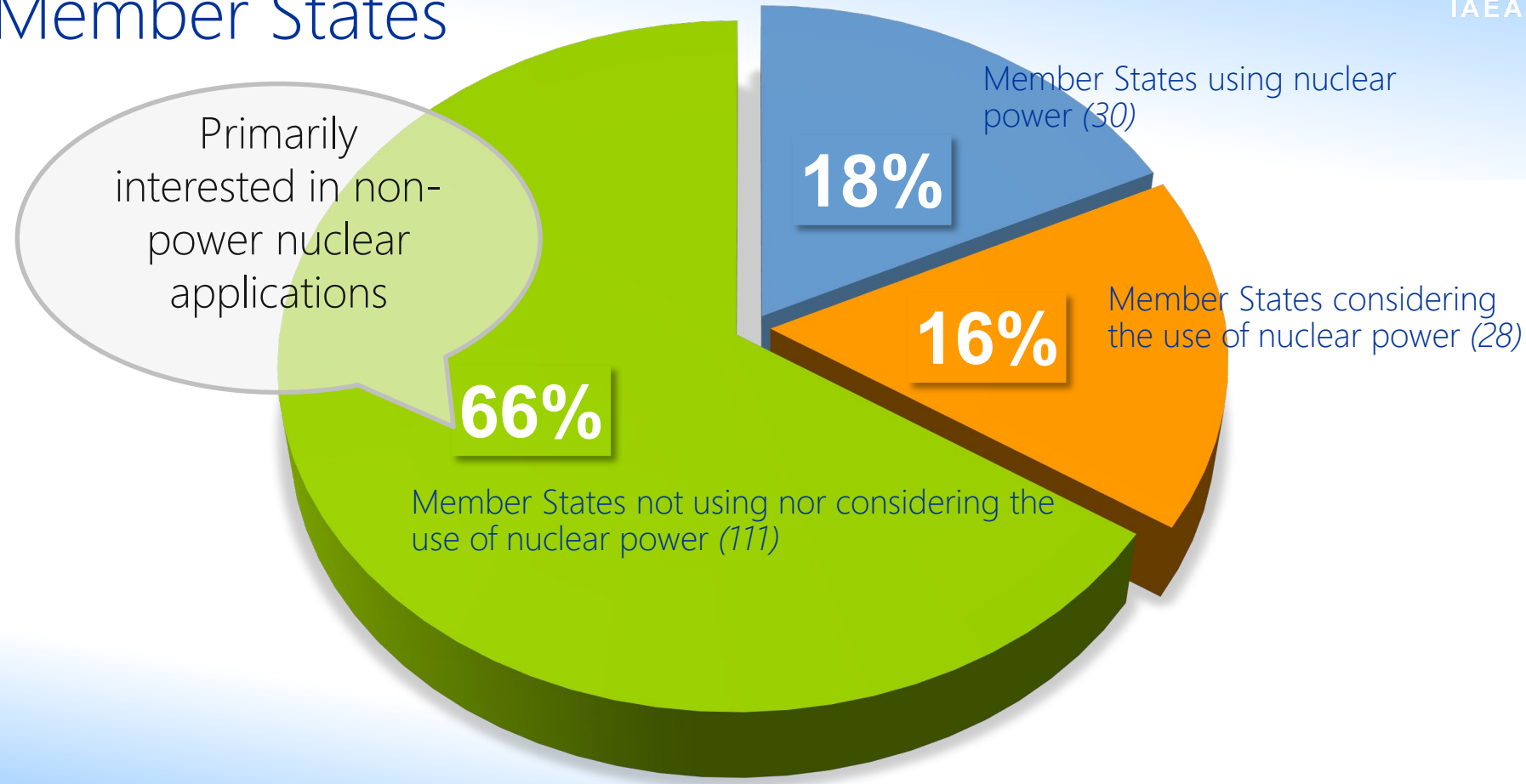
Main sources of radiation exposure



Source: WHO, 2018

2. Nuclear Science, Technology and their Applications

Nuclear power and interest of the IAEA Member States



Some of the uses of non-power nuclear applications

Use of Radiation

- Plant mutation breeding
- Insect pest control
- Animal diseases control (irradiated vaccines)
- Diagnosis and treatment of human diseases
- Industrial applications
- Forensic analysis

Use of Isotopes and Stable Isotopes

- Radiopharmaceuticals
- Materials analysis
- Livestock genome mapping
- Food authenticity testing
- Environmental contaminant monitoring
- Assessing changes in soil and water

Quality Control

- Dosimetry
- Calibration of environmental sampling equipment

Non-power nuclear applications at the IAEA

Food & Agriculture

Promoting food security and sustainable agricultural development

Human Health

Improving the diagnosis and treatment of diseases and nutrition

Science & Industry

Providing knowledge and expertise for science and industry

Water Resources

Making cleaner water accessible to more people

Environment

Understanding and protecting the environment

Main areas of work

Science and Technology	Safety and Security	Safeguards and Verification

Nuclear Sciences & Applications (NA)

Nuclear Energy (NE)

Nuclear Safety & Security (NS)

Technical Cooperation (TC)

Safeguards (SG)

Management (MT)

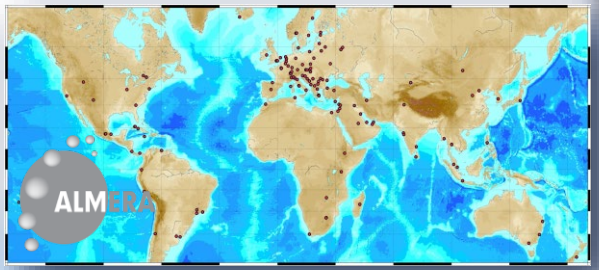
DGOC + Offices Reporting to DG

3. Nuclear Science, Technology and their Applications: Did you know?

#atoms4life

…that Vienna is *close to* the ocean…

- Reference materials for marine and terrestrial environments
- Coordination of ALMERA (Analytical Laboratories for the Measurement of Environmental Radioactivity) network



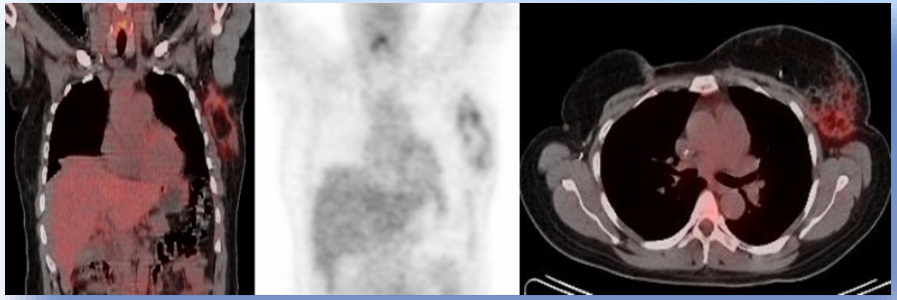
Understanding and protecting the environment

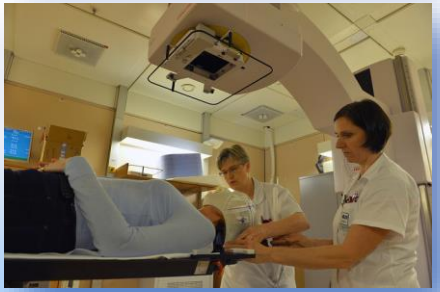
Seawater sampling in Fukushima

#atoms4life

that *PETs* can save lives…

PET=Positron Emission Tomography





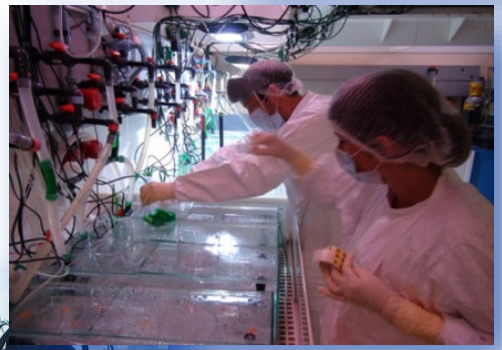
- Dosimetry, calibration
- Diagnostic imaging for Non Communicable Diseases
- Radiotherapy
- Stable isotopes for nutrition

Improving nutrition, diagnosis and treatment of diseases

Molecular imaging to diagnose Alzheimer's

#atoms4life

...where to *find Nemo*...



- Ocean acidification
- Monitoring of pollutants, radioactivity
- Harmful Algal Blooms

Understanding and protecting the environment

Monitoring changes in coastal waters of Kuwait

#atoms4life

...that there is a *birth control* for insect pests...

1+1 = 0

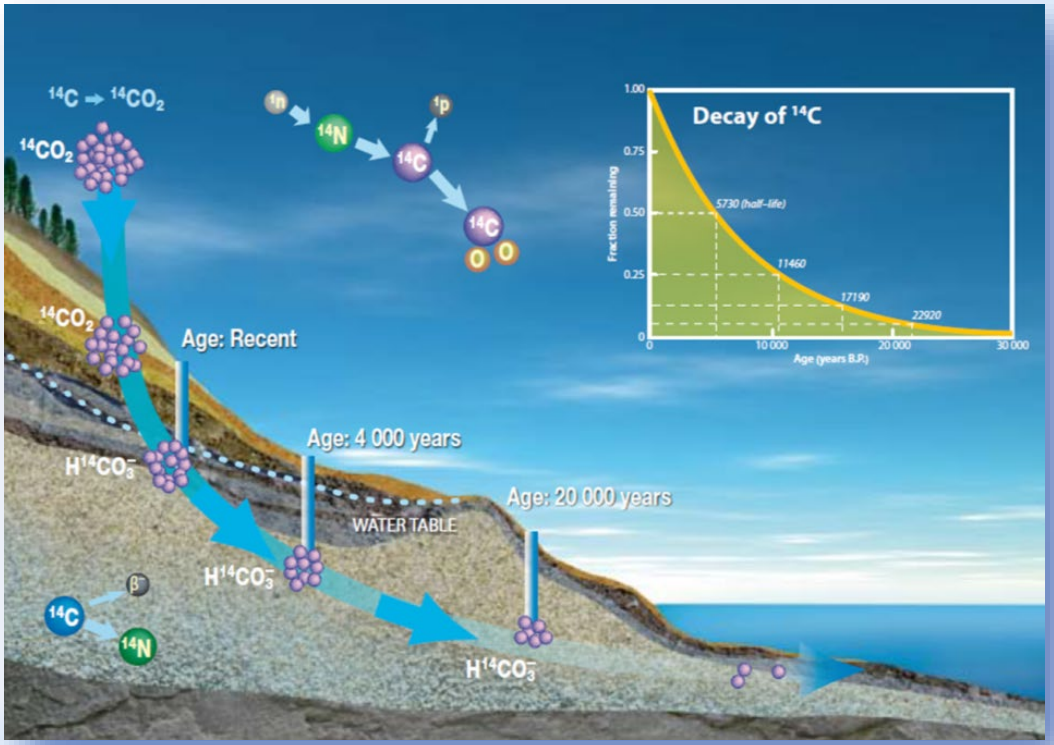
- Soil and water management
- Mutant plant varieties
- Diagnosis of animal diseases and livestock management
- Food safety, traceability and authenticity

Promoting food security and sustainable agricultural development

Studying erosion with radionuclides

#atoms4life

…that *age matters*…even for water …



H_2O

Making more, and cleaner water available to more people

- Mapping of groundwater resources with isotope hydrology

Freshwater resources in Argentina

SCIENCE

#atoms4life

...that the *"Saliera" spiced up* the work of the IAEA labs...

- Sterilization of healthcare products
- Radiopharmaceuticals
- Radiation processing of natural polymers
- Cross-linked coatings
- Wastewater treatment

Providing knowledge and expertise for science and industry

Radiation technologies in daily life

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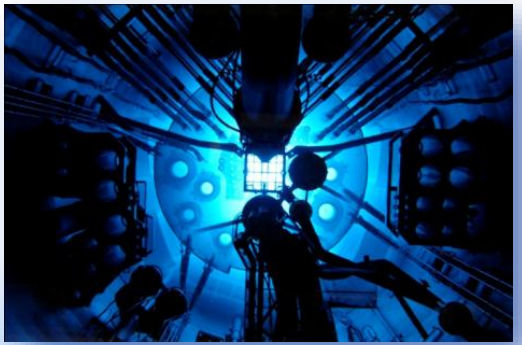
Nuclear Energy in brief

Planning & training

Uranium exploration & production

Power production



Research reactors

Spent fuel & waste

Decommissioning

Fusion Energy Conference 2018

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Nuclear Safety and Security in brief

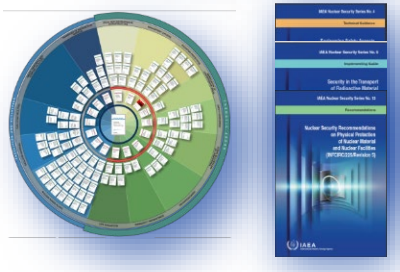
Nuclear Installation Safety

Global Nuclear Safety and Security Framework

Global Nuclear Security

Emergency Preparedness and Response

Radiation, Transportation and Waste Safety



Nuclear Safety Standards and Security Guidelines

100th IRRS Mission

4. Nuclear Science, Technology and their Applications: How do we deliver?

How do we deliver?

REGULAR BUDGET programme

TECHNICAL COOPERATION Programme

R&D

- NA Labs
- CRPs
- CCs

Validation

- CRPs
- Pilot projects
- ICT*

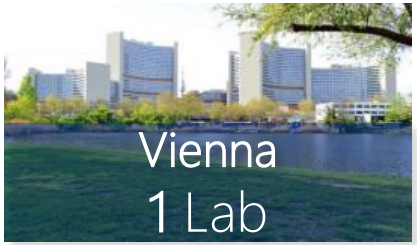
Transfer

- TC projects
- Education & training

IF TRUE THEN

*Information Communication Technologies

Twelve dedicated laboratories



Water Resources

Isotope Hydrology

Food & Agriculture

Human Health

Nuclear Science

Environment

SIT: Sterile Insect Technique

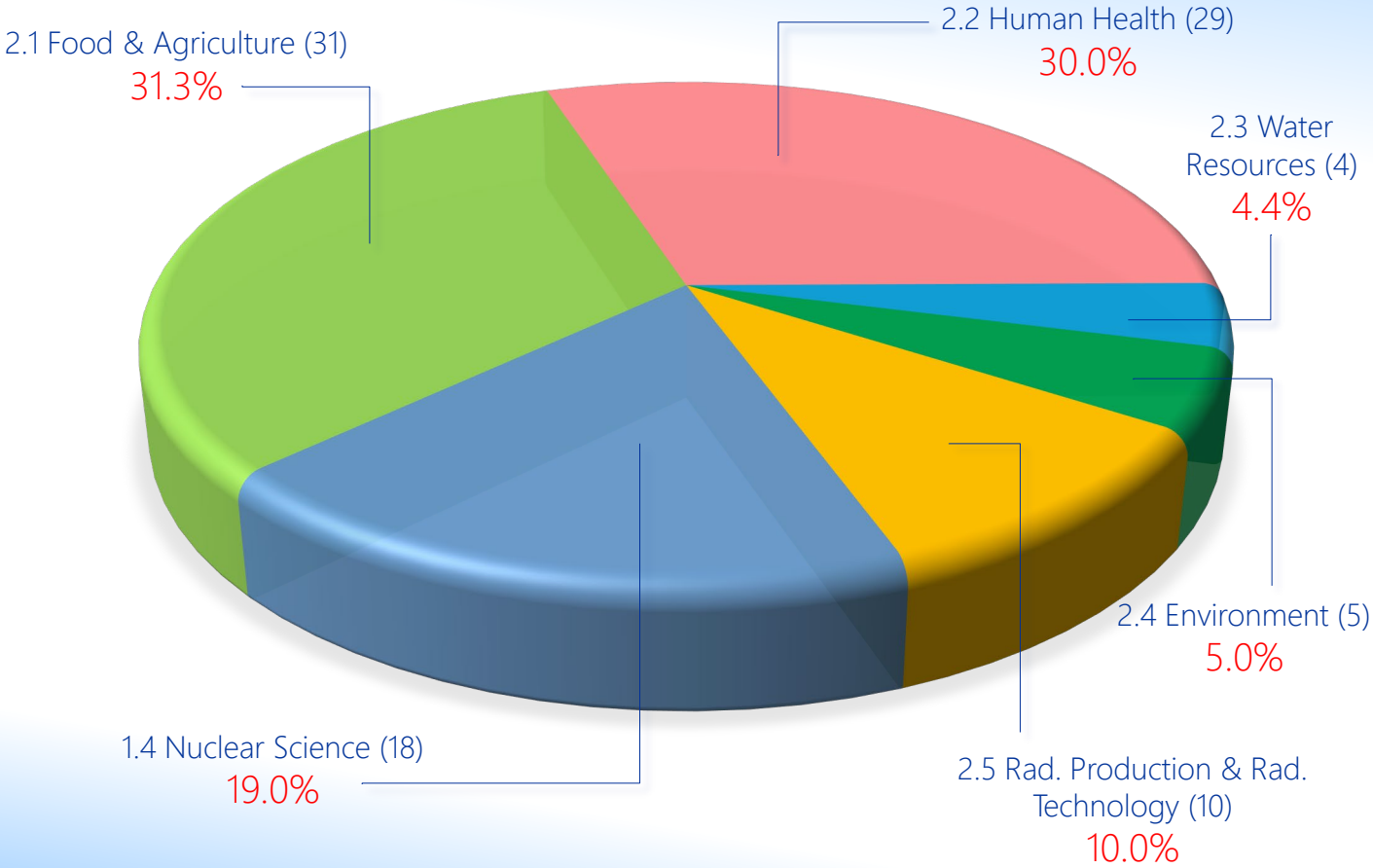
Plant Breeding

Environment

The only marine environment laboratories in the UN system

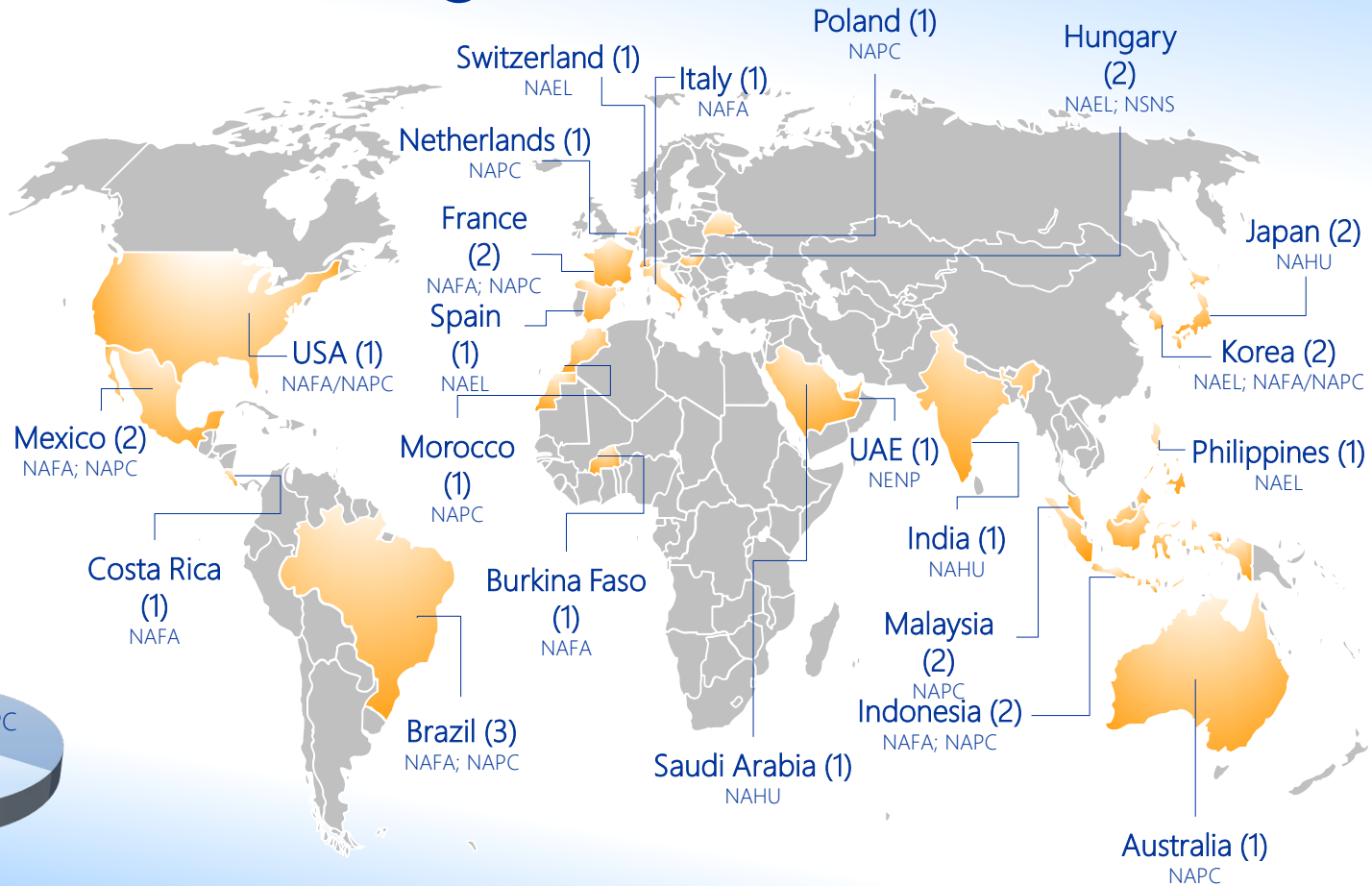
Radioecology

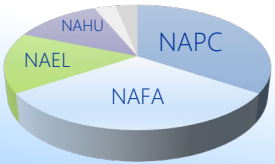
Coordinated Research Projects



NACA, 2017 data

IAEA Collaborating Centres worldwide





NACA, 2018 data

Working with partners/donors

- **Main UN partners**: FAO, WHO, UNEP.
- **Practical Arrangements**:
  Non-legally binding instrument negotiated with an institute or an organization. Arrangements to cooperate on issues of common interest (European Commission).
- **Memorandum of Understanding**:
  Used in general when funding is involved for cooperation (Fukushima Prefecture).
- **PUI projects**:
  Specific projects developed by technical Departments (NA, NE, NS), planned and implemented within IAEA programme, funded by donors, with impact at country level (VetLab; Iwave).
- **Private sector**:
  Specific equipment for technical Departments (Varian, Shimadzu).

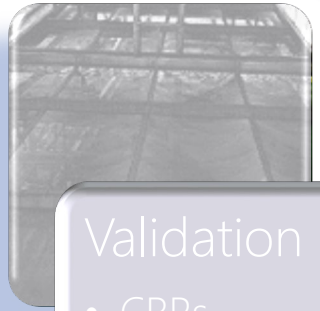
How do we deliver?

REGULAR BUDGET programme

TECHNICAL COOPERATION Programme

R&D

- NA Labs
- CRPs
- CCs



Validation

- CRPs
- Pilot projects
- ICT*

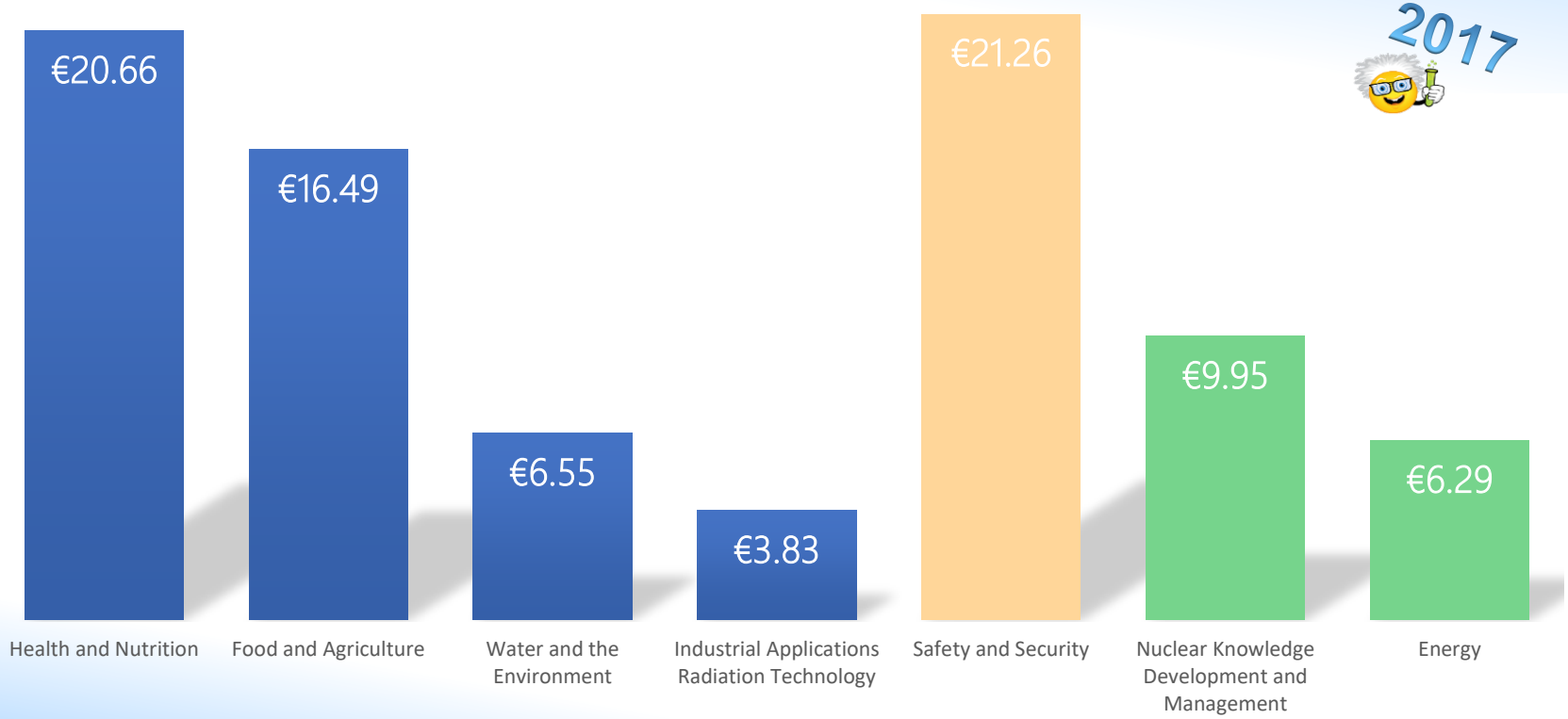
Transfer

- TC projects
- Education & training

IF TRUE THEN

*Information Communication Technologies

Disbursement at country level through IAEA Technical Cooperation Programme



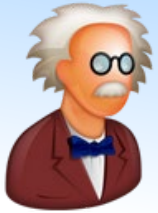
Total TCF disbursements in 2017: €85.02 million

5. Ready for a quiz?

How much do you know? *(1/2)*

	Irradiated	Radioactive
1. Tomorrow, I will go to the hospital to get an x-ray of my chest, I will be…	✓	✗
2. Uranium and/or Plutonium are stored inside pools in nuclear reactors because they are…	✗	✓
3. The tires of my car are now more resistant to abrasion because they have been…	✓	✗
4. The mangoes I bought today at the market have been treated with radiation before export for phytosanitary purposes, they are…	✓	✗
5. If I eat food which has been irradiated, I will become…	✗	✗

How much do you know? *(2/2)*



	TRUE	FALSE
1. Radiation occurs naturally	✓	✗
2. Consequences of exposure to radiation are always bad	✗	✓
3. When using radiation, the dose applied must always be:		
a. the lowest	✗	✓
b. the highest	✗	✓
c. the most appropriate and accurate	✓	✗
4. Being a passenger in one transatlantic flight results in more radiation exposure than a dental x-ray	✓	✗
5. Of the average dose received per year per person:		
a. >70% is of artificial origin	✗	✓
b. ±8% comes from food and water	✓	✗
c. >70% is of natural origin	✓	✗

Thank you

Ministerial Conference

Nuclear Science and Technology: Addressing Current and Emerging Development Challenges

28-30 November 2018
IAEA, Vienna, Austria

https://www.iaea.org/events/ministerial-conference-on-nuclear-science-and-technology-2018

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