MODARIA:
Modelling and Data for Radiological Impact Assessment
Context and overview

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International Atomic Energy Agency - Division of Transport, Radiation and Waste Safety

15-16 December 2015

Interagency Steering Committee Meeting on Performance and Risk Assessment Community of Practice Annual Technical Exchange Meeting

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Outline

- IAEA Safety Standards
- Assessment od exposures
- Modelling and Data for Radiological Impact Assessments (MODARIA)
- Peer reviews and Advisory Work
- The last point
- Summary

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IAEA Safety Standards

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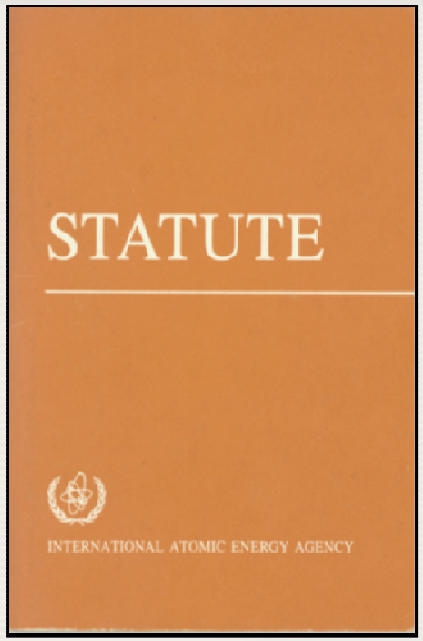
Statutory Obligations of the IAEA (1957)



Article III, *Functions*
Paragraph A.6.

" To **establish or adopt**, in consultation and, where appropriate, in collaboration with

- the competent organs of the United Nations and
- with the specialized agencies concerned,

standards of safety for protection of health and minimization of danger to life and property (including such standards for labour conditions), and

to **provide for the application of these standards** to its own operation as well as to the operations making use of materials, services, equipment, facilities, and information made available by the Agency …; "

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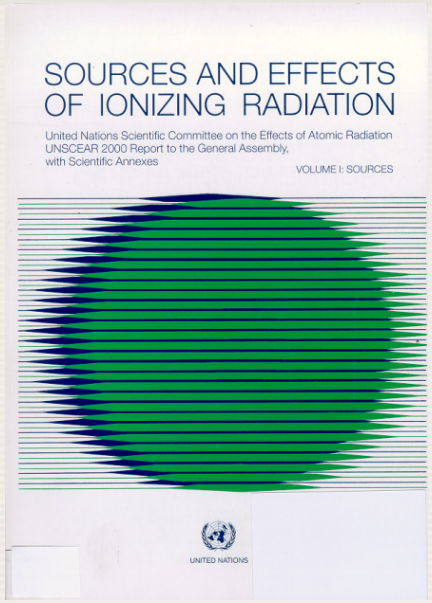
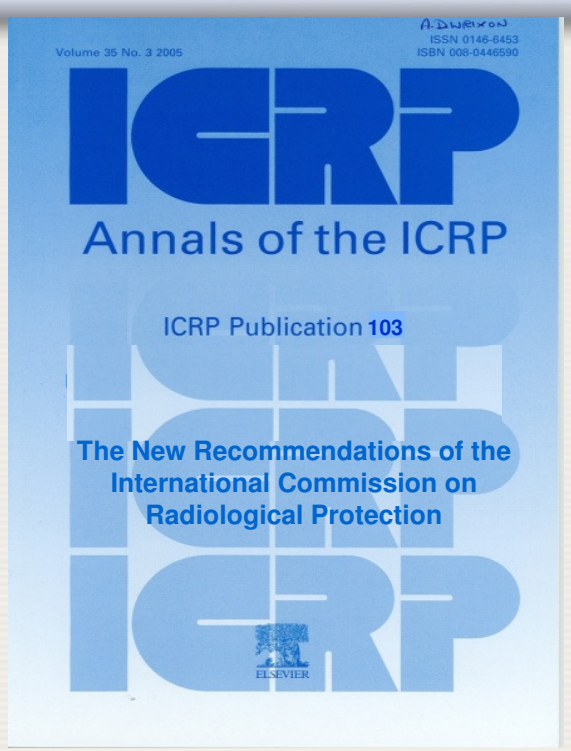
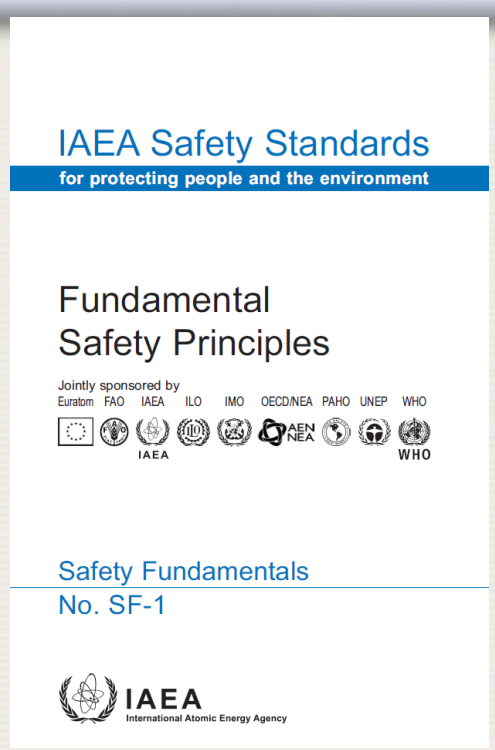
Development of International Standards







UNSCEAR:

Scientific Reports

ICRP:

Recommendations

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Safety Standards

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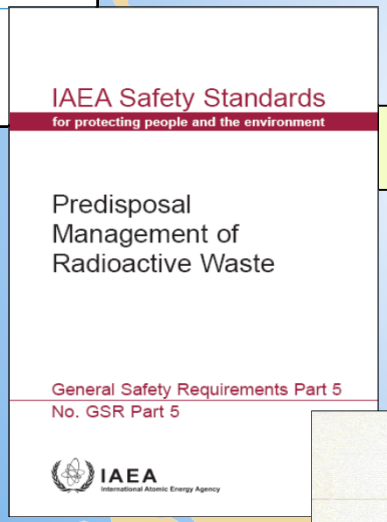
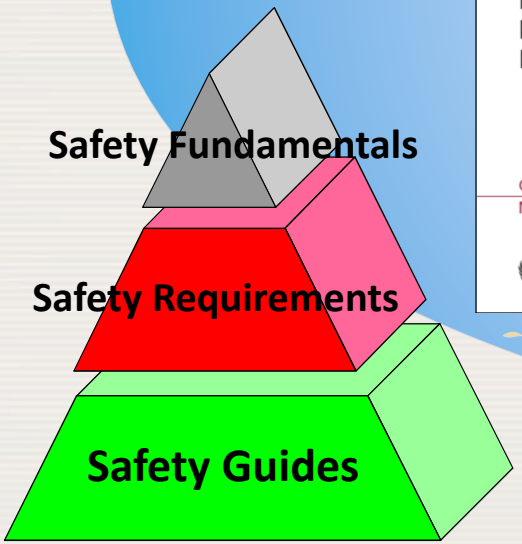
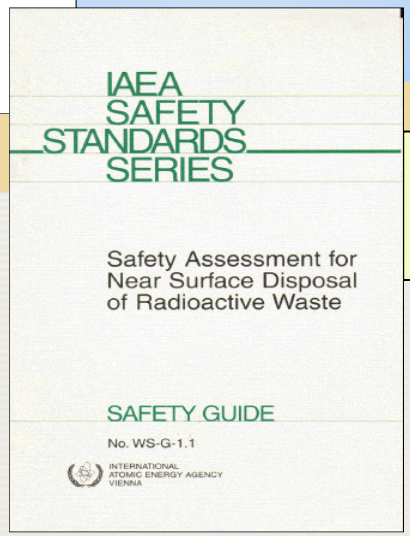
Safety Standards Categories

Fundamental Safety Principles



Requirements: What to do?





Best Practice to meet Requirements: How to do?

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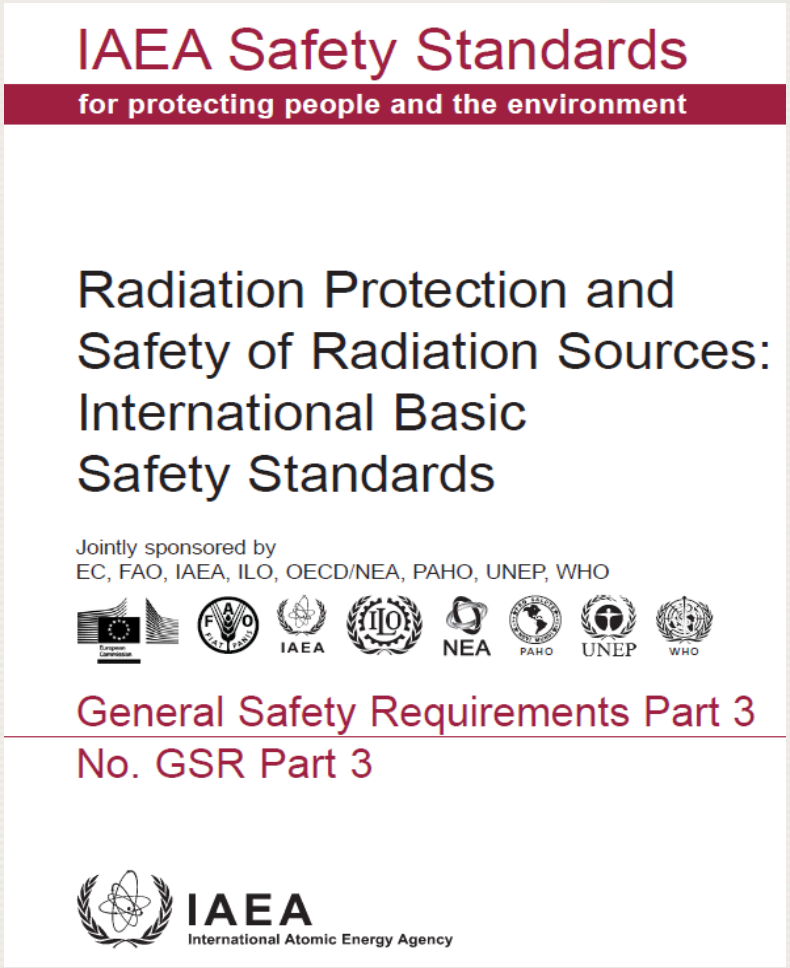
IAEA Basic Safety Standards (IAEA GSR part 3)

- ***International consensus*** **on Radiation Protection**
  - Based on ICRP 103 (2007)
- **Defines responsibilities**
  - Government and regulatory body
  - Operator
- **Defines exposure situations**
  - Planned, existing, emergency situation
- **Radiation protection principles**
  - Justification, Optimization, Limitation
- **Radiological criteria**
  - Public in all exposure situations
  - Workers



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Three exposure situations

- **Planned exposure situation**
  - Exposure due to planned operation of a facility or activity
- **Emergency exposure situation**
  - Exposure due to accidents or unexpected events requiring prompt action to reduce or avoid consequences
- **Existing exposure situation**
  - Exposure due to natural sources or presence of radioactive contamination
  - Need to control and reduction of exposure

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Related Safety Guides

- **Radiation Protection** of the Public and the Environment
  - Application of Radiation Protection Principles in all exposure situations
- Regulatory **Control of Radioactive Releases** to the Environment from Facilities and Activities
  - Setting discharge limits for nuclear facilities in planned exposure situations
- **Radiological** Environmental **Impact Assessment** for Facilities and Activities
  - Guidance to assess exposures to people and the environment in planned exposure situations
- Application of the concepts for **exclusion, exemption and clearance**
- **Environmental and source monitoring** for purposes of radiation protection
- **Remediation** Process for Areas with Residual Radioactive Material

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Assessment of exposures

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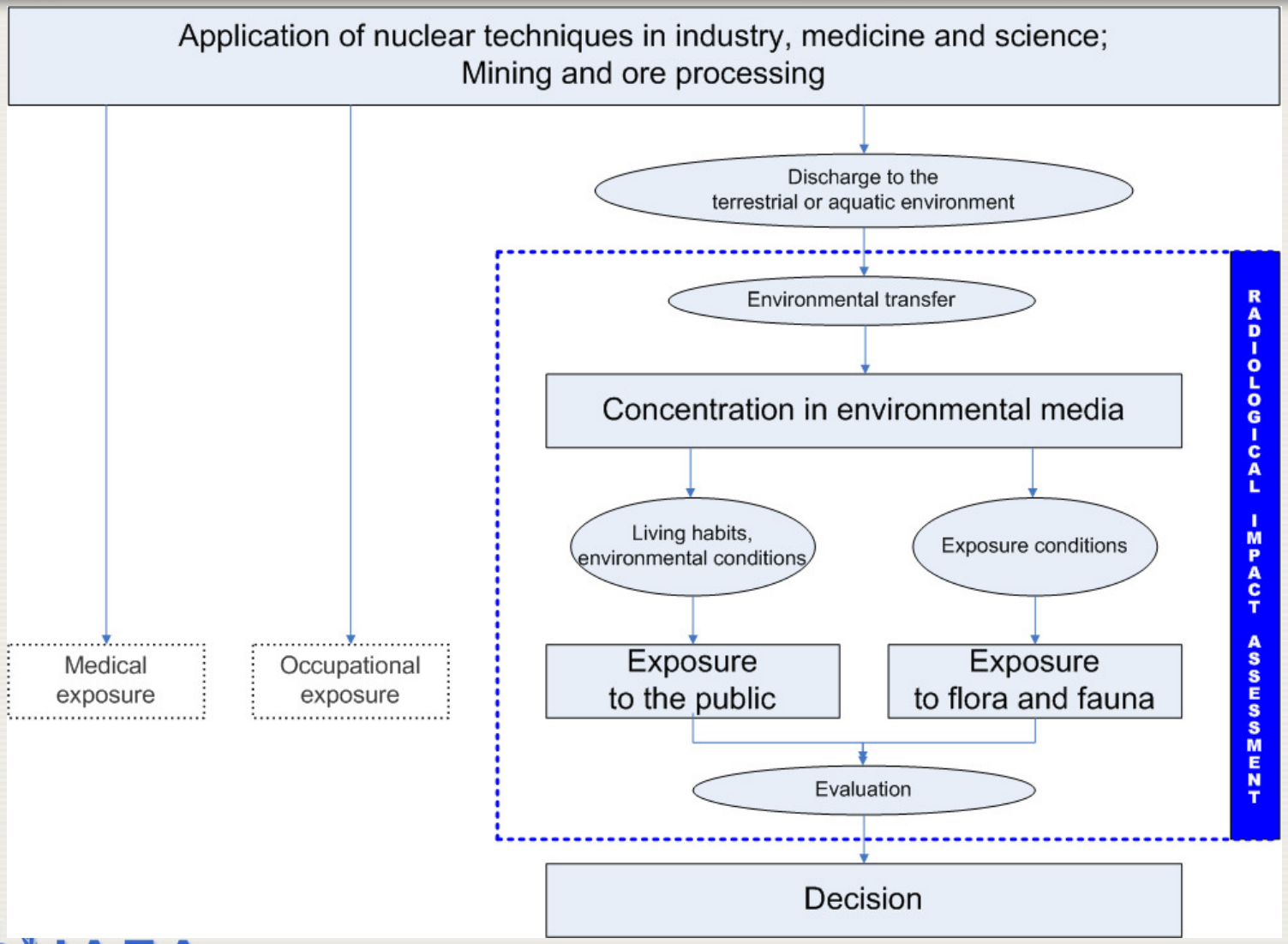
Public and environmental exposure

- **Applications**
  - Routine discharges
  - Accidental releases
  - Remediation of existing contaminations
  - Legacies
  - Uranium mining
  - NORM contaminations
  - Long-term safety studies for waste disposal facilities
- **Ecosystems**
  - Terrestrial
  - Urban areas
  - Freshwater
  - Marine

Assessment of Exposure to People and the Environment



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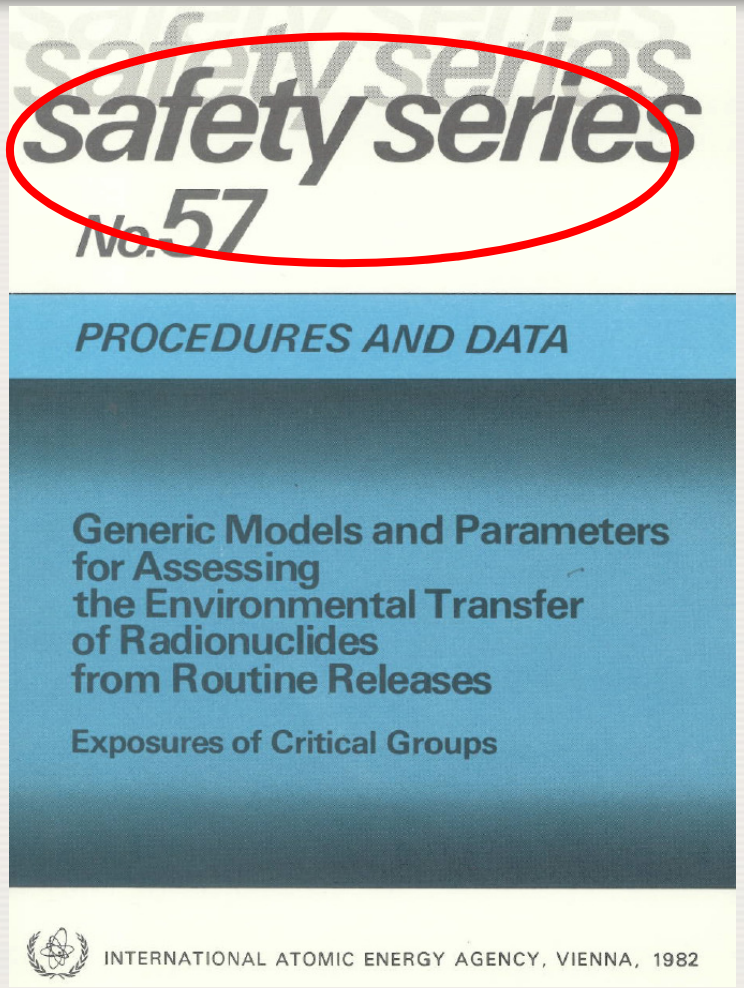
Generic models for assessment of exposures



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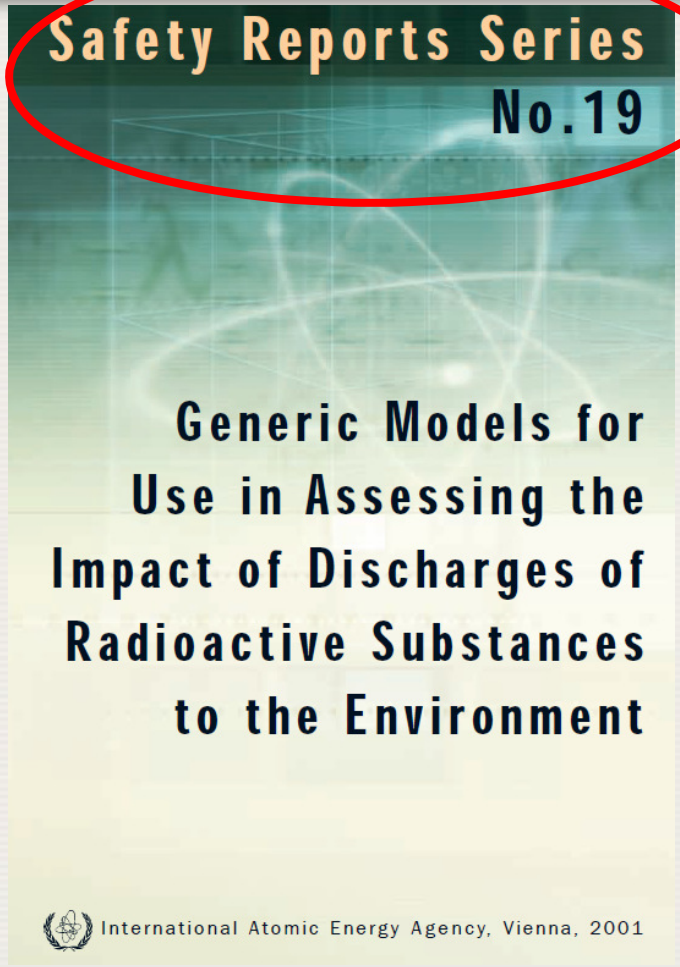

2001

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MODARIA:
Models and Data for Radiological Impact Assessments

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Goals of MODARIA

- **Improve capabilities in radiological impact assessment**
  - Test, compare and develop models
  - Analyse, evaluate and compile data
- **Addressing assessments in planned, emergency and existing exposure situations**
  - For people
  - For flora and fauna
- **Forum for discussion and exchange of experience**
- **Support to fulfil regulatory requirements in Member States**

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Previous International IAEA modelling testing programmes

- **1985-1991: BIOMOVS**
  - —BIOspheric Model Validation Study, sponsored by SSI (Sweden)
- **1988-1994: VAMP**
  - —Validation of Model Predictions, prompted by Chernobyl
- **1991-1996: BIOMOVS II**
  - —BIOspheric Model Validation Study, with SSI, Sweden
- **1996-2001: BIOMASS**
  - —BIOsphere Modelling and ASSessment, 1996-2001,
- **2003-2007: EMRAS I**
  - —Environmental Modelling for Radiation Safety, 2003-2007
- **2009-2011: EMRAS II**

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MODARIA Working Groups

Theme A: Remediation of Contaminated Areas

1 Remediation strategies and decision aiding techniques

- Post-accidental conditions
- Uranium legacies

2 Exposures in contaminated urban environments and effect of remedial measures

- Models for external and internal exposure
- Atmospheric dispersion in cities
- Atmospheric dispersion in

3 Modelling radiological impacts arising from NORM and radioactively contaminated legacy sites

- Assessment framework based on IAEA Standards
- Development of an assessment methodology
- Application to contaminated sites

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MODARIA Working Groups
Theme B: Uncertainties and Variability

4 Analysis of radio-ecological data

- Data analysis and evaluation
- Identify key radionuclides and associated parameters
- Address human and wildlife exposure assessment

5 Uncertainty and variability analysis for assessments

- Radiological impacts arising from routine discharges of radionuclides
- Influence of national regulatory requirements

6 Environmental change in long term safety assessments of radioactive waste disposal facilities

- Influence of climate
- Implications of landscape evolution
- Development of “future environments”

7 Models for accidental tritium releases

- Implications of dry/wet, day/night, summer/winter
- Inter-comparison, simplification, harmonization

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MODARIA Working Groups

Theme C: Exposures and Effects on Biota

8 Modelling exposures to biota

- Test and comparison of existing models
- Compilation, analysis and evaluation of transfer data
- Development of exposure scenarios to fulfil regulatory requirements (if they exist)

9 Radiation effects on populations of wildlife species

- Acute vs chronic exposure
- Laboratory vs field conditions
- Explore effects on populations

Theme D: Marine Modelling

10 Modelling of marine dispersion and transfer of radionuclides accidentally released from land-based facilities

- Post -Chernobyl scenario: Baltic Sea
- Post-Fukushima: Pacific Ocean

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Participation and results

All programmes were well attended

- MODARIA:
  - About 150 participants from 42 Member States

Results

- I*AEA-TECDOCs* (all Working Group reports)
- *IAEA Safety Reports*
  - Handbook of **Parameter Values** for the Prediction of Radionuclide **Transfer in Terrestrial and Freshwater Environments** (IAEA TRS-472)
  - Handbook of **Parameter Values for** the Prediction of Radionuclide **Transfer to Wildlife**, (IAEA –TRS 479)
- *Numerous publications* in peer reviewed scientific journals

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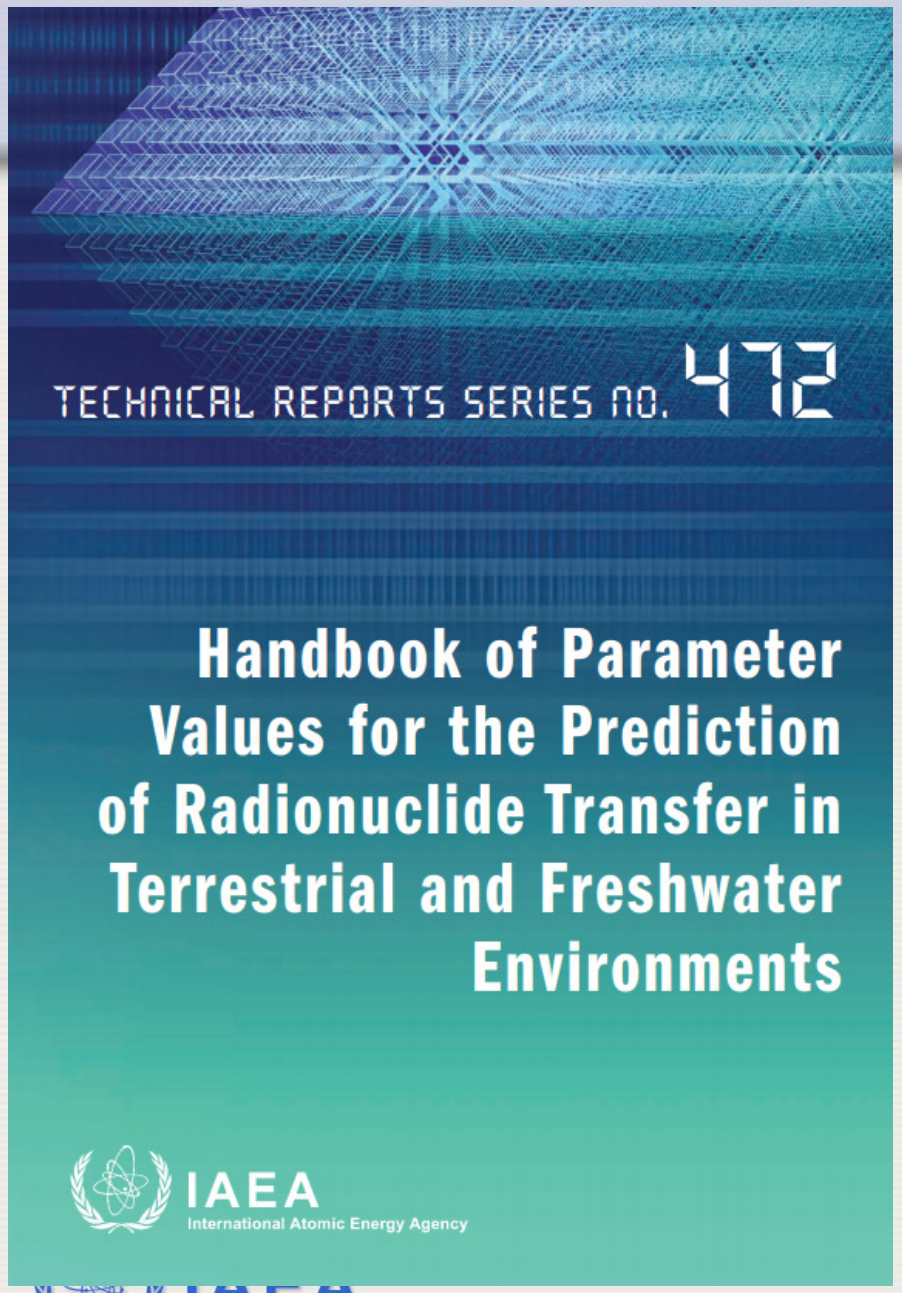
TECHNICAL REPORTS SERIES NO. 472
Handbook of Parameter Values for the Prediction of Radionuclide Transfer in Terrestrial and Freshwater Environments
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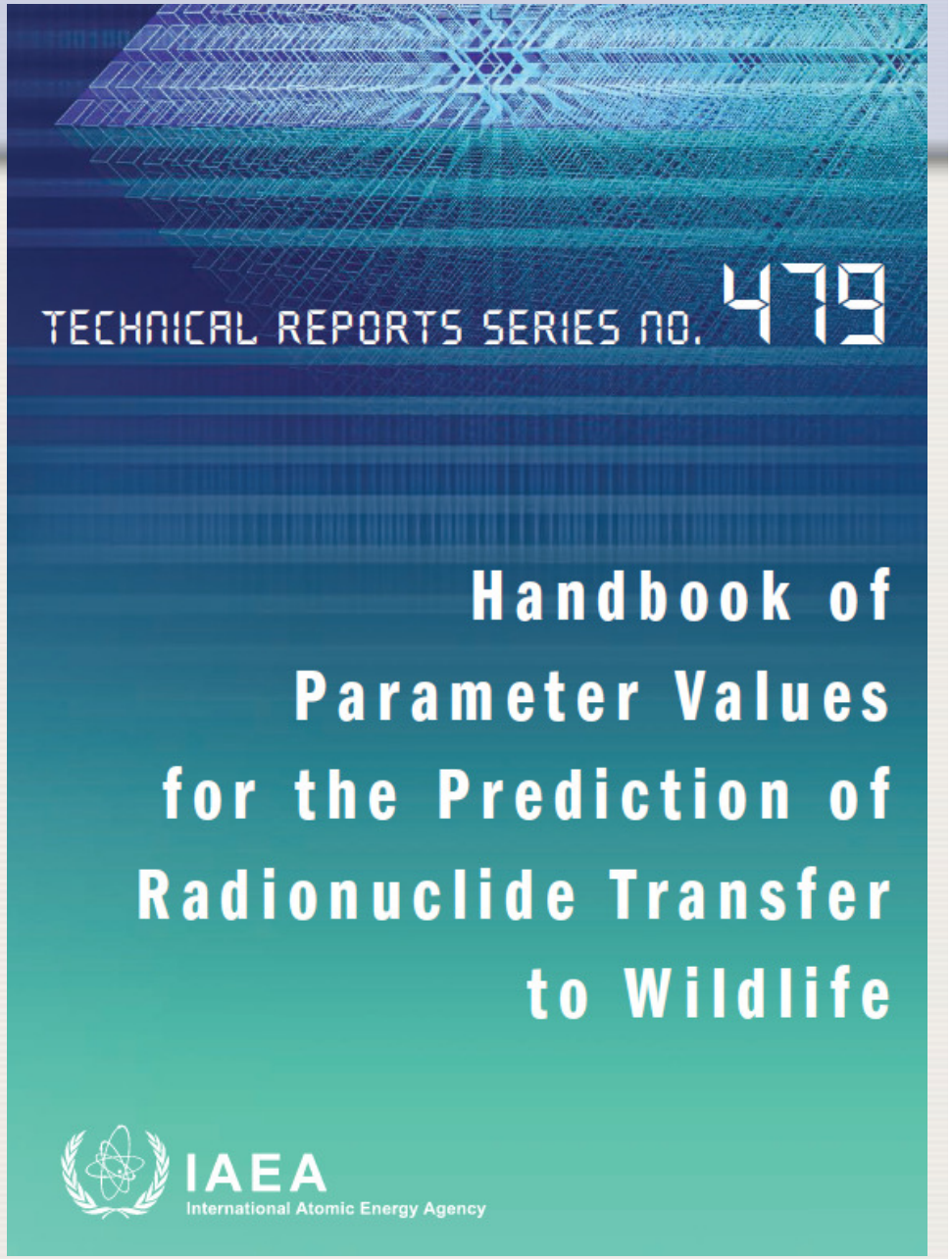
TECHNICAL REPORTS SERIES NO. 479
Handbook of Parameter Values for the Prediction of Radionuclide Transfer to Wildlife
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Follow-up: MODARIA II

- Four year programme (2016 – 2019)
- **First Technical Meeting**
  - *31 October – 4 November 2016*
  - *Programme to be developed in early 2016*
- **Tentative themes**
  - **Exposures in urban environments following accidents**
  - **Modelling releases to the environment**
  - **Marine modelling**
  - **Exposure and effects to wild-life**
  - **Biosphere modelling for long-term safety assessments of waste disposal facilities**
  - **Radioecological data**
  - **Remediation and decision making**

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Funding

- **Mainly self-supporting**
  - Small amounts of IAEA
  - Limited to few participants with key contributions who could otherwise not attend
  - Big interest from countries in Africa, Asia, Latin America, and Eastern Europe
  - Less than 10 nominees from these countries could manage participation

Further information

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Good 4 3 2 1 0 Poor

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Modelling and Data for Radiological Impact Assessments

Fourth Technical Meeting

The Fourth Technical Meeting (TM) for MODARIA was held at the IAEA's headquarters in Vienna from **9 to 13 November 2015** and was the final meeting for this phase of the MODARIA Programme. The TM was attended by 135 participants from 35 Member States and was again chaired by Ms Jane Simmonds of the United Kingdom.

As for all three previous TMs, this final meeting commenced with a Plenary Session, where the Leaders of the 10 Working Groups reported on their respective working group's results, achievements and progress made since the Third MODARIA TM last year and the subsequent Working Group Interim Meetings which were held during 2015. It became apparent that many of the Working Groups are well advanced with their respective final reports which will be published as IAEA TECDOCs in due course. Moreover, many of the working groups already have ideas and plans of how they'd like to move forward during the next phase of MODARIA and expand on the important work they've already accomplished.

Resources

- EMRAS II
- Environmental Assessment

Page links

- Background
- Objectives
- Organization of the MODARIA Programme
- MODARIA Working Groups
- First Technical Meeting
- Second Technical Meeting
- Third Technical Meeting

http://www-ns.iaea.org/projects/modaria/default.asp?l=116

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Thank you!

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