Planning a new IAEA Model Test and Comparison Programme

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Division of Transport, Radiation and Waste Safety

3rd Technical Meeting

Modelling and Data for Radiological Impact Assessments

Vienna, 12 November 2014

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International Atomic Energy Agency

Goals of model testing programmes

- **Support to fulfil regulatory requirements in Member States**
- **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**

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IAEA model test and comparison 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
- **2003-2007: EMRAS I**
  2009-2011: EMRAS II
  - Environmental Modelling for Radiation Safety
- **Since 2012: MODARIA**
  - Modelling and Data for Environmental Impact Assessment

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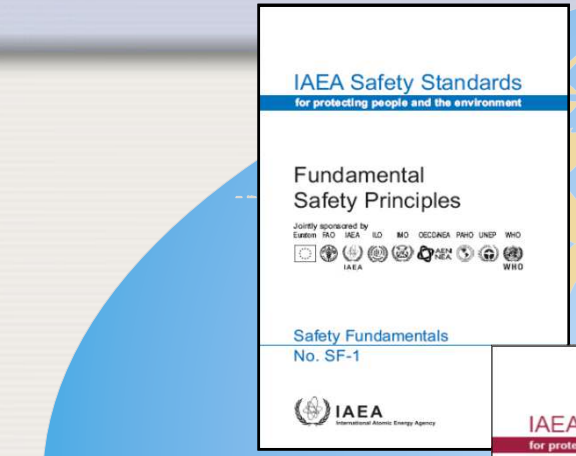
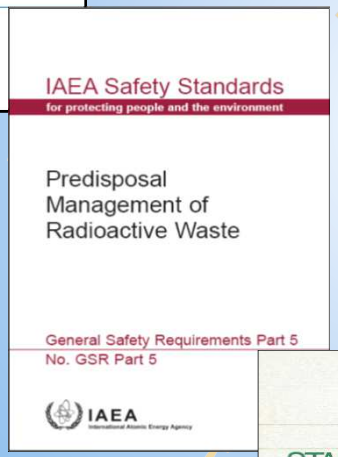
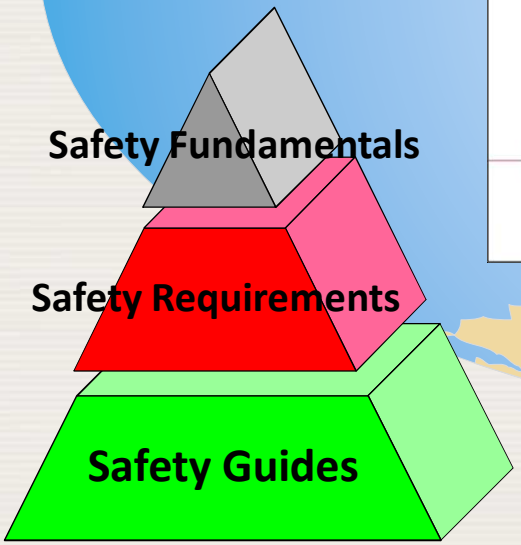
Safety Standards Categories

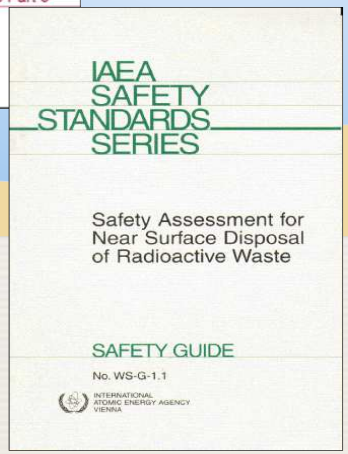


Fundamental Safety Principles



Requirements: What to do?





Best Practice to meet Requirements: How to do?

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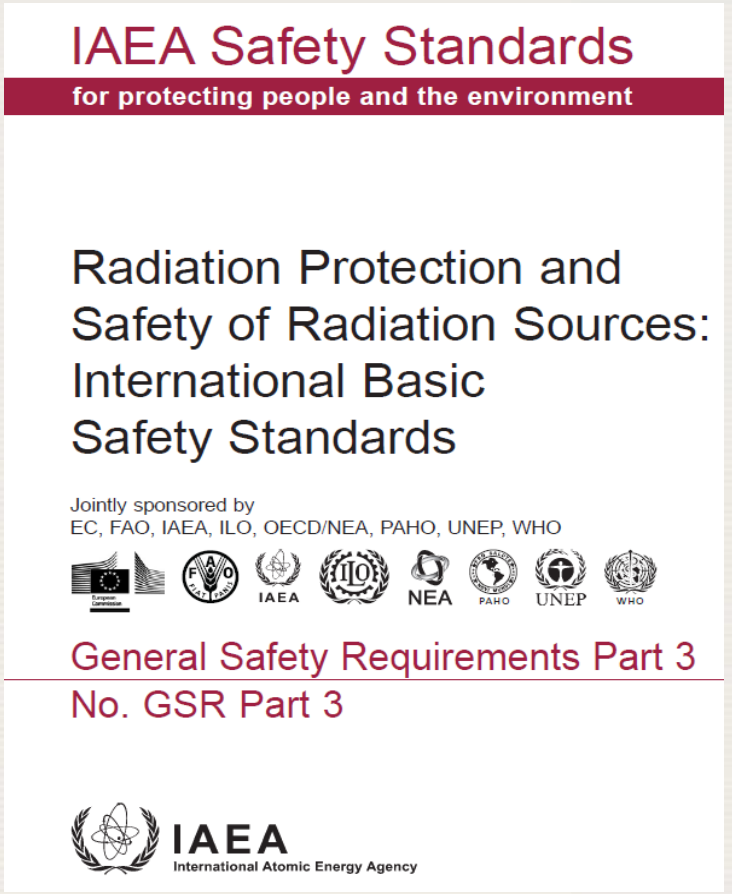
IAEA Basic Safety Standards (BSS)

- **Represents international consensus**
- **Based on ICRP 103 (2007)**
- **Defines responsibilities**
  - Government and regulatory body
  - Operator
- **Defines a framework for Radiation Protection**
  - Exposure types
    - Public, Occupational, Medical
  - Exposure situations
  - Radiation protection principles
  - Radiological criteria



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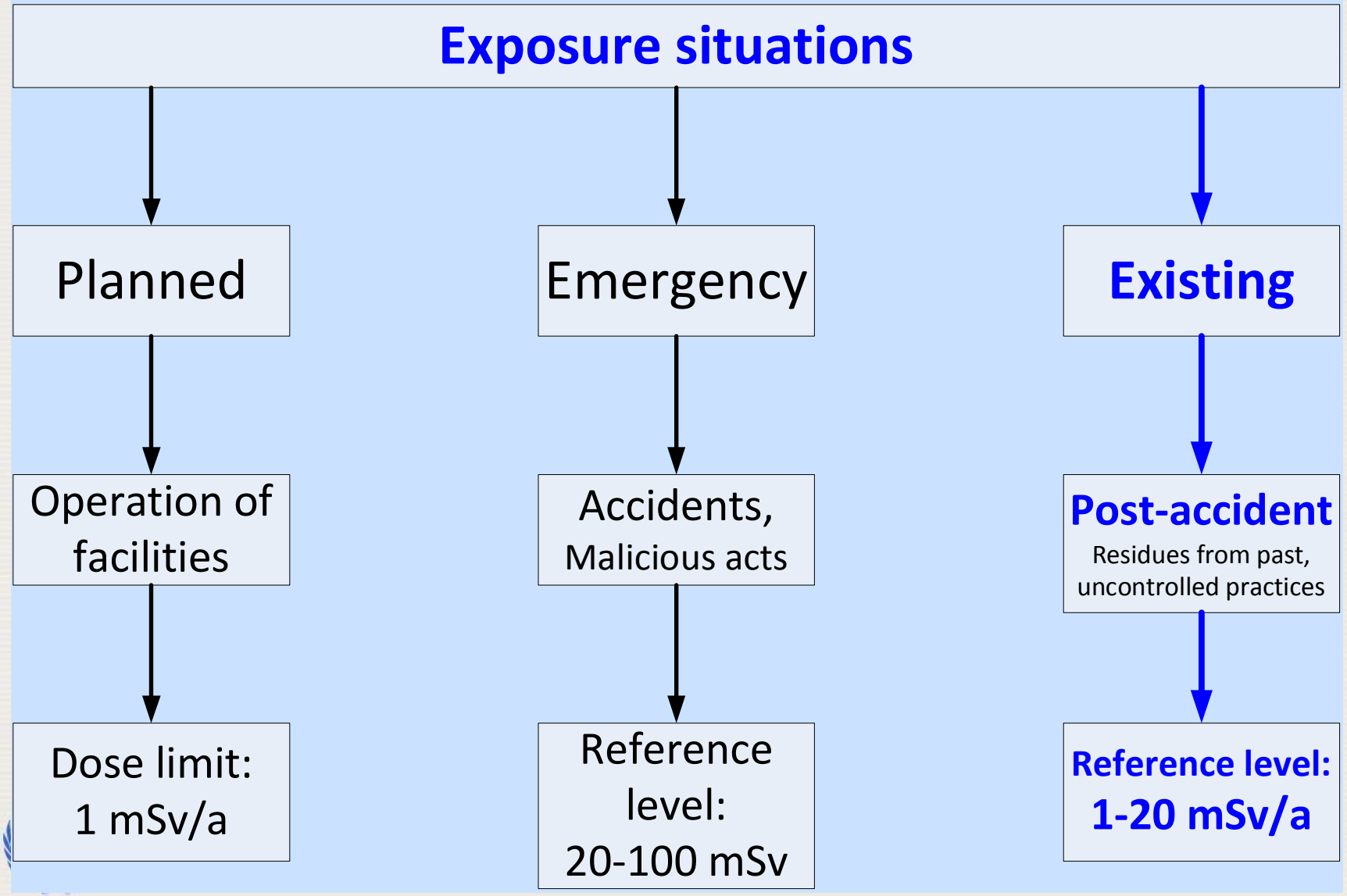
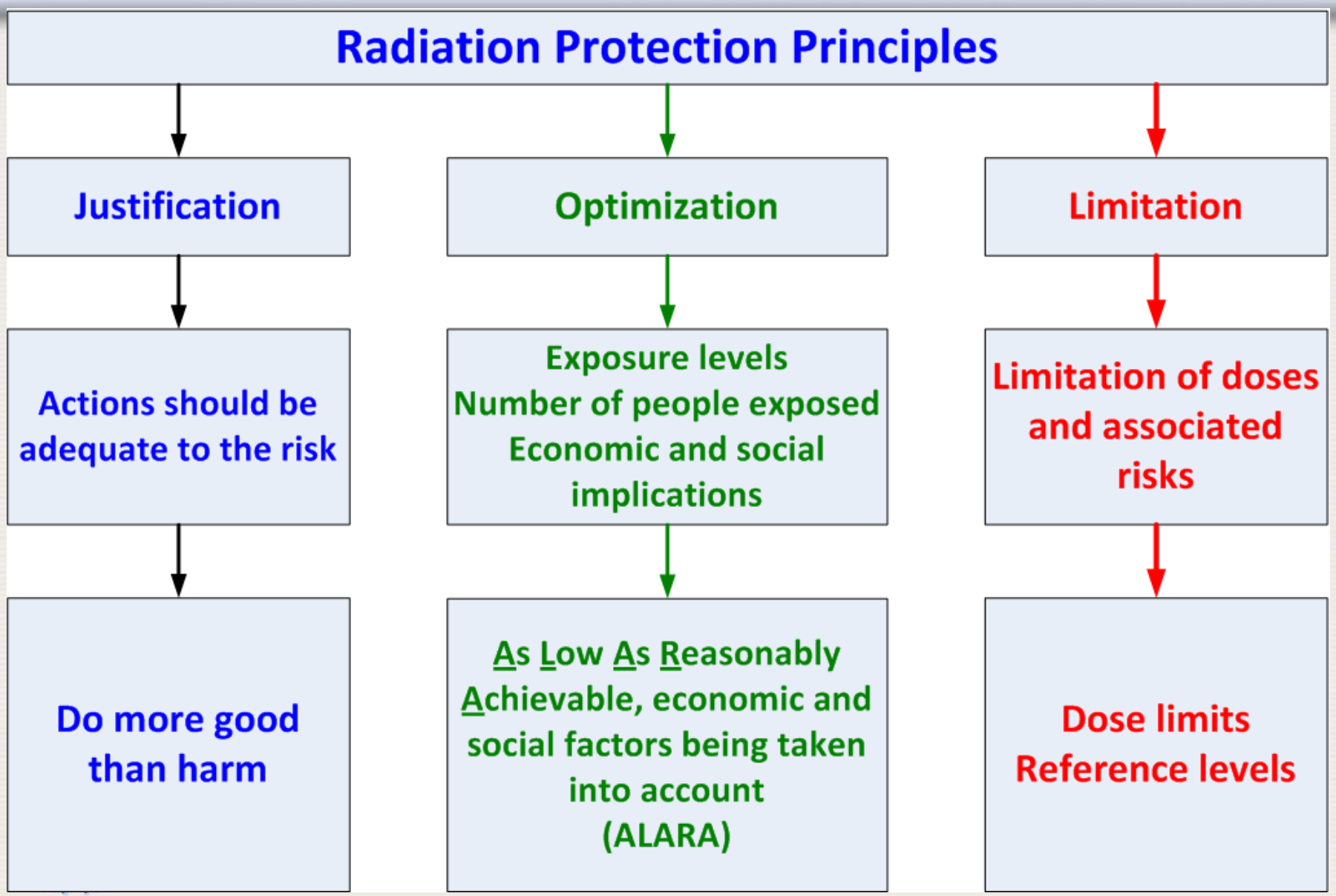
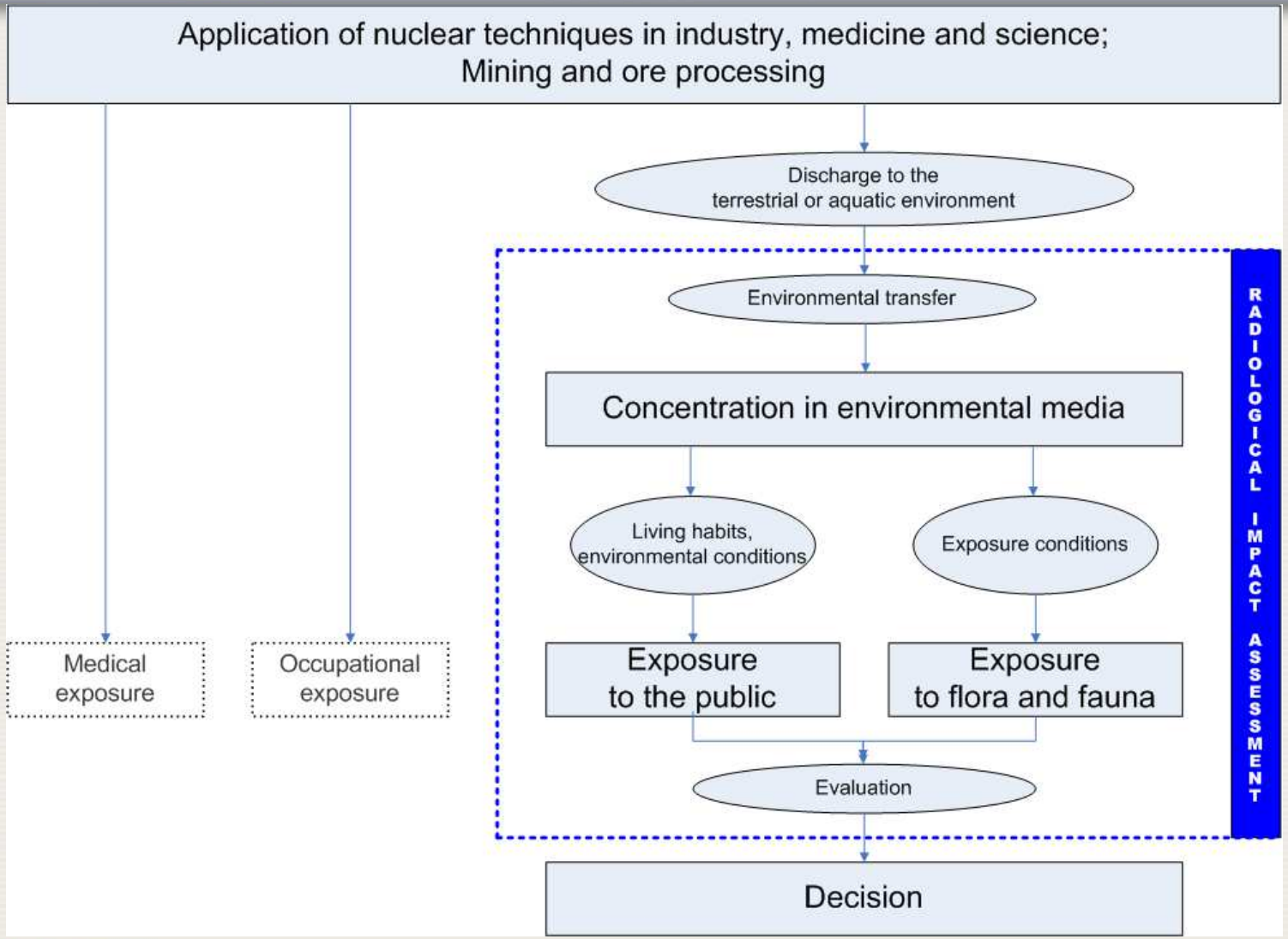
Three exposure situations for *Public exposure*



Radiation Protection Principles



Assessment of Exposure to People and the Environment



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EMRAS II (2009-2011):

- **Reference Approaches for Human Dose Assessment**
  - WG 1 – Reference Methodologies for "Controlling Discharges" of Routine Releases
  - WG 2 – Reference Approaches to Modelling for Management and Remediation at "NORM and Legacy Sites"
  - WG 3 – Reference Models for "Waste Disposal"

- **Reference Approaches for Biota Dose Assessment**
  - WG 4 – "Biota Modelling"
  - WG 5 – "Wildlife Transfer Coefficient" Handbook
  - WG 6 – Biota "Dose Effects Modelling"

- **Approaches for Assessing Emergency Situations**
  - WG 7 – "Tritium Accidents"
  - WG 8 – "Environmental Sensitivity"
  - WG 9 – "Urban Areas"

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MODARIA themes and working groups

A Remediation of Contaminated Areas

1 Remediation strategies and decision aiding

2 Exposures following contamination of urban environments

3 Impacts from NORM and contaminated legacy sites

B Uncertainties and Variability

4 Analysis of radio-ecological data

5 Uncertainty and variability analysis

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

7 Models for accidental tritium releases

C Exposures and Effects on Biota

8 Biota modelling: Transfer and exposure models

9 Models for assessing radiation effects on wildlife

D Marine Modelling

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

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Applications of models and data

Assessing radiological impacts for regulatory purposes

- Routine discharges
- Accidental releases
- Remediation of existing contaminations
- Long-term safety studies for waste disposal facilities

Scientific and public interest

- Long-term behaviour of radionuclides in the environment
  - Tritium
  - Marine systems
- Retrospective doses assessment

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Routine discharges: Issues that could be addressed

- **Regulatory context of assessments**
  - What needs to be assessed? Why?
- **Assessments for Reference Cases**
  - Large nuclear facilities
  - Small facilities: labs and hospitals
  - Link of assessments for humans and biota
  - Application of the graded approach
    - How much assessment efforts are necessary
- **Generic models**
  - Possibilities and limitations of generic models
  - Uncertainties
- **Source and environmental monitoring**
  - Link of results from models and monitoring to improve dose assessments
  - Monitoring to check compliance with the discharge authorization
- **Realistic assessments vs cautious assessments**
  - When do we need what?
  - How reduce conservatism?

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Accidental releases: Issues that could be addressed

- **Regulatory context of assessments**
  - What needs to be assessed ? Why?
  - Which assessment endpoints are useful beyond regulatory requirements?
- **Data analysis and evaluation**
  - Radio-ecological observations in Japan since March 2011
    - Seasonal factors
    - Long-term observations
    - Natural ecosystems
- **Assessments for Reference Cases**
  - Urban environments
  - Rural environments
- **Realistic versus cautious assessments**
- **Link of monitoring and models**

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Management and remediation of existing exposure contaminations: Issues that could be addressed

- **Regulatory context of remediation**
  - What needs to be assessed and why?
  - Which assessment endpoints are useful beyond regulatory requirements?
- **Post-accidental situations**
  - Systematic link of results from models and monitoring
  - Analysis and summary of existing compilations for remedial actions
    - EURANOS, IAEA TRS-475, etc.
- **Past practices**
  - Uranium mining, NORM contaminations
  - Nuclear legacies
  - Link of models and monitoring
- **Freshwater environments**
  - Possibilities for remediation
- **Realistic dose assessment as a base for remediation**
  - How conservative can an assessment be without causing problems

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Long-term safety studies for waste disposal facilities: Issues that could be addressed

- **Regulatory context**
  - What needs to be assessed? Why?
- **Generic dose assessment models**
  - Link to climate, hydrology, landscape evolution
- **Systematic exploration of analogue approaches**
- **Review of existing model exercises**
  - BIOMASS
  - EMRAS and MODARIA
- **Assessments for Reference Cases**
  - Further developments based on BIOMASS
  - Cooperation with BIOPRPTA

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Special areas

- **Tritium and Carbon-14**
  - Systematic uncertainty analysis of models
    - Accidental releases (H-3 only)
    - Normal operation
    - Long-term performance of waste disposal facilities (C-14 only)
- **Exposures to biota**
  - Regulatory context for assessments
  - Simplification of assessments
  - Reliability of simple models
- **Modelling the input of radionuclides to agricultural land through irrigation**
  - River water: normal operation
  - Ground water: long-term safety assessments of disposal facilities
- **Marine Modelling**
  - Fate of radionuclides released to marine systems
- **Radio-ecological data**
  - Review and update of bases

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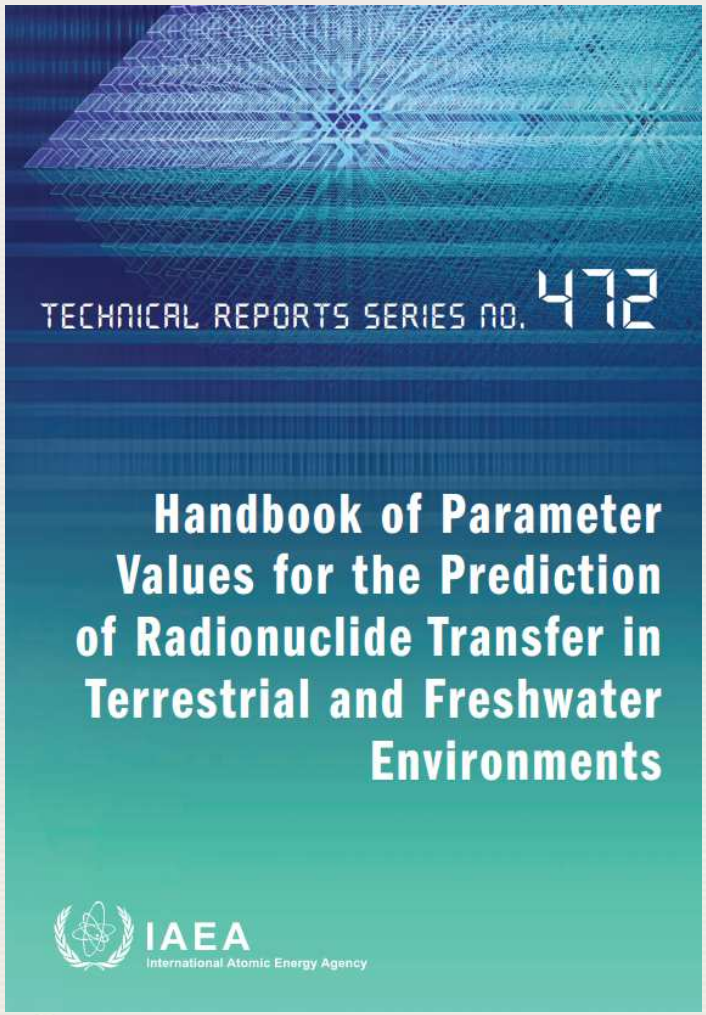
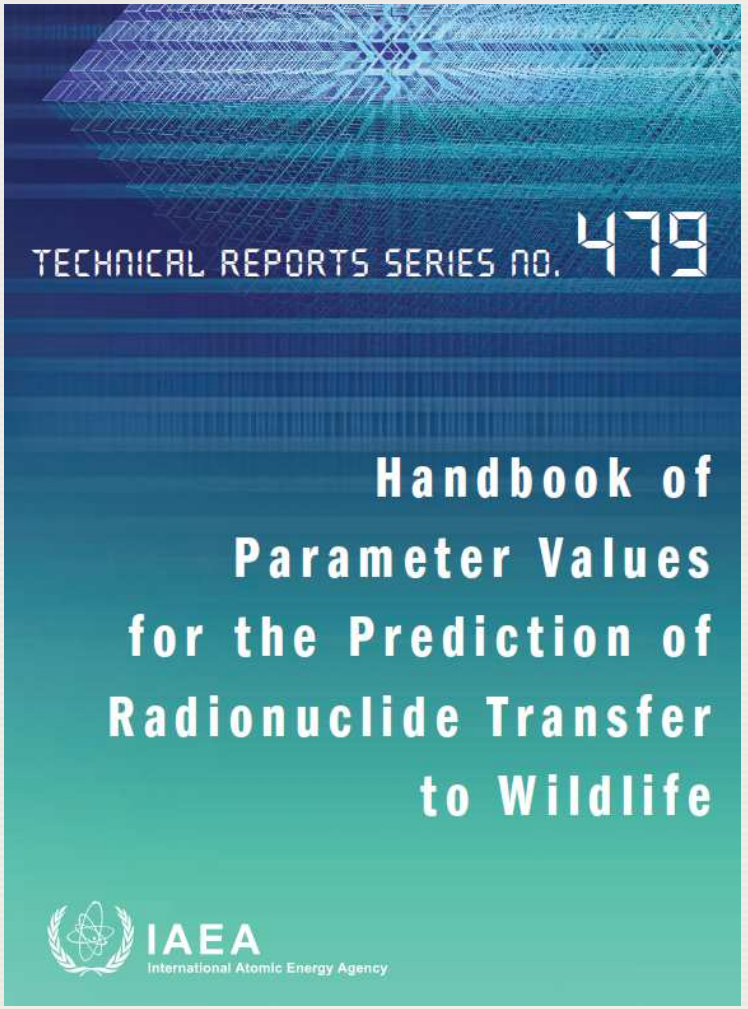
Examples for data compilations





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The next steps to define a follow-up programme

- **November 2014: 3rd MODARIA TM**
  - Call for topics to be included in a MODARIA **follow-up IAEA model test and comparison programmes**
- **2015**
  - **Participants, interested parties, individuals are encouraged to develop proposals for a new programme**
  - **Proposals can be send at any time to IAEA**
  - **Presentation & discussion of proposals at the 4th MODARIA TM (Nov. 2015)**
- **2016**
  - Setup of a new IAEA assessment model test and comparison programme
- **End 2016 / early 2017**
  - Start of the new programme

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Elements of proposals

Proposals should include:

- Title
- Aims and Objectives
- Main working steps
- Expected results

Can be sent at any time
to the IAEA

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Thank you!

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