



Overview of C5 Protection of the Environment

ICRP Meeting

October 21-27, 2013 – Abu Dhabi, UAE

Kathryn Higley
Vice-Chair, ICRP Committee 5



INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION

Committee 5 Membership

Carl-Magnus Larsson, Australia, Chair

Kathryn A. Higley, USA, Vice-Chair

Almudena Real, Spain, Secretary

David Copplestone, UK

Jacqueline Garnier-Laplace, France

Jianguo Li, China

Kazuo Sakai, Japan

Per Strand, Norway

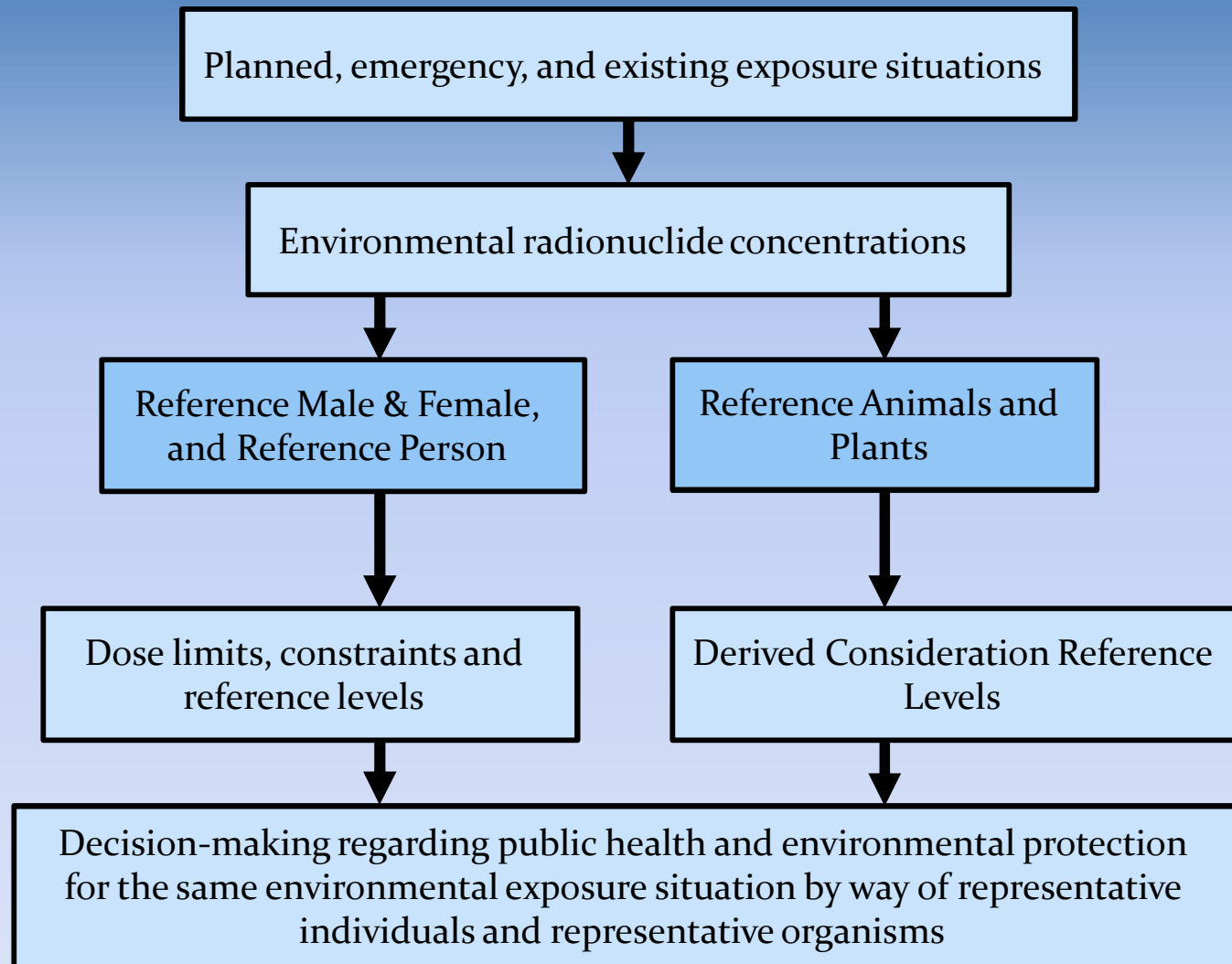
Alexander Ulanovsky, Germany

Jordi Vives I Batlle, Belgium

C5 Mission

“C5 is concerned with radiological protection of the environment. It will aim to ensure that the development and application of approaches to environmental protection are compatible with those for radiological protection of man, and with those for protection of the environment from other hazards”

Evolution of two parallel pathways



ICRP 91 (2003)

Review of ethics and principles, recommending that the System for Environmental Protection should

- *focus on biota;*
- *consider **adequate protection** on the basis of understanding of effects;*
- *identify reference animals and plants (RAPs); and*
- *let the RAPs guide the derivation of*
 - *exposure scenarios (CFs and DCFs)*
 - *effects data*
 - *dose rates benchmarks*

ICRP103

(30)aim is...preventing and reducing the frequency of deleterious radiation effects to a level where they would have negligible impact on the maintenance of **biological diversity**, the **conservation of species**, or the health and status of **natural habitats, communities and ecosystems**.

(366)Reference Animals and Plants.....

ICRP 108



WILDLIFE GROUP	RAP
Large terrestrial mammals	Deer
Small terrestrial mammals	Rat
Aquatic birds	Duck
Amphibians	Frog
Freshwater pelagic fish	Trout
Marine fish	Flatfish
Terrestrial insects	Bee
Marine crustaceans	Crab
Terrestrial annelids	Earthworm
Large terrestrial plants	Pine tree
Small terrestrial plants	Wild grass
Seaweeds	Brown seaweed

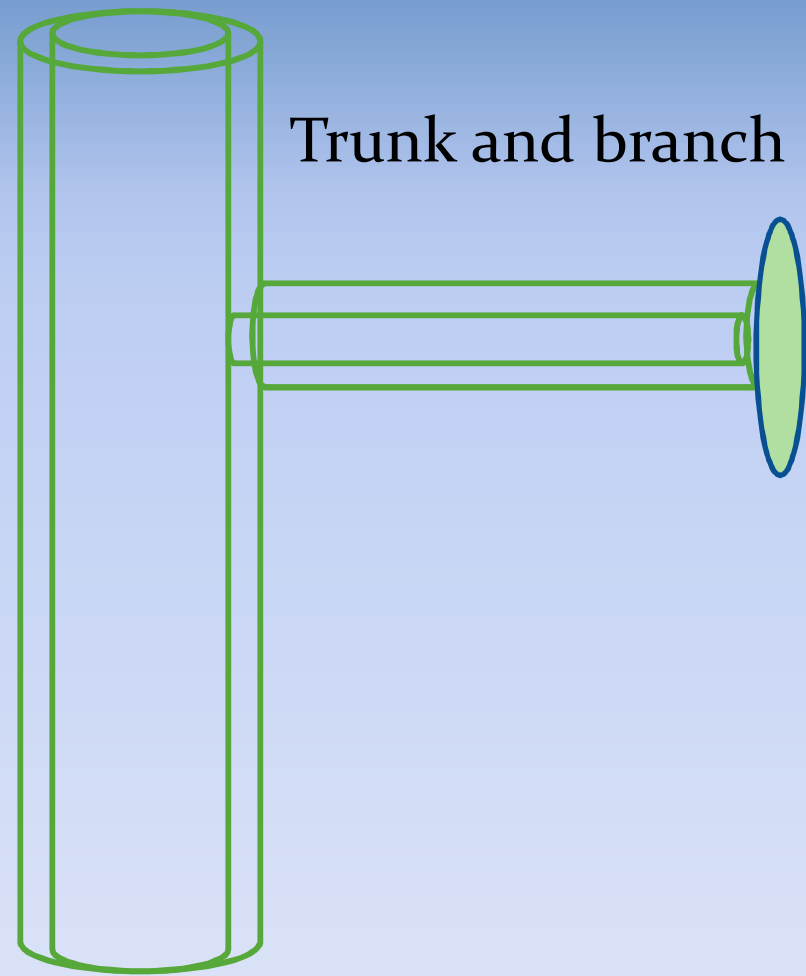
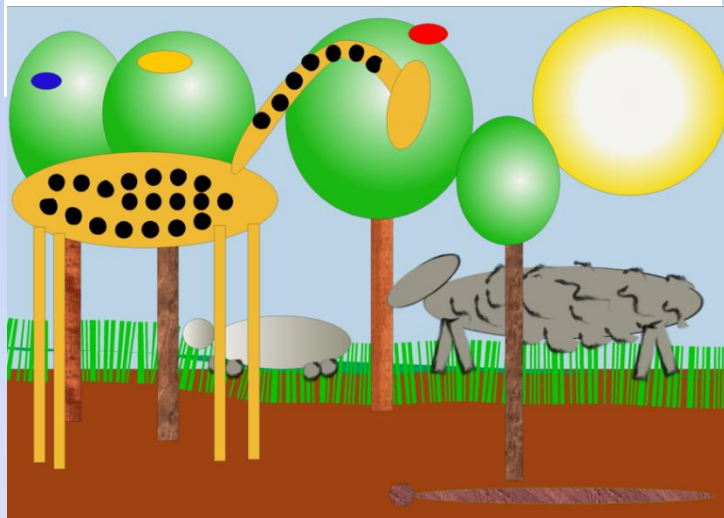
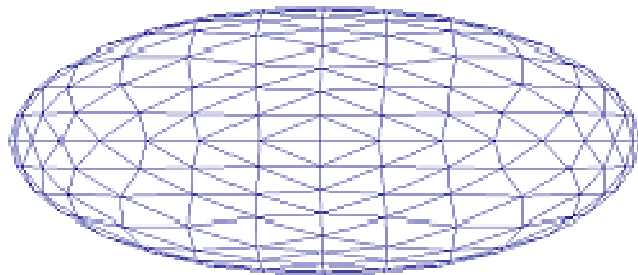
ICRP 108

ICRP 108 reviews biological characteristics

- *Occurrence*
- *Taxonomy*
- *Life cycle and life span*
- *Reproductive strategy*
- *Physiology*
- *Ecology*
- *.....other factors.....*

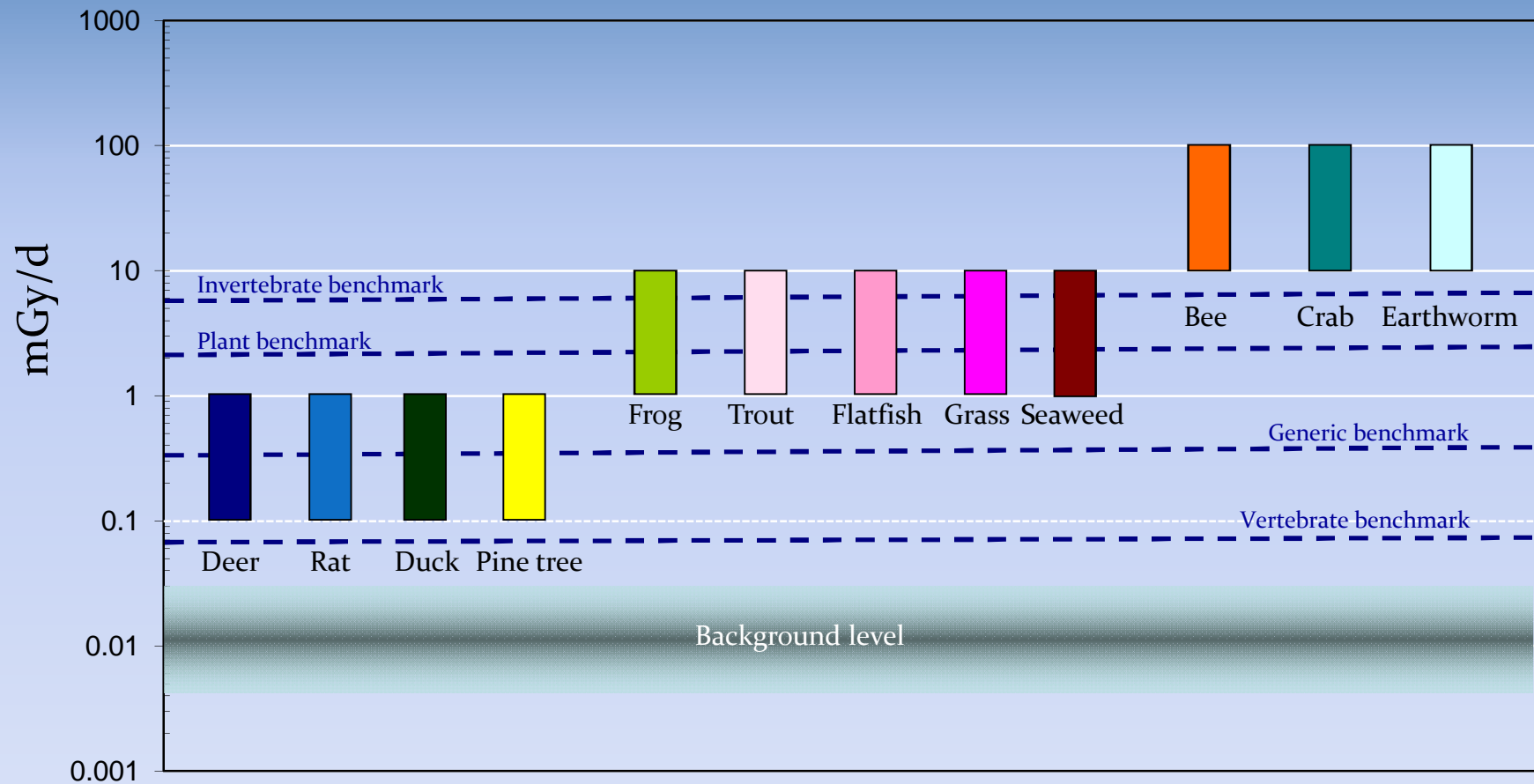
ICRP 108

DCCs for simple geometries



ICRP 108

Derived Consideration Reference Levels, DCRLs

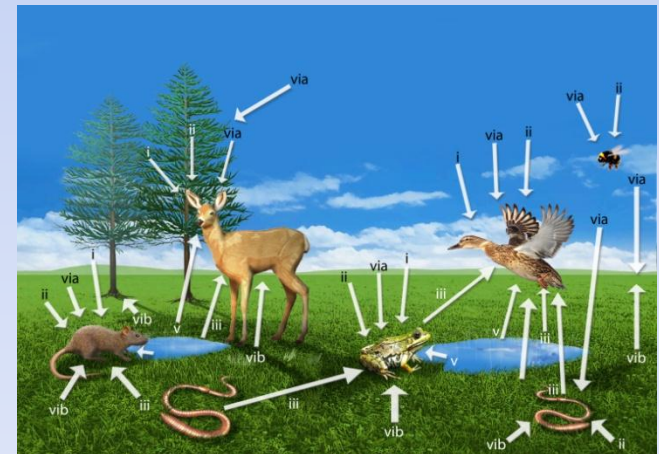


Benchmarks from other studies/systems

ICRP 114

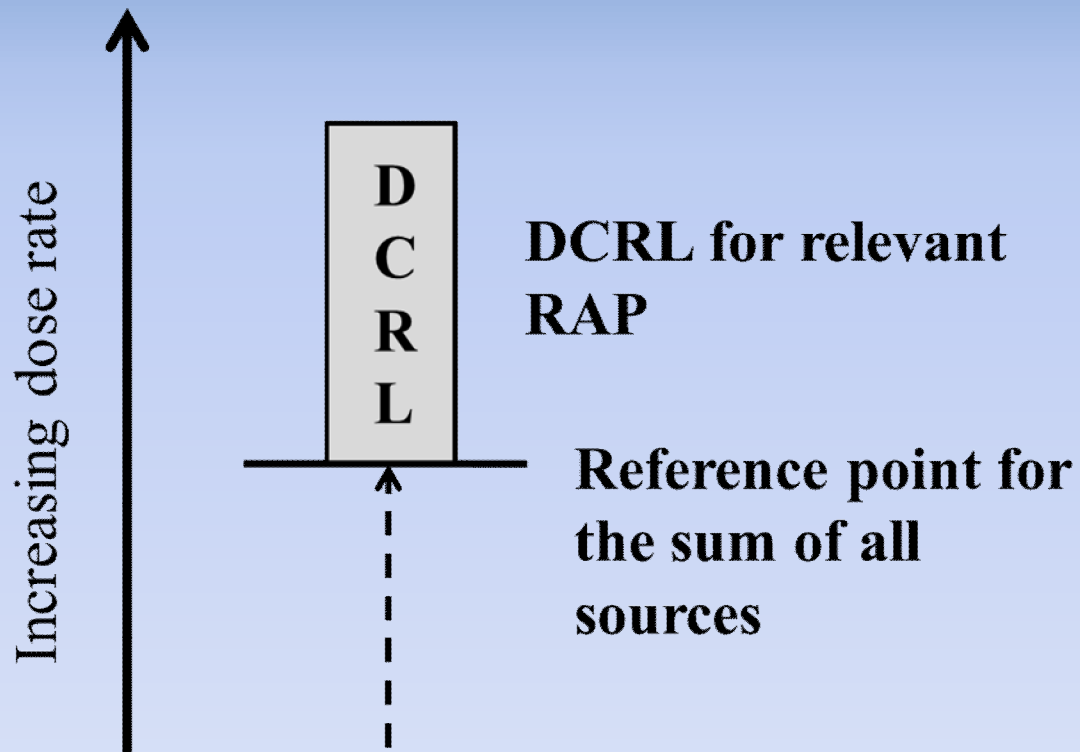
Concentration Ratios for 39 elements and 12 RAPs

- *with associated statistics;*
- *based on existing field and laboratory data;*
- *using new methodology to derive data ('surrogate data') where such are missing;*
- *taking in to account life cycle stages and habitats, when possible; and*
- *discussing the robustness of the data*



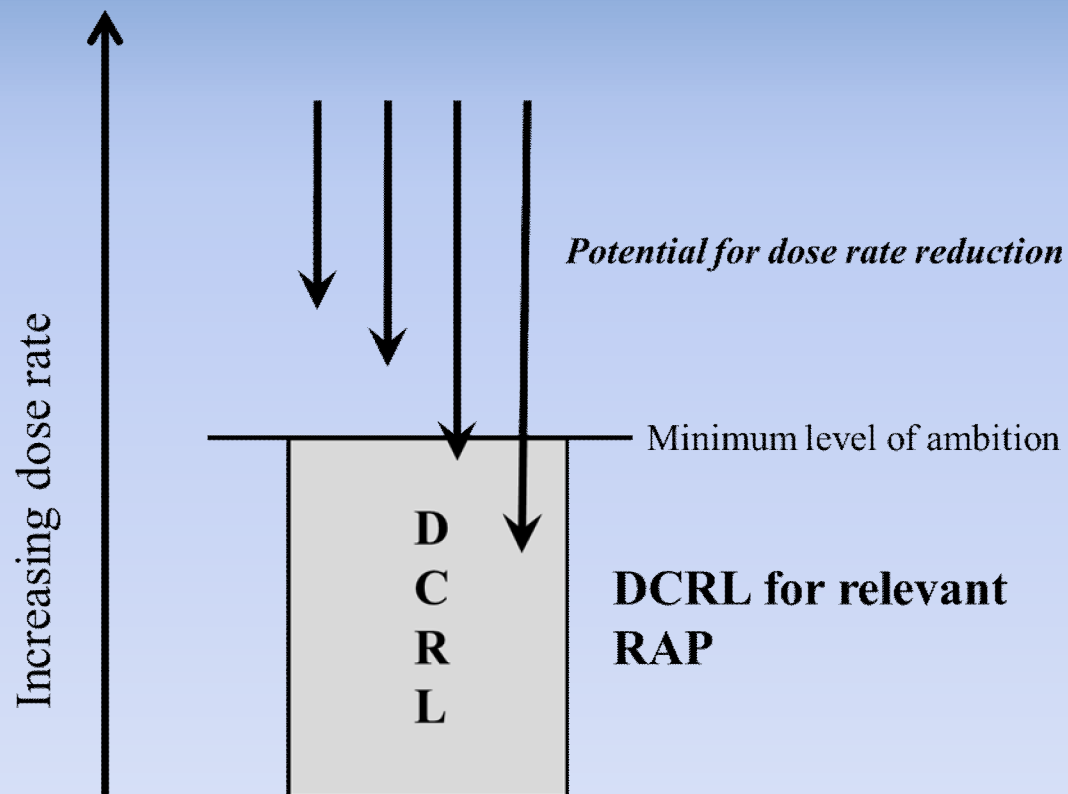
ICRP 124

Application in planned exposure situations



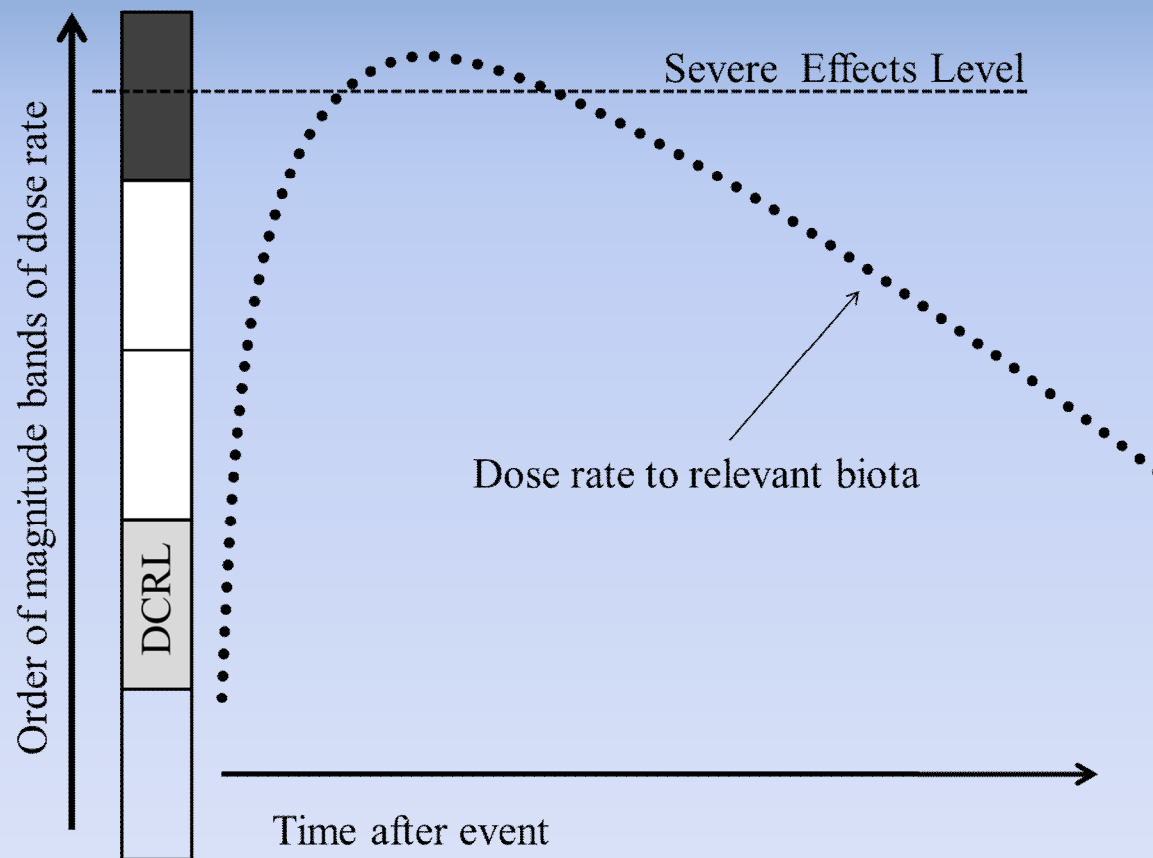
ICRP 124

Application in existing exposure situations

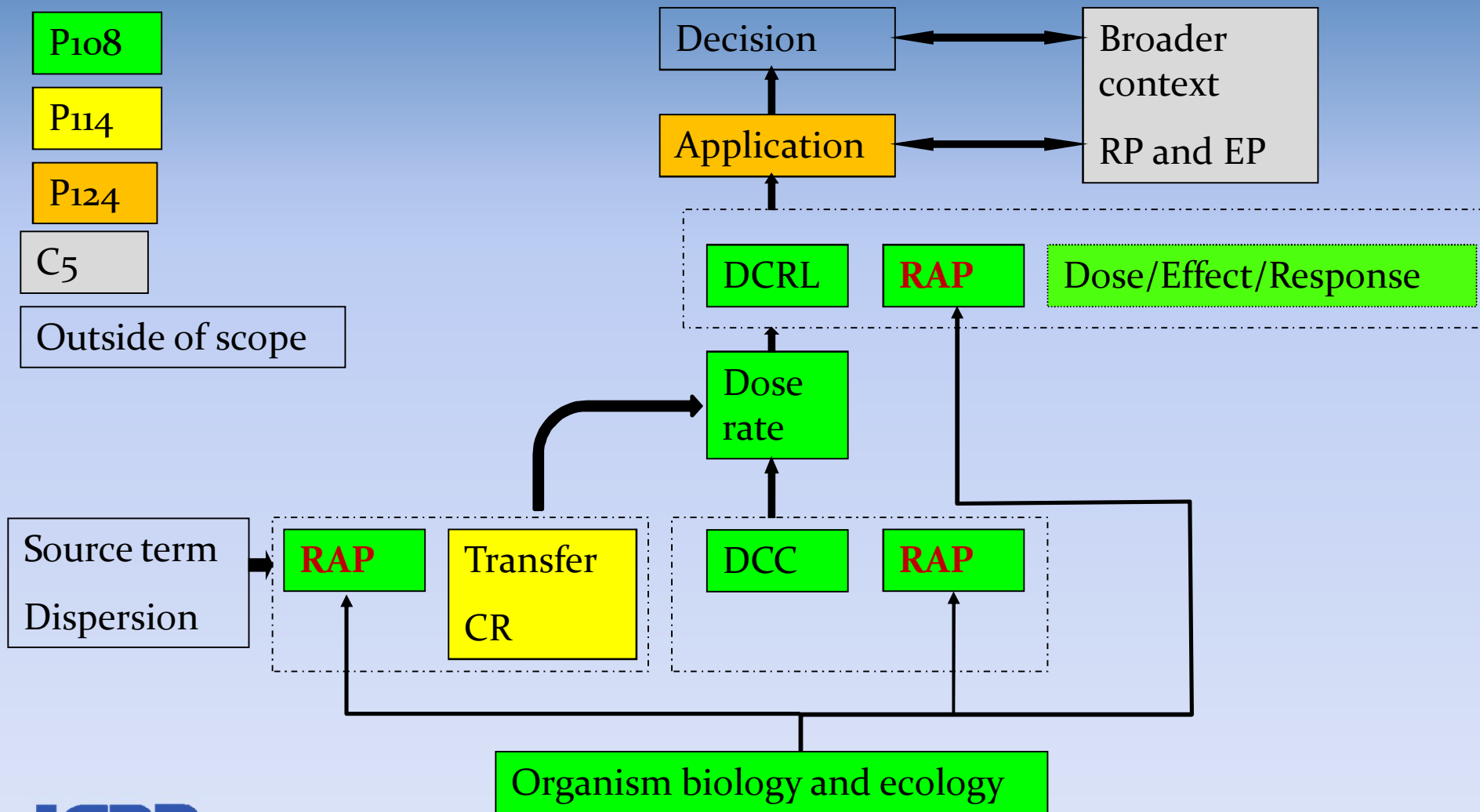


ICRP 124

Application in emergency exposure situations



ICRP EP/RP System



Past Experience / Future Work

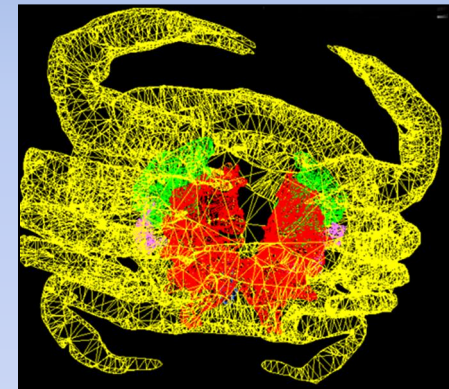
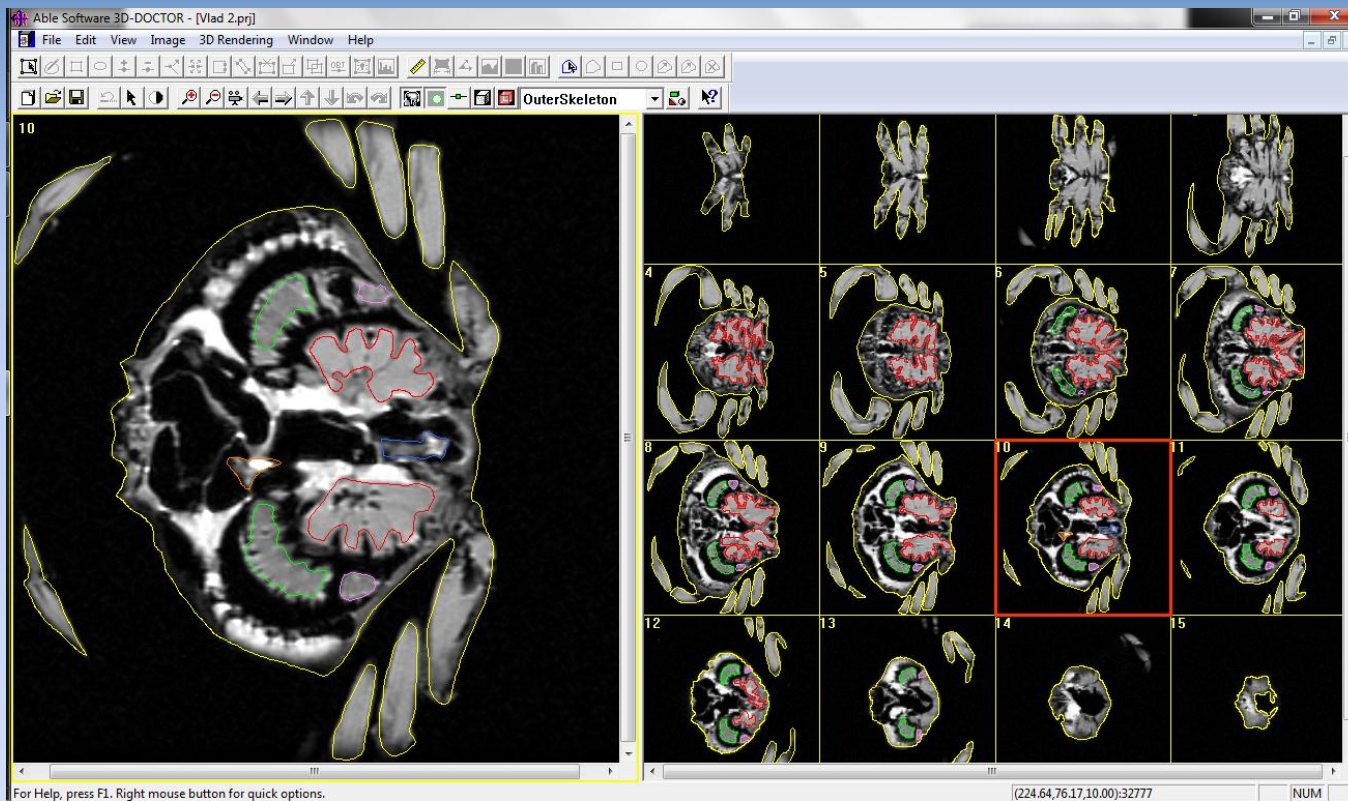
- Past efforts identified data and process gaps
- Activities initiated *because* of ICRP:
 - Voxel phantoms (partitioning of radionuclides)
 - Dynamic transfer modelling (moving away from steady-state assumptions) e.g., emergency & pulsed systems
 - Spatial/temporal factors in dose
 - Filling RAP-specific effects data gaps
- Testing DCRLs in light of new data and their proposed application

Looking ahead

Consolidation of system and data bases

- Extrapolating from RAPs to Reference Organisms for use in assessments. Outline of report structure developed.
- RAP monographs. Compilation of data on biology, life cycle, stable element ratios, exposure scenarios (incl background), transfer factors, effects, (dynamic) models, conclusions.

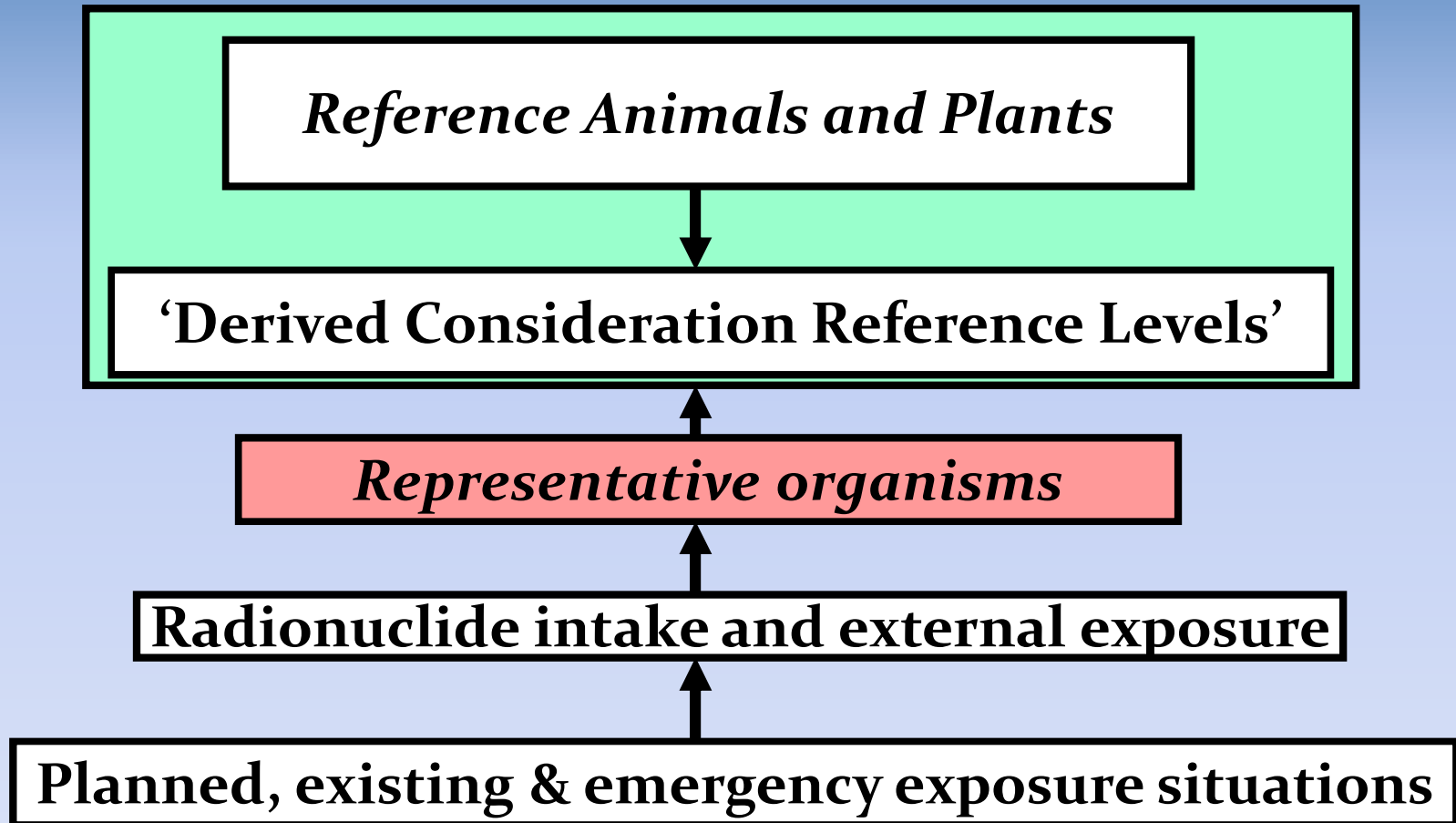
Looking ahead RAPS monographs



Vlad the crab

Looking ahead

Application

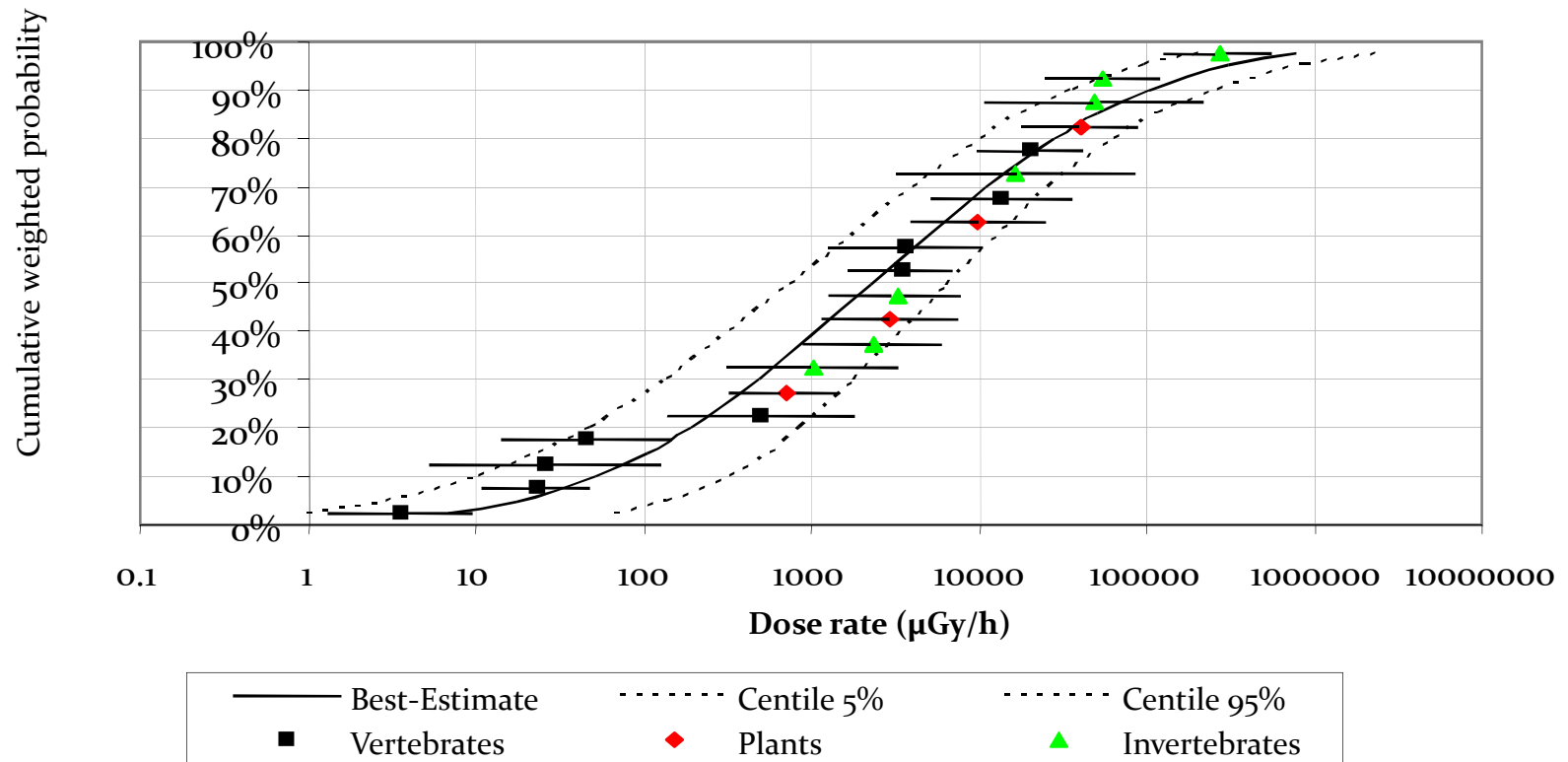


Looking ahead

Species sensitivity

$R^2 = 0.9467$
KSpvalue = 0.500

SSD - Log Normal



Looking ahead

Develop/Test Under Various Scenarios:

Environmental compliance index.

If :

Σ radionuclides not greater than x

**& no individual radionuclide greater than y
then**

OK for man and/or the environment



Max. concentrations of radionuclides in air, water and 'soil'



Authorised Release Rate(s)

Conclusions

- A robust system has evolved that is compatible with the RP system for man and the EP system developed for other hazards
- Considering the environment in its own right is appropriate and facilitates communication
- Simple to apply using default RAPs databases – but can also cope with complex exposure situations
- Priority during this term to
 - Consolidation
 - Broadening the scientific basis
 - Improving applicability

ICRP

www.icrp.org

ICRP

INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION