

*Dr. Jörg Mönig*

# The European Perspective on Performance Assessment Methodologies: The Integrated EU Project PAMINA

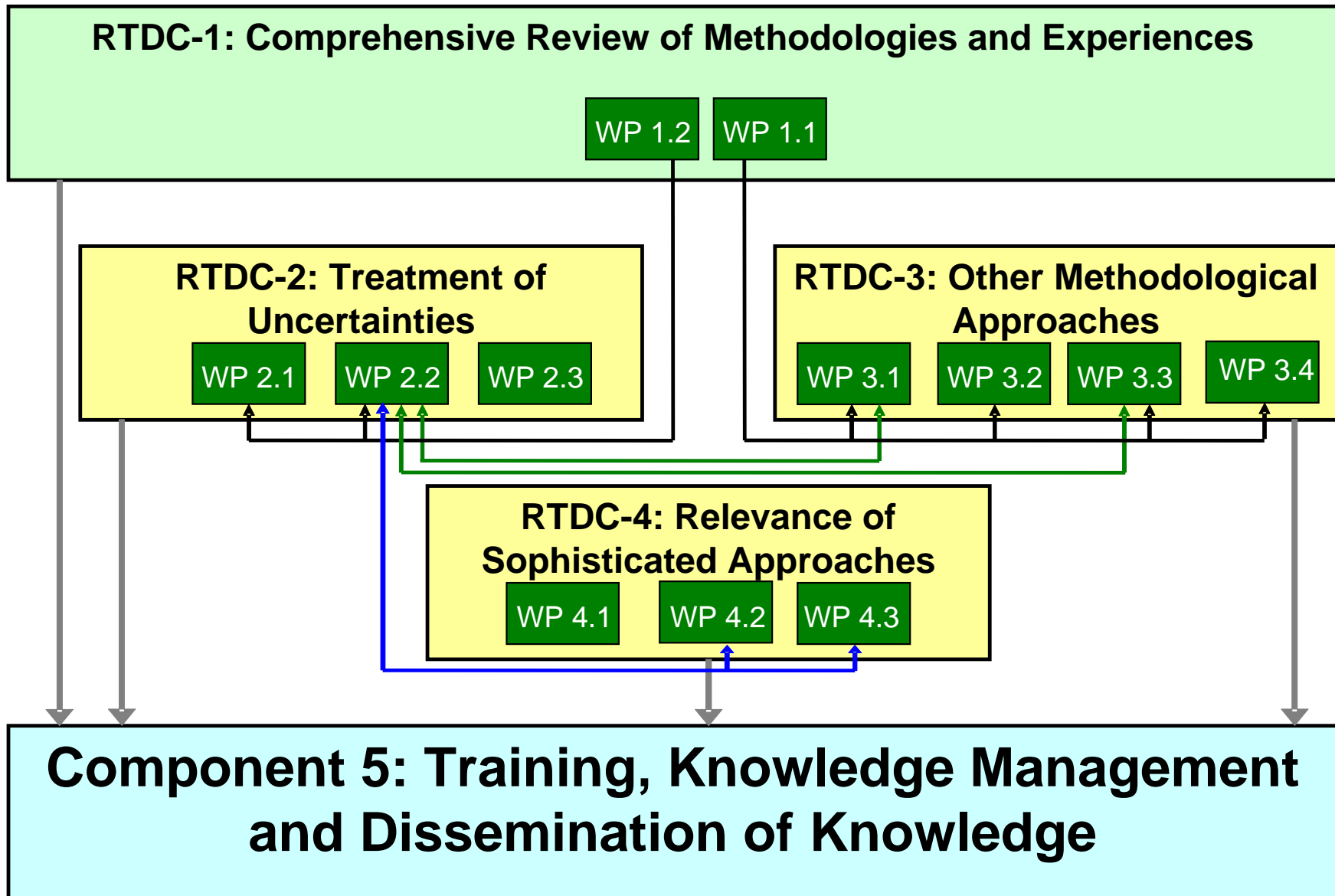
# PAMINA General Information

- Performance Assessment Methodologies in Application to Guide the Development of the Safety Case
- EC 6<sup>th</sup> Framework Programme  
October 1, 2006 – September 30, 2009
- coordinated by GRS
- 27 partners from 10 European countries
  - Germany: GRS, BGR, DBETec, FZK, TUC
  - France: ANDRA, CEA, IRSN, Univ. Lyon
  - Belgium: ONDRAF, SCKCEN, Bel-V
  - UK: NDA, Galson Sciences
  - Spain: Enresa, UPV, UDC, Amphos 21
  - Switzerland: NAGRA, AF-Colenco
  - Czech Republic: NRI
  - Finland: Posiva, VTT
  - Netherlands: NRG
  - Sweden: SSM, Facilia
  - EC: JRC Petten

# General Objectives

- promotion of a common understanding of the techniques and methods for performance assessments and the development of a safety case within the European countries
    - notable differences in methodologies to demonstrate repository safety owing to specific national regulations as well as the geological and technical framework
  - adaptation to the state of the scientific and technical knowledge
  - improvement of integrated PA methodologies and tools
- ⇒ project results valuable for all national programmes, regardless of waste type, repository design, and stage

# Work Structure



# Specific Aims

- RTDC-1
  - assessment of the state of the art regarding methodologies and approaches needed for the safety assessment of geological repositories
  - extraction of the lessons learned from the rich experience accumulated in their development and application
- RTDC-2
  - development of a common understanding of different approaches to the management of uncertainty in PA
  - guidance on good practice on how to treat different types of uncertainty both as a whole and in specific areas

# Specific Aims

- RTDC-3
  - development of methodologies and tools for integrated performance assessment for various geological disposal concepts
  - link between the review work undertaken in RTDC-1 and the practical cases investigated in RTDC-4
- RTDC-4
  - evaluation whether using more complex and more realistic modelling approaches
    - provide an added value
    - are required to include processes not yet fully accounted for in performance assessment.

# Review Results (I)

- improvement of common understanding was gained
- mainly driven by the reports for the topical reviews in RTDC 1
  - 11 topics relevant for safety case
  - approach to conduct review provides
    - good coverage of each topic (at least conc. Europe)
    - balanced view
  - national reports are a treasure of information
- differences are acknowledged and much better understood
- treasure is even more worthy due to other review work throughout PAMINA

## Review Results (II)

- many areas with fairly coherent views (even if different terminology is used)
  - role of the safety case
  - types of scenarios
  - principle safety functions
  - safety / performance indicators
  - principle types of uncertainties
  - uncertainty analysis / sensitivity analysis
- areas with diverging views/approaches
  - biosphere modelling
  - treatment of human intrusion in SC
  - assignment of scenario probabilities

# Improvement of Methods

- Sensitivity analysis
  - limitations of usual methods explored
  - new methods tested (need to explore in more detail)
    - response surface method
- Good and flexible calculational tools are available but are constantly improved
- Some interesting protocols have been suggested
  - derivation of PDFs
  - treatment of model uncertainties
  - should be tested *asap*, shared experiences could provide valuable guidance

# Conservative vs. Best Estimate

- different pro's and con's
  - conservative approach
    - showing overall safety (+)
    - values are often easier to defend in a licensing procedure (+)
    - but proving conservatism may be difficult (-)
    - gaining system understanding (-)
    - communication with the public (~)
  - approach must fit the purpose

# Probabilistic vs. Deterministic Approach

- driven in the various countries by regulation
- viewpoints
  - in the past more antagonistic views
  - today seen to complement each other, providing different insights
- New approaches to probabilistic methods
  - NAGRA example: allows to monitor effect of simplification
- communication of PA results may be difficult
  - in the regulatory framework if not prescribed
  - for lay audiences other, short term concerns more important

# Outreach

- results are publicly available on PAMINA internet page
  - [www.ip-pamina.eu](http://www.ip-pamina.eu)
  - Internet page will be operated beyond PAMINA
- Final Report
  - part I: Review on Methods
  - part II: All deliverables of PAMINA (in total 29)
  - 11 deliverables available on Internet page
- about 150 Milestone reports
  - selected reports also available on PAMINA internet page
- results provide important input for further OECD/NEA work

# Conclusions

- PAMINA is a useful reference, that
  - provides concise information conc. different national approaches
  - helps to understand the terminology used
  - is useful for countries with advanced waste management programmes, but also for less advanced programmes
  - provides guidance on many issues ...
  - ... but must be taken cautiously
- PAMINA has identified areas for methodological improvements
  - current methodological approaches have limitation
  - allow to gain more insights
  - improve robustness of safety case

Thank You

