TM-47040

Second Technical Meeting of the International Project on Human Intrusion in the Context of Disposal of Radioactive Waste (HIDRA)

- WG3: Working Group Activity

"Consideration of Different Aspects" -

05 December 2014

IAEA
International Atomic Energy Agency

WG3: Working Group Activity

Content

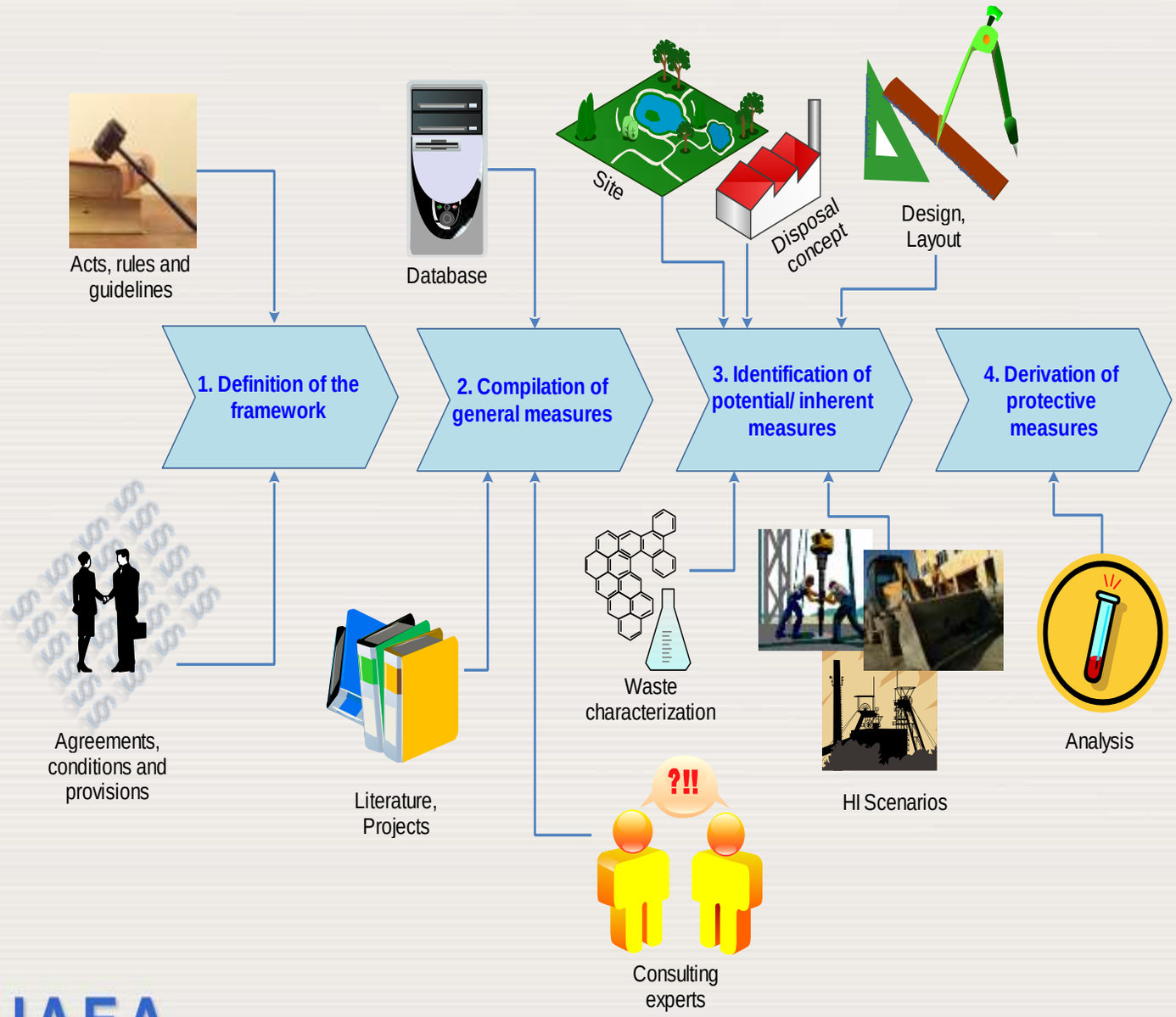
- Participants
- Structure of the chapter
- Approach
- Discussion of Chapter 7 in relation to measures
- Joint session WG1 and WG3
- Iterative process

WG3: Working Group Activity

- 9 Protective measures
  - 9.1 Background and Rationale
  - 9.2 Approach for the derivation of protective measures
    - Step 1: Definition of the framework
    - Step 2: Compilation of general measures
    - Step 3: Identification of potential/inherent measures
    - Step 4: Derivation of protective measures
  - 9.3 Categories of measures
    - A) Monitoring/ Surveillance
    - B) Design of disposal facilities and engineering barriers
    - C) Knowledge management
    - D) Siting
    - E) Waste types and characteristics
  - 9.4 Conclusions

WG3: Working Group Activity

- Discussion on working methods



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- Introduction (to be discussed)
  - For near surface disposal : HI scenarios are key factors determining WAC ; HI scenarios play a role in the design and optimization of the performance of the system
  - For geological disposal: Inherent features => HI scenarios have a different perspective: HI scenarios oriented towards robustness demonstration

- Objectives of chapter 9:
  - Derive methodology
  - Establish database measures : structure
  - Discussion of the different measures of the different categories (A to E) : pros and cons of different measures

- Messages in chapter 9
  - Clarify what are protective measures for:
    - Reduce HI potentials as much as possible
    - If intrusion took place: minimize impact/consequences

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- Step 1: Definition of the framework
  - Identification of regulations, standards and safety requirements pertaining to HI.
  - Provisions for deriving protective measures (e.g. past and current technologies to derive the human actions to take into account)
  - Consider the conceptual model of the disposal system (layout and if necessary inventory).
  - Take into account stakeholders' inputs regarding scenarios, potential measures

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Step 2: Compilation of general measures on the basis of:

- Existing literature
- Lessons learned from other projects
- Experts'elicitation
- Database of general measures

Note for chapter 9:

- The detailed documentation of the iterative process is vital
- Including the iterative process after deriving protective measures when e.g. the disposal concept will be modified

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Step 3: Identification of inherent/potential measures

- Detailed inputs from different sources of information: site (e.g. topography, geological formations), disposal concept, layout and also waste inventory and characteristics (waste forms).
- Identify inherent & potential measures from the different information sources.
- Inherent measures belong already to the disposal concept (e.g. site, layout). It can be e.g. location or separation of waste types (placement in different places).
- Inherent measures can be enhanced.
- Consider stylized scenarios and judge of the plausibility (input from WG1)
- Need of stylised scenarios (interactions needed from WG1)
  - to get information about exposure pathways and significant consequences (to know where to put potential measures).
  - to demonstrate effectiveness of measures (iterative process with WG1)
  - to demonstrate robustness
  - to demonstrate compliance
- Output : adaptation/addition of potential measures or adaptation of inherent measures to consider in step 4.

WG3: Working Group Activity

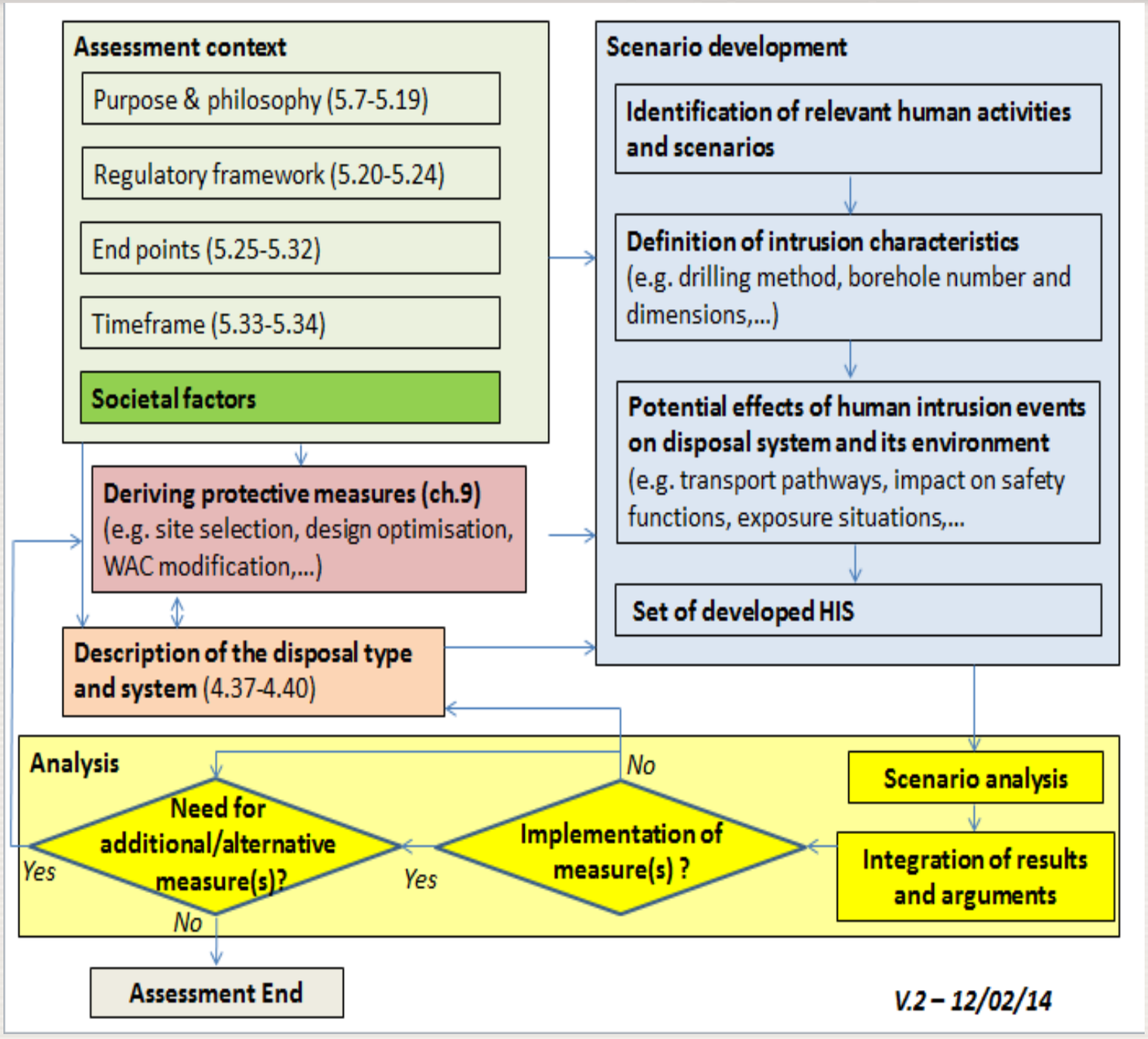
Step 4: Derivation of protective measures

- Rational: Evaluate if the potential measures from step 3 are in conflict with primary criteria like long term safety and operational safety and others
- If primary safety criteria are jeopardized, the potential measure is screened out.
- Classify proposed measures according to their safety impact
- Evaluate the cost / benefit of the potential measure
- Evaluation requires interdisciplinary interactions to judge of the feasibility and the effectiveness of the potential measures
- Evaluation of the potential measure in the context of the defense in depth (consideration of the whole system)
- The potential measure is derived through an optimisation process (e.g. graded approach to cost/benefits on wall thickness in relation to resistance of the container, gas production and cost)

Joint WG session WG1 and WG3

- Link between figure 7.1 and figure 9.1
- Should we make the difference between Near surface & disposal system in the table of measures (what are the measures applicable to which disposal type)
- Pathways and exposure ways (how exposure is taking place as e.g. air pathways) should be emphased when defining HI scenarios (step 2 in figure 7.1) to guide how to implement measures
- How are the scenarios related to the safety functions ; which safety functions are jeopardized in the scenarios; suggestion to make a table synthetizing the scenarios categories, the safety functions impacted.
- Make the difference between direct and chronic impact
- Chapter 7.5 : Review of the scenario output should also show that defense in depth is preserved (robustness demonstration). Can be done also through scenario
- Chapter 7.5 : Check that the scenario are still representative.

Joint WG session WG1 and WG3



Joint WG session WG1 and WG3

- Comments
  - SF should be more discussed in a general sense (maybe an example should be given)
  - Role of scenarios for measures and vice versa => should be adressed in chapter 6
  - Stewise approach of derving protective meausres should indicate the link to scenario development

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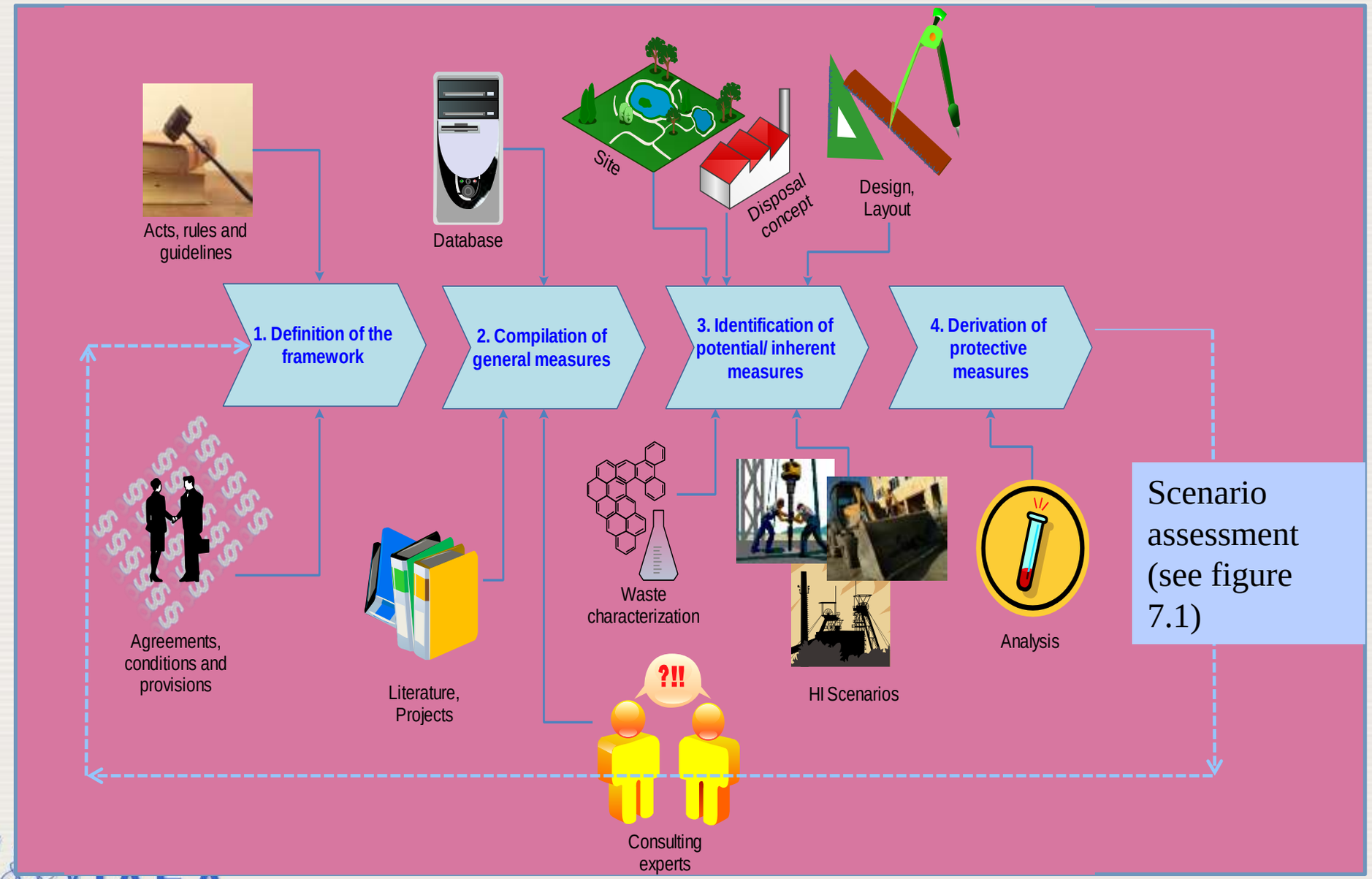
- Discussion on working methods



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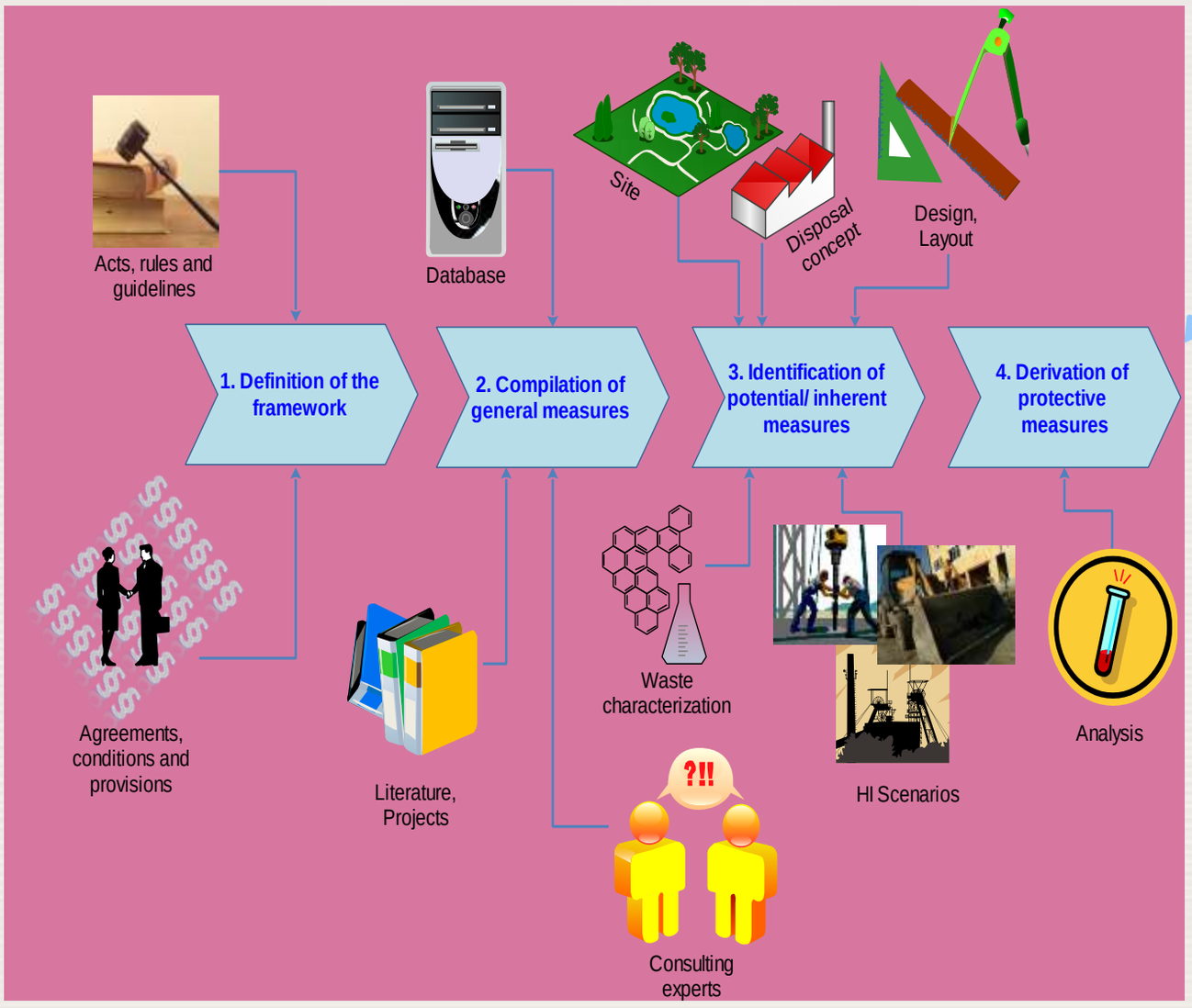
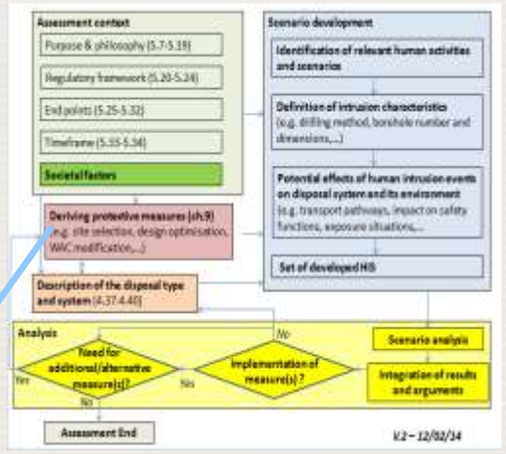
- Deriving protective measures (cf. fig. 7.1)





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Iterative process

- Check the deriving protective measures process every time the input data for step 3.This includes inventory change, sitting and design change, and HI scenarios)
- Concept or design modifications can be due to protective measures but also due to other requirements.
- Hi scenarios can be affected by measures selections.

WG3: Working Group Activity

- Remaining works
  - Implementing outstanding questions/comments
  - Consideration of comments from this TM
  - Revision of the database
  - Completion of the documentation

WG3: Working Group Activity

- Adressed Topics
  - NSD and DGR part for the introduction
  - Working plan WG3
  - Role of scenarios and measures
  - Integration of the Approach for deriving protective measures in the common figure
  - Suggestions for the follow-up project
  - Recommendations to WASSC/RASSC
  - Structure for the table regarding national examples

WG3: Distinction between DGR and NSD to be included in the introduction

- Suggestion for the Near Surface Disposal (NSD) vs. Deep Geological Repositories (DGR) issue as part of the introduction
  - Consideration of HI aspects are quite essential for NSD due to potential for direct impact because of accessibility of the source of radioactive materials. Nevertheless intrusion into DGR could be also important due to indirect accessibility through drilling or exploration for subsurface resources.
  - In addition WAC for NSD could rely heavily on the potential of intrusion as well as on measures to minimize or prevent such intrusion (e.g. inadvertent intrusion).

WG3: Working Plans

Step 3: Documentation of sub-chapters

- Waste characterisation: Benoit
- Design and layout: Cho
- Disposal system: Shizong
- Site: Manuel
- Scenarios: Thomas

Step 4

- Documenting: Thomas

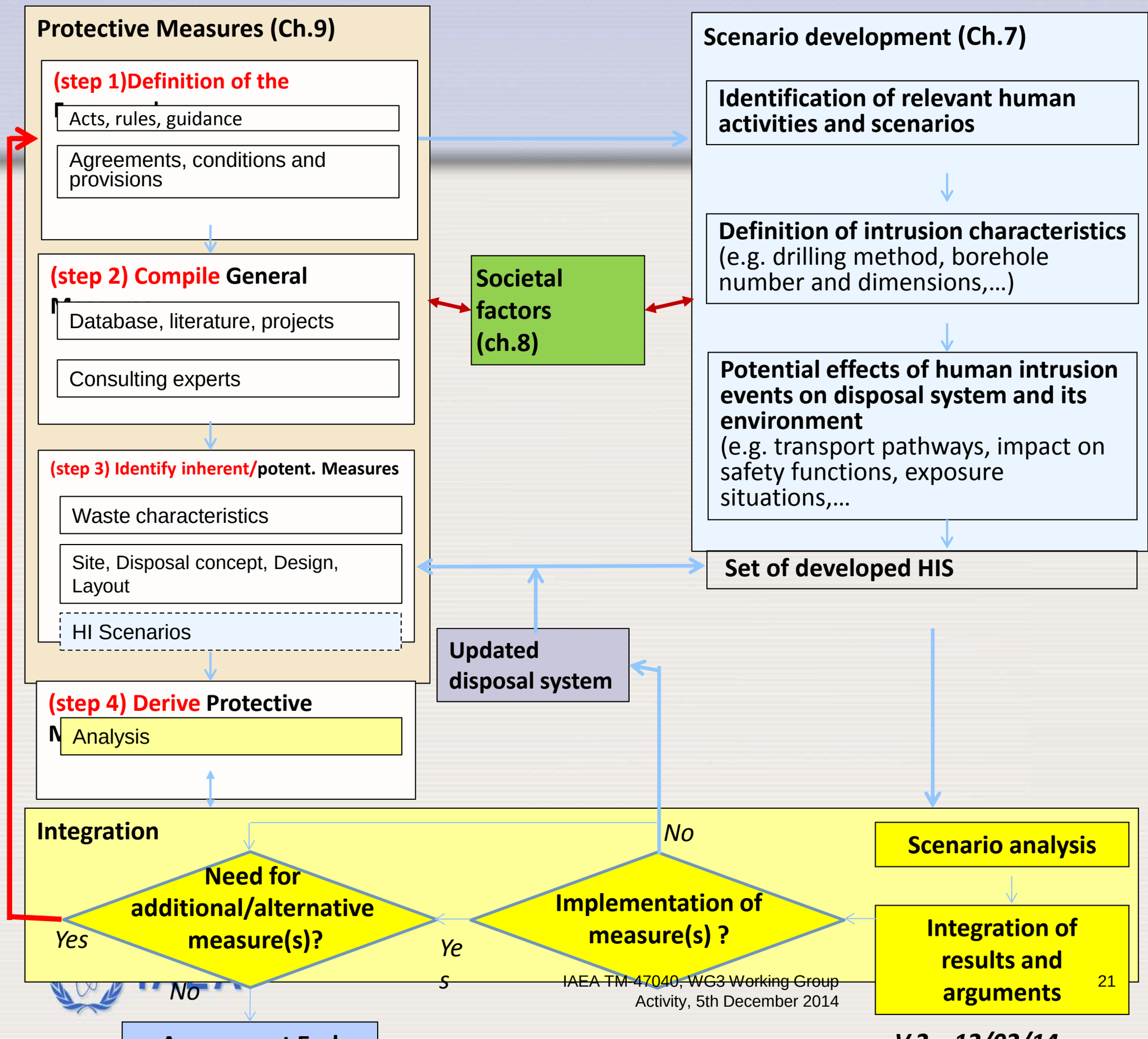
Conclusions : Thomas

Review: Bobby

Deadline: End of January

WG3: Plans

- Suggestion for Chapter 5
  - The role of measures and scenarios: Frank & Manuel (deadline: Mid February)


Protective Measures (Ch.9)
(step 1)Definition of the
Acts, rules, guidance
Agreements, conditions and provisions
(step 2) Compile General
Database, literature, projects
Consulting experts
(step 3) Identify inherent/potent. Measures
Waste characteristics
Site, Disposal concept, Design, Layout
HI Scenarios
(step 4) Derive Protective
Analysis
Societal factors (ch.8)
Scenario development (Ch.7)
Identification of relevant human activities and scenarios
Definition of intrusion characteristics (e.g. drilling method, borehole number and dimensions,…)
Potential effects of human intrusion events on disposal system and its environment (e.g. transport pathways, impact on safety functions, exposure situations,…
Set of developed HIS
Updated disposal system
Integration
Need for additional/alternative measure(s)?
Yes
No
Implementation of measure(s) ?
Yes
No
Scenario analysis
Integration of results and arguments

WG3: Follow-up project ?

- Practical illustration of treatment & optimisation approach of HI.
- Application of the HIDRA methodology in the context of PRISMA (generic site for DGR and NSD).
- Getting further into the difference between DGR and NSD.

WG3: Recommendations to/from WASSC/RASSC

- Feedback and comments on methodology and HIDRA report.
- To have their recommendations for HIDRA phase 2 (practical illustration of the HI approach as proposed)
- Need for updating/developing IAEA safety guides pertaining to HI.

WG3: Table summarizing questionnaire results
A proposal

- Country
- Facility type/type of waste
- Regulatory requirements : yes/no + references ?
- WAC based on HI criteria : yes/no
- Institutional control required
  - Active : yes, timeframe/no
  - Passive : yes, timeframe/no (?)
- Measures
  - Select No among the database of general measures
  - If the measure is not included in the database, comment it
- HI scenarios
  - Select among representative/generic scenarios developed by WG1
- Consequences
  - Qualitative and/or Quantitative
  - Limits if quantitative analysis
- Comments

WG3: Table summarizing questionnaire results What is the table intended for ?

- Summary of the information included in the text (kind of entry) ?
- Table portraying best practices, representative examples ?
- Table(s) to derive general practices (e.g. what is the intrusion timing range / what is the typical ranges of intrusion times) ?
- Structure ?
  - Line by country ? Disposal facility ?
  - Table by disposal facility/state ?