

Modern2020

Planning for Evaluating and Responding to Monitoring Results, and Use of Monitoring in Decision Making

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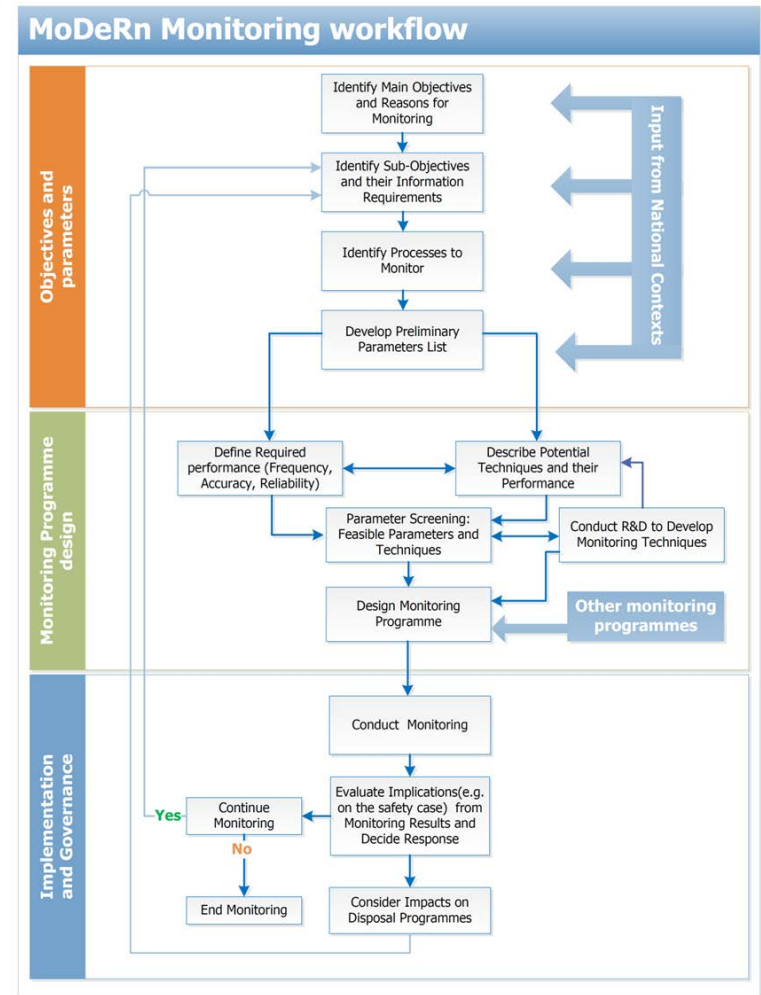
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- The MoDeRn Project formulated a reference framework and a generic workflow for developing and conducting a monitoring programme
- Further work was required to consider explicitly how a waste management organisation might plan for responding to monitoring results



Presentation Objective

- Consider how a waste management organisation might plan for responding to monitoring results
- Develop recommendations and observations on responding to monitoring results
 - ✓ General guidance and principals, rather than specific plans
- Develop a generic process for responding to monitoring results

Assumptions Regarding Monitoring Programmes: Process Understanding

- Extensive modelling will be undertaken to support the post-closure safety case
 - ✓ Process modelling to understand near-field evolution
 - ✓ Safety assessment modelling, using conservative values to account for uncertainty, to estimate dose/risk consequences
- Process understanding can be used to develop predictions of monitoring parameter values over the monitoring period
- Accuracy and precision of models needs to be appropriate for making decisions, and to be consistent with monitoring technology capabilities

Assumptions Regarding Monitoring Programmes: Parameters

- Parameters to be monitored will respond to the objectives of the monitoring programme
- Building further understanding of processes might require monitoring of a suite of thermal, hydraulic, mechanical and chemical parameters
- Checking the performance of the disposal system might be undertaken using a more limited set of parameters
 - ✓ Proxy or indicator parameters, such as flow across the deposition tunnel plug (KBS-3V) or subsidence (WIPP)

Assumptions Regarding Monitoring Programmes: Use in Decision Making

- Modern2020 Project has recognised a general framework for decision making, with decision making made at three different levels
 - ✓ Technical and engineering decisions
 - ✓ Disposal programme decisions
 - ✓ Governance decisions
- Monitoring will provide a support to technical and engineering decisions, and disposal programme decisions

- Continuous evaluation
 - ✓ As monitoring data are collected, the results for each parameter will be checked against parameter value predictions, on a continuous basis
- Periodic evaluation
 - ✓ Evaluation of monitoring results on a parameter-by-parameter basis, would not provide a sufficient check on integrated repository performance
 - ✓ Performance of the repository system should therefore be checked periodically based on all available information

Continuous Evaluation: Classifying Results

- Comparison of monitoring results to predicted parameter values:
 - ✓ **Consistent Results:** Monitoring results lie within the range of predicted parameter values and trends indicate that they will continue to do so
 - ✓ **Inconsistent but Insignificant Results:** Monitoring results lie outside the range of predicted parameter values and/or trends indicate that they will do so in the future, but the results do not contradict assumptions made in the safety case
 - ✓ **Inconsistent and Potentially Significant Results:** Monitoring results lie outside the range of predicted parameter values and/or trends indicate that they will do so in the future, and the results have the potential to contradict assumptions made in the safety case

- **Consistent Results**
 - ✓ Continue monitoring programme with no change, feed results into planned periodic evaluation
- **Inconsistent but Insignificant Results**
 - ✓ Evaluate sensor performance
 - ✓ Check results
 - ✓ Report deviating results
 - ✓ Feed results into periodic evaluation
- **Inconsistent and Potentially Significant Results**
 - ✓ Initial actions similar to Inconsistent but Insignificant Results
 - ✓ Depending on significance, intervene, e.g. halt emplacement
 - ✓ Trigger for periodic evaluation

Triggers for Periodic Evaluation

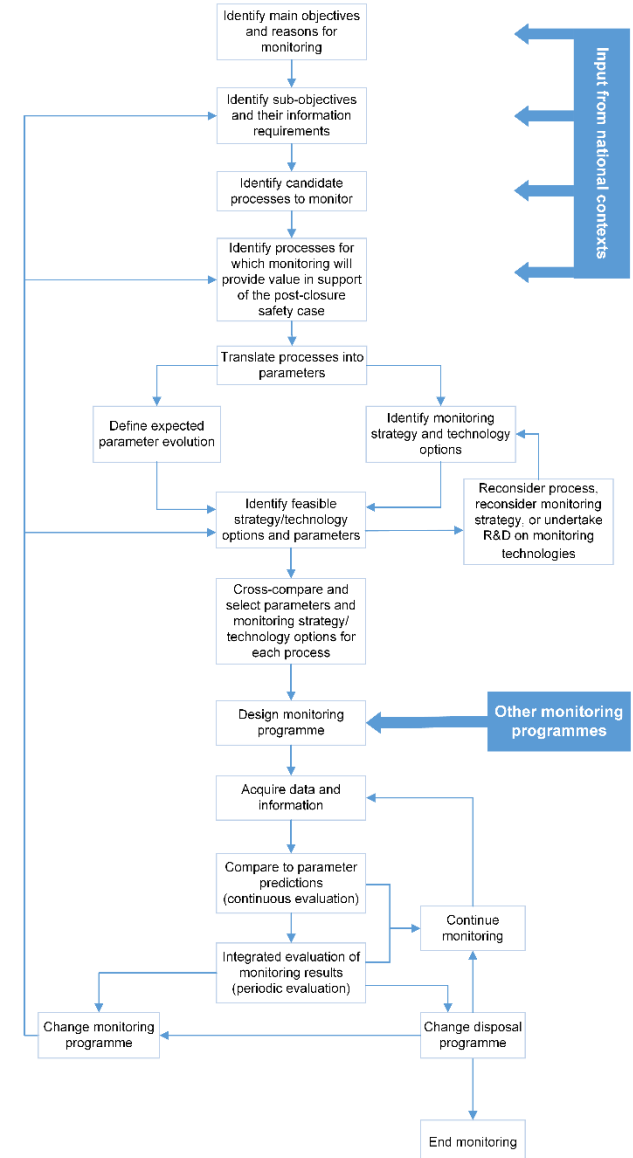
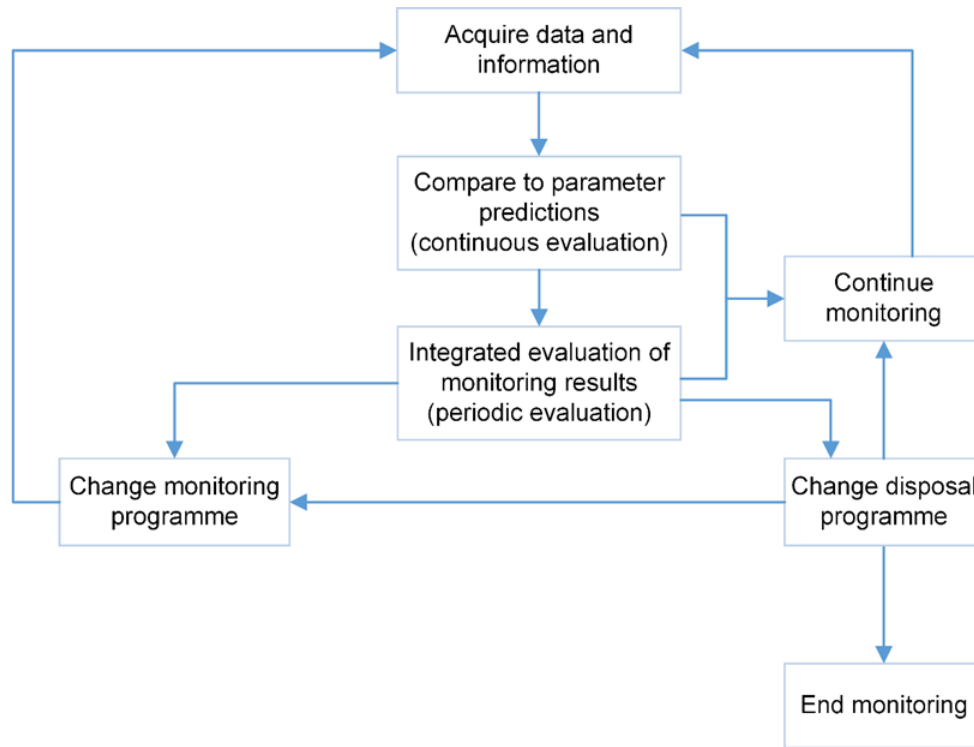
- In response to Inconsistent and Potentially Significant results
- Planned periodic updates to the safety case
- As the result of an external decision, e.g. a request from the regulator or other Government agency



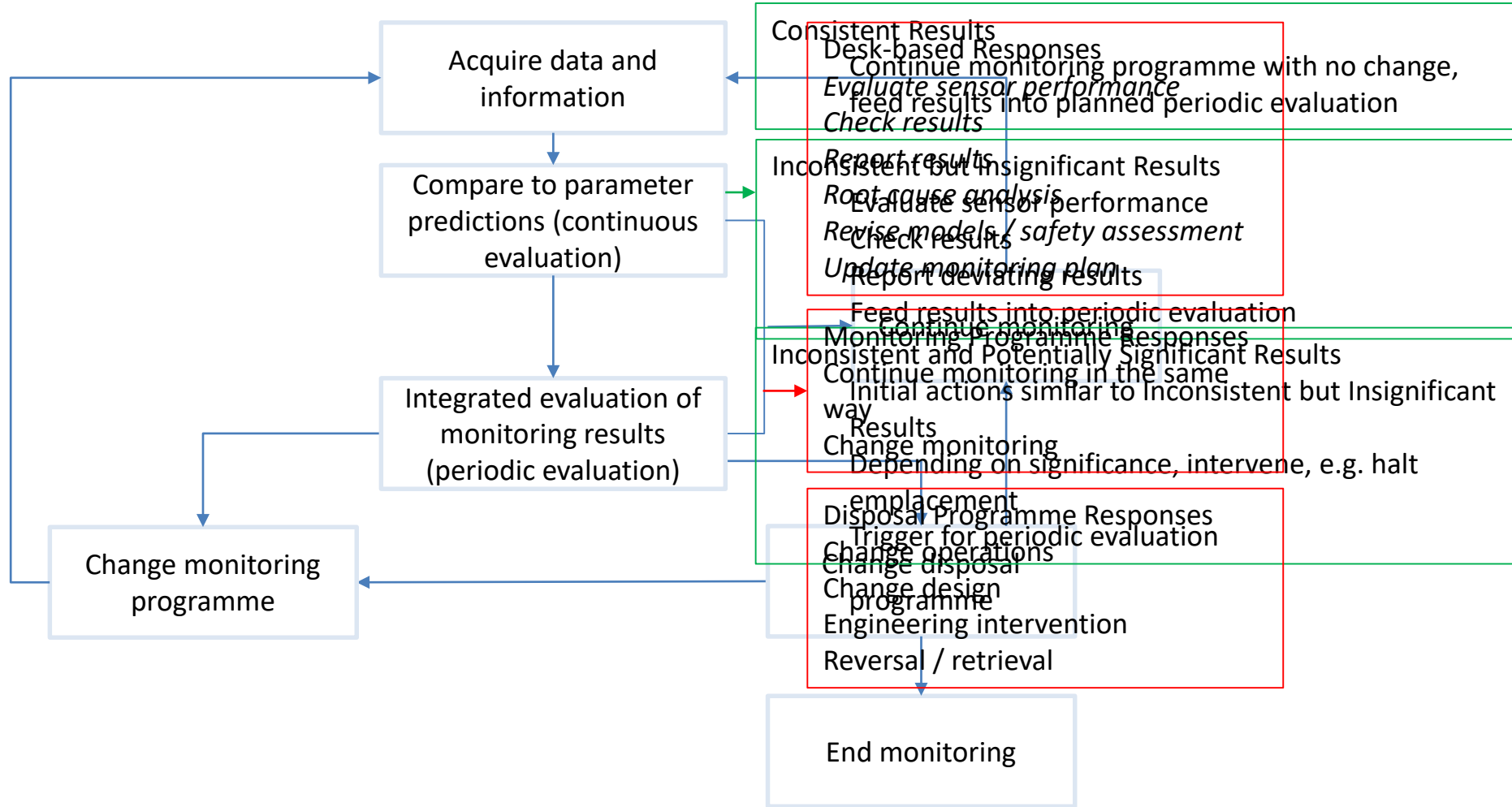
Periodic Evaluation: Potential Responses

- Desk-based Responses
 - ✓ Root cause analysis
 - ✓ Revise models / safety assessment
 - ✓ Update monitoring plan
- Monitoring Programme Responses
 - ✓ Continue monitoring in the same way
 - ✓ Change monitoring
- Disposal Programme Responses
 - ✓ Change operations
 - ✓ Change design
 - ✓ Engineering intervention
 - ✓ Reversal / retrieval

Workflow for Responding to Monitoring Results



Workflow for Responding to Monitoring Results



Conclusions: Recommendations and Observations

- Monitoring results should be compared to predicted parameter values
- Responding to monitoring results requires continuous evaluation of specific data and periodic evaluation of the monitoring dataset
- Response plans need to be adaptable and consider the organisational process as the details of unexpected repository system behaviour cannot be predicted in advance, and responses should consider the overall repository system behaviour
- Usually, the first response to results inconsistent with predictions is to re-check data quality/interpretation, and then to consider the implications for safety
- The approach to responding to monitoring results can be guided by consideration of a generic action list, comprising desk-based actions and physical actions
- Responding to monitoring results can be undertaken in dialogue with stakeholders, as determined by programme-specific and country-specific procedures and regulations
- Decision making is a complex process where monitoring is only one input

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