UNCERTAINTY IN ENVIRONMENTAL IMPACT ASSESSMENT RELATED TO GROUNDWATER

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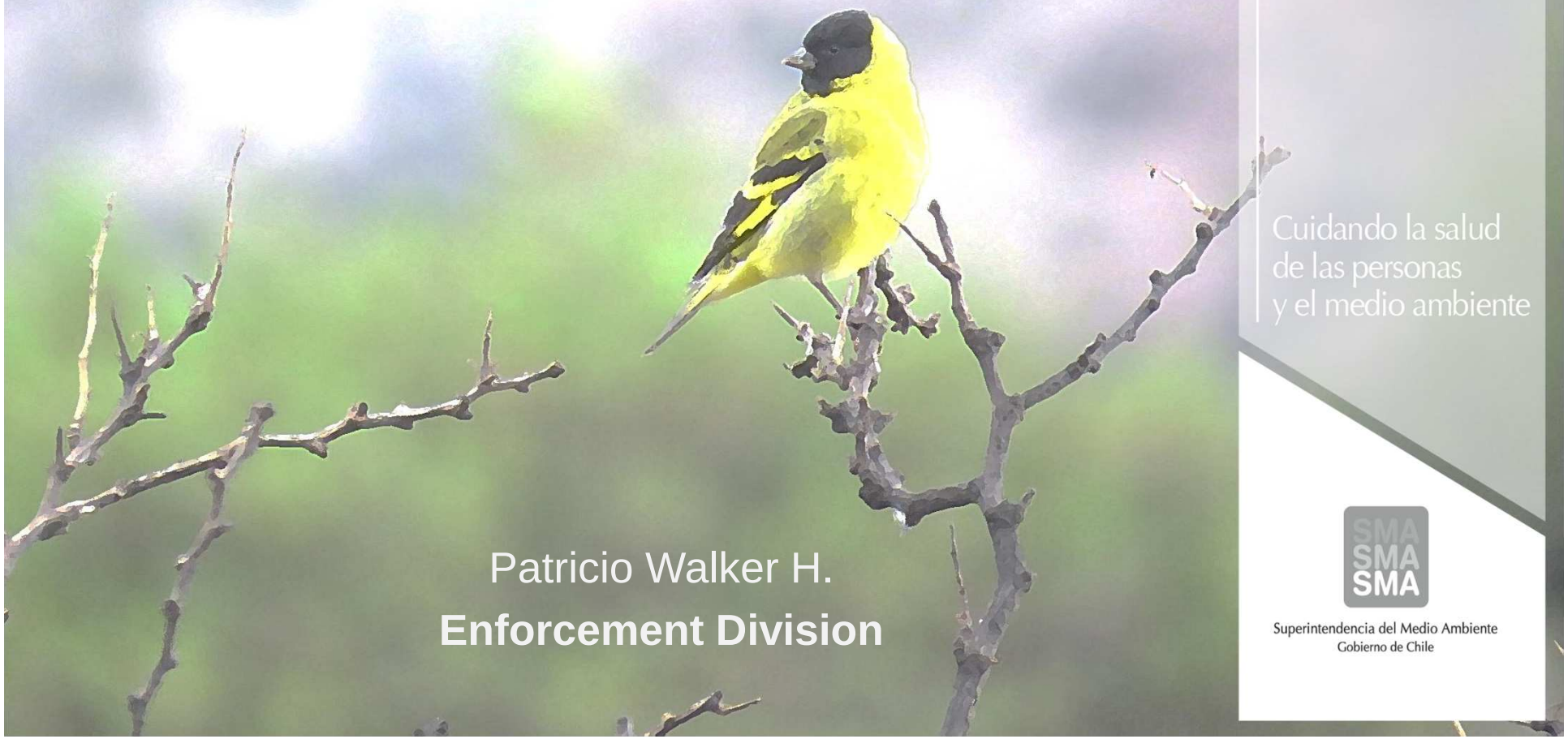

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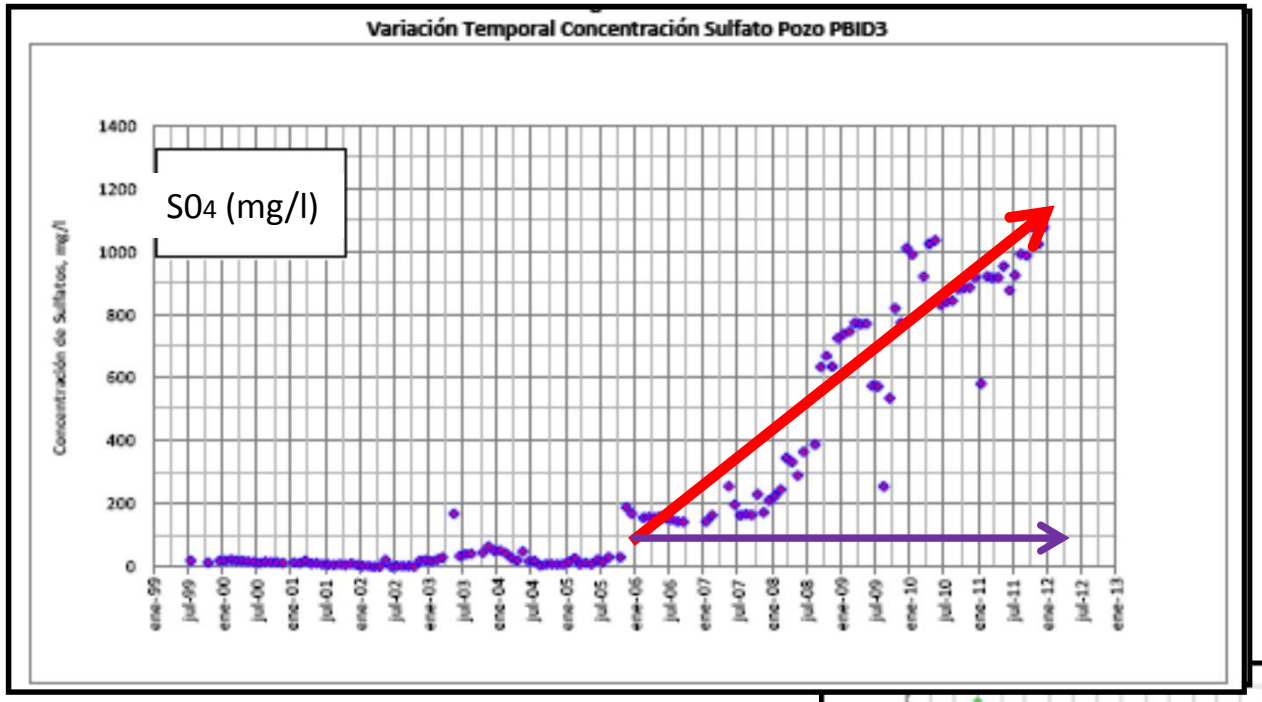
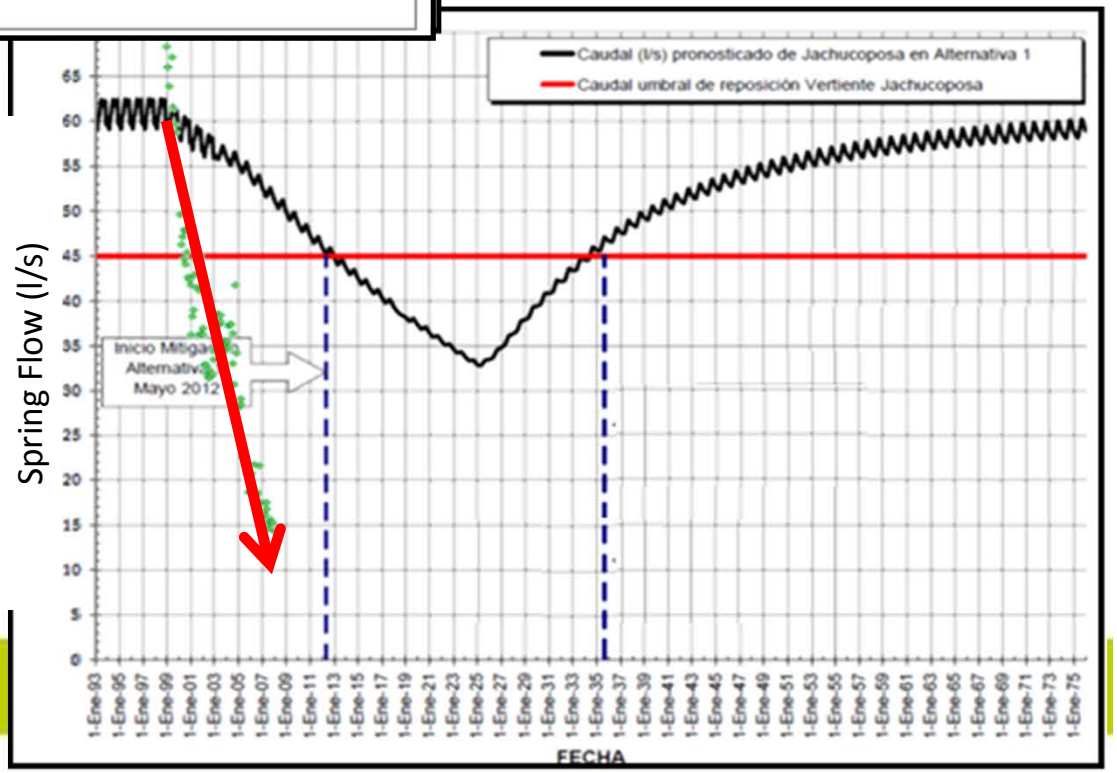
Summary

1. Introduction: the problem
2. The role of modeling in EIA
3. Uncertainty on modeling
4. How to deal with uncertainty
5. Conclusions



¿Why?

¿What should we do?



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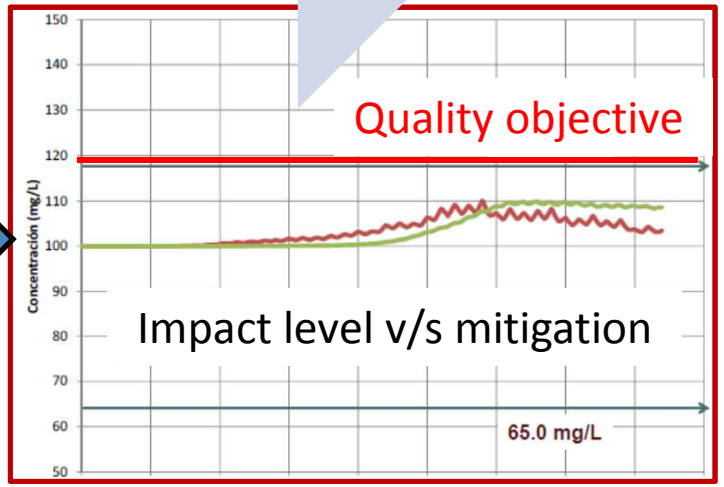
The role of modelling in EIA

Hydrology
Geochemistry
Hydrogeology

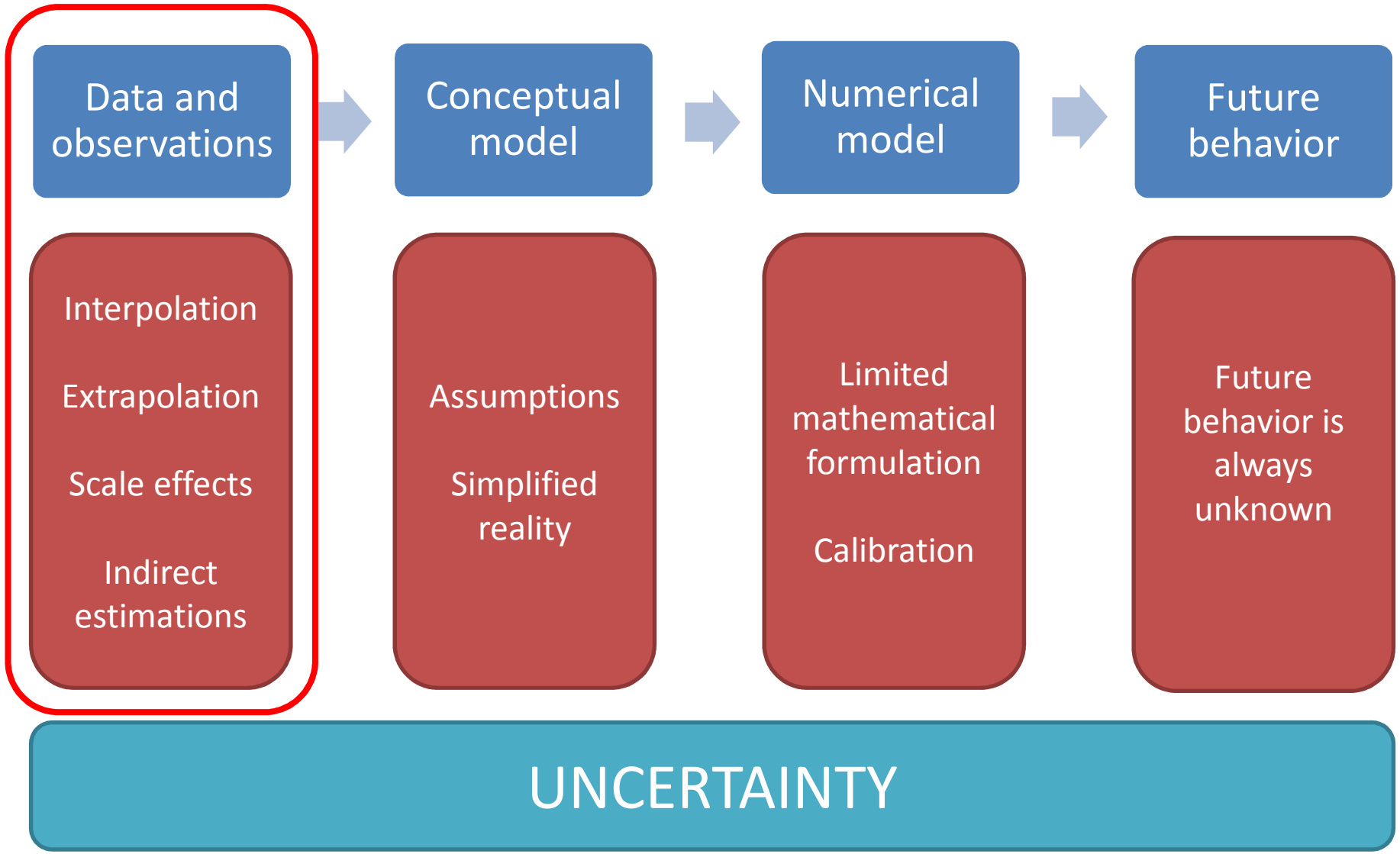
Conceptual model

Numerical model

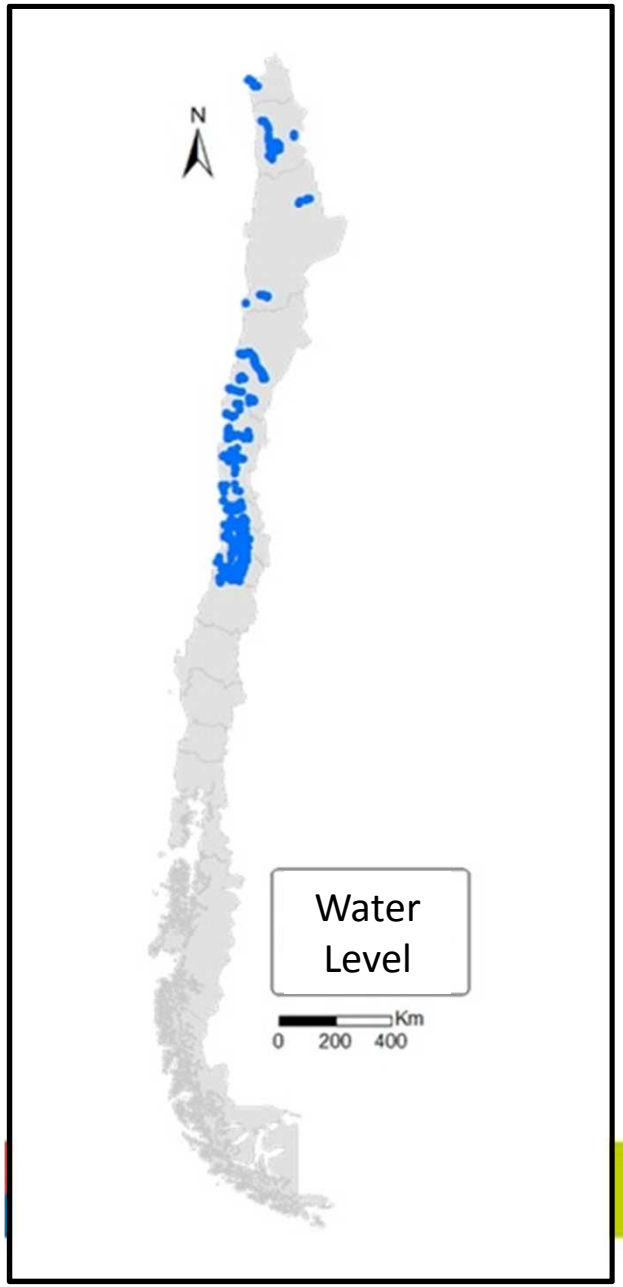
Impact Assessment

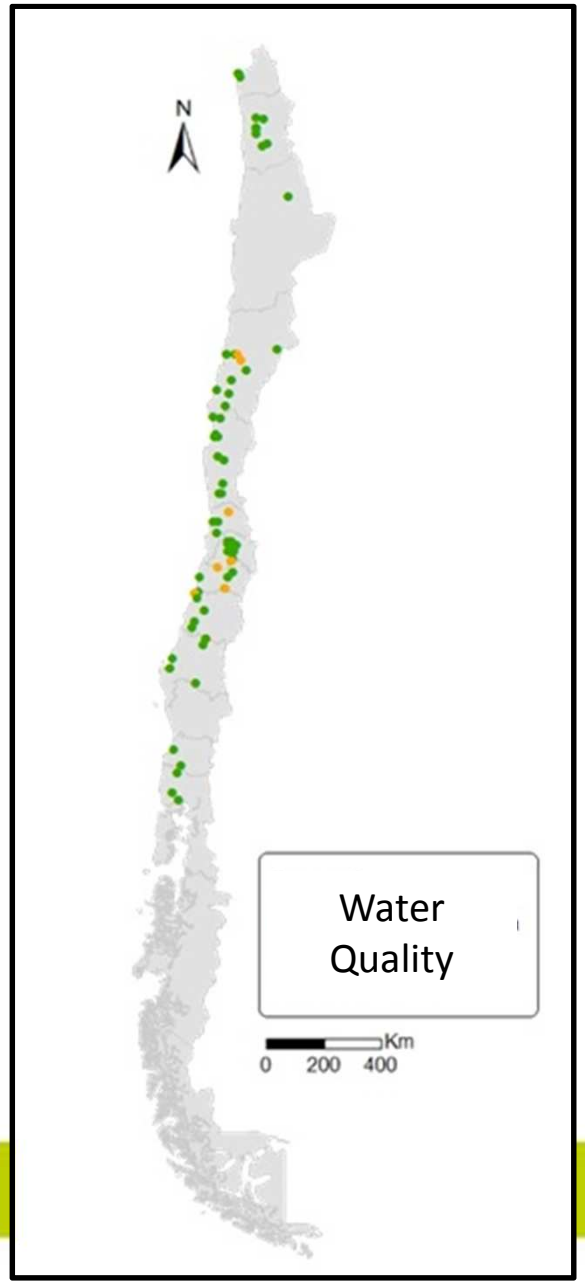


Uncertainty is inherent to models



Groundwater data in Chile



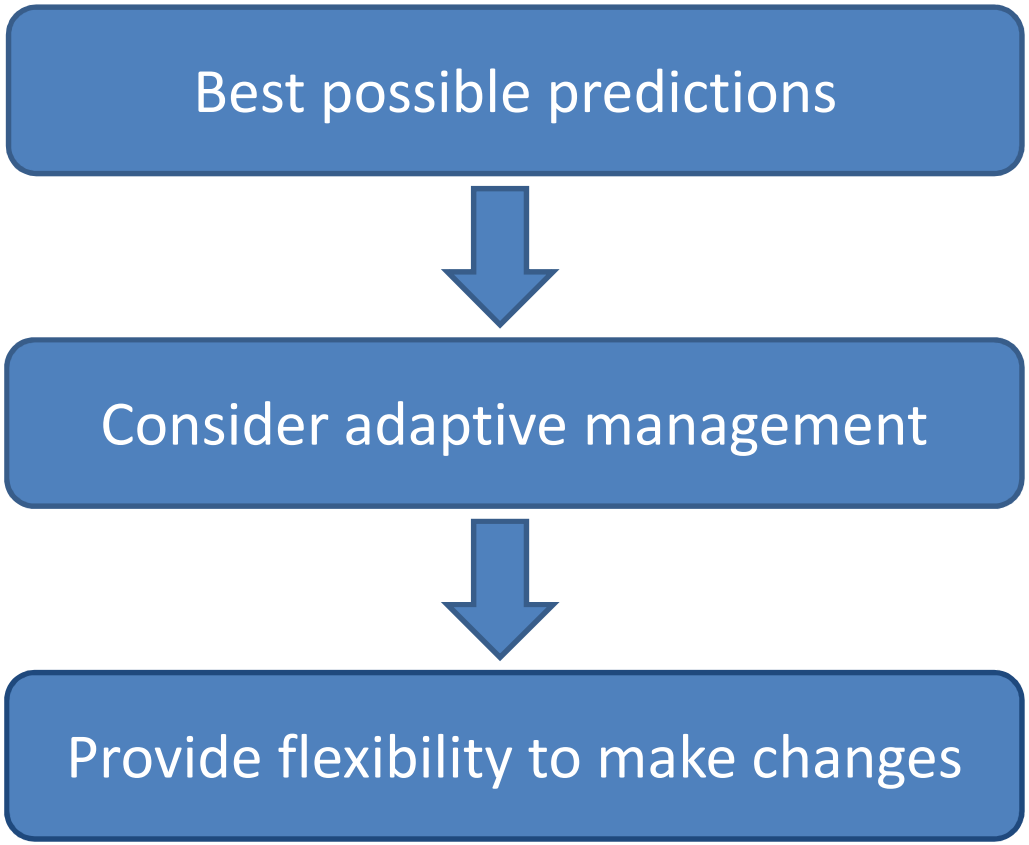


- Only few monitoring stations
- Each project must gather its own data
- It is not practical to ask for long-term data

Important source of uncertainty

Source: DGA, 2012.

Dealing with uncertainty



Dealing with uncertainty

Reduce controllable sources of uncertainty

Data scarcity: sensitivity analysis + monitoring plan to collect data

Modelling : best practices + periodically update predictions using new data

Realistic predictions and margin of safety

"the prediction and assessment of environmental impacts shall consider the state of the elements of the environment and the project or activity in its worst condition"

Corrective actions (adaptive management)

Instrument called "Early Warning Plan" aimed to prevent timely impacts bigger than what was predicted and accepted in the EIA

Modify the EIA permit to adopt new strategies

If previous strategies failed significantly permit can be modified to take all necessary actions to avoid (if still possible) or mitigate potential unaccepted impacts

Early warning plan

Key state variables	**Related to the impact** **Specific control points**
Decision criteria	**Clear threshold** **Triggers actions**
Corrective actions	**Investigate causes** **Reduce impact (source)** **Prevent the spreading**

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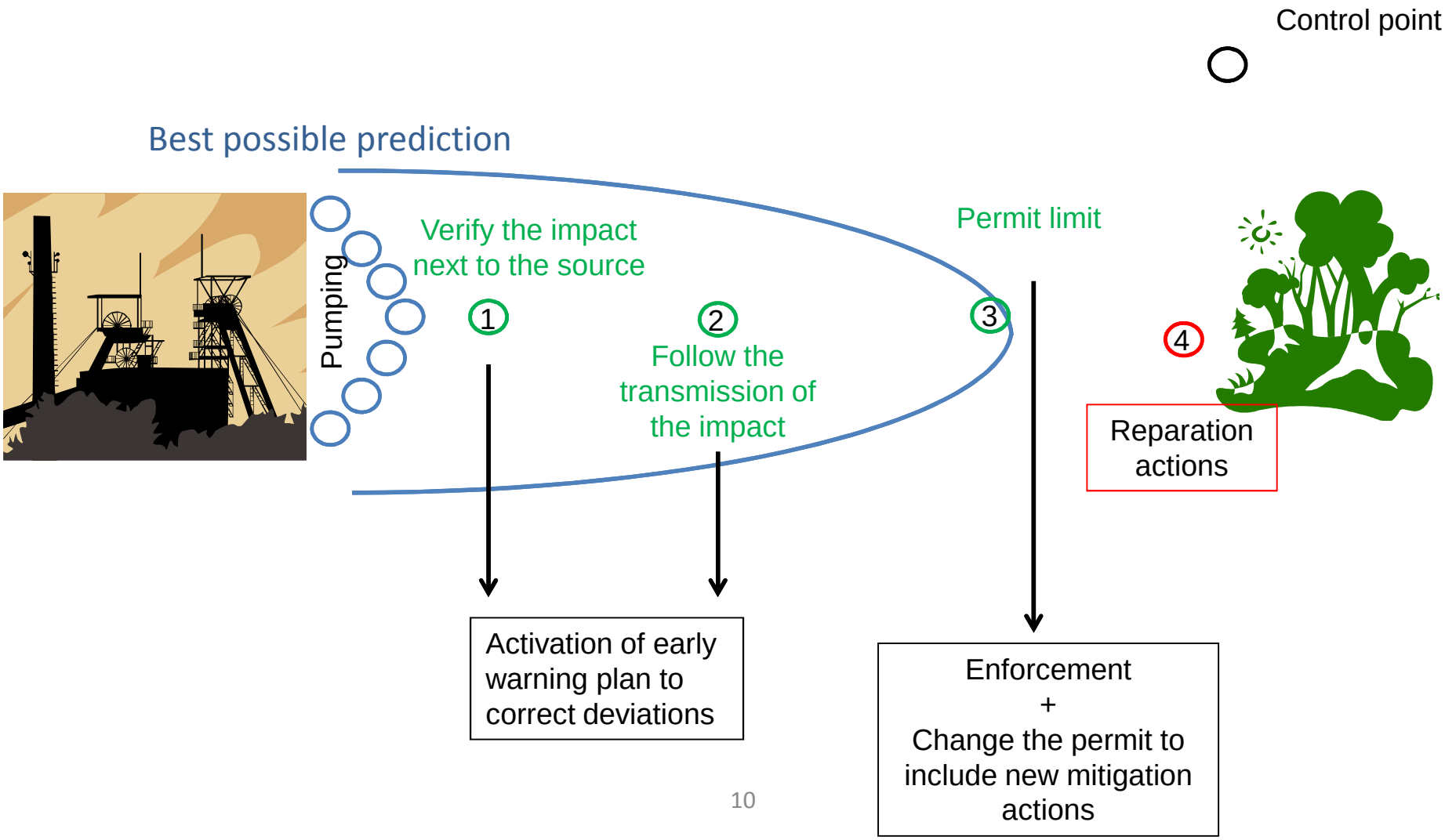
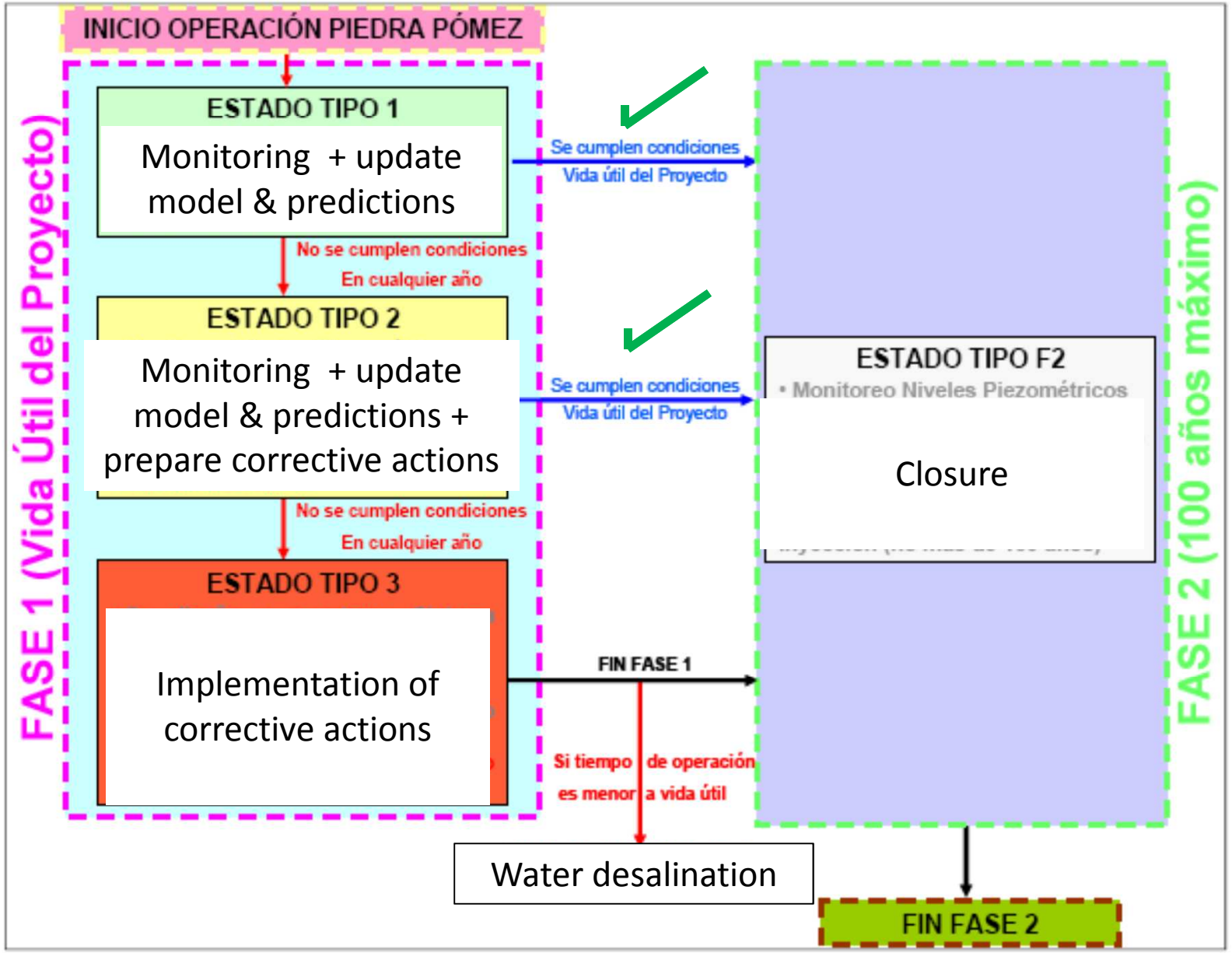
Dealing with uncertainty



Early warning plan example



CONCLUSIONS

- Uncertainty is inevitable when predicting the future behavior of groundwater.
- If this is not considered in EIA, predictions and mitigation actions may fail.
- When using proper management tools to deal with uncertainty it is possible to reduce the risks and be prepared to react timely to unforeseen events.

QUESTIONS

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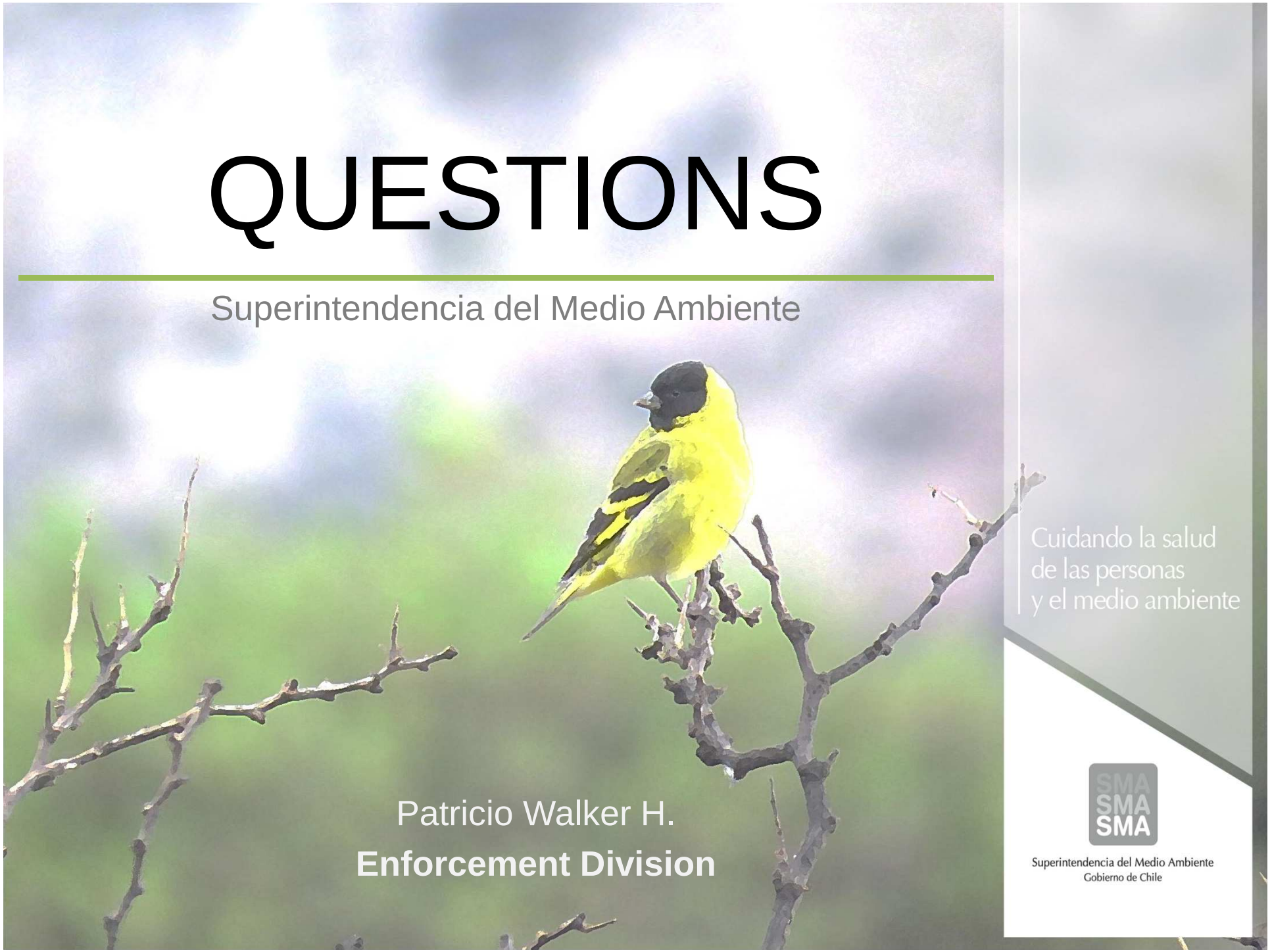

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