

**Deliverable Number D5.8: WP5 results summary report
relevant for Environmental Best Practices; WP5;
lead beneficiary no 16 (DNVGL)**

ACKNOWLEDGEMENTS:

The research leading to these results has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement n° 265847.

1 AIM OF THE REPORT

This report summarizes all information from WP5's "Environmental Risk Assessment for the Sleipner Utsira CO₂ storage project" that is relevant as input to CCT4 "Best Practice Guidance for Environmental Risk Assessment" for offshore CO₂ geological storage".

2 ASSESSING THE CONSEQUENCES, PROBABILITIES AND RISKS

Risks are characterized (ISO31000) by their consequence (or impact) and probability (or frequency). The objective of the assessment of environmental risks involves estimating consequence for the benthic species above a geological storage site and the probability of CO₂ stored deep in the subsurface to contact the sea floor. This is done for each identified discrete risk scenario, which are generally linked to potential site-specific leakage pathways from the target storage reservoir.

The estimation of consequences involves setting site specific **environmental value** for environmental resources within the potential impact area (benthic species), and defining the **degree of impact** based on vulnerability to exposure provided for by CO₂ storage, leakage and sea floor plume modelling.

In the common risk evaluation method of discrete scenario analysis, the task of estimating probability is usually separated from the parallel task of estimating consequences. Reservoir simulation models provide plausible estimates of leakage rates for assumed subsurface structure, geology, leakage features and storage forecasts. To complete the risk scenarios related to CO₂ geological storage sites requires estimates of the probability for realizing the given leakage outcome with associated consequences. The lessons learnt from analogue subsurface industrial activities are that

- Proper application of proven geoscience and subsurface engineering methods results in very safe and secure operations
- Cost-effective site performance is achievable and
- Technical and geological risks are manageable.

In addition, hundreds of thousands of wellbores in the oil and gas industry have provided deep insight into why and how frequently wellbores leak both during active operations and after they have been plugged and abandoned.

However, the overall impression of these subsurface industrial analogues is that although they have large statistical databases of performance, these have limited relevance for predicting future performance of CO₂ geological storage sites. The reasons are varied, but the conclusion is clear.

It is considered best practice to estimate probability for a given CO₂ geological storage site leakage scenario based on site-specific geological and engineering system descriptions.

This entails constructing a structural model of the specific storage site subsurface based on seismic and wellbore data and subsurface engineering description of the specific storage complex and injection project, complete with the relevant uncertainties including those implied in forward modelling.

Because there is limited industrial experience with CO₂ geological storage site operations, there is no direct statistical basis for estimating leakage probability from sites which have been observed to leak, and therefore, probability estimates must be based on a “bottoms-up” approach in which site-specific features are represented and evaluated.

2.1 Overall approach

A generic approach for assessing consequence, probability and risk has been developed to incorporate different scenarios ranging from small to large scale and different sources of influence, and can be applied for different environments such as offshore, inshore, benthic and pelagic. The approach contains six main steps (Figure 2-1):

1. **EBSA methodology** (Ecologically or Biologically Significant Marine Areas). A description of marine resources within a defined area, and a site specific environmental value for each highlighted resource in that area.
2. **Overlap analysis of plume and valued resource.** A quantification of the potentially affected population or habitat expressed as a proportion, number of individuals, or size of an area.
3. **Vulnerability and degree of impact.** An assessment of the vulnerability of, and the impact on the valued environmental resource.
4. **Consequence.** Combination of the “environmental value” and “degree of impact” for each valued environmental resource expressed as consequence categories negligible, moderate, large or severe
5. **Propensity to Leak.** Estimated for each site-specific leakage pathway and leakage scenario.
6. **Risk matrices** for valued environmental resources.

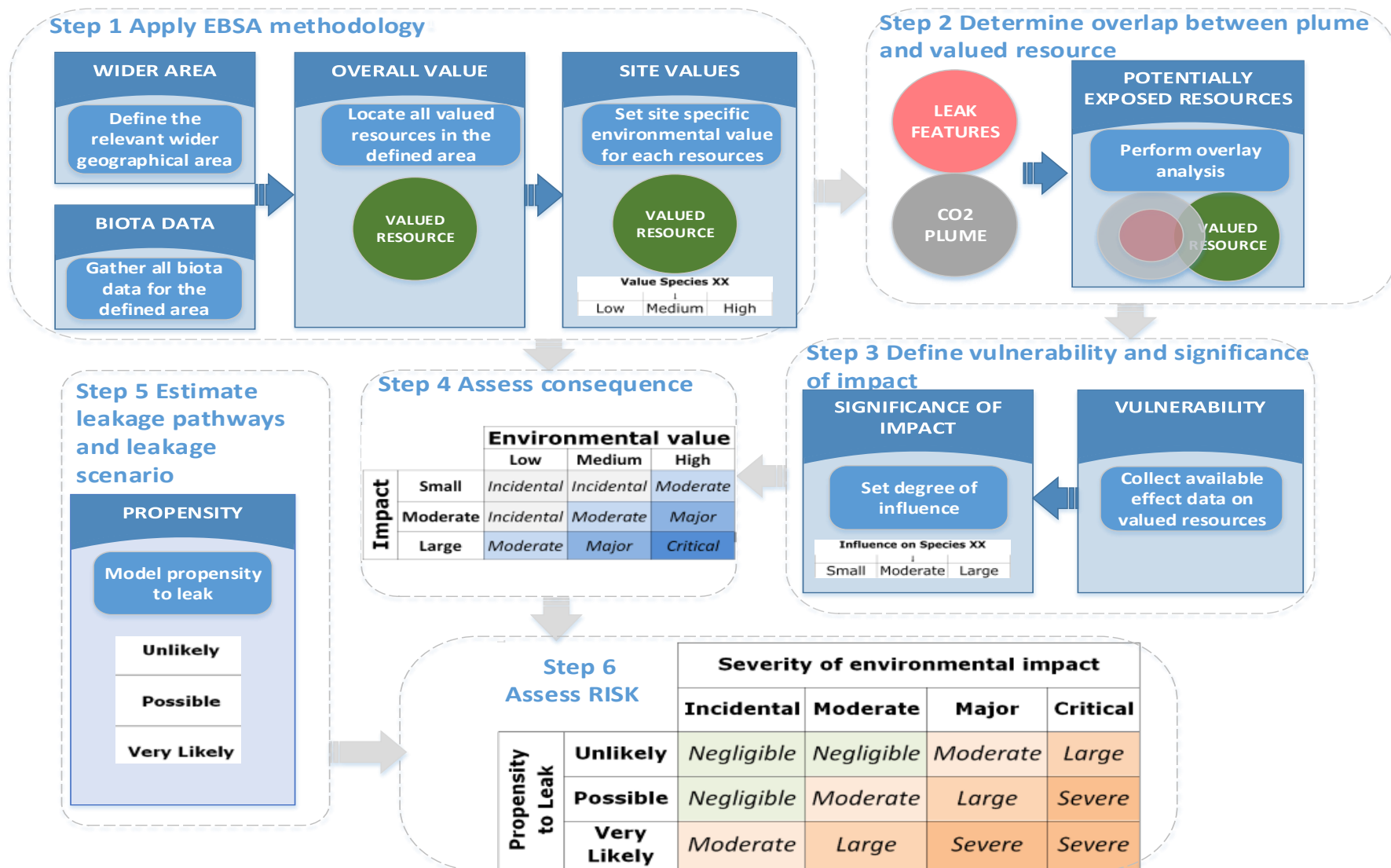


Figure 2-1 This shows the overall ERA approach applied for assessing consequence.

2.2 Step 1 – Apply EBSA methodology

Site specific biology and habitats should be investigated and described in a systematic manner. The description should highlight species and habitats considered as important and a measure of value should be given for identified important species and habitats.

A recommended approach for this is the EBSA (Ecologically or Biologically Significant Marine Areas) approach. EBSA approach is an already established method, first initiated at a high level, by the Convention on Biological Diversity (CBD). The EBSA approach is transparent and logical, and aims to ensure that no resources of value are overlooked. A set of seven criteria to identify ecologically or biologically important areas in the sea (see [CBD COP 9 Decision IX/20](#)) are proposed as the basis for the environmental value assessments.

Table 2-1 The seven criteria used to identify ecologically or biologically important areas in the sea in the EBSA approach

CBD COP 9 Decision IX/20)		
Criteria	Definition	
Uniqueness or rarity	(i)	unique ("the only one of its kind")
		rare (occurs only in few locations)
		endemic species/populations/communities
	(ii)	unique/rare/distinct habitats
		unique/rare/distinct ecosystems
	(iii)	unique/unusual geomorphological features
		unique/unusual oceanographic features
Special importance for life history stages of species	Those areas required for a population to survive and thrive.	
Importance for threatened, endangered or declining species and/or habitats	Area containing habitat for the survival and recovery of endangered/threatened/declining species.	
	Area with significant assemblages of endangered/threatened/declining species.	
Vulnerability, fragility, sensitivity, or slow recovery	Relatively high proportion of sensitive habitats/biotopes/species that are functionally fragile	
	Habitats/biotopes/species with slow recovery	
Biological productivity	Area containing species/populations/communities with comparatively higher natural biological productivity	
Biological diversity	Area contains comparatively higher diversity of ecosystems/habitats/communities/species/diversity.	
Naturalness	Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation.	

In order to investigate and describe the site specific biology and habitats in an objective and transparent way, three main processes (based on Clark et al. 2014) are suggested.

1. Identify the area to be examined
2. Determine appropriate data sets, and identify valued resources
3. Assign environmental value

2.2.1 Identifying the area to be examined

The seabed area potentially at risk from CO₂ leakage should be defined based on the location of the CO₂ storage reservoir, and of leak features and pathways such as chimneys and conduits. The potential risk area is placed in the context of its location and importance. Marine areas are characterized by particular bathymetric conditions, human impacts and ecosystems, and they can be classified into distinct entities at different geographical scales. It is this area that is assessed for *Valued Resources* in an ERA methodology.

2.2.2 Determine appropriate data sets and identify valued resources in the wider area

To ensure a comprehensive assessment, all sources of biota and habitat information available for the area are consulted and documented. This refers principally to biological resources, such as benthic species and important habitats. The biota data is evaluated against criteria (such as that illustrated in Table 2-1) to ensure no resources of value are overlooked. Existing recognized frameworks which evaluate the conservation/value status of marine species, habitats and areas can be applied. These include international, national and regional frameworks, such as the OSPAR List of threatened or declining species, IUCN Red List of threatened species, and national Red Lists of threatened habitat and species. This method does not exclude resources which are considered valuable by a particular sector, and any resource can be taken through the process.

The outcome of this step within the overall process should be an overview of the ecological and biological components along with an environmental map for each identified species/habitat describing the spatial distribution.

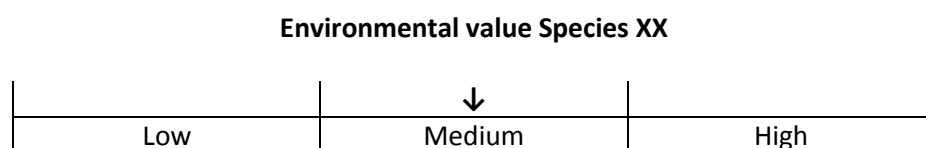
2.2.3 Assign environmental value

Each identified valued resource within the anticipated influence area should be valued descriptively according to the following criteria:

- Low value:** Area with *local* importance for species and habitats
- Medium value:** Area with *regional* importance for species and habitats, and/or having national Red List species/habitats classified as data deficient (DD) or nearly threatened (NT).
- High value:** Area with *national* importance for species and habitats, and/or having national Red List species/habitats classified as vulnerable (VU), endangered (EN), critically endangered (CR) or regionally extinct (RE).

As a starting point, the value assigned by recognized frameworks (international, national and regional) are applied. If higher resolution data on abundance and distribution of the valued resource are available, these can be used to adjust the assigned value. The value derived would thus be case-specific. The rationale behind assigning a value to a resource, and the sources of data used, must be clearly documented and traceable.

For a given species which e.g. has been assessed to have “medium value” the outcome would be as illustrated below.



2.3 Step 2 - Determine overlap between Plume and Valued resources

2.3.1 Sub-seabed Leak features

In order to assess environmental consequences one has to identify potential leak features that can connect the CO₂ stored in the target subsurface geological formation with the seabed. All identified leak features should be described and drawn up in a map.

2.3.2 Model of leaks and plumes

The CO₂ leak from identified leak features is modeled. Modeling should include all necessary aspects of a leak scenario appropriate for the leak features identified. As each leak features is unique, the potential leakage should ideally be modelled for each individual feature based on its specific characteristics and the overall operation of the storage site. The results from modelling should in general be data on the plume characteristics leaking into the water column and include, but not necessarily limited to, changes in pH and/or pCO₂, and the extent of the change in 3 dimensions (x,y,z). A cut-off of the plume extent should be defined based on either natural variation and/or specific tolerance for a given environmental resource.

2.3.3 Overlap analysis

The purpose of the overlap analysis is to determine the overlap between the CO₂ leak and each valued resource identified in Step 1. By combining identified leak features and the spatial distribution of the identified valued resources, the leak features that may have an impact on identified resources are visualized. The potentially affected valuable population or habitat in the overlap area can then be quantified. This could be expressed as a proportion of a population, number of individuals, or size of an area.

2.4 Step 3 - Define vulnerability and significance of impact

After valued resources have been identified, an environmental value for each has been generated, leak features have been identified, and CO₂ modelling results are available, impacts on each valued resource need to be described and defined for the source of influence (i.e. pH change). This description should refer to results from research available for the public. If there is no published research available on effects, a precautionary principle should be applied.

2.4.1 Vulnerability

The most up-to-date and comprehensive data available on the valued organisms' vulnerability to increased levels of carbon dioxide at the sea bed should be gathered. The vulnerability can be expressed as a 'threshold value' -a level to which it is believed a species can be exposed without adverse effects. As new information from research becomes available, the ERA can be updated. All sources of data should be documented clearly to ensure traceability and reproducibility of the ERA, and to enable policy decisions based on particular information to be traced back to source.

The following source of species effects data should be used in the ERA in the following order of preference:

1. Specially designed experiments on the particular species of interest from the population in the potential risk area.
2. Published data on the species of interest from a different population
3. Published data from closely related taxa that are matched for life history, traits and physiology
4. Published data on less closely related taxa, matched for life history, traits and physiology

5. Expert judgment based on knowledge of the organisms' physiology and life history traits
6. Apply precautionary approach: if there is a suspected risk of causing an effect to the species, in the absence of scientific consensus that the action is not harmful, the burden of proof that it is not harmful lies with those taking the action.

2.4.2 Defining the degree of the impact on the valued resource

The threshold values obtained from literature are integrated into the modeled pH/pCO₂ plume as a cut-off, outside which no adverse effect on that particular valuable resource is expected. Contours within the plume indicate zones of effect on the particular valuable resource.

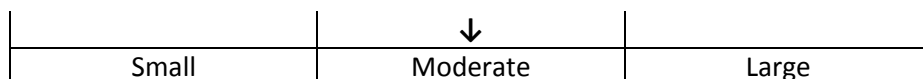
The degree of the impact (i.e. the magnitude of the effect on the species) on each identified resource can be descriptively assessed according to the following criteria:

- Small degree:** The impact can impair/reduce species and habitats on an individual level.
- Moderate degree:** The impact can impair species and habitats at the population level.
- Large degree:** The impact can reduce/remove species and habitats at the population level.

The method for defining degree of impact will depend on the particular valuable resource being assessed: whether it is a discrete entity which has an individual value, whether it is a valuable habitat which must cover a certain area of sea bed, etc.

For a given species, which for example has been evaluated to be impacted to a “moderate degree” the outcome would be as illustrated below:

Degree of impact on Species XX



2.5 Step 4 – assess consequence

The assessment of environmental value and the degree of impact are further compiled in a consequence matrix (see below). Each valued resource identified in Step 2.2.2 is taken through the process from 2.2.3 onwards, and ultimately placed in the consequence table. The results from the consequence matrix are a direct input to the risk matrix for the given resource.

Degree \ Value		Environmental value		
		Low	Medium	High
Degree of impact	Small	Incidental	Incidental	Moderate
	Moderate	Incidental	Moderate	Major
	Large	Moderate	Major	Critical

2.6 Step 5 – Estimate Propensity to Leak (PTL)

The work flows, methods and tools for subsurface descriptions and flow modelling are well-known from the oil and gas industry. However, the starting point of the oil and gas reservoirs is that they have a functioning cap rock and sealing system, and all focus is on flow within the hydrocarbon-bearing reservoir itself. In contrast, a CO₂ geological storage site in a saline aquifer has no such proven cap rock seal system, and therefore, much of the focus is on how stored CO₂ might leave the storage complex and migrate through the overburden. Thus, a description is required of the **overburden** as well as for the target storage formation, which is a much broader and more varied starting point and scope than for oil and gas reservoir description and modelling. Furthermore, characterization of the sea floor can give valuable insight to potential leak features deeper in the overburden, and this represents a key area where ECO₂ has made significant progress on testing systems and methods at actual offshore sites.

Such a broad coverage of a large volume of the subsurface is difficult to include in currently available reservoir simulation modelling software without making fundamental compromises on numerical resolution or the physics included (or both) of the modelled system. Furthermore, the time required to run such reservoir simulation models is significant. This implies that the project which plans to numerically model leakage scenarios must invest heavily in computer capacity, manage unstable numerical results (=unreliable) or accept very long turnaround time for individual simulations. Furthermore, reservoir simulation models are limited in the physics they can represent, such that the features, processes and events (FEPs) that lead to a leakage event, may not be included at all.

This has motivated the ECO₂ project to apply an approach to estimating leakage *propensity* (a small nuanced variation on probability) based on a compact description of the storage complex and more heuristic techniques. Prime among these is the use of discrete scenario analysis, in a similar way applied by Quantitative Risk Analysis (QRA), in which a very large outcome space that is dimensioned by a large number of parameter uncertainties is represented by a small number of scenarios of various discretized consequence levels.

Inventory of Discrete Leakage Features and Potential Pathways

The result of a FEPs identification process for a specific site shall produce a list or inventory of potential discrete leakage pathways and their locations in UTM coordinates and associated depths, top and bottom of the features in the overburden. Further analysis should be performed subsequently on each identified potential pathway based on their individual characteristics.

The types of potential leakage pathways are as a minimum (additional potential leakage pathways may be identified)

- Wells
- Faults
- Chimneys and pipes identified from anomalies on seismic data
- Competent but vulnerable caprock

It is considered best practice to compile a complete inventory of these site-specific features according to plausible predictions of where the stored CO₂ will be in its target reservoir.

For wellbores that have at least a small chance of being contacted by the stored CO₂, a schematic shall be available showing the current state and locations of casing, cement tops plugs or any other material or equipment left in the wellbore.

‘Competent but vulnerable caprock’ is meant to describe areas with no confirmable pre-disposed leakage features related to chimneys or faults. This potential leakage pathway is considered a local

caprock characteristic. Every caprock with a large area extent (thousands of square kilometres) will likely have faults, pinch-outs, micro-fracturing, i.e. potential leakage feature somewhere although not necessarily over the CO₂ plume in the storage target formation. In this context, vulnerable is meant that if it is exposed to a large CO₂ column and the target storage reservoir has increased reservoir pressure to a degree that the local capillary entry pressure of the caprock is exceeded, allowing unintended vertical flow of stored CO₂ upwards.

Characterization of each member in the site inventory of discrete leakage features and potential pathways requires a fully-interpreted set of seismic surveys, supporting reservoir dynamic flow models and expert opinion to evaluate all of these. In addition, this expert opinion can be further sub-divided in a way that can support a reasoned estimate of the propensity to leak of a specific site feature, event or process.

Aggregating the sum of the expert opinion, “hard” evidence and “soft” evidence can be accomplished in two contrasting ways. The first is to apply Bayesian inference using a diverse set of evidence and expert opinion. The second is to apply Evidence Support Logic, which implements directly expert opinion in a way that also includes the innate ambiguity imbedded in claims with a binary outcome.

The ECO₂ project has produced a prototype Bayesian Belief Net (BBN) that implements the first method of aggregating opinion and evidence. The ECO₂ project tested one of these by building a prototype PTL model based on a BBN software tool which implements the basic mathematics of Bayesian inference using a graphical interface and representation of causal linkages. There are several advantages to the BBN platform, but here we mention the main one for estimating the PLF. The BBN can combine qualitative, quantitative, statistical and expert opinion data in a way that represents the main evidence for each site-specific FEP, and the evidence can include ambiguity, i.e. can be inconclusive or point in contrasting directions. This prototype PTL model was tested on the Sleipner Utsira CO₂ storage project and documented in a separate ECO₂ deliverable (D5.1). One particular highlight of this prototype PTL model is illustrated on figure below. The heart of the BBN method is the correlation table, which states in statistical terms the causal relations between “parent” nodes and “child” nodes in the network graph that represents causal relationships between site characteristics and propensity to leak.

Two examples of sub-parts of a sub-model representing PTL for a chimney feature in the prototype BBN is shown below with associated correlation tables. The software paradigm discretizes relations into intervals with associated probabilities.

Table 2-2 Buoyancy pressure due to CO₂ column at top Utsira. When the sum of this and the increase in reservoir pressure due to CO₂ injection exceed the local capillary entry pressure, CO₂ will start to enter the cap rock. BBN nodes shown in Fig. below.

In-situ CO ₂ density, kg/m ³	200 - 300							300 - 450						
Max. vertical CO ₂ column below chimney, metres	-inf-0	0-2	2-6	6-12	12-20	20-40	40-inf	-inf-0	0-2	2-6	6-12	12-20	20-40	40-inf
-inf – 0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
0–0.5	0	1	1	0.064	0	0	0	0	1	1	0.264	0	0	0
0.5–1.0	0	0	0	0.936	0.096	0	0	0	0	0	0.736	0.397	0	0
1.0–1.5	0	0	0	0	0.795	0	0	0	0	0	0	0.603	0.139	0
1.5–2.0	0	0	0	0	0.109	0.597	0	0	0	0	0	0	0.742	0.24
2.5–5.0	0	0	0	0	0	0.403	1	0	0	0	0	0	0.118	0.76
5.0–inf	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 2-2 sub-model for buoyant pressure due to stored CO₂ in the target formation. Correlation table shown above. The complete sub-model for a chimney is seen in Figure 2-4.

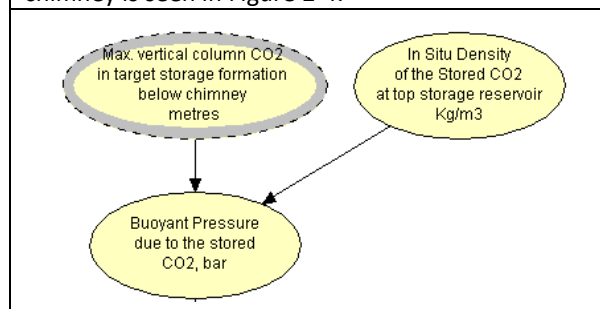


Figure 2-3 sub-model for chimney lithology. A sand injectite is much more permeable than an altered mudstone. Correlation table shown below.

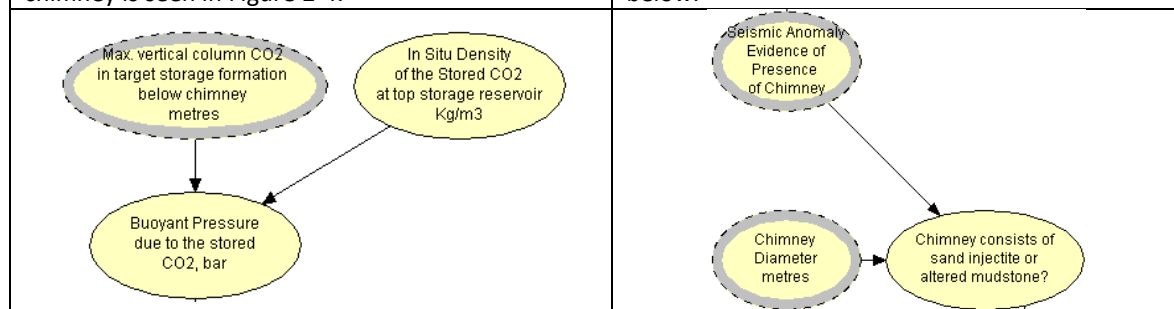


Table 2-3 Output is the chimney lithology class below chimney diameter. Chimney Types are described in Karstens and Berndt (2015).

Chimney diameter, metres	50 - 150			150 – 500			500 - 1000		
Seismic Anomaly Evidence of Presence of Chimney	Type A	Type B	Type C	Type A	Type B	Type C	Type A	Type B	Type C
Background(unaltered) mudstone	0.1	0.1	0.2	0.1	0.1	0.8	0.2	0.2	0.85
Re-worked mudstone	0.1	0.1	0.2	0.8	0.1	0.1	0.7	0.3	0.099
Micro-cracks in mudstone	0.1	0.1	0.5	0.05	0.1	0.05	0.09	0.4	0.05
Sand injectite in background of mudstone	0.1	0.7	0.1	0.05	0.7	0.05	0.01	0.1	0.001

The simple sub-models shown above are part of a total BBN for a chimney feature shown on Figure 2-4 below. A sub-model has been created for the other leakage features mentioned above. A node with no arrows going into it is an input node with a simple discrete interval uncertainty table associated with it. All nodes “downstream” of these input nodes require a correlation table (also

based on discrete numerical interval representation, qualitative labels for intervals, or an intermediate formula calculation) which relates all incoming arrow links to be represented and an output from the intermediate (or final node).

The BBN model platform is considered best practice for representing uncertainties from different sources (from directly measured data, interpreted proxy data, numerical simulation model data, analogue data and statistics and expert opinion) in a model that includes a large number of contrasting geological, physics and engineering features, events and processes (FIPs). The experience of ECO₂ has shown conclusively that trying to integrate all these into a single reservoir numerical simulation model is still not feasible with today's best software and computing hardware. Furthermore, the lack of data for critical parameters for some FIPs is simply not reconcilable without disproportionately large investment in collecting field data. The most prominent examples are the capillary entry pressure, effective permeability of a chimney or pipe and its base depth. For these, expert opinion based on proxy data and advanced interpretation or small-scale sub-models with increased detail and physics will still be the only source of estimates.

But an even more fundamental site characteristic can be crucial yet uncertain despite good coverage of survey data. The movement of CO₂ in the target reservoir determines whether it will contact a potential leakage feature. The mapping of the topography of the top of the target storage reservoir is deduced by processing and interpreting acoustic seismic data, which has a fundamental limit on resolution and accuracy. It is known that top target reservoir may have low spots and high spots which determine whether CO₂ can travel in one direction or another. Numerical reservoir simulation models may be useful to identify scenarios of different CO₂ movement directions, but these are often limited to even coarser resolution than the static models on which they are based. So even in this basic site characteristic of mapping target storage formation topography, it is considered best practice to apply a high-level approach which captures a full range of possible outcomes in direction of movement of the stored CO₂ plume. This has been tested in the BBN model for ECO₂.

Figure 2-4 shows one BBN sub-model that produces an estimate of the propensity to leak (PTL) for a single site-specific chimney. This figure is intended to illustrate both the causal relationships between different characteristics of the chimney itself, the main physical features that influence the PTL for the chimney, the storage site overall layout and properties of the cap rock sealing system. It has been constructed based on a specific storage site. Different storage sites may have different FEPs as primary influencers and the BBN sub-model that works best may be different.

The second method for aggregating the sum of expert opinion is the Evidence Support Logic (ESL) technique¹. This starts with a top-level binary claim or hypothesis and structures a linearly-linked hierarchy of sub-claims or sub-hypotheses that lead to the top-level. Each sub-claim has evidence for which it is directly assigned two numerical values, one value for the degree to which the evidence supports the sub-claim, and one value for the degree to which the evidence refutes the sub-claim. A single piece of evidence can in other words have both supporting and refuting value at the same time. A special mathematical algorithm then aggregates the values of support and refutation for each evidence piece for each sub-claim up to the top-level claim, and this then is seen in terms of conclusiveness of result and otherwise. In contrast to the BBN platform described above, there is no option in ESL for including other calculation logic or other results than support/refute of the sub-claim or lower-level hypothesis. As such ESL is purely mapping expert opinion, for which the original sources are completely outside the ESL method.

¹ Commercial software that implements Evidence Support Logic is available from Quintessa (Tesla) and Argevide (NOR-STA).

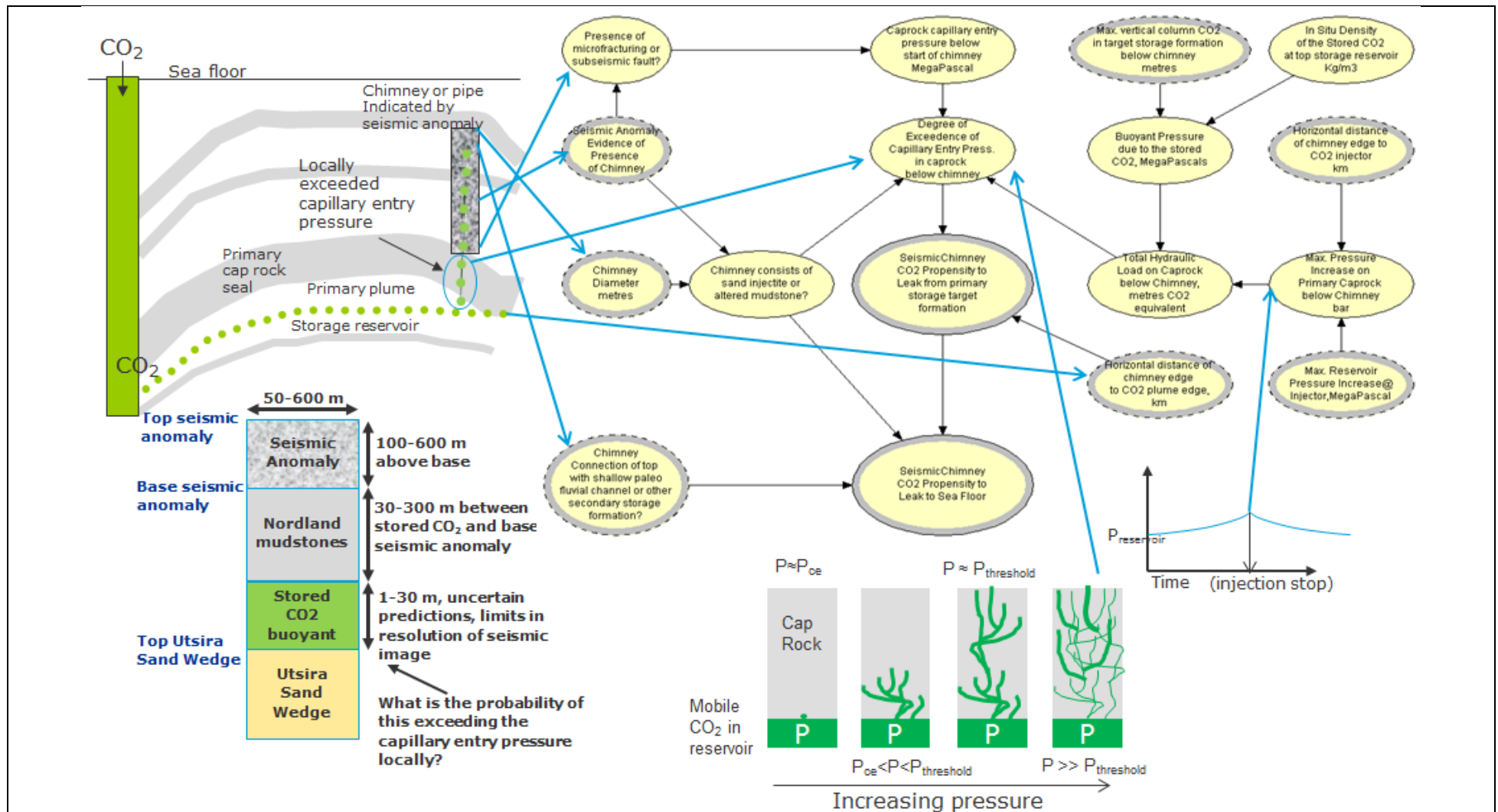


Figure 2-4 Bayesian Belief Net (BBN) sub-model (yellow nodes) for Propensity to Leak (PTL) along an identified seismic anomaly labelled as a “chimney” (or “pipe”) in the context of the overall storage site data. Sources of data are indicated by blue lines to the BBN. The black arrows between yellow nodes indicate internal causal relationships in the BBN model. Each node has an associated correlation table with data entered into the software user interface. See tables for examples.

2.1 Step 6 – Assess individual risk for each potential leakage pathway

The leakage risks of CO₂ storage sites can be assessed using risk matrices similar to those applied for environmental value and the degree of impact are further compiled in a consequence matrix (see below). The results from the consequence matrix are a direct input to the risk matrix for the given resource.

The uncertainties associated with the estimates of propensity to leak (PTL) are dominated by geological uncertainties in the overburden and to a lesser extent the uncertainties in the target storage reservoir itself. To make a material decrease in these uncertainties implies significant and disproportionately increasing costs in data collection at the storage site. Therefore, the PTL scale is simplified to three discrete outcomes. In situations where data is more complete and uncertainties smaller, more probability and consequence discrete levels may be applied than the 3x3 matrix shown here.

Therefore a simple two-dimensional matrix model is considered as best practice to assess environmental risks related to leakage to the sea floor from offshore CO₂ geological storage sites.

The horizontal axis is output from step 5 described above. The vertical axis is output from step 6 above. This is done for each discrete leakage pathway and leakage scenario identified for the storage site and based on the associated features, events and processes characterized for the site. The aggregate results will be a collection of risks labelled by a number or letter placed in the matrix below.

This will enable effective prioritisation of monitoring of specific storage site locations and potentially adjusting the injection programme to avoid the stored CO₂ from contacting high-risk features in the subsurface which may lead to leakage to the sea floor.

Severity measured in Environmental Value Propensity to Leak	Severity of environmental impact			
	Incidental	Moderate	Major	Critical
Unlikely	<i>Negligible/small negative</i>	<i>Negligible/small negative</i>	<i>Moderate negative</i>	<i>Large negative</i>
Possible	<i>Negligible/small negative</i>	<i>Moderate negative</i>	<i>Large negative</i>	<i>Severe negative</i>
Very Likely	<i>Moderate negative</i>	<i>Large negative</i>	<i>Severe negative</i>	<i>Severe negative</i>

Answers are required that are understandable to the general public and non-technical stakeholders, for a global understanding and also with regard to single projects.