

The Water Framework Directive & its implications

Challenges in risk assessment for infrastructure projects & remediation projects

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Site solutions

Rambøll Denmark

The tip of the iceberg

- Does your project potentially affect inland, transitional and/or coastal surface waters or groundwaters?
- Yes? → Risk assessment.
- Sounds simple?



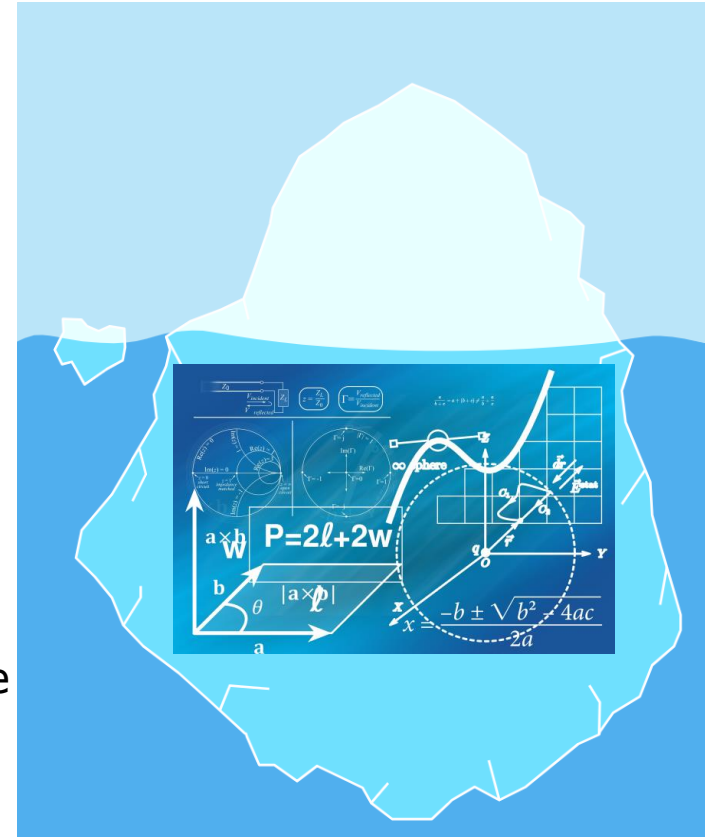
Conclusion of the risk assessment: A description of how and to what extent your project affects waterbodies.

- Complex reassessment based on real, representative, project specific data.
- Must follow EU- and national guidelines and cover sediment, water and biota and all hazardous substances/pollutants relevant for the given project.
- No approved methods as it is project specific and the space is constantly changing.

The tip of the iceberg

- Does your project potentially affect inland, transitional and/or coastal surface waters as well as groundwaters?
- Yes? → risk assessment → describe how and to what extent the project affects these waterbodies.
- Sounds simple? Unfortunately, it's not that simple.

- Consequence:
- Nearly impossible in Denmark to get a permit for remediation of contaminated soil/water if the final discharge does not meet the statutory quality requirements for the recipient.
- The same applies for many projects that are otherwise considered sustainable
 - the utilization of soil/waste products for infrastructure projects (road construction, etc.)
 - separating rain and sewer water systems where rainwater retention basins are established to delay and clean the rainwater/surface runoff before directing it to a stream.

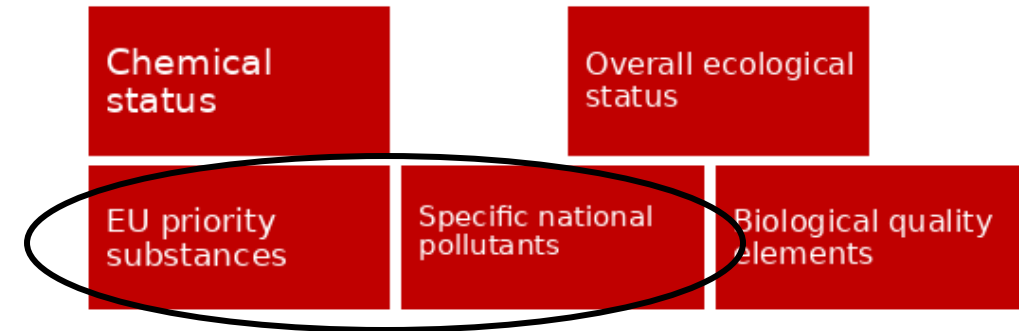


Agenda

- The problem/challenge ✓
- Quick facts: Quality elements and environmental objectives - DK
- Example 1: Remediation of an existing contaminated site
- Example 2: Reuse of lightly contaminated materials
- Risk assessment example 1 and 2 (chemical impact)
- Conclusion

Quick facts: Quality elements and environmental objectives

- For surface water:
 - EU priority substances, each substance = a quality element.
 - Specific national pollutants and biological quality elements.
- For groundwater: Qualitative (chemical) and quantitative status.
- Set EQS for substances (EU & national) for water, biota and sediment.
- Key principle:
 - A project must not cause deterioration of a waterbody or create a risk that environmental objectives will not be achieved.
 - “deterioration” = status of one or more quality elements declines by 1 class.
 - Project-specific assessment of potential impacts on each individual quality element.
 - In practice: often only focus on surface water & chemical status.



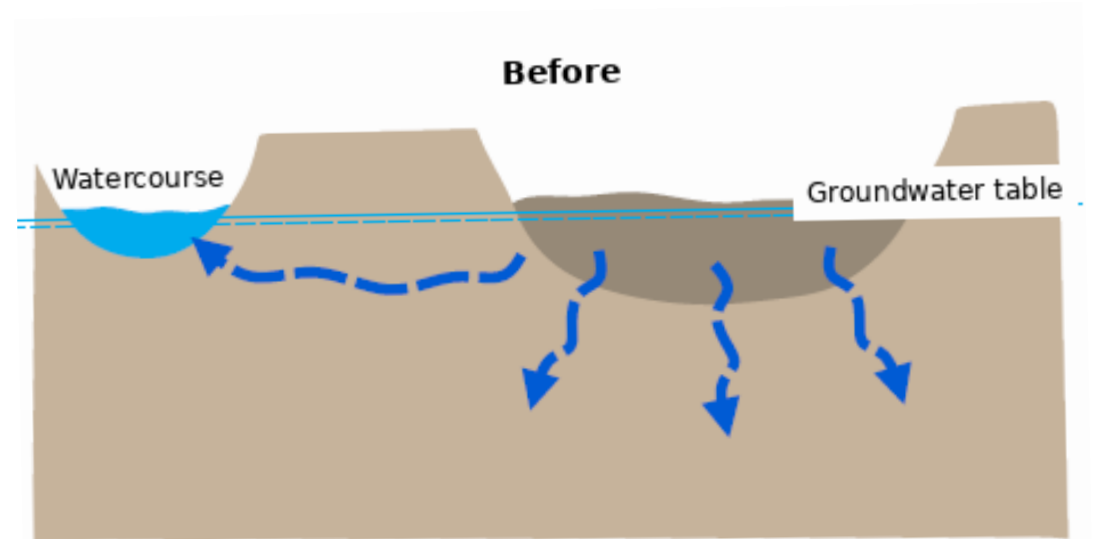
	Rivers	Lakes	Coastal waters
Benthic invertebrates	x		
Fish	x	x	
Macrophytes	x	x	
Phytoplankton		x	
Specific national pollutants		x	x
Chlorophyll		x	x
Eelgrass			x
Benthic fauna			x

EU priority substances
>45 substances

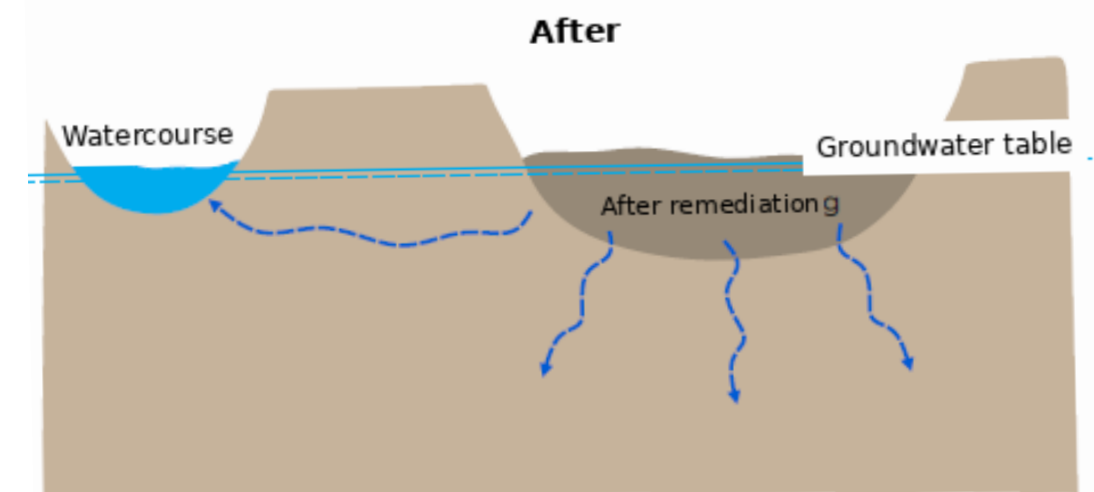
Specific national
pollutants
>130 substances

Example 1 – remediation of an existing contamination

- Before remediation:
- Leaching from existing soil contamination into groundwater and the watercourse
- Concentrations > EQS (water, sediment and biota)
- After remediation (source removal, cleaning of water):
- Reduced leaching, reduced impact
- Source removal and treatment not “complete”, but proportional to what is available & costs
- Concentrations in leachate still > EQS
- Cannot achieve “good” status

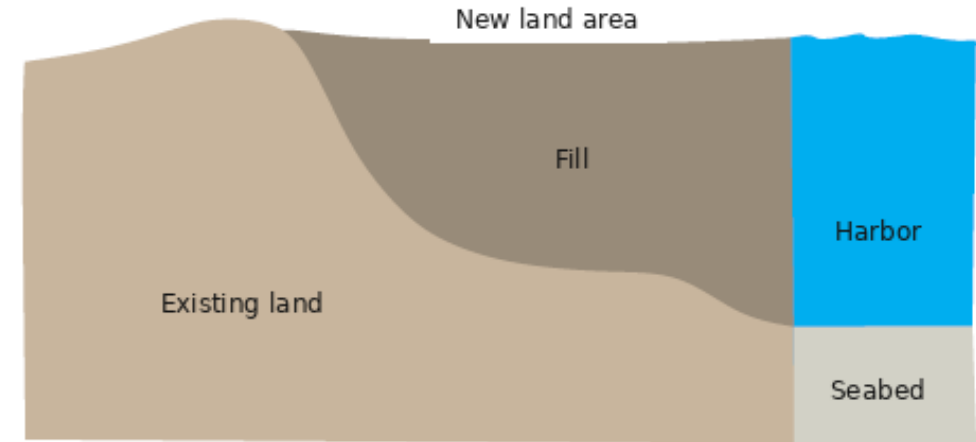


Receptors: surface water & groundwater

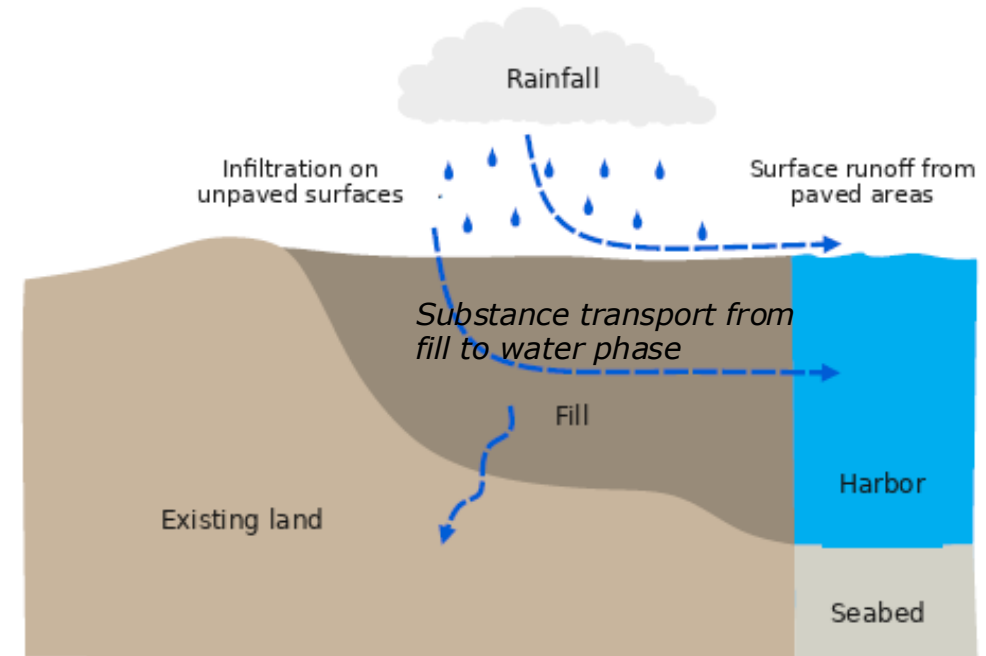


Example 2 – reuse of slightly contaminated materials

- Save resources by using slightly contaminated materials (slag, soil, seasediments)
- Riskassessment: The potential impact on receptors (streams, coastal waters, groundwater)
- After:
 - 2 new pathways:
 - Leaching from fill material into groundwater and the sea through infiltration
 - Runoff from surface materials: rainfall on paved surfaces

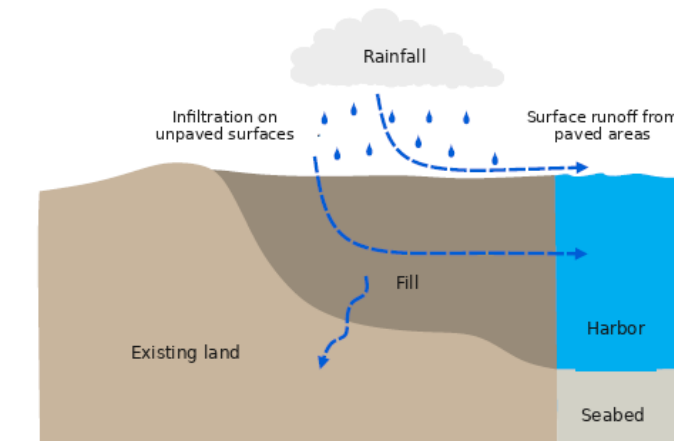
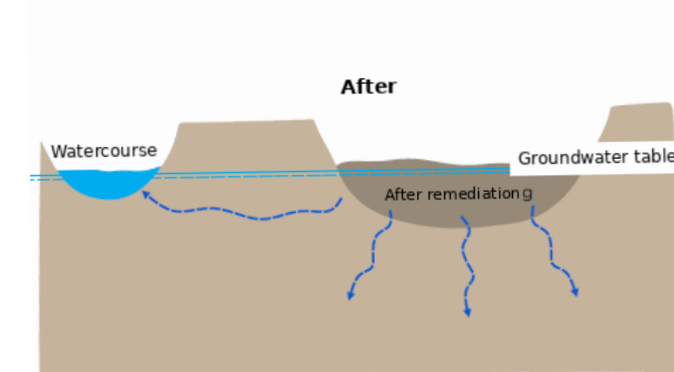
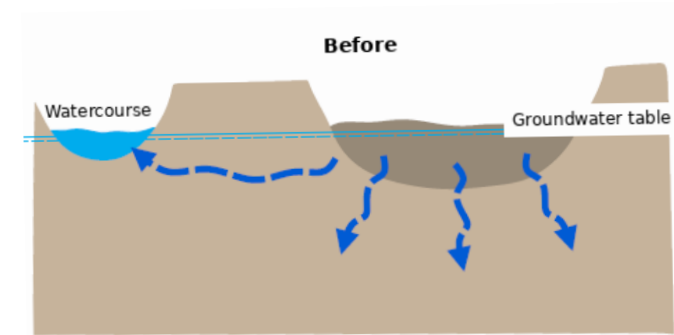


Receptors: groundwater, sea



Step by step risk assessment

- Focus on chemical impacts (but other quality elements must also be included in the assessment!)
- Selection of substances and determination of discharge/leachate concentrations
 - Typical concentrations in slag/slightly contaminated soil (solids, porewater, leaching tests), new (uncontaminated?) materials
 - All relevant substances: national specific pollutants + EU priority substances + other relevant substances
 - Substance properties: sediment-associated, bioaccumulative – often missing
 - Relevant substances for water and biota vs. substances relevant to sediment impacts



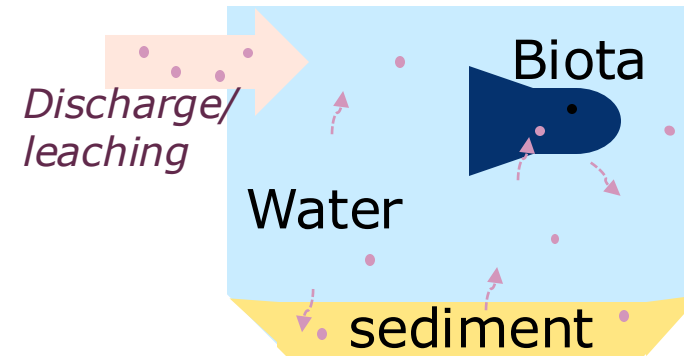
Step by step risk assessment

- Dilution

- Danish EPA guidance on the use of mixing zones (not applicable for surface runoff, but dilution ok)
- Lack of project specific data for recipients (concentration and dilution)
- Hydrodynamic model?

- Calculation of final concentrations in water, sediment and biota

- Lack of data: background concentrations – collect data or make an assessment
- What are representative data?
- No officially approved methods - substance transfer among the three matrices.
- Sediment: ECHA method (equilibrium), Danish EPA method (all substance mass accumulates in a defined volume)
- Annual contribution/increase vs. total contribution (permanent vs. temporary)
- How long will a material leach?



Step by step risk assessment

- Which standards must be met?
 - Environmental quality standards (EQS) are not established for all substances in all three matrices – use e.g. PNEC values
 - For some substances (especially PAH), detection limits exceed the EQS. If existing concentrations exceed the EQS, no additional load may be added.
 - If a quality element is already in the lowest class, any deterioration — regardless of how small or short-lived — constitutes deterioration of status.
- Treatment/reduction of substance concentrations in discharges and leachate
 - Must be proportionate – treatment must reduce concentrations to the EQS where dilution occurs
 - Application of BAT?
 - Remediation: Must we meet the same requirements as a new project?
 - Source removal and treatment not “complete”, but proportional to what is available & costs

	Detection limit	EQS for surface waters
Benz(a)anthracene	0,001	0,0005
Dibenz(a,h)anthracene	0,0005	0,00014

Summary and conclusion

- Complex: many possible recipients, and many quality elements, substances.
- Lack of data, models and approved calculation methods.
- Complex calculation: the distribution between the 3 matrices & dilution.
- Often focus on the chemical impact, must also include other quality elements.
- Very often focus on impact on surface water, but must not forget groundwater.
- Proportionality (treatment, remediation, short-term vs. permanent discharges)
- Good practice: dialogue with the authorities, but not always possible.
- Requires cooperation and discussions.
- Need to take a first step forward, test the method & share with others if successful

Thanks for your attention.
Any questions? 😊



Ever changing space (extra slide if time)

- EU:
 - EQS updated continuously (both concentration limits & substances included, for example PFAS).
 - EQS for some substances have become stricter, particularly for sediment.
- Nationally, DK:
 - The 2021–2027 Water Management Plan, revisited and sent for consultation.
 - That process included reassessment of status of waterbodies using the most recent data.
- Parallel to that - many appeals and decisions, including from the Court of Justice of the EU, individual countries, e.g. Denmark, this brought greater focus on:
 - The principle that no additional discharge should be permitted where status is already poor.
 - Need for project-specific assessment and on describing all quality elements.
 - Impact on sediment because many pollutants accumulate in the sediment.
- Implication of new rules, new EQS, new/changing focus → no officially approved methods for assessing impacts on quality elements, hard to get projects approved that improve or in other ways benefit the aquatic ecosystems.