Screening of sites for large scale coastal infrastructure development

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Screening of sites

- Localization of port or sea based industrial site
- Some specific challenges – and a generic example
- Not a complete review – merely an example of complexity
First considerations

• **Purpose, need?**
  • Are the needs defined or unclear?
  • Any prognoses for the development?
  • Only visions – at which stage?
  • Private or public development?

• **What is a suitable site?**
  • Where to look? Local in county, or wider area?
  • Consider third person property?
  • Any existing assessments or feasibility studies?
  • Importance of maritime conditions?
  • Importance of local weather, waves, current?
Screening of sites – authorities and plans

- Public area plans?
  - Municipal master plan/land-use
  - Coastal area plan
  - Zoning plan
  - Impact assessments

- Nature conservation issues?
  - National salmon fjord?
  - Reindeer husbandry?

- Historical sites, artefacts?

- Sector interests: Public and political processes are unpredictable
- Authority handling a central element
Screening of sites – available infrastructure

- Available infrastructure; public or private
  - Power supply
  - Water supply
  - Sewage
  - Roads

- «City benefits»?
  - City infrastructure
  - Service industry
  - Manpower

- «City problems»?
  - Conflicts of interest?
  - Noise?
Screening of sites – acts and regulations

- Plan- og bygningsloven – PBL
- Forurensingsloven
- Petroleumsloven
- Kulturminneloven
- Naturmangfoldloven
- Havne- og farvannsloven
- Sjøfartsloven
- Lov om brann- og eksplosjonsvern
- Energiloven
- Reindriftsloven
- Finnmarksloven
- Et cetera......
Screening - local weather, waves and current

Wind:
- Using existing observations
- Statistical transformation
- Numerical modeling

Numerical modeling of waves:
- Wind waves
- Swell propagation
Screening – maritime considerations

Using ship simulators for evaluations
- Evaluating pier locations and directions
- Testing of operational conditions

- Sailing distance inshore
- Narrow?
- Number of course alternations
- Input from pilots and locals
Screening – geotechnical investigations

- Geotechnical investigations of ground and seabed
- Foundations, fillings, groundwater,...
Screening process - general example

- Coarse assessment of several sites
- Narrowing in fewer sites
Screening process – objective weighting

Agree on weighting of aspects with client, for example:

<table>
<thead>
<tr>
<th></th>
<th>Maritime conditions</th>
<th>25 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Pipeline to plant</td>
<td>10 %</td>
</tr>
<tr>
<td>C</td>
<td>Site preparation</td>
<td>5 %</td>
</tr>
<tr>
<td>D</td>
<td>Infrastructure (roads, power supply, etc.)</td>
<td>25 %</td>
</tr>
<tr>
<td>E</td>
<td>Zoning plan status, property relations and the environment</td>
<td>10 %</td>
</tr>
<tr>
<td>F</td>
<td>Costs</td>
<td>25 %</td>
</tr>
</tbody>
</table>

**Weighted total score**

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Assumed idealized layout
Screening process – room for idealized layout?

Distributing critical elements of layout at each site:
- Processing plant
- Pipelines
- Storage caverns
- Different piers and jetties
- Construction phase areas
- Expansion areas

Some sites ruled out:
Not enough space
Screening process - detailing

At remaining sites:

- Splitting main criteria
- Detailing criteria
## Screening process – sensitivity tests

<table>
<thead>
<tr>
<th>Main Items</th>
<th>Main Test</th>
<th>Sensitivity Test 1</th>
<th>Sensitivity Test 2</th>
<th>Sensitivity Test 3</th>
<th>Sensitivity Test 4</th>
<th>Sensitivity Test 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authority and neighbours</td>
<td>20%</td>
<td>60%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Local conditions</td>
<td>15%</td>
<td>10%</td>
<td>60%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Process – layout - landfall</td>
<td>15%</td>
<td>10%</td>
<td>10%</td>
<td>60%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Maritime / harbour facilities</td>
<td>35%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>60%</td>
<td>10%</td>
</tr>
<tr>
<td>Differential cost/volumes</td>
<td>15%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>60%</td>
</tr>
<tr>
<td>Sum each test</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

### Sensitivity tests:
Testing different weights on main criteria
Screening process – narrowing in

- Narrowing in to two sites
- Two best options
Screening process – fine tuning of choice

The best option?

Closer assessments of e.g.:

- Strategic location
- Weather/wave conditions (metocean)
- Maritime factors (including mooring of vessels, manoeuvrability,...)
- Geotechnical assessments
- National salmon fjord– other restrictions
- Political considerations
- Et cetera...
Screening of sites for large scale coastal infrastructure development

A blend of subjective and objective assessments, politics, legislation, sector interests and engineering handicraft