Overview of landscape research by expert group 1

Þorvarður Árnason
Landscape Value(s)

- Landscape has featured prominently in Iceland since the earliest Act on nature conservation (1956).
- Landscape as such was, however, not defined in nature conservation law until Act 60/2013 came in effect.
- Act 60/2013 includes an article (nr. 50) concerning the establishment of landscape protected areas (IUCN V).
- The first National Planning Strategy (2015-2026) places strong emphasis on landscape.
- Icelandic signed the *European Landscape Convention* in 2012; its ratification has been approved (March 2019).
## Values

<table>
<thead>
<tr>
<th>Classes</th>
<th>subclasses</th>
<th>Attributes</th>
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<tbody>
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<td>Geology &amp; hydrology</td>
<td>bedrock, unconsolidated sediments &amp; processes, subterranean water (incl. groundwater &amp; geothermal), rivers &amp; lakes</td>
<td>richness, diversity, rarity, size, completeness, fragmentation, disturbance, international responsibility, information &amp; symbolic value, visual value</td>
</tr>
<tr>
<td>Species</td>
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<td>Ecosystems and soils</td>
<td>ecosystems/habitats, soils</td>
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Some problems

• No official method for landscape analysis in Iceland:
  – no formal system of landscape classification
  – no established methodology for landscape evaluation

• Landscape research is not included in the mandate of any government agency:
  – no ongoing, systematic research on landscapes, natural or cultural

• Landscape has limited recognition in protected areas:
  – has „general protection“ e.g. within national parks but tools are lacking to protect – and understand – landscape as landscape
Rammaáætlun, 2nd Phase

Icelandic Landscape Project (2006-2010) intended to:
(a) Develop a method for the classification of natural and semi-natural landscapes
(b) Test this method on a nationwide basis
• The goal of the ILP was to produce a classification that would include all the major landscape types in Iceland. The project was field based, i.e. all sites were visited and data collected *in situ*. A systematic sampling design was used, based on the $10 \times 10$ km grid system of the Icelandic Institute of Natural History, selecting a third of the grids, yielding a total sample size of 130. In the end, 16 sites were not sampled for various reasons; inaccessibility, prohibitively high costs of access in time and money and unfavourable weather.
<table>
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<th>Variable</th>
<th>Summary description</th>
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<tr>
<td>Basic landscape contour</td>
<td>From highly concave (1) through flat (3) to highly convex (5)</td>
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<tr>
<td>Landscape depth</td>
<td>From shallow and enclosed (mean visible distance ≤ 3km) to open with distant horizon (mean visible distance &gt; 40 km).</td>
</tr>
<tr>
<td>Elevational range</td>
<td>From flat plain to highly mountaineous (&gt;1000 m elevational difference within 20 km distance range)</td>
</tr>
<tr>
<td>Forms and lines</td>
<td>Includes five variables: 1) straight lines and linear forms, 2) rolling shapes and lines, 3) angular shapes and lines that meet at acute angles, 4) sinuous shapes and lines, 5) diversity of forms and lines.</td>
</tr>
<tr>
<td>Repeated forms</td>
<td>Clusters or series with several, dozens or hundreds of the same or similar landscape features.</td>
</tr>
<tr>
<td>Vegetation cover</td>
<td>From barrens (≤5% cover, score of 1 or occasionally 0 if there were literally no plants visible) to complete cover (5).</td>
</tr>
<tr>
<td>Vegetation diversity</td>
<td>Diversity of different vegetation types.</td>
</tr>
<tr>
<td>Patterns</td>
<td>Includes two variables: Patch size from coarse (score 1) to fine (5) and patch diversity estimated as number of different patch types.</td>
</tr>
<tr>
<td>Texture</td>
<td>Includes three variables: prominence of smooth surfaces, prominence of rough surfaces and texture diversity.</td>
</tr>
<tr>
<td>Water</td>
<td>Includes three variables: area of water cover (from 0 to large area, score 5), current (from 1 for still water to 5 for waterfall) and diversity of expression.</td>
</tr>
<tr>
<td>Sea</td>
<td>Degree of prominence scored</td>
</tr>
<tr>
<td>Snow</td>
<td>Degree of prominence scored</td>
</tr>
<tr>
<td>Glaciers and ice</td>
<td>Degree of prominence scored separately. In the final analysis, only glaciers were included.</td>
</tr>
<tr>
<td>Colour diversity</td>
<td>From virtually monochromatic (1) to extremely colourful (5).</td>
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<tr>
<td>Visual diversity</td>
<td>Compound variable including elevational range, the diversity of forms &amp; lines, vegetation, colour and texture, patch diversity and size of mosaic, and the prominence and diversity of water expressions.</td>
</tr>
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Table 1. The variables included in the Icelandic Landscape Project for a description and classification based on visual properties.

The classification system is based on visual characteristics (23 variables), observed in the field.
Examples of characteristics

- Basic shape convex
  Angular shapes prominent
  Fine grained patchiness
  High colour diversity

- Basic shape flat
  High landscape depth
  High vegetation cover
  Coarse grained patchiness

- Basic shape highly concave
  High vegetation cover
  Low landscape depth

- Linear features v. prominent
  Angular forms present
  Very low landscape depth

- Sinuous forms prominent
  High elevational range
  Water colour grey

- Very fine grained patchiness
  High score for coarse texture
  High texture diversity

- Very high landscape depth
  Smooth surface texture
  V. coarse grained patchiness
  Very low texture diversity
  Very low colour diversity

- Rolling forms very prominent
  Water prominent
  High colour diversity
  (note red colour right)

- High diversity site: glacier,
  high elevational range,
  diversity of water
  expressions, high diversity of
  textures, colours and
  vegetation types.
The aim of the ILP was to produce a hierarchical classification allowing groups to be compared with a quantitative similarity measure. To this end, Cluster Analysis (CA) was utilized, whose product may be displayed as a tree-like dendrogram, where each object is placed at the end of a branch that links to all other objects with a distance representing similarity. CA is agglomerative, i.e. starts by calculating the distance between all objects and then clusters the two most similar. This is iterated until all objects have been placed. The final step is the demarcation of classes. The classes are objective, generated by the data themselves.
The multivariate cluster analysis produced 11 major landscape groups of different sizes. The single glacier site was the first to diverge and formed a sister group to the rest of the sample. The next major split in the tree was into vegetated and barren land. The better-vegetated land fell into five major classes: fjords (N = 10 with a subgroup of a further 3 that are flat coastal sites by high mountains), flat coasts and islands (N = 10), well vegetated but homogeneous lowlands and heathlands (N = 20), deep, well vegetated glaciated valleys (N = 20) and finally a group of 14 sites that are characterized by high visual diversity but are otherwise not a uniform group.
Phase 3: Focus on evaluation
10 meginflokkar íslensks landslags

**Landslagsgerðir**

1. Jökull
2. Sandar og auðnir við jökla og há fjöll
3. Sendnar og oft öldöttar auðnir
4. Einiseittar, ávalar og úfvar auðnir og urðir með vatni
5. Háflgróin, grýtt og þurr öræfi
6. Urðir og úfin hræn við sjo
7. Fjörir
8. Flatar stendur og eyjar
9. Veð gróða en einsleitt láglendi og heiðar
10. Djúpir, vel gróða dalir
11. Fjölbreytt svæði; gróðir grunnir dalir og heiðar

RESEARCH CENTRE IN HORNAFJÖRDUR
Phase 4: Focus on windfarms

• Research, begun in Phase 3, was completed on pilot projects concerning (a) landscape evaluation based on qualitative methods and (b) on the cultural-historical value of landscapes in the Central Highland.

• Work has started on developing methods for gauging landscape impacts of proposed windfarms. This involves data collection (based on the ILP checklist), as well as the use of new software for visibility analysis.

• This is the first phase of work which is expected to be continued in 2020, with the main focus on evaluation.
Fagurferðilegt gildi landslags
á áhrifasvæðum virkjanakosta við Hvamm í Pjórsá, og Trolladyngju, Austurengjahver og Krýsuvík á Reykjanesskaga

Forrannsókn til greiningar og mats á gildi landslags, unnin fyrir faghóp 1, 3. áfanga Rammaðæltunar

Mars, 2019

Edda R.H. Waage
Guðbjörg R. Jónnesdóttir

Minjar og menningarsögulegt gildi landslags á hálendi Islands

Bírna Lárusdóttir Kristjóri
Ragnheiður Glö gylfadóttir Hofundur

FS736-16171
Reykjavík 2019
Fornefaðstofnun Íslands
Kort 1: Yfirli yfir alla hnitsetta minjastaði á miðhálandinu. Gráu linurnar eru sýslumörk.
Thank You!