# IMPERIA – Integrated framework and tools for supporting environmental impact assessment

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# IMPERIA Project

**"Improving environmental assessment by adopting good practices and tools of Multi-Criteria Decision Analysis (MCDA)"**

Active in **August 2012 – December 2015**

**EU Life+ -project**

- Total budget 1.292 M€, of which EU finances half
- Other financiers: Project partners, Ministry of Environment, Ministry of Agriculture and Forestry

**Project partners**:

- Finnish Environment Institute, University of Jyväskylä, Thule Institute, Ramboll Finland, SITO

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# Multi-Criteria Decision Analysis (MCDA)

A **general term for systematic approaches** for analyzing complex problems involving multiple criteria

Objective to facilitate

- **Structuring** of the problem
- Systematic **identification of the objectives**
- Accommodation of **incommensurable effects**
- Consistent and transparent **comparison of alternatives**
- Identification of main **trade-offs** from different viewpoints

Various approaches and tools available

- Structuring tools
- Cause–effect diagrams
- Multi-attribute value theory
- …

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# Main aim of IMPERIA to improve the quality and effectiveness of EIA with good practices and methods of MCDA

**Identify, develop and report good practices** for carrying out different phases of EIA process

**Develop methods and tools** for impact significance assessment, comparison of alternatives and participation

**Familiarize and educate practitioners** with good practices and new tools

**Good practices, reports, tools, education**

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# IMPERIA approach for impact significance assessment

Developed on the grounds of **best practices identified** in many international and national projects

Core of the approach is a **structured framework** based on

- **Sensitivity of the target**
- **Magnitude of the change**

Developed support material

- **ARVI tool** for helping the assessment
- **Forms for the experts** to support the use of the impact significance assessment framework
- **Template scales** for classifying different dimensions of various types of the impacts

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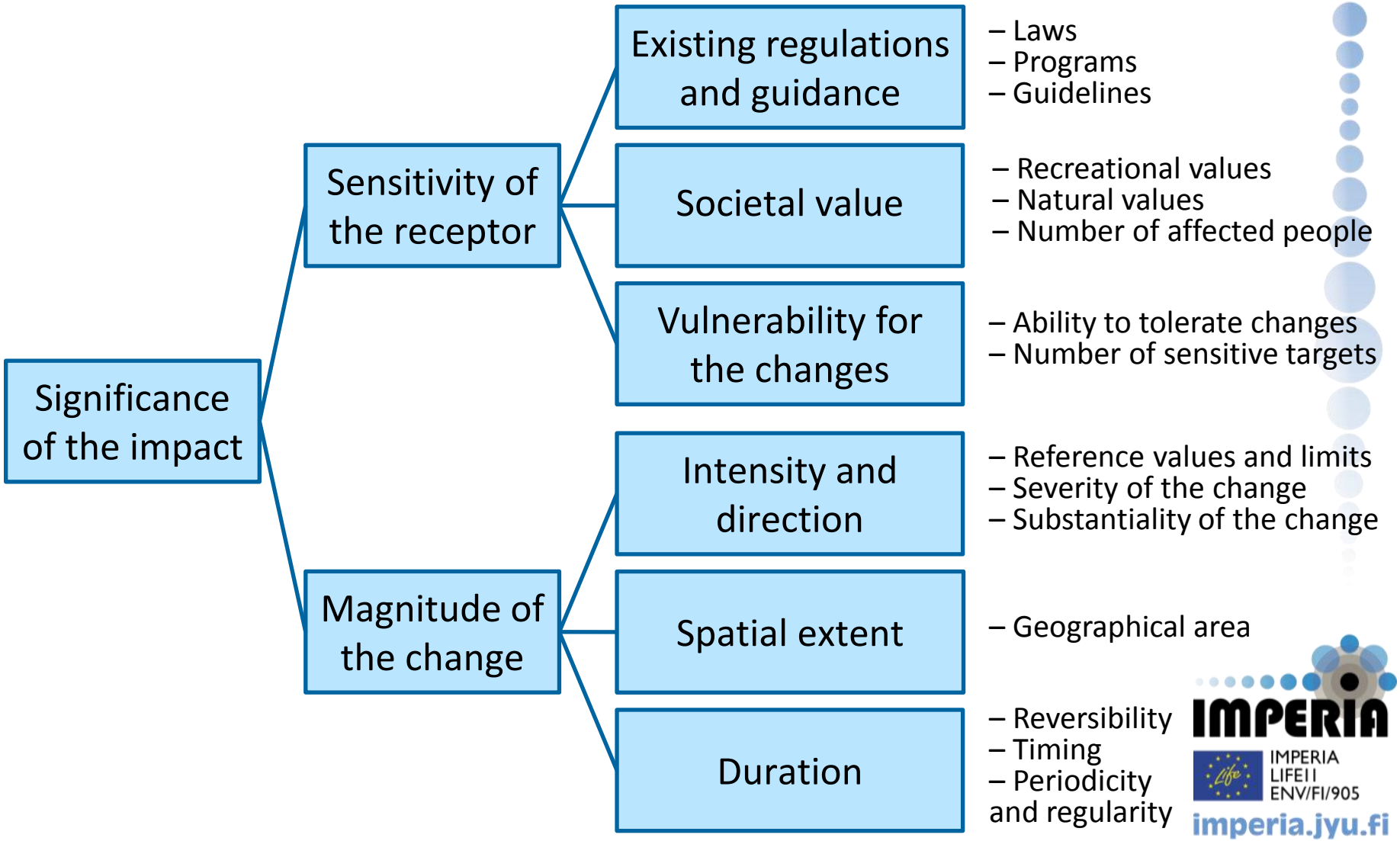
# Impact significance assessment framework

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# Use of the framework on each impact

1. Assess all **the lowest level characteristics**
   - Scale: No impact – Low – Moderate – High – Very high
   - Classification scale templates available for helping the assessment
2. Assess **sensitivity** on the basis of its characteristics
   - Support material available for helping the assessment
3. Assess **magnitude** on the basis of its characteristics
   - Support material available for helping the assessment
4. Assess **impact significance** on the basis of sensitivity and magnitude
   - Utilization of sensitivity–magnitude matrix

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# Support material for the assessment

Guidance for **how to derive sensitivity and magnitude** on the basis of their characteristics

**Classification scale templates** for various impact types

- 18 different impact types
  - E.g. noise, landscape, nature, water, etc.
- Scales for both sensitivity and magnitude
  - Characteristics of these identified with different colors
- Templates are **only general guidelines**
  - Cases and case types can vary considerably from each other

→ **Should be adapted to each case separately** to meet its characteristics

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# Example classification on sensitivity – Surface water

| | |
|---|---|
| Very high | There are Natura 2000 areas in the project area. The area is strictly protected by the water legislation. There are very important protected species in the area. The area has great national recreational value (e.g. fishing, ecotourism, etc.) Water is largely used for household water or excellent quality water for industry. Size of the catchment area is under <XX $km^2$. Retention time of the water is very long (XX–YY months). Aquatic organisms are very vulnerable for any changes in water quality. The ecosystem recovers very slowly from any changes. |
| High | There are Natura 2000 areas in the project area. The area is protected by the water legislation. There are important protected species in the area. The area has national recreational value (e.g. fishing, ecotourism, etc.) Water is largely used for household water or high quality water for industry. Size of the catchment area is between XX–YY $km^2$. Retention time of the water is long (XX–YY months). Aquatic organisms are vulnerable for any changes in water quality. The ecosystem recovers slowly from any changes. |
| Moderate | … |

Existing regulations and guidance, Societal value, Vulnerability for changes

# Assessment of impact significance

| Impact significance | | Magnitude of change | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **Very high** | **High** | **Moderate** | **Low** | **No change** | **Low** | **Moderate** | **High** | **Very high** |
| **Sensitivity of the receptor** | **Low** | High* | Moderate* | Low | Low | No impact | Low | Low | Moderate* | High* |
| | **Moderate** | High | High* | Moderate | Low | No impact | Low | Moderate | High* | High |
| | **High** | Very high | High | High* | Moderate* | No impact | Moderate* | High* | High | Very high |
| | **Very high** | Very high | Very high | High | High* | No impact | High* | High | Very high | Very high |

* Especially in these cases, significance might get a lower estimate, if sensitivity or magnitude is near the lower bound of the classification

**General guideline**: High or very high significance implies that the project cannot be implemented without mitigation measures

- Only general guideline – varying legislations on difference impacts should be considered

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# Advantages of structured framework

## Systematic assessment

- All the various dimensions of the impact will be considered

## Consistency

- Different impacts will be assessed on the basis of the same principles

## Illustration of the reasoning

- The grounds for the assessment will be presented transparently
- The chain of judgments on which the assessment is based on will be clearly illustrated

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# ARVI tool

Support for applying the **impact significance assessment framework** in practice

Familiar **Excel-based interface** for

- Facilitating the collection of assessment information from the experts
- Producing various charts and tables to illustrate the results

Will be freely available at **imperia.jyu.fi**

- English version in September 2015

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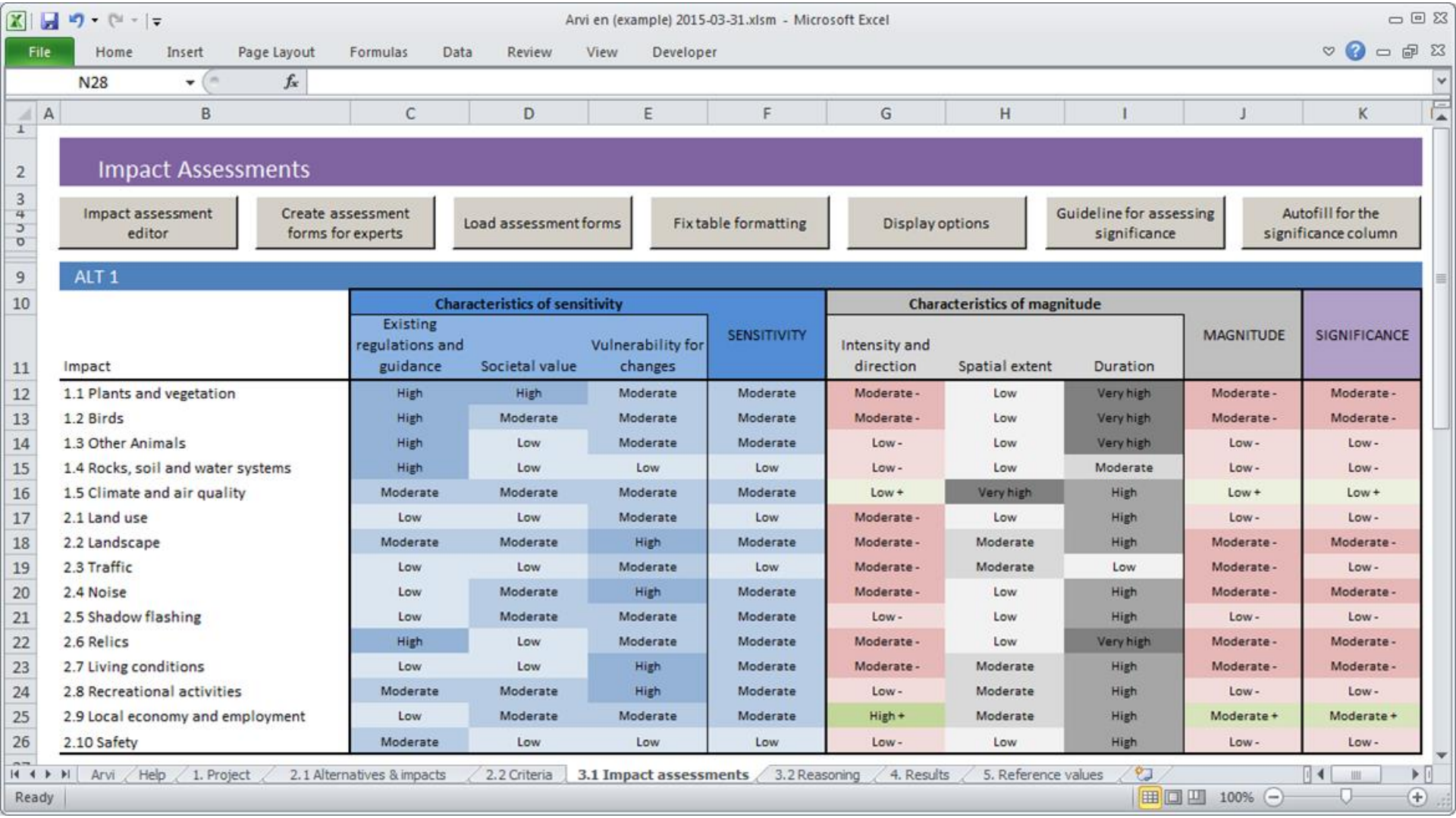
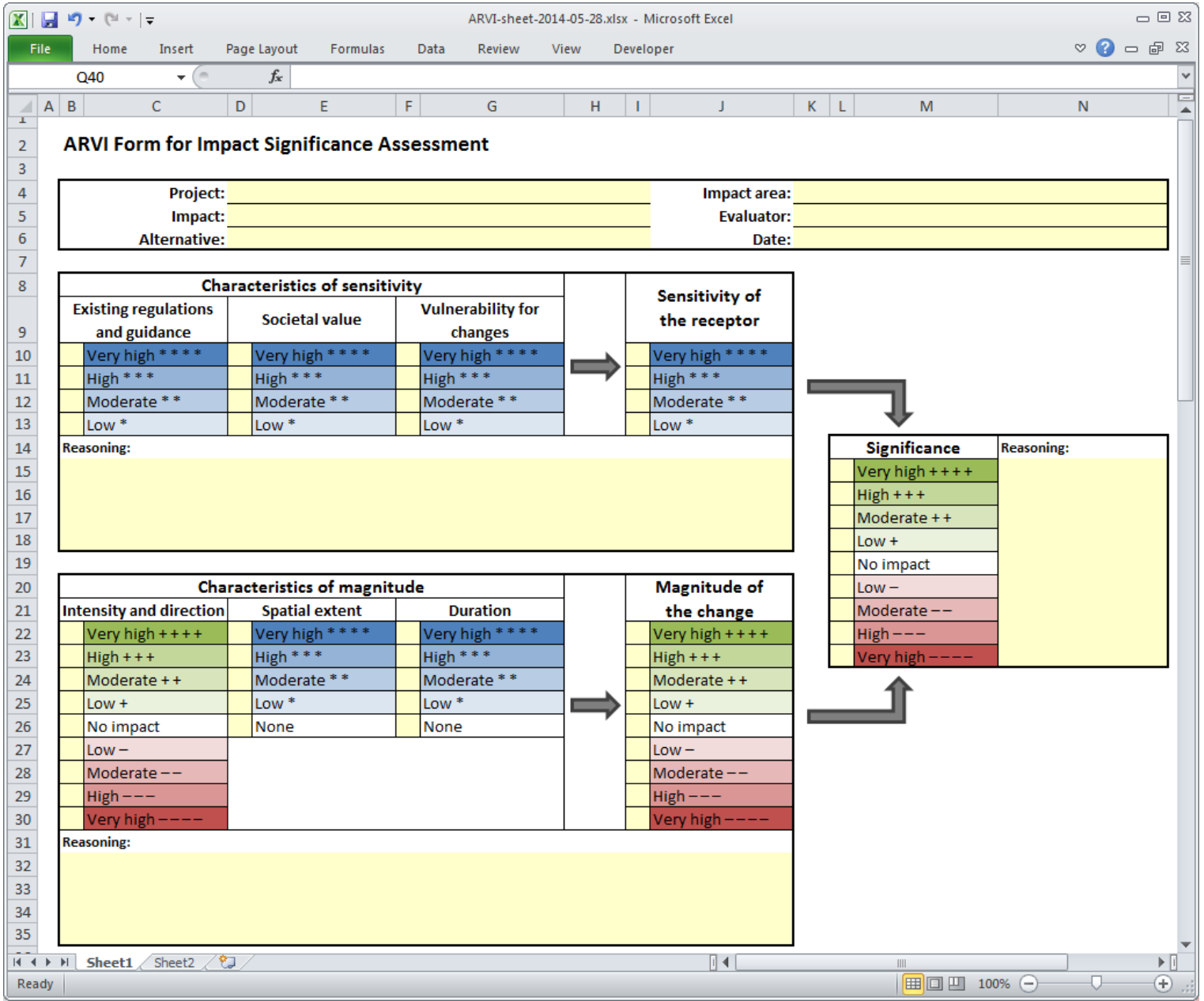
# ARVI main window




| Impact | Characteristics of sensitivity: Existing regulations and guidance | Societal value | Vulnerability for changes | SENSITIVITY | Characteristics of magnitude: Intensity and direction | Spatial extent | Duration | MAGNITUDE | SIGNIFICANCE |
|---|---|---|---|---|---|---|---|---|---|
| 1.1 Plants and vegetation | High | High | Moderate | Moderate | Moderate - | Low | Very high | Moderate - | Moderate - |
| 1.2 Birds | High | Moderate | Moderate | Moderate | Moderate - | Low | Very high | Moderate - | Moderate - |
| 1.3 Other Animals | High | Low | Moderate | Moderate | Low - | Low | Very high | Low - | Low - |
| 1.4 Rocks, soil and water systems | High | Low | Low | Low | Low - | Low | Moderate | Low - | Low - |
| 1.5 Climate and air quality | Moderate | Moderate | Moderate | Moderate | Low + | Very high | High | Low + | Low + |
| 2.1 Land use | Low | Low | Moderate | Low | Moderate - | Low | High | Low - | Low - |
| 2.2 Landscape | Moderate | Moderate | High | Moderate | Moderate - | Moderate | High | Moderate - | Moderate - |
| 2.3 Traffic | Low | Low | Moderate | Low | Moderate - | Moderate | Low | Moderate - | Low - |
| 2.4 Noise | Low | Moderate | High | Moderate | Moderate - | Low | High | Moderate - | Moderate - |
| 2.5 Shadow flashing | Low | Moderate | Moderate | Moderate | Low - | Low | High | Low - | Low - |
| 2.6 Relics | High | Low | Moderate | Moderate | Moderate - | Low | Very high | Moderate - | Moderate - |
| 2.7 Living conditions | Low | Low | High | Moderate | Moderate - | Moderate | High | Moderate - | Moderate - |
| 2.8 Recreational activities | Moderate | Moderate | High | Moderate | Low - | Moderate | High | Low - | Low - |
| 2.9 Local economy and employment | Low | Moderate | Moderate | Moderate | High + | Moderate | High | Moderate + | Moderate + |
| 2.10 Safety | Moderate | Low | Low | Low | Low - | Low | High | Low - | Low - |

# ARVI sheet for experts



# ARVI and MCDA tested in pilot projects



**Eight pilot and mini-pilot projects** including

**Wind farm** of Piiparinmäki–Lammaslamminkangas

- Testing the preliminary version of ARVI tool

**Wastewater refinery** of Vihti municipality

- Utilization of cause–effect diagrams
- Testing of ARVI tool

**Natural gas pipeline** Balticconnector between Finland and Estonia

- English material
- Testing of ARVI tool

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# Examples of ARVI outputs

| Negative ↔ Positive: Significance | Alternative 1 | Alternative 2 |
|---|---|---|
| **Very high** | | |
| **High** | | |
| **Moderate** | - Local economy/employment | |
| **Low** | - Climate and air quality | - Local economy/employment |
| **No impact** | | |
| **Low** | - Other Animals<br>- Rocks, soil and water systems<br>- Land use<br>- Traffic<br>- Shadow flashing<br>- Recreational activities<br>- Safety | - Plants and vegetation<br>- Birds<br>- Rocks, soil &water systems<br>- Climate and air quality<br>- Land use<br>- Traffic<br>- Shadow flashing<br>- Relics<br>- Living conditions<br>- Recreational activities<br>- Safety |
| **Moderate** | - Plants and vegetation<br>- Birds<br>- Landscape<br>- Noise<br>- Relics<br>- Living conditions | - Other Animals<br>- Landscape<br>- Noise |
| **High** | | |
| **Very high** | | |

**Significance of plants and vegetation**

| Magnitude / Sensitivity | Low | Moderate | High | Very high |
|---|---|---|---|---|
| **Low** | B | | | |
| **Moderate** | | A | | |
| **High** | | | | |
| **Very high** | | | | |

**Scale for significance**

= Low
= Moderate
= High
= Very high

**A = Alternative 1**

**B = Alternative 2**

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# Experiences of using IMPERIA framework and ARVI

## Advantages

- “Helps to understand the reasoning behind the assessment”
- “Helps to distill and visualize the impacts”
- “Does not necessarily save time, but increases the quality of the assessment”

## Challenges

- “Possible resistance among the experts”
- ”Lack of time and resources – The profits obtained from EIA projects are low due to price competition”
- ”Learning takes time”

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# Thank you!

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