Working group meeting:
Development of a Spatial Decision Support System to analyze the effect of risk reduction planning alternatives on reducing the risk now and in the future, and support decision makers in selecting the best alternatives.

Thursday 14 & Friday 15 March, 2013. Faculty ITC, University of Twente.

Aim: The aim of this meeting is to define the workflow of the SDSS and the various components of it, and to establish the roles and responsibilities of the working group members.

Within both the CHANGES and INCREO project we would like to develop a Spatial Decision Support system. The SDSS should be able to analyze the effect of risk reduction planning alternatives on reducing the risk now and in the future, and support decision makers in selecting the best alternatives.

The figure shows the conceptual design of the SDSS. Different colors refer to different components: **green** = stakeholders, **Blue** = organizations responsible for providing hazard maps. **Orange** = organizations responsible for providing elements at risk maps, **Yellow** = organizations responsible for providing risk modeling, **Violet** =


Organizations that are working on the analysis of trends related to climate changes, land use change and population change, **Red** = end-users of the platform that use the information from the others.
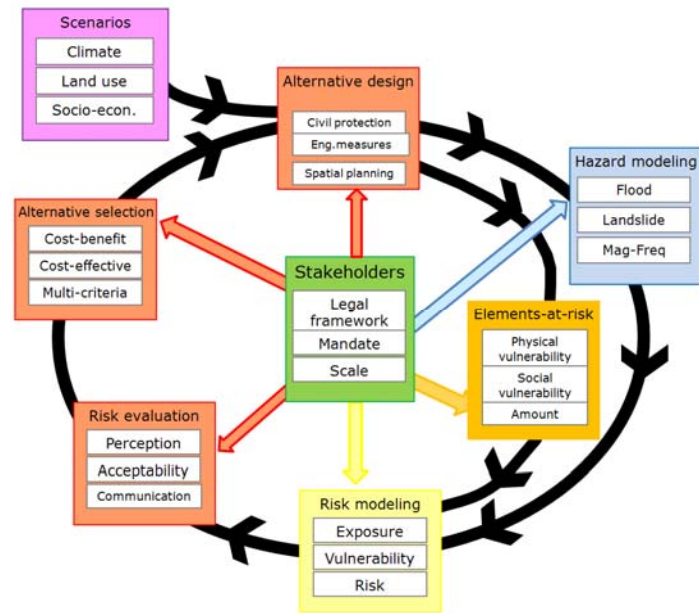
The tool can be used for a number of different purposes (See Figure below):
1. <u>**Analyze the risk of the current situation**</u>. This is the most conventional part of the platform. It is the starting point also for the other types of analysis. The user can select the hazard types, the assets, and depending on the input type can carry out either a simple exposure analysis (how many assets are located in the hazard zones), qualitative risk assessment or quantitative risk assessment.

2. **Analyze the risk of the current situation for different alternatives of risk reduction**. After analyzing the current risk, the user can define one or more alternatives for risk reduction (either disaster preparedness planning, planning of engineering measures, or spatial planning). The user will then define whether the implementation of the alternative would require another hazard map and another asset map as input.

3. **Analyze the different scenarios through time. In order to evaluate the effect of changes**. The user should define here which future scenarios will be taken into account. The user can select scenarios for climate change, land use change and population change. The user can also select which time periods are selected, and also whether for the same time period different scenarios will be evaluated.

4. **Analyze the change in hazards for different scenarios through time**. The effect of the scenarios selected in step 3 on the hazards considered will be evaluated. The actual hazard assessment is not carried out within the system, only the hazard maps are loaded into the system. The user can select the hazard scenarios for the situation without implementation of risk reduction alternatives (the current situation projected into time) for the different scenarios. This component has mainly a visualization and change analysis component. Not an actual hazard modeling component.

5. **Analyze the change in assets for different scenarios through time**. The effect of the scenarios selected in step 3 on the assets considered will be evaluated in this step. What is the effect of the land use and population scenarios on the location, type, vulnerability and quantity of the assets in the different future years considered. Note that these are not including the effect of alternatives of risk reduction planning, but are the projected changes from the current situation. This will also be mainly a visualization and change analysis tool.

6. **Analyze the change in risk for different scenarios through time**. This is major component of the platform: to analyze how for the scenarios defined in step 3 and the changes in hazard and assets that are analyzed in step 4 and step 5. What will be the change in risk if no risk reduction measures are taken, and the development of the area is governed by trends in landuse and population change. So this is the "what will be the risk if we don't do anything" analysis.

7. **Analyze the effect of different alternatives in risk reduction for different scenarios through time**. The last part will allow to analyze what would be the effect of implementing risk reduction alternatives (defined in step 2) combined with the scenarios (defined in step 3) on the risk over a period of time, and will allow to select which of the risk reduction measures would have the largest effect on the long term.
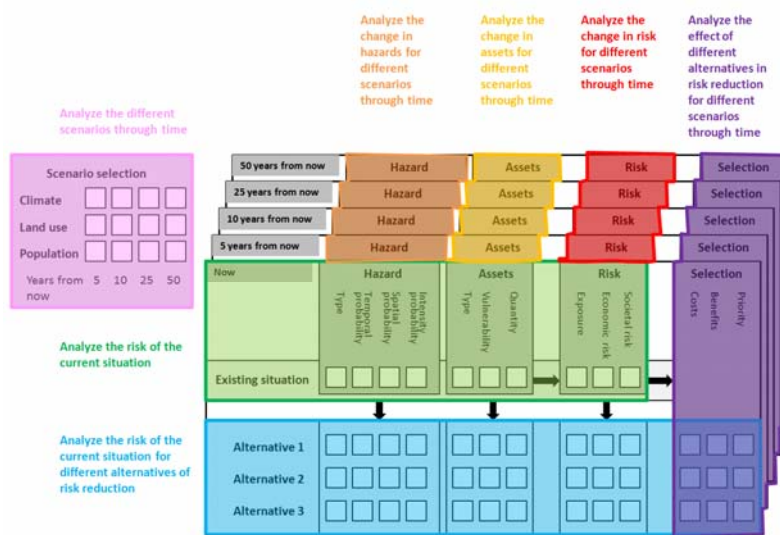
Workshop programme:

Thursday 14 March:

09.30 – 10.30 : Introduction & presentation of the proposed SDSS structure.
Overview of the system, and its different components, breakdown of work, working group, hiring of 5 ESRs. Planning for the workshop.

11.00 – 12.30: Presentation of the individual modules and their links, and formation of individual working groups that would concentrate on defining the workflow of the individual components.

13.30 – 17.00: Split up the work in several working groups:

- Designing the workflow for the **hazard module**.
  - o Which hazards? Which scales? Which formats do hazard maps have? Work with susceptibility maps. Input of return periods, intensities, spatial probability.
- Designing the workflow for the **elements at risk & vulnerability module**.
  - o Which elements at risk? Which scale? Which form of representation? Building data, population data, agriculture data, and transportation infrastructure. Which attributes for each? Which types of vulnerability will be included? Qualitative indices? Vulnerability curves? Library of curves.
- Designing the workflow for the **alternative selection module and the scenario selection module**.
  - o Difference between alternatives and scenarios. Risk reduction alternatives and how these will affect the hazard and elements at risk. Storage and description of alternatives. Methods that allow the change of hazard and elements at risk maps. Scenario development? Which types of scenarios? Scenario description? How do these affect hazards and elements at risk?
- Designing the workflow for the **risk analysis module.**
  - o The link between the hazard input, elements at risk input, vulnerability input and the types of risk analysis that can be carried out. Exposure analysis. Qualitative risk analysis using SMCE, Quantitative risk analysis: economic losses, societal risk, individual risk, single hazard risk, multi-hazard risk, losses per type of element at risk, or per administrative unit.
- Designing the workflow for the **cost-benefit analysis module**
  - o How to enter information on the costs of risk reduction alternatives? How to analyze the risk reduction for alternatives? How to compare investment costs with risk reduction? How to carry out a cost-effective analysis, when we cannot quantify the risk reduction in monetary terms? What if we can also not quantify the investment in monetary terms?
- Designing the workflow for the **comparison of risk scenarios and prioritization.**
  - o How to visualize the different risk alternatives and scenarios in the system? Using maps, using graphs and animations? How should the interface look like?

Friday 15 March:

09.00 – 10.30: Presentation and discussion of the results of the working groups

- Designing the workflow for the **hazard module**
- Designing the workflow for the **elements at risk & vulnerability module**.

- Designing the workflow for the **alternative selection module and the scenario selection module**.

11.00 – 12.30: Presentation and discussion of the results of the working groups
- Designing the workflow for the **risk analysis module.**
- Designing the workflow for the **cost-benefit analysis module**
- Designing the workflow for the **comparison of risk scenarios and prioritization.**

13.00 – 15.00: Defining software requirements for the implementation of the modules.
- Which modeling tools will be used.
- Presentation of ILWIS
- Discussion on the web-GIS component and integration with SDSS

15.30 – 17.00: Summary, conclusions and planning of next steps.
Definition of subgroups that will further work out the individual components. Requirements for the detailed workflow description. Planning of next meetings. Procedure for hiring the 5 researchers.

Logistic information:

The meeting will be held in ITC, Hengelosestraat 99, 7514 AE Enschede, The Netherlands
http://www.itc.nl/Pub/organisation/Contact-information/Maps-and-Directions.html

By air:
- Schiphol (direct train connection from Schiphol takes 2 hours)
- Airport Munster Osnabruck (Air Berlin flights, about 2 hour to Enschede by public transport)
- Airport Dusseldorf or Dusseldorf/Weeze (Ryanair, about 3-4 hours by public transport, 1.5 hour by car)

Hotels:
- ITC International Hotel. Single room : € 47.50, Double room: € 71.35 (no breakfast available, but breakfast can be arranged in nearby locations).
  http://www.itc.nl/ITC-International-Hotel
- Rhodenbach Hotel . Single room: € 95,00
  http://www.rodenbach.nl/hotel/index.php

Coordination:

- Cees van Westen (tel: +31 53 4874263, mobile +31 6 48863452) c.j.vanwesten@utwente.nl
- Marleen Noomen (tel: +31 53 4874294) m.f.noomen@utwente.nl