

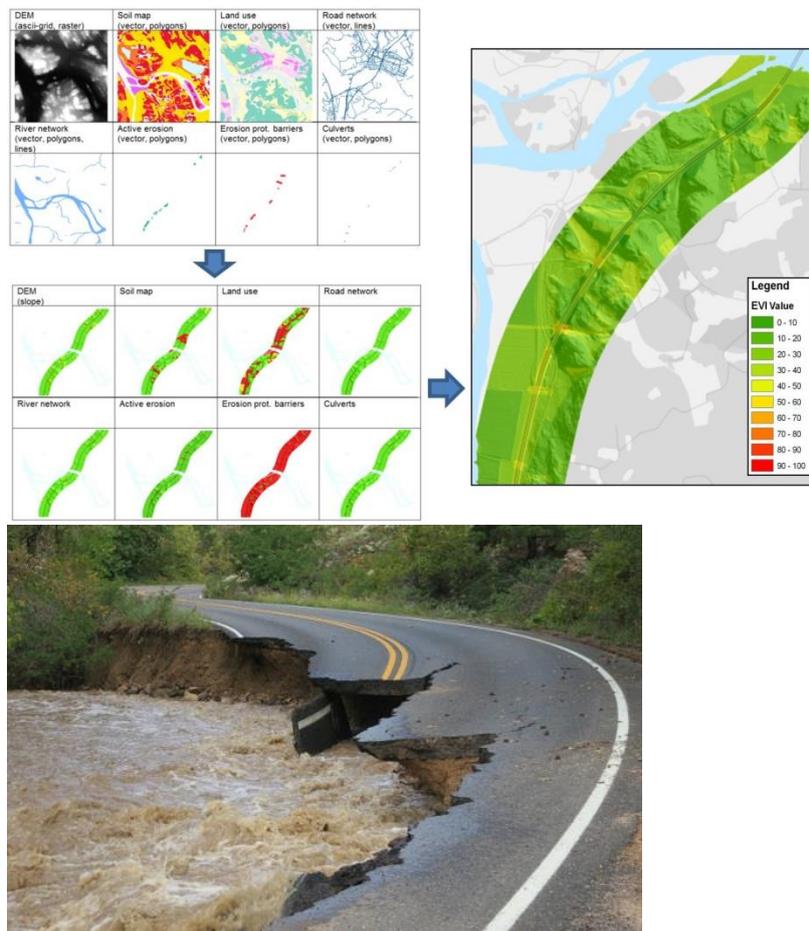
## Context

Critical infrastructure forms the backbone of society. As such it is also vital for regional developments and therefore even more vital for developing countries. In the same time the infrastructure networks are threatened by natural hazards and climate events (eg. flooding, landslides, erosion, earthquakes). There are numerous examples where infrastructure networks were not capable of withstanding the forces of nature (eg. Mozambique 2019, Philippines 2013)

Over the past years Deltares has contributed to numerous climate resilient infrastructure analyses, on risk, impact and mitigation strategies for road infrastructure. During these studies several methods have been developed and applied during case studies. To build resilience, a risk analysis process is required, that amongst others pinpoints vulnerable locations in the infrastructure network.

However, in these countries the availability of accurate and complete data is often limited. At the same time a lot of information can be obtained using experiences of operators and users of the infrastructure. Specific knowledge about the vulnerabilities therefore often has to be derived using interviews with stakeholders. It is important to combine both the available 'hard' and 'soft' data. For this purpose a web-based tool (RI2DE – Risk Indicators for Infrastructure in Data scarce Environments) was developed. Various types of (often globally) available information, such as DEM, topographic maps, land use maps, etc can be combined, but also expert input (e.g. maintenance information, historic data) can be added to produce a rough first impression of vulnerable locations.

The figure below shows an example of a risk identification from one of the previous climate resilient infrastructure studies (this case for erosion of road embankments), where the top left part shows the input datasets. The input datasets were a combination of maps derived from satellite observations and global maps, and local datasets (erosion and location of bridges/culverts) delivered by a mapping action together with asset managers at the road authority.



## Challenge

The quality of the results of this approach all depend on the quality of the input data and how these are combined. It is very important to build a knowledge base that we can use for verification and validation of the tool. Real life events, together with high quality modelling outputs need to be compared with the outputs of the RI2De tool.

During this graduation project a validation of the RI2DE tool will be conducted. The candidate will develop an approach for this purpose, perform detailed hazard analyses for comparison, calibrate the factors for use in the tool and validate the outcomes of the tool. This will allow future users to determine how the results fit the intended use. Furthermore you will help to develop this web-based tool further.

Who are we looking for:

- An MSc student in the field of Earth Sciences, Geomatics, Remote Sensing, Civil Engineering (or other relevant direction)
- Knowledge of GIS, (spatial) statistics, python and OGC standards
- Affinity with hazard and risk analysis

We will offer you a very nice team and are always open to new ideas.