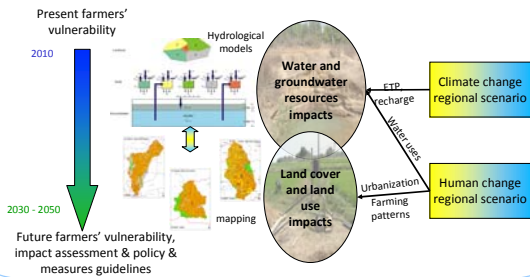


Socio-economic Assessment of the rural Vulnerability of water users under stressors of global changes in the Hard rock area of South India

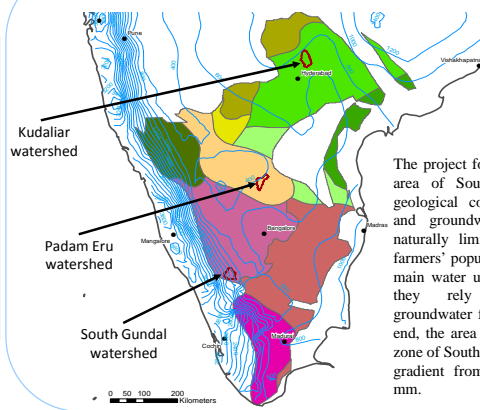
The SHIVA-ANR project (2009-2011) aims at estimating the vulnerability of farmers to both climate and human changes by 2030 and 2050, assessing the impacts of vulnerability in terms of costs and / or benefits and evaluating the possibilities to modify rural vulnerability trends through adapted water management policies or initiatives.

Method

Our research team is split in six thematic groups in order to face the different scientific issues which are: climate regional scenario downscaling, agricultural prospective, vulnerability assessment and quantification, vulnerability mapping, hydrological modeling and upscaling, and vulnerability impacts assessment. Our approach is multidisciplinary to deal with the numerous inherent themes and integrated as vulnerability is a dynamic and multidimensional concept.



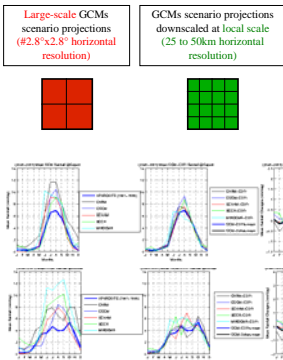
Project area & pilot sites



The project focuses on hard rocks area of South-India as in this geological context, both surface and groundwater resources are naturally limited. It also targets farmers' population as they are the main water users of the area and they rely exclusively on groundwater for irrigation. By the end, the area covers the semi-arid zone of South-India, with a rainfall gradient from 1100 mm to 600 mm.

Preliminary results

Climate Change Downscaling Process



Statistical Downscaling Methods (SDM) are generally validated by examining the quantiles, CDF/PDF of daily rainfall as well as wet spell length at local-scale. One method recently developed by Michelangeli *et al.* (2009) based on CDF-transform (CDF-t) presents the advantage to deal with and provide local-scale CDFs. After a validation on historical statistical characteristics, the later CDF-t is first calibrated over a 40 years period (1961-1999) and then applied on GCM A2 anomalies (2046-2065). The projected signal is reconstructed using the future large-scale seasonal cycle where the historical biases have been removed.

Similar results for both Delta method & CDF transform (enhanced rainfall during the monsoon rainy season)

Over the southern Gundal basin, impact on rainfall particularly marked during the second half of the monsoon rainy season

The results from CDF-t are then compared to downscaled GCM output using the Delta method from Déqué (2007). Both methods show an increase in precipitated amount from June to September, particularly pronounced for the southern Gundal basin during the second half of the monsoon season.

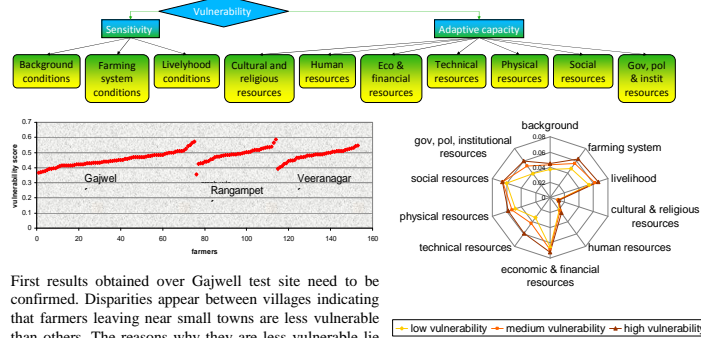
Landuse & landcover



Field surveys are carried on 3 times a year when a new cropping season starts. An unaligned systematic random sample approach is used (sample fraction around 0.5%). The Land Use and Land Cover Classification Schemes of LUCAS are adapted to South India context. Field survey overlays are scanned and georeferenced, parcels are on-screen digitized with attribute data entry. A regression estimator combining landcover / landuse interpretation and satellite imagery provides reliable area estimates.

Vulnerability index

Farmers' vulnerability to global change in South-India is described through 63 components characterizing farmers' sensitivity and adaptation capacity to global change. They are organized into a hierarchical matrix. Local experts (government, NGOs, research areas) carried out a weighting procedure through pairwise comparisons according to Analytic Hierarchy Process. Components are quantified according to the results of a test survey over 153 farmers of the small watershed of Gajwel (within Kudaliar pilot site). A vulnerability score is calculated for each farmer, corresponding to present vulnerability state..



First results obtained over Gajwel test site need to be confirmed. Disparities appear between villages indicating that farmers leaving near small towns are less vulnerable than others. The reasons why they are less vulnerable lie in technical and institutional resources but also in farming and livelihood conditions.

CONCLUSION

SHIVA project aims at assessing farmers' vulnerability to global changes and its impacts on rural economy. One year after the beginning of the research, pilot sites and methods are set on and first results are briefly presented here. Geological surveys will start by end 2009, and hydrological modeling by January. SHIVA allows recruiting 2 master students, 2 post doctors and 1 doctor. Presently, 2 abstracts are submitted to international conferences. **Acknowledgements:** This work has been supported by French Research National Agency (ANR) through VMCS2008 program (project SHIVA n° ANR-08-VULN-010-01)

Authors

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