Applied Research Partnerships with Developing and Transition Countries
Swiss Universities of Applied Sciences and Universities of Teacher Education

Foto: Daniel Pittet

Project title

Combat water shortage by supporting land use improvement in forest areas in Indonesia

Thematic focus

Measuring influence of agroforestry on groundwater

Year

2012

Project location

Java, Indonesia

Swiss Institution

Istituto Scienze della Terra, DACD, Scuola Universitaria Professionale della Svizzera Italiana (SUPSI)

Partner Institution

Faculty of Forestry, University Gadjah Mada, Yogjakarta, Java, Indonesia

Description

A worldwide increasing demand of drinking water and unreliable water quality are main issues that urge sustainable groundwater use and therefore require a coherent groundwater policy, especially in highly populated areas like the island of Java in Indonesia. In this proposed preliminary project the Institute of Earth Science (IST) intends to launch a collaboration with the Faculty of Forestry, University Gadjah Mada (UGM), the oldest and largest state university in Indonesia, with the goal to study the effect of deforestation and agroforestry on the groundwater composition in terms of its use as drinking water.

In a preliminary phase, for which this proposal applies, the involved institutions (IST and UGM) will prepare and schedule the details of an action plan, especially defining the exact places of measurements (for example Java and Kalimantan) and the intended time schedule. The preliminary project will be coordinated with the Ministry of Forestry (Government of Indonesia) on a one-day workshop at UGM. Furthermore a one week field trip to a location candidate for the intended measurements is planned where instruments, provided by UGM, will be tested.

Development relevance

The proposed project takes account of the Millennium Development Goals declaration of the United Nations, Target 7.A: Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources. Since Indonesia is a place where deforestation and agro-forestry are growing fast, this fact is supposed to create a huge deficiency of drinking water. As an attempt of providing strategic input to tactical decision-making within the groundwater management objective, the establishment of an administering protocol through the provision of regional groundwater database with spatial orientation is the main subject of this project.

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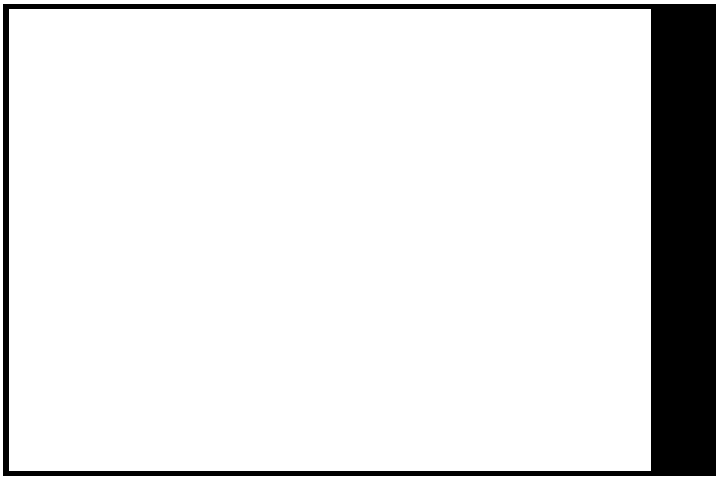
Main features of the project

This preliminary project intends to prepare a series of future geochemical isotopic measurements, planned in the framework of a medium to long-term collaboration with the Indonesian partner UGM. The goal of the foreseen collaboration is to study the effect of deforestation and agro-forestry on recharge and groundwater balance together with an IT platform representing the obtained results. These Web-based maps, quantifying changes in groundwater balance while using mainly open source software, will be implemented and provided via internet to concerned facilities. This will provide strong evidence to the policy decision processes in the spatial planning and help to develop a forest-based landscape management that supports groundwater sustainability.
In a preliminary phase both institutions will chose suitable locations on place for the measurements and define details of the research strategy. In collaboration with the Ministry of Forestry of the Indonesian government, a Spatial Decision Support System (SDSS) to represent the research results (with limited access for the concerned authorities) will be designed. A SDSS is a combination of Geographical Information System (GIS) and a Decision Support System (DSS). This SDSS is planned to be linked with a second communication platform for direct information and suggestion exchange between the Ministry of Forestry and local authorities. All this is part of the application-oriented research and development aspect of the proposal.
In a first step, micro-catchment sites will be selected on the basis of ecological, climatic and land-use criteria, to assess its effects on groundwater recharge by using geochemical isotopic analysis (stable isotopes and noble gases). A field trip to one of the possible candidates for the planned measurements and testing of instruments will help to define the strategy.
Using the outcome of the field trip, in a series of discussions at UGM the design of the SDSS platform will be established and finally coordinated with the Ministry of Forestry in a workshop. To improve the capabilities of the Indonesian partner, the Swiss applicant IST will host two UGM scientists for a “GIS on open source platforms” course, which is supposed to design and develop a preliminary version of the projected SDSS system.
The Swiss applicant IST already has an ongoing project on application of environmental isotopes and noble gases to assess the impact of tunneling on the hydrological cycle, giving positive results about the use of such techniques to minimize negative impacts. Through the proposed project, IST will extend its know-how and competences on application of such techniques for studying possible new components of the hydrological cycle. The acquired know-how can be later used also in Switzerland to assess the impact on groundwater resources as the result of ongoing changes in land use.
For the IST the proposed project would open new horizons in applying the know-how in the hydro-geological sector in a transition and developing country. At the same time the IST benefits of the possibility to improve its capacities working with the in the methodology mentioned above. The creation of new collaborations for future projects is of great importance especially concerning intercultural cooperation. The IST also plans to involve postgraduate students which will work in the preparation and execution of specific tasks of this preliminary project.
For the UGM the cross-cutting between geo-hydrologist, geo-morphologist and forester is a new challenge. The most technical aspects on geochemistry and GIS the UGM relies on the support of the applicant institute. Active involvement of the Ministry of Forestry (especially Directorate General of Forest Rehabilitation and Social Forestry) will allow that the results outputs could be adopted by the national governing body as well as to be transferred into each local level. Several studentships are also foreseen in the project.
The UGM hosts a multi-disciplinary postgraduate program in which the proposed project would be involved, using several hydrological sites to be continuously improved for providing a better research-education base. The UGM partner has now running a three year research program on landscape management funded by the



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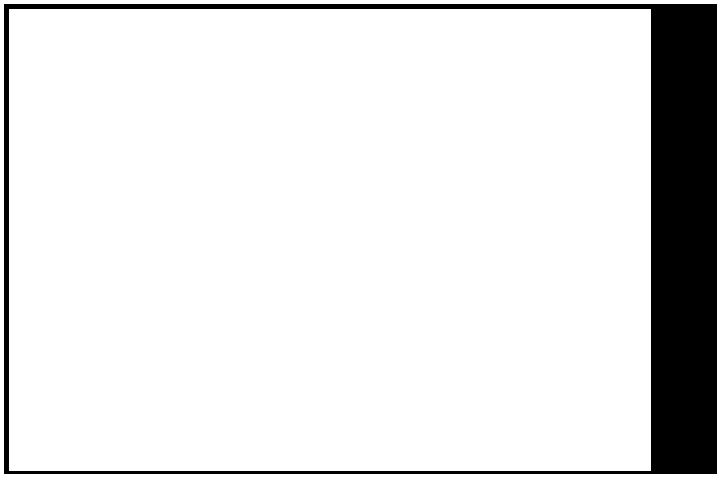

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