



Subject offered for a contract starting October 2019

SUBJECT TITLE:

Actionable knowledge for sustainable water management: Transforming scientific information to enhance community understanding and engagement in water management in the Galapagos Islands

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Financing: **Doctoral contract without teaching assignment**

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Presentation of the subject: (1 or 2 pages)

Background

The Galapagos Islands are renowned worldwide for their unique ecosystem and on going contribution to scientific knowledge. They are also home to a number of communities who live permanently on the four largest islands. The last population census in 2010 indicated that 21,500 people are permanent residents in Galapagos, in addition to this there is a continuous flux of visitors (160,000 in 2010 then >200,000 in 2015) and temporary workers, largely linked to the tourism industry which has been increasing drastically since at least 2 decades. Although the populated area comprises only 3% of the total protected area, the Galapagos National Park under the authority of the CGREG (Consejo de Gobierno Regimen Especial de Galapagos), as the main governmental institution responsible for administrating the Galapagos protected area, assesses that more than 90% of the conservation issues threatening biodiversity in the islands can be attributed to the impact of the populated zones. In order to effectively address conservation challenges in the Galapagos Islands there is a need for research, which explores the interaction of natural, social and economic dynamics.

Although the climatic conditions in the Galapagos Islands are usually cool and dry, the hydrological regime vary in each island depending on factors such as geomorphology, time since volcanic cessation, slopes, among others; above an elevation of 200 meters is where the humid and very humid zone exists and where water is available for runoff or infiltration (Violette et al., 2014). Water is critical for the health of terrestrial ecosystems and the

survival of endangered and threatened species. It is also core to the health and well-being of the human communities who live on the islands and to the island economy, in particular the farming and tourism sectors. The use of water as a core resource in the populated islands of the Galapagos Archipelago has been limited not only in terms of quantity, since these islands are naturally arid, but also in terms of quality due to inadequate water supply, wastewater treatment and misunderstanding of the hydrogeology dynamics in the islands. Although there has been considerable research effort on the natural water cycle in the islands done by the GIIWS team¹, which is essential for water management planning, scientific knowledge has not been effectively absorbed and used by, key stakeholders including Government decision makers, communities or the tourism industry.

Globally, there is a need to ensure that scientific results are used to guide planning and action. This involves bridging natural science, social science and understanding how to best communicate knowledge so that theory is transformed into action, to support effective natural resource management and biodiversity conservation.

To date, little research has been conducted on the transformation of scientific knowledge into information that can be understood and used by different stakeholder groups to guide their use and management of water in Galapagos.

The core purpose of the research to be undertaken through this PhD is to generate “Actionable knowledge” that directly improves community, public sector and tourism understanding and engagement helping to shape the development of grassroots strategies for sustainable water management.

Research concept / questions

An effective conservation strategy of Galapagos must include an adequate water management, which depends on improving local knowledge gaps and coordination between state agencies, scientific researchers and the population living in and visiting the islands. Considering the already existing scientific effort to understand the water cycle in two of the four populated islands (San Cristobal y Santa Cruz), it offers an important opportunity not only to generate actionable knowledge with the existing information but also to evaluate its impact and community engagement in improving the knowledge in Isabela Island.

The research process will generate information through a methodology which increases local understanding of the importance of sustainable water management and which establishes strong local ‘ownership’ of the information and ensures that information is useful to, and used by, the full range of local stakeholder groups. By directly involving local stakeholders at all levels the research will also help to establish an on going monitoring system, supporting the continual generation of ‘Actionable Knowledge.’

Through the PhD, key areas of research will:

- Identify and examine water management priorities amongst the residential population including farmers as key water users and the tourism industry; the current policies and management priorities of state agencies; and the actions and priorities of scientific researchers and NGOs;
- Assess how water use is governed in the three islands (San Cristobal, Santa Cruz and Isabela) what community institutions and coping strategies have been developed to influence water use, what scientific related knowledge has been generated and how these institutions and strategies are affecting a range of water related issues;
- Assess how sustainable water management can be achieved in the three islands, taking into account the interests of the target groups and the existing scientific information. This

assessment will also directly improve hydrological knowledge and develop a strategy and approach to improve water management on Isabela Island.

- Explore the generation of actionable knowledge for the main target groups and evaluate their impact on water vulnerabilities to support more sustainable water management on the populated islands.

Methodology

The research will use participatory techniques, working with the main target groups in Galapagos to explore how more effective forms of sustainable water management can be developed, based on a more nuanced understanding of scientific of water cycle knowledge. The research thus offers exciting possibilities to shape new forms of actionable knowledge that can help boost community engagement in water management in islands.

This participatory research will analyze the usefulness, usability, and exchangeability of the knowledge required by the range of stakeholders in Galapagos, using a combination of qualitative and quantitative methods. These methods will include focus group interviews, observations of decision-making processes, user testing sessions and statistical analysis (Zulkafli et al., 2016). The generation of actionable knowledge will require a multidisciplinary approach, which directly engages all stakeholders and establishes strong ownership of both the information generated, its importance and will establish the process required for ongoing monitoring to guide effective management.

Given the gaps in knowledge on water use and management on Isabela Island, the PhD will place a strong emphasis on development of citizen science approaches amongst communities living on Isabela, to establish hydrological monitoring led by the local community in partnership with other key stakeholder groups including public sector, NGOs and scientific researchers.

Student skills: geography, environmental sciences and water management

References

- Violette, S., d'Ozouville N., Pryet A., Deffontaines B., Fortin J., Adelinet M., 2014. Hydrogeology Of The Galapagos Archipelago: An integrated and comparative approach between islands. *In K. S. Harpp, E. L. Mittelstaedt, N. d'Ozouville, and D. W. Graham (Eds.), The Galápagos as a Laboratory for the Earth Sciences*, Chapter 9, 167-183. American Geophysical Union, Washington, D.C. ISBN: 978-1-118-85241-5
- Zulkafli A.R., Mohammad Noor Amal Azmai, Shamarina Shohaimi, Sikander Ayub. 2016. Length–weight relationships of 15 fish species from Tembeling River, Pahang, Malaysia. *Journal of Applied Ichthyology*.