



FELLOWSHIP SUMMARY REPORTS

- ❖ Please submit this Summary Report in Word, in Times New Roman, font size 11, using UK English spellings.

Cover page – which should include:

- Your name: SANDA IEPURE
- The subject title and theme number of your research fellowship: **Towards the use of groundwater biodiversity as indicators for aquifers quality in agricultural watersheds: an ecological field approach (GROUND-BIODIV)**. No: JA00094194
- Your host institution: CEAZA, Chile
- The name of your host collaborator: Nicolas Gouin
- The dates of your fellowship: 23/09/2017 – 22/11/2017
- Your consent to your report being posted on the Co-operative Research Programme's website, or alternatively, a short paragraph about your fellowship which could be used anonymously.

1. What were the objectives of the research project? Why is the research project important?

The groundwater quality largely depends on its ecological status which relies on a well-structured biological community (microorganisms and invertebrates) capable of carrying out key ecological functions and services. The present project aimed to assess the environmental decline of groundwater ecosystems from agricultural watersheds in Coquimbo region (Chile), by the estimation of groundwater biodiversity; the effects of groundwater loads with pesticides and fertilisers on groundwater biota and on the ecosystem services they provide. The importance of the project is twofold: on one side the project aims to provide information on groundwater quality in the area, to improve the understanding of groundwater as ecosystems with the final scope to recommend effective strategies to protecting groundwater resources and its fauna. On the other, the project would bring new information's about one of the poorly investigated aquatic ecosystems in South America represented by groundwater. This hidden ecosystem hosts a very special biocenosis with many unique species, endemic and relict that colonized the groundwater in the past. Especially the groundwater crustaceans display various evolutionary and geographic patterns gained through complex and long term (millions of years) underground processes of speciation and adaptation. The evolution of groundwater crustacean in different biogeographic regions worldwide is reflected in a particular biodiversity underground. In these regards, Chile, by its geographic position and specific past and present climate (currently with extremely reduced precipitations) might host one of the most unique groundwater species worldwide that evolved underground in complete isolation. In the specific region of Coquimbo, the groundwater is currently under high treats due to overexploitation and contamination, and this specific fauna might disappear even before being discovered.

2. Were the objectives of the fellowship achieved?

The main objective of the fellowship was achieved by the effectuation of the planned field work (groundwater and groundwater fauna sampling). The field trip represents the essential activity of the project that stand at the base of groundwater quality evaluation and biodiversity estimation. The water samples collected are currently under process and will be analysed for isotopes, major ions, pesticides, fertilisers and heavy metals. Groundwater biota is also in process of identification which is time consuming. This process is impeded by the absence of key identifications for groundwater fauna of South America and also because several species are new to science. However, this impediment has been settled out during December 2017 and January 2018 and the biological material is under process of identification by different taxonomists in the field.

3. What were the major achievements of the fellowship? (up to three)

1. Assessment of a first extensive exploratory study on groundwater fauna biodiversity from Chile
2. Contribute to a better characterisation of groundwater quality specifically in the Coquimbo region (IV) using biological criteria

3. A consolidated starting point for further joint projects applications among IMDEA Water and CEAZA

4. Will there be any follow-up work?

- Is a publication envisaged? Will this be in a journal or a publication? When will it appear?

At least one publication in a scientific journal due to appear along the 2018

Popularisations articles are already available on web portal of Madrid+d (<https://www.madrimasd.org/>) and on web blog of IMDEA Institute (<http://www.water.imdea.org/>):

1. Iepure S., 2017. La escasez de agua subterránea en las regiones semiáridas del norte de Chile: el conflicto por la demanda de agua afecta a los ecosistemas de aguas subterráneas

<http://www.madrimasd.org/blogs/remtavares/2017/10/16/133328>

2. Iepure, S, 2017. Running out of water in semi-arid regions of northern Chile: conflicts over water demands threaten the groundwater ecosystems.

<https://groundwaterecology.wordpress.com/2017/10/28/running-out-of-water-in-semi-arid-regions-of-northern-chile-conflicts-over-water-demands-threaten-the-groundwater-ecosystems/>

- Is your fellowship likely to be the start of collaboration between your home institution and your host?

Yes, a collaboration scientific agreement would be signed between the two institutions

- Is your research likely to result in protected intellectual property, novel products or processes?

No

5. How might the results of your research project be important for helping develop regional, national or international agro-food, fisheries or forestry policies and, or practices, or be beneficial for society?

Over the last decades in Chile the demands for groundwater increased exponentially. In northern Chile this high demand is caused by the intensification of mining explorations that use huge amounts of water for the ore processing; and by the incrementation of extensive agriculture in the watershed of the main hydrographic basins, Elqui, Limari and Choapa. The water used for mining and agriculture are extracted from rivers and the glaciers located in the Andes Precordillera, and also from aquifers. The intensive use of groundwater resources in the region, brought to significant social and economic benefits, but their inadequate planning usage resulted in negative environmental, legal and socioeconomic consequences. Furthermore, both activities are responsible for a decline in groundwater quality due to the contamination with pesticides, insecticides, fertilisers and heavy metals (especially Zn, Cu, Pb).

Currently, the region is confronted with significant environmental conflicts between the local communities that use the water for drinking and irrigation, and mining companies – the main cause being water use. Our project primarily intent to rise the problem of groundwater contamination in the Coquimbo region due to both agriculture activities and mining. Secondly, we aim to put in value this hidden aquatic ecosystem as important reservoir of biodiversity, that host important biological elements with species new to science, endemic relicts and rare species with huge patrimony value, but also with a practical importance as biodindicators for groundwater quality.

Beside the publication of scientific articles and reports, beneficial for the academic community, it is in our intent to write a detailed report for the competent authorities responsible for groundwater management in the Coquimbo region, and specifically to the Junta de Vigilancia del Rio Choapa. This report will include recomendation about the necessity to better inform the local populations via the Comunidad del Comité de



Agua Potable Rural about the groundwater quality in the Choapa watershed. We also aim, as the results obtained within the project to be use to improve the monitoring of groundwater in the Choapa valley and of the program SAI (Programa de Seguimiento Ambiental Integral). We aim as with this very local action to increment the local people conscience about the quality of the waters they use for both drinking and irrigation, and to oblige the competent authorities to accomplish with the requirements of providing good water quality for the local population.

The present project proposal aimed to be in line with the current strategic priorities of water resource protection in Chile, with current actions for a sustainable management plan across the country and specifically in the arid watersheds, targeting to enhance coordination and collection of groundwater data to better inform decision-making by water resource managers. We are aware about the difficulties of our demarche, but we target to encourage the initiative to revise the threshold values for specific contaminants present in groundwater such are heavy metals of which current limits values cf. Chilean normative NCh. 409 for groundwater are significantly higher than those stipulated in the European normative Groundwater Directive (GWD 2006/118/EC); and to initiate a process to implement a strategy for the monitoring of pesticides in groundwater, that currently are not regulated in Chile.

6. How was this research relevant to:

- The objectives of the CRP?

To strengthen the scientific collaborations and provide relevant information and advice that will inform future policy decisions related to the sustainable use of natural resources in the area of agriculture.

- The CRP research theme?

The project addresses the Theme I of the OECD CRP: *Managing natural capital for future*. Groundwater biodiversity assessment is essential in understanding the impact produced by agriculture activities on groundwater as a resource and as ecosystem, a nexus that become more and more widely recognised.

7. Satisfaction

- Did your fellowship conform to your expectations?

Yes

- Will the OECD Co-operative Research Programme fellowship increase directly or indirectly your career opportunities? Please specify.

As groundwater ecologist, my current research interest is related to the assessment of ecological status in groundwater and groundwater dependent ecosystems. I am currently leading the Groundwater Ecology Group in IMDEA Water Institute (since 2012), of which main research lines are related to the assessment of the ecohydrological functioning of groundwater ecosystems, groundwater biodiversity conservation, and to explore the use of groundwater biota as ecosystem service providers for an integrated management and protection of water resources. The fellowship allow me to extent the current international cooperation in South America, to plan a long-term scientific collaboration and students exchanges between my institution, CEAZA and the University of La Serena, where the host scientist Nicolas Gouin is developing his research.

- Did you encounter any practical problems?

Only delay in executing the field trip for groundwater and groundwater biota sampling.

- Please suggest any improvements in the Fellowship Programme.



8. Advertising the Co-operative Research Programme

- How did you learn about the Co-operative Research Programme?

Internet

- What would you suggest to make it more “visible”?

The outcomes of the projects to be visible (published) in OECD country reports, where the fellowships took place

- Are there any issues you would like to record?

No

