



Message From Project Leader Prof. Hitoshi TANAKA

Graduate School of Engineering, Tohoku University, Japan

Since we launched GRANDE project with UMSA in Bolivia in 2010, five years have already passed with great success including numerous research results from five sub research groups. Time really flies! I still clearly remember the occasion when I visited Bolivia for the first time in 2009. Although I suffered from serious high-altitude sickness throughout my stay in Bolivia, I was highly confident great research outcomes to contribute to future water resources planning in Bolivia, and now the project is going to be terminated with extreme success as I have expected six years ago.

It is highly symbolic connotation that three Bolivian students are graduating from Tohoku University, and also one from Fukushima University after their hard working here in Japan. Because the issues induced by climate change are of course long term phenomena, the five-year project is not sufficient to solve whole of the matters related to water resources in Bolivia. Hence, besides research activities in each sub group, we emphasized higher education in Japanese universities to Bolivian younger people. In total two Ph.D. students along with six M.Sc. students have been educated in Japan.

Although GRANDE is going to terminate soon in March, I strongly believe that these human resources educated in Japan will definitely contribute to future planning of water resources in Bolivia.

Finally I, as a project leader of GRANDE, would like to gratefully acknowledge both Japanese and Bolivian colleagues, who has made great effort to make this project so fruitful and successful. In addition I would like to extend my appreciation to JST and JICA for their consistent support during these five years.



Photo: Prof. Hitoshi Tanaka,
Tohoku University, Japan



Photo: JCC conference on August 14, 2014

At the end of the GRANDE Project Prof. Angel Aliaga Rivera And Prof. Andres Calizaya Terceros

Instituto de Hidráulica e Hidrología, Universidad Mayor de San Andres, Bolivia

At the end of the GRANDE Project, based on the Final Evaluation Report, we want to point the following:

The Project related to the issue of water resources evaluation under climate change scenarios in a Metropolitan area between the cities El Alto and La Paz, has not only enabled the development of a scientific study of the complexity of this problem, but also to allow, based on the conformation of the GRANDE Platform, a strategic partnership between an Academic Institution like the UMSA (San Andres University) and a Government Institution like MMAyA (Ministry of Environment and Water) has established to share a mutually benefits. In this order, the MMAyA can expect the UMSA capabilities to solve the problems related to the water resources evaluation and, the UMSA can open a new research topics about the water resources related problems.

Regarding to the scientific way, the GRANDE Project has set up the Bolivian working team in to a five components related to Glaciology, Run-off, Erosion and Sedimentation, Water quality and water resources management.

The knowledge of useful tools, techniques and methodologies, current and consistent with contemporary development of science and technology has been transferred from our Japanese counterpart to the Bolivian team.

Training and education of our young human resources in specialized water resources scientific problem have been done; as well as managing the techniques and methodologies to study and solve them.

Finally, we would like to express our gratitude to Prof. Hitoshi Tanaka, Project Leader for the wise leadership of the GRANDE Project; to the Academic Japanese Project Team in facing the challenge of driving an adequate management of water resources; to the funders and sponsors of the GRANDE project (SATREPS, JST and JICA); to the UMSA Authorities and to the Bolivian GRANDE Project team for the work done and goals achieved.

The science and engineering of water resources continue in its evolution, and in the future we hope that new initiatives and new research projects will allow to work together again.

Thank you very much to all of you.



Photo: Prof. Angel Aliaga Rivera,
Higher San Andres University, Bolivia



Photo: Prof. Andres Calizaya Terceros,
Higher San Andres University, Bolivia

Activity Report

GRANDE Data Catalogue

GRANDE project published data catalog version 1 in July, 2014. This catalog illustrates study area, and meteorological, hydrological and water quality data measured in GRANDE project. These data were very valuable to understand climate change effect in Andean mountains as well as model development for water resources management. In addition, we are discussing more useful ways to use data with Bolivian government and water-related company. Version 2 are also going to be published in February, 2015.

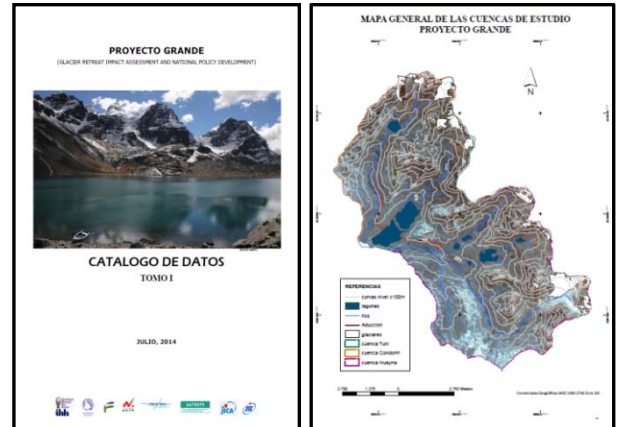


Photo: GRANDE data catalogue

GRANDE Water Resources Platform

On October 27, 2014, UMSA and MMAYa signed an agreement on establishment of GRANDE Water Resources Platform. This platform provides opportunity to share scientific knowledge of climate change impact and discuss adaptation of water resources management among university, government, water-related company and development aid agency.

On December 1, second meeting of GRANDE platform was held at IIS-UMSA and members were MMAYa, UMSA, Tohoku University, SENAMHI, EPSAS, Municipal Government of La Paz, El Alto Municipal Government, JICA, World Bank and the Inter-American Development Bank attend meeting. Platform is planning to apply outcome of GRANDE in water management.



Photo: Platform meeting on December 1, 2014

Water Management Seminar

GRANDE project held training program of water management from December 6th to 12th, 2014 at Tohoku University, Japan. The training is designed for Bolivian policy maker to learn adaptation of water management to climate and social change. Six policy makers participated from ministry of environment, public company of water supply and sanitation, and San Andres University.

Seminar consisted of lectures and field studies. In day 1 to 3, Prof. Tanaka, Project leader of GRANDE, showed impact of climate change on water resources management. Mr. Miyazaki of the Japan international Cooperation Agency gave a lecture on integrated water resources management in developing country. Prof. Okumura and Mr. Gustavo also gave a lecture of water management system which is one of the main outcome



Photo: Lecture of integrate water resources management by Mr. Miyazaki, JICA

of GRANDE. During lecture, they had to opportunity to discussion about adaptation of water management to climate change, actively.

In day 4, participants visited Tohoku University's Kawatabi field seminar center to learn sewage treatment with artificial wetland. Dr. Nakano made a lecture in the field. This system is suitable for developing countries because of their low operational and maintenance coast.

In day 5, participants visited Sichigasyuku Dam and Nanbuyama water treatment plant in Miyagi prefecture. In this area, meltwater from snow is one of the main water resources. They learned Japan's currently reservoir operation and drinking water supply and asked many questions to local experts.



Photo: participants with Prof. Okumura



Photo: Lecture of sewage treatment with artificial wetland by Dr. Nakano



Photo: Operation space at Sichigashuku dam



Photo: Nanbuyama water treatment plant



Photo: Tasting drinking water produced by Nanbuyama water treatment plant

GRANDE Students

Gustavo AYALA TICONA, Master course student, Tohoku University

My name is Gustavo Ayala Ticona. I am master's student at Tohoku University in Sendai. I am from Bolivia. Within the GRANDE project my research is focused on the analysis of water management for the cities of El

Alto and La Paz in my country. Regarding my studies, I am in the final steps of the Masters course. I consider all things I learned here until now invaluable and I would like to thank JST/JICA-SATREPS for giving me the opportunity to make my studies at Tohoku University, similarly, thanks to Japanese professors specially to my advisor Prof. Makoto Okumura and Dr. Yoshihiro Asaoka who share their knowledge and experience with me to improve day by day my research during the master course.

Regarding the area of water resources management in the cities of La Paz and El Alto, strategies for joint planning between the company in charge of water supplied systems in the two cities (EPSAS) are handled and the ministry of environment (MMayA). Several initiatives have been defined on the inclusion of new water sources. In the case of my research interest has been focused on offering an additional alternative related to the improvement in the conditions of distribution current system, it means, reducing water losses (leakage) in the system through a simulation model of losses in distribution networks. These systems are characterized by a significant loss due to material conditions, topography and policy maintenance and operation of the networks. The results of modeling losses are intended to raise awareness about the conditions that will be generated in the future due to increased demand and reduced water supply in these systems, in this sense, the spatial distribution of loss is important in the process of socialization of the problem addressed to the population and water company. Furthermore, the results of estimated future loss scenarios are helpful in the water balance issues, something that can be implemented as an useful tool in the planning and operation between distribution systems, in order to more efficient management in the next years.



Photo: Mr. Gustavo Ayala Ticona

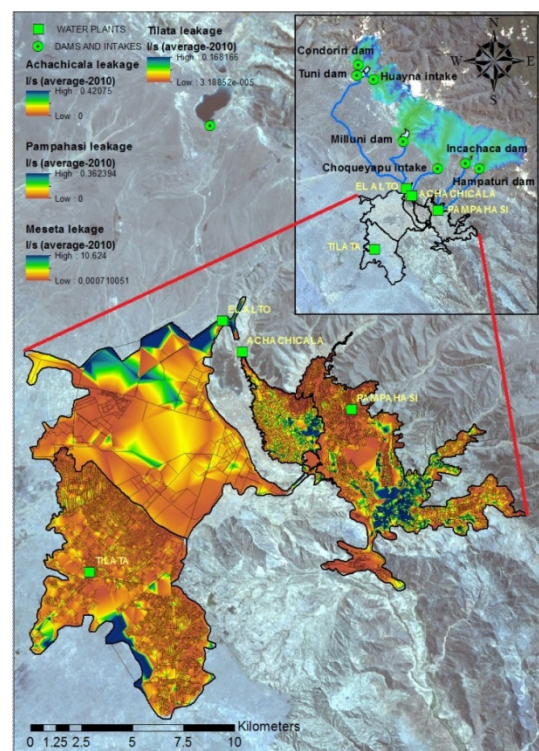


Figure: Estimation of water loss estimation in the drinking water supply network



Photo Presentation in the fourth Asian seminar in regional science, Seoul, Korea



Photo: Discussion with Prof. Okumura

Publication List

2014.04-2015.03

Journal

- Hokuto TAKEMURA and Tsuyoshi KINOCHI, 2015: Quantification of wetlands distribution and form in the highland Andes and its hydrological effects, Journal of Japan Society of Civil Engineers, Der. B1 (Hydraulic Engineering), Vol.71 (in print).
- Evelin HUMEREZ and Makoto UMEDA, 2015: Seasonal and spatial variation of stream water quality in the Royal Range of Andes, Journal of Japan Society of Civil Engineers, Ser. B1 (Hydraulic Engineering), Vol.71 (in print).
- Kazuki YOSHIKAWA, Yoshihiro ASAOKA, Pablo FUCHS and So KAZAMA, 2014: Future projection of glacier variation of the tropical Huayna Potosi West glacier with mass balance and melt model, Journal of Japan Society of Civil Engineers, Ser. G (Environmental Research), Vol.70, No.5, pp. I_219-I_225.
- Evelin HUMEREZ and Makoto UMEDA, 2014 : Macrophyte biomass, nutrients and primary production of a tropical glacier river in the Andes, Journal of Japan Society of Civil Engineers, Ser. G (Environmental Research), Vol.70, No.5, pp. I_227-I_233.
- V. Moya Quiroga, A. Mano, Y. Asaoka, K. Udo, S. Kure, J. Mendoza, 2014: Estimation of Glacier Melt Water Contribution for Human Consumption in the Royal Andes Considering Temperature Measurement Errors, Open Journal of Modern Hydrology, Vol.4, No.2, pp.I_27-43
doi:10.4236/ojmh.2014.42003.

Conference Proceedings

- Gustavo AYALA T., Makoto OKUMURA, Jinyoung KIM: Water Demand and Supply Balance by Using Urban Spatial Development Model and System Dynamics, Tottori, Japan, June – November 11, 2014.
- TSUYOSHI KINOCHI, JAVIER MENDOZA, JOSÉ LUNA: Modeling hydrological impact of glacier retreat in Bolivian Andes under changing climate, Proceedings of the 19th IAHR-APD Congress 2014, Hanoi, Vietnam , September 24, 2014.
- V. MOYA QUIROGA, A. MANO, Y. ASAOKA, K. UDO, S. KURE, J. MENDOZA: RAINFALL SNOWFALL ESTIMATION CONSIDERING TEMPERATURE UNCERTAINTIES: THE ANDEAN BASINS CONDORIRI AND HUAYNA WEST, 19th IAHR-APD Congress 2014, Hanoi, Vietnam , September 24, 2014.
- V. MOYA QUIROGA, A. MANO, Y. ASAOKA, K. UDO, S. KURE, J. MENDOZA: ENERGY MASS BALANCE AND EQUILIBRIUM LINE ALTITUDE IN THE WEST SIDE OF THE ROYAL ANDES: THE HUAYNA POTOSI WEST GLACIER, 19th IAHR-APD Congress 2014, Hanoi, Vietnam , September 24, 2014.
- MAKOTO UMEDA & KEISUKE TANI: ASSESSMENT OF WATER QUALITY INFLUENCE BY A FUTURE CLIMATE CHANGE IN A RESERVOIR LOCATED IN THE BOLIVIAN ANDES, 19th IAHR-APD Congress 2014, Hanoi, Vietnam , September 24, 2014.
- EVELIN HUMEREZ & MAKOTO UMEDA: INFLUENCE OF NUTRIENTS IN WATER AND SEDIMENTS ON MACROPHYTE GROWTH IN A GLACIER RIVER IN THE BOLIVIAN ANDES, 19th IAHR-APD Congress 2014, Hanoi, Vietnam , September 23, 2014.
- FABIANA MERCADO, NAOYA IMAIZUMI AND SEIKI KAWAGOE: EVALUATION ON HIGHT MOUNTAIN VEGETATION UNDER THE GLACIER AREA, TUNI RESERVOIR IN BOLIVIA, 19th IAHR-APD Congress 2014, Hanoi, Vietnam , September 23, 2014.
- Evelin HUMEREZ, Makoto Umeda y Francisco Bellot A.: VARIACIONES ESPACIALES Y TEMPORALES DE LA CALIDAD DEL AGUA Y LA VEGETACIÓN ACUÁTICA EN EL RÍO CONDORIRI EN LOS ANDES, XXVI Congreso Latinoamericano de Hidráulica, Santiago, Chile, August 29, 2014.
- Gabriela Sossa Ledezma, Hitoshi Tanaka: EVALUACIÓN DE LA TASA DE DEPOSICIÓN DE SEDIMENTO, XXVI Congreso Latinoamericano de Hidráulica, Santiago, Chile, August 29, 2014.
- Kazuki Yoshizawa, Yoshihiro Asaoka and Pablo Fuchs: EVALUATION OF ANNUAL VARIATION IN SURFACE AREA AND MELTWATER OF TROPICAL GLACIERS IN BOLIVIA FOR THE NEXT THREE DECADES, XXVI Congreso Latinoamericano de Hidráulica, Santiago, Chile, August 29, 2014.



Photo: Change in Condoriri glacier front



Photo: Closing Ceremony on February 26 at UMSA

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