

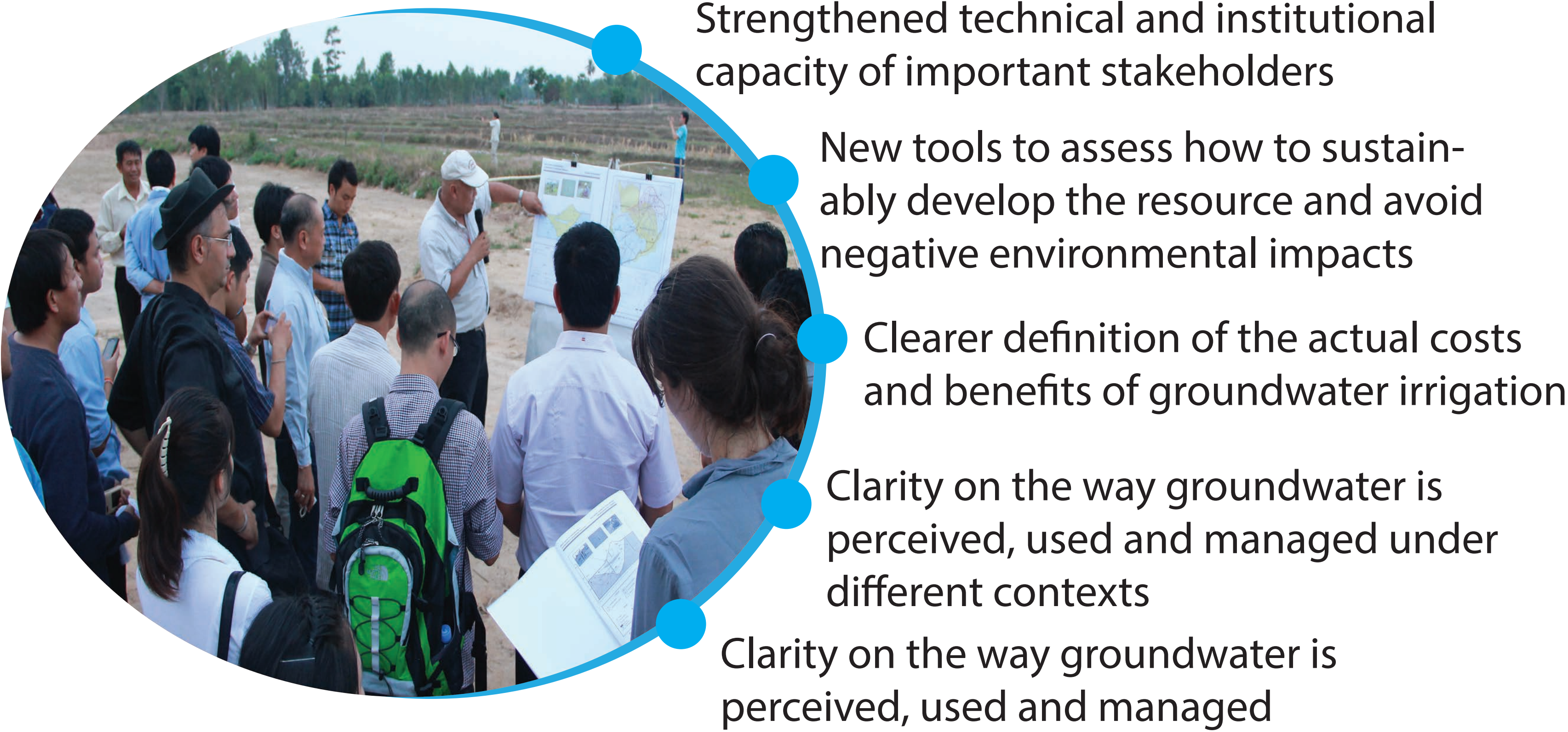
Enhancing the resilience and productivity of rainfed dominated systems in Lao PDR through sustainable groundwater use

What MAF/NAFRI goals the project fit in?

MAF's Goal (Program) 1:	Food Production
NAFRI'sThematic areas of strategic research programmes:	Improved agricultural productivity programme , Agriculture adaptation to climate change programme, & Capacity building programme

What are the results and outcomes?

Project achievements in 5 key areas



- Strengthened technical and institutional capacity of important stakeholders
- New tools to assess how to sustainably develop the resource and avoid negative environmental impacts
- Clearer definition of the actual costs and benefits of groundwater irrigation
- Clarity on the way groundwater is perceived, used and managed under different contexts
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Specific outcomes & impacts to date

Scientific:

- Improved knowledge of the groundwater systems, their potential to be developed, rates at which they are replenished, existing levels of usage and water quality in four specific areas situated within Vientiane, Bolikhamxay and Champasak provinces. Understanding at the national level has also been improved.
- The first community-managed groundwater irrigation scheme has been established at Ekxang village (Phonhong district) to allow farmers to use groundwater for supplementary irrigation of paddy fields in the event of delayed monsoon rains or dry spells and to grow cash crops during the dry season.
- 'Bottom-up' approaches to managing groundwater, when applied effectively by local communities, sustain lives, livelihoods and the resource. There is now clarity on the way the emerging trend for greater 'top-down' management by government can be better combined with bottom-up to create tailored hybrid approaches to better serve communities.

Agricultural Practices:

- Considerable potential exists for additional groundwater use across wide parts of the country. Groundwater during the dry season by individual farmers is more widespread than previously envisaged in some regions. Privately-owned and operated shallow groundwater wells allow farmers to grow cash crops profitably, particularly in areas where groundwater resources are easily accessible, and land and labour do not pose constraints- this option is free of the complexities associated with community managed systems.
- We now more clearly understand how to position agricultural groundwater development in ways that recognize linkages between the resource availability and farmers' activities and strategies, and in ways that do not pose potential threats to existing groundwater users. Many areas share similar constraints to groundwater use, including limited access to finance for infrastructure development and a lack of information on groundwater.

National Policy:

- Going forward, the main areas of impact are likely to arise from strengthened governance of groundwater resources and greater recognition of their role in agricultural development and use for other purposes - drinking, domestic, industry and the environment. This is being achieved by:
 - Embedding our findings and improving the skills of those tasked with designing and implementing key water reforming strategies, policies, laws and regulations within MONRE. In practice, the National Groundwater Action Plan, for example, is being progressed through many of the activities in this project.
 - Developing linkages to agricultural and land related development policies & programmes.

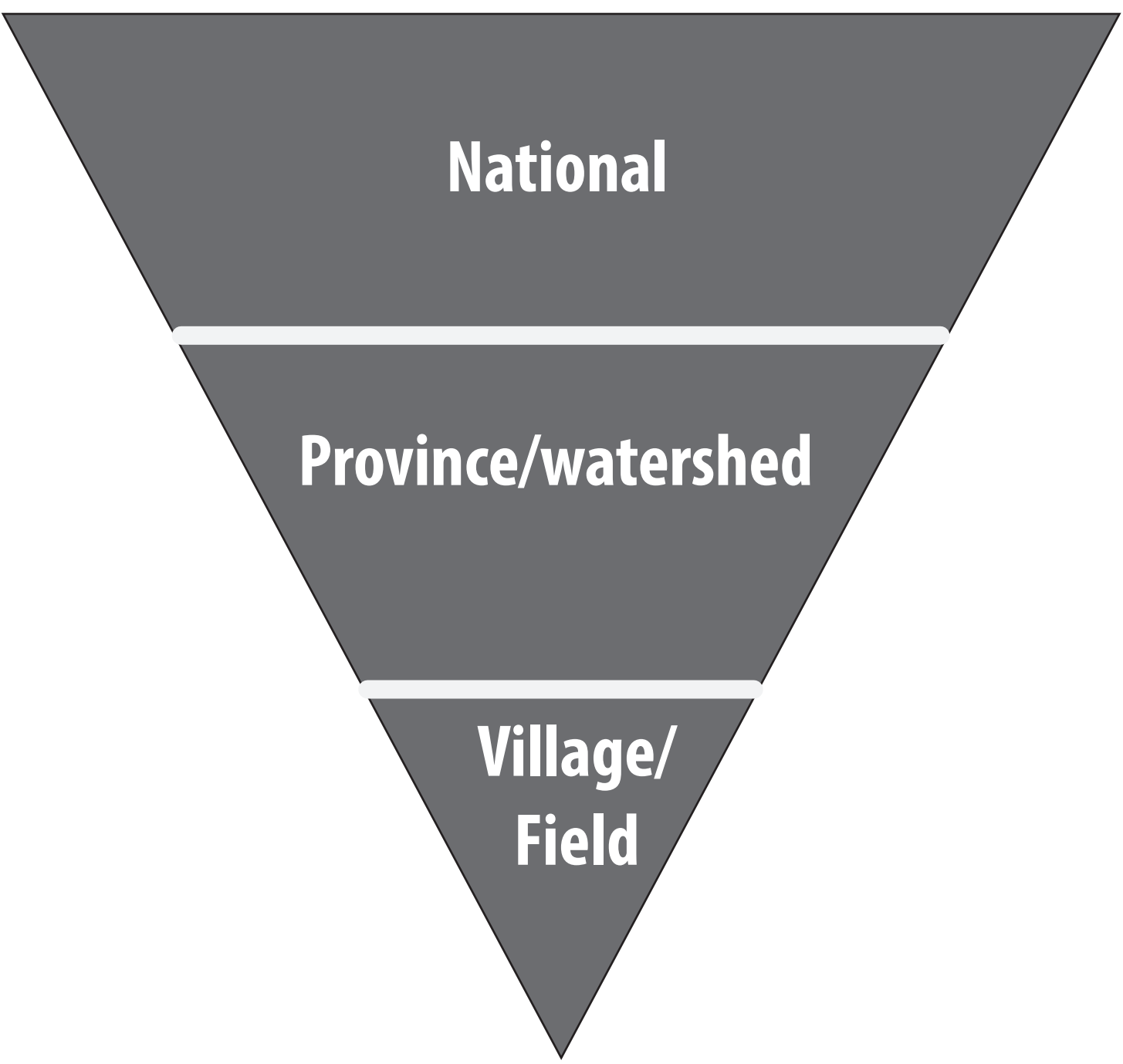
Capacity Building:

- Strengthened capacity of key partners to carry out their mandates, for example:
 - DWR and NREI are jointly monitoring the resource on the Vientiane Plain (since 2014).
 - DWR are beginning to develop a groundwater management plan for 4 districts within Vientiane province as a pilot.
 - NUOL lecturers are using training course materials in their curriculums and government officers are using in formation and concepts gained from courses in other projects.
- An experimental facility has been set up at the new NUOL Faculty of Water Resources campus at Tad Thong for the first time which allows students and lecturers to continue to conduct practical studies directly linked to their courses on water resource management and use. Research capacity at the campus has been given a boost by placing a bilingual technical advisor and student mentor to oversee the demonstration trial.
- Capacity enhancement has been a success at a variety of levels as indicated in Table 1 (below). Longer-term support and trainings targeted at promising individuals appears to work better than short-term blanket approaches. Linking international students with national students, when done well, can yield excellent co-learning outcomes.

INDICATOR	NUMBER
PhD candidates studying in Australia on a groundwater-related topic	1 with second to start in 2017
Masters theses produced by Lao nationals	2 complete and 1 underway
Bachelors theses produced by Lao nationals	5 complete and 4 underway
Lao nationals from central government and NUOL trained through formal Short Courses, internships, on-the-job training or academic study	>100
International students contributing through internships, volunteering and thesis projects	10 in total including 4 Australians
Farmers and local government officials provided with on-site training	> 40

How do project achieve MAF/NAFRI goals with specific research?

The two major domains of this project cover 'groundwater resources assessment and governance' as well as the more specific issue of 'agricultural groundwater use technologies'.



- Groundwater potential mapping
- Policy analysis
- Capacity building & training
- GW resource assessments
- Environmental impacts
- GW Irrigation demonstrations & performance assessment
- Cost-Benefit analysis

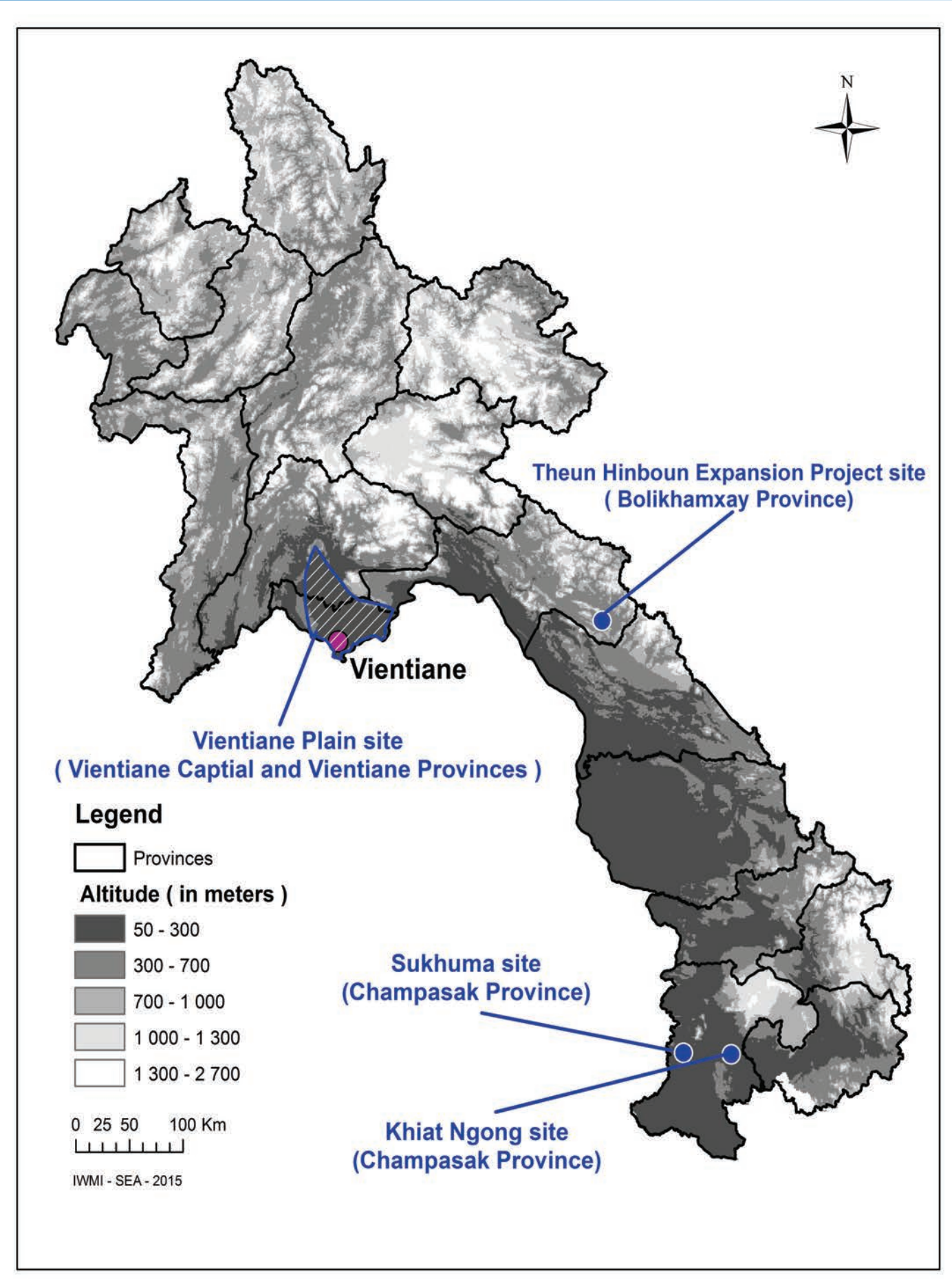
Key message

The Government and its Development Partners should continue to invest in groundwater, in the dual domains of:

- (i) resource assessment, monitoring and management,
- (ii) building human and institutional capacity.

This would maintain progress in key socioeconomic development priority areas that include improving water supplies and sanitation, enhancing food & nutritional security, and building resilience to climate change and climate shocks. It makes more sense now than ever to capitalize on the inroads that have been made through this and several other projects working towards similar goals.

Project Sites



Partners

Lao Government Departments and Institutions

Ministry of Agriculture and Forestry (MAF)
Department of Irrigation (DOI)
District/Provincial Agriculture and Forestry Office (DAFO/PAFO), Phonhong District, Vientiane Province

Ministry of Natural Resources and Environment
Department of Water Resource (DWR)
Natural Resources and Environment Institute (NREI)

Research/Academic Institutes

National University of Laos
Faculty of Water Resource (Former Water Resources Engineering Department (WRED))
Faculty of Environmental Science

Institute for Global Environmental Strategies (IGES)

Khon Kaen University-Groundwater Research Centre