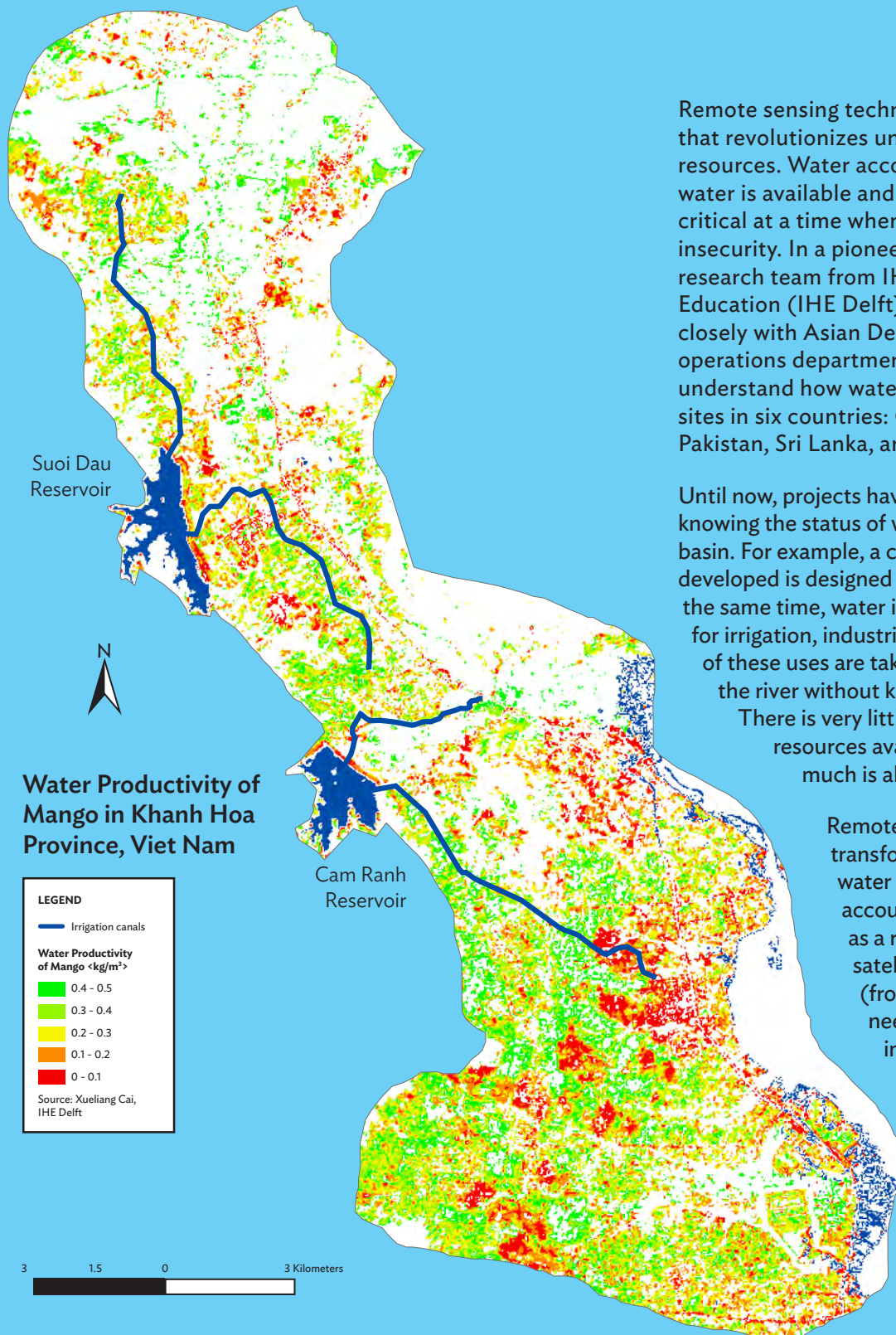


MEASURING WATER USE WITH REMOTE SENSING



Remote sensing technology is a powerful tool that revolutionizes understanding of basin water resources. Water accounting—knowing how much water is available and who is using how much—is critical at a time when Asia is facing increasing water insecurity. In a pioneering collaborative study, a research team from IHE Delft Institute for Water Education (IHE Delft) (box, page 2) is working closely with Asian Development Bank (ADB) operations departments, using remote sensing to understand how water resources are used in project sites in six countries: Cambodia, India, Indonesia, Pakistan, Sri Lanka, and Viet Nam.

Until now, projects have been developed without knowing the status of water resources within a river basin. For example, a city water supply project being developed is designed to draw water from a river. At the same time, water is being withdrawn from the river for irrigation, industrial, and environmental uses. All of these uses are taking and putting water back into the river without knowing who is using how much.

There is very little or no awareness of the total resources available in that basin and how much is allocated to various uses.

Remote sensing technology will transform understanding of the state of water resources, allowing rapid water accounting over large areas, such as a river basin. Although there are satellite images available without cost (from Google, for example), projects need cloud-free, high-resolution images that allow detailed visuals of an individual farm.





Irrigated mango farm in Khanh Hoa Province, Viet Nam. (Photo: Nguyen Van Manh)

The satellite images—together with easy-to-understand sheets, tables, and maps—show water flows, fluxes, consumptive use and services, and water resources reporting. This provides a rapid accounting of the water balance in a given area. Doing the study in the traditional way would take years and would involve numerous volumes of reports that require a lot of work to piece together to provide answers.

This method does not do away with ground truthing, which is still necessary to verify land classification and allow calibration of the model interpreting the satellite images. To have confidence in the results, there is a need to verify the data on the ground, for example, and compare with readings from flow gauges in rivers and irrigation systems. However, the technology does provide a relative understanding of the quantum of flow and how much is used by various users in the river basin.

Using remote sensing technology, for the first time water productivity can be measured right down to the farm level. The map (page 1) shows how many kilograms of mangoes are produced by a cubic meter of water (kg/m^3) in an irrigation scheme in Khanh Hoa Province, Viet Nam. As expected, the remote sensing image shows better water productivity in areas at the head of the irrigation scheme (shown in green). However, there are also areas of low productivity (shown in red) very near to the Suoi Dau Reservoir. This may be a case of waterlogging, with soils over saturated. Ground truthing is necessary in the mango farms to identify the problem. With remote sensing imagery, farmers can be advised on measures to improve water productivity and the yield from their fields, as part of an innovative new project.¹

For years, the limitation has always been the lack of data. With remote sensing technology, this will no longer be an issue. The new window

of understanding derived from this technology will be fundamental to sound planning of future water projects. Remote sensing data will be available to all stakeholders. It is therefore transparent and holds the promise of improving water governance. In the future, farmers will be able to access this vital information on their mobile phones.

KNOWLEDGE PARTNER

ADB has a partnership agreement with IHE Delft, an internationally acclaimed research center on water and development, which has unique knowledge of the use of remote sensing data for water accounting. The head of the project team is Wim G.M. Bastiaanssen, professor of global water accounting, who developed the Surface Energy Balance Algorithm for Land (SEBAL), an image-processing model using satellite remote sensing imagery to map evapotranspiration, biomass growth, water deficit, and soil moisture.

THE AUTHOR

Yasmin Siddiqi (ysiddiqi@adb.org) is principal water resources specialist at ADB's Sustainable Development and Climate Change Department.

For more information on ADB's water resources projects, contact:

Pia Reyes
Water Resources Officer
piareyes@adb.org



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¹ ADB. 2016. *Viet Nam: Water Efficiency Improvement in Drought Affected Provinces*. Manila.