The ROCKEFELLER FOUNDATION

Exploring Incentive-based Solutions for Freshwater Management

One of the largest impediments to both investment into the sector and adoption of water efficiency measures is the chronic under-valuation of water.

(this page) A woman walking her goat in Bangladesh. Photo: Felix Clay.
(next page) Sarus Crane at Beel Akbarpur wetlands in Dadri, Uttar Pradesh, India. Photo: Koshyk; Colorado River, USA. Photo: Jeremiah LaRocco; River fishing in Guizhou, China. Photo: Christina Xu.

Foreword

For more than 100 years, The Rockefeller Foundation's mission has been to promote the well-being of humanity throughout the world. Today, The Rockefeller Foundation pursues this mission through dual goals: advancing inclusive economies that expand opportunities for more broadly shared prosperity, and building resilience by helping people, communities and institutions prepare for, withstand, and emerge stronger from acute shocks and chronic stresses.

There's no doubt that water scarcity represents one of the greatest threats to the well-being of people, and the ecosystems they depend on. Water is central to nearly every aspect of economic and social development. As a resource, it's both vitally important and susceptible to overuse from competing demands. From river basins in California and China, to the cities of São Paulo and Bangkok, competition for freshwater is on the rise and people around the globe already face water crises each and every day.

Overuse of water is just one example of the myriad ways that humans have used, benefited from, and shaped the natural environment for the whole of human history. But what we have not done – especially in the course of industrialization and modernization – is find effective ways to integrate natural ecosystems into our economic and social systems. Freshwater ecosystem crises are representative of the kind of misaligned incentives we seek to correct.

In 2015, The Rockefeller Foundation collaborated with several partners to begin developing incentive-based mechanisms to address competition for freshwater, and to bring human water use back in balance with the water needs of freshwater ecosystems in order to build long-term resilience. The early solutions that emerged, and the wider lessons from the group's work, are captured in the report that follows.

We hope that you will find this report useful and encourage you to explore the findings and share it widely with colleagues.

The ROCKEFELLER FOUNDATION

Exploring incentive-based solutions for freshwater management

Currently 1.6 billion people live in water basins with severe water stress. In times of scarcity and increased competition, freshwater ecosystems and poor and vulnerable people commonly lose out to more powerful users

Rice terraces in the Philippines. Photo: Andrew Smith.

Overview of global competition for freshwater

Food production, energy production, drinking and sanitation, and even recreation and spiritual renewal all depend on water. Water is a vital resource for human life and livelihoods, and is also critical for terrestrial ecosystems and the plethora of species on earth. Historically, the vast majority of human water use has been applied to the agriculture sector.[1] As demand for water grows from population growth, industrialization and urbanization, and water supply becomes more variable due to climate change, competition for freshwater is reaching unprecedented levels, especially in more arid and poorer basins.

Currently, 1.6 billion people live in river basins with severe water stress and more than half of the world's cities and three-fourths of all irrigated agriculture experience water scarcity on a recurring basis.[2] Assuming no efficiency improvements, by 2030 the world will face a 40 percent shortfall between forecasted demand and available water supply, and two-thirds of the world's population will live in water-stressed basins. While human water use has been unsustainable for decades, we have now reached the limits of business as usual.

The traditional response to drought has been to invest in new supply sources (e.g., dams or groundwater pumping). Unfortunately, it is becoming increasingly difficult to find new supplies in many basins. Surface flows are increasingly over-allocated and groundwater supplies are being exhausted at alarming rates. A new assessment from NASA shows that the world's major aquifers are being withdrawn at much faster rates than what can be naturally replenished.[3] Groundwater depletion is occurring particularly rapidly in the key agricultural regions of the world, including in the US Midwest, US Central Valley of California, Northwestern India, and North China Plain. Over two billion people rely on groundwater as their primary water source.

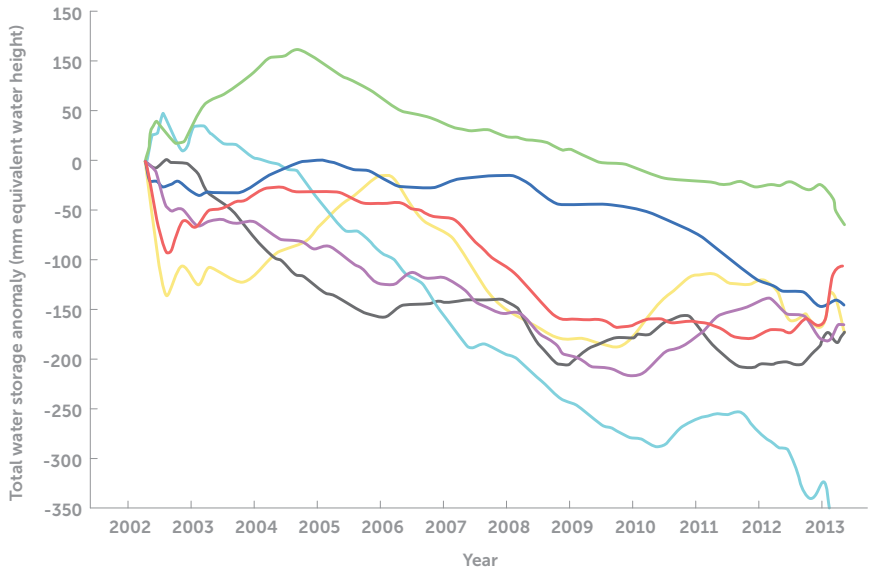
1 Today, agriculture accounts for about 70% of global water use. Source: 2030 Water Resources Group. "Charting Our Water Future: Economic frameworks to inform decision-making." 2015.

2 "Water Depletion: Seasonal and drought-related water scarcity poses risks to food security and urban water supplies" by Kate A Brauman, Brian Richter, Sandra Postel, Marcus Malsy, and Martina Floerke. In review at Science Advances, 2015.

3 Richey, A. S., B. F. Thomas, M.-H. Lo, J. T. Reager, J. S. Famiglietti, K. Voss, S. Swenson, and M. Rodell (2015), Quantifying renewable groundwater stress with GRACE, Water Resources Research. doi:10.1002/2015WR017349.

The graph shows water storage declines in several of the world's major aquifers in arid and semi-arid mid-latitudes. Sourced from the NASA GRACE satellite mission.

Water storage declines (mm equivalent water height)

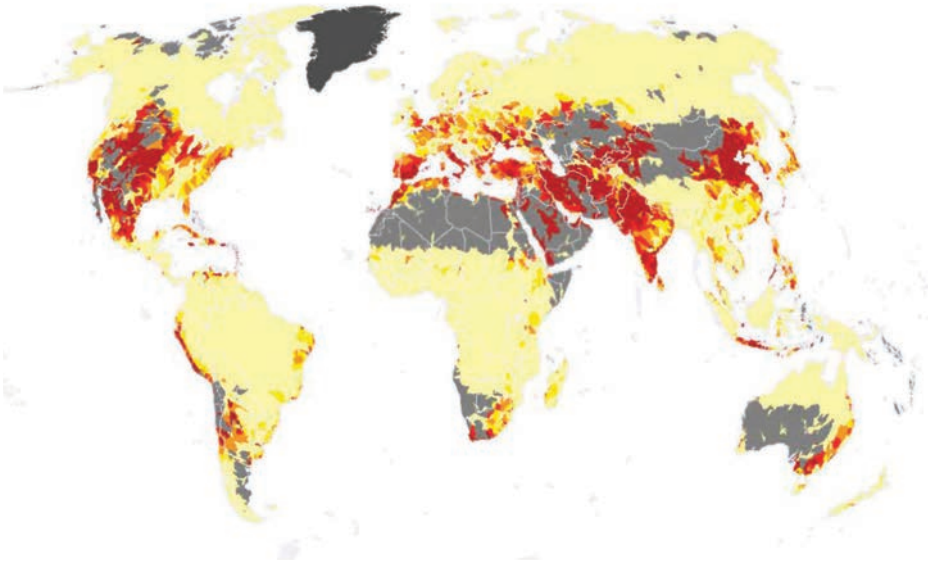


- Guarani (South America)
- Southern Plains (US)
- Northwestern India
- Middle East
- Canning (Australia)
- North China Plain
- Central Valley (United States)

The world's major aquifers are being withdrawn at much faster rates than what can be naturally replenished.

Map source: Aqueduct Water Risk Atlas, World Resources Institute.

Baseline Water Stress



- Low (<10%)
- Low to medium (10–20%)
- Medium to high (20–40%)
- High (40–80%)
- Extremely high (>80%)
- Arid & low water use
- No data

Assuming no efficiency improvements, by 2030 the world will face a 40 percent shortfall between forecasted demand and available water supply, and two-thirds of the world's population will live in water-stressed basins.

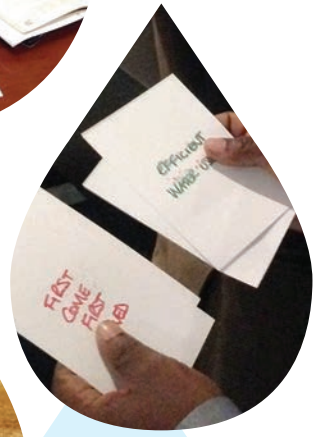
Despite the urgency of finding solutions to global water challenges, the sector suffers from a critical lack of investment and innovation. Compared to other major economic sectors, such as the electric power sector, there is a staggeringly low level of investment in water. One of the largest impediments to both investment into the sector and adoption of water efficiency measures is the chronic under-valuation of water. As a common pool resource, water is often not priced to reflect the value it provides to humanity, the cost of delivering the water to the user, or the scarcity of the resource.

Shifting the focus of water management from supply and infrastructure to demand management, through improved pricing mechanisms, more equitable and flexible allocations, and more efficient water markets will improve resource use efficiency in the face of resource limitations. Incentive-based approaches, including, but not limited to regulatory approaches, can help make systems efficient and better harness the investment capacity and innovation of the private sector.

In times of scarcity and increased competition, freshwater ecosystems and poor and vulnerable people commonly lose out to more powerful users. There is strong urgency and opportunity to develop a new water economy and a new paradigm of water resilience—one that anticipates and creates solutions for water stress and scarcity, rather than acting in a short-term, reflexive manner.

A **water market** is a system in which privately held rights to water are legally allowed to be sold, bought, or leased between users. In well-functioning water markets, water prices signal scarcity and abundance as conditions change, incentivizing efficiency of water use and the productive allocation of water. Well-functioning water markets provide protections for both environmental flows and for vulnerable populations so that they do not get priced out of access to water.

(this page) Coal power-plant and oilseed rape, Mehrum, Germany. Photo: Martin; The Folsom Lake marina shows the effects of the four-year California drought. Photo: Robert Couse-Baker.
(next page) IUCN and TNC prototyping process in Tanzania and Chile. Photos: California Environmental Associates.

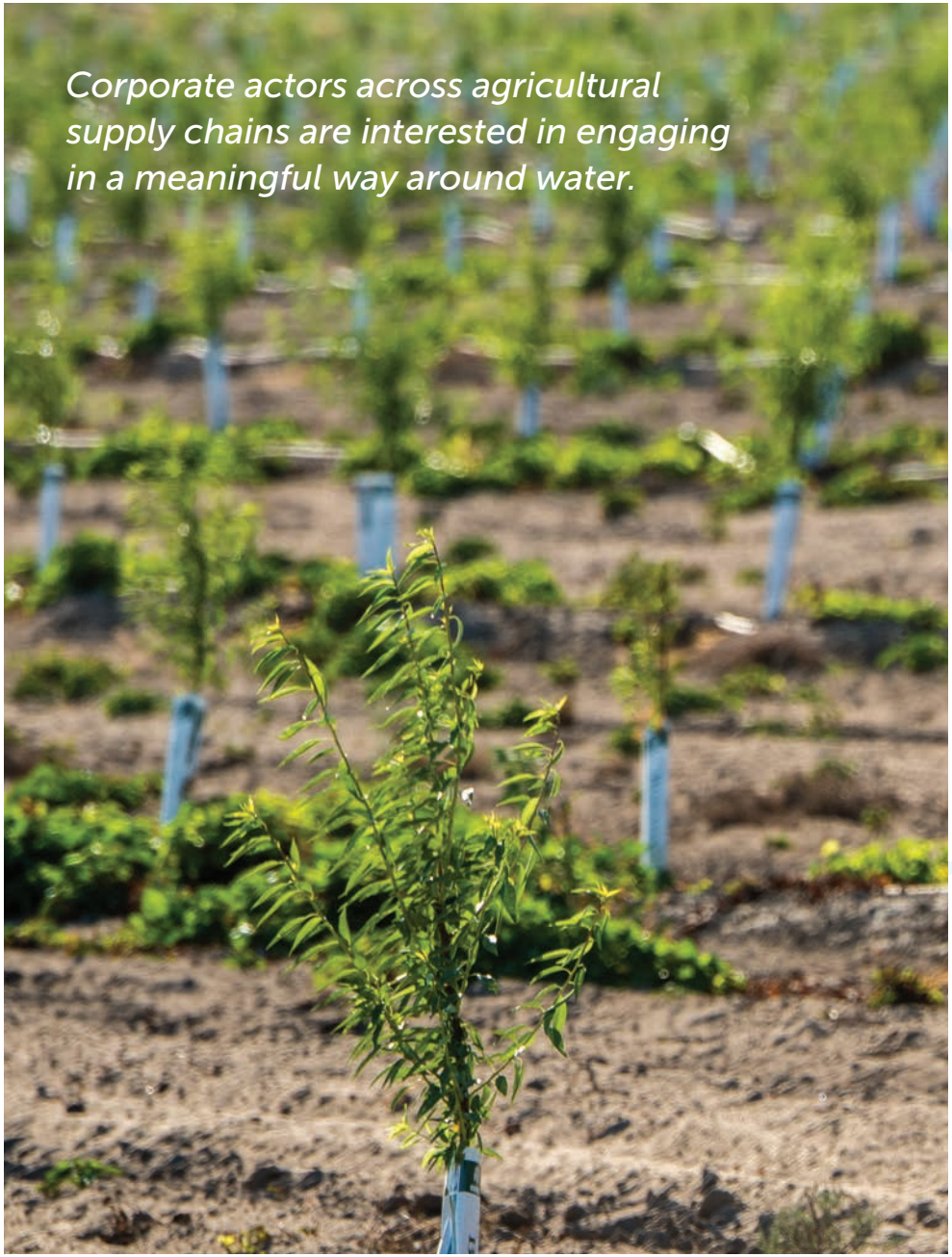


Prototyping is a term adopted from the field of human centered design. It describes the rapid iteration and testing process the grantees undertook as a part of The Rockefeller Foundation's exploration of incentive based solutions to freshwater.

Introduction to The Rockefeller Foundation's prototyping process

Across its work, The Rockefeller Foundation supports the development and scale-up of innovative responses to the world's most pressing problems. Often, surfacing these innovations requires new ways of working – both as a Foundation and with our grantees. In spring 2015, The Rockefeller Foundation launched a six-month prototyping process with five grantees designed to innovate and test incentive-based solutions that could address the challenge of freshwater competition and increase water resilience. This represented a departure from typical grant-making for the Foundation, and the opportunity to build a cohort of organizations with a shared ambition to achieve change. We sought grantees with deep expertise in the freshwater space, a diverse geographic footprint, and a commitment to identifying new solutions to water management. The five grantees were: **Environmental Defense Fund** (EDF), **International Union for Conservation of Nature** (IUCN), **The Freshwater Trust** (TFT), **The Nature Conservancy** (TNC), and **World Resources Institute** (WRI).

Together with these leading organizations, we undertook an intensive design and testing process drawing on prototyping and human-centered design methods. Each organization took an initial kernel of an idea and, over the course of the process, iterated and refined it based on research, analysis, and feedback from stakeholders and potential users. Convenings of the cohort served to enable exchange of ideas and peer review. Throughout the process, the five organizations shared insightful and productive feedback with each other, strengthening each prototype and deepening our shared understanding of the problem. At the end of the process, each organization emerged with a more fully developed paper prototype that could eventually be implemented in river basins to address the challenge of freshwater competition. We are grateful to each of the organizations for their time, energy, and deep commitment to the process.



Environmental Defense Fund

PROTOTYPE: SUPPLY CHAIN SOURCING

Over the last 25 years, the Environmental Defense Fund (EDF) has partnered with the business sector to advance environmentally-preferable business practices and to innovate around supply chain sustainability. EDF's prototype focused on developing 1) supply chain sourcing standards that could catalyze sustainable water use at the farm level as well as 2) mechanisms for helping buyers to advocate for water policy change at the basin or regional level.

EDF selected almonds and processing tomatoes in California's Central Valley and lettuce in the Yuma Valley of Arizona for their test cases. They conducted thorough analyses of these supply chains, studied the economics of different irrigation practices, and interviewed or surveyed a large number of stakeholders surrounding each crop. Their prototype was developed in the following context:

- Agriculture uses roughly 80 percent of all water supplies in the western United States (ten to forty percent more than is necessary).
- Both California and Arizona produce high value crops and are facing severe water shortages. In California, a four-year drought has led to massive over draft of groundwater resources. In the Colorado River Basin (which supplies water to Arizona), a complex set of allocation priorities and growing demand for water have led to a chronically over-allocated basin; the pressure is on agriculture to free up water for other uses.
- Corporate buyers of agricultural products are beginning to recognize the increasing risks that their supply chains will face given the increased frequency of drought and the movement of water out of agriculture (to higher value municipal and industrial uses). Buyers have not yet internalized these risks into their sourcing standards.

Findings and take-aways

Broadly, EDF found that corporate actors across agricultural supply chains are interested in engaging in a meaningful way around water. Specifically, many agricultural buyers reported a willingness to engage in regulation. EDF found that the most influential supply chain actor varied by commodity. For lettuce, the retail actors seemed to provide the strongest demand signal. For tomatoes, it is the processors and for almonds, investors who invest directly into almond farms are more likely to be the best influencers. Many buyers see the need for better engagement with their supply chains around water, but do not yet have the tools to do so effectively.

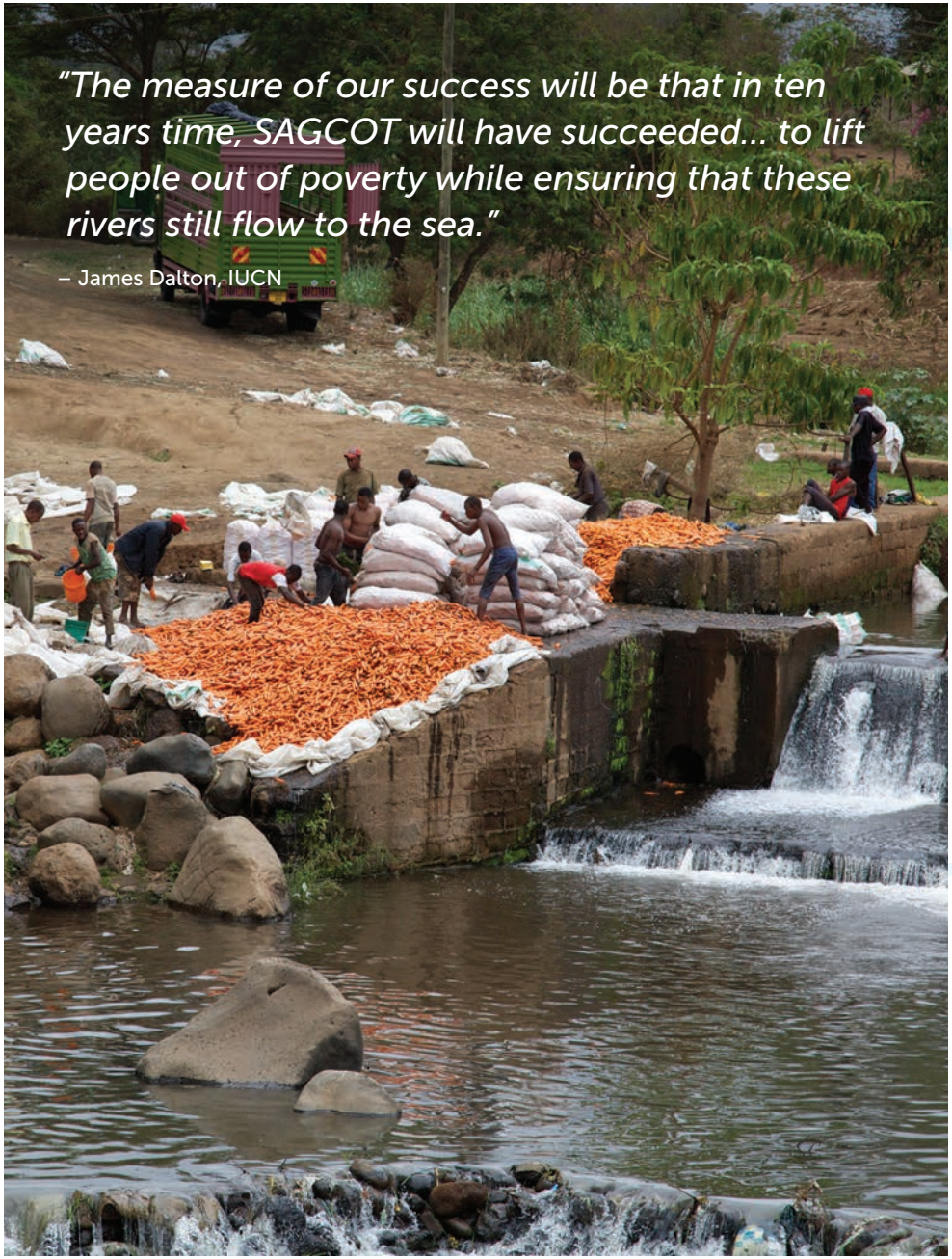
(previous) Micro irrigation in an almond orchard in Livingston, CA. Photo: USDA. (this page) Retail consumer buying produce. Photo: Anthony Albright; Almonds. Photo: Harsha K R; Lettuce farm workers. Photo: Peter Hayden.

EDF has proposed a tiered set of sourcing benchmarks that could guide supply chain engagement around water. The benchmarks cover field level consumptive use, the sustainability level of the water supply sources used at the field level, region-level water management, and region-level qualitative measures of ecological and vulnerable community access to water. For each benchmark, a concrete metric is needed to help buyers compare producers and basins by the level of sustainability in their water management.

Moving forward, EDF will continue conversations with leading supply chain actors in their target commodities, as well as existing supply chain sustainability efforts (e.g., Field to Market and The Sustainability Consortium), to try to more concretely define the benchmarks, metrics, and associated data needs.

"With water users and supply chain interests largely aligned, change is possible. With policy engagement, change can be sustained. We now know that supply chain actors are open to mitigating supply chain water-based risks through revised incentives, sourcing practices, and policy engagement."

– Rebecca Shaw, Environmental Defense Fund



International Union for Conservation and Nature (IUCN)

PROTOTYPE: NATURAL INFRASTRUCTURE FACILITY

The Global Water Programme of IUCN is focused on the conservation of water-related biodiversity through sustainable uses and equitable sharing of water resources. IUCN's SUSTAIN initiative is focused on demonstrating how climate-resilient solutions for land, water, and ecosystem management can be coupled with strategies for achieving sustainable and inclusive economic growth in growth corridors in Africa.

The objective of IUCN's prototype was to develop a plan for a "natural infrastructure facility" (NIF) in the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) which could serve as a platform for deal making. The NIF would allow private sector actors to participate in transactions that promote effective and equitable utilization of freshwater resources and/or that protect the natural infrastructure of basins and their ecosystems (e.g., forests, wetlands, soils, floodplains, aquifers). By protecting these resources, the investments would help to sustain water supplies needed for economic growth, food security, resilience to climate change and biodiversity conservation.

IUCN's prototype was developed in the following context:

- SAGCOT is a public-private partnership designed to improve agricultural productivity, food security and livelihoods in Tanzania. SAGCOT intends to catalyze over USD $3 billion in private investment and public sector grants and loans, over a twenty year period. The goal is to triple the area's agricultural output, with a focus on commercializing smallholder production.
- The SAGCOT region encompasses critical ecosystems across southern Tanzania. The health of these ecosystems is important for biodiversity value, Tanzania's tourism industry, as well as the ecosystem services of water storage and regulation, which are critical for both smallholder and commercial-scale agriculture, as well as hydro-electricity production.
- Although green economic growth is one of the principles of SAGCOT, there is a real risk that the scale and speed of investment into the region will lead to increasing competition for freshwater between sectors and conflict over water use rights, with the environment and rural communities most likely to lose out.

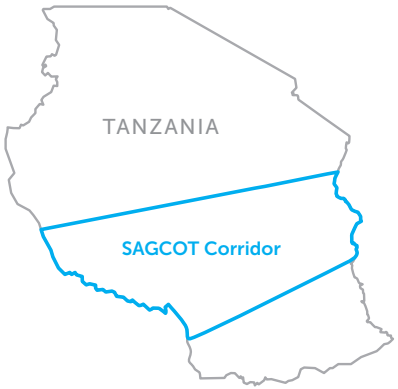
Findings and take-aways

IUCN's in-going hypothesis was that businesses and investors with economic interests in the SAGCOT region would benefit from investments in natural infrastructure of the region and that the NIF could provide an attractive way for them to make such investments.

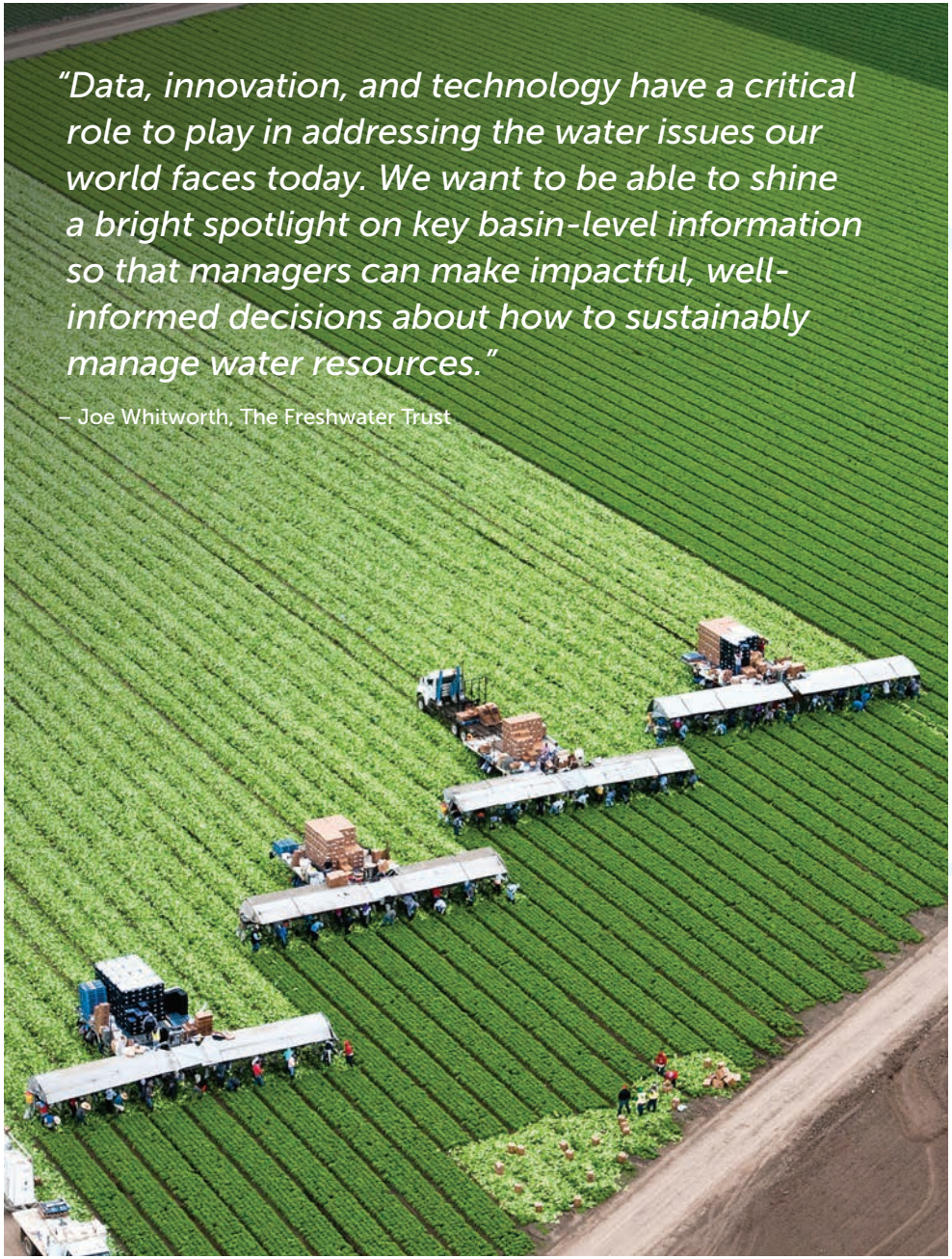
Through focus groups, interviews, research, and analysis, IUCN identified a range of types of investors and investment scenarios that could generate the desired ecological and equity outcomes and that could make for attractive financial investments. General reception to the NIF concept was very positive among the range of stakeholders in the SAGCOT region, including agribusiness operators, farmers' organizations, companies whose supply chains source from the SAGCOT, impact investors and the Ministry of Water.

In the near term, IUCN will continue to work with partners in SAGCOT to support their ambitions for growth that is sustainable and inclusive. They will focus on developing and brokering a demonstration investment that can prove the NIF concept. IUCN will also start to explore what the NIF concept could look like at a continent-wide scale. For example, the NIF could work in partnership with or be built into Grow Africa, an initiative working to increase private sector investment in agriculture across Africa.

The SAGCOT region



(previous) Preparing a carrot shipment in Tanzania. Photo: David Brossard. (this page) Safari in Tanzania; IUCN prototyping process in Tanzania. Photos: California Environmental Associates.



The Freshwater Trust

PROTOTYPE: BASINSCOUT DECISION SUPPORT TOOL

Founded in 1983, The Freshwater Trust (The Trust) seeks to accelerate the pace and scale of freshwater restoration through the use of science, technology, and incentive-based solutions. In 2013, The Trust received the U.S. Water Prize for its innovative efforts and impressive outcomes restoring rivers in the Pacific Northwest.

In 2014, California enacted The Sustainable Groundwater Management Act (SGMA). This act established a framework for the sustainable management of groundwater supplies, for the first time in the state's history. Under this legislation, local and regional authorities will form Groundwater Sustainability Agencies (GSAs) that oversee the implementation of local Groundwater Sustainability Plans. Stakeholders have until 2017 to establish these agencies, until 2022 to begin implementation of the sustainability plans, and until 2040 to achieve groundwater sustainability. In the wake of SGMA's passage, The Trust recognized that quickly scalable and replicable data and decision-making tools would play a valuable role in helping stakeholders understand trade-offs and in creating more effective sustainability plans.

The Trust set out to develop a tool that would help stakeholders understand the implications of different regulatory approaches to groundwater management and allow basin managers the opportunity to optimize plans for different environmental, economic, and social outcomes. The Trust chose California's Salinas Valley to begin prototyping its tool.

- Nicknamed "the Salad Bowl for the World," the Salinas Valley is a major producer of high-value crops, including lettuce, broccoli and strawberries. More than 60% of the Valley area is under agricultural cultivation.[4]
- The region depends almost entirely on groundwater withdrawals and has been running a groundwater deficit for many years, which has caused significant seawater intrusion.[5]
- Nitrate contamination of groundwater from agricultural fertilizers and unreliable instream flows for endangered salmonids are key concerns for the region.

4 Multi-Resolution Land Characteristic Consortium, National Land Cover Database-2011 (Mar. 2015)

5 Saltwater intrusion is the phenomenon of saltwater from the ocean moving into freshwater aquifers, thus contaminating groundwater. Groundwater extraction, which lowers the freshwater table and lowers the pressure exerted by the groundwater column, allowing room for saltwater to move inland, is the primary cause of saltwater intrusion.

Findings and take-aways

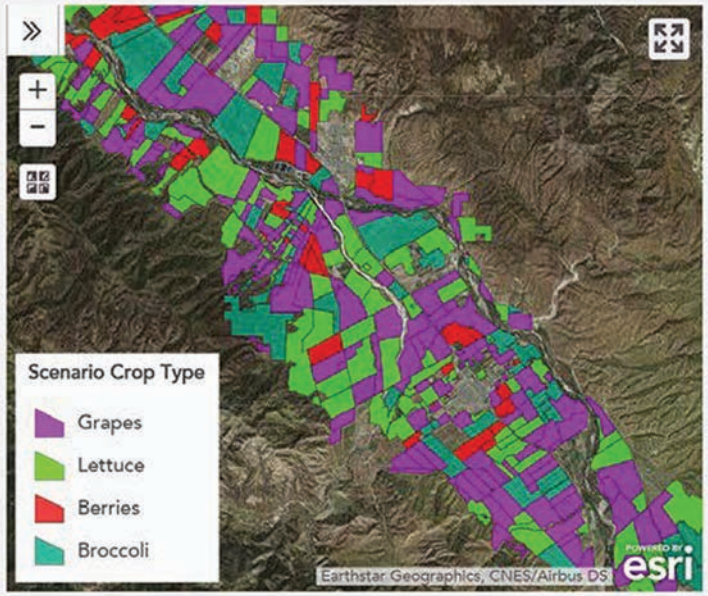
For the prototype, The Trust built a decision support tool named "BasinScout" which allows a user to define a total basin-wide pumping volume and then prioritize key indicators, reflecting social, environmental, and economic interests. The model returns an optimal water allocation solution based on cropping configurations, toward which users can plan and shape effective management mechanisms.

Through focus groups and interviews, The Trust received valuable feedback from a variety of stakeholders in the Salinas Valley. Community representatives appreciate that the model takes into account social indicators like employment, profitability, and nitrate concentrations. A GSA has not yet been identified for the Salinas Valley. This was one limitation identified for testing the receptivity of BasinScout as a key tool for the development of a Groundwater Sustainability Plan, as it will be ultimately be the responsibility of GSAs to develop sustainability plans.

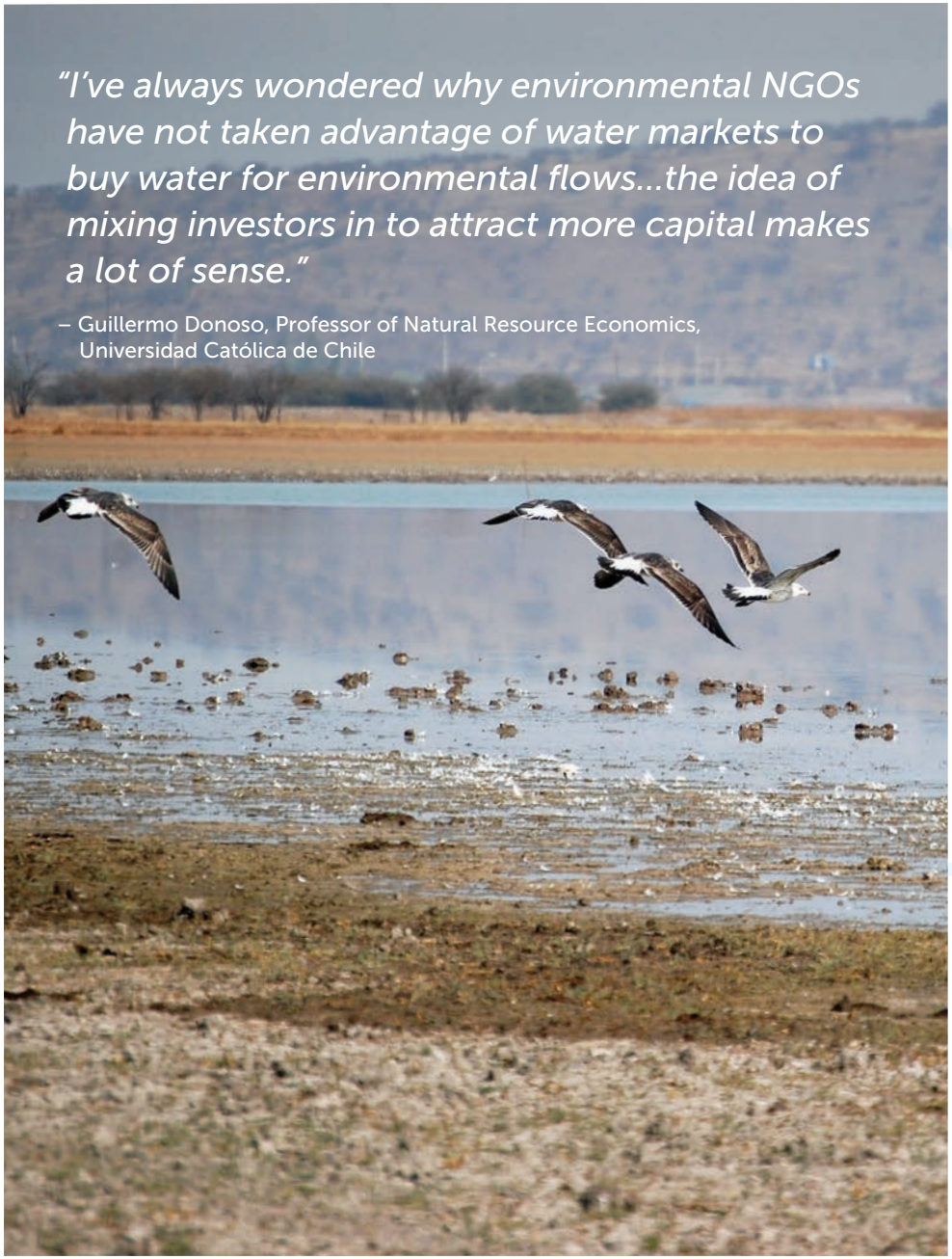
The Trust will continue to build relationships with key actors in the Salinas Valley and refine BasinScout to best serve their needs. Additionally, The Trust is exploring ways in which this initial effort can be replicated with increased efficiency and decreased cost so that it could provide decision support for all California basins working through the SGMA process.

	Agricultural Water Use (Acre-Feet/Year)	Acreage Under Production (Acres)	Profit ($)	Nitrate Hazard Index	Jobs (FTE/Year)
Current	345,881	159,623	1,177,198,417	7.94	25,077
Scenario 1	329,178	146,745	2,225,555,936	7.71	44,492
Change	-16,703	-12,878	+1,048,357,519	-0.23	+19,415

CURRENT



(previous) An aerial shot of lettuce production in California's Salinas Valley. Photo: Sharpshots Aerial Photography. (this page) Strawberries in Watsonville, CA. Photo: USDA; Results of a water allocation scenario modeled using BasinScout that weights profit and jobs along with a user fee. BasinScout is a scenario-building tool to model impacts of policy changes and to limit unintended consequences of management actions. Image: The Freshwater Trust.



The Nature Conservancy

PROTOTYPE: WATER SHARING INVESTMENT PARTNERSHIP

The Nature Conservancy (TNC) is a global conservation organization whose work on freshwater is focused on protecting watersheds that supply drinking water to major urban centers, addressing water scarcity through water markets, promoting sustainable hydropower development, and flood-plain restoration. TNC's prototype built on its previous work in water markets and continued to test TNC's Water Sharing Investment Partnership (WSIP) model. A WSIP uses impact investment capital to acquire a portfolio of water rights in a given basin either by directly purchasing the rights in a water market or obtaining them through cooperative agreements with farmers. Farmers can implement water-saving measures and then transfer the 'surplus' portion of their water rights to the WSIP. A portion of the total water acquired by the WSIP is then leased to high value water users, generating a financial return for investors, while the remainder is retained to supplement environmental flows and provide water to underserved communities.

TNC has already successfully funded and launched its initial WSIP in Australia's Murray-Darling Basin. The innovation of the WSIP is the use of private impact investment, which, by providing more upfront capital and a steady revenue stream to fund on-going trust operations, can enable greater impact than could be accomplished through traditional philanthropy alone.

TNC's prototype examined the feasibility of implementing water sharing investment partnerships in two new locations:

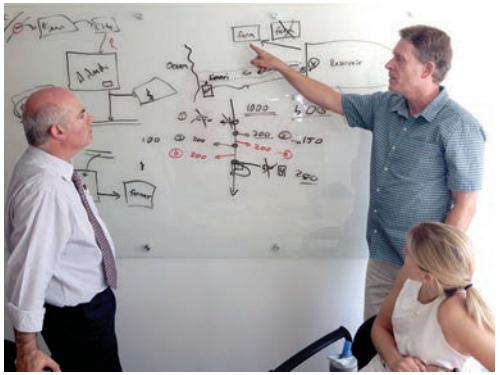
- The Colorado River in Texas (USA), where municipal, agricultural, and other water use needs are testing the limits of natural supply during dry times, leading to water conflicts, financial stress for certain farming communities, and, in some stream reaches, no water to support aquatic ecosystems.
- The Maipo River (Chile), where the rapidly growing city of Santiago, expansion of water-intensive industrial uses, and irrigated agriculture are placing stress on water sources. Reliable water supply, wetlands, and aquatic ecosystems are threatened.

In both locations, TNC investigated the necessary enabling conditions (legal frameworks, market liquidity, environmental and social conditions, and data availability), and tested the WSIP model with local stakeholders and investors to assess the viability of WSIPs in different contexts. Different funding mechanisms were also explored, ranging from private impact investment to "pay-for-performance" arrangements (e.g., social impact bonds, development impact bonds) between private investors and governments.

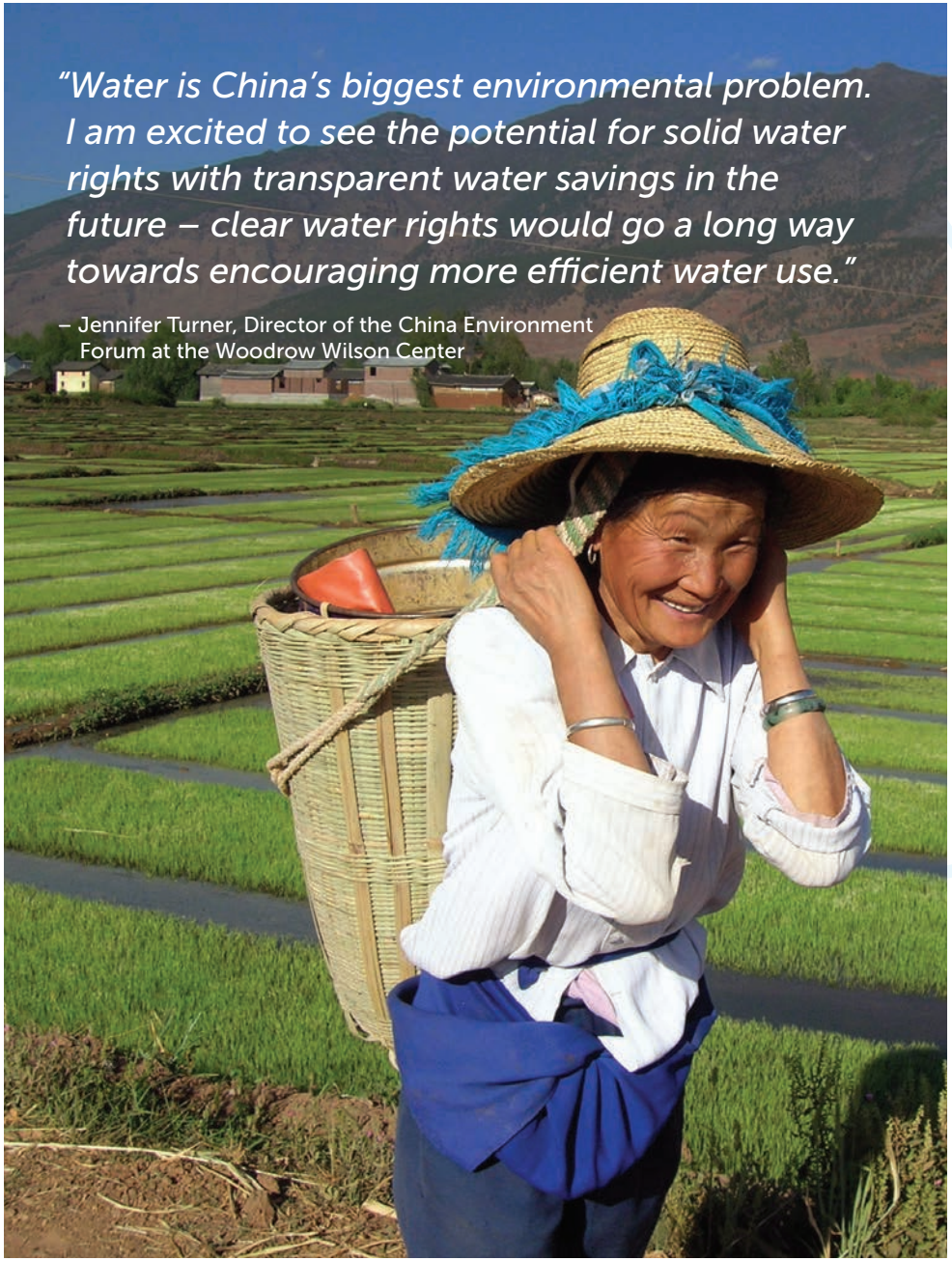
Findings and take-aways

TNC found that the WSIP model is potentially viable in both locations where it was tested. While the details of structure and operation will vary, the opportunity exists to attract impact investment, deliver financial returns, and generate social and ecosystem benefits through enhanced environmental flows.

On a more granular level, TNC found that there must be multiple water users that place different value on water in a given basin, so that an incentive for trade between users is created. An existing water market framework with adequate regulatory support is also necessary to enable trade. TNC will continue to develop WSIPs in both basins, following in the steps of the Murray-Darling Basin example. If successful, the WSIPs will demonstrate a novel model of attracting new sources of capital to help address freshwater competition and deliver environmental flows. For more information on TNC's Water Sharing Investment Partnership work click here.



(previous) The Maipo River, Chile. Photo: California Environmental Associates.
(this page, top) Murray-Darling Basin, Australia. Photo: Tim J. Keegan;
TNC work sessions in Chile. Photos: California Environmental Associates.



World Resources Institute

PROTOTYPE: WATER MARKETS

WRI is a global research organization focused on climate, clean energy, food, forests, water, and sustainable cities. Its freshwater work provides unique, insightful, and publically accessible maps and data on global water, through its Aqueduct program, and directly advises a range of governments, corporations, and civil society organizations. WRI's focus throughout the prototyping process was to identify the key challenges in water management in China's Ningxia Province — including lack of good data, unclear water allocation rights, weak monitoring and enforcement, and inadequate funding for irrigation efficiency improvements and farmer training.

China is experiencing acute and increasing water stress that limits the country's ability to achieve food and energy security, two of the country's main goals. Ningxia is the smallest province in China and shares the Yellow River as its main water resource with nine other provinces, which are much larger in size and population. In addition, Ningxia is targeted as a major province to absorb industrial growth in the energy sector, which is very water intensive. As a result, Ningxia had already started to experiment with water transfer mechanisms between the agriculture and industrial sectors prior to Ningxia being selected by the National Government to participate as one of seven pilot provinces to test potential market-based solutions to China's water challenges. WRI's prototype centered on helping China's Ningxia Province develop a water market allocation and trading system that would transfer water savings from improved irrigation practices to water-thirsty industries and municipalities.

Findings and take-aways

One of the biggest obstacles for developing water allocation and trading systems in China is the challenge of allocating water rights in the context of a state-run allocation system. The solution that WRI has devised, in partnership with the Ningxia and Chinese governments and international experts, clearly defines the water entitlements of small farmers and allows them to get paid for water savings (both annually and at the point of transfer), even without direct ownership of the water right. This model "frees up" inefficiently used irrigation water in Ningxia and makes the savings available to the growing industries and cities. The model also takes pressure off of environmental flows and vulnerable ecosystems by providing industries and cities with an alternative mechanism to acquire needed water.

WRI will continue to work with the Ningxia government to establish an allocation system in the coming months, and to implement the framework for a water trading scheme. If taken to scale in China, the model has the potential to benefit hundreds of millions of small farmers who regularly experience water stress by providing them with incentives and opportunities to improve on-farm efficiencies which they could not otherwise afford, thereby improving rural livelihoods. The model also has the potential to help China support future urban and industrial growth, while ensuring needed food production, and help to limit future conflict over freshwater.

(previous) Rural farmer in He Qing Yunnan, China. Photo: Hong Meen Chee/WorldFish.
(this page) Canal system, water-saving irrigation, and cellar to store rainwater in Ningxia, China. Photos: WRI.

Children in Sindh, Pakistan, play at a water pump in a village. Photo: DFID/Russell Watkins; Migrant workers process green peppers on Uesugi Farms in Gilroy, CA. Photo: USDA/Bob Nichols.

Summary of findings from the prototyping process

A variety of incentive-based approaches have the potential to change water management for the benefit of ecosystems and poor or vulnerable populations, including:

- **regulatory reforms** (e.g., water markets, water pricing reform),
- **other market mechanisms** (e.g., payment for ecosystem services, water banks, water benefit credits),
- **corporate supply chain engagement** (e.g., benchmarking, sourcing requirements), and
- **finance-related incentives** (e.g., standards for major infrastructure projects, impact investments, investor-led reporting requirements).

Each of The Rockefeller Foundation's prototyping partners sought to innovate around one of these incentive-based approaches.

The lessons learned through prototyping suggest that the most direct way to achieve positive and comprehensive outcomes at a basin scale is to implement regulatory reform (water markets are one option, but less extensive reforms such as changes to pricing structures can also be effective). Supply chain engagement and finance-related incentives can drive water management changes for individual actors and entire supply chains – a scale of impact that can be very meaningful. If widely adopted, supply chain and finance-related approaches can become standard practice across an entire industry and catalyze adoption of incentive-based regulations.

Through the prototyping process, it became clear that there is a great deal of existing activity as well as a tremendous opportunity for expanded engagement in water along corporate supply chains, particularly in the agricultural sector. There is even evidence of appetite for supply chain actors to engage more in regulatory processes. However, it is also clear that companies need additional support to develop the right tools and frameworks necessary for engagement; this is particularly true for those companies looking to support sustainable water management at a basin level.

If well designed, water markets are perhaps the most comprehensive form of incentive-based water management, because they are regulatory driven and can deliver strong outcomes at a basin scale.

Longsheng rice terraces, China. Photo: Lihi Koren; Empty drinking water bottles are transported by bicycle in Tanzania. Photo: Unitarian Universalist Service Committee (UUSC).

Finance-related approaches have similar impact potential, although they seem to be more nascent than supply chain approaches. Managing the risk of disruptions to water supply is important for both corporations and investors, and tools are emerging to assess water-related risks. However, despite the fact that the World Economic Forum recently cited water as the number one environmental risk to global society, it still does not seem to be one of the key risks investors are managing around.

If well designed, water markets are perhaps the most comprehensive form of incentive-based water management, because they are regulatory driven and can deliver strong outcomes at a basin scale. Currently, water markets only exist in a handful of geographies and their uptake is limited by the pre-requisite of strong governance. Historically, water markets were not designed to deliver environmental benefits or to be inclusive of poor or vulnerable populations. The work of the prototyping partners helped demonstrate that these elements can be incorporated into water market designs or added through ancillary mechanisms such as TNC's Water Sharing Investment Partnerships. Furthermore, as WRI's prototype demonstrated, there are innovative ways to bring the benefits of water markets to a range of governance contexts, even those that do not lend themselves to traditional market-based trading, such as China's. In Ningxia Province, the water trading system in development will allow small-scale farmers to sell their water savings rather than their water rights, because water rights are owned by the state.

Across all of these approaches, data is often a limiting factor. Good analyses and decision support tools can help stakeholders understand the ramifications of change in water policy, or help corporate and financial actors make good management decisions. Continued innovation in these areas is critically important.

The prototyping process uncovered a number of exciting ways in which various incentive-based water management approaches can be developed to support resilient ecosystems and inclusive economies. The process also demonstrated that there is burgeoning interest and momentum behind many of the different approaches and helped to identify the key needs for their further expansion. The Rockefeller Foundation believes that the opportunity is ripe for increased adoption across a range of incentive-based approaches and applauds all of its prototyping partners for their excellent contribution to innovation in this field.

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(front cover) An aerial shot of the Salinas Valley in California. Photo: Sharpshots Aerial Photography. (back cover) Amazon River, Brazil. Photo: Neil Palmer/CIAT for Center for International Forestry Research (CIFOR).

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