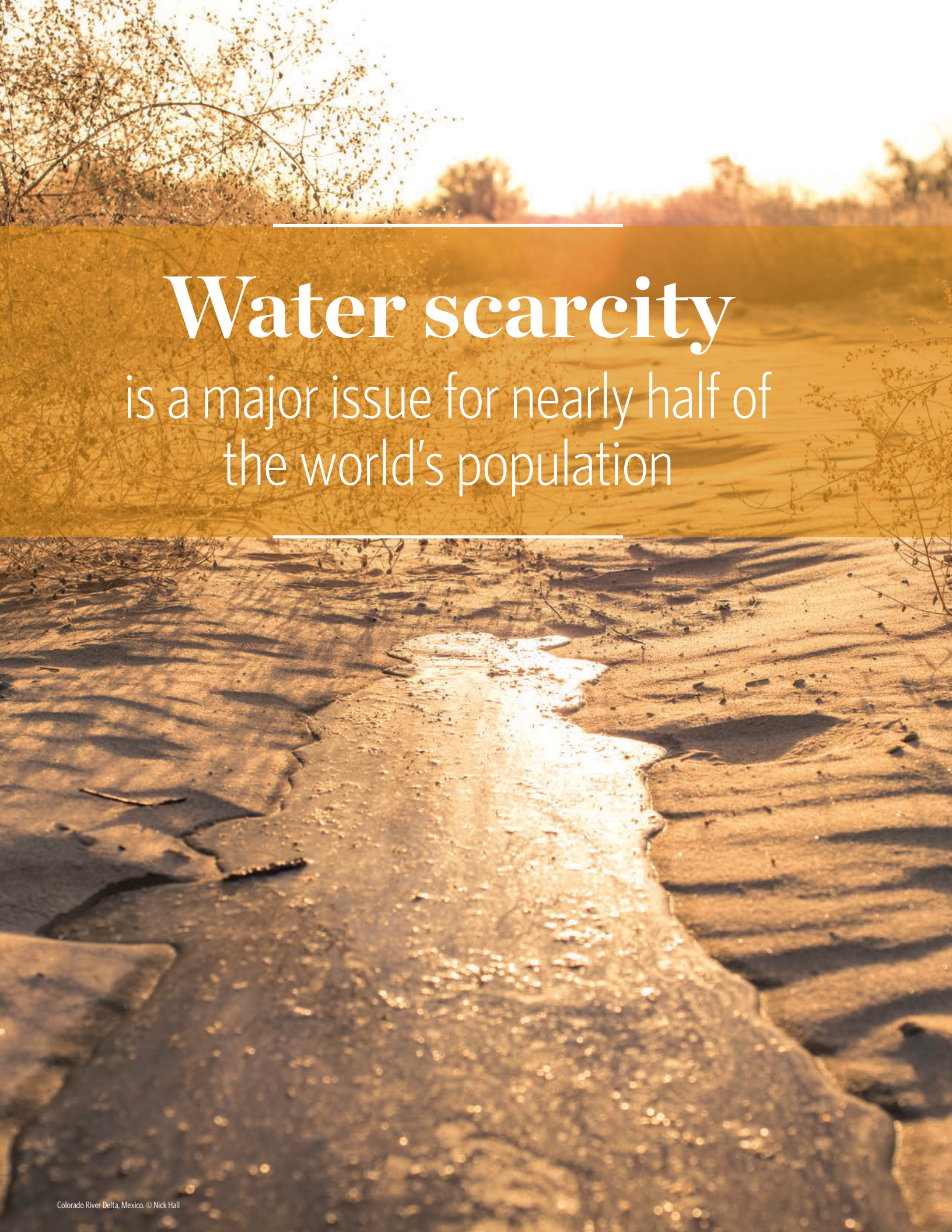
Water Share

Using water markets and impact investment to drive sustainability

Executive Summary

The Nature Conservancy



Water scarcity

is a major issue for nearly half of the world's population

Colorado River Delta, Mexico. © Nick Hall

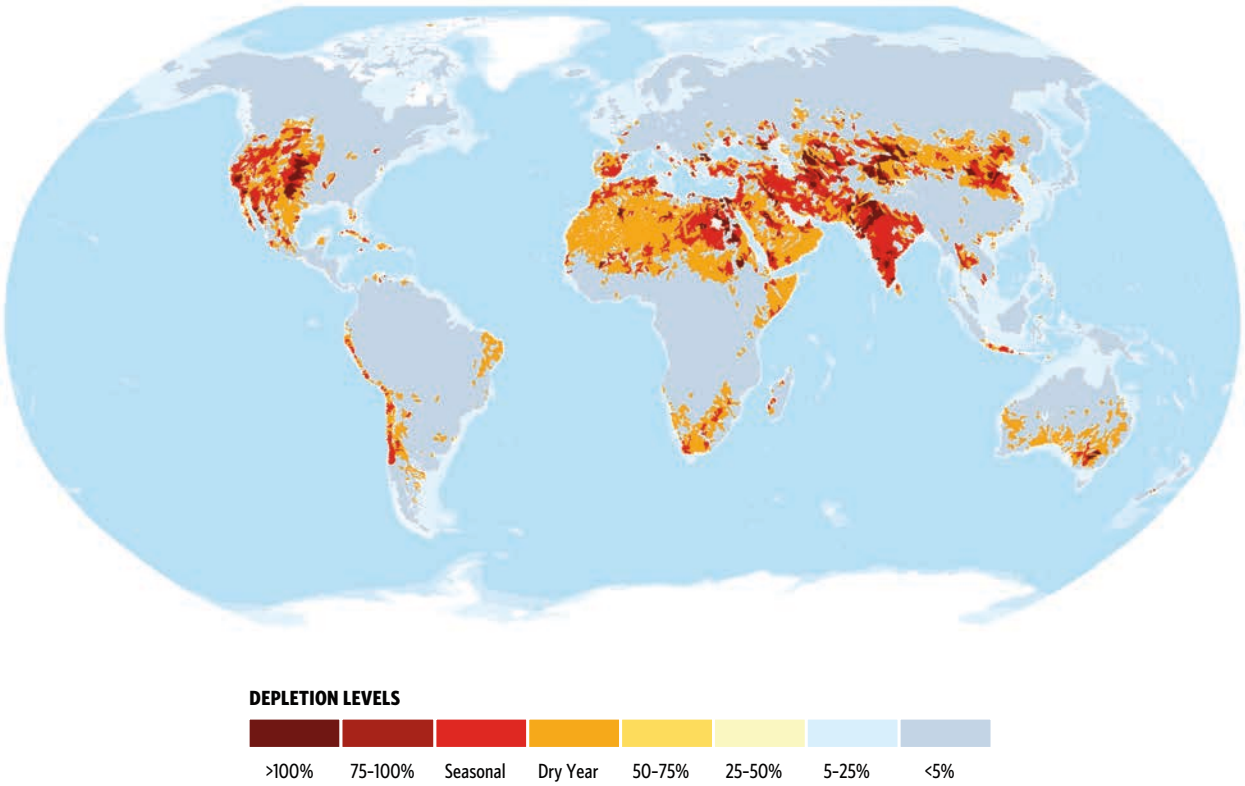
Executive Summary

Water scarcity is a top risk to global prosperity and ecological integrity

Water scarcity is a consequence of allowing too much water to be consumed relative to the renewable, affordable supply of water. When human consumption of water begins to approach the limits of the available supply, communities, businesses and ecosystems face great risk of water shortages with damaging consequences.

The problem of water scarcity is planetary in scale: today, at least one-third of the rivers, lakes and aquifers on our planet are being heavily tapped for their water resources. More than 90 percent of water consumption in water-scarce regions goes to irrigated agriculture. Globally, irrigation consumes 10 times more water than all other uses combined. There are few places in the world where water scarcity can be alleviated without substantially reducing the volume of water being consumptively used in agriculture. Given concerns over food security in many regions, and the importance of protecting the social fabric of rural communities, this must be accomplished in ways that sustain agricultural production and livelihoods.

Figure ES-1. Global water depletion



Across more than one-third of all water basins, communities are now bumping up against the limits of their renewable, affordable water supplies. This map highlights basins where the renewable replenishment of water is being depleted by more than 75 percent on a regular, annually averaged basis (75-100 percent or >100 percent), seasonally, or during dry years (adapted from Brauman and others, 2016[5]).

Water scarcity presents enormous challenges for the growth of cities and industries. Cities are reaching far and wide into distant water basins to bolster their supplies and investing in other costly and energy-intensive strategies, such as desalination, to secure additional water. Water scarcity also threatens our food supply. More than three-quarters of all irrigated farmlands are vulnerable to water shortages, and one-fifth of all irrigated crops are being produced with nonrenewable groundwater abstraction.[1]

Nature is the silent and unseen victim of water scarcity. The excessive removal of water from freshwater ecosystems is a leading cause of imperilment for freshwater species. According to the *Living Planet Report*, freshwater species populations declined by an estimated 76 percent globally between 1970 and 2010.[2]

It is time for new approaches in water management

Historically, communities and governments have focused heavily on infrastructure solutions – such as building water storage reservoirs or importing water from other places – to ensure that their water supply kept pace with growing water demands.

However, it is now highly unlikely that these supply-side approaches will be able to arrest or reduce water scarcity at its current levels, nor prevent further expansion and intensification of water scarcity, for three major reasons: 1) There is no more surplus water to be found in most water-scarce regions; 2) The renewable water supply is declining in many regions as the climate changes; and 3) The costs to secure more water are too high for communities to bear.

The promise of water markets

Many cities, farms and industries have in recent decades begun to give much greater attention to water conservation and other forms of demand management, enabling levels of water use to stabilize in many regions. Sustainable water management in the 21st century will require more than just stopping scarcity from worsening, however. The volume of consumptive use must be lowered below current levels to alleviate water scarcity. This will require that governments, or communal water systems such as irrigation districts, set firm limits or 'caps' on consumptive water use to avoid exhausting the available water supply, and to ensure that sufficient water remains available in freshwater and estuarine ecosystems to sustain their health and productivity.

A common misconception is that any reduction in consumptive water use in irrigated agriculture would necessarily result in a loss of agricultural productivity or revenue generation. To the contrary, there are many practical and cost-effective ways to reduce non-beneficial water consumption in irrigated agriculture without compromising economic returns or crop production, including investments in improving irrigation efficiency (i.e., regulated deficit irrigation), improving soil management, reducing water losses in delivery systems, shifting to less water-intensive crops, temporarily fallowing certain crops, reducing farm-to-market crop losses and other proven measures.

Water use remains highly inefficient in many places, and far too much water is being used for low-value or wasteful purposes, dampening the water productivity and economic prosperity of many regions. Given pressing needs to feed and clothe a growing global population, the productivity of water – meaning the production of crops or others goods, or the economic returns gained per unit of water use – will need to rise sharply in coming decades.

Lowering existing levels of consumptive water use, while at the same time increasing water's productivity, will require both strong governmental leadership as well as game-changing innovation in the private sector. The establishment of high-functioning and well-governed water markets[3] – in which a cap on total use is set; rights to use water are legally defined, monitored, and enforced; and in which rights can be exchanged among water users – can provide a powerful integration of public and private efforts to alleviate water scarcity. A well-functioning water market can provide financial incentives for improving water's productivity by enabling those willing to use less water to be compensated by those needing more water, or wanting to return water to the environment. By so doing, water markets open up pathways for entities wanting to access more water to do so in a highly cost-effective manner that is far less environmentally damaging than building new infrastructure.

The necessary governance (enabling) conditions to support high-functioning water markets exist in only a few countries presently, and problematic impediments to water trading can be found in all existing water markets. The intent of this report is therefore aspirational: to make the case that water markets offer a powerful mechanism for alleviating water scarcity, restoring ecosystems and driving sustainable water management.

There are six noteworthy benefits of water markets:

1. ***Stimulating water savings*** – By establishing a monetary value for water, water markets can provide strong stimulus for reducing consumptive water use because a water-saving entity can be rewarded financially by selling or leasing the portion of their water rights that is no longer needed. When water is appropriately priced it also discourages waste.

2. ***Increasing water availability*** – By accessing additional water through a market, a community or government can avoid expensive, time-consuming and environmentally-damaging alternatives for increasing their water supplies.

3. ***Improving community flexibility*** – By enabling the transfer of water between users, individuals and communities can adapt more quickly to changing conditions, personal preferences and needs. This includes providing farmers with new, revenue-generating opportunities and options for averting irrigation shortages during droughts.

4. ***Improving water's productivity and allocation efficiency*** – By discouraging wasteful or low-value uses of water, the trading of water facilitates reallocation of water rights to more productive uses, commonly resulting in more revenue generation in local economies.

5. ***Returning water to nature*** – Markets offer opportunities for conservation interests and government agencies to restore water flows in depleted freshwater and estuarine ecosystems by purchasing water in the market and then dedicating its use to environmental purposes.

6. ***Improving accounting for water use and availability*** – When water is appropriately priced and water assets are being traded, water users are more willing to participate in transparent water measurement and reporting practices.

There are four case studies in Appendix I of this report demonstrating many of the economic, social and environmental benefits to be gained through water market trading. These case studies illustrate not only the potential for reducing consumptive water use on irrigated farms, but also for transferring the rights to the saved water to other farmers or uses, including the environment.

- The **San Diego County Water Authority in California** (United States) negotiated an agreement with a large irrigation district that pays farmers to reduce their consumptive water use. The water saved is transferred to the metropolitan area, providing more than one-third of its water supply each year.

- **Austin Water** in Texas (United States) purchases up to 40 percent of its water each year from a river authority that has been bolstering the volume and reliability of its own water supplies through acquisition of water rights from irrigation districts.

- More than half of water deliveries by the **San Antonio Water System** in Texas (United States) have come from water rights purchased from farmers or through water-lease agreements with other water providers.

- Farmers in the **Murray-Darling Basin** of Australia have prospered from an active water market in which more than 40 percent of water use comes from trades in annual water allocations. This water trading has provided a new revenue stream for farmers and helped them manage the impacts of irrigation shortages during severe droughts.

The Nature Conservancy is now advancing an innovative new concept based upon the strategic trading of water-use rights within select river and lake basins, called a "Water Sharing Investment Partnership." These institutions operate with investor capital within existing water markets for the purpose of redistributing water use in a manner that enables water productivity to increase and economic benefits to grow, while returning water to nature.

The Nature Conservancy launched its first Water Sharing Investment Partnership in Australia in 2015. As of May 2016, approximately AUD$27 million has been invested in the Murray-Darling Basin Balanced Water Fund, with a goal of scaling to AUD$100 million within the next four years. The Nature Conservancy is now building off of this success in Australia, as well as its existing track record of using philanthropic dollars to purchase water on behalf of the environment in North America, to craft WSIPs and a variety of other water transactions and investment mechanisms to help rebalance water use in stressed basins.

Conclusions and recommendations for action

The potential benefits that could be realized from the establishment of high-functioning, well-governed water markets are significant. At least 37 countries in water-scarce regions have already established water-allocation systems based on the issuance of water rights – an essential precursor for water markets – and more than half of these countries already allow re-allocation of water through trade. If additional countries adopt water rights systems and other important enabling conditions, and allow trading of water-use rights, they too would be able to realize the benefits of water markets elaborated in this report. Those benefits include overall GDP growth with greatly-lessened water constraints, helping all water users better adjust to and manage economic shocks associated with water shortfalls, and reducing social and ecological disruption during droughts and water shortages.

This report concludes with four major market-based strategies for alleviating water scarcity that would be applicable in at least two-thirds of all water-scarce basins, presuming that appropriate governance frameworks were in place. These strategies are tailored to four of the six scarcity conditions found in water-stressed basins, as illustrated in Figures ES-2 and ES-3.

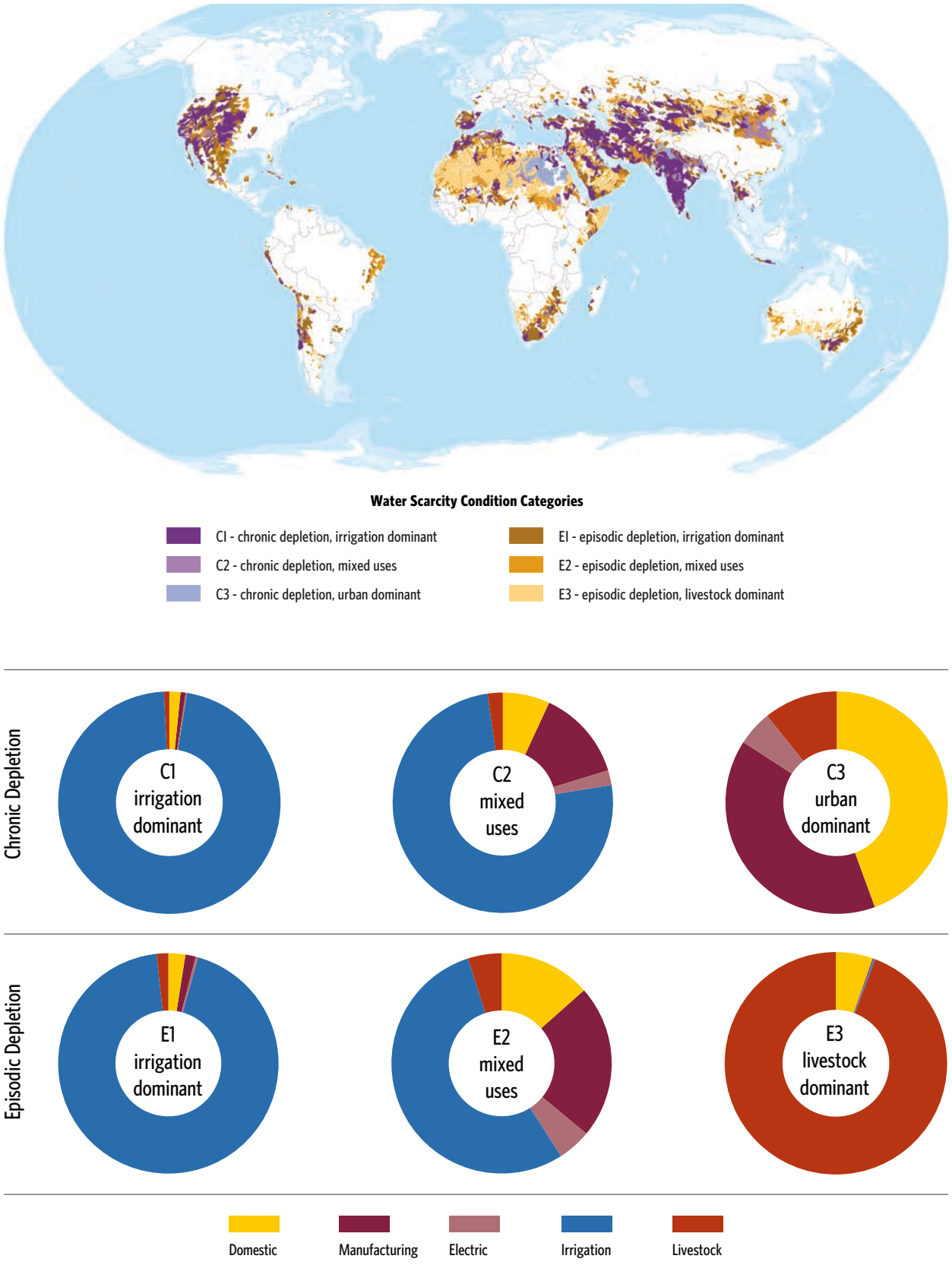
- ***Strategy C1 – Facilitate long-term (permanent) water trades within farming communities by establishing 'farmers' water markets.'*** This strategy is tailored to basins experiencing chronic scarcity, with irrigation water use dominating. Whereas both permanent and temporary water trades will be very useful in these basins, the exchange of permanent rights will be particularly important in reducing long-term, chronic scarcity. A good model is the Murray-Darling Basin, where in recent years nearly 10 percent of all water entitlements, worth nearly AUD$2 billion, have been exchanged each year on average.

- ***Strategy C2 – Facilitate long-term (permanent) trades between farmers and cities.*** This strategy is designed for basins experiencing chronic scarcity with mixed uses of water. The intent would be to facilitate rural-to-urban water exchanges, either through regional water markets or through bilateral transactions between cities and farming communities. Three urban case studies in Appendix I (San Diego, Austin and San Antonio) document that rural-to-urban water market transfers have spurred GDP growth of 3 to 6 percent per annum in these water-challenged cities over the past decade.

- ***Strategy E-1 – Facilitate short-term (temporary) trades within farming communities.*** This strategy will be particularly helpful in basins presently experiencing only episodic (dry-year) scarcity with heavy dominance of irrigation water use. During dry years or droughts, mechanisms are needed to substantially reduce or curtail water use on lower-value or annual crops on farms that will not suffer long-term damage from temporary fallowing or deficit irrigation. With proper compensation given to those water users or producers who are able to reduce their water use, this strategy will encourage higher-value crops to be produced. A case study of the Murray-Darling Basin of Australia in Appendix I documents that short-term market trades averted losses in the gross value of agricultural production of 20 to 25 percent in the worst two years of the Millennium Drought. In recent years, approximately 44 percent of all water use has come from trading of annual water allocations, helping to realize gains in agricultural revenues estimated at AUD$2.6 billion each year.[4]

- ***Strategy E-2 – Facilitate short-term exchanges between farmers and cities.*** In basins with episodic scarcity caused by mixed water uses, carefully designed drought management plans will be essential in averting drinking water or electricity shortages, or economic damage due to lost industrial production. Opportunities for short-term lease options with irrigation farmers to free up water supply should not be overlooked as the cost-effectiveness of paying farmers to curtail water use during drought years may look even better than urban conservation strategies.

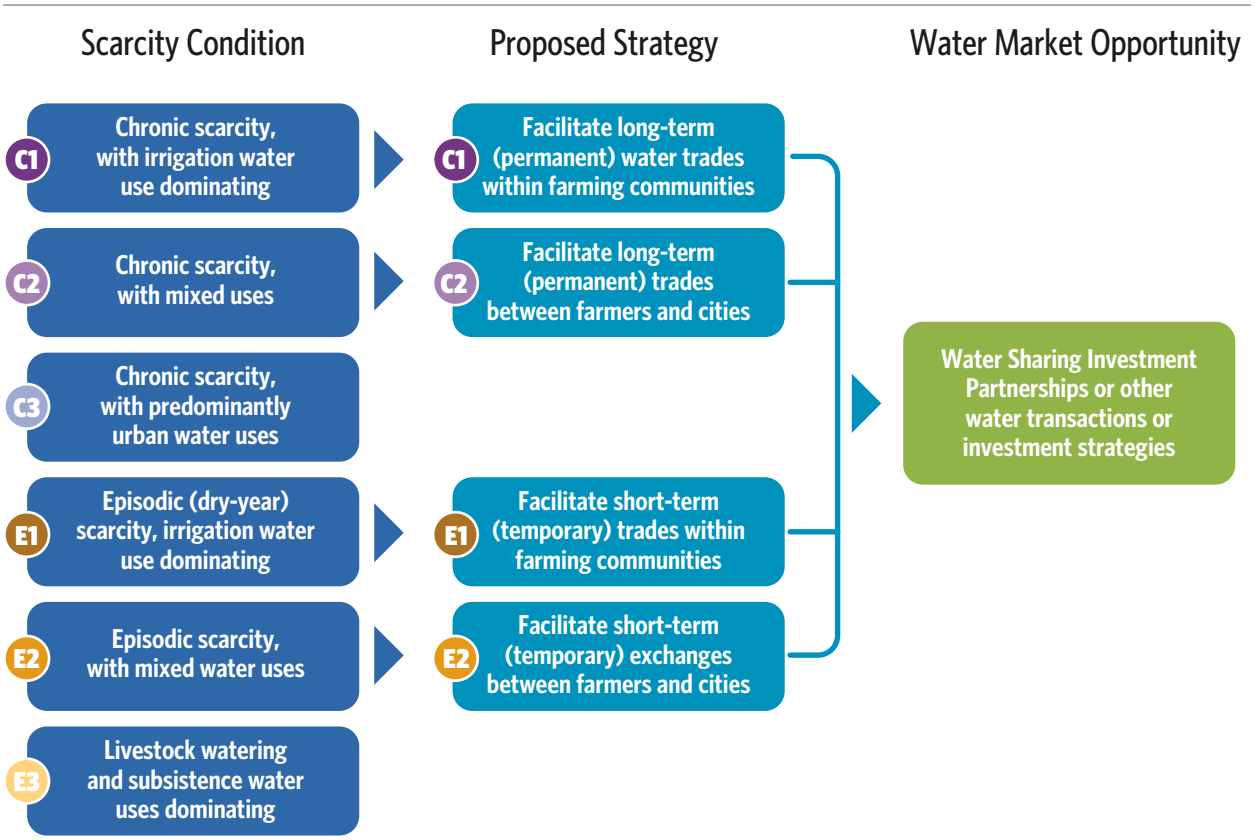
Figure ES-2. Water scarcity conditions and dominant categories of consumptive water use



The map above indicates the global distribution of the six water scarcity condition categories described in this report. The pie charts above indicate the proportion of total consumptive water use going to each sector, for each of the six scarcity categories. Relative proportions of sectoral water consumption are averaged across all basins within each scarcity category. (Source: model outputs from WaterGAP3)

Drying Peppers, Chilean Matorral ecoregion, Chile. © Tom Crowley

Figure ES-3. Market strategies for addressing water scarcity



Four water market strategies are offered in this report, addressing four of the scarcity conditions found in water-stressed basins around the globe. Market strategies are not offered for scarcity conditions C3 and E3, for reasons explained in the text.

If all four of these strategies could be fully implemented – in just the countries with existing water-rights systems and some evidence of water trading already taking place – they could collectively generate total annual water sales of USD$13.4 billion per year, equating to market assets of USD$331 billion (Table ES-1).

Unleashing the benefits of water markets will require bold leadership and concerted action on the part of non-governmental organizations (NGOs), irrigation farmers, political leaders, private investors and urban water managers. Specific recommendations are offered for each group.

Table ES-1. Potential water sales and market asset values of four water market strategies

Strategy	Potential Annual Water Sales (USD$ billions)	Potential Market Value (USD$ billions)
C1	3.8	37.7
C2	1.0	6.7
E1	0.6	18.7
E2	8.0	268.2
TOTAL	**13.4**	**331.3**

Glossary of Terms

Consumptive water use – the volume of water that is not returned to its original source after use

Desalination – a technology that removes salt from ocean water or saline groundwater to create fresh water

Water markets – the rights to use water are traded among water users, government agencies, water utilities or non-governmental organizations; this trading is facilitated by governance conditions including formally defined water rights with associated monitoring and enforcement, and a fixed cap on total water use

Water productivity – the production of crops or others goods, or the economic returns gained, per unit of water use

Water scarcity – the result of excessive human use of water relative to the renewable water supply, resulting in shortages and disruption to ecosystems and human endeavors

Water Sharing Investment Partnership – institutions that operate within existing water markets, using investor capital and other revenue sources to acquire a pool of water-use rights that can subsequently be reallocated to the environment, or sold or leased to other water users to enhance water productivity or generate financial returns for investors

Water shortage – the result when the rate of consumptive use approaches or exceeds the rate of water replenishment

Endnotes

1 "Nonsustainable groundwater sustaining irrigation: A global assessment" (2012) by Yoshihide Wada, L. P. H. van Beek, and Marc F. P. Bierkens. *Water Resources Research* 48.

2 This is based on trends in 3,066 populations of 757 freshwater mammal, bird, reptile, amphibian and fish species as recorded in the *Living Planet Report: Species and Places, People and Places* (2014), by WWF International, Gland, Switzerland.

3 The need for very strong governance to enable high-functioning water markets is explicitly recognized here. This includes the need for formal legislation and supportive political leadership; legally-defined water rights registries supported by diligent and accurate water measurement and accounting, monitoring, and enforcement of rights; detailed hydrologic measurement and modeling; full consideration of the vulnerabilities of underserved and poorer communities, ecosystem water needs, and the direct and indirect impacts of trading water out of communities or sectors; and numerous other administrative rules and considerations.

4 This is not an estimate of the additional economic benefit of trading, which would require evaluation of each individual transaction to understand the increased revenue gained as measured against the previous use. Instead, this estimate is based on the overall economic productivity of water in the basin multiplied by the portion of water that is traded.

5 'Water Depletion: An improved metric for incorporating seasonal and dry-year water scarcity into water risk assessments,' (2016) by Kate Brauman, Brian Richter, Sandra Postel, Marcus Malsy, and Martina Floerke. *Elementa* doi: 10.12952/journal.elementa.000083

If all regions with defined water rights functioned in a similar manner to the Australian market, the markets could collectively generate total annual water sales of USD$13.4 billion per year, equating to market assets of USD$331 billion

Onlookers watch the Colorado River pulse flow, Mexico. © Nick Hall

It is time to **unleash the potential** of water markets

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