Valuing Water

A Framing Paper for the High-Level Panel on Water

June 2016

Prepared for the Australian Water Partnership
at the request of the Australian Department of Foreign Affairs and Trade by:
Huw Pohlner, Simon Hone, Will Fargher, Chris Olszak – Aither, Australia

Australian Aid

The Australian Water Partnership is supported by the Australian Government

waterpartnership.org.au

THE AUSTRALIAN WATER PARTNERSHIP

ISBN 978-1-921543-23-4

The AWP thanks Aither for preparing this report at short notice for the UN/World Bank High-Level Panel on Water. The AWP is publishing this report in its original form, as it was submitted to the High-Level Panel on Water, and we note that the short timeframes for preparation meant that normal process of copy edit was unable to be completed.

Australian Water Partnership
UC Innovation Centre (Bldg 22), University Drive South
Canberra ACT 2617 AUSTRALIA
T: +61 2 6206 8320 **E:** contact@waterpartnership.org.au

The Australian Water Partnership is a funded initiative of the Australian Department of Foreign Affairs and Trade.

Australian Aid

Valuing Water

A Framing Paper
for the High-Level Panel on Water

June 2016

Contents

Valuing Water 1

- Key messages 1
- Background and purpose 1
- What ‘valuing water’ means and how it is done 2
- Current global practice in valuing water – actors and activities 4
- Opportunities for creating impact by incorporating water valuation into a clear development policy agenda 8
- Global actions to accelerate progress to 2030 9
- Conclusion - a vision for success 10

References 11

Valuing Water

Key messages

1. *Individuals, communities and governments make implicit valuations of water resources all the time; formal valuation methods enable more informed and transparent decisions.*
2. *Approaches to revealing the benefits that people receive from water, and taking these values into account, range from the administrative to the market-based, and often combine both.*
3. *Valuing water (including by expressing value in monetary terms) is not inimical to equity and environmental sustainability, and can be a useful tool to progress these objectives.*
4. *Good valuation practices can inform future-focused and equitable water services pricing, pollution pricing, water market development, and administrative allocation of water.*
5. *If we miss the opportunity to take the next step in valuing water, we risk allowing critical investments in water resource management to fall off the list of global development priorities.*

Background and purpose

The High-Level Panel on Water ('the Panel') was established to 'mobilize effective action to accelerate the implementation of Sustainable Development Goal (SDG) 6 and its related targets'. The Panel has identified four 'lighthouse initiatives' intended to bring a global focus onto specific issues and advance the agenda in those areas. These initiatives are intended to demonstrate progress during the two-year timeframe of the panel and offer breakthroughs requiring political leadership at the Heads of State or Government level. This framing note addresses one of the four lighthouse initiatives: 'valuing water'.

SDG 6 does not include explicit targets relating to valuing water. However, many of the agreed targets represent outcomes promoted by valuing water: universal access, adequate sanitation and hygiene, improved water quality, increased water-use efficiency, and ecosystem protection. Additionally, Target 6.5 aims for the implementation of integrated water resources management (IWRM) at all levels by 2030. A founding principle of IWRM is that water has a value in its diverse uses, and that those values should be considered in water management (Dublin Statement, 1992).

The purpose of this framing note is to:

1. identify the state of global practice in valuing water and describe how valuation has been integrated into water management to achieve more efficient, equitable and sustainable outcomes; and
2. provide options to spark global action within an SDG timeframe to improve water management by making more effective use of valuation.

Valuing water is not a new concept. Valuation happens every time someone uses water or chooses not to. In practice, all water management decisions implicitly value water for diverse uses and trade these uses off against one another. The challenge is to explicitly determine the value of water in its competing uses, enabling decision-makers to better understand and communicate values and the trade-offs between differing uses. In this way, effectively valuing water supports more transparent and better informed decision-making in the allocation and use of a resource that often possesses 'common-pool' characteristics (i.e. is rivalrous and non-excludable) and suffers from related issues of overuse and pollution (Ostrom, 1990).

In a development context, taking the value of water for multiple uses into account can support more efficient, equitable and sustainable water management. Importantly, valuing water does not preclude making water policy and management decisions on equity or environmental grounds. Providing subsidies to meet the water needs of the poor or directing water for the protection of the environment are valid policy decisions. Proper valuation simply provides a clearer picture of the trade-offs involved.

This note introduces the concept of valuation of water resources and presents some common approaches to revealing and taking into account the value of water. It identifies opportunities for creating impact by incorporating valuation into a global development agenda, and recommends global actions to more effectively value water in support of improved water policy and management decision making and the implementation of SDG 6.

What 'valuing water' means and how it is done

The concept of 'valuing water'

The value of water is the benefit that people receive from water. This is a broad concept and includes all people and all alternative uses. It includes the benefits that subsistence farmers receive from irrigating their crops, the benefits that children in impoverished towns receive from clean drinking water, and the benefits that people receive from healthy wetlands. It is not limited to commercial benefits, although these are also considered. The value of water also covers the benefits that people will receive in the future, even for people yet to be born.

In practice, these benefits are generally expressed in monetary terms, which can be contentious – expression in dollar terms explicitly requires a monetary benefit to be assigned to, for example, cultural and environmental uses of water, which is philosophically concerning to some. It can also create the impression that a resource (e.g. water) is of less value to the poor simply because they have less capacity to pay for it – in fact, valuation methods include well-established ways to deal with differences in wealth and income. The purpose of valuation is to facilitate comparisons between options where resources are scarce and decisions must be made; the benefits are expressed in monetary terms to provide a common metric and to enable comparison with the costs of, for example, investing in provision of water-related services.

Valuing water is important because it can improve decision making, which ultimately improves human wellbeing. This applies to decisions at the household level through to governments making decisions that affect industries, communities and environments. Valuing water is central to estimating the benefits and costs of different water management options and how they are distributed across communities. This evidence-based approach to water management ensures that the preferences of all people, including the poor and disadvantaged, are considered in decision making. It is helpful in considering how to pursue all water-related elements of the SDGs.

Revealing values and taking them into account

Approaches to revealing the benefits that people receive from water, and taking these values into account, range from the administrative to the market-driven. An administrative approach sees decisions made by a central authority based on available information. For example, governments typically use administrative approaches in water resource planning where high-level decisions are made about how water is to be shared among competing users and jurisdictions. This includes establishing rules determining how water is used for hydropower generation, agriculture, urban use, flood protection, transportation, and environmental protection. Administrative decision making processes are also used in assessing options for investment in urban water supply and sanitation. Analysis of the benefits and costs

of these schemes can help prioritise investment to where it is most beneficial in contributing to the SDGs. Under an administrative approach, the benefits people receive from water might be obtained by asking people directly, by observing their behaviour, or other methods.

Administrative allocation of water generally reflects valuations of people's water use made by government officials and tends not to establish firm incentive structures for end users, other than to obtain the highest possible return on their use. The case discussed in this note is China's South-North Water Transfer and its associated allocation regime.

Under an individual or market approach, decisions are made by water users reflecting the benefits they receive from water. In this sense, valuation is automatically built into decentralised water management systems. This does not imply that individual or market decisions are better than administrative ones – there are advantages and disadvantages of both. In particular, allowing people to make decisions in their own interests without having adequate incentives to consider the interests of others could lead to negative outcomes. As such, governments often play a very important role in regulating markets, managing market failures, and allocating water where no market-based instruments exist.

In reality, some of the most common mechanisms for revealing and taking into account the value of water include elements of both administrative and market approaches. This applies to pricing of water-related services and infrastructure, pricing of pollution, and secure tradeable water rights, which all rely on hybrid mechanisms:

- Cost-reflective administrative **pricing of water-related services and infrastructure** allows value to be taken into account by clearly signalling the costs of water provision to the end user. While it is cost that determines price, valuation can play a role as users weigh the value they place on various water-related services against their price and thus communicate their assessment of value to water utilities and governments through their choices. The decision on charges is administrative while also establishing clear market-based incentive structures. The cases discussed in this note are from South Africa, the Philippines, Jordan and India.
- **Pricing of pollution** allows value to be taken into account by forcing polluters to consider the negative value (i.e. costs) of surface and groundwater degradation. This has often been achieved by establishing permitting regimes for wastewater discharge where permit price is administratively determined. Cap and trade or property rights approaches have also been used to establish a market-determined price for pollution (or water quality), with governments allocating wastewater discharge permits and then allowing trade of the permits under the cap (Lal et al., 2009). Finally, payments for ecosystem services (PES) encourage landowners to consider the impacts of their actions on the downstream value delivered by ecosystems. This note includes a case study of PES from Costa Rica.
- **Secure tradeable water rights** can be used, when combined with robust markets, to reveal the value of water for multiple uses. A cap and trade water market involves an administrative decision to establish a cap on total water use, which can promote sustainability, and a market approach, encouraging water to flow to its highest-value use through voluntary trade. Market fluctuations reveal the marginal value of water for various uses at different times. The cases discussed in this note are Australia's Murray-Darling Basin water market and the Chilean experience with markets.

Despite significant progress in the development and application of approaches for assessing and revealing the value of water, taking into account the value that people receive from water remains challenging, and there will always be uncertainty. The case for valuing water is that the information has sufficient worth in decision making to justify the costs. The challenge is to find a means of determining the value of water that is appropriate, effective and efficient, and to ensure this informs decision making. The best approach will depend on each country or region's objectives and circumstances.

Current global practice in valuing water – actors and activities

The value of water is determined and taken into account with varying degrees of sophistication and effectiveness in both developed and developing economies. Mechanisms for the determination and consideration of value range from the administrative to the market-based, as described above, with many mechanisms mixing elements of both. We outline current global practice in valuing water with reference to case studies for each of the four mechanisms described above: administrative allocation of water; pricing of water-related services and infrastructure; pricing of pollution; and secure tradeable water rights.

Administrative allocation of water (China)

Under an administrative approach to valuing water, allocation decisions reflect a government-led valuation of available water resources. Water is allocated to those uses deemed most valuable by decision-makers alone – these government officials may base their valuation of water resources on observed behaviours among water users, on the directly stated preferences of those users, or on other sources of information available to them, including historical allocations.

Although it is increasingly developing market-based instruments to reflect the value of water for multiple uses in allocation processes, China is largely reliant on administrative allocation of water (Liu and Speed, 2009). In the case of the recently completed Middle Route of the South-North Water Transfer (SNWT-MR), the world's largest interbasin water transfer scheme, the decision about how much of the transferred water to allocate to each of the recipient regions along the project's 1,200-kilometre-long route is taken by the central government, following negotiation with local governments from each of those regions (Pohlner, 2016).

However, the Chinese case also provides a useful example of the mixing of administrative and market-based mechanisms for valuing water. Institutions developed to manage outcomes from the SNWT-MR break new ground in Chinese water pricing policy. The introduction of a two-tier tariff for water delivered by the megaproject – a fixed tariff is paid by provincial governments regardless of their abstractions from the canal while a volumetric tariff reflects actual water use – is a move toward cost-based pricing, minimal cost recovery and related incentives (Pohlner, 2016).

While a predominantly administrative approach to valuing water is unlikely to deliver the efficient allocation outcomes or incentives for sustainable use that other market-based approaches can, it does permit a government to pursue its policy goals free of constraint. Additionally, the state is usually the only institution that has jurisdiction over all sectors of the economy (Dinar, Rosegrant and Meinzen-Dick, 1997). However, an administrative approach delivers no guarantees that decisions made by government actors will reflect all or most of the benefits that all or most of that government's stakeholders receive from water.

Pricing of water-related services and infrastructure (South Africa, the Philippines, Jordan and India)

The provision of water for domestic use in cities often entails large costs, chiefly associated with the construction and maintenance of water treatment infrastructure and fresh and wastewater pipelines. By valuing water, governments and utilities are able to better understand the benefits delivered by these services and weigh them against the costs. While the final decision on charges is administrative, it does establish clear market-based incentive structures. Valuation also plays a role as users weigh the value they place on various water-related services against their price and thus communicate their assessment of value to water utilities and governments through their choices.

Very few municipalities have established fully cost-reflective pricing and urban water services are generally subsidised to some extent, especially in developing countries. This is a valid government policy decision; valuing water does not mean such decisions cannot be taken, it merely means having a full view of the trade-offs involved when coming to these decisions. South Africa is one example of a country where a decision was made to offer a subsidy in order to protect the human right to water and sanitation: households receive a free daily water allowance equal to the WHO's recommended minimum volume of water available per person per day (Szabo, 2015).

> *"Even if only a part of water use is allocated based on a price that brings supply and demand into balance, many of the problems of climate and socio-economic scarcity can be resolved."*
> – ***World Bank, 2016***

Decisions about pricing urban water services should take into account the value of water for diverse uses, and the corresponding diversity in the services related to those water resources, and should be sustainable to support the management of water resources for future generations (EU Water Initiative, 2012). This statement refers not only to the maintenance and expansion of critical infrastructure but to the reduction of demand to conserve scarce water resources. Grafton et al. (2011) conducted a ten-country online household survey, finding that volumetric pricing was more effective at reducing domestic water consumption than subsidies, conservation promotion or requirements to install water-saving devices. In general, price setting should follow this approach: determine level of service; determine cost base; determine who pays and allocate costs; develop charging structure; and, finally, enable review and feedback loops.

In the case of the Philippines, a public-private partnership based on a build-operate-transfer relationship, extensive corporatisation and price restructuring enabled Manila Water to reduce non-revenue water, improve maintenance practices and ultimately supply water continuously. For the poor, largely reliant on bottled water and informal markets set up by households with illegal water connections, connection to the municipal supply system reduced payments (per cubic metre of water) by up to 95 per cent (Rivera, 2014, 54). More than half of the increase in Manila Water's customer base since the beginning of the reform process has been accounted for by 'base-of-the-pyramid' beneficiaries (Rivera, 2014, 55). By valuing water services through a sustainable price structure and infrastructure financing model, Manila Water has improved financial and health outcomes for all residents, with some of the most significant livelihood improvements flowing to the city's poorest.

By encouraging users to consider the costs of water provision, partially or fully cost-reflective pricing can yield benefits for the equitable and environmentally sustainable use of irrigation water too. However, governments must make pricing decisions based on their particular policy priorities. The Hashemite Kingdom of Jordan, for example, is one of the world's driest countries, yet modelling suggests that 'demand [for irrigation water] is only responsive to prices at levels which are in general not compatible with… equity' (Venot, Molle and Hassan, 2007, 255). In India, despite very low irrigation water prices, 'canal water prices cannot be raised to the point where they can significantly affect water demand' in the short to medium term, and 'low water prices are often not the main reason behind water-inefficient crop choices' (Ray 2007, 122). In both cases, policy levers other than pricing may be more appropriate in reflecting the value of water in its use.

Pricing of pollution (Costa Rica)

By valuing clean water for ecosystem functions, and the negative value of pollution and decreased water quality, decision-makers recognise the value of those functions for the sustainability of human settlements, industries, and cultures.

The negative value of pollution can be expressed in a number of ways. One option is to establish a wastewater permitting scheme where the price of the permits is administratively determined, based partially or fully on an assessment of the benefits of clean water and the costs of degradation of that resource. Another option is to use a cap and trade or property rights approach to establish a market-determined price for pollution (or water quality), with governments allocating wastewater discharge permits and then allowing trade of the permits under the cap. In Australia's Hunter Valley (New South Wales), a scheme like this has been established for salinity trading. A final means for reflecting the positive value of clean water for ecosystem functions, and the corresponding erosion of that value through polluting activities, is by establishing a payment for ecosystem services (PES) scheme.

A PES scheme is an incentive-based approach involving payments made to upstream land and water users to undertake activities that protect the watershed (or to cease activities that degrade it), thus maintaining the provisioning, regulating, supporting and/or cultural and amenity services provided by 'natural infrastructure' (Smith et al., 2006). Key steps in the establishment of a PES scheme include: linking land and water use to downstream benefits; identifying quantitative indicators of watershed health; determining baseline conditions of these indicators; setting a payment level based on a valuation of ecosystem service benefits and willingness to accept among payees; making payments; and measuring progress (Smith et al., 2006).

Several theoretical and practical difficulties arise when attempting to value water resources, and the degradation of those water resources, through the application of a PES scheme. Some of the most significant challenges include: measuring additionality of benefits against an often deteriorating baseline; reducing perverse incentives for the crowding out of existing beneficial land and water uses; and avoiding displacement of environmentally damaging activities to other areas where water is not valued economically under a PES scheme or similar.

> *"Ecosystems have an economic value in relation to water, but this value is poorly understood and rarely articulated. As a result, it is frequently omitted from decision-making, leading to a lack of funding and a lack of water for ecosystems. Consequently, those ecosystems lose their economic value as they are degraded and destroyed."* ***– Emerton and Bos, 2004***

A recent review of two decades of PES scheme operations in Costa Rica found that the scheme has contributed to the conservation of nearly one million hectares of forest, but that there is 'little to no evidence' that water-related ecosystem services have increased due to the effects of the program (Porras et al., 2013, 2). This may be partially due to the difficulty (and expense) of evaluating and monitoring PES schemes in often remote and sparsely populated regions. However, the broad reach of the program is significant, with 26 per cent and 23 per cent of participants coming from indigenous communities and female-headed households respectively by 2012 (Porras et al., 2013, 2). While PES in Costa Rica has helped regularise property ownership among smallholders, program participants have tended to own larger properties; if the government wishes to target payments more substantively to smallholders, further modification of scheme design is required.

Secure tradeable water rights (Australia and Chile)

In a cap and trade agricultural water market, based on secure tradeable water rights, the 'cap' represents an administrative determination of the total pool of water available for consumptive use. In Australia's Murray-Darling Basin, that amount shifts on an annual basis – state governments announce allocations (between 0% and 100%) against perpetual water entitlements depending on climatic and other factors. Within the announced cap, water users are able to trade both water entitlements and the annual allocation against those entitlements.

A cap and trade water market recognises the value of water to current and future generations of water users by restricting total consumptive water use to an administratively determined environmentally sustainable level. In the Murray-Darling, a cap on water abstractions was a direct response to water scarcity, the realisation that sustainable withdrawal limits had been reached, and an appreciation that future water use must rely on sharing the available resource. Markets then enable consumptive water to flow to its highest value use, allowing market participants to weigh the value of water for their needs against its price. In the Australian case, the Murray-Darling market is regulated to meet a number of policy objectives. For example, regulations are used to manage third-party impacts – if a trade between two users would reduce water availability for a third (downstream) user such that they would not be able to draw water to meet their allocation, that trade is restricted or prohibited.

In the Murray-Darling Basin, the Australian Government actively participates in the water market to meet its policy objectives, purchasing water on the market to return water to environmental uses. In this way, the Australian Government acts on its own valuation of water, just as other users do, and contributes to a market valuation of water that ultimately determines the price of traded water in the Basin. Research shows that the use of the market by the Australian Government to purchase water for environmental uses increases water prices, though not to the extent that drought does (Aither, 2016). In this way, markets provide immediate aggregated information on the value of a resource (of fluctuating availability and utility) to individuals, communities and sectors – when water is scarce, and more valuable, higher prices create incentives to conserve it. This information on the marginal value of water for various users can aid administrative decision-making outside the market too, demonstrating the interplay of administrative and market-based instruments for determining and accounting for the value of water.

Markets must be established on firm institutional and regulatory foundations. Some pre-conditions for effective water markets include: knowledge of the volumes of water available in system, a reliable register of water rights, universal metering to monitor use, enforcement to penalise over-abstraction, and a transparent and trusted market regulator. Even in a developed market such as Australia's, there is potential for further improvements in the availability and accuracy of data and in the efficient operation of the market (Aither, 2015). Where institutions are weak and regulations poorly enforced, market failures are more likely to go uncorrected and illegal behaviours more likely to proliferate. In Chile, for example, '[t]he result of decades of neo-liberal law and economics is a structural weakness in capacity for water governance' (Bauer, 2015, 168). The 1981 Water Code was characterised by weak regulation that restricted the government's ability to prosecute policies related to social and distributional equity (Bauer, 2015). If governments wish to pursue such policy objectives, they must either regulate the water market accordingly or pursue non-market interventions such as subsidies. In other words, the role of governments often continues to be critical to achieving desired policy outcomes even where markets are in operation. Of course, weak institutions and poor enforcement also limit the ability of governments to pursue policy objectives through non-market instruments too.

Opportunities for creating impact by incorporating water valuation into a clear development policy agenda

We have seen how water is being valued in numerous country contexts for diverse uses through administrative, market-based and hybrid mechanisms in the cases above. There are clear opportunities to create impact now by better incorporating valuation of water into a development agenda. This section demonstrates how more effectively valuing water can inform and improve decision-making at the government level across a number of intersecting policy areas captured under the other 'lighthouse initiatives' of the High-Level Panel.

In general, valuing water can aid in optimising water use to meet policy objectives related to efficiency, equity and sustainability. Valuation offers a reliable means to transparently demonstrate the trade-offs between managing water for competing uses, including by quantifying the costs and benefits of managing water to meet equity goals.

Water governance and institutions

A holistic and integrated approach to water governance and regulation benefits from adequately valuing water for multiple uses and users, allowing more informed, efficient and equitable decision-making. In turn, valuing water appropriately can help us to perceive the benefits of establishing and maintaining the governance regimes and institutions necessary to prosecute progressive water reforms.

Water data

Accurate valuation of water resources is facilitated by improving water data collection and transparency, especially through metering. Good water data enables decision-makers and water users to understand how the value of water differs across time and space. This understanding in turn enables targeted investments in water infrastructure, including in improved water data collection and analysis systems.

Infrastructure financing

According to the World Water Council and OECD (2015, 26), '[e]conomic instruments such as abstraction and pollution charges or water pricing have a pivotal role to play in financing water resources management'. By encouraging water users to weigh the value they place on water against the costs of accessing it, these instruments tap into individual valuations of water resources and promote an understanding of the underlying costs involved in water provision. Simply put, sustainable financing models for scaled-up long-term investments in water infrastructure all depend on appropriately valuing water. In all contexts, but especially in regions facing water scarcity or high variability of supply, infrastructure for water storage, flood management and irrigation is critical to achieving universal access to clean water for human health, economic opportunity and environmental sustainability.

Widely used options for financing water infrastructure include: tariffs; taxes; transfers; capital contributions; self-financing by users; and philanthropic contributions (World Water Council and OECD, 2015). Several options to improve the availability of private financing and make water infrastructure more attractive to investors have been explored, including developing financial risk mitigation products and mitigating foreign exchange risk (World Panel on Financing Water Infrastructure, 2003).

Environmental and ecosystem services

Regarding the environment as a major 'user' of water and investing in the environment as 'natural infrastructure' is essential to reducing degradation and ensuring sustainable human development. Ecosystems not only require water to maintain healthy function, but, through their use of water, deliver benefits to people. For example, freshwater fisheries, a crucial source of protein and economic opportunity for hundreds of millions of people, would not survive without the provision of water for the environment. In many ecosystems, an under-provision of water for environmental uses can lead to damaging phenomena like salinisation. Valuing water for the environment is an important first step in designing policies that support sustainable use of water resources (e.g. PES schemes, as described above).

Water quality, sanitation and health

Clean water and improved sanitation is a critical determinant of human health and forms the core of SDG 6. Yet, sustainable measureable progress toward this goal over the next 14 years will depend on our commitment to value water for all uses and all users. As outlined above, critical investments in water infrastructure – here, water treatment and monitoring, wastewater management, sanitation services, and pollution control – rely on a clear understanding of the diverse benefits of those investments. These benefits can only be quantified and compared through the application of valuation techniques, not only to assess the positive value of interventions but also to appreciate the negative value of releasing wastewater and pollution into water sources. Properly valuing the negative health impacts of wastewater runoff greatly enhances the investment case for critical wastewater infrastructure.

Resilient economies

In an era of accelerating anthropogenic climate change and increased frequency of some types of natural disaster and extreme weather shocks (IPCC, 2012), the notion of 'resilience' has gained considerable traction. Initiatives such as the Rockefeller Foundation's 100 Resilient Cities and the World Bank's CityStrength diagnostic are supporting governments to increase the resilience of human settlements in the face of adverse shocks, recognising that populations and assets at risk are constantly increasing (100 Resilient Cities, 2016; World Bank, 2015). Fully understanding the value of natural resources (including water) to the economic life of a city is central to designing targeted priority-driven resilience strategies that protect that city's assets. Those economies where water resource management and water supply and treatment infrastructure are designed to protect and extend the value of the resource, and to fully account for current and future pressures on water resources, are likely to be more resilient to climate, food, disaster and energy shocks than those where water is substantially undervalued. Importantly, resilience also highlights the dependence of globalised economies on distant water resources that are drawn upon and affected by economic activity at home.

Global actions to accelerate progress to 2030

The High-Level Panel's goal is to mobilise effective action to accelerate the implementation of SDG 6 and its related targets. This framing note has outlined the critical role that effective valuation of water resources can play in improving the sustainable, equitable and efficient management of water, and driving progress toward clean water and sanitation for all. The following priority actions provide a pathway to spark global action to determine and take into account the value of water more effectively within an SDG timeframe (i.e. to 2030). They each flow from the opportunities identified in the preceding section and require high-level leadership from global governments and heads of state.

Short term (to 2020)

1. Government ministers and high-ranking bureaucrats should promote valuation as a means of informing better and more transparent decision making on the allocation of scarce water resources, reducing opportunities for corruption and the dominance of vested interests.
2. Developed nation governments should fund and promote capacity building to enhance applied valuation capabilities in developing economies, though bilateral initiatives or existing multilateral instruments.

Long term (to 2030)

3. Developing governments and international donors should use valuation techniques to capture and communicate benefits to the poor, and to local and national economies, from investments in water infrastructure, for example by highlighting the high cost of reliance on bottled water.
4. All governments should consider, where appropriate, developing a timeline for the establishment of instruments such as water rights, water accounting, use metering and allocation enforcement.
5. All governments should develop the institutional and regulatory architecture to enable the effective integration of valuation into improved water policy and management decision making, including by implementing the OECD Principles on Water Governance where possible.
6. All governments should require comprehensive cost-benefit analysis for major water resource development decisions, including those relating to new dams and major irrigation projects, to promote transparent consideration of full positive and negative value of water for all uses.

Conclusion - a vision for success

Valuing water means changing the way we think about water by attaching a value to it in all its uses. The value that we give to water will be different depending on who we are and what we are using that water for. When we manage water, our actions should be informed by these diverse – sometimes, divergent – values. Valuing water means optimising the values attached to water as far as possible through management and allocation, noting that this will often mean optimising for multiple criteria, including those related to equity and environmental sustainability. When decision-makers elect to regulate, subsidise or otherwise favour one or more uses or users of water, valuing water simply means understanding the trade-offs involved, and being equipped to communicate them to stakeholders.

By properly valuing water, we can accelerate progress toward the SDG vision of clean water and sanitation for all, funding critical investments in infrastructure and sustainably managing resources for the benefit of current and future generations. If we miss the opportunity to take the next step in valuing water, we risk allowing investments in the economic, social, cultural, environmental and health benefits of appropriate water resource management practices to fall off the list of global development priorities.

As freshwater supplies dwindle in some areas, and the global population continues to grow, valuing water will only become more important to protecting this shared resource. Good valuation practices will equip governments, communities and other decision-makers to use the best information available to optimise the allocation of water and weigh the trade-offs inherent in various pathways to greater efficiency, equity and sustainability in the use of the world's water.

References

100 Resilient Cities 2016, *The city resilience framework*, 100 Resilient Cities, New York, viewed 10 June 2016, <http://www.100resilientcities.org/resilience#/-_/>.

Aither 2015, *Water markets report: 2014-15 review and 2015-16 outlook*, report, Aither, Melbourne.

Aither 2016, *Supply-side drivers of water allocation prices: Identifying and modelling supply-side drivers of water allocation prices in the southern Murray-Darling Basin*, report, Aither, Melbourne.

Bauer, CJ 2015, 'Water conflicts and entrenched governance problems in Chile's market model', *Water Alternatives*, vol. 8, no. 2, pp. 147-172.

Dinar, A, Rosegrant, MW and Meinzen-Dick, R 1997, *Water Allocation Mechanisms – Principles and Examples*, policy research working paper WPS1779, World Bank, Washington DC.

Dublin Statement on Water and Sustainable Development 1992.

Emerton, L and Bos, E 2004, *Value: Counting ecosystems as water infrastructure*, report, IUCN, Gland.

EU Water Initiative 2012, *Pricing water resources to finance their sustainable management*, think piece, EUWI, Stockholm.

Grafton, RQ, Ward, MB, To, H and Kompas, T 2011, 'Determinants of residential water consumption: Evidence and analysis from a 10-country household survey', *Water Resources Research*, vol. 47, no. W08537.

IPCC 2012, *Managing the risks of extreme events and disasters to advance climate change adaptation*, report, Cambridge University Press, Cambridge.

Lal, H, Delgado, JA, Gross, CM, Hesketh, E, McKinney, SP, Cover, H and Shaffer, M 2009, 'Market-based approaches and tools for improving water and air quality', *Environmental Science & Policy*, vol. 12, no. 7, pp. 1028-1039.

Liu, B and Speed, R 2009, 'Water resources management in the People's Republic of China', *International Journal of Water Resources Development*, vol. 25, no. 2, pp. 193-208.

Ostrom, E 1990, *Governing the Commons: The Evolution of Institutions for Collective Action*, Cambridge University Press, Cambridge.

Pohlner, H 2016, 'Institutional change and the political economy of water megaprojects: China's south-north water transfer', *Global Environmental Change*, vol. 38, pp. 205-216.

Porras, I, Barton, DN, Chacon-Cascante, A and Miranda, M 2013, *Learning from 20 years of payments for ecosystem services in Costa Rica*, report, International Institute for Environment and Development, London.

Ray, I 2007, ''Get the prices right': A model of water prices and irrigation efficiency in Maharashtra, India' in F Molle and J Berkoff (eds.), *Irrigation Water Pricing: The Gap Between Theory and Practice*, CABI, Wallingford.

Rivera, VC Jr. 2014, *Tap secrets: The Manila Water story*, report, Asian Development Bank and Manila Water Company, Manila.

Smith, M, de Groot, D, Perrot-Maite, D and Bergkamp, G 2006, *Pay: Establishing payments for watershed services*, report, IUCN, Gland.

Szabo, A 2015, 'The value of free water: Analyzing South Africa's free basic water policy', *Econometrica*, vol. 83, no. 5, pp. 1913-1961.

Venot, J-P, Molle, F and Hassan, Y 2007, 'Wells and canals in Jordan: Can pricing policies regulate irrigation water use?' in F Molle and J Berkoff (eds.), *Irrigation Water Pricing: The Gap Between Theory and Practice*, CABI, Wallingford.

World Bank 2015, *The CityStrength diagnostic: resilient cities program*, World Bank, Washington DC, viewed 15 June 2016, <http://www.worldbank.org/en/topic/urbandevelopment/brief/citystrength>.

World Bank 2016, *High and dry: Climate change, water, and the economy*, report, World Bank, Washington DC.

World Panel on Financing Water Infrastructure 2003, *Financing water for all: Report of the World Panel on Financing Water Infrastructure*, report, World Water Council, Marseille.

World Water Council and OECD 2015, *Water: Fit to finance? Catalyzing national growth through investment in water security*, report, World Water Council, Marseille.

Australia

water partners for development

The Australian Water Partnership is an Australian Government aid initiative bringing together public and private organisations from the Australian water sector with development partners in the Asia-Pacific.

Australian Water Partnership UC Innovation Centre (Bldg 22), University Drive South, Canberra ACT 2617, Australia
T +61 2 6206 8320 **E** contact@waterpartnership.org.au **waterpartnership.org.au** Implementing partner: eWater Ltd ABN 47 115 422 903 (www.ewater.org.au)