Building Resilient Economies and Communities Through the Effective Management of Water Scarcity and Drought

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:
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Key Messages

- *Water scarcity has both natural and human-related causes. Drought is the most acute state of water scarcity, and both scarcity and drought impact on poverty and economic growth, human health and well-being, gender inequality and social dislocation, as well as on environmental condition and biodiversity.*
- *Under climate change, water scarcity will worsen in many countries where it is already a significant problem, and will extend to new areas. There will be more frequent and/or severe droughts, accompanied by worsening economic and societal shocks, unless planned for and mitigated well in advance.*
- *Changes in human populations and settlements will exacerbate problems of scarcity and drought, as will poor decisions on water allocation and use.*
- *Building resilience to scarcity and drought needs to be seen as an integral component of water security planning for economic growth, with innovative allocation and demand-side policies complementing the traditional approach of building additional, or more reliable, water supply infrastructure.*
- *In many countries and regions, options to build new water supply infrastructure, will be necessary but also constrained because systems are approaching hydrological and ecological limits and/or are becoming less reliable under climate change.*
- *The High-Level Panel on Water can play a significant role in changing the current paradigm for water management by ensuring that the need to build economic and community resilience to water scarcity and drought is recognised as a critical component in all water policy and planning. In this regard, six key strategies are proposed*
    - *Scarcity planning as an integral part of long-term water management*
    - *Growing and diversifying water supply and understanding its reliability*
    - *Reforming the efficiency of water allocation*
    - *Improving the efficiency of water use*
    - *Seeking multi-benefit and multi-stakeholder solutions*
    - *Improving scarcity-related hydro-meteorological data and forecasting*

1 The Scarcity Challenge and its link to the 2030 Agenda and SDGs

Currently, water scarcity affects more than 40 per cent of the global population. Over 1.7 billion people are currently living in river basins where water use exceeds recharge. This is projected to rise as demand increases with growing populations and rising incomes. However, this predicted increase in people affected by water scarcity will be compounded by the effects of climate change in the future. Climate change is predicted to change the patterns of surface run-off globally. In many of these regions, climate change will not only cause a reduction in rainfall and streamflow but also an increase in hydrologic variability (World Bank, 2016). This means that in many regions, there will be an increase in the frequency and severity of droughts and floods.

The real impacts of 'chronic' water scarcity manifest themselves during 'acute' droughts. Droughts have been shown to have significant negative effects on economic growth and this effect can compound over time. Poor countries with highly variable rainfall and run-off can spiral into poverty traps due to the recurrent effect of droughts because of the substantial feedback loops between water-related losses and national wealth (Sadoff et al., 2015). These include crop failures, food shortages, livestock deaths, famine, migration and conflict. Droughts also exacerbate the impact of water resource development on the environment. These periods of water shortage cause great hardship to people and communities. They cause shocks to their local environments and regional economies in highly complex and inter-related ways and can have social, economic and environmental impacts that can continue for decades.

Water scarcity and the provision of water security are now recognised as a key global challenge. The Global Risks Report 2016 (World Economic Forum, 2016) highlighted the failure to adapt/mitigate to climate change and water crises in the top three global risks but noted that these are inter-related and that climate change will significantly exacerbate the existing water risk. The answer to water scarcity in the past has been investment in water infrastructure to provide storage and buffer against periods of water shortage, thus providing some degree of water security. This has been shown to be effective. Countries which have made large investments in water security infrastructure (eg dams) are generally wealthier than those who have not (Sadoff et al., 2015). They can cope better with droughts when they occur, although they are never 'drought-proofed'. Moreover, the opportunities to continue to build water supply infrastructure decrease significantly as the country approaches the physical and ecological limits of its surface- and ground-water systems.

As we face a future with the potential for more frequent, more severe droughts in more parts of the world, it will be important that we give serious consideration as to how we build resilience to water scarcity into our water planning, management and investment decisions. Investment in water infrastructure will continue to be highly important but it will need to be undertaken within a policy and planning environment that understands the ongoing, residual risk of drought and water shortage and mitigates it with a variety of policy and regulatory tools that will remain effective in a less certain future.

This framing paper proposes that planning and investment for water security needs to include a thorough understanding of the risk and consequences of scarcity and should aim to build resilience to minimise negative economic, social and environmental consequences when drought inevitably occurs (whether seasonal or multi-year). Solutions for the future will require not only investment in diverse types of water supply infrastructure (including greater reuse and climate-independent supplies such as desalination), but also policy and regulatory frameworks that manage demand and promote efficient allocation and use within sustainable social and ecological objectives and limits.

2 Interlinkages with other challenges

The High-Level Panel on Water has recognised that there are at least five inter-related areas where work is required to produce a definitive development agenda (Figure 1)

Figure 1. Key global water-related challenges (after High-Level Panel on Water Draft Action Plan)

Ensuring that we build resilience to water scarcity will have impacts in all of these key challenge areas. It should be a critical consideration in building resilient economies in countries currently affected and likely to be affected by water scarcity in the future. It is an obvious consideration in the development of a water infrastructure and investment agenda. It is critical in the protection of environmental services given that drought and water shortages are the times when impacts of water management are most apparent and obviously damaging to the environment. It is also an important consideration in food production, electricity generation and in the design of human settlements as they grow and expand and the provision of water quality and sanitation and health services.

Building resilience to water scarcity needs to be a key consideration in the policy and action agendas in all challenge areas and a key performance indicator of success for the Action Plan of the High-Level Panel on Water.

The approach is critical to a number of the Sustainable Development Goals. This approach will assist in meeting goals and specific targets in relation to SDG 6 relating to water. However, it will also assist in meeting related goals and targets for SDG 1 in building resilience of the poor to climate-related shocks and disasters, SDG 13 relating to climate change and SDGs 2,7,8,9 and 11.

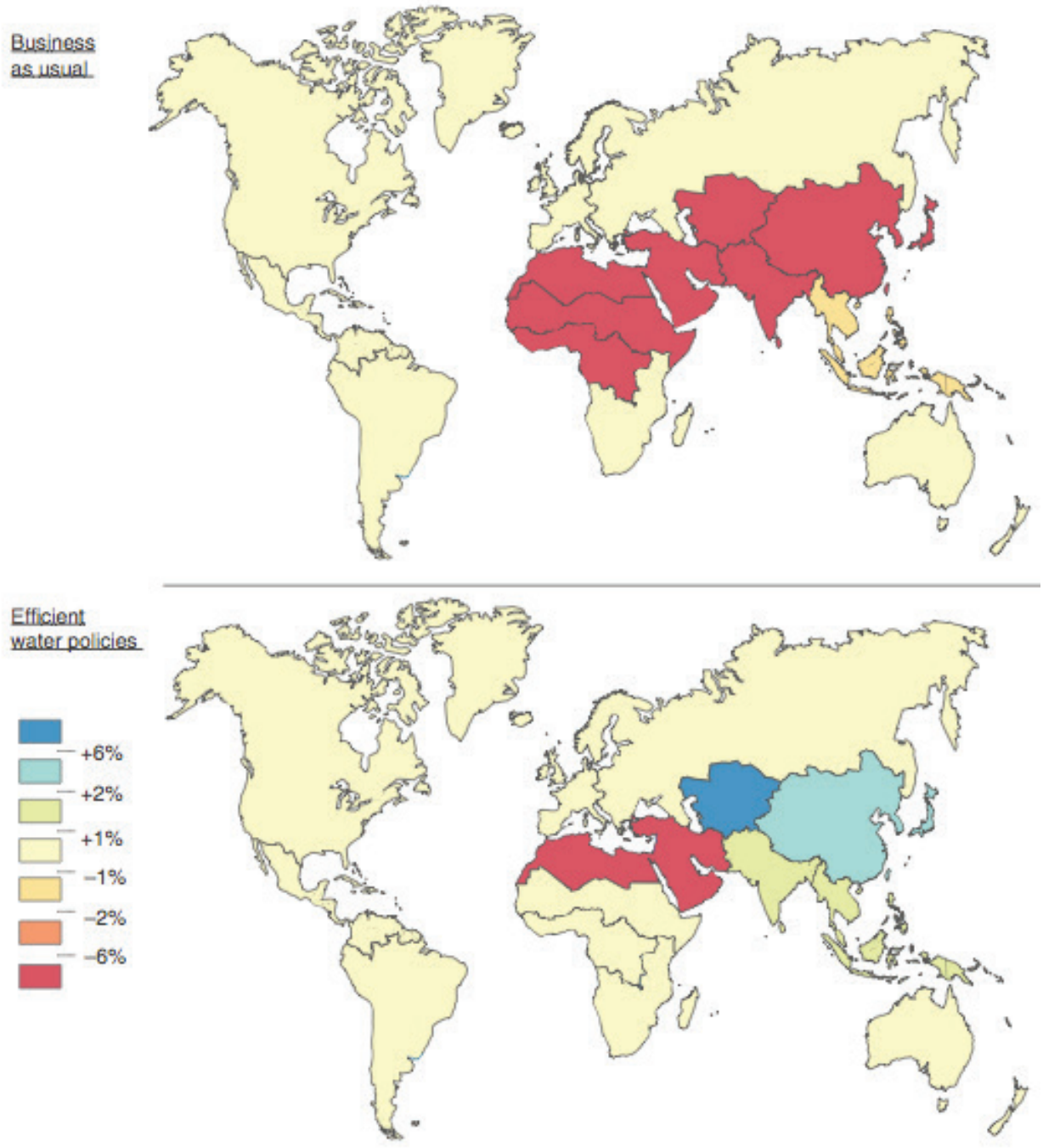
3 International Context

The issue of water scarcity and the need for water security has been recognised as a global issue and there are a number of major groups working in this area. Most recently, the GWP/OECD Task Force on Water Security and Sustainable Growth released a significant report 'Securing Water, Sustaining Growth' (Sadoff et al., 2015) which aimed to promote sustainable growth by providing clear empirical evidence to guide investment in water security. The World Bank report 'High and Dry' (World Bank, 2016) documented the drivers of changing patterns in supply and demand for water in a climate change affected world and looked to offer solutions to ensure that water did not become more of a constraint on prosperity.

This report identified those broad areas within the world where water security would be hardest hit by climate change. It showed that the largest increases in water deficits are predicted to occur in the Middle East, North Africa, Central Asia and parts of South Asia and that this is likely to lead to economic losses in the future. However, the report also highlighted that the implementation of improved water management policies with a focus on boosting efficiency and allocating water to more highly-valued uses could not only mitigate predicted losses from climate stress but could lead to improved growth rates (Figure 2). Their overarching message is that prudent water-management policies can do much to secure growth, making people more prosperous and thus more resilient to climate stresses.

In addition, many countries and regions, particularly those currently experiencing drought, are looking to dry countries such as Israel, Jordan and Australia to see if their experience in managing water scarcity or sustaining prolonged drought can provide useful guidance in building greater resilience to scarcity (Turner et al., 2016). The recent 'Millennium Drought' in Australia) bears out the conclusions in the World Bank report 'High and Dry' (World Bank, 2016). Whilst the Millennium drought caused significant challenges for the cities, rural communities, agricultural enterprises and the environment, the economic and social consequences of that drought were less severe as a result of long-term scarcity planning and water reforms, particularly those relating to the establishment of allocation regimes set within sustainable system limits, legal water rights for water users, and water trading and public accounting (National Water Commission, 2014).

Figure 2. The estimated effects of water scarcity in 2050 under two policy regimes (from World Bank, 2016)



Source: World Bank calculations.
Note: The top map shows the estimated change in 2050 GDP due to water scarcity, under a business-as-usual policy regime. The bottom map shows the same estimate, under a policy regime that incentivizes more efficient allocation and use of water.

4 A Potential Way Forward

In many regions currently affected by water scarcity and drought, individual countries are working with international investment agencies to develop a program of planning and infrastructure to improve water security, reduce poverty and social hardship, especially for women and children, and to enable sustainable economic growth. Given the potential impact of climate change, it is important that these programs build greater resilience to drought and water scarcity alongside or as a counterpart to improving overall water security. Drought will continue to occur but its impacts can be better managed and mitigated with smart water policy and management. This will require changes in approaches to both water infrastructure and investment, allocation planning and demand management, efficient treatment, distribution and use – whether at basin, city or village scale - and a greater emphasis on drought planning and forecasting of water availability under different climate and allocation scenarios. Six key areas that can assist in building resilience to scarcity and drought are described below.

Increasing water supply and understanding its reliability

In considering options for new water supplies, it is critical that reliability of supply is understood under all climate change scenarios, and that decisions are made that will continue to be effective under drier and more variable climate. This means understanding how water yield may be affected by climate change, the dependence of various water users and uses on reliability of supply and the impacts of climate scenarios on each of these uses. It also requires understanding how the physical, environmental and ecological resource limits may be impacted (eg. through changing land-use patterns or river management approaches). In 'over-allocated' surface- or ground-water it may be necessary to 'cap', or even reduce, water abstraction for irrigation or industry, to provide greater reliability for critical human needs or for protection for the environment. Making decisions that continue to be effective under a drier or more variable climate may require consideration of a broader range of water supply options with less dependence on climate influences eg desalination, recycled water, aquifer recharge, inter-system connections (although energy and ecological impacts first need to be carefully considered).

Reforming the efficiency of water allocation

In countries or basins where water use is approaching or has overstepped the physical and ecological limits of the (surface- or ground-water) system, there may be few options for increasing water supply. Where this is the case, abstraction limits will need to be set, and no more water can be allocated for use in the future. Once this occurs, the imperative is then to manage within the available pool for consumptive use. If the aim is to increase the economic production from a water system over time, while maximising social and environmental outcomes, this can only occur through becoming more efficient in both the way water is allocated between user and uses, and then how efficiently it is used in each use setting.

Improved 'allocative efficiency' can be achieved through a government-led 'administrative' system of water allocation and water licences, or through a government-regulated 'tradeable' (or market-based) system of water rights. Both approaches enable water to move to higher value economic uses, although many argue that a tradeable system is the most efficient way to allocate water in a resource-limited setting (this topic is given greater in-depth coverage in the Australian framing paper on 'Valuing Water').

In the Australian context where water trading is widespread in many areas (especially within the Murray-Darling Basin), for individual farmers, a legally-defined water right becomes a financial asset (like land tenure) providing water that they can either use or sell. In droughts, farmers have greater flexibility and choice about how they manage their farms – they can choose to sell their seasonal water allocation and realise cash or, if financially able, they can choose to buy additional water rights or seasonal allocations.

Efficient allocation and trading enables greater economic value to be realised with however much water is available for use. This being said, establishing systems of tradeable water rights must be undertaken with care and in sensible stages where the evolution of a trading system is accompanied by complementary advances in governance and information systems. For example, a staged approach could include firstly the introduction of local agreements to trade water, that could eventually be expanded to include 'bulk' water transfers between districts and, ultimately, a move to the establishment of open water markets.

The introduction of water trading in some form provides a much greater degree of economic resilience to drought within the irrigated agriculture sector a much higher level of production for a nation overall. This was shown in Australia in the Millennium Drought when, in the critical period between 2005-06 and 2008-09, water availability for irrigation decreased by 53 per cent but the gross economic value of irrigated agricultural production dropped by only 29 per cent. (National Water Commission, 2014).

Of course, such approaches may be less controversial in developed countries and economies where fundamental issues of poverty and social hardship have been (largely) addressed. Nevertheless, for many developing countries, *in situations where water supply systems have reached physical and ecological limits of use*, moving to some form of tradeable system of water rights – whether formally instituted by governments or informally established amongst local farmers – may be critical for building long-term water scarcity and drought resilience.

Improving the efficiency of water use

Within a broad framework of social equity and fairness, people in cities and working in agriculture and industries, should be incentivised to make the most efficient use of water through a range of mechanisms. These could include clear pricing signals (at whatever level of subsidy/cost-recovery is deemed appropriate by governments in different societal settings), performance benchmarking for water utilities, and quantity- and quality-related licence conditions for industries (including recycling/reuse conditions). It could include government investment in water efficient agricultural practices, irrigation systems and farm enterprises, and the introduction of drought tolerant crops. It could also include regulation, particularly in cities, requiring water efficiency to be built into new building codes and 'smart' city planning processes, and the provision of behavioural change programs, water efficiency labelling schemes and incentives to encourage more efficient use of water in households. The degree and extent to which each of these tools can be applied will depend on the level of water development, and the socio-economic setting, in a specific country or region. In developing countries, working to provide basic water and sanitation to their communities, the focus would be to implement, as far as possible, water efficient water supply and wastewater management processes and water efficient agriculture. Wherever possible, this should including learning from the successes ,and mistakes, of other countries, taking advantage of emerging technologies and avoid some of the costly mistakes that other have made from over-allocation and water profligacy. In doing so, ensuring equity and access for the poor and soicaly excluded is a key consideration that must be built into policy frameworks for managing water scarcity.

Looking for multi-benefit and multi-stakeholder solutions

Building resilience to drought requires consideration of the impacts of drought on the environment, as well as on rural and urban communities especially the poorest and most disadvantaged. Quite frequently, periods of water shortage put massive pressure on already stressed environments and can result in an acceleration of environmental loss that can then have significant consequences for dependent communities. For example, in the coastal areas of Bangladesh, drought impacts include soil salinization as water levels drop, exacerbating agricultural losses (Miyan, 2015). Drying of wetlands and lakes severely affects the livelihoods of fishing communities.

Building resilience to water scarcity in these situations will require understanding of the environmental impacts and community dependencies, and including these considerations in water security programs. For example, in looking to invest in new water supplies or more water-efficient infrastructure, there may be real opportunities to achieve multi-benefits for the environment as well. For example, new irrigation infrastructure can be planned to provide environmental benefits by enabling wetland watering; pipelining open irrigation channels can save significant volumes of water some of which could be provided for environmental protection. In considering new infrastructure proposals, there are real opportunities to require a range of environmental and social benefits as well as pure economic benefits and build resilience to drought along the way.

Drought planning as a key part of water management

Building resilience to scarcity also requires understanding how drought will impact on community sectors, agriculture and the environment and being prepared to deal with these effectively. This means that adequate drought planning needs to be undertaken at the regional and local level with mitigation strategies planned and information provided to communities and industry sectors.

As already noted, effective drought planning requires a real understanding of the true reliability of water supplies under climate scenarios and a matching of water use to reliability. In developed countries, this is then manifested in restriction policies, seasonal allocation rules, water trading rules, and contingency plans for providing water supplies to meet critical human needs. In less developed countries, it could include improved early warning monitoring and the development of regional drought coping strategies that could include the provision of advice on appropriate crop planting and the best areas for herd management. It could also include monitoring food supplies and contingency planning for food provision in advance of disasters occurring (Miyan, 2015).

Drought planning should also enable identification of high priority ecological areas (eg drought refuges for native fish) and the development of plans to provide maintenance regimes for them to survive through water shortages. It also supports the provision of green spaces in cities and sets the triggers for agricultural and community drought relief programs. Drought planning is aimed at coping with water shortages, minimising their impacts as far as possible and building long term resilience to drought.

Improved hydro-meteorological data and forecasting

A key element of being prepared for drought is to be able to forecast water availability over the short and medium term with some degree of accuracy. This is critical to support water utilities providing water supplies to cities, and to support a more drought resilient irrigated agriculture sector making decisions about crop plantings and water trading (where implemented). It is critical in less developed countries where timely information can enable improve crop planting and local drought strategies to be implemented, reducing the impacts of water scarcity when it does occur. The greater the accuracy in forecasting, the greater preparedness for drought, which then enables better mitigation strategies.

All of these areas are consistent with the conclusions in the World Bank report 'High and Dry' (World Bank, 2016). However, for a specific nation, the combination of these actions and the focus of each would very much depend on its current level of water resources development, patterns of water use and degree of water scarcity. Implementation would clearly have to be designed to suit a nation or region. For a wealthy country with highly developed water resources, the combination could be more around enhancing markets, promoting efficiency with sophisticated drought planning for cities and industries. For a poorer country with low water security, the focus could be on provision of climate-insensitive infrastructure, providing less water-dependent ecological outcomes (eg. habitat protection/restoration), the implementation of efficient irrigation practices and the adoption of drought resilient crops coupled with improved forecasting and information provision.

From a global perspective, the priority for providing assistance in managing water scarcity will be in the Middle East, North Africa, Central Asia and parts of South Asia where droughts currently cause massive economic hardship which will only worsen under climate change. Regardless of the region or country involved, building drought security in any realistic and effective way, will require a change in the way water is viewed and treated in many parts of the world, as observed in the World Bank report (World Bank, 2016). It will require transitioning to a view that water is an increasingly scarce resource that, if managed well, can provide significant economic value to a nation whilst working within a fair and equitable societal context and sustainable ecological limits. While this may be increasingly observed, it has not yet become the definitive paradigm for water management globally.

Potential actions for consideration of the High-Level Panel on Water include

- A clear statement on the need to manage water as a scarce resource, within sustainable physical and ecological limits, to reduce poverty and enable economic prosperity
- In developing policy and investment criteria for water infrastructure, include the need to build drought resilience alongside general water security
- Promote water use efficient in all contexts and across all scales
- Selectively support high-level forums for further discussion on pathways to scarcity and drought resilience, including provide case-studies of drought resilient cities and drought resilient irrigation sectors.
- Encourage drought planning at regional scales in countries and regions with current and predicted water scarcity issues
- Invest in improved forecasting of short, medium and long term water availability at scales that can be applied in local management
- Undertake an analysis of nations on the basis of their water security status and climate change predictions and identify broad pathways to build resilience to drought as a guide to investors and relevant NGOs (building on (World Bank, 2016)
- Develop guidelines for improving drought resilience in regional water management programs including reduction of poverty and environmental considerations
- Assist countries with water scarcity problems transitioning to systems where water can move between users – this could occur through a long-term phased process moving from administrative allocation, to systems of local agreements, to expanded bulk water transfers and potentially to tradeable water right and accounting systems
- Support partnering (twinning) between countries with experience in building drought resilience with those at threat of increasing water scarcity and a readiness to tackle the issue.

If countries currently at risk of water scarcity can adopt smart water management policies and approaches (such as those broadly outlined above), modelling suggests in 2050 the impact of climate change and water scarcity on the GDPs of the nations of the world will not be as severe as under current water management regimes, and some countries will experience increased growth rates despite greater water scarcity (World Bank, 2016) (Figure 2 above). For those countries, this will provide very significant economic benefits and the prosperity and wellbeing of their communities will increase.

The alternative of persisting with inadequate water management policies puts a large section of the world with the greatest proportion of the poor at huge risk of greater economic decline with its accompanying problems of instability.

Implementing these approaches will mean there is a greater chance that the ambitious SDG goals will be able to be met. Without them, there is little chance they can be achieved given the likely impact of climate change on the water resource of the world.

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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.

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