



The United Nations World Water Development Report 2016

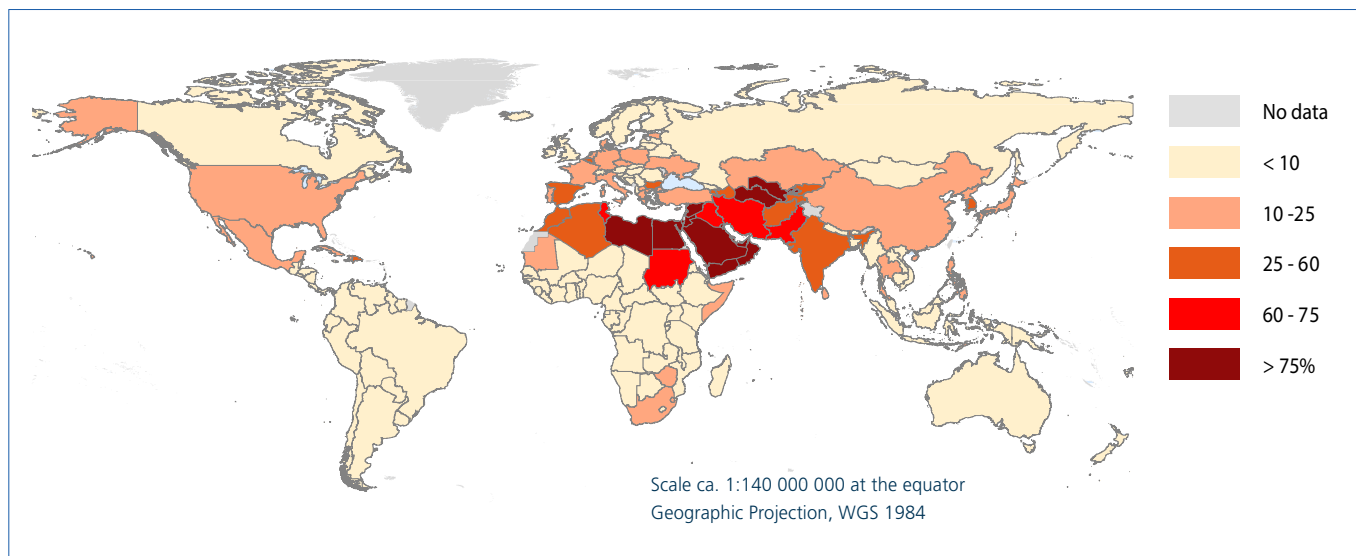
WATER AND JOBS

Facts and Figures

FRESHWATER: STATE OF THE RESOURCE, DEMAND AND ACCESS

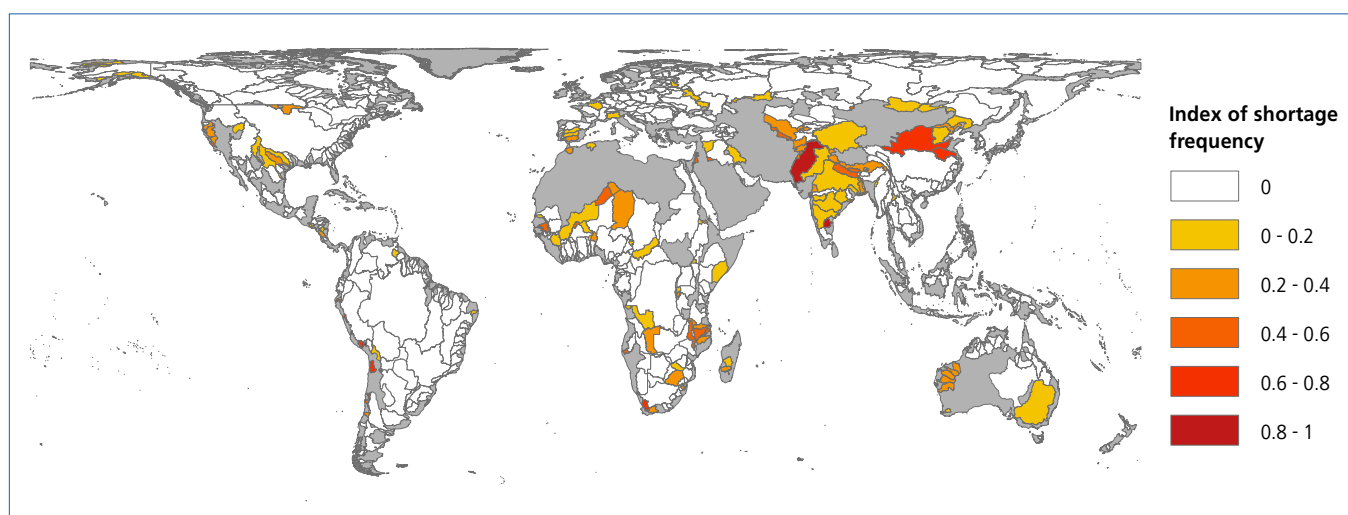
- In an attempt to better capture the relation between supply and demand, the Millennium Development Goal Water Indicator purports to measure the level of human pressure on water resources, based on the ration between water withdrawal by agriculture, municipalities and industries over total renewable water resources (UNSD, n.d.) (see Figure 2.2)

Figure 2.2 Percentage of renewable water resources withdrawn



Source: FAO (2015a, http://www.fao.org/nr/water/aquastat/maps/MDG_eng.pdf).

Figure 2.4 Index of frequency of shortages of water available for use on a month-to-month basis



Note: The index shows how frequently reservoir levels are predicted to fall below 20% of the total storage, which the authors have taken as being the storage level at which, on average, restrictions on water use may be applied. Their analysis tracked whether there is enough water available from rivers, groundwater or reservoirs on a monthly basis to satisfy existing water use patterns.

Source: Sadoff et al. (2015, Fig. 8, p. 77).

- Water scarcity emerges from a combination of hydrological variability and high human use, which may in part be mitigated by storage infrastructure. According to Figure 2.4, while the risks of monthly water shortages are most severe in South Asia and Northern China, some significant risks of seasonal water scarcity appear on all continents. However, since this analysis is based on river basins, it does not address the most arid parts of the world, such as North Africa and the Arabian Peninsula, through which no rivers flow (Sadoff et al., 2015).
- Between 2011 and 2050, the world population is expected to increase by 33%, growing from 7.0 billion to 9.3 billion (UN DESA, 2011), and food demand will rise by 60% in the same period (Alexandratos and Bruinsma, 2012). Furthermore, it is projected that populations living in urban areas will almost double, from 3.6 billion in 2011 to 6.3 billion in 2050 (UN DESA, 2011).
The OECD's 2012 Global Environmental Outlook's Baseline Scenario (OECD, 2012a)¹ projects increasing strains on freshwater availability through 2050, with an additional 2.3 billion people expected to be living in areas with severe water stress, especially in North and South Africa and South and Central Asia. Another report predicts the world could face a 40% global water deficit by 2030 under a business-as-usual (BAU) scenario (2030 WRG, 2009).
- Water-use efficiency improvements are considered instrumental to address the projected 40% gap between demand and supply and mitigate water scarcities by 2030 (UNEP, 2011d).
- An estimated 663 million people lack ready access to improved² sources of drinking water, while the number of people without reliable access to water of good enough quality to be safe for human consumption is at least 1.8 billion (UNICEF/WHO, 2015), and possibly significantly more. More than one third of the global population – some 2.4 billion people – do not use improved sanitation facilities; of these, 1 billion people still practice open defecation (UNICEF/WHO, 2015).
- Agriculture accounts for roughly 70% of total freshwater withdrawals globally and for over 90%

¹ The OECD's Baseline Scenario is a business-as-usual scenario that assumes linear growth rates in water demand trends and the absence of new policies that would affect these growth trends.

² An 'improved water source' is defined as one where human use is kept separate from use by animals and faecal contamination. However, water from an 'improved source' is not necessarily free of bacteria or other contamination and is not necessarily safe.



Employees monitoring operational data in Civitavecchia (Italy)
Photo: © Alessia Pierdomenico/Shutterstock.com

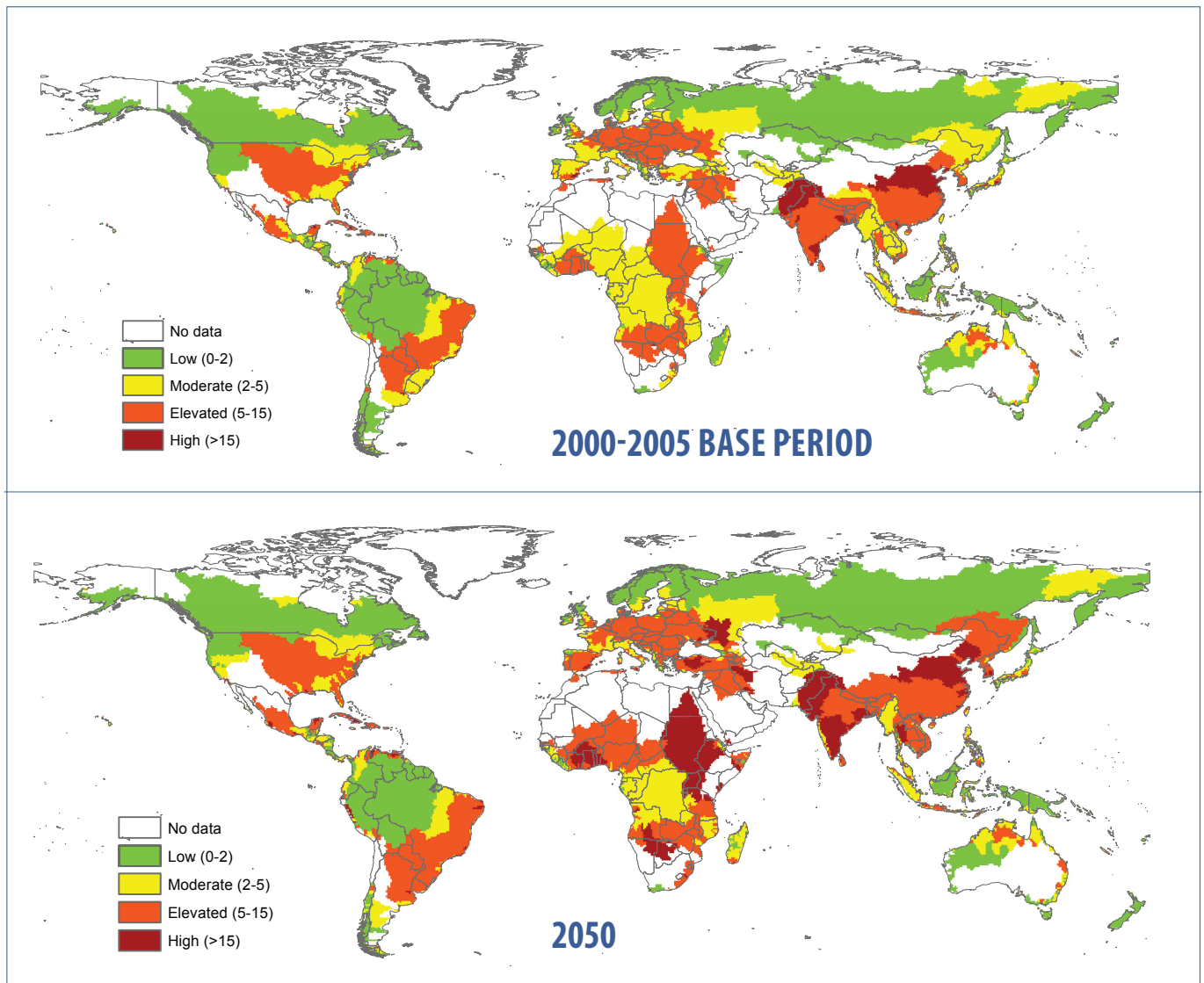
in the majority of Least Developed Countries (LDCs) (FAO, 2011a). Without improved efficiency measures, agricultural water consumption is expected to increase by about 20% globally by 2050 (WWAP, 2012).

- Globally, some 38% of irrigated areas depend on groundwater (Siebert et al., 2013), which has contributed to a ten-fold increase of groundwater abstraction for agricultural irrigation over the last 50 years. At the same time, almost half of the world's population depends on groundwater for drinking (Tushaar et al., 2007). Projected increased water demand, primarily from manufacturing, electricity and domestic use will generate further stress on water resources and possibly impact water allocation for irrigation (OECD, 2012a).
- Overall, industry (including energy) uses about 19% of the world's total water withdrawal (FAO, 2014f). According to the IEA (2012b), energy uses about 15% of the total, which implies approximately 4% for large industry and manufacturing (but not including all the small- and medium-sized industries which receive water from municipal distribution systems). However, it is predicted that by 2050 manufacturing alone will increase its use by 400% (OECD, 2012c).
- Water demand for energy, and electricity generation in particular, will also grow significantly (WWAP, 2014), as energy demand is expected to grow by more than one-third in the period 2010-2035, with 90% occurring in non-OECD countries (IEA, 2012a).w
- Fulfilling the water-related needs of households (for drinking water, sanitation, hygiene, cleaning, etc.), institutions (e.g. schools and hospitals) and most small- and medium-sized industries, municipal systems account for the remaining 10% of global freshwater withdrawals (WWAP, 2012).

Ecosystem health

- Environmental water requirements (EWR) required for maintaining a fair condition of freshwater bodies range globally from 20% to 50% of the mean annual river flow in a basin (Boelee, 2011).
- In 2010, severe organic pollution (with monthly in-stream concentrations of BOD above 8 mg/L) is estimated to affect 6% to 10% of Latin American river stretches, 7% to 15% of African river stretches, and 11% to 17% of Asian river stretches (UNEP, forthcoming).
- It is estimated that the number of people living in environments with high water quality risks due to excessive biochemical oxygen demand (BOD) will affect one fifth of the global population in 2050, while people facing risks from excessive nitrogen and phosphorous will increase to one third of the global population over the same period (Veolia and IFPRI, 2015). Projected changes in water quality risks vary at country and basin levels (Figure 2.7).
- Use of municipal wastewater can represent up to 35% of the total water extracted for use in some countries (Jiménez Cisneros and Asano, 2008a). The re-use of water for irrigation is the most common strategy for recycling wastewater.

Figure 2.7 Water quality risk indices for major river basins during base period (2000-2005) compared to 2050 (N index under the CSIRO*-medium scenario**)



Note:

* Commonwealth Scientific and Industrial Research Organization

** This scenario takes account of a drier future (as projected by the CSIRO climate change model) and a medium level of socio-economic growth.

Source: Veolia and IFPRI (2015, Fig. 3, p. 9).

Opportunities for water source diversification

- Globally, it has been estimated that between four to six million hectares (Jiménez Cisneros and Asano, 2008b; Keraita et al., 2008) and 20 million hectares (WHO, 2006) of land are irrigated with untreated wastewater (Drechsel et al., 2010).
- The use of rainwater harvesting, green roofs and other green infrastructure is gaining interest in some urban environments. This has a direct impact on reducing water consumption, in addition to reducing flood risk through increasing and decentralizing storage, reducing energy consumption through evaporative cooling, and improving the urban environment.
- Estimates indicate that about 30% of global water abstraction is lost through leakage (Kingdom et al., 2006; Danilenko et al., 2014). Even in developed countries the loss in water supply systems can be higher than 30%, with cities such as London reaching 25% (Thames London, 2014), and in Norway 32% (Statistics Norway, 2015).

Climate change and extreme events

- The 5th assessment of the Intergovernmental Panel on Climate Change (IPCC) projects that for each degree of global warming, approximately 7% of the global population will be exposed to a decrease of renewable water resources of at least 20% (Döll et al., 2014; Schewe et al., 2014).
- The impacts of climate change are expected to lead to substantial unemployment across the global economy through employment cuts, and may amount to a reduction of 2% of jobs by 2020 (Jochem et al., 2009).
- Worldwide flood damage amounted to over US\$50 billion in 2013 and is increasing (Guha-Sapir et al., 2014).
- Several studies estimate that by 2050 between 150 and 200 million people could be displaced as a consequence of phenomena, such as desertification, sea level rise and increased extreme weather events (Scheffran et al., 2012).
- Worldwide, the total cost of water insecurity to the global economy is estimated at US\$500 billion annually. Including environmental impacts, this figure may rise to 1% of global gross domestic product (GDP) (Sadoff et al., 2015).

A costly status quo

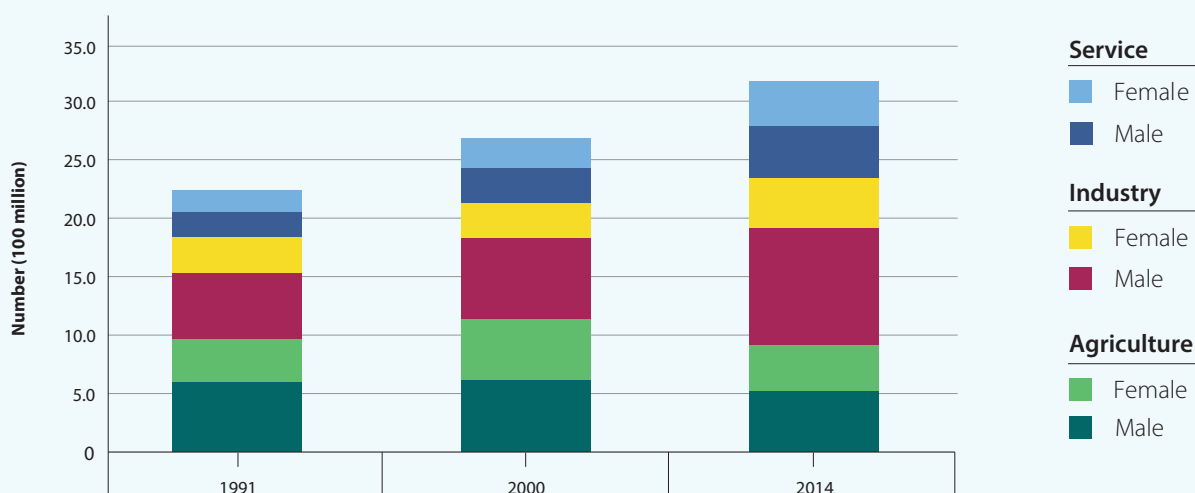
- The World Bank estimates that degraded water quality costs Middle Eastern and North African countries between 0.5% and 2.5% of their annual GDP (World Bank, 2007a).

ECONOMY, JOBS AND WATER

Employment trends and water-dependent jobs

- ILO's employment statistics show that the global active workforce (i.e. paid work) increased from 2.3 billion people in 1991 to an estimated 3.2 billion in 2014, while the global population grew from 5.4 billion to 7.2 billion over the same period (UN DESA, 2001, 2015). The industry and services sectors account for this increase, while employment in the agricultural sectors (agriculture, forestry and fishing) experienced a slight decrease during this period (Figure 3.2).
- Half of the global workforce is employed in eight water and natural resource-dependent industries: agriculture, forestry, fisheries, energy, resource-intensive manufacturing, recycling, building and transport. Over a billion people are employed in the fisheries, agriculture and forestry sectors alone, the last two representing some of the sectors most threatened by freshwater disruptions (ILO, 2013a).
- Employment in the agriculture sector dropped from just over one billion people in 2000 to 930 million in 2014, accounting for just under 30%. Globally, in 2014 roughly 520 million men and 410 million women were employed in agriculture, accounting for one third of all employed women. Agriculture is the primary employment sector in most developing countries and currently accounts for 60% of all jobs in Sub-Saharan Africa where women account for one half the sector's workforce.
- Employment figures for the industrial sector have grown from 1 billion to 1.4 billion people between 2000 and 2014, accounting for just under 45% of the global active workforce. Men account for 70% of the global industrial workforce.

Figure 3.2 Global employment trends, by sector and sex



Source: WWAP, based on the Supporting Datasets for the World Employment Social Outlook: Trends 2015 (ILO, 2015a).

- Employment in the services sector grew by 50% between 2000 and 2014, increasing from 545 million to just over 835 million people, accounting for a little over 25% of the global active workforce.
- It is estimated that 95% of jobs in the agriculture sector, 30% of jobs in the industry sector, and 10% of jobs in the services sector are heavily dependent on water. Accordingly, 1.35 billion jobs (42% of the world's total active workforce) are likely to be heavily water-dependent (2014 est.).
- It is estimated that 5% of jobs in the agriculture sector, 60% of jobs in the industry sector and 30% of jobs in the services sector are moderately dependent on water. Accordingly, 1.15 billion jobs (36% of the world's total active workforce) are likely to be moderately water-dependent (2014 est.).
- In essence, this means that 78% of the jobs constituting the global workforce are water-dependent.
- In addition, a number of ancillary jobs facilitate the creation of water-dependent jobs. These include many jobs in regulatory institutions within public administrations, infrastructure financing, real estate, wholesale and retail trade, and construction. Such jobs provide the enabling environment and necessary support to the activities or operation of water-dependent organizations, institutions, industries or systems.

Water and jobs in the agri-food sector

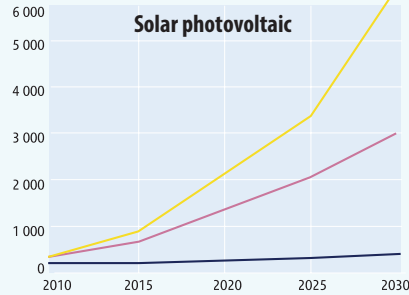
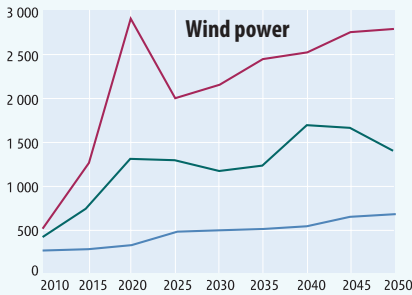
- Jobs in the agri-food sector are difficult to estimate and go beyond jobs, as food production has multiple meanings for different people. Only 20% of people working in agriculture are considered to be employed as waged workers (World Bank, 2005), and the remaining are self-employed or contribute family labour to around 570 million farms in the world.
- Farm incomes and agricultural wages represent 42% to 75% of rural income in agricultural based countries, and 27% to 48% in transforming and urbanizing countries (see Table 3.3 for definitions) (World Bank, 2007b).
- Increasing pressures to meet rising food demand and climate change will exacerbate the challenges related to land degradation, industrial development and growing cities. 'Under business-as-usual scenario, 45% of global GDP, 52% of the world's population and 40% of grain production could be at risk due to water stress by 2050' (IFPRI, n.d.).
- Supporting the predominant small family farmers, fishers and processors can help absorb the growing rural labour force by better managing labour intensive production while facilitating progressive transitions out of agriculture (Losch et al., 2012).
- With the lowest level of irrigated agriculture (5% of the cultivated area against more than 40% in Asia and a world average of just over 20%), and only one third of its potential in irrigation tapped, Sub-Saharan Africa appears to be a priority for investment in water and aquaculture (FAO/WWC, 2015).

Figure 3.8 Direct jobs in renewable energy

Green jobs in the future

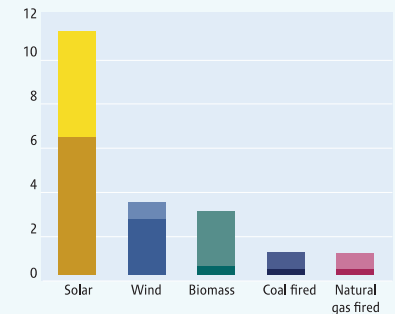
Scenarios — Reference Moderate Best case

Thousands jobs per year



Average employment over life of facility

Jobs per megawatt of average capacity



Source: UNEP/GRID-Arendal (n.d.).

Water and jobs in the energy sector

- The vast majority of electricity production is either very dependent on cooling water or is generated as hydroelectricity by using water.
- With the increasing growth in renewable energy, there are new water/jobs dynamics as some types, such as solar PV (photovoltaic), wind and geothermal, essentially use no water, but show a growth in jobs (Figure 3.8).
- It estimates that 7.7 million people worldwide were employed (directly or indirectly) in renewable energy in 2014. Solar PV was the largest employer with 2.5 million, followed by liquid biofuels with 1.8 million (IRENA 2015).
- Recent studies across eight countries in Africa (Burkina Faso, Egypt, Ghana, Kenya, Mauritius, Rwanda, Senegal and South Africa) demonstrate that green economy policies will be an important source of new jobs. Investments in low water-intensive options such as solar and wind capacity can bring employment benefits. For instance, in Senegal, these energy options are projected to create between 7,600 and 30,000 additional jobs by 2035 (UNEP, 2015).

Water and jobs in industry

- Employment figures for the industrial sector have grown dramatically in recent years, from 1 billion to 1.4 billion people between 2000 and 2014, accounting for just under 45% of the global active workforce.

- Worldwide, some of the most water-intensive industry sectors employ great numbers of people: 22 million in food and drink (with 40% women), 20 million in chemical, pharmaceutical, and rubber and tyres, as well as 18 million in electronics (ILO, n.d.a.).
- Water scarcity can have very serious effects on some major industrial sectors. In 2014, the Water Program of the Carbon Disclosure Project (CDP) reported that 53% of industrial respondents reported water risks in direct operations and 26% in supply chains (CDP, 2014).

Investing in water: A path to economic growth and jobs

- It is estimated that improving water productivity to close the worldwide gap between supply and demand for water will cost US\$50-60 billion annually over the next 20 years. With private sector investment comprising about half of that spending, positive returns could be expected in just three years (Boccaletti et al., 2009).
- In the agriculture sector, the potential savings from increased water productivity in irrigation could be as high as US\$115 billion annually by 2030 (in 2011 prices). Moreover, the provision of more efficient water technologies to some 100 million poor farmers would generate an estimated direct total net benefit of US\$100-200 billion (Dobbs et al. 2011).
- The basic provision of adequate water, sanitation and hygiene (WASH) services at home and in the workplace enables a robust economy by contributing to a healthy and productive population and workforce, with benefit-to-cost

ratios as high as 7 to 1 for basic water and sanitation services in developing countries (OECD, 2011a and 2012a).

- One study found that investing US\$1 billion in water supply and sanitation network expansion in Latin America would directly result in 100,000 jobs (more than equal investments in coal-powered energy or rural electrification) (Schwartz et al., 2009). Another study in Peru found that villages with a rehabilitated irrigation infrastructure hired 30% more agricultural workers than comparable villages, with greater benefits accruing to poor farmers (IFC, 2013).
- The US Department of Commerce's Bureau of Economic Analysis found that each job created in the local water and wastewater industry creates 3.68 indirect jobs in the national economy (United States Conference of Mayors, 2008b).
- According to UNEP, investments in small-scale projects that provide access to safe water and basic sanitation in Africa could return an estimated overall economic gain of about US\$28.4 billion a year, or around 5% of GDP (UNEP, n.d.). Another study found that in poor countries with better access to improved water and sanitation services, the annual economic growth rate reached 3.7%, while those without similar access to improved services had an annual growth of just 0.1% (WHO, 2001).
- From the global health perspective, one of the greatest water-related challenges is inadequate water, sanitation and hygiene (WASH), which are associated with global economic losses of US\$260 billion every year, largely related to lost time and productivity (WHO, 2012). While costly to address, the estimated rates of return on water supply and sanitation investments are striking: every US\$1 invested in WASH could have a return of US\$3-34, depending on the region and technology involved (Hutton and Haller, 2004).
- In developing countries large infrastructures are predominantly (75%) funded through government budgets and long-term finance from state banks. Moreover, about 90% of the total funding of catchment management and protection of aquatic ecosystems in 2013 – estimated at US\$9.6 billion – came from public funds (WWC/OECD, 2014). As such,

thematically the second largest proportion of green stimulus spending has been allocated to water and waste, after energy efficiency (ILO, 2011a).

- In the USA, investments in sustainable water practices are estimated to generate: between 10 and 15 direct, indirect and induced jobs per US\$1 million invested in alternative water supplies (Pacific Institute, 2013).
- Investing US\$188.4 billion, the amount needed to manage stormwater and preserve water quality in the US, could generate US\$265.6 billion in economic activity, create nearly 1.9 million direct and indirect jobs (e.g. in manufacturing to supply equipment and machinery) and result in 568,000 additional (induced) jobs from increased spending (Green for All, 2011).

Water jobs

Jobs in the water sectors and human resources needs

- An analysis of ILO data by the International Finance Corporation (IFC) found that about 1% of the labour force in both developed and developing countries work in the water sectors³ (Estache and Garsous, 2012).
- Water supply and wastewater facilities operators employ about 80% of the workers in the water industry (UNESCO-UNEVOC, 2012). Although industry-wide numbers are not available on the global scale, the International Benchmarking Network for Water and Sanitation Utilities (IBNET) estimates that the total professional staff in these utilities number about 623,000 (Danilenko et al., 2014).
- A variety of countries are faced with systemic issues such as staff attrition, erosion of experience and weak interest from new graduates to join the water sectors, and these will have an impact well beyond 2020. Across OECD countries in particular, the gap is increasing due to an aging workforce (Wehn and Alaerts, 2013).

³ Jobs in water sectors fall under one of three functional categories: a) water resources management, including integrated water resources management (IWRM) and ecosystem restoration and remediation; b) building and managing water infrastructure; and c) the provision of water related services, including water supply, sewerage, waste management and remediation activities (UN DESA, 2008)

- According to GLAAS, of the 67 countries that reported on systems operation and maintenance, only 27 countries had sufficient staff to operate and maintain their urban drinking water systems, and only 11 had the capacity to operate and maintain their rural drinking systems. Less than 20% of countries considered the supply of skilled labour and technicians sufficient to meet the needs in rural sanitation (WHO, 2014).
- While more research is needed to further specify the nature and size of these gaps, another study, conducted in 10 countries (Burkina Faso, Ghana, Laos, Mozambique, Niger, Papua New Guinea, Senegal, Sri Lanka, Tanzania), reveals a cumulative shortfall of 787,200 trained water and sanitation professionals in order to achieve universal coverage in water and sanitation (IWA, 2014a).
- Lack of capacity and the challenges facing the water sector require design of adequate training tools and innovative learning approaches to enhance the competencies of staff as well as strengthen institutional capacity. This applies to government and its agencies, river basin organizations, as well as other organizations including those in the private sector.

Bridging the gender gap

- The gap in labour market participation between men and women has decreased only marginally since 1995. Globally, about 50% of women were working in 2014, compared to 77% of men. In 1995, these figures were 52% and 80% respectively (ILO, 2015b).
- Women (and girls) perform most unpaid water fetching work. About three quarters of households in sub-Saharan Africa fetch water from a source away from their home (UNICEF/WHO, 2012) and 50% to 85% of the time, women are responsible for this task (ILO/ UNDP WGF, forthcoming).
- Women have traditionally been the primary custodians of collecting and managing domestic water and they are often responsible for managing and making payments for water. Yet, they have been consistently excluded from entering the sector in a professional or technical capacity: 15 national human resources assessments found an average of 17% of staff to be female (IWA, 2014a).

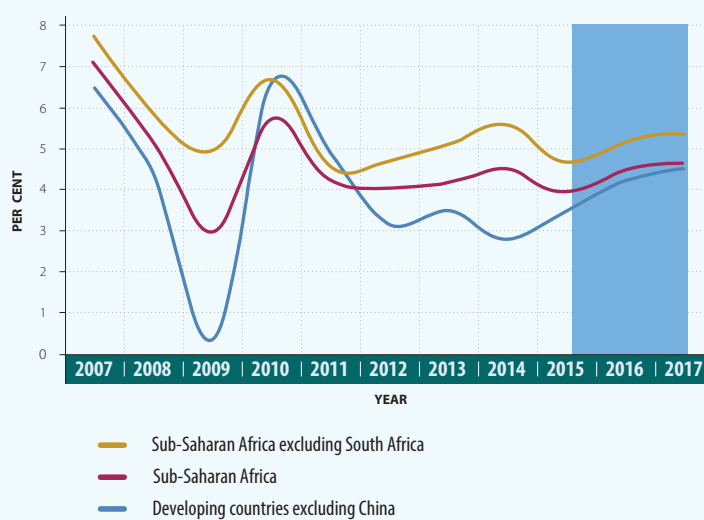
- A report by Catalyst (2011) stated that Fortune 500 companies with three or more women on their board showed a significant performance advantage over those with fewer women in these positions. Similarly, McKinsey & Company (2013) found that companies with a higher percentage of women on executive committees performed significantly better than their all-male counterparts. Qualitative analyses also show that women’s involvement in the management of water resources and water infrastructure can improve efficiency and increase outputs (GWTF, 2006; van Koppen, 2002).

REGIONAL OUTLOOK

Africa

- Africa has about 9% of the world’s fresh water resources and 11% of the world’s population. (World Bank, n.d.a.).
- Around 75% of sub-Saharan Africa falls within 53 international river basin catchments crossed by multiple borders (World Bank, n.d.a.).

Figure 6.1 GDP growth in Africa, and developing countries, 2007-2017



Source: Chuhan-Pole et al. (2015, Fig. 1, p. 4, © World Bank. License: Creative Commons Attribution CC BY 3.0 IGO).

- According to the World Bank, GDP growth in sub-Saharan Africa averaged 4.5% in 2014, up from 4.2% in 2013 (Figure 6.1).
- Africa's population surpassed the 1 billion mark in 2010 and is projected to double by 2050 (AfDB/OECD/UNDP, 2015). The population that will need jobs is expected to comprise 910 million out of the projected two billion total population by 2050. Most of the growth in workforce will be in Sub-Saharan Africa (about 90%).
- In 2015 it is estimated that 19 million young people will be joining the sluggish job market in Sub-Saharan Africa and 4 million in North Africa. The demand for jobs is expected to increase to 24.6 million annually in Sub-Saharan Africa and 4.3 million in North Africa by 2030, representing two thirds of global growth in demand for jobs (AfDB/OECD/UNDP, 2015).

Jobs in water-dependent sectors

- African agriculture is mostly based on rainfed farming and less than 10% of its cultivated land is irrigated (World Bank, n.d.a).
- Currently, the most important water-dependent sector in Africa is agriculture, which forms the bedrock of most economies of African states.
- Agriculture was the source of employment for 49% of Africans by 2010 (FAO, 2014e). In spite of the declining

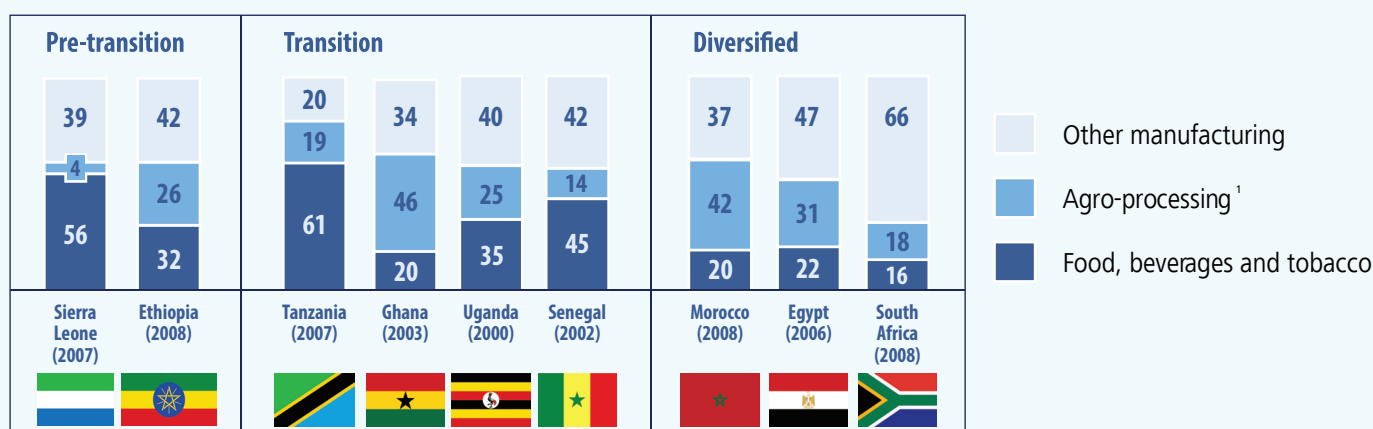
trend, agriculture is expected to create eight million stable jobs by 2020 (McKinsey Global Institute, 2012).

- If the continent accelerates agricultural development by expanding large scale commercial farming on uncultivated land and shifts production from low-value grain production to more labour-intensive and higher value-added horticultural and bio fuel crops (a good example is Ethiopia), six million additional jobs may be created continent-wide by 2020.
- The fisheries and aquaculture sector employed 12.3 million people in 2014 and contributed US\$24 billion or 1.26% of the GDP of all African countries. About half of the workers in the sector were fishers and the rest were processors (mainly women) or aquaculturalists (FAO, 2014f).
- In many African countries, agribusiness accounts for more than half of all manufacturing jobs (Figure 6.4)

The Arab Region

- Of an Arab population of approximately 348 million, an estimated 63% were of working age in 2010. Of these, 20% were youth between the ages of 15 and 24 years and 43% were adults between the ages of 25 and 64 years. Given the current youth bulge, it is expected that the adult working age population will represent over 50% of the national workforce by

Figure 6.4 Job creation by water-dependent manufacturing industries in selected African countries (%)



Notes:

¹ Includes textiles, footwear and apparel, leather products, paper and wood products, and rubber products. Numbers may not add up due to rounding.

Source: McKinsey Global Institute (2012, Exhibit 14, p. 33). © 2012 McKinsey & Company. All rights reserved. Reprinted by permission.

2050, when the region's population is projected to reach 604 million (UNESCWA, 2013a).

- At the beginning of this decade, youth unemployment stood at 23% on average for the region, which is the highest level in the world (UNESCWA, 2013a).

Jobs in the water sectors

- While employment in the water sectors remains relatively limited, the potential growth for jobs in the water supply and sanitation sector is particularly evident: The WHO/UNICEF Joint Monitoring Programme (JMP) figures show that approximately 55 million people in the Arab Region (15%) do not have access to improved drinking water, while 65 million people (18%) do not have access to improved sanitation (UNESCWA, 2015).
- The global desalination market is estimated to grow at a compounded annual growth rate of 8.1% between 2014 and 2020 (GWI, 2015), with the largest plants coming on line in the Middle East. This will generate ancillary water jobs in engineering, law, finance and the environment.

Asia and the Pacific

- Since 1970, more than 4,000 water-related disasters have been reported costing more than US\$678 billion of economic losses (UNESCAP 2014a). Over

50% of the world's recent natural disasters occurred in Asia-Pacific as a result of heightened climate change (UNESCAP, 2014b), affecting water supply infrastructure.

- During the past 12 years, the regional coverage to the water supply and sanitation services grew by 0.5% and 0.7% respectively, thus improving productivity and livelihoods (UNESCAP, 2014a). However, over 1.7 billion people in Asia and the Pacific continue to live without access to improved sanitation (UNICEF, n.d.).
- In South-East Asia, 41% of the labour force is in the industrial sector and 21% is in the service sector. In South and South-West Asia, 39% of the labour force is in the industrial sector and 15% is in the service sector (ILO, 2014c).
- While between 60% and 90% of water is used for agriculture (UNESCAP, 2011), the employment rates in this sector are 39% in South-East Asia and 44.5% in South and South-West Asia (ILO, 2014c).
- Hydropower employs most of the people in the renewable energy sector. China alone accounts for half of the global employment of 209,000 people in small hydropower and 690,000 in large hydropower (IRENA, 2015).
- Employment in the fisheries and aquaculture industry has grown rapidly since 1990, with 84% of the approximately 60 million jobs in this sector now based in Asia (FAO, 2014a).

Europe and North America

Employment in water services and water-dependent economic sectors

- The water services sector is a significant provider of employment in this region. In the EU, it includes 9,000 small- and medium-sized enterprises (SME) and provides 600,000 direct jobs in water utilities alone (EC, 2012). In recent decades, the number of people employed by water supply and wastewater treatment facilities has consistently decreased, while the level of education and specialization of personnel has increased.



The bridge of Marina Barrage, a government-commissioned dam built across the mouth of Marina Channel (Singapore)
Photo: © Tristan Tan/Shutterstock.com

- In Eastern Europe and Central Asia, there are nine staff per 1,000 connections. This is significantly higher than that observed in the best-performing quartile of utilities worldwide (< 0.6) (Danilenko et al., 2014; based on the IBNET database).
- In the United States, the job market outlook for water and wastewater treatment plant and system operators is positive, with employment projected to grow by 8% from 2012 to 2020 (US Bureau of Labor Statistics, n.d.).
- Irrigated agriculture employs significant numbers of people in Central Asia and in the Caucasus. In Central Asia, agriculture accounts for between 26% (Kazakhstan) and 53% (Tajikistan) of national employment (World Bank, n.d.b.).
- In contrast, in the EU, where industrialization and intensification of agricultural practices have transformed the agriculture sector, around 10 million people are employed in agriculture, representing 5% of total employment. At the same time, some 25 million people were regularly engaged in farm work in the EU during 2010.

Latin America and the Caribbean

- In general, there is strong labour demand in water-related economic activities. The region is highly dependent on hydropower which provides over 60% of electricity generation, in comparison with the world average of less than 16%, and it still has significant (74%) undeveloped technical potential (IEA, 2014b).
- Although irrigated land is not a large proportion of arable land (13%), it accounts for almost 67% of total water withdrawals (FAO, 2015a). In several countries (e.g. Argentina, Brazil, Chile, Mexico and Peru), irrigation is responsible for a major part of agricultural production, particularly for export. It provides important employment opportunities for rural populations.
- Most of the regional export products, and related employment, are water intensive, either because they use water in the production process (e.g., food, mining), depend on it (e.g., tourism) or they use water as a key component of their final products (e.g., beverages).

Prepared by WWAP | Michael Tran, Engin Koncagul and Richard Connor

Cover photo: Traditional fish cages on Lake Toba, North Sumatra (Indonesia)

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<http://www.unesco.org/water/wwap>

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Regione Umbria