Water Infrastructure Investment in a Climate-Challenged World

Executive Summary

- Climate change is compounding the historical challenge of water availability and usage, with the agricultural sector being particularly vulnerable to water scarcity. A rising global population and economic growth will exacerbate the pressure on water supplies.
- The water industry is introducing initiatives and technologies to reduce and address usage conflicts linked to water scarcity.
- The Lazard Sustainable Private Infrastructure (SPI) strategy is paying particular attention to adaptation assets (e.g., desalination plants), climate mitigation assets (e.g., small-scale hydro-electric power plants), and agriculture-related infrastructure (e.g., solar energy assets installed on agricultural land). Our focus on mid-market infrastructure assets excludes large water and wastewater utilities (not covered in this paper).

Established around one thousand years ago, the Valencia Water Tribunal was set up to resolve conflicts over water usage and to manage water infrastructure in the city's surrounding region. It remains the oldest court still in activity and is one of Europe's most ancient democratic institutions. The challenge that led to the Tribunal's foundation remains strikingly relevant today: how to distribute water fairly in the face of competing demands, including from households, agriculture, and industry.

Changing Weather Patterns

Climate change, particularly its impact on water cycles, has compounded the historical challenges of water distribution, significantly affecting water availability globally. As the pace of climate change is expected to accelerate over the medium term, these challenges are set to mount further. Hundreds of millions of people already regularly experience previously unfamiliar hydrological conditions, and water usage conflicts are expected to become more acute.[1] Reduced crop yields and repeated drinking water shortages are already happening and will become more commonplace. A warmer climate has led to higher air moisture, causing more recurrent extreme precipitation and, ironically, dryer soils, which have damaged ecosystems and put further strain on the agriculture sector. In financial terms, lost agriculture production due to climate events exacerbated by human activity amounted to US$166 billion between 1983 and 2009.[2]

Competition for Water Usage

The agriculture sector is having to adapt to the implications of climate change for water supply and demand. As the main consumer of water globally, the sector risks coming into direct competition with industry—in Europe, industry and agriculture collectively account for 80% of water usage. Electricity production alone accounts for 28% of the Continent's annual water usage (consider the need to produce steam, cool nuclear and thermal power stations and fill dam reservoirs).[3] With electricity demand and production expected to increase at the same time that rainfall patterns become less predictable, water usage conflicts will only continue to be a major challenge for stakeholders.

As another example of the increasing challenge, consider the impact from data centers on water usage: a small-scale data center consumes 18,000 gallons of water per day, increasing by a factor of 30 for hyperscale centers, representing the daily water consumption of up to 30,000 Americans.[4] Given the predicted growth in the sector, partly driven by the rise of artificial intelligence, demand for power capacity is expected to increase by approximately 50% between 2024 and 2027 to 71 GWh, only worsening potential conflicts in communities already experiencing water stress.[5]

A swelling global population will add further demands. The world's population is not anticipated to peak until the end of the century, putting pressure on industrial output and agricultural production to maintain living standards.

Two forces are thus at play: rising water demand and more limited supply. Water demand is expected to increase by 30% by 2030 while freshwater sources have already fallen by 60% since 1962.[6] In Europe alone, water scarcity has affected nearly one-third of EU territory annually since 2015, while water supply per capita has decreased by 24% over the past 50 years.[7]

Investing in Adaptation

If economies and communities do not act to adapt to climate change, we collectively risk a less prosperous economy and geopolitical instability. The World Bank has estimated global GDP could shrink by 6% between now and 2050 because of water-related losses.[8] With an increase in the intensity and occurrence of droughts, finding adequate solutions has become imperative.

The good news is that water investments have been estimated to produce returns in economic activity of up to six times, including flood-protective infrastructure.[9] Extending irrigation to its fullest potential to maintain or expand crop yield would cost just 0.1% of GDP per year in subsidies in middle-income countries, largely mitigating the cost of doing nothing.[10]

Contribution to Easing Water Stress

Desalination

Desalination, particularly reverse osmosis, is a stable and developed technology that has the potential to supply freshwater in coastal regions experiencing water scarcity. The technology is already the key source of freshwater for countries such as Cyprus and remote Spanish islands.

Desalination demand is anticipated to increase due to accelerating urbanization, continued industrial growth, and population increases. In Europe, desalination capacity could grow by up to 120% by 2040 and meet up to 30% of all water demand.[11]

Global revenues from desalination technologies are expected to achieve an 11% compound annual growth rate between 2024 and 2032.[12] This growth is anticipated despite higher costs compared to conventional freshwater sources (up to five times more per cubic meter).

As investors recognizing the need for desalination technology in a climate-challenged world, we see value in integrating locally produced renewable energy with desalination plants, notably through direct behind-the-meter infrastructure, reducing energy usage impact on local grids, and delivering "clean" water to the community.

Risks

- Environmental challenge from usage of chemicals and production of brine by-product
- High energy usage per cubic meter output
- Assets are often sited on the coast and therefore vulnerable to extreme weather events, exacerbated by climate change

Agrivoltaics/Agri-PV

Agrivoltaics represents an opportunity to combine crop yield management and renewable electricity generation within a single infrastructure asset while reducing land usage conflicts. This is particularly relevant as 50% of new EU solar capacity between 2021 and 2030 is expected to be installed in agricultural areas.[13]

Through reducing heat stress on crops and by providing physical protection from severe weather events, agrivoltaics leads to reduced soil erosion, increased biodiversity, and more efficient water consumption. The latter is encouraged through gutters placed next to solar panels, allowing farmers to redirect water to where it is needed.

Industry participants have reported that siting solar panels above crops reduced ground temperatures by as much as 3.8°C in periods of high heat and drought and improved humidity conditions, leading to lower irrigation needs of up to 30% (and ~20% in average non-drought situations).[14, 15]

Major EU economies and crop producers have started to include the technology in their legislative arsenal, notably Germany and Switzerland, with significant growth anticipated in France and Spain. Lazard SPI is closely monitoring the sector and focusing its origination efforts within those EU countries combining high population density with significant agriculture output.

Risks

- Maturing technology with limited rollout
- Lack of harmonised regulation in the EU and potential prioritisation conflicts in low irradiation years: prioritise electricity production or crop yield?

Small-Scale Hydro-electric Power Plants

As water scarcity increases and rain patterns shift, especially in southern Europe, we see small-scale, run-of-the-river hydro-electric power plants as an efficient solution that satisfies competing needs for water.

By temporarily diverting a small portion of water flow from rivers, the same water used in mini-hydro plants can be directed through canals for cooling, electricity generation, and irrigation, thus promoting cooperation rather than competition. This is done without the need for large reservoirs, which helps to protect local biodiversity.

Concession models, especially in Italy, have proven resilient and adequate in efficiently managing mini-hydro power plants.

In addition, as investors, we see further value from diversifying renewable generation, since in any given location, run-of-the-river electricity production is mostly inversely correlated to PV generation. As such, we have focused our origination activities on hydro power plants in southern Europe.

Risks

- The concession model and legal framework are essential to a successful hydro-electric project
- Unsurprisingly, the impact of climate change on weather patterns, historical production, and the competency of the operator are directly reflected in valuations

Lazard SPI's Focus in the Water and Agriculture Sectors

The water industry is introducing initiatives and technologies to help solve the investment gap and usage conflict linked to water scarcity. As an investor in mid-market infrastructure that enables the transition to a more sustainable society, the Lazard SPI strategy focuses on the following water infrastructure sub-sectors:

- Adaptation assets, such as desalination plants, filtration and drainage systems, and wastewater treatment centers
- Climate mitigation assets, such as small-scale hydro-electric power plants
- Agriculture-related infrastructure including agri-PV (solar systems installed alongside productive agricultural land)

Sustainable Long-Term Investment Opportunities

Water-related infrastructure and adaptation projects present diverse and deep investment opportunities for private and public capital. The sector contributes to a more sustainable society in many respects, while being lucrative in the long term for local communities and financiers, even for adaptation assets. However, we recognize that investing time, resources, and money into water-related infrastructure is not straightforward, leading to both significant investment gaps and tricky public relations when things go wrong. We have identified specific sectors that can be part of the solution, even at a small scale. Lastly, we welcome self-regulation initiatives and strongly support increased cooperation and regulation of the sector by public authorities.

About the Authors

Robert Wall
Managing Director, Sustainable Private Infrastructure
Lazard Asset Management Limited (London)

Robert Wall is the Head of Sustainable Private Infrastructure at Lazard Asset Management. He has more than 20 years of experience in growing private market investment portfolios, investing in infrastructure companies, and delivering engineering projects. Robert began working in the investment field in 2007, and prior to joining Lazard in 2021, he was a partner and member of the infrastructure investment committee in private markets at Federated Hermes. Previously, he was a founding member of the infrastructure investments team at the Canada Pension Plan Investment Board. Robert has acted as a Non-Executive Director of operating companies and he began his career as a professional engineer. Robert has an MBA from Queen's University and a BE in Civil Engineering from the University of Canterbury.

Alexis Agabriel
Vice President, Sustainable Private Infrastructure
Lazard Asset Management Limited (London)

Alexis Agabriel is a Vice President on the Sustainable Private Infrastructure team. He began working in the investment field in 2018. Prior to joining Lazard in 2022, Alexis was an Investment Manager with Hermes GPE. He has a Master's in Economics and Business, and a Bachelor of Arts both from Sciences Po Paris. He is a member of the Advisory Board of Collective Energy GmbH.

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Notes

1. Source: IPCC; *Sixth Assessment Report – Chapter 4*, 2022-2023
2. Source: Idem
3. Source: European Environment Agency, *Water use in Europe—Quantity and quality face big challenges*, August 2023
4. Source: Dgtl Infra, Data Center Water Usage: A Comprehensive Guide, January 2024
5. Source: FTI Consulting, *Current Power Trends and Implications for the Data Center Industry*, June 2024
6. Source: BNP Paribas, *Water: the trillion-dollar investment gap*, September 2023
7. Source: European Environment Agency, *Water scarcity conditions in Europe*, January 2023
8. Source: World Bank Group, Water Overview: Development news, research, data | World Bank; accessed in July 2024
9. Source: www.wwdmag.com/utility-management/video/10939674/why-invest-in-water-infrastructure-wwd-weekly-digest
10. Source: IPCC; *Sixth Assessment Report – Chapter 4.7.5*, 2022-2023
11. Source: Medium, *Addressing Water Scarcity in Europe: Exploring the Leading Desalination Plants and Their Contributions to Providing Clean Water*, March 2024
12. Source: Polaris, *Desalination Technologies Market Share, Size, Trends, Industry Analysis Report*, January 2024
13. Source: EU Commission, *JRC Science for Policy Report, Overview of the Potential and Challenges for Agri-Photovoltaics in the European Union*, 2023
14. Source: ActuEnvirommement; *Agrivoltaïsme et économies d'eau: les synergies émergent*, April 2023
15. Source: Andre Joffre (blog), *Sun'Agri dévoile des résultats inédits sur le rôle positif de la technologie face à la sécheresse*, August 2023

Important Information