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Innovation in water-related technologies

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Executive summary

According to the United Nations (United Nations, 2024), 2.2 billion people lacked access to safely managed drinking water as of 2022, while 3.5 billion lacked safely managed sanitation services. The situation is projected to worsen significantly by 2050 if current trends persist. In addition, droughts and floods regularly cause deaths, leading to billions in economic losses every year and affecting hundreds of million people. This study relies on patent information to provide insights into trends in innovation in water-related technologies aimed at addressing these critical challenges. It also focuses on new solutions to improve water access and management, as well as resilience to extreme weather events.

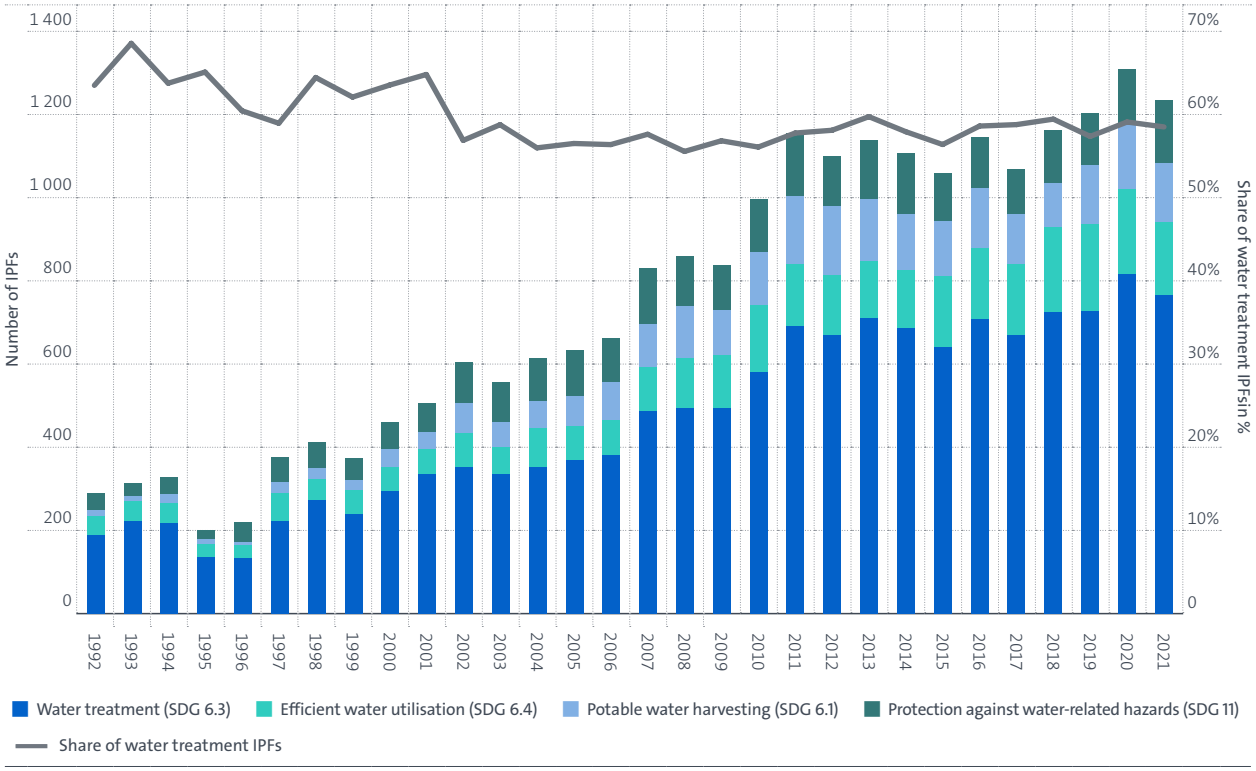
1. A small, but growing technology field

With 22 372 or 0.33% of all international patent families (IPFs) filed worldwide between 1992 and 2021, water-related technologies constitute a relatively small area of the global innovation landscape. In a context of climate change and increasing water scarcity, however, they are critically important. Innovation in these technologies increased almost fourfold in thirty years, from 300 annual IPFs in the early 1990s to over 1 200 in the 2020s, often driven by new regulations or changes to existing regulations. This growth aligns with the overall rate of patenting activity over that period, yet it lags behind the pace of many other clean technology sectors.

Innovation in water-related technologies is dominated by water treatment, which represents a stable share of about 60% of all IPFs. IPFs in water treatment are mainly focused on waste water and sludge treatment, and particularly on tertiary water treatment technologies such as disinfection and the removal of micropollutants. Over the past decade, however, the fastest growth has been seen in the number of IPFs in efficient water treatment, especially technologies related to the automation and control of water treatment operations. IPFs in other fields are fairly equally distributed between efficient water utilisation, potable water harvesting and protection against water-related hazards.

Figure E1

Growth in IPFs in water-related technologies, 1992–2021



Source: EPO

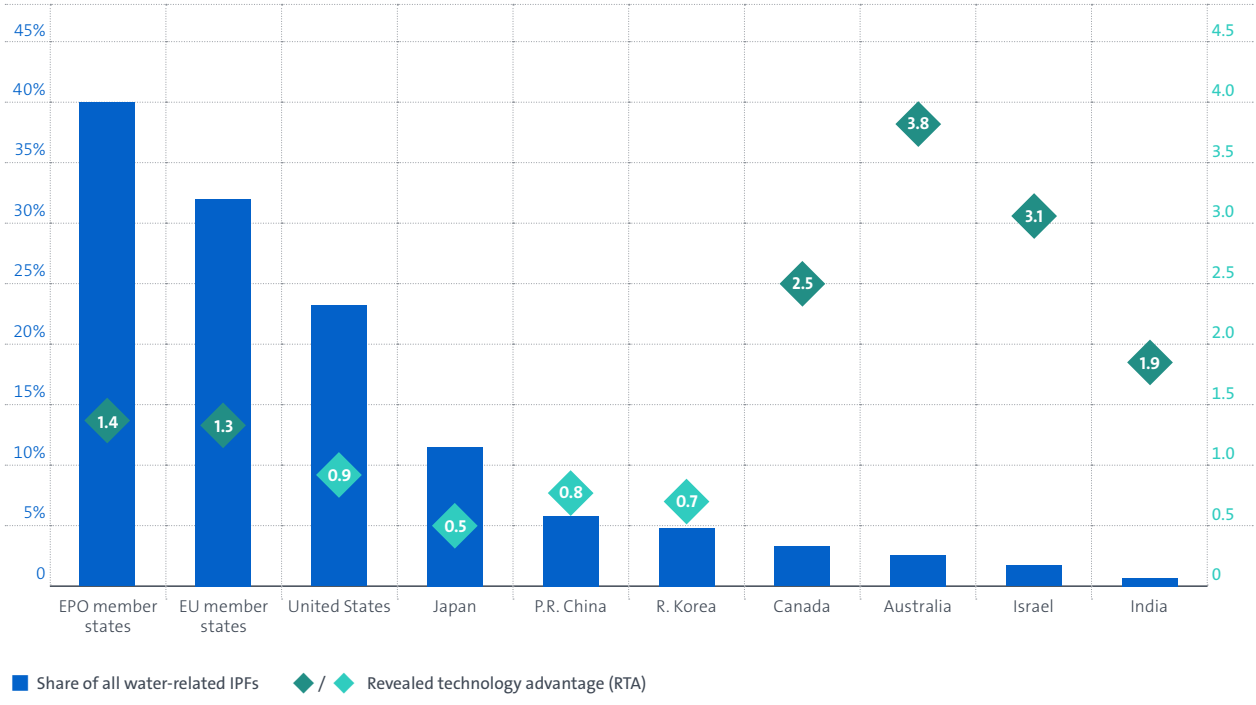
2. Europe is at the forefront of innovation in water-related technologies

European countries play a major role in fostering innovation in water-related technologies. They contributed 40% of all IPFs in this sector between 1992 and 2021 and hold leading positions in all water technology fields. Europe is the only global innovation centre exhibiting a comparatively high level of specialisation in water-related technologies, with an RTA[1] index of 1.4 from 1992–2021, intensifying to over 1.5 in recent years. While Germany, France and the UK are Europe's leading countries in terms of number of water-related IPFs, Spain stands out with a high level of specialisation in those technologies.

Beyond Europe, the US is the second major innovation centre in water-related technologies, but does not show a clear specialisation pattern, whereas Japan, R. Korea and P.R. China show a lack of specialisation in those technologies. However, other countries, including Australia, Canada, Israel and India emerge with relatively high degrees of specialisation (RTA>1) denoting a local prioritisation of innovation in water-related technologies.

Figure E2

Share of IPFs and specialisation in water-related technologies by region, 1992–2021



Source: EPO

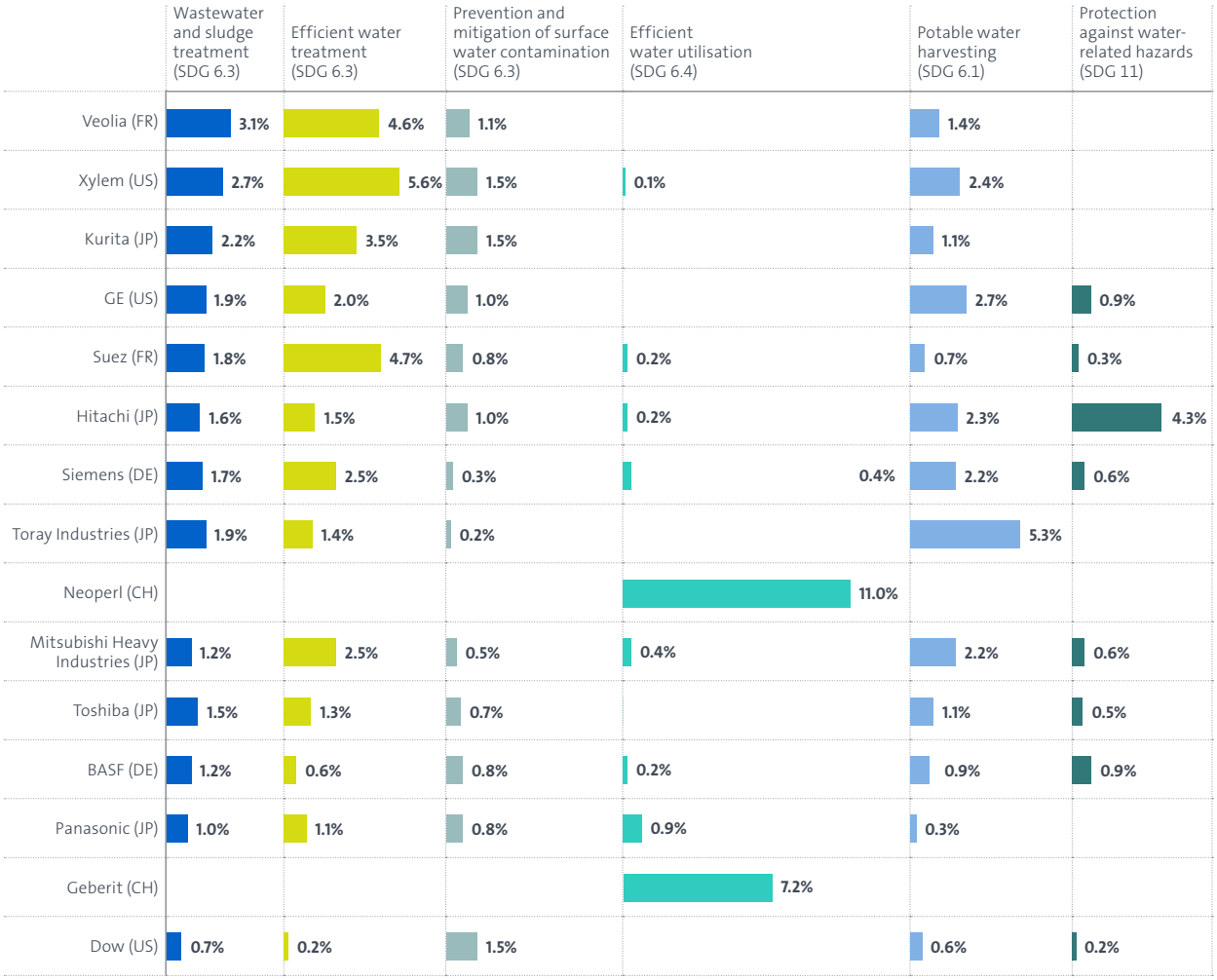
1 The RTA index indicates a country's specialisation in terms of water-related innovation relative to its overall innovation capacity. It is defined as a country's share of IPFs in a particular field of technology divided by the country's share of IPFs in all fields of technology. An RTA above one reflects a country's specialisation in a given technology.

3. All top 15 applicants are private enterprises, most of which are headquartered in Europe

Veolia, a diversified French company, tops the list with over 200 international patent families (IPFs) from 1992 to 2021, closely followed by two players predominantly active in the water industry, the US-based Xylem and Japan's Kurita. Europe has six companies among the top 15 applicants, followed by Japan, also with six, despite its low overall level of specialisation. The primary focus of the top companies has been in water treatment technologies. The majority of the leaders in water-related technologies are large conglomerates that are active in many different industries, who saw a peak in their IPFs in the period 2012–2016, followed by a decline in the next five years. The Swiss companies Neoperl, a drinking water specialist, and Geberit, a sanitary product provider, are notable exceptions with a strong specialisation in efficient water utilisation technologies.

Figure E3

Profiles of top 15 applicants in water-related technologies, 1992–2021



Note: The Figure indicates the share of IPFs in each field originating from the respective top applicants.

Source: EPO

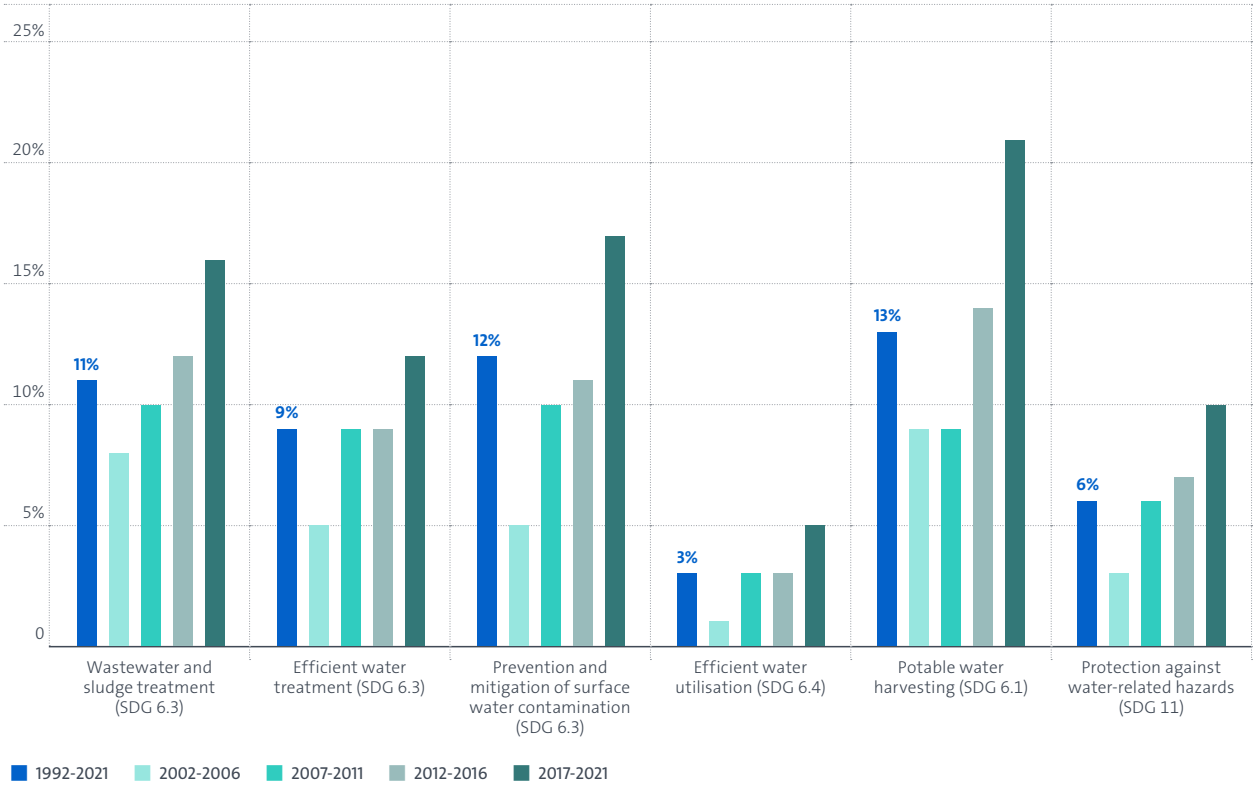
4. Significant and growing role of universities and PROs

Universities and public research organisations (PROs) are increasingly contributing to water-related technology innovations, from under 5% of all IPFs in the 1990s to 14% by 2017-2021. A closer analysis of their inventions suggests that this trend is in a large part driven by efforts to address growing water challenges, such as potable water harvesting or the prevention and mitigation of surface water contamination, where the contribution of industry innovators to date has remained limited. Potable water harvesting emerges as the field with the highest share of IPFs from universities and PROs, increasing to over 21% in the most recent five-year period.

Most of the growth in academic contributions is observed in P.R. China and R. Korea. Chinese universities and PROs accounted for 26% of all the IPFs originating in China in the period 1992–2021, the highest share of all countries, while contributions in Europe and the US are still below 10%. Although contributions from public research institutions are very important, such high shares in China point to differences in institutional frameworks and a market for water innovation that is possibly still developing in China compared to other major innovation centres.

Figure E4

Trends in shares of IPFs contributed by universities and PROs by technology field, 1992–2021



Source: EPO

The full report is available for download at:
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