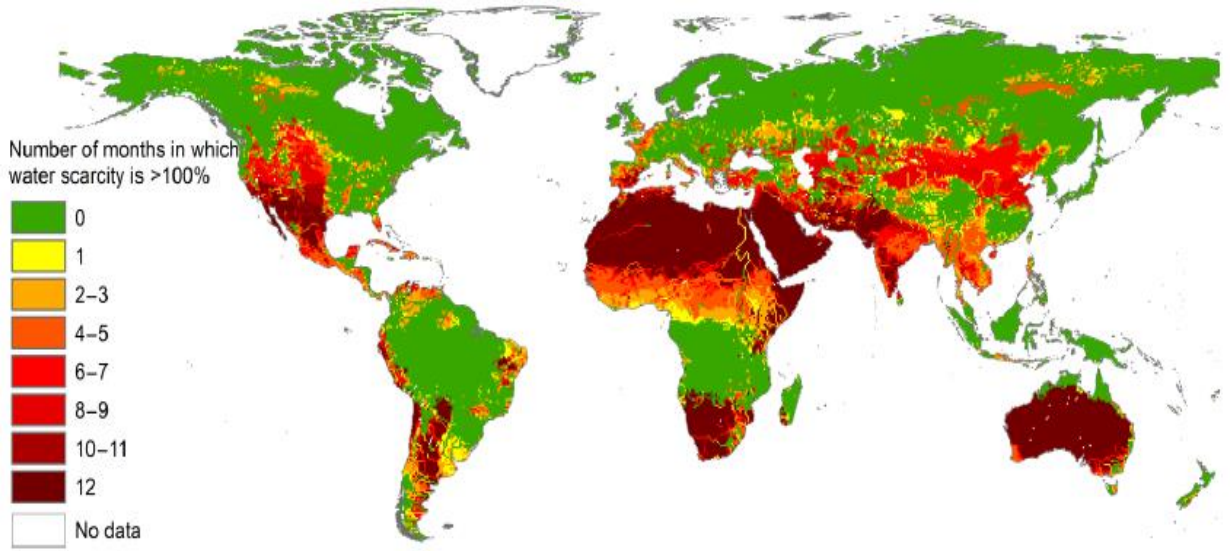
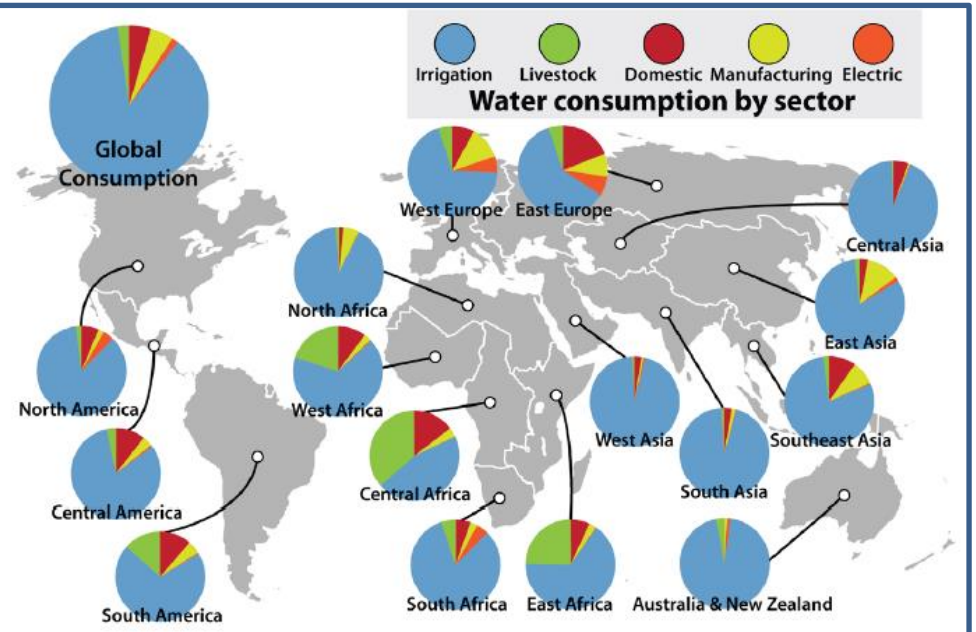
- Enough freshwater available on Earth
- Large spatial and temporal variations of demand and availability => water scarcity in several areas during specific times of the year
- **≈1.9 bil. people live in potential severely waterscarce areas** (Burek *et al.*, 2016)
- **One third of the world largest groundwater systems in distress** (WWAP-UN Water, 2018)
- Climate change impacts projected to increase with every degree of global warming (IPCC, 2022)
- **2050: 3.6–4.6 bil. people under water stress; ≈93% living in Asia and ≈6% in Africa** (Burek *et al.*, 2016)

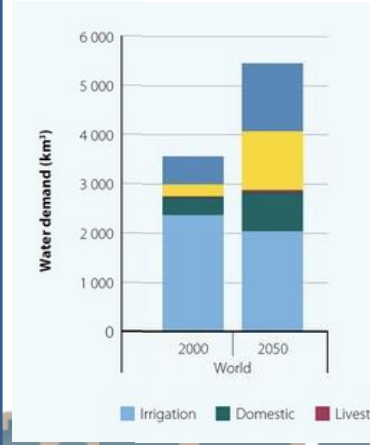


Number of months/yr with water scarcity >1.0
Period 1996-2005 (Mekonnen and Hoekstra, 2016)

- **Current global water demand: ≈ 4,600 km³/yr** (Burek *et al.*, 2016)
- World irrigated agriculture: **70% of total water use** (mostly for irrigation) **- 40% total food production on 20% total cultivated land** (FAO, 2003)
- Significant future increase in water use in nearly all regions of the world; ≈ **1-2%/yr**
- **Increase by 20% to 30% by 2050; up to 5,500 to 6,000 km³/yr** (Burek *et al.*, 2016); mostly for **industry** and **energy** (OECD, 2012)
- Greatest increases in **African and Asian sub-regions (x 3)** and **Central and South America (x2)** (Burek *et al.*, 2016)

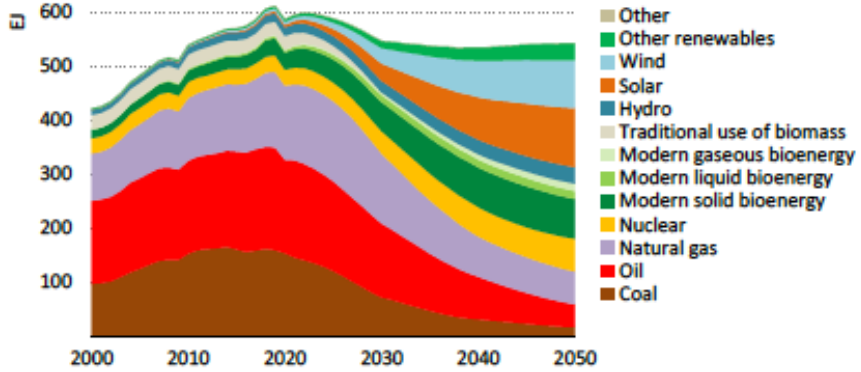


Water consumption by sector for regions worldwide (Brauman et al., 2016)

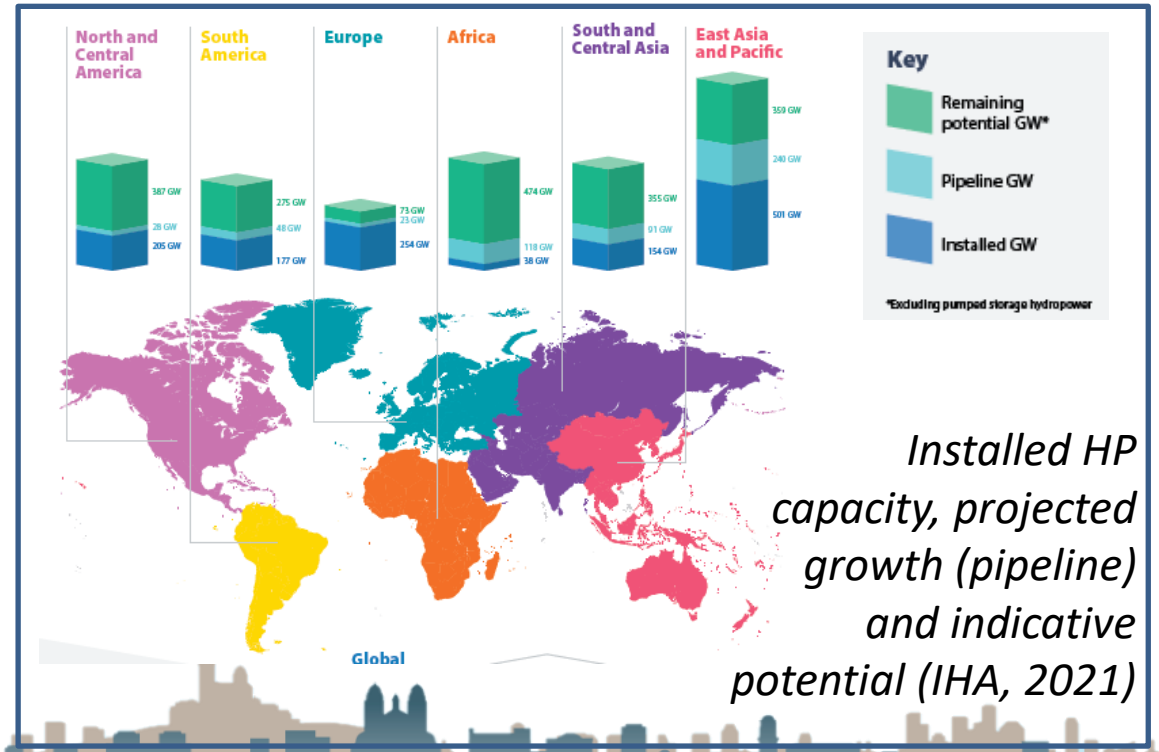


Global water demand: baseline scenario 2000 and 2050 (OECD, 2012)

- **Renewable Energies (RE): 2/3 of energy use by 2050** (IEA, 2021)
- **At least 850 GW of new hydropower capacity to keep <2°C; +1,170 GW more for 1.5°C** (IRENA, 2020, 2021)
- **≈ 500 GW of projects in the pipeline, but only 156 GW under construction** (IHA, 2021)
- Connexions with other RE sources :
  - **Reservoirs (> 400,000 km²) as surface for floating PV => ≈400 GW (520 TWh/y) if 1% total surface area used** (World Bank Group, ESMAP and SERIS, 2019)
  - **Buffering** for the variability of RE sources (e.g. pumped storage)
  - **Coupling** with H_2 production (e.g. Schiffenen dam-Switzerland: 2 MW-300 t H_2 /yr in 2023)

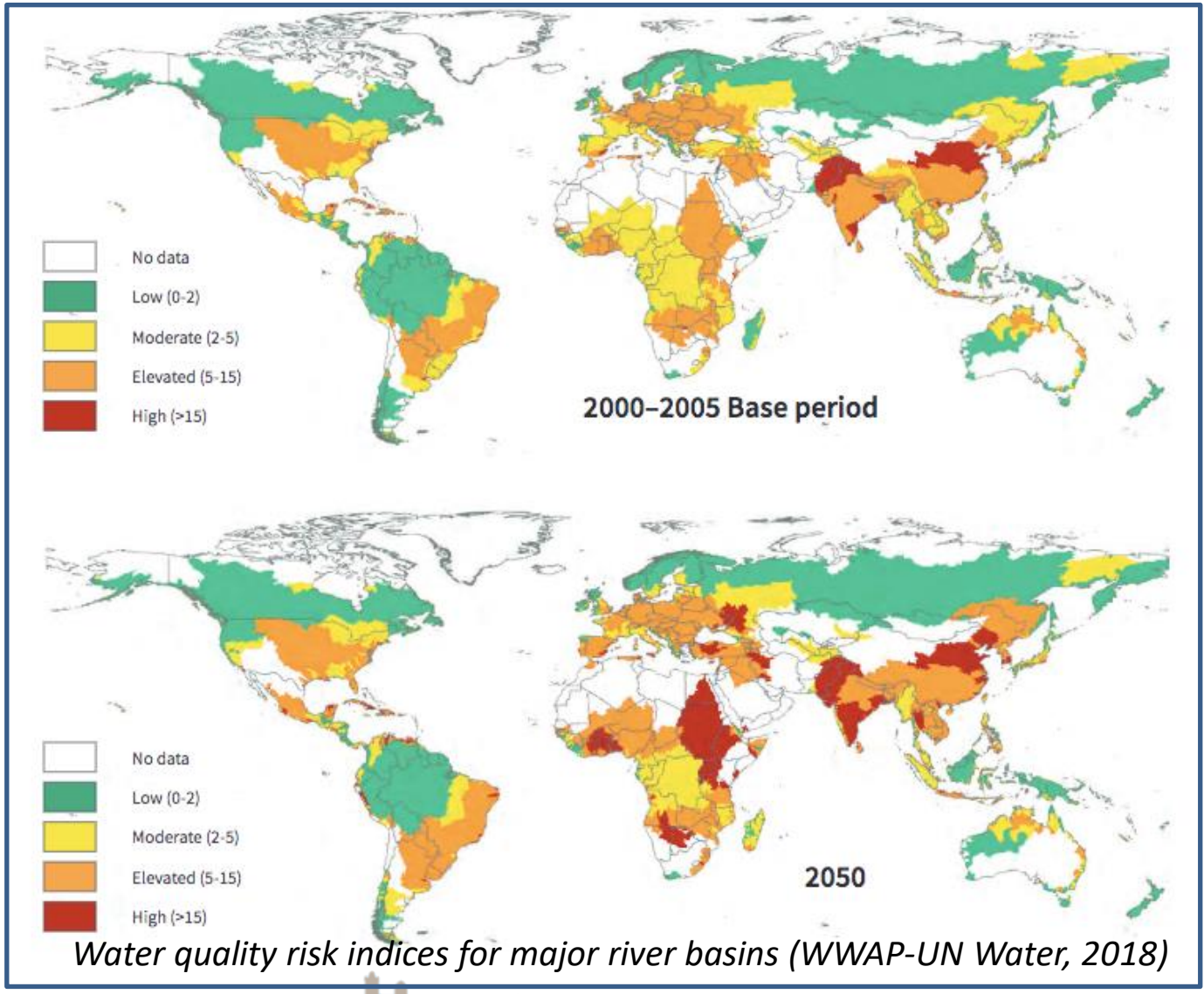


Total energy supply in the NZE by 2050 scenario (IEA, 2021)



Installed HP capacity, projected growth (pipeline) and indicative potential (IHA, 2021)

- Pollution has worsen in the last few decades.
  - **12% of the world population drinks water from unimproved and unsafe sources**
  - **>30% of the world population (2.4 bi. people) without any form of sanitation** (UNICEF/WHO, 2016)
  - Nutrients and hundreds of chemicals (Veolia/IFFPRI, 2016)
  - Almost every river in Africa, Asia and Latin America (UNEP, 2016)
- Water pollution will intensify over the next few decades (Veolia/IFFPRI, 2016)
- Pollution as one of the main drivers of biodiversity erosion; affects ecosystem services delivery to humans (IPBES, 2019)



Water quality risk indices for major river basins (WWAP-UN Water, 2018)