1. Objective
This study focuses on:
- The effects of abstractions on trends in low-flow conditions.
- The effects of water return flows on river regimes.

2. Methodology
**Input:** Global water demand

**Model:** PCR-GLOBWB\(^1\)

- Groundwater plus surface water abstractions, for irrigation (Irr) and industrial & domestic (I&D) use\(^2\).
  1) No-abstractions,
  2) Abstractions 1960,
  3) Abstractions 1960-2000

**Legend**
- Daily time steps, 0.5° resolution, built with global datasets

3. Results

**Figure 2:** A comparison of global total abstractions of this study (left) and Wada et al. (2011)(right). Doll et al (2011) calculated 1179 km\(^3\)a\(^{-1}\) renewable abstraction.

**Figure 3:** 1960-2000 trends. Non-renewable abstractions almost tripled since 1960 (400-1080 km\(^3\)y\(^{-1}\)), and is likely to increase further in the near future.

**Figure 4:** Regime curves and flow duration curves of three rivers for the no-abstraction- and abstraction scenario, and driest 10% of the period 1960-2000. Stream flows get lower due to abstractions and low-flow frequency increases. Timing and magnitude of low-flows change due to return flows.

4. Conclusions
- Effects of water abstractions on river discharges are evident at the global scale, particularly on frequency of low-flow conditions.
- Return flows are important and influence magnitudes and timing of low-flows.
- The global non-renewable plus non-local abstraction is 1080 km\(^3\)yr\(^{-1}\) for the year 2000, which is 30% of the total demand. This amount almost tripled during 1960-2000.

5. Next steps
- Desalinated water uses will be included. This increases water availability.
- Total demand will be distributed over groundwater and surface water resources in more realistic proportions.