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Addressing Groundwater Resilience under Climate Change

THEME III

Contribution of technology to groundwater resilience

Technology allows for cheaper and more extensive data collection

KEY POLICY MESSAGES

- Groundwater management requires cooperation and information exchange among experts, regulatory authorities, and water users.
- Technology allows for cheaper and more extensive data collection, organisation, sharing, and communication among stakeholders.
- Designers should develop groundwater data management tools that balance technicality with usability.

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Groundwater management encompasses many processes that rely on cooperation and information exchange among experts, regulatory authorities, and water users - technology can streamline these processes. Technology allows for cheaper and more extensive data collection, organisation, and sharing among stakeholders leading to improved groundwater management and resilience.

To be effective, groundwater data must be connected to spatial and temporal data and stored in an easily accessible format.
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DATA CHALLENGES NECESSITATE NOVEL PROXIES

Groundwater data is challenging to collect. The novel use of existing proxy data can help overcome this challenge, particularly in data-poor regions.

For example, Wang used electricity consumption as a proxy for groundwater abstraction in the North China plain. Indirectly monitoring groundwater abstraction through energy consumption substantially reduces the investment and efforts required for data collection, while providing acceptable accuracy for use in groundwater modelling, planning, and system maintenance.

Chavez overcame data challenges in Africa by using open datasets and technology to develop a novel Geographic Information System (GIS) based methodology to assess urban groundwater use in the African continent. Dr. Chavez estimated the maximum fraction and the likely fraction of continent's urban population that could meet its domestic water needs through self-supplied groundwater. This information can inform sustainable groundwater policy and help allocate public investment in rapidly growing urban areas that lack groundwater data.

To assess potential streamflow impacts from groundwater pumping, Kerr developed an analytical method with minimal data requirements. Calculations of streamflow-losses obtained by the developed method were comparable to numerical models in accuracy but required far less effort and time. A web-based Decision Support System (Web DSS) developed for this project provides basic information on the timing and magnitude of streamflow depletion from existing, and new wells in an easily digestible format which will improve the effectiveness of sustainable management efforts..

KNOWLEDGE IS POWER

Sustainable groundwater governance requires that all stakeholders have access to data and information, to participate actively

Use of proxy data can address challenges of collecting groundwater data.

Groundwater data is challenging to collect.
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and in an informed manner. To be effective, groundwater data must be connected to spatial and temporal data and stored in an easily accessible format. Several institutions have developed Spatial Data Infrastructure (SDI) to share geospatial data online, like groundwater map layers. Ongoing efforts aim to facilitate the sharing of groundwater monitoring data alongside groundwater map layers.

Using Decision Support Systems (DSS) for groundwater management allows for structuring information and consolidating research tools for decision-makers. For example, a DSS developed for local water managers in the North China Plain integrates groundwater modelling and irrigation calculations for water quota planning. The DSS includes a friendly user interface, is easy maintainability, and was designed specifically to simplify the workflow of water managers with little experience in GIS or modelling software. It also includes automated crop mapping and integration with data on precipitation and water use for better monitoring.

To aid planning, Songa presented an Integrated Water Resource Management (IWRM) toolkit and mobile application designed to help local government agencies plan and execute different stages of water management collaboratively with other water-related ministries in India. The toolkit includes a six-stage process to guide local governments through data collection, data management and analysis, and developing Integrated Groundwater Management plans that inclusively achieve Water, Sanitation Hygiene (WASH) and IWRM goals.

Technology can also aid water law enforcement, but cooperation between regulators and water users is central to compliance. Telemetry and new meters for remote and real-time monitoring make law enforcement cheaper and faster, but they raise privacy concerns regarding when regulatory overlook becomes too powerful. In the case of New South Wales (NSW), to overcome resistance from the regulated, regulators should aim to increase accountability and transparency and highlight the long-term benefits of adoption

Sustainable groundwater governance requires that all stakeholders have access to data.

of such technologies, such as better water management and reduced delays by inspector visits.

CHANGING TIMES REQUIRE INNOVATIVE MANAGEMENT STRATEGIES

Current and future climatic changes require innovative new management strategies. Campana described a promising strategy to address the unsustainable melting rates of glaciers by injecting glacial meltwater into aquifers to temporarily increase water storage. A successful application of managed aquifer recharge (MAR) using glacial meltwater in the Yakima River Basin in the USA helped meet agriculture and other water needs in the region, ensured sufficient ecological flow in the river during the salmon season, and was welcomed by the members of the Native American Yakama nation.

These technological methods offer opportunities to improve groundwater data collection, facilitate information sharing among stakeholders, and aid transparent decision-making, leading to improved groundwater management and resilience.

ADDRESSING GROUNDWATER RESILIENCE UNDER CLIMATE CHANGE
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Proceedings (abstracts, presentations and posters).

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