GGMN

GLOBAL GROUNDWATER MONITORING NETWORK

igrac
International Groundwater Resources Assessment Centre

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Groundwater resources are vital for drinking water supply, agriculture, the sustainability of wetlands and rivers as well as many other important issues, including climate change adaptation. The state of groundwater resources needs to be monitored regularly to provide the basis for their qualitative and quantitative assessment. Hence, water management decisions rely strongly on the availability and quality of monitoring data.

Groundwater is monitored in many parts of the world by measuring groundwater tables, piezometric levels, groundwater withdrawals, spring discharge and groundwater quality. Point measurements are often interpolated and combined with other data (e.g. remote sensing and modelling) to assess the state of groundwater resources.

There is however, a lack of information on groundwater monitoring at the regional and global scales which hampers assessment and informed water management. Recognizing the need for a systematic collection of groundwater data, IGRAC took the initiative to establish the Global Groundwater Monitoring Network (GGMN).

GGMN is a participative, web-based network of networks, set up to improve quality and accessibility of groundwater monitoring information and subsequently our knowledge on the state of groundwater resources. GGMN is a UNESCO programme, implemented by IGRAC and supported by many global and regional partners. The GGMN Programme consists of two components:

1. The GGMN Portal
2. The GGMN People Network

GGMN PROGRAMME

GGMN PORTAL

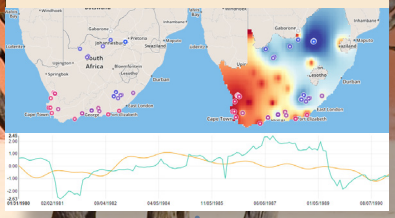
GGMN PEOPLE NETWORK

PROTECTED ENVIRONMENT

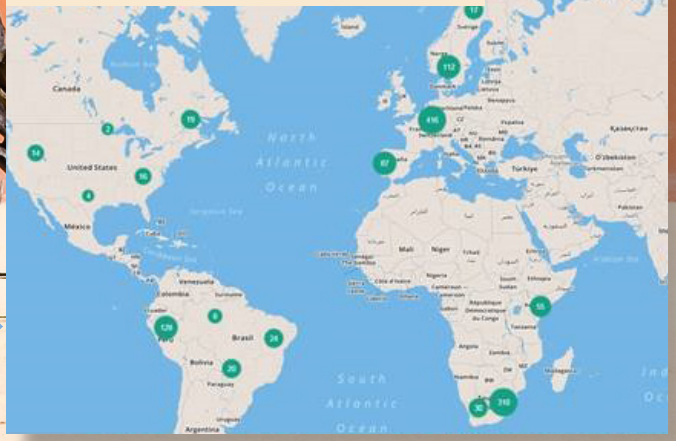
PUBLIC VIEW

REGIONAL GROUNDWATER KNOWLEDGE

UPLOAD, INTERPOLATE AND ANALYSE GROUNDWATER DATA



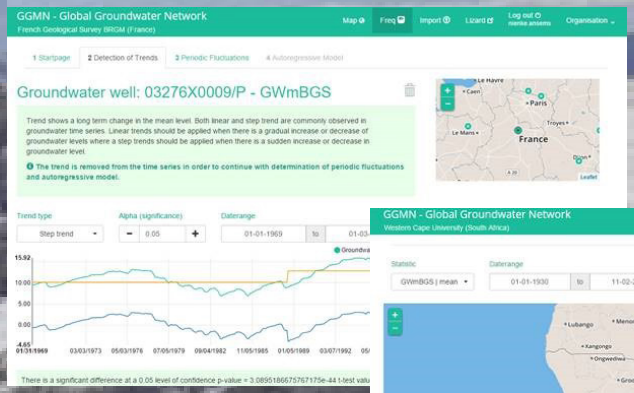
VISUALISATION AND ANALYSIS

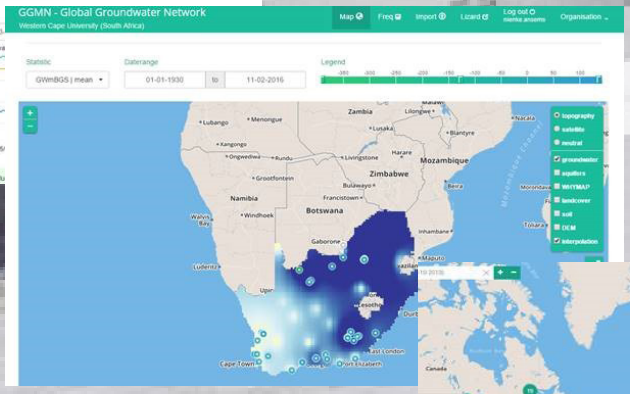


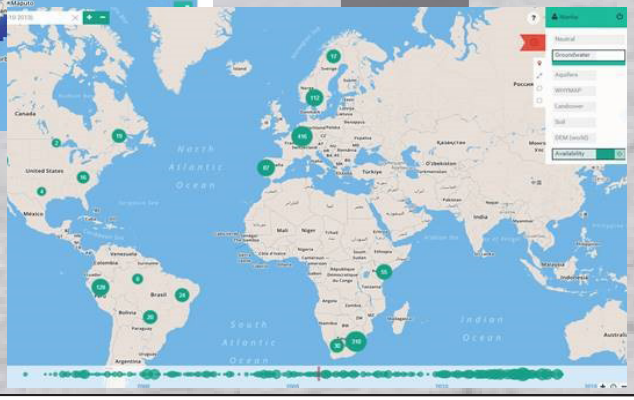
THE GGMN PORTAL

The GGMN portal gives insights on the availability of groundwater monitoring data across space and time. Groundwater level data and changes occurring in groundwater levels can be displayed on a regional scale. Additional data layers and information are available to understand the monitoring data in a broader water-related context.

The web-based software application assists in the spatial and temporal analysis of monitoring data. The system is integrated with QGIS to process data offline. QGIS is an open source Geographic Information System that contains variety of functionalities to analyse the data and create spatially interpolated groundwater level maps.







YOUR GGMN PORTAL

Member states which are interested in making use of the GGMN are provided with a password protected environment within the GGMN application. This allows users to upload, interpolate and analyse the groundwater data using the following options:

1. Representative groundwater point measurements can be uploaded to the protected environment. Alternatively, measurements can be transferred from a national system via web services.
2. Data can be displayed showing the mean, range or change in groundwater level for a selected time period.
3. The GGMN is integrated with QGIS to process data offline. Using personal expertise, point measurements can be combined with proxy information to create groundwater level maps. Produced groundwater maps can be shared via the online GGMN Portal.
4. Time series analysis can be performed for each point measurement location to better understand temporal changes of groundwater levels. The time series analysis is a step-by-step procedure to identify trends, periodic fluctuations and autoregressive model. Time series analysis helps defining optimal monitoring frequencies, one of the key components of groundwater monitoring network design.

Data in the protected environment are only accessible for authorised users. Ownership of the data uploaded to the Global Groundwater Monitoring Network remains with the data provider. Nevertheless, data providers are encouraged to make data accessible to improve the global availability of groundwater information.

Your GGMN Portal can be configured for one organisation, for multiple organisations in one country, multiple organisations sharing an aquifer, or it can be used within projects which aim to collect groundwater data on a regional scale from various sources.

PUBLIC VIEW

The GGMN portal has a public view mode that is meant for the general public, including researchers, consultants, teachers, policy makers and NGOs. From the publicly available data, changes in groundwater level point measurements can be calculated and visualised over time on a regional and a global scale.

DATABASE CONNECTIONS

Many countries already have online databases but currently only few provide open-access to groundwater data. In collaboration with the countries supporting international data sharing, IGRAC is establishing automated data flows between these countries' national databases and the GGMN.

THE GGMN PEOPLE NETWORK

The GGMN relies on the participation of groundwater specialists with knowledge of regional hydrogeology. Regional (spatial) interpolation of groundwater point measurements is much more than a numerical interpolation and averaging process. It needs to be carried out by regional experts with a clear understanding of local hydrogeological conditions, existing monitoring practices, historic developments, socio-economic changes and other relevant factors. Therefore, establishing a network of regional groundwater specialists is the key task of the GGMN.

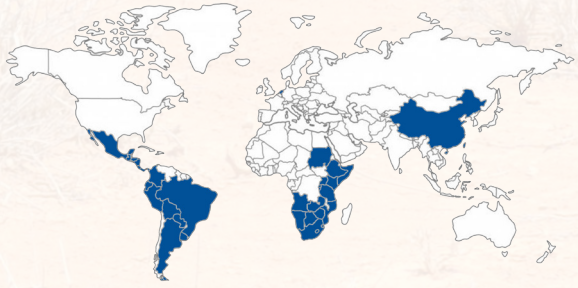
PARTICIPATORY MONITORING

Participatory monitoring is a collaborative process of collecting and analysing data and communicating the results in an attempt to identify and solve problems together. This process not only generates credible data and information but also builds trust and creates mutual understanding needed for international water cooperation.

When it comes to management strategies for transboundary aquifers, a participatory approach is essential. National groundwater monitoring networks play a key role in transboundary aquifer management. Connecting national, regional and global networks is a first step towards transboundary water management. Within this framework, the GGMN attempts to contribute to the harmonization of transboundary groundwater information and to promote further dialogue for transboundary cooperation.

REGIONAL WORKSHOPS

Regional workshops are organised to strengthen and expand the GGMN People Network. The workshops are intended for regional groundwater specialists to become familiar with the GGMN Programme and the functionality of the GGMN Portal. For countries without an online groundwater database, the GGMN Portal can be fully employed. The workshop participants have the opportunity to discuss the programme with their peers from neighbouring states with whom they may be sharing groundwater resources. After the workshop, participants will have the opportunity to acquire an active role in the GGMN People Network and to continue using the GGMN interactive portal.



Countries participated in pas GGMN workshops

DISSEMINATION AND PARTNERSHIPS

The GGMN operates according to principles of the World Meteorological Organization (WMO) and UNESCO with the aim of encouraging the widespread use of hydrological data for national, regional and global studies. Members and other data providers are encouraged to contribute to the GGMN, quality controlled groundwater data. The simplicity of the application and clear information on data ownership (it remains with the supplier) ensure the essential support and commitment of the global groundwater community to the GGMN Programme.

The software is regularly updated to better serve the GGMN community. Additionally, the GGMN Programme is embedded in complementary initiatives and global programmes, such as Group on Earth Observations (GEO), Global Terrestrial Network of Hydrology (GTN-H), Global Climate Observing System (GCOS) and the Groundwater Resources and Climate project (GRAPHIC).

IGRAC is exploring the possibility of using remote sensing to monitor the change of global groundwater resources. Remote sensing data would provide complementary information to the in-situ observations input by regional experts. Therefore, the GGMN is strengthening collaboration with the remote sensing and global modelling communities.

The long-term ambition of the GGMN is to provide an online overview of global groundwater changes. If you would like to make use of the GGMN application, or to simply contribute with groundwater data, please contact us for more information.

International Groundwater Resources Assessment Centre

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