



International Groundwater Resources Assessment Centre

# ANNUAL REPORT

# 2015



United Nations  
Educational, Scientific and  
Cultural Organization



International  
Hydrological  
Programme





# IGRAC Report 2015

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Delft, March 2015



IGRAC (International Groundwater Resources Assessment Centre) facilitates and promotes international sharing of information and knowledge required for sustainable groundwater resources development and management worldwide. Since 2003, IGRAC provides independent content and process support, focusing particularly on transboundary aquifer assessment and groundwater monitoring.

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ANNEX: Minutes from the Governing Board meeting, Dec. 2015

## LIST OF ACRONYMS

BGR	German Federal Institute for Geosciences and Natural Resources
BGS	British Geological Survey
DGIS	Directorate-General for International Cooperation (Dutch Ministry of Foreign Affairs)
DIKTAS	Protection and Sustainable Use of the Dinaric Karst Aquifer System project
EU WFD	European Union Water Framework Directive
FAO	Food and Agriculture Organization
FREEWAT	Free and open source software for water resources management
GCOS	Global Climate Observing System
GEF	Global Environment Facility
GEMI	Global Environmental Monitoring Initiative
GGIS	Global Groundwater Information System
GGRETA	Groundwater Resources Governance in Transboundary Aquifers project, a new name for the SDC project
GGMN	Global Groundwater Monitoring Network
GTN-H	Global Terrestrial Network - Hydrology
HYCOS	Hydrological Cycle Observing System
IAH	International Association of Hydrogeologists
IGAD	Intergovernmental Authority on Development
IHP	International Hydrological Programme
IMS	Information Management System
INWRMP	Inland Water Resources Management Programme
ISARM	Internationally Shared Aquifer Resources Management
IWA	International Water Ambitions (new cooperation mechanism among three ministries in the Netherlands)
IWMI	International Water Management Institute
MAR	Managed Aquifer Recharge
MIM	Meta Information Module (a GGIS component)
NASA	National Aeronautics and Space Administration
OGC	Open Geospatial Consortium
PCU	Project Coordination Unit
RESILIM	Resilience in the Limpopo Basin Program
RWSN	Rural Water Supply Network
SADC	Southern African Development Community
SAP	Strategic Action Plan
SDC	Swiss Agency for Development and Cooperation, in the past also used to indicate the SDC funded GGRETA project
SDGs	Sustainable Development Goals
SIDS	Small Island Developing States
TAC	Technical Advisory Committee
TBA	Transboundary Aquifer
TDA	Transboundary Diagnostic Analysis
TWAP	Transboundary Water Assessment Programme
UN-Habitat	United Nations Human Settlements Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
UpGro	Unlocking Groundwater's Potential for the Poor Programme
USAID	United States Agency for International Development
USGS	United States Geological Survey
WHYMAP	World-wide Hydrogeological Mapping and Assessment Programme
WHO	World Health Organization
WMO	World Meteorological Organization
WRI	Water Resources Institute



## 1. SUMMARY

This is a report of IGRAC's activities in 2015, which were conducted in line with 'Work Plan 2015' and 'Strategic Document 2012-2017.'

In 2015, most time and effort was invested in transboundary aquifer (TBA) assessment activities as planned; although the rounding off and the closure of three long-term TBA assessment projects took longer than expected. Almost half of IGRAC's time in 2015 was dedicated to TBA related activities, including development of Guidelines for Interdisciplinary TBA Assessment and various TBA software modules in the Global Groundwater Information System (GGIS).

The GGIS was completely renewed in 2015, with exception of a groundwater motoring portal that is still under development. Development of contemporary software applications with cloud-based services is a challenging but rewarding undertaking: the new GGIS makes sharing, on-line processing and reuse of groundwater information easier and more beneficial for the user. Finally, the GGIS can be easily extended with new portals such as the one developed for Managing Aquifer Recharge.

Implementation of the Global Groundwater Monitoring Network (GGMN) programme continued, including a development of new GGMN portal. We began organizing two regional workshops with key partners and began preparation this year, although they will be executed in the course of 2016.

In 2015, IGRAC provided ongoing contributions to the development of indicators for Sustainable Development Goals (SDG) in the framework of the 2030 Agenda for Sustainable Development. This report also briefly describes IGRAC's participation in various other groundwater related projects, initiatives, webinars, conferences, etc. We also developed new websites (for us and our partners), produced a number of publications and substantially expanded our networks through the social media.

IGRAC had the largest turnover in 12 year of its existence. Despite good performance and good financial situation, there was no increase in staff due to high uncertainty about funding of the centre after 2015. Towards the end of the year, the Government of the Netherlands and United Nations Educational, Scientific and Cultural Organization (UNESCO) formally expressed their intention to renew the IGRAC Agreement and the Government of the Netherlands confirmed its intention to continue providing the core-financing to the centre. This together has made 2015 a very good year for IGRAC.

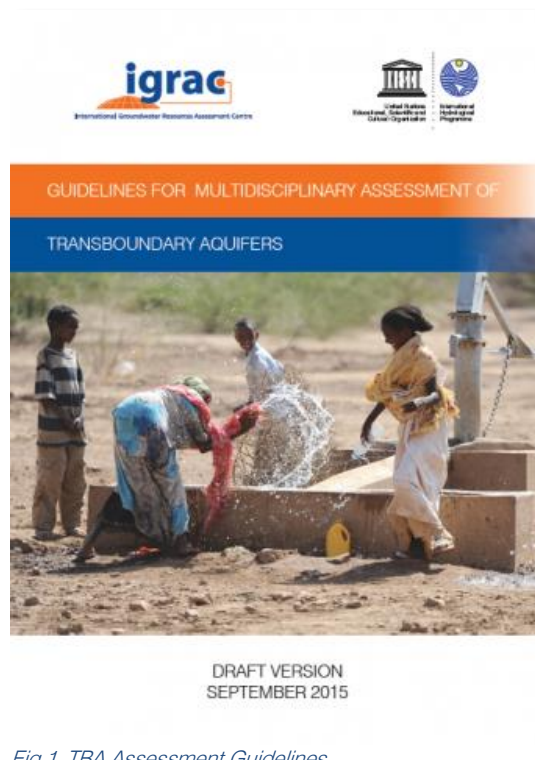


Fig 1. TBA Assessment Guidelines

## 2. ORGANISATIONAL / INSTITUTIONAL ACTIVITIES

### 2.1 INSTITUTIONAL ACTIVITIES

In 2015, IGRAC continued efforts to further strengthen the Centre's organisational structure as well as its links with various other institutes and international programmes. UNESCO's International Hydrological Programme (UNESCO-IHP) remained to be IGRAC's main partner, in particular through engagement of IGRAC in execution of UNESCO-IHP-led externally funded projects: DIKTAS, TWAP and GGRETA. UNESCO-IHP is IGRAC's natural partner as IGRAC's mission and objectives are closely related to UNESCO-IHP objectives and projects. Both IGRAC and UNESCO-IHP made considerable efforts to develop the most optimal working relationship. The main obstacle is still the rather ambivalent position of UNESCO category II centres like IGRAC: The UNESCO Water Division and the UNESCO-IHP Secretariat would like to see IGRAC as an integral part of UNESCO, while the UNESCO administration deals with IGRAC in the same way as with any other external partner. This ambivalent position leads to complications in interpretations of agreements and contracts, different expectations and consequently reduced effectiveness of common activities. These issues have been discussed in the 2015 Governing Board meeting. The renewal of the agreement on IGRAC between UNESCO and the Netherlands in 2016 is a logical moment to review this situation.

IGRAC strives to get engaged in World Bank activities. In January 2014, IGRAC was introduced at the World Bank and since that time, together with groundwater specialists at the World Bank, we have been searching for a modality to get engaged in various World Bank activities/projects. A promising opportunity for IGRAC involvement is the Bank's project Sustainable Groundwater Management in Southern African Development Community (SADC) Member States but the formal start of the project has been delayed considerably which means no activities have yet been undertaken. In 2015, The Netherlands and the World Bank signed a Memorandum of Understanding about a newly-founded Water Global Practice fund. In meetings between the Bank and the Netherlands to define priority water issues for these funds to be allocated to, the relevance of groundwater has been highlighted, as well as the role of IGRAC as an important associated institute.

In August 2015, IGRAC hosted a meeting with representatives from the World Bank, the Directorate-General for International Cooperation (DGIS) of the Netherlands Ministry of Foreign Affairs and groundwater specialists from the Netherlands.



*Fig 2. World Bank roundtable*

Opportunities for IGRAC's involvement in World Bank projects depend also on priorities set by the Ministry of Foreign Affairs Directorate-General for International Cooperation. Groundwater is often included in programmes but it is not a priority for DGIS. The new cooperation mechanism among three ministries in the Netherlands on the International Water Ambitions (IWA) can be promising for groundwater and IGRAC. On request of the Ministry for Infrastructure and Environment, IGRAC has provided suggestions on IGRAC's potential contributions to the International Water Ambitions programme. Also, IGRAC involvement in monitoring of Sustainable Development Goals (SDGs) could be of interest to the Government of the Netherlands, especially as the Netherlands has become one of the 'water related SDG proof of concept countries'.

In October 2015, IGRAC was invited to the World Bank for a meeting to exchange ideas on groundwater in the Bank's lending activities. The event was organised by Water Global Practice and five organisations were involved, including USGS (United States Geological Survey) and NASA (National Aeronautics and Space Administration). One of the outcomes of the meeting is



that IGRAC will be involved if the Bank decides to develop a country-based groundwater assessment approach.

IGRAC substantially increased contacts and cooperation with the World Meteorological Organization (WMO), as was agreed in the 2014 Governing Board meeting. IGRAC is now involved in the preparation of the WMO Manual on Water Resources Assessment. In May 2015, IGRAC visited WMO and discussed possibilities for cooperation with Mr Jarraud, WMO Secretary-General. Among others, it was agreed that IGRAC could provide training on groundwater monitoring in the framework of the Hydrological Cycle Observing System (HYCOS) and GGMN programmes, with the first training currently being organised for representatives of the Small Island Developing States (SIDS) in the Pacific region.

In 2015, IGRAC contributed substantially to the congress of the International Association of Hydrogeologists (IAH) in Rome. IGRAC also provides one of the co-chairs to the IAH commission on Transboundary Aquifers. No further steps were made towards closer institutional cooperation with the IAH Council (IGRAC is awaiting reply of the IAH Executive office on IGRAC's proposals).

IGRAC was invited to become a formal partner in the UNESCO led World-wide Hydrogeological Mapping and Assessment Programme (WHYMAP) consortium. This might also lead to closer cooperation with the German Federal Institute for Geosciences and Natural Resources (BGR) as an important international partner.

In 2015, IGRAC intensified contacts with the International Water Management Institute (IWMI) and the Water Resources Institute (WRI) in order to explore opportunities to establish institutional links. IWMI and WRI were chosen as they are international organisations that are, like IGRAC, financially supported by the Netherlands and that work on issues which are closely related to IGRAC's work. At present, the contacts with IWMI are very promising; IWMI is preparing a new strategic plan and it has consulted IGRAC about a possible strategic partnership. IWMI also invited IGRAC as a partner in the United States Agency for International Development (USAID) funded RAMOTSWA project (Botswana and South Africa), because of IGRAC's experience in the region and in setting up groundwater information management systems. In 2015 IGRAC took the initiative to join forces with IWMI to submit Expressions of Interest for two major projects for ZAMCOM together with ANTEA and UNESCO-IHE.

IGRAC held the regular Foundation Board meeting in April 2015. In this meeting the director of IGRAC reported on the (primarily financial) management of the IGRAC foundation, which was thoroughly discussed and subsequently approved by the board. Current and potential links between IGRAC and the Netherlands groundwater sector were discussed as well.

The anticipated meeting of the Technical Advisory Committee (TAC) was not held because of several reasons, among others the uncertainty about the future of the centre after 2015. IGRAC has a Strategic Plan 2012-2017. A new Strategic Plan may be prepared for the new financing cycle, probably with a renewed TAC membership.

In 2015 there has been no increase in staff, even if the financial situation may have allowed it. Despite good performance one of the temporary contracts was not renewed and the other three contracts have been renewed for a limited period only. The reason for this is that there was much uncertainty about funding of the centre after 2015. At the end of 2015, IGRAC employed seven staff members (3 with permanent contracts and 4 with temporary contracts), including one PhD researcher. In accordance with the 2012-2017 Strategic Plan, IGRAC still aims to increase this number to around ten staff members in coming years.

## 2.2 PROJECT ACQUISITION ACTIVITIES

In 2015 the IGRAC team intensified its project acquisition activities. Tender websites were consulted on a weekly basis to identify project funding opportunities. IGRAC responded to several calls for proposals. The table below gives an overview of the most relevant project acquisition activities in 2015.

**Overview of major project acquisition activities in 2015**

<b>Fund / Client</b>	<b>Programme / Project</b>	<b>Study location</b>	<b>Partners</b>	<b>Status March 2016</b>
Adaptation Fund	Groundwater resources in the Greater Mekong Sub region; collaborative resource management to increase resilience	Cambodia, Lao PDR, Myanmar, Thailand, Vietnam	UNESCO, IWMI, Country agencies, CCOP	Proposal declined
Angola Instituto Nacional de Recursos Hidricos	Sustainable development of the Cuvelai-Etoshia transboundary aquifer (Angola and Namibia).	Angola (and possibly Namibia)	Deltares	Project idea on hold
GEF / UNDP	Determining parameters of the aquifer underlying Mt. Kilimanjaro for sustainable development and management, factoring in effects of climate change	Kenya, Tanzania	UNESCO	Project identification phase
GEF / UNDP / ANBO	Strengthening the institutional capacity of African Network of Basin Organization (ANBO), contributing to the improved transboundary water governance in Africa	Africa (ANBO /AMCOW)	UNESCO	Proposal submitted
GEF / UNEP	Improving IWRM, knowledge-based management and governance of the Niger Basin and the Iullemeden-Taoudeni/Tanezrouft Aquifer System (ITTAS)	Algeria, Bénin, Burkina Faso, Mali, Mauritania, Niger and Nigeria	UNESCO	Proposal submitted
Horizon-2020 (EU)	Preserving and improving quality and availability of groundwater in complex and changing environments	Mediterranean countries	Mediterranean countries	1 <sup>st</sup> phase proposal declined
IGAD	Transboundary Aquifer Assessment in the (Intergovernmental Authority on Development) IGAD Region	IGAD region	IGAD, Ministry of Water Kenya	Project idea submitted
Kenya - Water Resources Management Authority	Hydrogeological study in Kenya – Mandera County	Kenya	Acacia Water, Earth Water Ltd	Proposal submitted
USAID	Sustainable Water Management in the Limpopo Basin - Transboundary Ramotswa Aquifer Project	Botswana, South Africa	IWMI, XRI-geosciences solutions	Contract phase 1 awarded Phase 2 in preparation
USDA	Project component 'Pakistan Groundwater Data management' of the Pakistan Water Dialogue	Pakistan	IWMI	Proposal declined
WMO	Advancing Groundwater Monitoring in Small Island Developing States in the Pacific	Pacific SIDS	SPC, SPREP	Project initiated
World Bank / Brazil	Hydrogeological study of the North-Central region of the State of Tocantins	Brazil	Acacia Water, Panaoá Consult	Eol submitted
World Bank / ZAMCOM	Zambezi River Basin Management Project – component: Strategic Plan for the Zambezi Watercourse'	Zambezi Basin	Lead: IMWI Sub consultants: Antea group, UNESCO-IHE, PRIME AFRICA	Eol submitted
World Bank / ZAMCOM	Zambezi River Basin Management Project – component: Zambezi Water Resources Information System (ZAMWIS) Enhancement 3: Hydro-Met Database and Decision Support System	Zambezi Basin	Lead: Antea group Sub consultants: IMWI, UNESCO-IHE	Eol submitted Preparation of full proposal underway.

In addition to external project acquisition IGRAC has also initiated some internally funded activities/projects in 2015: E.g. the publication of a *Methodology on the Multi-Disciplinary Assessment of Transboundary aquifers*, internal project to perform additional analyses on the data

collected in the Transboundary Waters Assessment Programme (TWAP Groundwater), study to collect/process data on large national aquifers, etc. These activities are described under relevant sections in the next chapter.

### 3. CONTENT ACTIVITIES

IGRAC's content activities in 2015 were mostly continuation of previous activities, conducted in accordance with 'Work Plan 2014' and IGRAC's 'Strategic Planning 2012-2017.' To some extent IGRAC activities were also influenced by external factors and new developments but there was no significant deviation from the work plan. An important milestone in 2015 was the completion of large projects including DIKTAS, GGRETA and TWAP. The main structure of activities remained the same as previous years:

- Global Groundwater Information System
- Global Groundwater Assessment
- Global Groundwater Monitoring Network
- Knowledge Sharing and Groundwater Governance

This chapter provides an overview of the main activities and their outcomes. Additional information is available in project documents and other IGRAC products and services, as referenced to in the overviews below.

#### 3.1 GLOBAL GROUNDWATER INFORMATION SYSTEM (GGIS)

The Global Groundwater Information System (GGIS) is IGRAC's interactive and web-portal to groundwater related information and knowledge. The main purpose of the GGIS is to assist in collection, storage and analysis of information on groundwater resources and its sharing among stakeholders such as water experts and decision makers. The system provides a global overview of aggregated information per country and per aquifer; detailed information for a selection of transboundary aquifers; and information sheets for 199 recently assessed transboundary aquifers. The map interface of the GGIS is complemented with a Meta-Information Module (MIM), where additional information and references are uploaded and linked to other data in the system. Software developed for monitoring within the GGMN application as well as IGRAC's other online databases are also considered a part of the GGIS.

##### 3.1.1 Software development

In 2015, IGRAC finalised the development of the fully redesigned and expanded GGIS after nearly two years of design, development, testing and implementation. The system has been developed using open and extendable state of the art technology, making it possible to connect to more varied external data sources and systems through the internet. The user interface has been upgraded following specific requirements for usable data types, layout, GIS tools and web mapping services. All modules are built in the same environment to create consistency among user interfaces and to make it possible to combine data from the various projects. The accessibility, performance and user friendliness of the GGIS have been improved whilst also allowing more interactive participation of its users.

##### Development of a TWAP Groundwater viewer

The TWAP module of the GGIS allows the upload and storage of information collected through the groundwater component of the TWAP project. TWAP Groundwater is the first global baseline assessment based on systematically structured data of transboundary aquifers and groundwater systems of Small Island Developing States (SIDS). The TWAP viewer contains aggregated data on parameters, variables and project-specific indicators, altogether covering the hydrogeological, environmental, socio-economical and governance dimensions of the aquifer systems. The TWAP Groundwater viewer enables users to compare transboundary aquifers within the same region or across the globe. Users can browse and query a large number of thematic maps, download data in tabular format and download transboundary aquifer and SIDS groundwater information sheets.

##### Development of GGRETA Information Management System

As part of the GGIS redesign, IGRAC also developed a module for the Groundwater Resources Governance in Transboundary Aquifers project (GGRETA). The GGRETA Information

Management System provides detailed, map-based information on the three pilot transboundary aquifers located in: Southern Africa, Central Asia, and Central America. The portal is developed to collect, store, visualise and share information between (international) stakeholders and aims to be a tool in support of transboundary groundwater governance. The GGRETA system allows upload of various types of data, and the possibility to overlay different GGRETTA data into customized maps.

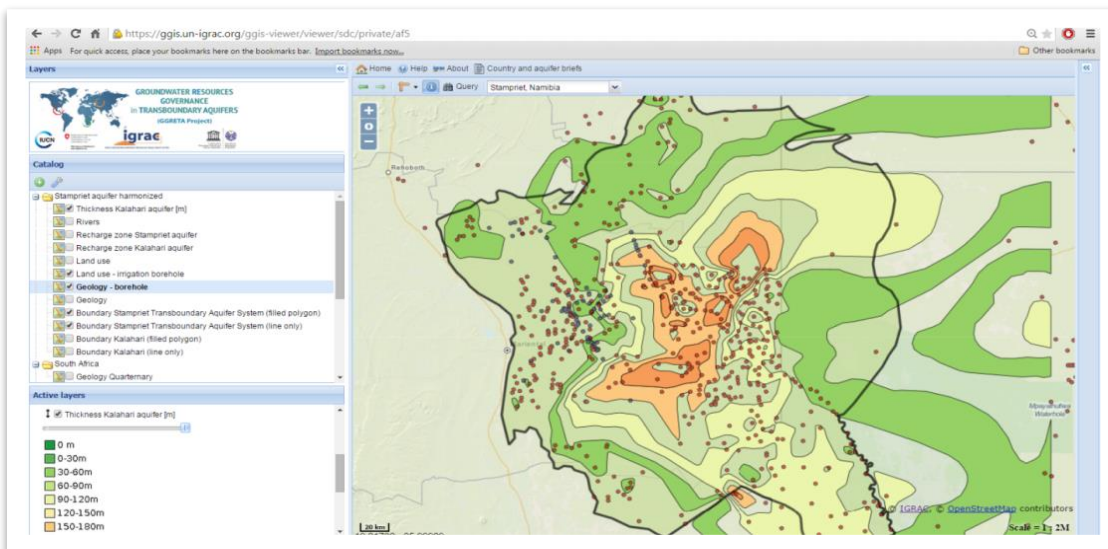


Fig 3. GGRETA IMS

#### Digital portal Map of Transboundary Aquifers of the World

In 2015, an online portal was set-up in the new GIS to provide access to all editions of the maps of 'Transboundary Aquifers of the World' produced by IGRAC (2009, 2012, 2014, and 2015) online. The digital version of the maps shows delineations of small aquifers and EU groundwater bodies that are not possible to visualised on a printed map. The viewer also provides basic information on individual transboundary aquifers and EU groundwater bodies.



Fig 4. Digital version TBA Map 2015

#### Development of Managed Aquifer Recharge Information System

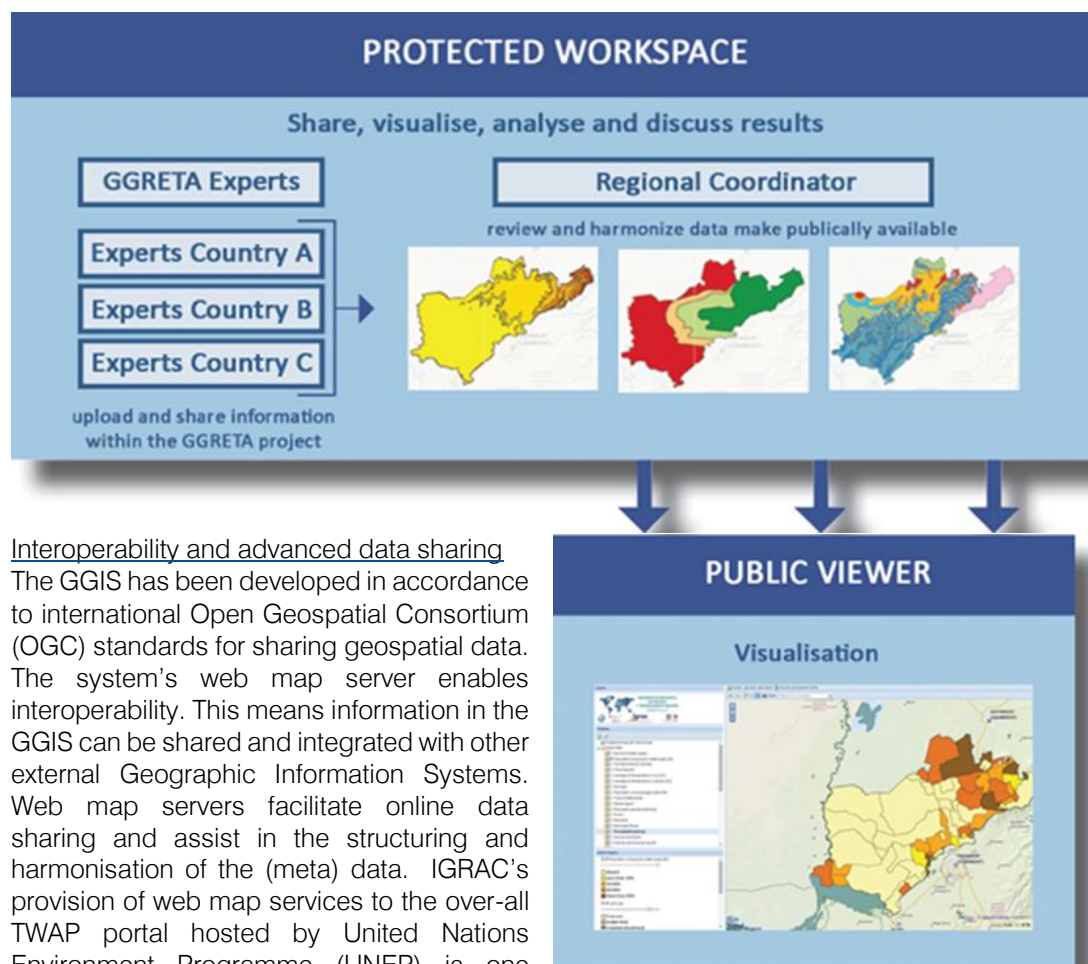
The Managed Aquifer Recharge Information System (MAR Information System) contains a global overview of MAR case studies and their relevant parameters. Available maps include location and information on MAR types, purpose of MAR, and end use of effluent. The data shown in this portal are available by INOWAS (TU Dresden, Germany and funded by the German Federal Ministry of Education and Research) and the DEMAU project (European Union FP7 project consortium).

#### Development of Information Management System for the Merti Aquifer

To improve the outreach and to increase visibility of the IGAD-MAR project (see chapter 3.2.3), the IGAD-MAR module was developed. The final maps include thematic groundwater maps and maps of areas with MAR potential. These were made available to share project results via the web and to facilitate information access and exchange between stakeholders and the IGAD member states for the IGAD Inland Water Resources Management Programme.

### Password-protected workspaces

The GGIS has two types of workspaces. The first are public viewers that are freely accessible to anyone with internet access. The second are password-protected workspaces for projects that provide exclusive access to registered users. Authorised project partners can upload and manage the information in their workspace and decide which data will be made generally available to the public in the public viewer. The password protected environment is particularly useful for sharing draft maps or information which is considered to be sensitive.



### Interoperability and advanced data sharing

The GGIS has been developed in accordance to international Open Geospatial Consortium (OGC) standards for sharing geospatial data. The system's web map server enables interoperability. This means information in the GGIS can be shared and integrated with other external Geographic Information Systems. Web map servers facilitate online data sharing and assist in the structuring and harmonisation of the (meta) data. IGRAC's provision of web map services to the over-all TWAP portal hosted by United Nations Environment Programme (UNEP) is one example of this interoperability. Additionally, if IGRAC updates or amends these data, they will automatically be available to all external users without the need to make copies of data bases. A selection of web services is available on the IGRAC website for sharing purposes.

*Fig 5. Protected and Public workspace*

### Redesign of the Global Groundwater Monitoring Network portal

In 2015, IGRAC commissioned the development of a completely redesigned web-application for the Global Groundwater Monitoring Network (GGMN). Improved functionality of the GGMN include performance, user-friendliness, use of international standards, improved visualisation of data availability in space and time, improved visualisation of groundwater change and spatial aggregation. New functionalities include a time series analysis tool, inclusion of a digital elevation model, land cover maps, download functionality, multiple log in per country or organisation and automatic import via web services. A first trial version of the new GGMN is online via [ggmn.un-igrac.org](http://ggmn.un-igrac.org).



### 3.1.2 Content update

The main content update of the GGIS in 2015 consisted of the following:

#### Transboundary Waters Assessment Programme (TWAP)

In TWAP large amounts of data have been collected for 199 transboundary aquifers and 43 groundwater systems of Small Island Developing States (SIDS). Indicators describing the general state of the aquifers have been calculated based on the collected data. All available data and indicators from the Global Inventory (TWAP questionnaire survey), WaterGAP global modelling and SIDS Groundwater inventory have been uploaded to the TWAP Information Management System (IMS), in total 224 data layers are now available in the TWAP IMS. All data can be downloaded as maps or excel files. Information on the aquifers has also been compiled in transboundary aquifer information sheets, which are now available for download in pdf-format. For more information, see on the TWAP project description further on in the report.

#### Groundwater Governance in Transboundary Aquifers (GGRETA) project

In 2015, spatially distributed data (such as shape files, geo-tiff and point data) for the three aquifers have been collected, processed and uploaded to the system. In total 29 layers for the Pretashkent aquifer, and 13 layers for the Stampriet aquifer have been uploaded to the system. At the request of the participating countries, most data are only available in the password protected environment. For more information, see GGRETA project.

#### Managed Aquifer Recharge Inventory

The GGIS MAR module contains integrated information collected through a European Union project consortium in the DEMEAU project. The information consists of point data with information on MAR sites in Europe. Additionally, data from a global inventory on MAR Sites from the TU Dresden, Germany are available. This global MAR database contains data on 1500 MAR sites worldwide, with for each site key information on construction, operation and aquifer properties. The first data have been added to the system in 2015 and more will be uploaded in 2016.

#### Training material and technical documentation on GGIS

IGRAC drafted instruction sheets and user manuals explaining the more advanced functionalities of the GGIS and in particular of the TWAP and GGRETA modules. The GGRETA manual has also been translated into Spanish. For internal use, IGRAC also drafted technical manuals for system administrators, which describe the advanced and 'behind the scenes' procedures related to the database management and publishing settings of map layers etc. In 2015 IGRAC also organised and conducted hands-on training sessions for GGRETA project partners. See 3.2.2 for more information.

## 3.2 GLOBAL GROUNDWATER ASSESSMENT

Groundwater assessment activities at IGRAC encompass country-based assessments, transboundary groundwater assessments and thematic assessments.

### 3.2.1 Global Country-based Assessment

#### Country briefs and the Groundwater Atlas of Africa in cooperation with BGS

In 2014 IGRAC developed briefs describing the state of groundwater resources in Bolivia, India, the Netherlands and Yemen. The country briefs are 3 to 5-page brochures that provide an overall picture of the country's groundwater resources in a standardised, short narrative that is supplemented with some graphical information. For 2015, IGRAC planned to develop more country briefs with the ultimate goal of creating briefs for all countries in the world. Yet, due to obligations from external projects and other activities which received a priority, progress in development of the country briefs has been very limited. Nevertheless, the agreement was made with British Geological Survey (BGS) on common storage and dissemination of country-based groundwater brief. This activity is planned for next year.

### 3.2.2 Transboundary Aquifer Assessment

Transboundary Aquifer Assessment remained the main IGRAC activity in 2015. Commissioned by UNESCO-IHP, IGRAC concentrated its activities on three large projects: TWAP, DIKTAS and GGRETA and one smaller, but innovative project on the Ramotswa TBA. Transboundary Aquifers of the World Map was updated as well. A brief description of main TBA assessment activities 2015 is given below.

#### Transboundary Water Assessment Programme (TWAP)

Recognizing the importance of transboundary water systems to humans and ecosystems, the fact that many of the water systems continue to be degraded and that most are managed in fragmented ways, the Global Environment Facility initiated the TWAP project ([www.geftwap.org](http://www.geftwap.org)). IGRAC was previously involved in the TWAP medium-sized project (2009-2011) in which the methodology for an indicator based assessment was developed. In 2013 the TWAP full-sized project started. This programme is the first global comparative assessment of five transboundary water system categories: groundwater, lakes, rivers, large marine ecosystems and open oceans. The envisaged outcome is to provide the Global Environment Facility (GEF) and other international organizations with tools and information for setting priorities in activities related to sustainable management of transboundary water systems. The assessment is executed through institutional partnerships aiming to also seed future follow-up assessments. The TWAP groundwater component ([www.twap.isarm.org](http://www.twap.isarm.org)) has assessed 199 transboundary aquifers and 43 groundwater systems of Small Island Developing States (SIDS). Data have been collected through networks of regional and national experts. The project is executed by UNESCO-IHP in close cooperation with IGRAC.



Fig 6. TWAP Viewer

The project started in April 2013 and concluded in 2015 after a no-cost extension. The final activities included the publication of final reports and launching of web based products including data portals.

IGRAC's main responsibilities have been coordinating the global data collection process, setting up the TWAP-groundwater information management system (TWAP IMS), providing technical assistance to all parties, contributing to the analyses and reporting, and over-all project management in conjunction with UNESCO-IHP.

Data collection was formally finalised by the end of 2014. In 2015, the focus has been on processing all data, collating all data and information into the TWAP Groundwater report and Transboundary Aquifer Information Sheets, finalising development of the TWAP Information

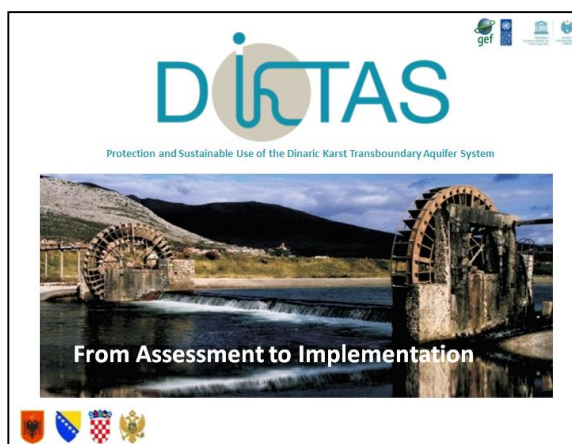
Management System (TWAP IMS), populating the TWAP IMS, and communicating project results. Activities in 2015 included:

- Project management: together with UNESCO-IHP, IGRAC formed the project management team for the TWAP Groundwater component. As such IGRAC was involved in all aspects of the project's organisation.
- Steering committee: Together with UNESCO-IHP, IGRAC represented the Groundwater component in the TWAP steering committee meetings. In 2015, remote meetings have been conducted using skype and conference calls and a face-to-face steering committee meeting took place in Paris in March 2015. IGRAC, together with other experts, represented the TWAP Groundwater team and took care of several presentations.
- Participation in the cross-cutting working groups (with the other water systems) on Governance and Data & Information Management.
- Coordinating technical harmonisation with Frankfurt University for global groundwater modelling component and Simon Fraser University Canada for SIDS-groundwater assessment.
- Being responsible for the data collection process through questionnaires (526 questionnaires have been sent out to 116 countries), IGRAC processed all questionnaires and finalised uploading of all information into TWAP database, performed basic quality checks (and liaised with national and regional experts as required), calculated indicators, assisted in drafting aquifer information sheets, etc.
- Finalising all improvements of delineations of transboundary aquifers has culminated in the publication of a new edition of the Map of Transboundary Aquifers of the World – 2015 edition, which was launched during the World Water Forum in Korea.
- IGRAC developed, tested and implemented the web-based Information Management System (IMS) for the TWAP Groundwater component enabling public access to all data collected in TWAP Groundwater (maps, documents and graphics). The TWAP IMS is developed as a module of the fully upgraded and redesigned GGIS.
- Contributions to the TWAP Groundwater report, which combines and summarises the findings of the assessment of 199 transboundary aquifers, 43 SIDS groundwater systems and the results from the scenario studies through modelling. Contributions include processing comments from reviewers.
- Transforming / upgrading TWAP Groundwater component website from a project progress reporting site, to a website to communicate and disseminate final products.
- Presentation of TWAP (preliminary) results in several international conferences and meetings:
  - March 2015: TWAP Project Steering Committee & GEF Secretariat – Paris, France.
  - April 2015: 7th World Water Forum – Daegu & Gyeongbuk, Korea
  - May 2015: 16th World Water Congress – Edinburgh, United Kingdom
  - August 2015: UN Water conference – Stockholm, Sweden.
  - November 2015: United Nations Economic Commission for Europe (UNECE) meeting of the Parties to the Water Convention, side event - Budapest, Hungary.

#### DIKTAS project

Protection and Sustainable Use of the Dinaric Karst Aquifer System (DIKTAS) project (<http://diktas.iwlearn.org>) has started in 2010 and it is the first GEF project executed by UNESCO. IGRAC has provided the project manager and also contributes to various content activities. The total project budget is about 5.6M USD, wherefrom about 2.1M funding from the GEF and 3.4M in co-financing in kind by the project partners. IGRAC's total contribution to the project is about 1M USD, wherefrom approximately 40% is funded by GEF and 60% is in-kind.

The DIKTAS project was closed in 2015. Originally, the project was supposed to be closed in December 2014 but it was extended till June 2015 because of delays in preparation of the Transboundary Diagnostic Analysis (TDA) and organisation of the conference Karst without Boundaries in 2014. The second round of Inter-ministerial Committee (NIC) meetings was held in Bosnia and Herzegovina and Croatia in November 2014, in Montenegro in February 2015 and in Albania only in May 2015. In this second round, the NICs discussed a draft Strategic Action Plan (SAP) document and provided many comments and suggestions to be processed by the DIKTAS Project Team. The regional meeting of NICs was held in Trebinje 28<sup>th</sup> of May 2015, followed up by the Steering Committee meeting the next day.



*Fig 7. DIKTAS Project*

The main conclusions from these meetings were as follows:

- DIKTAS was a successful project; with many lessons learned for future activities.
- The main achievements of the project are:
  - Improved knowledge on karst groundwaters in the Dinaric region mainly through implementation of the TDA and collecting, structuring, harmonising data;
  - Strengthened cooperation in the region through Project Team, National Interministerial Committees, Steering Committee;
  - Increased capacity and awareness through the Karst School, stakeholder workshops, conferences, publications, etc.
- Through these achievements the project has paved the way for further, broader cooperation in the region.

The project faced several challenges and most of them were overcome without major repercussions. However, some issues required more time and effort to tackle, leading to delays in the project execution. The main reasons for delay were the complexity of the TDA and the organisation of the conference; both legitimate reasons but the simple lesson learned is to plan more resources for activities which are not routine and/or highly dependant on external factors. There were, however, other reasons for delay as well, such as: changes of governmental representatives in the project (due to elections or other reasons); performance of some Project Team members, changes in the Project Coordination Unit (PCU), limited flexibility in UN rules and regulations on practical organisational matters, etc. Nevertheless, the delay was limited and the experience gained will be very useful for the next project phase.

The Steering Committee requested the extension of the project in order to prepare a concise version of the Strategic Action Plan. In September 2015, an extension of six months was granted.

The project Terminal Report was prepared and placed on a CD-ROM together with about 40 of the most important project documents. The CD-ROM also contains the produced project maps in various formats and all data collected during the project execution.

The concise version of the Strategic Action Plan was prepared in November 2015 and was submitted to the project countries for considerations.

#### The GGRETA project

Phase I of GGRETA started in April 2013. The project ran until December 2015 and was funded by the Swiss Agency for Development and Cooperation (SDC). It was executed by UNESCO-IHP with IGRAC as a major partner. The objectives of the first phase of the project were:

- to improve the knowledge and recognition of the importance and vulnerability of transboundary groundwater resources;
- to establish cross-border dialogue and cooperation;



- to develop shared management tools; and
- to facilitate governance reforms focused on improving livelihoods, economic development and environmental sustainability.

The focus of Phase 1 was on joint assessment of the selected transboundary aquifers and laying the foundation for joint management. Three transboundary aquifers were selected for the project: the Trifinio Aquifer between El Salvador, Honduras, and Guatemala; the Stampriet Aquifer between Botswana, Namibia, and South Africa; and the Pretashkent Aquifer between Kazakhstan and Uzbekistan.

IGRAC was responsible for data and information management and also provided technical support to the project management and national/regional expert teams. IGRAC's main activities in 2015 were:

- Providing guidance on the assessment methodology to project partners.
- Developing, testing and implementing of the final version of the web-based Information Management System (IMS) for the GGRETA project, enabling sharing between stakeholders of the final outputs (maps, tables, graphs, documents, etc.) from the three GGRETA case studies.
- Assisting UNESCO-IHP in general project management activities related to reporting to SDC and managing activities in the three case studies.

**Stampriet case study:** IGRAC contributed to the organisation and execution of four workshops in 2015:

- Regional technical workshop in Johannesburg – South Africa (February 2015)
- Regional technical workshop in Gaborone – Botswana (May 2015)
- Stakeholder meeting in Johannesburg – South Africa (July 2015), which on IGRAC's suggestion was organised in conjunction with the inception meeting of the RAMOTSWA project executed by IMWI (see below).
- Stakeholder meeting in Mariental – Namibia (November 2015)

Additionally, IGRAC helped draft the Stampriet case study assessment report and analyses.

**Pretashkent case study:** Throughout 2015, IGRAC provided guidance and technical assistance to the project's partners in Kazakhstan and Uzbekistan.

IGRAC organised two training sessions in Delft, namely for Kazakh water professionals in February 2015 and for Uzbek water professionals in October 2015.

The trainings entitled 'Advanced Groundwater Monitoring Analysis' were organized in collaboration with UNESCO-IHE, Deltares, and Royal Eijkelpomp. The training introduced state-of-the-art knowledge on groundwater monitoring and related quantity and quality analysis. An introduction to monitoring and analysis equipment was provided in order to assess its suitability for operation in the region. The training covered various aspects of groundwater monitoring, including optimization of a groundwater monitoring network, water quality analysis, equipment required for water management and introduction of the GGMN Programme and the GGRETA Information Management System:



*Fig 8. Field visit at Royal Eijkelpomp*

IGRAC and UNESCO also organized the workshop 'Added Value of Groundwater Management Systems' in Almaty, Kazakhstan to introduce the GGRETA information management system. Participants were trained to use the IMS and invited to thoroughly discuss its current and potential added values.

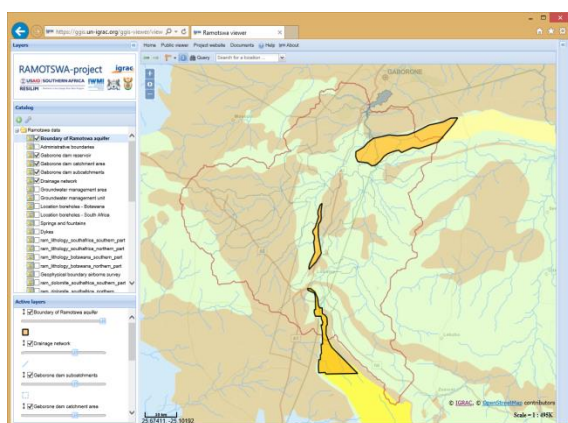
**Trifinio Case Study:** IGRAC, UNESCO-IHP and IUCN organised a one-week training course on the functionalities and use of GGRETA-IMS for the professionals of the project “Assessment of Groundwater Resources in the Trifinio Area.” GGRETA-IMS is the Information Management System-tool to store, visualise and share information collected during the aquifer assessment. The course took place at the Centenario Hotel in Esquipulas – Guatemala and was given by IGRAC’s coordinator for the Trifinio’s project. A follow-up training is planned for 2016.

### Ramotswa Project

In December 2014, the International Water Management Institute (IMWI) invited IGRAC to be a partner in the project ‘Resilience in the Limpopo Basin: the Potential Role of the Transboundary Ramotswa Aquifer’. This USAID-funded project is a component of the Resilience in the Limpopo Basin Program (RESILIM) which supports the riparian countries of the basin in their efforts to improve shared management of water resources and equitably address the economic, environmental, and social needs of each country, thereby enhancing the resilience of the ecosystems and the people. The project supports equitable access to water that balances urban and rural needs with ecosystem requirements under a changing climate. It reduces climate vulnerability by promoting adaptation strategies for integrated, transboundary water resource management. By building the capacity of river basin organizations, national authorities and local communities to sustainably manage natural resources, high priority ecosystems and human communities will be resilient to climate-induced pressure.

The Ramotswa project addresses the overall objectives by critically examining the opportunities the freshwater aquifer offers in terms of climate adaptation and human induced changes such as pollution and depletion, while preserving and enhancing the resource and associated ecosystems through transboundary and local management.

IGRAC’s contribution to the first phase will be to set-up and manage the Ramotswa aquifer information system in the GGIS, to provide training in three workshops on the use of the system and on assessment as well as contribute to the analyses and reporting and possibly to scientific papers resulting from the project. IGRAC’s formal involvement in the project started in November 2015 and will continue until December 2016, additionally, a 2<sup>nd</sup> phase that would last until 2018 is under negotiation.



*Fig 9. Ramotswa viewer*

In 2015, IGRAC contributed to the Inception meeting of the project. Because of similarities and partial overlap in project partners, between the Ramotswa project and the GGRETA – Stampriet project, IGRAC suggested organising a joint meeting for the two project to create synergies. This joint meeting was organised in July in Johannesburg (South Africa).

In the last quarter of 2015, IGRAC also set up the first version of the Ramotswa Information Management System as a separate transboundary aquifer viewer within the Global Groundwater Information System. In

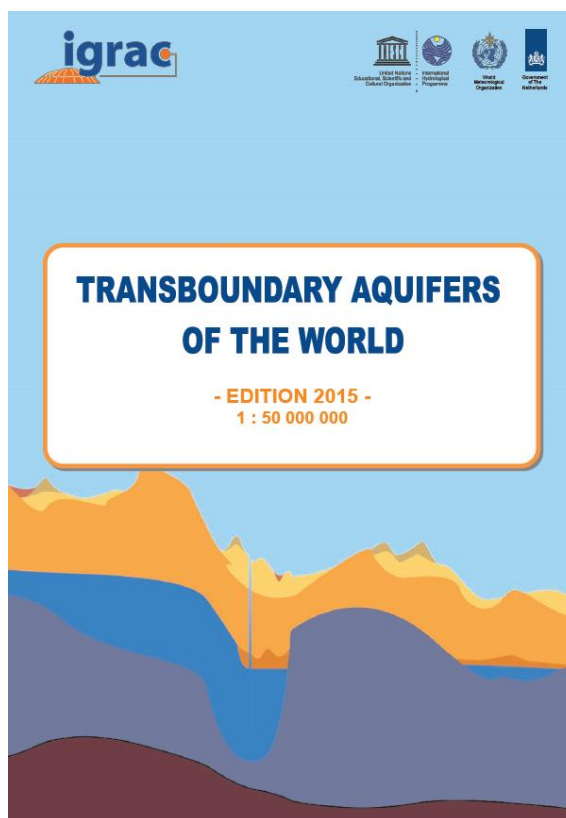
2016, the system will be further populated, training will be provided, and there will be a gradual handover to the national governments. IGRAC also developed a first draft of the Ramotswa Information Management System User Manual for advanced users.



### Transboundary Aquifers of the World Map

IGRAC launched the 2015 edition of the map of Transboundary Aquifers of the World (TBA map) at the 7<sup>th</sup> World Water Forum in the Republic of Korea. In this new edition there are 592 identified transboundary aquifers, including transboundary 'groundwater bodies' as defined in the European Union Water Framework Directive (EU WFD). The map provides a global overview of these important, shared groundwater resources and intends to encourage further research and assessment thereof. In publishing this map, IGRAC aims to contribute to raising awareness on the importance of the governance of shared aquifer resources and to building the much needed global knowledge base.

This latest edition of the TBA map encapsulates information provided by various organisations and from projects dealing with transboundary aquifer assessments. A significant new source of information for the 2015 map was data collected as part of TWAP. The TWAP project resulted in minor changes to the delineation of 28 TBAs (change of surface area less than 10%), significant changes to 65 TBAs (>10% change in surface area) and added 53 completely new TBAs. The guiding principle in compiling the 2015 map was to stay as close as possible to the information provided by the individual sources, while presenting the information in a form that is appropriate for the chosen scale of the map (1:50.000.000).



*Fig 103. TBA Map 2015*

New to the 2015 edition are the three thematic maps. These maps overlay the delineations of the (large) transboundary aquifers of the world with maps of climate zones, groundwater resources and recharge, and population density. Viewed side by side, these three maps give an indication of the potential for groundwater to contribute to sustainable development by showing the relation of climate, potential for groundwater recharge and potential human needs.

### 3.2.3 Thematic Assessment

In 2015, IGRAC conducted several thematic studies, including developing a TBA assessment methodology, analysis of global groundwater data, and implementing a data system for managing aquifer recharge.

#### Guidelines for Multidisciplinary Assessment of Transboundary Aquifers

In 2015 IGRAC, in cooperation with UNESCO-IHP, published 'Guidelines for Multidisciplinary Assessment of Transboundary Aquifers'. The guidelines were launched in draft form during the 42<sup>nd</sup> IAH congress in Rome in September 2015. Based on feedback received on this draft IGRAC will publish the final guidelines in 2016.

The guidelines are the outcome of several initiatives, including the Internationally Shared Aquifer Resources Management (ISARM) programme and the methodology developed for the Groundwater component of the TWAP project, funded by the GEF. Over the past few years, IGRAC further developed the methodology and it was tested in the three case studies of the GGRETA project funded by the Swiss Agency for Development Cooperation. The published guidelines have been prepared to assist in-depth assessments at aquifer level. Nevertheless, they can also be

used for comparative, regional assessments by aggregating data to the aquifer level and focussing on the indicators-based assessment.

#### Analysis of the global groundwater data sets

TWAP project yielded a significant volume of data on 199 of the transboundary aquifers in the world. Given the short time span and deadlines for TWAP, only a limited analyses was possible in the framework of TWAP itself. Therefore, IGRAC continued in-depth analyses of the TWAP Groundwater data sets in order to maximise opportunities that this important data set on could yield regarding transboundary groundwater. The in-depth analyses also included analyses of some of the background data (the 'raw' data from the questionnaires). The initial analysis focused on country segments where available data suggest a high human dependency on groundwater. These aquifer segments were evaluated based on groundwater development stress and their renewal capacity. Aquifer vulnerabilities and observed pollution patterns, natural and anthropogenic, were visualized in more detail. The analysis will be rounded off in 2016.

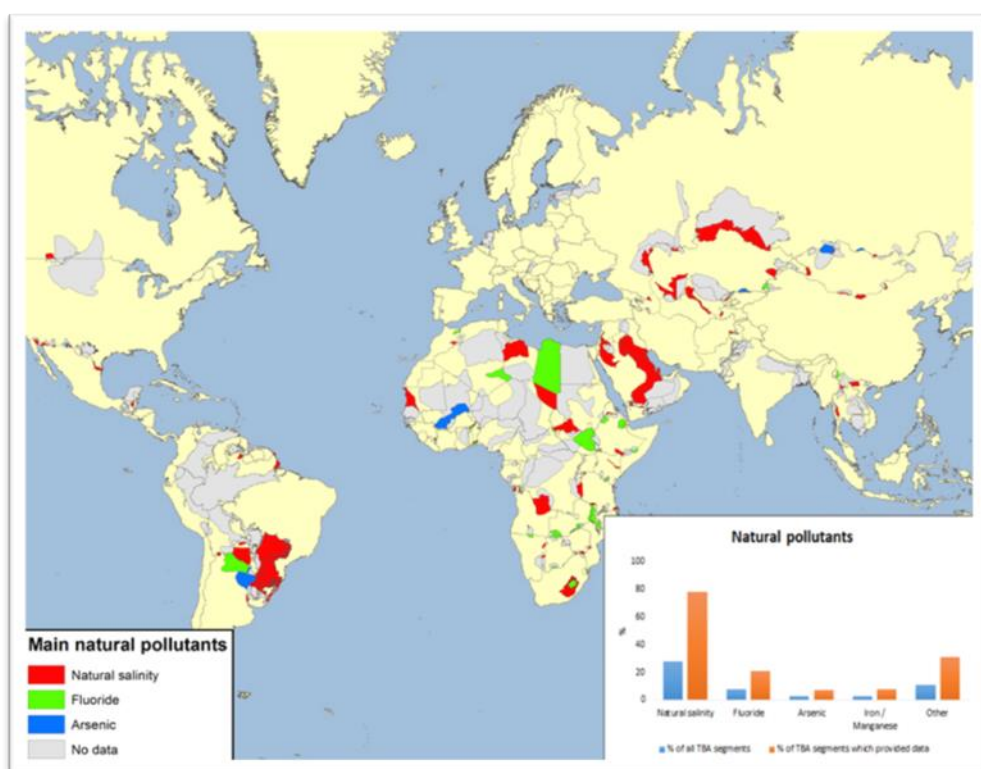
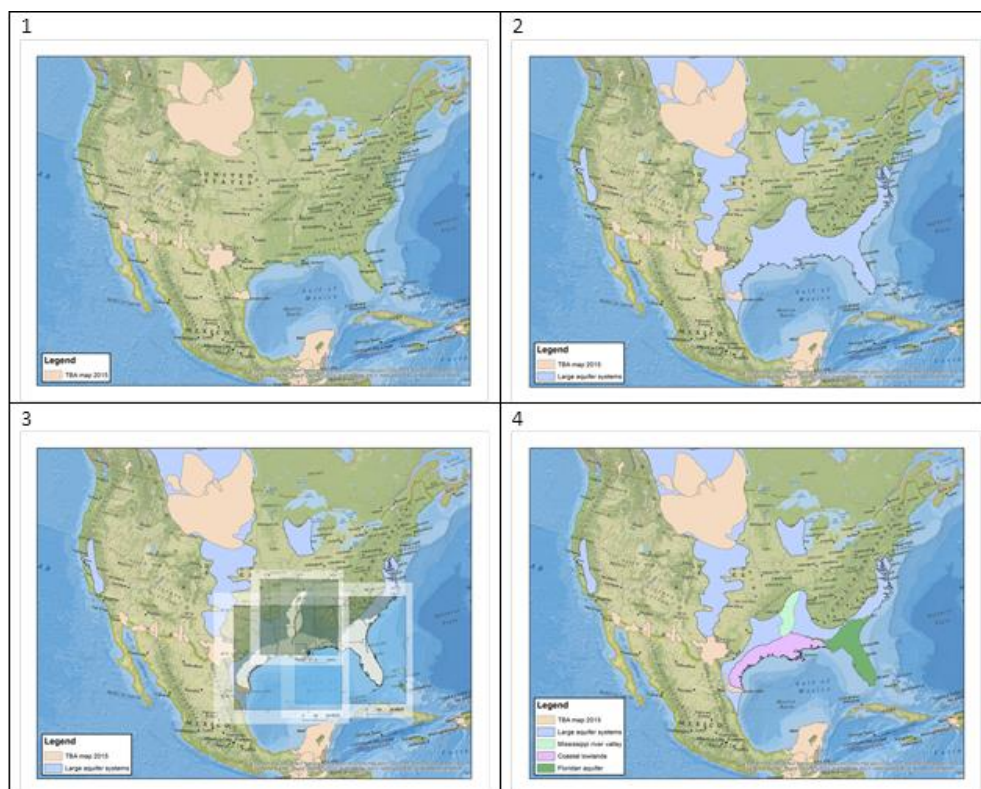


Fig 114. TWAP Natural Pollutants

#### From TBAs to Global Coverage - inclusion of large national aquifers

In 2015, IGRAC started work on a map and database of aquifers of the world, by complementing the map of *Transboundary aquifers of the world* with data on large national aquifers. In addition to creating a map with delineations of the (large) aquifers of the world, we also intend to include data on two indicators describing the state and importance of each aquifer: groundwater development stress (recharge volume divided by groundwater abstraction volume) and human dependency on groundwater. The figure below shows the step-wise procedure for delineating these aquifers.



*Fig 12. Inclusion of large national aquifers*

#### Assessment of Sustainable Development in the Châteaguay Transboundary Aquifer

IGRAC hosted and guided Lea Weiss, an intern from the University of Utrecht – faculty of Environmental Sciences – from 1 July to 1 September. During her time at IGRAC, Lea assessed the potential for the sustainable development of the Châteaguay Transboundary Aquifer (shared between Canada and the United States) from a legal perspective. Adapting the conceptual and analytical framework developed but IGRAC's PhD Research Fellow, Kirstin Conti, Ms. Weiss looked at the existing laws with direct and indirect applicability to groundwater in the aquifer. She identified strengths and weaknesses in these legal frameworks, assessed how the contents of the laws may or may not promote sustainable development and made recommendations in this regard. The report will be published in a concise form in coming months.

#### Data management system for the application of managed aquifer recharge in the Merti aquifer

In the first months of 2015, IGRAC and Acacia Water finished a consultancy project that designed and developed of data systems to support the application of Managed Aquifer Recharge (MAR) in the Horn of Africa. The project was awarded by IGAD/INWRMP to IGRAC with Acacia Water as a subcontractor. The project's overall emphasis was to identify and map the potential for different MAR applications within the transboundary Merti Aquifer, shared between Kenya and Somalia, and the development of a MAR data management system. The potential of critical groundwater zones for current and future water supply and the potential of MAR to strengthen this resource were identified and mapped. The study was presented to key stakeholders in a 2-day workshop on MAR technology for the Merti aquifer in Naivasha, Kenya. This workshop was combined with a training session on the use of the MAR data system. The objectives were to promote the use of a

data-driven approach to MAR and to equip local experts with the knowledge and skills to apply MAR techniques.

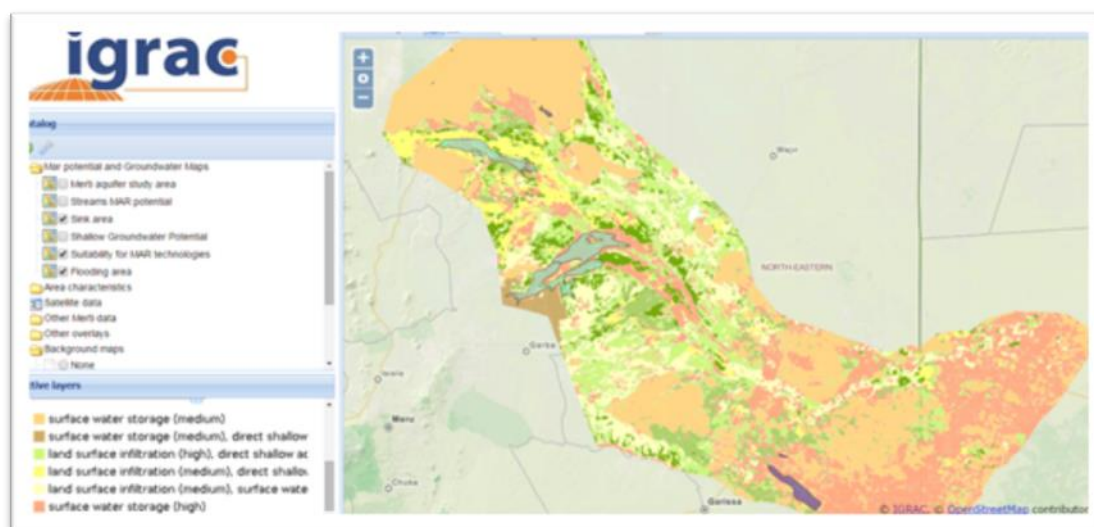


Fig 13. Data management system for the application of MAR in the Merti Aquifer

### 3.3 GLOBAL GROUNDWATER MONITORING

The Global Groundwater Monitoring Network (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.

In 2015 IGRAC began fully redesigning the GGMN web-application. The required developments are complex given that state of the art technology is employed and international standards for data sharing followed. With these improvement, the system is more robust and user friendly, enabling GGMN users to work with the system independently. IGRAC is investing about 100.000€ in the new GGMN portal. Detailed Software Requirement Specifications have been prepared and UNESCO-IHE is also involved in the development.

IGRAC contributed to the 7<sup>th</sup> panel session of the Global Terrestrial Network - Hydrology (GTN-H) in June in Koblenz, Germany. GTN-H links existing networks and systems for integrated observations of the global water cycle. The GTN-H is a joint project of the Global Climate Observing System (GCOS), the World Meteorological Organization / Climate and Water Department (WMO/CLW), and the Global Terrestrial Observing System (GTOS). Its goal is to provide comprehensive information on the total climate system where groundwater makes one of the essential climatic variables. IGRAC is responsible for the groundwater observations.

Two regional workshops were planned for 2015, one for Pacific Small Island Developing States (SIDS) with WMO and other for South-East Asia with UNESCO Bangkok office. Both workshops are postponed until 2016: the SIDS workshop because of local organizational issues and the Bangkok workshop because of delay in the software development.

### 3.4 KNOWLEDGE SHARING AND GOVERNANCE

Knowledge sharing is a part of all IGRAC activities and involves creating networks of people and development of services for these networks. Some activities listed below can also be seen as thematic developments but they do not necessary include assessment. These activities are dedicated to knowledge sharing (and governance) beyond the usual management structure. In the chapter below, a distinction is made between project-based activities and dissemination and outreach through publications, social media, events, etc.



### 3.4.1 Governance

#### Sustainable Development Goals (SDGs)



Fig 14. SDGs

In 2015, UN organisations and member states formulated a new agenda for development: 2030 Agenda for Sustainable Development, more commonly called the Sustainable Development Goals (SDGs). The SDGs were adopted in September 2015 by the United Nations General Assembly. They include 17 Sustainable Development Goals with 169 associated targets. The new Goals and targets came into effect on 1 January 2016 and will guide the decisions of UN organisations and member states over the next 15 years. A clear set of indicators and a coherent monitoring framework is required to track progress of achieving the SDGs. Therefore, the Global Environmental Monitoring Initiative (GEMI) is set up to address this need for SDG 6: 'Ensure availability and sustainable management of water and sanitation for all'. GEMI is an inter-agency initiative composed of the UNEP, the United Nations

Human Settlements Programme (UN-Habitat), the United Nations Children's Fund (UNICEF), Food and Agriculture Organization (FAO), UNESCO, the World Health Organization (WHO) and WMO, co-operating under the umbrella of UN-Water.

IGRAC already began contributing to GEMI in November 2014 during the inaugural meeting in Nairobi. A second, key meeting was held in Geneva in January 2015, where the GEMI programme was discussed with Member State representatives. Throughout 2015, IGRAC provided comments and suggestions on the proposed indicators for targets 6.3-6.6. IGRAC also supported UNESCO IHP and UNECE in their efforts to ensure inclusion of indicator 6.5.2 'Percentage of transboundary basin area with an operational arrangement for water cooperation.' Future involvement of IGRAC in GEMI will be determined by available funding. In the current GEMI planning, the UNESCO water family is designated roughly 2% of the total budget.

IGRAC released its second position paper on Groundwater in the SDG's entitled 'Groundwater in the Sustainable Development Goals – Emphasizing groundwater in the negotiations of the final goals.' This paper focused on the role of groundwater in the Draft Zero goals as authored by the UN Open Working Group on Sustainable Development Goals, particularly Goal 6. It also discussed the particular ways groundwater could be highlighted to enhance goal outcomes.

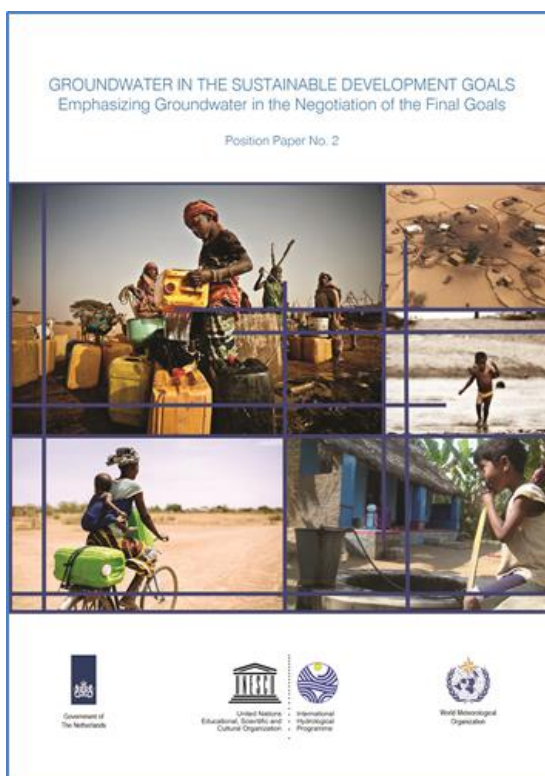


Fig 15. Second Position Paper on SDGs

#### Advanced Governance Assessment of the Stampriet Aquifer – PhD fieldwork

In May and June of 2015, IGRAC's PhD Research Fellow undertook field research in the Stampriet Transboundary Aquifer System, straddling Botswana, Namibia and South Africa. The fieldwork is part of the IGRAC funded PhD project entitled 'The Normative Framework for Sustainable Groundwater Governance: Principles and Patterns.' The objective of the research was to understand groundwater governance from both a normative and practical perspective. Over 60

interviews were conducted in the countries' capitals as well as at locations in the remote aquifer area. Conclusions were drawn regarding the potential for sustainable development of the Stampriet's groundwater resources and the impacts of a multi-faceted legal context on inclusivity in groundwater governance. The results from the fieldwork will be incorporated into the PhD thesis, and also inform the Swiss Agency for Development and Cooperation's (SDC) Project on Groundwater Resources Governance in Transboundary Aquifers (GGRETA).

#### Groundwater Futures in Sub-Saharan Africa (GroFutures)

The GroFutures project is a four-year initiative led by the University College of London and supported by the programme Unlocking Groundwater's Potential for the Poor (UpGro). UpGro is jointly funded by UK's Department for International Development (DFID), Natural Environment Research Council (NERC) and the Economic and Social Research Council (ESRC). It aims to develop the scientific knowledge and participatory processes by which groundwater resources can be used sustainably for poverty alleviation in Sub-Saharan Africa. The work is focussed around 3 focal 'Basin Observatories' comprising the Upper Awash (Ethiopia), Great Ruaha (Tanzania), and Iullemmeden (Niger/Nigeria/Benin/Burkina Faso). IGRAC has two roles in the project:

1. The project Information Management Strategy will employ IGRAC's Global Groundwater Monitoring Network to disseminate the results of the project;
2. IGRAC will help decision makers and stakeholders to transparently consider trade-offs associated with development pathways by improving and applying the Groundwater Serious Game 'Tragedy of the Groundwater Commons' (GW-GAME).

In 2015 IGRAC has further improved the GW-GAME, set-up a share point site for sharing of project documentation and participated to three project meetings:

- The UPGro kick-off meeting in London – United Kingdom (April 2015): The main purpose of this meeting was to better understand the aims and activities of the other UPGro Consortium projects so that research activities, dissemination, and engagement across the UPGro programme would better be coordinated. IGRAC staff guided the Play & Dialogue test-session of the GW-GAME at the Geography department of UCL with the participation of nine UCL fellows.
- The GroFutures workshop in Addis Ababa - Ethiopia (June 2015): The aim of the workshop was to train the team of social scientists involved in the project. The workshop started with an overview of the main goals of the project and the work package relevant to the social scientists. IGRAC staff led the Groundwater Game for a group of 11 participants. IGRAC further contributed to brainstorm sessions to characterise the three project basins in terms of its physical and social aspects and to identify relevant stakeholder groups in the basins.
- The GroFutures Inception workshop in Addis Ababa – Ethiopia (September 2015): The event was attended by 25 professionals from the 12 participating organisations, which are based in 11 different countries. IGRAC organised a 'Play & Dialogue session' of the GW-GAME for the entire project team. The session provided an opportunity to the physical scientists to get to know the game and to bring their suggestions and comments. The workshop also included a field trip to the Upper Awash basin and presentations/discussions regarding contribution to the project for the different organisations involved and exchanges of ideas on the necessary adaptations to the basins' physical and social context.

#### Groundwater Serious Game

In the past, IGRAC developed a Groundwater Serious Game based on Garrett Hardin's theory and article 'The Tragedy of the Commons' (1968). As a contribution to the GroFutures project, IGRAC has further improved and tested the Game in 2015. The game is used in the project as an awareness rising tool between stakeholders; it assists them to understand the dilemmas faced by small-scale farmers seeking effective and equitable ways to manage their groundwater resources individually and collectively to irrigate their land.



In total, four 'Play & Dialogue' sessions have been held to test and collect feedback on the game: (1) in April at UCL in London, (2) in June at IWMI in Addis Ababa, (3) in September at the IGRAC office and (4) in September at University of Addis Ababa. After each test session the game has been modified based on the observations made and the objectives to be reached. Three of these sessions were part of the GroFutures' project related activities. Some features of the game that have been modified based on these sessions. These included the total number of playing rounds, the amount of hectares to be brought into production, and the interference of the wells on each other's pumping rates, amongst others. These adjustments shortened the duration of game, making it easier to fit into the time constraints of an event/meeting, and made the game more realistic to the situation of small scale African farmers.

#### Quantifying the benefits of transboundary water cooperation

IGRAC drafted both a conceptual and case study contribution to the UNECE initiative "Quantifying the benefits of transboundary," which aims to develop a policy guidance note for UNECE Water Convention parties. Content contributions discussed the role of groundwater in using economic approaches to bolster transboundary water cooperation. The case study focused on results of IGRAC's previous analysis of groundwater economics in the DIKTAS region. The case study has been integrated in the Draft Policy Guidance note released in 2015. The concept contributions may get integrated in a later phase.

#### 3.4.2 Knowledge Sharing and People Networks

##### Free and open source software for water resources management (FREEWAT)

FREEWAT is a HORIZON 2020 project financed by the EU Commission under the call *Water Innovation: Boosting Its Value for Europe*. FREEWAT aims at promoting water resource management by simplifying the application of the Water Framework Directive and other EU water-related directives. FREEWAT's main output will be an open source and public domain GIS integrated modelling environment for the simulation of water quantity and quality in surface water and groundwater. It will also include an integrated water management and planning module.

In 2015, there were several meetings and work-sessions related to developing IGRAC's role in the project. IGRAC has also assisted UNESCO-IHP in setting up a program with USGS for MODFLOW training. This training was given in the Stampriet region in December 2015 in the framework of FREEWAT and HOPE. IGRAC has also taken part in self-training in QGIS software. The objective of this self-training activity is to build a capacity in using QGIS as a basis for performing the further FREEWAT activities.

The contract defining IGRAC's formal participation in the project consortium was finally signed in December 2015. IGRAC's main role in the FREEWAT project will be to contribute to capacity building and promote the use of FREEWAT in the Stampriet case study area.

##### WMO manual on Water Resources Assessment

IGRAC contributed to the WMO Manual on Water Resources Assessment, which was developed under the framework of the Commission of Hydrology's activities on water resources assessment. The manual is developed to provide National Hydrological Services and other operational agencies with state of the art methods for assessing the water resources availability and potential of its exploitation at the national, subnational or regional scale in support of Integrated Water Resources Management. The manual deals with both surface and groundwater resources.

An expert meeting was held in Geneva, Switzerland to discuss and finalizing the structure and form of the manual, reviewing the work done by the consultant in charge of designing its content and collecting inputs and suggestion for its finalization. IGRAC developed a chapter of the manual and a case study on aquifer assessment. The manual is expected to be finalised and published in 2016.

## IW LEARN

In January 2015, IGRAC with the support of UNESCO-IHP hosted a webinar entitled “Moving with the Momentum: Reviewing Lessons for Groundwater from 2014 and a Looking Ahead to 2015.” The webinar included five presentations from eight presenters covering a range of topics relevant to groundwater governance. All the presenters were well prepared and enthusiastic. There were 45-50 attendees in total, a majority of which stayed for the duration of the webinar. Several of IGRAC’s key project partners were also in attendance. IGRAC made significant contributions to the content and technical execution of the webinar including moderating the event, presenting on the SDGs, the TWAP programme and the new edition of the map of Transboundary Aquifers of the World; confirming other speakers; collecting, organizing and formatting presentations; managing software; setting up a location on the IGRAC website dedicated to the webinar; and formatting the event recording. For future web summits, we hope to increase audience participation and engage presenters from a broader range of geographic locations.

## Rural Water Supply Network Webinar series

In late 2015, the Rural Water Supply Network (RWSN) launched a series of ten webinars on topics related to rural water supply, among them equality, sustainable services, groundwater, self-supply approaches, rainwater harvesting and human rights. IGRAC participated on the webinar entitled “The magic and mystery of groundwater data” and gave a presentation on issues encountered when trying to harmonized data obtained from neighbouring countries sharing the same transboundary aquifer. Examples were used from the Stampriet aquifer case study performed under the framework of the SDC-funded “Groundwater Resources Governance in Transboundary Aquifers” project.

## Capacity building and education

Even though it is not one of IGRAC’s core activities, IGRAC aims to contribute to capacity building in groundwater monitoring, assessment and governance through specialized training workshops and on-the-job training.

In 2015, this activity also included supervising PhD research (on karst hydrogeology in cooperation with Karst Water Institute in Slovenia) as well as lecturing, supervising and examining MSc students at UNESCO-IHE.

## 3.4.3 Publications and communications

### Publications:

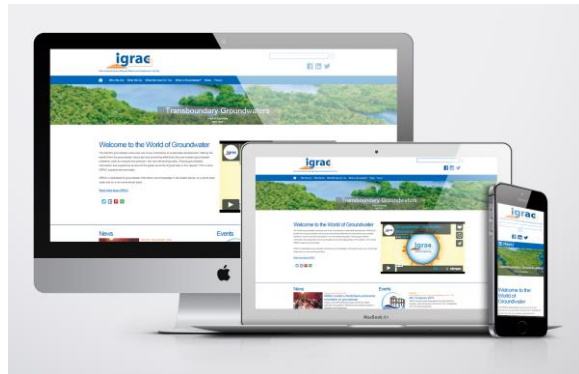
- Transboundary Aquifers of the World Map 2015:  
The 2015 Map of Transboundary Aquifers of the World (TBA Map 2015) shows the information presently available on the occurrence and extent of Transboundary Aquifers worldwide. The majority of changes with respect to the previous edition are the result of TWAP, which in turn has made use of the results of many projects carried out around the world. This 2015 special edition also includes three thematic maps on world climate, groundwater resources & recharge and population density. The TBA Map 2015 is also available online at IGRAC’s GGIS where the map can be explored in more detail in combination with all previous editions of the map.
- Groundwater in the Sustainable Development Goals: Emphasizing Groundwater in the Negotiation of the Final Goals - Kirstin Conti, IGRAC  
This position paper is the second in a three-part series. This series spans the Post-2015 Sustainable Development Goals (SDG) process and is designed to discuss strategic points of intervention related to groundwater prior to the development of the draft SDGs (Position Paper No. 1); after the release of the draft and during the negotiation of goals by UN member states (Position Paper No. 2); and after the entry into force of the final SDG text (Position Paper No. 3). The objective of this series is to emphasize the critical role that groundwater has in the 2030 development agenda and ensure that relevant stakeholders make “the invisible resource”, visible in their policy, planning and monitoring activities over the next 15 years.

- [Guidelines for Multidisciplinary Assessment of Transboundary Aquifers](#)  
The first draft of “Guidelines for Multidisciplinary Assessment of Transboundary Aquifers” was presented at the IAH Congress held in Rome, Italy. This first draft was distributed at the congress and later published on the IGRAC website with the objective to receive comments and feedback from experts. These comments will be used as input when writing the final version of the guidelines. This final version is expected to be published in the first half of 2016.
- [IGRAC contribution to World Water Development Report 2015](#)  
IGRAC has contributed to the World Water Development Report 2015, which has been launched at the official celebration of World Water Day 2015. IGRAC has provided the Groundwater Development Stress (GDS) Map for the WWDR 2015, titled 'Water for a Sustainable World'. Moreover, IGRAC's map of arsenic traces in groundwater in Asia was included in the Case Studies and Indicators document titled 'Facing the Challenges'.
- [Transboundary Shale Aquifers of the World Map](#)  
IGRAC has made a map which overlays its Transboundary Aquifers of the world map 2015 with a shale layer. The aim of this map is to provide a global overview of the spatial relationships between transboundary aquifers and some of the major shale potential and extraction. This 'Shale Transboundary Aquifers Map' has also been included in the Global Overview module of IGRAC's GGIS.
- [GRAPHIC position paper](#)  
IGRAC contributed to the preparation of the new GRAPHIC position paper (Groundwater and climate change) that has been prepared for COP21. IGRAC's position paper (Conti, 2014) was mainly used as inspiration and additional suggestions were later provided regarding effects of climate change on natural groundwater quality and the importance of groundwater monitoring as a management strategy to reduce vulnerabilities.

#### Communications:

##### New IGRAC website

The main novelty in terms of communications has been the development of IGRAC's new website ([www.un-igrac.org](http://www.un-igrac.org)). In August 2015, IGRAC launched its new website with improved functionality, design and navigation. A new and improved website was needed to meet today's web-browsing requirements. For example, unlike the previous website the new one is fully responsive, which means that the interface changes when visiting the IGRAC website using tablets or mobile phones.



*Fig 16. New IGRAC website launched in 2015*

Another major change is the integration of social media, which allows users to easily share interesting content with their network by Twitter, Facebook, LinkedIn, Whatsapp and many other channels. Also the Downloads section has been improved in terms of usability. Users can browse through the available resources, using the search function or the dropdown to either search by topic, resource type or keyword.

Apart from these technical improvements, this new website also contains some new sections and updated content. For example, the 'What is groundwater?' page, which explains the groundwater basics. In 2016, this section will be expanded to cover more groundwater-related topics.

##### New ISARM Website

The new ISARM website ([www.isarm.org](http://www.isarm.org)) was launched in December 2015. The previous website was developed at the start of the ISARM Initiative in 2002 and therefore, become outdated. In contrast to the previous website, the new ISARM website is fully responsive and therefore more suitable for mobile devices.

## UNESCO-IHP Groundwater Portal



Fig 17. UNESCO-IHP Groundwater Portal launched in 2015




The Groundwater Systems Section of UNESCO-IHP initiated the development of a new web portal that highlights UNESCO's groundwater activities. IGRAC was asked to lead this development process.

Before starting the developments, IGRAC's Communication Specialist interviewed several UNESCO-IHP staff members in order to define UNESCO-IHP's wishes and requirements for the Groundwater Portal. Then a set of requirements were defined and the portal was developed based on these interviews and the Communication

Specialist's own expertise. The portal can now be found at: [www.groundwaterportal.org](http://www.groundwaterportal.org).

## Social Media

After setting up IGRAC's social media channels in 2014, a few goals were set in the 2015 Work Plan in terms of social reach. Table below that shows progress throughout 2015:

	Followers in 2014	Goal for 2015	Followers in 2015	Growth
	190	760	13,234	+ 6,865 %
	74	296	743	+ 904 %
	85	340	175	+ 106 %

## IGRAC Brochures and Public Relations Material

In 2015, IGRAC developed several print materials dedicated to IGRAC's activities. Leading up to World Water Forum 7 in Daegu, IGRAC developed a 4-pager highlighting its transboundary assessment activities and a Z-Card exclusively focusing on the groundwater component of TWAP (see image below).



Fig 18. New IGRAC Corporate Profile

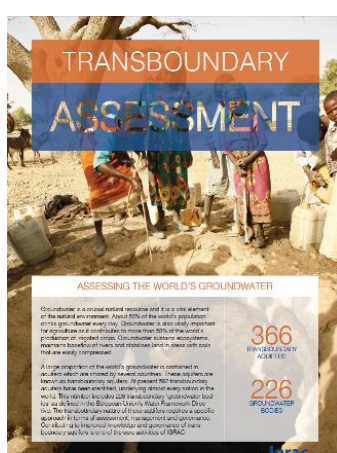


Fig 19. Transboundary Assessment



Fig 20. TWAP Groundwater ZCard

PRINT MATERIAL	COPIES DISTRIBUTED IN 2015
Corporate Profile	1,500
Transboundary Assessment	1,250
Transboundary Aquifers of the World Map 2015	1,000
IGRAC Corporate Brochure	750
SDG Position Paper 1	750
SDG Position Paper 2	750
TWAP Groundwater Z-Card	500
GGMN Brochure	500
DIKTAS booklet incl. CD-ROM	200
GGRETA Information Management System (English)	200
GGRETA Information Management System (Russian)	100
Draft Guidelines for Multidisciplinary Assessment of Transboundary Aquifers	100
Factors Enabling Transboundary Aquifer Cooperation: A Global Analysis	100
Groundwater around the World	100
<b>TOTAL</b>	<b>7,800</b>

#### 3.4.4 Events

This brief overview includes only the events that were not a part of IGRAC content activities described in sections 3.2 and 3.3.

- 7th World Water Forum in Daegu, Republic of Korea  
The 7th World Water Forum was held in the Republic of Korea from 12 to 17 April 2015. The World Water Forum is the world's largest meeting on water and is held every three years. IGRAC participated in this major event with several presentations. IGRAC presented DIKTAS and the groundwater component of TWAP, organised the official launch of the 2015 Edition of our TBA Map and was represented in the UNESCO Water Network booth at the Expo & Fair.
- World Water Congress XV in Edinburgh, Scotland  
IGRAC presented 'Worldwide Assessment of Transboundary Aquifers with focus on the African Continent' during the 15th World Water Congress in Edinburgh, Scotland. The presentation was part of session 'Transboundary Water Resources: Aquifers', which was held on Wednesday 27 May 2015. The presentation focused on the baseline assessment undertaken as part of TWAP groundwater.
- World Bank Partnership Roundtable on Groundwater in Delft, the Netherlands  
Together with NWP (Netherlands Water Partnership) IGRAC organised a 'Roundtable on Netherlands Groundwater Expertise in Integrated Delta Management'. Mr. Junaid Ahmad, Senior Director Water at The World Bank, met representatives of Dutch groundwater sector to hear about groundwater management practice in the Netherlands and to explore possibilities to implement related knowledge into World Bank operations.
- 42<sup>nd</sup> IAH International Congress in Rome, Italy  
IGRAC presented the Information Management System (IMS) and a poster about the IGAD MAR project. IGRAC staff also participated in the GRAPHIC back-to-back meeting and the IAH Transboundary Aquifers (TBA) Commission meeting. IGRAC and UNESCO-IHP shared the booth.
- Waarde van Grondwater Symposium in Nieuwegein, the Netherlands  
In September, Neno Kukuric gave a presentation about groundwater in relation to climate change during the symposium 'De Waarde van Grondwater' (Value of Water) held at the KWR Watercycle Research Institute in Nieuwegein. This event was co-organised by IGRAC in cooperation with IAH, KWR, Deltares, NHV and VVM.
- Workshop 'Integrated Water Resource Analytical Techniques and Remote Sensing Applications in Support of Water Resource Assessments in Central Asian Countries' in Astana, Kazakhstan



IGRAC presented the GGIS during the international training workshop 'Integrated Water Resource Analytical Techniques and Remote Sensing Applications in Support of Water Resource Assessments in Central Asian Countries'. This workshop which was held in Astana, Kazakhstan, from 14 to 18 September, was organised by UNESCO, JSC, ISTC and USGS. Delegations from Afghanistan, Kazakhstan, Kirgizstan, Pakistan, Tajikistan, Turkmenistan and Uzbekistan all participated in this workshop.

- 50 Years, 50 Movies on Water

This year, IHP celebrated half a century of water-related achievements with a series of film screenings, entitled "50 Years, 50 Movies on Water", which took place every two weeks from 25 June to 12 November 2015 at the Open UNESCO exhibition space. Each of the screenings focused on a different water-related challenge and solution that was introduced by an IHP professional or partnering expert, and concluded with a participant discussion. On 1 October, IGRAC's video 'Groundwater, the Hidden Resource' was screened during the session on 'Ecohydrology, Engineering harmony for a Sustainable World & Groundwater in a Changing Environment'.

- 197<sup>th</sup> UNESCO Executive Board in Paris, France

On Tuesday October 13<sup>th</sup>, IGRAC was presented to delegates of the member states of UNESCO, during the 197<sup>th</sup> UNESCO Executive Board. During the session "Groundwater: Our Hidden Resource", the main objective was to show the importance of groundwater as freshwater source and discuss how IGRAC as UNESCO Category II Centres could assist Member States.

- International Conference of the Commission on Legal Pluralism in Mumbai, India

IGRAC presented on 'Methods for Global Assessment of Legal Plural Regimes: Applications to Groundwater Governance' during the biennial international conference of the Commission on Legal Pluralism, which took place from 14 to 16 December 2015 at the Indian Institute of Technology (IIT) in Mumbai, India.

## 4. BUDGETING

The state of IGRAC's budgetary affairs at the end of 2015 is summarised in the table below. There is a Financial Statement Report (in Dutch, 26p) produced by an external bureau for the IGRAC Foundation Board and it is available on request.

Budgetary items (amounts in Euro)	
	Calendar year 2015
<b>INCOMES</b>	
Base subsidy	500000
Projects and Services <sup>1</sup>	387520
<b>Total incomes</b>	<b>887520</b>
<b>EXPENCES</b>	
Direct project costs	274828
<b>Gross company result</b>	<b>612692</b>
Wages and salaries	215526
Social security contributions	43749
Pensions	39626
Staff subcontracted (advisory, PhD, interns)	3463
Staff costs - miscellaneous	17535
<i>Total staff costs</i>	<i>319899</i>
Software development costs	54589
Office rent	18108
Office costs	10798
Depreciation	1138
General costs (insurance, fin. admin, etc.)	73536
<b>Total company expenses</b>	<b>478068</b>
Bank account interests and costs	6783
<b>Result 2015</b>	<b>141407</b>
Accrued liabilities <sup>2</sup>	-119927
Previous year balance	417924
General reserve condition	<b>559331</b>

<sup>1</sup> Including UNESCO contract from October 2016 for an amount of 106000\$ (ca 96735€). IGRAC delivered contracted products and services. The payment will be made in 2016.

<sup>2</sup> In 2015, IGRAC contracted software developer for 85000€ to redevelop the GGMN. A half of this amount is paid in 2015, the other half of will be paid after the software delivery in 2016. The GGIS development contract (made in 2015) is for two years, including 30086€ for hosting and use of the cloud services in 2016. There is additional contract for GGIS upgrade of 32025€. Accrued liabilities are in total 119927 inc. VAT).



# **The Minutes**

## **from the fifth meeting of the**

# **Governing Board**

Held in Delft on 18<sup>th</sup> December 2015

### **Present:**

Ms. Elaine Alwayn, the chair (Ministry of I&E, NL)  
Ms. Alice Aureli, a member (UNESCO-IHP) (via conference call)  
Mr. Fritz Holzwarth, a member (UNESCO-IHE) (left earlier)  
Mr. Julius Wellens-Mensah, a member (WMO)  
Mr. Neno Kukurić, secretary of the Board (IGRAC)  
Ms. Monique Berendsen, IGRAC liaison at the Ministry of I&E, NL  
Mr. Joop de Schutter, the chair of the IGRAC Foundation Board  
Mr. Youssef Filali Meknassi, UNESCO-IHP (via conference call)

### **Absent:** none

The chair Ms Alwayn opened the meeting at 9.30, welcomed the participants and especially Ms Aureli who could not attend the meeting in person because of very recent injury, therefore attending the meeting via a conference call. Ms Alwayn announced that Ms Berendsen has replaced Mr Vlaanderen as a contact person at the Ministry of Infrastructure and the Environment of the Netherlands (further in the text: the Ministry) and invited Ms Berendsen to introduce herself. Ms. Berendsen shortly informed the Board that she is a senior policy adviser at the Ministry and a contact person for UNESCO-IHP, UNESCO-IHE and IGRAC.

Subsequently, Ms Alwayn asked for adoption of the proposed agenda. Ms Aureli stated that she will provide some information on renewal and agreement within the agenda item Future of the Centre but she would also like to discuss the UNESCO-IHP/IGRAC database that has been developed at IGRAC, also in relation with the Member States. Accordingly Ms Alwayn suggested adding a sub-item UNESCO-IHP/IGRAC database under the agenda item Future of the Centre.

The agenda was adopted with this remark:

## **Agenda**

- 9.30 - 9.45: Welcome, adopting the agenda
- 9.45 - 10.00: Adoption of previously sent documents:
  - Governing Board Minutes of the Meeting 2014
  - IGRAC Report 2014
- 10.00 - 10.20: IGRAC State of Affairs (December 2015)
- 10.20 - 10.40: IGRAC Work Plan 2016

10.40 - 11.10: Discussion on State of Affairs & Work Plan  
 11.10 - 12.00: Future of the Centre (2016-2021) including:

- Evaluation procedure
- Renewal of the IGRAC Agreement
- UNESCO-IHP/IGRAC database
- Financing in 2016

12.00 - 12.15: Conclusions and agreements  
 12.15 - 12.30: Any other business  
 12.30: Closing the meeting

Ms Alwayn asked Mr Holzwarth which part of the agenda was the most interesting for him since he could not attend the whole meeting. Mr Holzwarth replied: the State of Affairs and the Work Plan. Then Ms Alwayn suggested proceeding with these items firstly and to adopt previously sent documents later in the meeting. The Board agreed with this suggestion.

### **IGRAC State of Affairs and Work Plan 2015**

Requested by Ms Alwayn, Mr Kukurić presented the State of the Affairs 2015 and the Work Plan for 2016. (The presentation is available on the IGRAC memory stick that the participants of the meeting received).

Mr Kukurić presented the state of the affairs and the work plan for 2016 as a combined presentation that included institutional activities, content activities and financing.

Institutionally, UNESCO-IHP Secretariat has been IGRAC main partner in 2015 and will hopefully remain in 2016. IGRAC is executing projects for UNESCO-IHP and the both parties have made considerable effort to develop the most optimal working relationship. The main obstacle is still the rather ambivalent position of UNESCO category II centres (like IGRAC): The UNESCO-IHP Secretariat would like to see IGRAC as an integral part of UNESCO, while the UNESCO administration deals with IGRAC in the same way as with any other external (commercial) partner. This ambivalent position leads to complications in interpretations of agreements and contracts, different expectations and consequently reduced effectivity in common activities.

Cooperation with WMO has intensified in 2015, and IGRAC aims to maintain this upward trend in 2016.

IGRAC has continued its efforts to get actively involved in the activities of the World Bank; IGRAC has support of the staff at the bank but still the way should be found to realise the involvement because IGRAC is not a consultancy, neither a country member nor a United Nation agency/programme. UNESCO, for example, has a procurement agreement with the Bank but IGRAC cannot use it being legally not UNESCO.

Cooperation with UNESCO-IHE is good but it can be extended. The cooperation with the Secretariat of the IHP-HWRP programmes in the Netherlands has increased since the new (two) secretaries were appointed.

The IGRAC Foundation Board had its regular meeting in April 2015. The Foundation Board is assisting IGRAC in managing the foundation (by controlling and advising). The new meeting is planned for April 2016.

A meeting of the Technical Advisory Committee (TAC) which has been postponed in 2015 should take place once there is clarity about the future of the centre; this in connection with a new strategic programme for the coming period.

There was no increase of IGRAC staff in 2015; two temporary contracts were extended for a limited period again due to insecurity related to funding of the centre in coming years. The third temporary contract was not extended at IGRAC but a temporary contract was made through UNESCO-IHP. At the moment IGRAC has seven staff members, including one PhD student.



Mr Kukurić then presented an overview of project leads, new ideas and initiatives. IGRAC has a small team and it is not easy to make IGRAC attractive as a partner for large organisations; nevertheless, IGRAC succeeded to acquire a couple of projects in the SADC and IGAD regions in Africa, and a number of Expression of Interest were prepared for possible projects in the next year.

IGRAC content activities in 2016 will mostly be a continuation of activities from previous year(s), and in accordance with the IGRAC Strategic Planning including:

- Global Groundwater Information System
- Global Groundwater Assessment
- Global Groundwater Monitoring Network
- Groundwater Knowledge Sharing and Governance

The most main components of the Global Groundwater Information System (GGIS) have been completed in 2015 although some improvements will be carried out in 2016, along with development of new modules. The GGIS is a contemporary and interactive system, hosting quite some data, which is for the first time that UNESCO has such a database. Mr Kukuric briefly demonstrated the main functionality of the system, including the authorisation and ownership of information.

Regarding the aquifer assessment activities, not much has been done on country-based assessment in 2015 because of external project priorities, but in 2016, cooperation with British Geological Survey in Africa and/or the World Bank for their global landing operation may lead to large activities.

Transboundary Aquifers Assessment will remain an important activity of IGRAC in 2016 although the major projects TWAP, DIKTAS and GGRETA are rounded off in 2015. While preparations for a new DIKTAS and GGRETA phase are on-going and led by UNESCO-IHP, IGRAC is also intensively looking for new opportunities for assessment of transboundary aquifers. IGRAC's assessment methodology and the GGIS applications make IGRAC services attractive for various kinds of regional groundwater assessments as was proven by IWMI's invitation to take part in the RAMOTSWA project.

As a part of thematic assessment, IGRAC and UNESCO-IHP produced a draft Guidelines for Multidisciplinary Assessment of Transboundary Aquifers that was presented at the IAH Congress in Rome in September 2015. In 2016 this guidelines will be finalised. Among other thematic assessments planned for next year are: inclusion of large national aquifers in the global coverage, managing aquifer recharge and water accounting and SIDS (Small Island Developing States). Mr Holzwarth informed the Board that UNESCO-IHE recently received twenty MSc grants from the Ministry of Foreign Affairs for the SIDS related research. Mr Holzwarth suggested that IGRAC should contact Ms Maria Kennedy who is a coordinator for the SIDS at UNESCO-IHE.

Ms Alwayn asked how often the groundwater assessment needs to be done. Mr Kukurić answered that a part of the assessment does not have to be done again because the structure of the aquifer is not changing but the aquifer is a dynamical system and therefore needs to be monitored to assess its state on regular basis. Since there is very little info on change and state of groundwater globally, IGRAC initiated Global Groundwater Monitoring Network (GGMN) several years ago. GGMN is a participative, web-based network of networks, set up to improve quality and accessibility of groundwater monitoring information and to subsequently improve our knowledge on the state of groundwater resources. IGRAC is developing a new GGMN portal investing about 100000€. The development of innovative software is not an easy process but hopefully the new version will be ready in February 2016. In 2015, IGRAC submitted a proposal to USAID together with IMWI about groundwater monitoring training in Pakistan, but the proposal was not honoured. In 2016, IGRAC will conduct two trainings that

we originally planned for this year but postponed due to: a) delay in the software development (trainings were foreseen in Thailand with UNESCO Bangkok office ) and b) logistical reasons (Pacific SIDS together with WMO).

Among Knowledge Sharing and Governance activities, the Sustainable Development Goals (SDGs) are receiving special attention. IGRAC is contributing to development of SDG monitoring indicators and is producing position papers. The Netherlands will be one of the SDGs "proof of concept" countries and IGRAC will try to get involved. Further, IGRAC is developing a project proposal to bring more groundwater knowledge in WASH activities. Two on-going projects, GROFuture and FREEWAT were mentioned, together with development of a WMO Water Resources Assessment, ISARM activities, IW-LEARN webinars and a new Erasmus Mundus Programme on Groundwater and Global Change where IGRAC is an associate partner of UNESCO-IHE.

Mr Kukurić reiterated that IGRAC would still like to have an intern from the Ministry on Groundwater and Disaster Risk Management, as agreed at the previous Board meeting. Ms Alwayn informed the Board that that will not be possible because of regulations at the Ministry, namely trainees are only allowed to work for governmental institutions.

The list of the main events in 2015 was presented and Ms Alwayn asked about judgement on whether an event was successful for IGRAC or not. Mr Kukurić replied that visibility is a very important criterion and Ms Aureli underlined the importance of presenting the newest developments because then they are becoming a reference for an international community, as it is the case with the map of transboundary aquifers. Some events are simply obligations for IGRAC and UNESCO to attend.

The main publications in 2015 and planned events and publications in 2016 were listed as well. About 8000 copies of various publications were distributed during 2015. Ms Alwayn asked about transition from hard copies to digital publications (because she is not using paper copies any more). Mr Kukurić replied that all IGRAC publications are available in a digital form but in some parts of world the hard copies are necessary. Mr Holzwarth added that hard copies are also very much needed at events such as WWF or WWW.

In terms of communication, IGRAC made in 2015 substantial progress, also reflected in the social media. New website is developed and bimonthly newsletters were produced, along other means of communication.

Finally the budget projects are presented; the 2015 was a very successful year, although not reflected so much in the projected total result and the reserve condition because of a considerable investment in the GGMN software (100000€). The large, long-term projects carried out for UNESCO were completed in 2015 and that will be reflected in the budget for 2016. Mr Kukurić noted that one or two of these projects might get a second phase and that IGRAC is trying to acquire additional projects. Yet, the presented budget projection for 2016 is rather conservative because there are no guarantees about project continuation or acquisition at the moment. Mr de Schutter asked whether is projected 200000€ from external projects an amount that IGRAC is almost sure to acquire? Mr de Schutter gave an example of organisation similar to IGRAC where the projected budget was split in two columns according to chance of acquisition (>50% and <50% chance). Mr Kukurić replied that IGRAC is not sure about acquisition of the most of projected project budget, having in mind uncertainties of acquisition trajectories. Ms Alwayn asked how much IGRAC has for sure of project-related budget for next year. Not more than 50000€, coming from IGRAC direct acquisition, Mr Kukurić replied.

Ms Aureli stated that IGRAC is considered as UNESCO by scientists at UNESCO, regarding of the legal status; as such, IGRAC was budgeted in 2014 and 2015 to develop an Information Management System (IMS) with contribution of many national and regional experts in a several large projects. Therefore, the importance and impact of the IMS is much larger than the budget allocated for

IGRAC. Mr Kukurić underlined the words of Ms Aureli and asked to continue discussion on future financing of the centre. (Mr Holzwarth left the meeting at this moment.) Ms Alwayn stated that the Ministry set aside 400000€ for IGRAC per year, for the period of six year. The budget for IGRAC is allocated in the new Partners for Water programme, developed for next six years in cooperation of three ministries in the Netherlands, making up the Interdepartmental Water Cluster (IWC). This will allow IGRAC to extend its network and seize new opportunities. Ms Alwayn invited IGRAC to explain to IWC and RVO (Netherlands Enterprise Agency) what IGRAC can do for Dutch embassies and organisations abroad, especially in relationship with International Water Ambitions programme that will be presented to the Dutch Parliament in January. Mr. Kukurić mentioned that IGRAC has already sent to the Ministry its possible contribution to this programme. Ms Alwayn said that she is very confident that new position of IGRAC in the international programming of the Dutch Government may increase IGRAC's revenue because the water is and remains a hot topic globally. Mr de Schutter gave an example of a Global Water Footprint Network that was presented at the Ministry of Foreign Affairs. Mr Kukurić noted that he would be very happy to present IGRAC since he is looking for an opportunity to do that for a long time.

Ms Aureli reiterated importance of the IMS build in last years for UNESCO and eventually the member states. In terms of project cooperation, Mr Aureli stressed that at this stage UNESCO is negotiating some project activities with donors, but she will be able to say more in April-May next year. But for the Member States is crucial to know that we can continue with development of the database, therefore for UNESCO is renewal of the agreement a priority.

Mr Wellens-Mensah asked for which parts of the world recent projects improved knowledge and what are the parts of the world we need to concentrate in coming period. Mr Kukurić replied that IGRAC conducted global assessment of transboundary aquifers and now is completing the global assessment by including large national aquifers. As far as monitoring is concerned, there are only about 15 countries that publish the monitoring data and IGRAC has some data from about 25 countries. The need for groundwater monitoring data is therefore global, but priority should be put on Africa, parts of Asia and South America. IGRAC is planning workshops in Asia (Thailand) and Pacific in 2016. Ms Alwayn noted that SIDS are important for Ministry of Foreign Affairs, being one of their focal points for 2016. Ms Aureli noted that the Member States requested UNESCO to put more effort in SIDS in coming years. Therefore Ms Aureli suggested that the Netherlands and UNESCO (via IGRAC and IHP) can team up on this issue. That is something that the Netherlands could suggest at the next meeting of the IHP Intergovernmental Council in June. Ms Alwayn advised Mr Kukurić to mention SIDS when he comes to present IGRAC to the IWC.

Mr de Schutter mentioned that Mr Bastiaanssen from UNESCO-IHE might be a good representative of UNESCO-IHE to the IGRAC Governing Board. Mr Kukurić replied that UNESCO-IHE was represented by a managing director and that he expects a similar representation in the future. At the same time, IGRAC already has on-going meetings with Mr Bastiaanssen looking for an opportunity to join the forces.

### **Adoption of previously sent documents**

Ms Alwayn noted that Ms Aureli is mentioned twice as Mr Aureli in the Minutes from the last Governing Board meeting held in December 2014. She also noted that "permanent position" should be replaced by "preferred partner" on the page 4, when describing a new funding from the Netherlands to the World Bank. Mr Kukurić will implement the suggested changes. Since other members of the Governing Board had no remarks on the draft Minutes neither on IGRAC Report 2014, the both documents were then adopted.

Ms Alwayn asked about IGRAC visits to WMO and UNESCO and the common statement of WMO and UNESCO to the WMO congress. Mr Kukurić informed that he had meetings at WMO with the Secretary General and at UNESCO with the ADG Natural Sciences. Mr Wellens-Mensah stated that the meeting at WMO had a spin-off in agreeing with IGRAC to organise a joint training on groundwater monitoring for Pacific Islands on Fiji next year. WMO is very interested to engage IGRAC in monitoring activities in the IGAD region, where WMO already has a monitoring programme, and later in other regions. Mr Wellens-Mensah also mentioned that a new director of Water and Climate department at WMO, Dr Johannes Cullmann, is very supportive of collaboration with IGRAC and wanted to attend this meeting. Finally, Mr Wellens-Mensah noted that IGRAC was mentioned - together with other three WMO data centra - in the documentation of the 17<sup>th</sup> session of WMO Congress held this year.

Mr Kukurić noted that he would still appreciate if UNESCO and WMO would prepare a kind of joint statement. The board members supported this and the joint statement therefore remains as an action point.

### **Future of the centre**

Ms Aureli informed the Governing Board about development of SDG monitoring activities and stressed that only a few parties recognise high importance of transboundary waters. Ms Alwayn underlined this importance and promised to support it as much as the Netherlands, as one country among many, can do. That would be very much appreciated – Mr Kukurić noted - since the transboundary water indicator has recently removed from the SDG indicator list.

Referring back to the item of the agenda, Ms Alwayn noted that the Ministry sent a letter to UNESCO about the willingness to renew the agreement and received a reply from UNESCO. Ms Aureli said that the renewal is opportunity to elaborate on issues that are important for the good functioning of the centre. The future of the centre was already discussed several times with the Netherlands Delegation at UNESCO and IGRAC. UNESCO Members States require database - Ms Aureli noted - that will give a regional and global overview of state of groundwater resources with respect to any impacts (basically climate change and human activities) and associated risks.

Ms Aureli noted that the only water-related database where data are consistently supplied by member states is AQUASTAT at FAO. We should strive to make the same or similar arrangement for the UNESCO database at IGRAC. The first step would be to agree on a necessary set of data to be requested from the member states and to submit this to the IHP Council for approval. This needs to be a fully intergovernmental process because some countries still consider groundwater as a strategic source. Because of this sensitivity the database needs to be clearly a UN database, where the countries (data providers) should decide on data sharing and dissemination.

UNESCO is investing in this database at IGRAC because scientifically, technically and practically IGRAC is UNESCO. However, for the UNESCO administration, IGRAC is not UNESCO and the contracting IGRAC is same as contracting of external partners. Therefore, Ms Aureli pointed out, renewal of the agreement should be taken as an opportunity to talk with the IOS and the Legal Affairs at UNESCO in order to find a solution for this problem.

Mr Kukurić noted that to his opinion the best option would be that of IGRAC becoming legally UNESCO (i.e. Category I Centre). Ms Aureli said that at this moment various options should be explored and probably there are several mid- and long term solutions. We should concentrate at agreement renewal and in meantime the collaboration in projects and programmes can continue without interruption. Ms Aureli stated that the intention is to renew the agreement for the category II centre, probably with some minor changes. Since both parties (UNESCO and the Dutch Government) expressed interest to renew the

agreement, the Ministry can make decision to continue funding IGRAC. Mr Kukurić asked what the Ministry still needs from IGRAC or UNESCO to execute this decision and release the grant for 2016. Ms Alwayn asked then UNESCO about the remaining steps required for the renewal. Ms Aureli replied that the agreement is reviewed at the moment to be aligned with the 2013 version of rules and regulations for category 2 institutes and centres under auspices of UNESCO. Ms Aureli asked Mr Kukurić to distribute this document to the Governing Board members. As soon as the agreement is reviewed and adjusted it will be sent to the Ministry. Ms Alice said that she is not expecting any major revision but it has to be checked with the legal affairs. Ms Aureli said that this is an opportunity for the Ministry and UNESCO to improve and expand the agreement according to preferences of both parties. Ms Aureli suggested that UNESCO and the Ministry should sit together and bilaterally discuss the new agreement. Ms Alwayn agreed with this. The meeting can be organised in February 2016 when the evaluation of the centre is also completed.

The evaluation of the centre will start in January and has to be completed before 10<sup>th</sup> of February. UNESCO received three CVs for an external evaluator and already selected the most suitable candidate. The questionnaire is prepared and sent to main UNESCO IHP regional offices, IGRAC partners, international institutions related to groundwater. Mr Kukurić noted that the evaluator will come to the Netherlands as well and he would like to have an interview with the representatives of the Ministry and the Foundation Board. Ms Aureli reiterated that the evaluation should assist in making arrangements with UNESCO administration that would improve cooperation, clarify status of the database and simplify contracting with IGRAC.

Mr de Schutter asked the evaluation report to be sent officially to the IGRAC Foundation Board. Ms Aureli replied that the report will be sent to the Permanent Delegation of the Netherlands to UNESCO, to be distributed further to the Ministry, to the Director of the centre, the Foundation Board and other stakeholders.

According to Ms Aureli, the renewed agreement will be submitted for the approval to the Executive Board in April so that it can come in force in August 2016. Mr Kukurić asked whether that can be done earlier, because it is important for IGRAC to renew the agreement as soon as possible, also because of the financing from the ministry. Ms Aureli said that the August is deadline, but it can be done earlier, probably already in May. Ms Alwayn said that the Ministry will continue financing IGRAC, of course if the evaluation of the centre is positive.

Mr. Wellens-Mensah asked about the legal status of the database at IGRAC, which is a common patrimony, whether this will be included in the agreement or not. We have to consider how to address this, Ms Aureli replied, the legal affairs from the both side need to look at it. Mr Kukurić pointed out that if a separate agreement is made, it should be with IGRAC and not with the Ministry. Ms Aureli said that even if most of the data collected are collected by UNESCO projects is premature to elaborate on options, it should be done in consultation with the legal affairs.

Mr. Wellens-Mensah asked whether UNESCO intends to pass a new resolution on data sharing; since WMO already has a similar resolution which will be then reinforced by the UNESCO resolution. Ms Aureli stated this will be rather technical/scientific resolution based on analysis of the an expert group on what kind of groundwater data/information Member States can provide to UNESCO on regular basis, similar as it is done with AQUASTAT database at FAO. This will also be of high importance for estimation and monitoring of SDGs.

Ms Alwayn asked Mr. Filali Meknassi to introduce himself. Mr. Filali Meknassi informed the Governing Board that he is at UNESCO for about nine years, working, among other places, in Rabat, Windhoek and from January 2016 in Paris in the IHP Secretariat.



### **Any other business**

None.

### **Conclusions and agreements**

- UNESCO and the Ministry exchanged the letters expressing intention to renew the agreement on IGRAC.
- UNESCO is preparing a concept of the renewed agreement that will be sent to the Permanent Delegation of the Netherlands to UNESCO not later than 10<sup>th</sup> of February.
- UNESCO is preparing an evaluation of IGRAC. The Ministry and the Foundation Board will be approached for an interview with the external evaluator. The evaluation report will be sent to the Permanent Delegation of the Netherlands to UNESCO not later than 10<sup>th</sup> of February.
- UNESCO and the Ministry will meet in February to discuss the evaluation report and finalise the renewed agreement.
- The renewed agreement will be submitted to the UNESCO Executive Board in April 2016 for approval.
- The renewed agreement needs to be signed before August but the both parties will strive to do it earlier.
- The Ministry expressed intention to continue core-financing of IGRAC for the following six year with 400.000€ p/a. The Ministry will continue the core-financing already for 2016, provided that evaluation report is positive.
- IGRAC will make presentation to the Interdepartmental Water Cluster on possible contribution to International Water Ambitions programme.
- IGRAC will contact Ms Maria Kennedy who is a coordinator for the SIDS at UNESCO-IHE to discuss possibilities for cooperation.
- Document (2013) describing strategy for category 2 institutes and centres under auspices of UNESCO will be distributed to the members of the Governing Board.
- UNESCO and The Netherlands will explore opportunity to team up on SIDS activities for a next meeting of the IHP Intergovernmental Council in June 2016.
- UNESCO and WMO will continue effort to find an opportunity to issue a joint statement on groundwater/monitoring/IGRAC.
- ...

### **Closing the meeting**

Meeting of the Governing Board was closed by the chair Ms. Alwayn at 12.20.

