



IAH COMMISSIONS AND NETWORKS

REVIEW FORM

(Please submit the final form to dave.kreamer@unlv.edu)

Background:

The reform of the IAH Commissions and Networks (C+N_s) was completed in 2011, which set up a procedure for initiating and reviewing the progress of these groups in IAH. This procedure allows both renewal of existing C+N_s, midterm review of progress, and the creation of new commissions and networks. In setting up the new commissions and networks, it was established that a review would be undertaken in the middle and end of each period of license, with the intention of informing the IAH Executive and Council about the progress with the work of the Commissions and Networks. This would be compared with the initial work plans and commitments set out by the commissions and networks in their proposals.

Now, we are at the end of the current license period for the REGIONAL GROUNDWATER FLOW COMMISSION (RGFC) which has had a license of period 6 years, last renewed in 2011 and with a submitted midterm report (well done) in 2014. As part of the renewal process, the RGFC is invited to submit a final report on their activities by answering the questions below. If you have any queries about the way to complete the form, please contact David Kreamer, Vice-President for Programme and Science (dave.kreamer@unlv.edu).

The final version of this document must also be sent to the same email address, in MS WORD or pdf format.

Review Questions:

1	Name of your Commission or Network	Regional Groundwater Flow Commission
1.1	Name and email contact(s) of the responsible(s) person for this Commission of Network	Judit Mádl-Szőnyi, Chair, szjudit@ludens.elte.hu Ádám Tóth, Secretary, adam.geophysics@gmail.com

2	Provide the address of your website	https://regionalgwflow.iah.org/
2.1	Is the website regularly maintained and updated?	Yes. You can find all recent and past activities and news on our website.
2.2	If you still don't have a website, please explain the reason	—

<p>3</p>	<p>List the activities which you were committed to organize (see your original proposal – if you do not have a copy, I can send one). See also Annex A below.</p>	<ol style="list-style-type: none"> 1.Group Meetings 2.Sessions at Conferences 3.Stand-alone Specialist Meetings/ Symposia 4.Training workshops 5.Exchange of Knowledge 6.Dissemination of Knowledge 7.Research 8.Liaison/Interaction with other groups/organizations 9.Interaction with other groups/ organizations 10.Education 11.Expert Advice e.g. to UN / Governments 12. Creation of a Global Inventory of Individuals and Research Groups interested in and/or actively working on <i>any</i> aspect of regional groundwater flow.
<p>3.1</p>	<p>List the activities you have organized in the context of the list above</p>	<p><u>1.Group Meetings:</u></p> <ul style="list-style-type: none"> - IAH Congress, Niagara Falls, Canada, September 2012 - Yinchuan Plain, Taole County, China, June 2013 - Budapest, Hungary, September 2013 - IAH Congress, Marrakech, Morocco, September 2014 - IAH Congress, Rome, Italy, September 2015 - Characterizing regional groundwater flow systems: Insight from practical applications and theoretical development, Calgary, Canada, June 2017 <p><u>2.Sessions at Conferences:</u></p> <ul style="list-style-type: none"> - Theoretical considerations and Practical issues on flow systems, IAH Congress, Niagara Falls, Canada, 2012 - Hydrogeology and Environmental Geology, 5th International Student's Geological Conference, Budapest, Hungary, 2014 - Regional Groundwater Flow as a Geologic Agent and a Management Tool, IAH Congress, Morocco, 2014 - Discharge area: a fingerprint of groundwater flow conditions, IAH Congress, Rome, Italy, 2015 - Groundwater vulnerability and circulation, EGU General Assembly, Vienna, Austria, 2016 - Approaches to characterizing groundwater flow systems at the watershed-scale for water management and regulation, GSA Annual Meeting, Denver, USA, 2016 - Verification of conceptual patterns and expected natural effects of regional groundwater flow by interpretation of relevant field observations, IAH Congress, Montpellier, France, 2016 - Groundwater vulnerability and circulation, EGU General Assembly, Vienna, Austria, 2017 <p><u>3.Stand-alone Specialist Meetings/ Symposia:</u></p> <ul style="list-style-type: none"> - International Symposium on Regional Groundwater Flow: Theory, Applications and Future Developments, Xi'an, China, June 2013 - International Symposium on Hierarchical Flow Systems in Karst Regions, Budapest, Hungary, September 2013

- 1st National Colloquium on Groundwater in Mexico, Mexico City, Mexico, November 2013
- First EAGE/TNO Basin Hydrodynamic Systems workshop, Utrecht, The Netherlands, May 2015
- 2nd National Colloquium on Groundwater in Mexico, Mexico City, Mexico, November 2015
- Characterizing regional groundwater flow systems: Insight from practical applications and theoretical development, Calgary, Canada, June 2017

4. Training workshops:

There were many lectures and courses organized by the members related to regional groundwater flow and RGFC. Here only the significant ones were listed, more information can be found in the Annual Reports.

- MANKARST-REGFLOW training short course in Karst Budapest, organized at the Eötvös Loránd University and RGFC and Karst Commission of IAH, 2-3 September 2013
- Groundwater Flow Systems Definition: Natural Manifestations and Controls, Short Course by JJ Carrillo-Rivera, China University of Geosciences (Beijing), China, 12-24 April 2014
- Groundwater Spreadsheets, highlighting the importance of regional groundwater flow, Short Course by C Molano, 41th IAH Congress, Marrakech, Morocco, 15-19 September 2014
- Coupled transfer processes controlling gas flow applied to waste rock piles; and Novel granular aquifer characterization methods applied to contaminant migration, Short Courses by R Lefebvre, Eötvös Loránd University, Budapest, April 2016
- The theory and applications of basin-scale groundwater circulation, Short Course by XW Jiang, Tianjin Center of Geological Survey, China Geological Survey, China, 18 November 2016
- The theory and applications of basin-scale groundwater circulation, Short Course by XW Jiang, Institute of Hydrogeology and Environmental Geology, Chinese Geological Academy of Sciences, 13 April 2017
- Is seawater intrusion in an arid coastal aquifer developed for agriculture, important? An Example from Santo Domingo, Baja, California, Short Course by JJ Carrillo-Rivera, Agricultural Institute of Investigation and Higher Teaching, INAT, Tunis, Tunisia, 26 April 2017
- Flow Systems in a Groundwater Law Proposal for Mexico, talk by JJ Carrillo-Rivera, Hungarian National Water Directorate, Budapest, March 2017

5. Exchange of knowledge:

Communicating theoretical and practical importance and applicability of regional groundwater flow is one of the main mission of the Commission.

In 2016 the RGFC-IAH with cooperation of the József and Erzsébet Tóth Endowed Hydrogeology Chair at ELTE Hungary made an electronic catalogue of the valuable reprint collection of József

Tóth, the “father of the Flow System Theory”. The collection can be accessed [here](#).

Books and Book chapters in the subject of Regional Groundwater Flow are also basic tools to achieve this goal. The detailed list of scientific papers published in the subject of regional groundwater flow can be found in the Annual reports.

6. Dissemination of Knowledge:

The internet and social media were used to provide new possibilities to disseminating knowledge regarding the regional groundwater flow.

- Running under our feet? – Underground flows in water circulation, TV Presentation by J Mádl-Szőnyi, made by Encompass 2.0. Ltd. Hungary
- Groundwater Flow Understanding, Video by S Ouysee and JJ Carrillo-Rivera
- Direct observation of complex groundwater flow systems, Video by X Liang et al.
- Tutorials in Regional Groundwater Flow System Analysis, Videos by C Molano
- Hidden Treasure (Australian TV program ABC Landline): B Smerdon was interviewed to discuss the groundwater conditions of Great Artesian Basin.

The first three videos can be found at our [YouTube channel](#).

The book of József Tóth “Gravitational systems of groundwater flow: theory, evaluation, utilization” has been translated into Chinese to spread the basics of gravity-driven regional groundwater flow and related phenomena among Chinese hydrogeologists: József Tóth, 2009 (translated by Zhang Renquan, Liang Xing, Jin Menggui et al, 2015): Gravitational system of groundwater flow: Theory, evaluation, utilization. Beijing, Geological Publishing House, 210 p

The RGFC with the support of the IAH Executive and ECHN initiated a competition in the AQUA Congress on regional groundwater flow. The RGFC received 18 applications for the Best Research Paper on Regional Groundwater Flow Competition. There were a preliminary assessment based on submitted abstracts, and relevance of regional groundwater flow. During the Congress, a panel of experts evaluated the oral or poster presentations based on technical quality, presentation and also relevance of regional groundwater flow. IAH Council supported the winners by free online memberships.

The RGFC celebrated IAH’s 60th anniversary in the form of Student Competition on Regional Groundwater Flow in collaboration with the ECHN, IAH Executive and organizers of the 43rd IAH Congress. After the first, online, round nine, university teams qualified for the second round held in Montpellier, where different regional groundwater flow topics were presented by each of them. The prizes are one-year memberships for 2017 provided by IAH,

additional small prizes granted by IAH–RGFC and regional groundwater flow related books.

The Council of IAH, appointed by election by the full membership every four years, is the Association’s governing body. Our current Council was elected at the General Assembly in Montpellier, France in September 2016. Two of our active RGFC representatives are now members of the IAH Council: Joanne Thompson – Vice President, North America and Carlos Molano – Vice President, Latin America and the Caribbean.

József and Erzsébet Tóth Endowed Hydrogeology Chair and Foundation was funded on 1 September 2016 at Faculty of Science, Eötvös Loránd University, Budapest thanks to generous donation of Prof. József Tóth. The main scope of the Chair is teaching, fostering, promotion and application of the „Tóthian” modern hydrogeological approach. The elaboration and preservation of the famous library of Tóth was also integrated into the activity of the Chair. The head is Judit Mádl-Szőnyi (Chair of RGFC) and she co-operates with her colleagues, PhD and MSc students in the frame of this group to urge the recognition of the vital Tóthian scientific heritage. The chair would like to attract scientific interest worldwide.

Communication among Commission members occurs principally via e-mail, however, establishment of the [RGFC LinkedIn Group](#) (which has already 260 members) helps a lot in this way. The group initiated and continues active discussion on the subject of Regional Groundwater Flow.

7. Research

The Commission could provide a background network and platform to those researchers who actively work with regional groundwater flow theory and concept. The efficient cooperation between groups and individuals were facilitated by the IAH RGFC Commission. Here you can find only a selection of the research projects, see in more detailed in the Annual reports.

Most important research projects of the active contributors:

- Application guide of the theory and method on groundwater flow system. Funded by China Geological Survey, Project manager: X Liang, 2008–2012

- Evaluation of hypogenic karstification, focusing on microbially mediated processes. Hungarian Research Foundation (OTKA), Project manager: J Mádl-Szőnyi, 2012–2017

- Basin-scale groundwater circulation. National Natural Science Foundation of China, Project Manager: XW Jiang, 2016–2018

- Comparison of nitrogen transport and transformation between the hyporheic zones of recharge and discharge areas. National Natural Science Foundation of China, Project Manager: Menggui Jin, 2017–2020

8. Liaison/Interaction with other groups/organizations

The RGFC collaborates with other organizations on national and international level and in the IAH.

- The first Session dedicated to ECHN was organized in the frame of Budapest Symposium, 2013
- IAH Central European Groundwater Conference 2013, Geothermal Applications and Specialties in Groundwater Flow and Resources, 8-10 May 2013, Mórahalom, Hungary. The Hungarian National Chapter of the IAH organized a conference with main focus on regional groundwater flow
- International Symposium on Hierarchical Flow Systems in Karst Regions, Budapest, Hungary, September 2013. The Symposium was organized by the Regional Groundwater Flow Commission of the RGFC and Karst Commission of IAH, Karst Hydrogeology and Speleogenesis Commission of the International Union of Speleology (UIS).
- The RGFC with the support of the IAH Executive and ECHN initiated a competition in the AQUA Congress on regional groundwater flow.
- The RGFC celebrated IAH's 60th anniversary in the form of Student Competition on Regional Groundwater Flow in collaboration with the ECHN, IAH Executive and organizers of the 43rd IAH Congress.
- Cooperation between scientists and decision makers was proposed by Alfonso Rivera at 42nd IAH Congress, Rome, Italy. This activity resulted in joint sessions of the EGU General Assembly 2016 and 2017 where the hydrogeologists and the vulnerability experts organized the session with the lead of Jim LaMoreaux.
- Characterizing regional groundwater flow systems: Insight from practical applications and theoretical development, Calgary, Canada, 2017 June was organized by RGFC in cooperation with the Canadian National Chapter of IAH.

10. Education:

Recognition and use of the Flow system Theory is indispensable for every level of society and particularly for Early Career Young Scientists was highlighted during the activity of the Commission with the use of new techniques.

The Board of RGFC formulated an opinion about the education related to IAH. This suggestion was sent to the IAH Council on 22 May, 2014

The members of the IAH RGFC have designed teaching materials on regional groundwater flow systems which could be used via [internet](#); a sharing mechanism is somehow highly needed.

11. Expert Advice e.g. to UN / Governments

The RGFC tried to help to the UN and national governments to understand and appreciate of flow-system concept in many ways:

		<p>- Judit Mádl-Szőnyi and other Hungarian professionals attended the Scientific Pre-Congress of the 2013 and 2016 Budapest Water Summit which was held in Budapest, Hungary. (Partners are World Water Council, UNESCO, Hungarian Government, Hungarian Academy of Sciences)</p> <p>- J Joel Carrillo-Rivera and a Member of Parliament of Saudi Arabia Kingdom, Dr Sultan Hasan AlSultan elaborate a programme to encourage the teaching of Groundwater Flow Systems at all levels of society in the country</p> <p>- J Joel Carrillo-Rivera and the Mexican Senate involved regional groundwater flow theory into the Mexican Water Law, document that has been placed under consideration and acceptance of members of the Mexican Congress</p> <p><u>12. Creation of a Global Inventory of Individuals and Research Groups interested in and/or actively working on any aspect of regional groundwater flow:</u></p> <p>The list of individuals interested in and/or actively working on <i>any</i> aspect of regional groundwater flow contains 175 scientists and professionals worldwide. The number of the supporters of the Regional Groundwater Flow Commission is continuously increasing.</p>
3.2	<p>Activities still planned for the rest of your period of license</p>	<p><u>2. Sessions at Conferences:</u> Groundwater management and energy source development in a changing climate, IAH Congress, Dubrovnik, Croatia, 25-29 September 2017</p> <p><u>5. Exchange of Knowledge and 8. Liaison/Interaction with other groups/organizations:</u> Communicating theoretical and practical importance and applicability of regional groundwater flow is one of the main mission of the Commission. The Commission intends to develop interfaces with other IAH Commissions and Networks and National Chapters to achieve this mission.</p> <p><u>6. Dissemination of Knowledge:</u> A Monograph on the state-of-the-art of the theory of regional groundwater flow is under preparation summarizing progress from 2012. We are planning to launch a ResearchGate project for the papers related to regional groundwater flow. It could be served as an online repository of relevant papers, books and book chapters.</p> <p><u>7. Research and 9. Interaction with other groups/ organizations:</u> The next period the research activity of RGFC is intended to widespread to those who are not familiar with the concept. To achieve this, a questionnaire was worked out and used. It is a great challenge to the RGFC to manage joint researches in the future. It is planned to work out the rules of an Award to an IAH Early Career Hydrogeologist who present the best research paper on the topic of Regional Groundwater Flow in the IAH Congresses. The best papers on regional groundwater flow is planned to follow in the homepage of RGFC and in the LinkedIn.</p>

		<p>The “Groundwater Flow Paper of the year” title will be also initiated and the rules of nomination and grant will be worked out.</p> <p><u>10. Education:</u> The Board of RGFC formulated an opinion about the education related to IAH. This suggestion was sent to the IAH Council on 22 May, 2014. We would like to continue our activity based on this document.</p> <p>RGFC intends to compile and publish online education materials for students of secondary and tertiary education.</p> <p>In Mexico, at the Autonomous University of Zacatecas a BSc course based on the flow systems has been proposed and is under consideration by the Administrative Authorities. The effort is that of Samira Ouyse and JJ Carrillo-Rivera.</p> <p><u>12. Creation of a Global Inventory of Individuals and Research Groups interested in and/or actively working on any aspect of regional groundwater flow:</u> Fostering the communication, networking and cooperation between research groups and individual scientists who are dealing with regional groundwater flow and related aspects.</p>
3.3	Please indicate other activities organized that were not planned initially	<ul style="list-style-type: none"> - LinkedIn group Activity to achieve the goals of RGFC - Logo for the RGFC of IAH - New website in the frame and design of IAH - YouTube channel
3.4	Please provide any reports you may have made on these activities	<p>All of the activities and reports was made by RGFC can follow in the Annual Reports from 2011.</p> <p>https://regionalgwflow.iah.org/activities/annual-reports</p>
3.5	Please indicate any activities you have organized jointly with other groups or organisations	<ul style="list-style-type: none"> - IAH Central European Groundwater Conference 2013, Geothermal Applications and Specialties in Groundwater Flow and Resources - International Symposium on Regional Groundwater Flow: Theory, Applications and Future Developments, Xi’an, China, June 2013 - International Symposium on Hierarchial Flow Systems in Karst Regions, Budapest, Hungary, 4-7 September 2013 - Best Research Paper on Regional Groundwater Flow, 2015 - Student Competition on Regional Groundwater Flow, 2016 - EGU Gerenal Assembly session, 2016 - EGU Gerenal Assembly session, 2017
3.6	Please provide any comments on difficulties found in the organization of your activities	<p>There are invitations for such activities, which cannot be fulfilled due to shortage in time available and the long distances to cover (keeping short courses, lectures about regional groundwater flow).</p> <p>Shortage of financial support. We could highly appreciate any financial support from IAH to our future activity.</p>

4	Deliverables	
4.1	Have you sent annual reports for your commission or network for 2015 and 2016?	Yes, you can download here .
4.2	Have you prepared any monographs or maps that were planned?	A Monograph on the state-of-the-art of the theory of regional groundwater flow is under preparation summarizing progress from 2012. It will be based on the Calgary Symposium held in June 2017.
4.3	Have commission members made contributions to IAH Blue or Green Book Series?	<p>Á Tóth, J Mádl-Szőnyi: Scale-dependent evaluation of an unconfined carbonate system - Practical application, consequences and significance. In: Z Stevanovic, N Kresic, N Kukuric: Karst without Boundaries. IAH Selected Papers on Hydrogeology 23. London: CRC Press - Taylor and Francis Group, 2016, ISBN:978-1-138-02968-2</p> <p>J Mádl-Szőnyi Judit, Sz Simon, J Tóth: Hydrodynamic Interaction between Gravity-Driven and Over-pressured Groundwater Flow and its Consequences on Soil and Wetland Salinization. In: L Riberio, TY Stigter, A Chambel, MT Condesso de Melo, JP Monteiro, A Medeiros: Groundwater and Ecosystems. IAH Selected Papers on Hydrogeology 18. London: CRC Press - Taylor and Francis Group, 2013, ISBN:978-1-138-00033-9</p> <p>A Erőss, J Mádl-Szőnyi, AÉ Csoma: Hypogenic karst development in a hydrogeological context, Buda Thermal Karst, Budapest, Hungary. In: P Maloszewski, S Witczak, G Malina: Groundwater Quality Sustainability. IAH Selected Papers on Hydrogeology 17. London: CRC Press - Taylor and Francis Group, 2012, ISBN:9780415698412</p>
4.4	Other publications (meeting compilations, brochures, etc.)	<p>Book of abstracts:</p> <ul style="list-style-type: none"> - International Symposium on Regional Groundwater Flow: Theory, Applications and Future Development, Xi'an, China - International Symposium on Hierarchical Flow Systems in Karst Regions, Budapest, Hungary - Characterizing regional groundwater flow systems: Insight from practical applications and theoretical development, Calgary, Canada <p>The outcome of the First EAGE/TNO Basin Hydrodynamic Systems workshop, Utrecht, The Netherlands, May 2015 was a special issue of journal of Marine and Petroleum Geology entitled Basin Hydrodynamics. The Editor was Hanneke Verweij, and Judit Mádl-Szőnyi was one of the invited editors.</p>

5	Other information (any other information you want to mention)	
5.1	Please indicate if you have received any funding support from within IAH and/or from	No funds were received from IAH, but several organization have partially assisted in our endeavor; however, other organizations have partially funded several activities, as universities of Mexico, Colombia, China, Morocco, Saudi Arabia, Hungary.

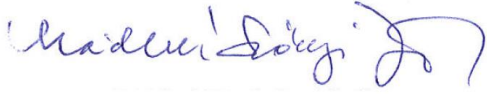
	other external groups or partners	
5.2	Relation between IAH Executive and the Commissions and Networks (feel free to send any information about contacts, support, etc., you feel could be changed or improved)	IAH should sponsor and encourage inter-commissional meetings outside the Annual Meetings, congresses.

6	How many meetings of its members has the Commission or Network organized?	We had six meetings.
6.1	Dates and locations of these meetings and estimated number of participants at each one	Niagara Falls, 2012: 40; Taole County China, 2013: 20; Budapest, Hungary 2014: 40; Marrakech, Morocco, 2014: 20; Rome, Italy, 2015: 25; Calgary, Canada, 2017: 15

7	Please use this space to insert any other information or to send any comment you haven't had the opportunity to insert in any of the previous points	<p>Joe Tóth received the Lifetime Honorary Member title for his request in July 2014. He has nominated Brian Smerdon for the position of a co-Chair in the Board. Brian Smerdon has been active since that and responsible for the communication of RGFC via social media.</p> <p>In the General Meeting at AQUA2015 a new officer was proposed for the RGFC Board to lead the task of research and developments in the Commission, into which Okke Batelaan (Flinders University, Adelaide, Australia) was elected. This activity group involves the broadening the circle of colleagues who consciously and habitually take flow systems into consideration when dealing with their own special hydrogeologic problem, and fostering the worldwide co-operation between reseachers and institutes dealing with theoretical and practical aspects of regional groundwater flow.</p> <p>The General Meeting also promoted the idea to have a secretary in the Board, who would assist organization and management issues. Ádám Tóth (Eötvös Loránd University, Hungary) was elected for this position.</p> <p>We would like to acknowledge the kind help of the members of the IAH Council, Ken Howard, Antonio Chambel, Viviana Re, Carlos Maldaner, Kellie Nicholson and John Chilton to the Activity of RGFC.</p>
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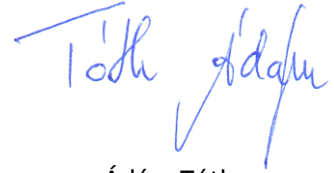
Date and signature of the person(s) responsible for completing this form

Calgary, 29 June 2017

A handwritten signature in blue ink, appearing to read 'Mádl-Szőnyi Judit', written in a cursive style.

Judit Mádl-Szőnyi

Chair

A handwritten signature in blue ink, appearing to read 'Tóth Ádám', written in a cursive style.

Ádám Tóth

Secretary

ANNEX A

<p>Point 3. Refer here to the general activities listed in the original Application Form, point 8:</p> <p>(add also the other activities you mentioned in point 9 of the Application Form)</p>	<p><i>Group Meetings</i> <i>Sessions at Conferences</i> <i>Stand-alone Specialist Meetings/Symposia</i> <i>Training Workshops</i> <i>Exchange of Knowledge</i> <i>Dissemination of Knowledge</i> <i>Research</i> <i>Liaison / Interaction with other groups / organisations</i> <i>Education</i> <i>Expert Advice e.g. to UN / Governments</i></p>
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