ISMAR9 CALL TO ACTION
SUSTAINABLE GROUNDWATER MANAGEMENT POLICY DIRECTIVES
June 2016, Mexico City, Mexico

Background
This document was developed for decision-makers and the public to inform, engage and educate stakeholders on the critical need for addressing our shrinking groundwater resources now, before it is too late, during two working sessions at the International Association of Hydrogeologists International Symposium for Managed Aquifer Recharge in June 2016 in Mexico City, Mexico. A working group further refined the document in the weeks following ISMAR-Mexico, as indicated below.

Principal Authors
- Fernando González Villareal, Universidad Nacional Autónoma de México
- Timothy Kevin Parker, Parker Groundwater Management, United States of America
- Rubén Chávez Guillen, Comisión Nacional del Agua, México
- Fernando González Cáñez, Organismo de Cuenca Aguas del Valle de México, Comisión Nacional del Agua, México
- Adriana Palma Nava, Universidad Nacional Autónoma de México

Contributing Authors
- Bill Alley, National Ground Water Association, USA
- Bob Bower, Golder Associates, New Zealand
- Peter Dillon, Aqueon, Australia
- Russell Martin, Aqueon, Australia
- Sharon Megdal, University of Arizona, USA
- Aristides Petrides, Oregon State University, USA
- Andrew Ross, Australian National University, Australia
- Yan Zheng, Columbia University, USA

Related Literature

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Introduction

Water is truly precious and essential for life, but limited and finite in extent occurring as surface water (lakes, rivers and wetlands) at the land's surface, and as groundwater in aquifers below the ground. Surface water constitutes 3% of the world's freshwaters and is visible, measurable and manageable; groundwater constitutes 97% of freshwater and is out of sight, generally not well measured, and therefore more difficult to understand, manage and protect in terms of quantity and quality. Groundwater and surface water are intricately linked, with groundwater providing base flow to surface water systems (feeding water to rivers and wetlands), and acting as a buffer to supply water during dry periods and droughts.

Groundwater is increasingly relied on globally for water supply and food security, yet is not being adequately invested in, regulated, managed or sustained on a global basis. It is a common pool resource, highly susceptible to overuse, resulting in the classic tragedy of the commons, with depletion in many areas of the world. Current and emerging challenges to maintaining the quantity and quality of groundwater resources include climate change and variability, pressures from a growing population, increasing urbanization, and large agricultural demands. Sustainable groundwater management should be implemented throughout the world, and done so consistent with the following policy directives.

I. Recognize aquifers and groundwater as critically important, finite, valuable and vulnerable resources.

Aquifers are porous, subsurface geologic materials containing groundwater that provides 50% of global water needs and water supply resiliency through droughts, and are therefore very valuable resources. The groundwater contained within aquifers is part of the hydrologic system, and in many places strongly connected with surface water bodies. Groundwater is not an unlimited resource, although generally shallow systems may be renewable on a short- to long-term basis. Many aquifers contain very old groundwater deposited 1,000's of years ago and are non-renewable unless purposefully recharged through managed aquifer recharge. Since groundwater is underground, it is not visible, generally not well understood, and widely thought to be endless in extent.

II. Halt the chronic depletion of groundwater in aquifers on a global basis.

Today, groundwater supplies in many of the world's aquifers are unsustainable, resulting from overexploitation and a lack of proactive management. Evidence of depletion includes chronically declining groundwater levels, loss of groundwater storage, water quality degradation, land surface subsidence, seawater intrusion, surface water depletion and loss of springs, base flow, and associated groundwater dependent ecosystems. Depletion can cause irreversible damage and deprive future generations of the resource. Actions need to be taken immediately to invest the required resources to regulate and actively manage groundwater quantity and quality as needed to halt chronic depletion, water quality degradation, and achieve sustainability in the next 25 years.

III. Aquifer systems are unique, need to be well understood, and groundwater should be invisible no more.

All aquifer systems are unique and diverse in physical characteristics and other features. As such, aquifer systems can be complex, difficult and expensive to evaluate, but must be well understood for effective management. Increasing the knowledge on aquifers is essential to developing a foundation for sustainable management of groundwater resources. The basic elements include but are not limited to, the nature of the aquifer geometry and chemical and physical characteristics, local hydrologic cycle and interconnectedness of aquifers, confining layers (aquitards) and overlying local and regional surface water systems, groundwater flowpaths and gradients, water budget and availability, current and future demands on the system, and an assessment of how land uses and climate change may affect local hydrology and water quality. This information is expensive to collect because of the subsurface nature of groundwater, and significant investments of resources are needed to increase independent data collection and dissemination in order to improve understanding over time. Needed also are continued efforts to improve tools and innovative technologies for less costly and higher value information, resulting in better understanding and management of groundwater resources. The government and private industry should help provide the resources to support academia to train the future workforce, managers and scientists, and for research to develop improved tools and technologies, all necessary to better manage groundwater in the future. Finally, the knowledge and data on aquifer systems should be shared widely so that groundwater should be invisible no more.

IV. Groundwater must be sustainably managed and protected, within an integrated water resource framework.

Sustainable management of groundwater includes increasing and sustained investment in groundwater, appropriate policies and regulations, legal framework, institutions with sufficient authority and accountability, and development and implementation of comprehensive and adaptable management plans. The legal framework should address the process and actions for assigning, accounting, and allocating water rights, and mechanism for resolving conflicts and disputes.

Groundwater management institutions should cover the entirety of each aquifer system, including recharge source areas and connected surface water systems, and should have the authority and accountability to sustainably manage groundwater. The groundwater management institutions should consider the interests of all beneficial uses and users of groundwater, and be integrated with surface water management institutions to manage connected systems. Institutions should have the authority to conduct studies, register and monitor wells, measure and regulate extraction, implement capital projects, freely share data and information and assess fees to cover the cost of groundwater sustainability. Responsible management institutions should ensure that all share the cost of groundwater sustainability equitably. Federal or state governments should provide the backstop and intervention as necessary if groundwater management institutions are unsuccessful in sustainably managing groundwater in their jurisdictional areas.

Management plans should include a sustainability goal, measurable objectives, an adequate understanding of the physical system and hydrology, monitoring program and protocols, a planning horizon of no less than 50 years, management component projects and actions to achieve sustainability, and integration of land use decisions. Management component projects and actions to be considered in management plans include conservation, water reuse, stormwater capture, managed aquifer recharge and demand reduction. Recycled water and stormwater should be put to beneficial use and developed as resources. Water markets, water trades and transfers should also be tools employed in sustainable groundwater management.

V. Managed Aquifer Recharge should be greatly increased globally.

Managed aquifer recharge (MAR), defined as the increase in groundwater recharge over natural infiltration processes as a result of interventions designed to enhance groundwater storage and quality, is recognized as a key groundwater management component that is utilized widely for long-term sustainability. MAR is a versatile technology that helps to increase the storage and availability of water from aquifers, may improve the quality of groundwater through natural subsurface treatment processes, and increase groundwater storage to supplement supplies during dry cycles or severe and prolonged droughts. This makes it important to promote MAR application in management plans, provide appropriate incentives for local users to implement MAR, and institute training of specialized personnel in this area. MAR needs to be employed much more widely in order to replenish depleted aquifer systems, and sustain groundwater resources in the future. MAR should be implemented where economically viable in suitable aquifers that can accept a sufficient quantity and quality of water at an adequate recharge rate, within areas where groundwater use is being actively managed.

VI. Effective groundwater management requires collaboration, robust stakeholder participation and community engagement.

Groundwater is a shared, local resource, and collaboration and robust participation of community stakeholders and leadership overlying the aquifer system, including stewards of the environment, provide invaluable tools and a pathway toward the collective action needed to manage groundwater resources sustainably. Community engagement is an important social tool and can be a driving force for fostering trust, acceptance, and support for the management actions and costs, and ultimate compliance to adhere to the actions implemented. Premised on the principle that those affected by the management decisions have a fundamental right to be involved in the decision-making process, community engagement should include encouraging local leadership in key roles to nurture sound decisions and promote compliance with needed actions. Management institutions will need to identify and engage these varied interests and determine how their involvement will be integrated into the decision-making, coordination, and implementation processes necessary to achieve groundwater sustainability. Further, the engagement of the local community is an ongoing and never ending process to achieve and maintain resource sustainability.