Advancing Water Resource Management through Space Applications

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The integration of a human rights-based approach (HRBA) across the use of space applications in advancing integrated water resource management (IWRM) provides a means for governments to fulfill their ongoing obligation to respect, protect and fulfill human rights. Access to water and sanitation are recognized by the international community as a fundamental human right, one which impacts upon the core nature of associated basic rights across every individual.

As highlighted during the 1992 Rio Summit, the Agenda 21 Document clarified the emergence of IWRM as a process which prioritizes measures which address pressing issues over scarcity, destruction, and pollution of freshwater resources through the coordinated development and management of water, land, and related resources. Herein, IWRM maximizes the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

HRBA is dictated by the 2003 UN Development group's Common Understanding document, providing a consistent approach to common programming processes at the global, regional, and national level. The utility of this approach lies in its broadly endorsed normative and legal framework which sets minimum standards for governance, and clarifies the rights and duties of governments and rights holders.

Context
The lack of access to safe, sufficient and affordable water, sanitation and hygiene facilities has a devastating effect on the health, dignity and prosperity of populations, and carries significant consequences for the realization of human rights. While not explicitly referenced across the Universal Declaration of Human Rights (UDHR), International Covenant on Civil and Political Rights (ICCPR), or the International Covenant on Cultural, Economic and Social Rights (ICESCR) – it has been recognized that the right to life (RTL) extolled under Article 3 bears a direct connection to the right to water (RTW), wherein one cannot exist without the other.

This contention was further reinforced in November 2002 when the Committee on Economic, Social and Cultural Rights adopted General Comment No. 15 (GC15) on the right to water. Article I.1 states that "The human right to water is indispensable for leading a life in human dignity. It is a prerequisite for the realization of other human rights". GC15 also defined RTW as the right of everyone to sufficient, safe, acceptable and physically accessible and affordable water for personal and domestic uses – placing expectations upon states to adhere to these requirements in fulfilling RTW.

Finally, in July 2010, the UN General Assembly passed Resolution 64/292, explicitly recognizing the RTW as derived from the right to an adequate standard of living, and acknowledging that clean drinking water and sanitation represent essential elements to the realization of all human rights. The effect of this resolution served to highlight the existence of this right as contained in existing human rights treaties, and therefore legally binding upon UN member states.

Space and Water

In December 2018, UNOOSA launched the Space4Water portal to promote the use of space technology for sustainable water management. Predicated upon the essential role of water for supporting life and achieving the UN Sustainable Development Goals (SDG), the initiative serves as a platform to gather information, strengthen partnerships related to space-based information for water accessibility, and achieve universal and equitable access to safe and affordable drinking water for all.

It is argued that all water resource management programs and frameworks which utilize and integrate space as part of its process must prioritize the realization of human rights. These spans both avenues which lie at the intersection between international human rights law (IHRL) and international space law (ISL).

Firstly, considerations surrounding the use of space applications in support of terrestrial human rights – pertaining to the use of satellites, earth observation technologies, and emergent Satellite Weather Modification Systems (SWMS). Secondly, concerning the extension of terrestrial human rights to human activities across the final frontier – pertaining to essentiality of water as a resource for basic human existence and survival, and the broader utility of water in supporting environmental control and life support systems (ECLSS) and for rocket propulsion.

The guidelines and restrictions surrounding use of such space technologies must advance a supportive and habitable environment conducive to ensuring the human rights of a nation's citizens – striking a balance between the commercial uses of such technologies versus its potential for rights enforcement. Further, the roles of institutions which retain control over the use of such technology must be considered, given their relevance in monitoring, complying, and fulfilling IHRL values and principles. Finally, management instruments surrounding such technologies must enable and help decision-makers to make rational and informed choices in their use, as conducive and aligned to human rights values and principles.

Sustainable Development Goal 6 – Clean Water and Sanitation for All

The use of space technology in meeting the water related aspects of SDG 6 serves to promote the capacity of governments to meet their obligation to respect, protect and fulfill concerning the existing RTW. This right is detailed throughout the UDHR, ICESCR, CEDAW, and CRC – recognizing the resource as indispensable for leading a life in human dignity, and a prerequisite for the realization of other human rights. Everyone possesses the right to sufficient, safe, acceptable, and physically accessible and affordable water for personal and domestic uses. Where the international human rights system has established water as a recognized human right, this provides opportunities to streamline global and national water governance and provide coherence in meeting basic standards conducive to human health and dignity. Such must be measured across the established standards of accessibility, adaptability, and accessibility.

Firstly, examples geared toward promoting the accessibility of water resources through space applications address improving the capacity for all peoples to reach, understand, and use space technologies to improve their lives. This is highlighted using smartphones and mobile phone applications to improve basic access to satellite data and services for 20,000 farmers under the Pakistan Council of Research in Water Resources (PCRWR). Herein, the PCRWR integrates NASA satellite data for meteorological purposes, providing publicly accessible information on current and future weather conditions, and advisories on how to water certain crops, for the purpose of helping Pakistani farmers avoid the issue of overwatering their crops. This feeds into target SGD-6.4, promoting measures which substantially increases water-use efficiency across all sectors, and reduces the number of people suffering from water scarcity.

Secondly, examples which seek to advance the adaptability of water resources through space applications concern tailoring water management programs in a manner which recognizes and accommodates the local context. This is demonstrated through measures to adapt remote sensing technologies to boost water resource management, achieved through the scalability of remote sensing

products and services on offer to various African countries. This is predicated on differing requirements concerning the accuracy, timeliness, and spatial representativeness of information acquired through remote sensing. This enables local governments to select the most appropriate and affordable solution to best improve water resource management in their region. This relates to target SGD-6.b, in supporting measures which facilitate and strengthen the participation of local communities in improving water and sanitation management.

Third, examples seeking to further the acceptability of water resources through space applications concerns measures to ensure that remote sensing services are ethically and culturally appropriate for people from different backgrounds – regardless of race, gender, class, ethnicity, disability or other identities and backgrounds. This is highlighted by the integration of Geographical Information Systems (GIS) into secondary education across different countries, with schools in South Africa being limited by challenges – including inadequate resources and limited exposure of students to GIS's practical uses, including for IWRM. This is contrasted by the Queensland Government's creation of a spatial educator's toolkit for secondary education, which educates students on a variety of GIS related issues – including matters relating to hydrology, meteorology, and water management. This relates to target SGD-6.b, in supporting measures which facilitate and strengthen the participation of local communities in improving water and sanitation management.

Recommendations

Improving the accessibility of water resources through space applications requires several measures. First, boosting the coverage of such technologies – to achieve the universal coverage of such IWRM tools and preclude the possibility of discrimination of any kind, especially individuals belonging to the most disadvantaged groups. Secondly, to address issues of affordability to such technologies – which may be addressed through the creation of contributory schemes, or creation of a more equitable sharing economy. Third, to support participation and information – whereby the beneficiaries of these technologies and services must be able to participate in their administration, and have the right to seek, receive and impart information on entitlements in a clear and transparent manner.

Improving the adaptability of space applications for IWRM requires additional outreach across local communities, distributing information about such technologies and services. Such communication should be adapted to reach the most vulnerable segments of society by using channels such as radio/TV broadcasts, and be available in languages used by minority and indigenous groups. Improving adaptability bears direct relevance to the increased effectiveness and efficiency of any IWRM measures undertaken using space applications.

Improving the acceptability of space applications for IWRM requires sensitizing the applicable technology, services and tools to account for the multiple forms of discrimination that might arise concerning race, language, religion or otherwise. Herein, additional measures must assess the asymmetries of power that exist between and among communities, concerning access to technology and management of local water resources. This may be conducted through broad consultations with the respective rights-holder groups. Special attention must be paid to groups that suffer from structural discrimination as a matter of priority in the design, implementation and monitoring of GIS services for IWRM – to meet obligations entailed within various human rights instruments.

Conclusion

The application of HRBA upon IWRM therefore bears relevance to the use of space applications in improving access to water and sanitation, promoting the importance of human rights values and principles in outer space affairs, and enabling the space-water-human rights communities to collectively work toward universal and equitable access to safe and affordable drinking water for all.

A continuing and growing emphasis upon the utility and wide reach of human rights across outer space applications will play a vital role in protecting vulnerable groups from abuse, advancing sustainable practices in the sharing and use of water resources, and safeguarding international peace and stability through the promotion and realization of water security.

Ongoing scientific debate and the management of water resources must integrate the foundational perspectives offered by IHRL. HRBA places the interests and rights of the individual as the core focus for any policy decisions surrounding water and the use of space applications – with government actions tempered by the need to respect, protect, and fulfil the individual right to health, wellbeing and dignity. The integration of HRBA is therefore vital in the determination of a broadly applicable and relevant solution – based upon the universal, inherent, and inalienable characteristics of human rights.