Parliamentarians Role In Water Management: Water and Politics in the South Caucasus

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Although the subject of water management is seemingly unrelated to political tensions, environmental resources, especially access to clean water, provide a unique venue for common discussions and partnership building between the opposing sides. During the long years of fighting and gradual desolation significant ecological decline equally suffered by Armenia and Azerbaijan has become a problem for both sides and thus requires joint action. Cooperation on environmental issues carries over to political dialogue. A strategic long-term partnership on shared water interests allows for increased collaboration and mutual agreement on issues in other areas. On the basis of this principle, Parliamentarians for Global Action (PGA) conducted a series of roundtable discussions between parliamentarians of Armenia and Azerbaijan to address the link between regional conflict management and environmental policy.

PGA Background

Parliamentarians for Global Action (PGA) is a membership organization of national legislators from around the world. Initiated in 1979 by a group of concerned parliamentarians, the organization includes only legislators from elected parliaments within its membership. All of PGA's activities are coordinated by the Secretariat based in New York. PGA's programmes in Sustainable Development & Population, Peace & Democracy, and International Law & Human Rights are directed by members of the governing body and the Executive Board, in cooperation with the International Council. Executive Board Members also serve as Chairs and Vice Chairs for specific programmes, and work closely with their respective programme officers at New York headquarters.

With a network of over 1,350 political leaders from 111 countries, PGA has been working with individual parliamentarians on environmental matters, with special focus on clean water access as critical mechanism for partnership building between countries with common borders, since 1995 when it convened South Asian Workshop on Water Management in the Maldives. The workshop involved parliamentarians from Bangladesh, India, the Maldives, Nepal, Pakistan and Sri Lanka who gathered together to discuss a range of regional water management projects, including hydro-electric dams and the distribution issues between India and Nepal and India and Bangladesh. PGA has continued its work on water management a series of dialogues between the parliamentarians of Greece and Turkey aimed at promoting better relations between the two countries torn apart by the ongoing conflict over the status of the island of Cyprus. At the same time, upon the recommendation of the USAID PGA Executive Committee has decided to run similar series of parliamentary discussions between the MPs from Armenia and Azerbaijan that had commenced in January of 2002.

Project Background

The conflict between the Armenians and the Azeri over Nagorno-Karabakh is among the most intractable disputes in the world. Both Armenians and Azeri claim absolute historic ownership of the region, located between the two countries and populated predominantly by the Armenians. As a result of serious fighting, Armenia has occupied the contentious area along with about 20% of Azeri territory by 1993. The leaders of Karabakh have declared the independence of the country hat has not been recognized by any other state.

Prolonged political tension and open fighting have led to a significant economic decline of all the participating sides that were already significantly impacted by the collapse of the Soviet system. Reduced GDP brought about economic and social problems and a 'free-fall' in the standard of living.[1] Armenia has suffered deeply from an energy blockade initiated by Azerbaijan and joined by Turkey; and Azerbaijan has so far been unable to use its rich oil and natural gas resources essential for normalization of its economy. Organised to find a resolution to the Nagorno-Karabakh stalemate by the OSCE in 1997, the "Minsk Group" has shown little progress in resolving the conflict. As a result, for over 13 years, the stalemate between Armenia and Azerbaijan has remained in place and the situation appears immovable. These tensions have had an enormous impact on water shortages in both countries that share the same water resources of the Kura-Araks water basin. Without good governance and a commitment by both governments to address social, developmental and political concerns at both the executive and legislative levels, the threats to human security will continue.

Environmental Background

The area occupied by the basin of Kura-Araks rivers is 188 thousand km^2 and spreads over the territory of five states.[2] An enormous part of the population of South Caucuses lives on these two rivers and most of agricultural and industrial enterprises are located on their banks. Furthermore, the basin of these two rivers, that also involves Lake Sevana in Armenia, is the main source of fresh water to the populations of Armenia and Azerbaijan as well as Georgia. Their waters, however, are subject to substantive pollution of physical, chemical and biological after-products of production. The average amount of pollutants exceeds the established norms by 2 to 9 times and often represents a substantial threat to human health.[3]

Various fragmented efforts applied on intergovernmental level by the states of the South Caucasus have not led to significant improvement as it requires cooperation among of all the states involved in the initial pollution of the Kura-Araks waters as well as lake Sevana and the Caspian Sea. All the sides involved have become signatories to a number of international conventions protecting transborder water resources as well as passed their own legislation to cleanse and protect the water-basins. However, the implementation of these conventions and laws, aimed at protecting the transboundary water resource has been severely hampered by the ongoing stalemate over the Nagorno-Karabakh.

Project Details

As institutions, parliaments have an enormous role to play in helping to stabilize nascent democracies and as national legislative bodies remain indispensable to any long-term resolution of conflict and maintaining peace. Parliamentarians play a role as political actors who can engage in discussions with protagonists as peers. The role of parliamentarians as legislators directly accountable and representative of affected constituencies necessitates their involvement in bilateral discussions to develop needed strategies and exchange information.

It has, therefore, been widely agreed that a comprehensive settlement requires the input and participation of legislators; the fifteen-year conflict, for which the parties are asked to assume responsibility and decide on the right of self-determination for the region, necessitate such

[1] Caucasus Environment Outlook (CEO) 2002, publication by UNEP
[2] ibid.
[3] ibid.

input. Parliamentarians, representing minority populations affected by the ongoing dispute, are responsible for decisions on development aid and assistance to displaced populations, critical to Nagorno-Karabakh.

On the basis of this belief, PGA has begun the series of dialogues on water management between the parliamentarians of Armenia and Azerbaijan in 2002 with the anticipation that the environmental discussions on a topic of common interest may later lead to more political programme of action that would lead to closer cooperation and relations between the stalemated states. The two parliamentary delegations, facilitated by an independent facilitator, Sen. Longin Pastusiak, President of Polish Senate, a water consultant and PGA's staff have convened three times since January 2002 and have defined and agreed on a practical strategy aimed to improve the cooperation and relations between the two countries. The negotiations, coined as Track 1 ½ diplomacy, have involved parliamentary groups of 5 parliamentarians representing relevant environmental committees and political groups from both sides. In the course of their collaboration the participating MPs have reviewed and prioritized national and regional water and environmental issues/problems though the site visits conducted in August 2002, where environmental damage to identified lakes and rivers was assessed. During their subsequent meetings in Johannesburg, August 2002 and Vienna, October 2002, the delegations have developed a tentative water and environmental vision for the two countries, which includes the relation of the environmental problems to regional stability and development.

After the initial introduction of the participating sides and site visits aimed at identifying concrete sites for specific projects for joint development such as Lake Sevana, Kura and Araks rivers and delta of the Caspian Sea, both delegations have participated in Parliamentary Workshop on Clean Air and Clean Water held by PGA on August 29 – 30, 2002, in Johannesburg, South Africa, as a parallel event to the World Summit on Sustainable Development (WSSD). In the letter of intent derived from the Johannesburg series of meetings both parties stressed the importance of international involvement in the region and an initiative that would establish a joint monitoring of water sites under the facilitation of PGA. The monitoring strategy is currently being devised by the participating legislators in collaboration with independent experts and PGA staff.

Furthermore, it has been continually stressed in the previous bilateral meetings between the delegations of Armenia and Azerbaijan that lack of information-sharing resulting from the political instability and lack of trust between the two sides offers a major obstacle to potential collaboration of the two countries in dealing with the environmental issues. Both delegations have requested PGA's facilitation in organizing a confidential information exchange channel exclusively available to the series' participants and PGA staff members. PGA is currently working on establishing a confidential electronic medium that will disseminate the technical information on water-pollution already available in both countries to each group via a confidential Internet database.

The Azeri and Armenian delegations continued their discussions in four bilateral side meetings to further develop their joint proposals. The delegations agreed that parliamentary site-visits would be conducted of the major pollution sites and a comprehensive, ongoing monitoring mechanism would be developed involving regional experts in water management and the parliamentarians of both countries.

When the two delegations reconvened at the Diplomatic Academy in Vienna in October of 2002, the parliamentarians formed a Coordination Council (CC), consisting of members of parliament and representatives of PGA to oversee the work of selected technical experts in identifying sites along the Kura and Araks rivers for monitoring and cleanup. This Coordination Council has been already put in place and is currently establishing a monitoring group composed of the selected experts, along with representatives of international

organizations who will liaise with relevant state and public organizations, scientific, research and educational institutions, and other legal entities in information collection and the creation of a database on the condition of transboundary water resources.

Conclusions

Collaboration on such technical environmental concerns has incorporated political dialogues from the start of the series, with parliamentarians providing a legislative perspective on the proposed compromise peace accords drafted by the Minsk group of the OSCE for discussion with both President Aliyev and President Kocharian. However, political matters have purposefully remained secondary to the series as it was recognized that cooperation on matters such as water management has more potential in promoting warmer relations that will allow the discussions on sensitive political issues to reconvene.

Indeed, the dialogues have provided an opportunity for collaboration and discussion and have led to the development of a concrete programme of action that will further the cooperation on the common environmental problems and hence potentially promote the dialogue on politically charged issues.

As the result of the discussions, both countries exhibited strong interest in establishing initiatives and programs to address water pollution and signed two letters of understanding that they would work through a commission of parliamentarians and water experts to identify significant sources of transboundary water pollution and develop projects on improving water monitoring. The participants have established a long working relationship and active participation in water management efforts. Furthermore, aside for the environmental collaboration the series have resulted in building a close personal relationship among the participating parliamentarians, who were able to see and get acquainted with the grievances of ‘the other side’.

Unfortunately, the series have been temporarily stopped due to the lack of funding that organisations such as ours severely depend on. The interest of the parliamentarians involved, however, has remained unchanged. They remain active members of PGA network and re-emphasize their search for wider development international involvement that they believe is crucial for environmental and political improvement in the region.

Le niveau pertinent pour la gestion des services d'eau et d'assainissement

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Abstract

Relevant level of decision making for water supply and sanitation

As far as the integrated water resources management is concerned, the general consensus is that the appropriate level of the management is the river basin.

But it is not the case for water supply and sanitation, which bring us to the following question: what is the relevant level of planning, management and decision making for water supply and sanitation?

Water supply and sanitation are both entirely local problems, not only for historical or cultural reasons, but mainly because transportation of drinking water is a costly procedure and waste water transport is even more expensive. Both are narrowly linked together and the best way of managing waste water is to finance investments, operation and maintenance of waste water transport and treatment, with money collected by drinking water bills.

Even if the relief is important for the cost of sanitation (it is not so true for drinking water), the physical geography is not important at all. In the case of water supply and sanitation, the responsibility of the management should be handed to the local communities. At this local level, all the problems may generally be taken in consideration in the best way: customer services quality, price (and the apportionment between the different types of users, between rich and poor, the distinction between what is paid by the present customers and what will be paid by the future generation through the reimbursement of debts), along with the consultation of the civil society carried through by the elected local councilors.

On a national level, it will just be necessary to enact general rules, minimum standards of water quality (for European countries it is even done on the European level), legal control of local communities and the possibility of partial price equalization between different communities (but preferably for a limited period of time without withdrawing the main responsibility of the local communities).

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Il est actuellement reconnu que les bassins des fleuves, des lacs et des aquifères sont les territoires appropriés pour l'organisation et la gestion intégrée des ressources en eau, visant la satisfaction durable de l'ensemble des besoins essentiels et légitimes des différents usagers, la protection contre les risques (inondations, sécheresses), la préservation et la restauration des écosystèmes. Le Réseau International des Organismes de Bassin (RIOB/INBO) rappelle dans sa dernière lettre (n° 12 Décembre 2003-janvier 2004) les conditions de mise en œuvre de cette politique, y compris pour les bassins transfrontaliers.

En France, la politique de mise en œuvre de Schémas d'Aménagement des Eaux (SAGE) applique ce principe à l'échelon local permettant la meilleure gouvernance possible grâce à la participation des toutes les parties concernées.

Il est également reconnu que la politique générale de l'eau doit être définie aux niveaux des états souverains, dans des conditions que rappelle le rapport du Panel mondial sur le financement des infrastructures de l'eau -
Financer l'eau pour tous", établi en 2003 sous la direction de Michel Camdessus pour satisfaire, dans les pays en développement, les objectifs du Millénaire dans le domaine de l'alimentation en eau et de l'assainissement.

Les considérations développées par le Panel restent pertinentes même pour les pays développés, étant entendu que la politique de l'eau peut être, pour partie, définie à un niveau plus élevé que celui des Etats, comme c'est le cas dans l'Union européenne, où de nombreuses directives établies au niveau européen s'imposent aux Etats membres (notamment la directive cadre européenne sur l'eau).

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Par contre, en ce qui concerne l'alimentation en eau et l'assainissement, il n'y a pas, en pratique de consensus sur le niveau pertinent de l'autorité en charge de la gestion des services correspondants, si l'on en juge par la diversité des solutions adoptées dans le monde. Il n'y a sans doute pas une réponse unique à cette question et il ne s'agit pas d'empiéter sur la souveraineté des Etats, ni même de porter un jugement quelconque sur les solutions adoptées: cette responsabilité est assurée parfois directement au niveau de l'Etat (cas de la Tunisie avec la SONEDE et l'ONAS) elle peut l'être par des collectivités locales pour les grandes agglomérations et par l'Etat pour les zones rurales (cas du Maroc avec les Régies des grandes villes en gestion directe ou déléguée et avec l'ONEP), par des grandes structures régionales privatisées, assorties d'une régulation au niveau central et d'une autorité nationale des rivières (cas de l'Angleterre et du Pays de Galles) ou par des collectivités locales (ou leurs regroupements) assurant elles-mêmes ou par délégation la gestion de ces services (cas de la France)….

Chaque solution a ses défenseurs et présente des contraintes, des avantages et des inconvénients, mais, même si les considérations qui suivent ne prétendent pas comparer entre elles des différentes possibilités d'assurer cette gestion, il nous paraît intéressant d'approfondir la réflexion sur cette question: quel est le niveau pertinent de responsabilité pour la gestion de l'alimentation en eau et de l'assainissement? On peut même envisager que puissent être établies ultérieurement des comparaisons (Benchmarking) pourvu que des indicateurs de performances fiables et admis par tous puissent être établis, mais le présent propos est seulement d'expliquer pourquoi il nous semble que le niveau le plus satisfaisant est celui assurant une "gestion de proximité" et que les problèmes qu'il pose peuvent tous trouver une solution

Alimenter en eau une maison, un village, voire même une grande agglomération est en général un problème essentiellement local. Bien que les ressources en eau soient inégalement réparties dans le temps et dans l'espace, elles sont liées au sol (nappes) ou aux écoulements de surface et le transport de l'eau à de grandes distances est très coûteux, rendant souvent plus économique le traitement d'eau locale de mauvaise qualité que la réalisation de longues adductions. La géographie physique importe peu et si le bassin versant constitue un territoire pertinent pour la répartition d'eau entre usagers, ce n'est qu'un élément tout à fait secondaire en ce qui concerne la distribution d'eau, le coût de la mobilisation de l'eau potable à distribuer dépendant beaucoup moins du relief que de la distance.

Le coût du transport des eaux usées dépend certes, beaucoup plus du relief, mais c'est un problème encore plus local, y compris en ce qui concerne le traitement des eaux usées avant

leur retour au milieu naturel (qui dépend étroitement de la qualité à maintenir dans ce milieu). De toute façon, l'eau et l'assainissement sont étroitement liés et comme l'assainissement nécessite de lourds financements, sans bénéfice direct pour les habitants, le meilleur moyen de financer les investissements et l'exploitation des services d'assainissement est de les assurer par la facturation de l'eau, comme cela est d'ailleurs pratiqué presque partout dans le monde.

Pour ces raisons le développement des services de distribution d'eau a été en général assuré historiquement à partir de projets locaux, même si ultérieurement la gestion des services d'eau et d'assainissement a été parfois assurée à des niveaux régionaux ou nationaux.

La distribution d'eau est un service de première nécessité et il nous semble de ce fait que la gestion de ce service public doit être assurée au plus près des usagers, qui doivent être traités comme des clients souvent plus attentifs à la qualité du service (fournir d'une façon fiable 24 heures sur 24 et 7 jours sur 7 une eau saine et à une pression suffisante) plus encore qu'à son prix, quoiqu'en disent les médias. C'est au niveau local que les élus et les associations peuvent le mieux faire valoir leurs préoccupations. En ce qui concerne le prix du service et son recouvrement, la meilleure gouvernance n'est-elle pas d'en confier la tarification aux élus locaux lesquels peuvent être confirmés ou récusés à chaque élection, cette tarification pouvant assurer une certaine modulation, entre riches et pauvres, entre résidents permanents et résidents occasionnels, entre ce qui est payé grâce aux emprunts (renvoyant la charge des financements sur les usagers futurs) et ce qui est payé directement par les usagers actuels? La qualité de la ressource en eau étant différente d'un point à un autre et le traitement de l'eau brute pouvant être plus ou moins poussé, n'est -ce pas au niveau local que l'on peut au mieux arbitrer entre la qualité de l'eau et le niveau des investissements à réaliser?

C'est le raisonnement qui a été depuis toujours suivi en France malgré à diverses reprises, la tentation d'autres solutions. Le "système" français conjugue trois aspects d'une façon originale en Europe; comme le souligne un rapport du Bipe de décembre 2003 " Eléments pour un benchmark des services d'eau et d'assainissement"

- la participation de la population, garantie par le rôle des élus, des collectivités locales, entités organisatrices,

- la concurrence pour le service, la France étant le seul pays à organiser une concurrence obligatoire, dans des conditions définies par la loi, entre prestataires pour la fourniture d'un service sur un territoire.

- la diversité des formes de contrat qui favorise l'adaptation aux situations locales des propositions faites par les sociétés de service, étant entendu qu'outre des sociétés privées, il existe des régies directes, des sociétés d'économie mixte, voire des structures organisées au niveau départemental.

Ces réflexions au niveau français correspondent aussi d'ailleurs à celles du "Panel mondial sur les infrastructures de l'eau" déjà cité. Dans le paragraphe consacré aux "entités publiques non souveraine" on peut lire:

" Les organismes au niveau régional sont les plus à même de faire évoluer les services de l'eau, que ce soit en termes de quantité ou de qualité. Dans la plupart des pays, ce sont les collectivités locales ou les autorités publiques en charge des eaux qui ont la charge de l'approvisionnement en eau. En effet, lorsque apparaissent des insuffisances, ces instances locales sont les mieux équipées pour définir des solutions, préparer la mise en œuvre et gérer la distribution à l'avenir. La décentralisation de la prise de décision permet de choisir

les technologies et les types de services les mieux adaptés. Enfin, on sait que l'erreur dans ces domaines critiques peut mettre fin à tout espoir de pérennité financière pour les prestataires de services d'eau concernés…."

Plusieurs critiques peuvent être faites qui méritent discussion, mais auxquelles des réponses peuvent être trouvées:

1) si la **"gestion de proximité"**, c'est-à-dire au niveau communal et intercommunal, paraît le meilleur échelon d'exercice de la responsabilité de la maîtrise d'ouvrage et de la maîtrise d'œuvre, n'est-ce pas un échelon trop faible sur le plan de la capacité des collectivités à assumer ces responsabilités? Il y a plusieurs réponses à cette question et elles peuvent être mises simultanément en œuvre: tout d'abord, le développement de l'intercommunalité, favorisé par la loi, mais voulu par les élus locaux eux-mêmes, permet de plus en plus d'obtenir des entités suffisamment importantes pour prendre en main ces responsabilités; ensuite, les collectivités ne sont pas livrées à elles-mêmes, car elles sont assistées par les services déconcentrés de l'Etat, voire par des bureaux d'études spécialisés. Enfin, à partir du moment où les collectivités sont en mesure de discuter les contrats avec des sociétés spécialisées, ces dernières, par leur capacité financière, leur savoir-faire, la possibilité grâce à leurs services administratifs (relevé des compteurs, facturation, encaissement…) et techniques (matériel, stocks….) d'obtenir l'effet d'échelle que certaines collectivités ne peuvent avoir par elles-mêmes, permettent d'assurer des services de qualité à des prix compétitifs et qui peuvent être comparés utilement à ceux de collectivités voisines, ce qui assure l'émulation nécessaire au maintien de cette qualité de service.

2) Il est nécessaire d'avoir une gestion qui ne soit pas en contradiction avec la politique de l'eau, mais au contraire soit totalement en cohérence avec elle. Rendre compatible une gestion au niveau local avec la gestion par bassin (en France, avec les SAGE) nécessite de conforter le rôle des Agences de Bassin, ce qui pour la France paraît être d'ailleurs dans la ligne de la mise en oeuvre de la directive cadre européenne sur l'eau. Les travaux actuels de l'Académie française de l'Eau, portent d'ailleurs sur les territoires de l'eau, et la nécessité, malgré le cloisonnement sur un même territoire des responsabilités, d'avoir pour un développement durable, une gestion intégrée dans le cadre d'un aménagement du territoire défini et voulu dans l'intérêt général, transcendant les intérêts spécifiques des différents usagers. Le fait de soutenir que l'on peut sans doute avantageusement dissocier la responsabilité des services de distribution d'eau potable (et par voie de conséquence d'assainissement) de celle de la gestion intégrée des ressources en eau, ne revient pas à minimiser l'importance de celle-ci et ce désir de "gouvernance locale" ne voudrait en aucun cas s'opposer au développement durable. La Journée d'études organisée à Arras le 26 mars 2004 sur "les territoires de l'eau" par Res-Eau à l'Université d'Artois, avec l'appui de divers organismes de recherche, montre que ces préoccupations sont d'actualité.

3) Il est nécessaire d'assurer une solidarité entre collectivités riches et pauvres, entre collectivités déjà bien équipées (même si ayant investi antérieurement, il est normal qu'elles aient un service moins coûteux) et collectivités nécessitant de lourds investissements. Ceci peut et doit être obtenu par des subventions au niveau départemental, régional ou national, par des aides des Agences de Bassin, mais si possible en évitant de déresponsabiliser les collectivités locales et donc avec des aides seulement temporaires.

4) Il peut être nécessaire de coordonner les services de collectivités voisines, et de les interconnecter pour qu'ils puissent se prêter mutuellement secours. L'exemple de Paris et de la région parisienne montre que cela est possible, bien que les services dépendant d'entités distinctes soient assurés par des sociétés également distinctes et concurrentes. D'importantes interconnexions ayant existé de tout temps et ayant été renforcées grâce à l'aide de l'Agence de l'Eau Seine-Normandie, ou n'a jamais manqué d'eau ni à Paris ni dans les première et deuxième "couronnes" de la banlieue parisienne.

5) Les financements des investissements sont au niveau local plus difficiles à obtenir qu'au niveau national. On peut, néanmoins en partie, pallier à ces difficultés y compris dans les pays en développement si on suit les différentes propositions du "Panel Mondial sur les infrastructures de l'eau" sous la rubrique " promouvoir les marchés locaux de capitaux et l'épargne locale".

6) Les conditions de la gestion d'un service d'eau et d'assainissement varient au cours du temps pour des raisons démographiques (urbanisation), économiques (création de zones industrielles), techniques (pollution d'une ressource…), ou politiques (désir de moduler différemment la tarification, fusion de collectivités…) et il faut dans le cas d'une gestion déléguée à une société privée pouvoir renégocier éventuellement le contrat avec la collectivité, mais ceux-ci comportent en France, des clauses de révision qui permettent à l'un des deux co-contractants d'obtenir cette révision sans attendre la fin du contrat. Des avenants à ce contrat parfois très importants ont en général permis de résoudre les problèmes posés à la satisfaction des deux parties.

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Ces réflexions sont d'actualité. Ce qui se passe en Italie depuis la loi Galli montre d'ailleurs que l'on peut avoir différentes approches de cette question, mais à une époque où l'on voudrait résoudre les problèmes au plus près des personnes concernées, dans le cadre d'une gouvernance de proximité, compatible avec la "mondialisation" et la fourniture de l'eau pour tous, on n'évitera pas des solutions apparemment compliquées, mais qui permettent en fait la meilleure réactivité et la meilleure qualité de service.

Is Water Policy Responding to Rural Preferences? A Choice Experiment of Household Water Priorities in South Africa

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Abstract

Water policy is often designed and implemented without negotiation with or participation of the intended beneficiaries. This is often the case in the implementation of global water policy initiatives that aim to benefit rural households in the developing world. Evidence of water policy responding to locally-defined preferences of the rural majority without improved water services is weak. Significant efforts have made to unpack quantity, quality and source attributes of domestic water supply to the least well-served populations in Sub-Saharan Africa and Asia. This effort has been limited to evaluating individual attributes in relation to health, productivity and usage criteria rather than a 'user evaluation' of these attributes together. The advantage of the latter approach is that trade-offs between attributes can be estimated to provide parameters for each attribute and marginal rates of substitution between attributes. A choice experiment in rural South Africa examines the preferences of households to changes in domestic water sources, water quantity, water quality, streamflow failure, and productive uses of domestic water. Trade-offs in rural household domestic water preferences estimate welfare coefficients that provide a 'user evaluation' of water policy interventions. The findings provide defensible estimates of the magnitude and direction of the utility gain/loss from water attributes that allows a more evidenced-based understanding of rural households' preferences to water policy interventions.

Keywords: choice experiment; rural development; South Africa.

1. Introduction

Globally, an estimated US$14 billion is spent annually on water and sanitation provision with calls for an additional US$30 billion per year to overcome the estimated under-provision in developing countries (ODI, 2002). The aim is to reduce the 1.2 billion people without access to improved water supplies and 3.3 billion without access to adequate sanitation. The human mortality, morbidity and related hardships that is attributed to this water under-provision has institutionalised the international drive to eradicate these problems within the Millennium Development Goals. However, evidence of water policy responding to the locally-defined preferences of the rural majority without water access is weak.

Significant efforts have made to unpack quantity, quality and source attributes of domestic water supply to the least well-served populations in Sub-Saharan Africa and Asia (Thompson, Porras, Tumwine, Mujwahuzi, Katui-Katua, Johnstone & Wood, 2001; Rosen & Vincent, 1999; Cairncross, 1990; White, Bradley & White, 1972). This effort has been limited to evaluating individual attributes in relation to health, productivity and usage criteria rather than a 'user evaluation' of these attributes together. The advantage of the latter approach is that trade-offs between attributes can be estimated to provide parameters for each attribute and marginal rates of substitution between attributes.

The purpose of this paper is to provide exploratory experimentation of water policy scenarios on a key primary stakeholder group, the rural poor. The paper attempts to provide a better understanding of the relative preferences of the rural poor to interventions that impact on domestic water services (source, quantity, quality), water resources (streamflow) and the productive use of domestic water (kitchen garden irrigation). These attributes are derived from two years fieldwork based on collaboration with policy makers, research institutes and the primary stakeholders. The findings estimate welfare coefficients that provide a defensible and multiple-level 'user evaluation' of water policy interventions. The research was conducted in Limpopo Province, South Africa, which provided an opportunity to evaluate innovative aspects of the 1998 National Water Act.

2. Domestic water issues in South Africa

In the Republic of South Africa (RSA), the National Water Act (NWA) of 1998 has promulgated bold and innovative legislation to provide equitable access to water services for all its citizens. One of the key initiatives in the NWA is the establishment of a 'Reserve' that includes both a Basic Human Needs Reserve (BHNR) and an Ecological Reserve. The BHNR "provides for the essential needs of individuals served by the water resource in question and includes water for drinking, for food preparation and personal hygiene" (RSA, 1998: Part 3). This has been legislated to be 25 litres/capita/day (lcd) of potable water, within 200 metres of the home, at a flow rate of 10 litres/second, and a 98% reliability of service delivery. Whilst domestic consumption of total available water resources is negligible in most countries (Gleick, 1996), efficient and equitable allocation of water resources involves important trade-offs between different potential users, and their rights.

The unitary and interdependent role of water raises allocation issues between upstream-downstream users. This is acknowledged in the NWA by taxing land-based activities that reduce streamflow above a natural vegetation cover. For example, streamflow reduction activities in upper catchment zones, such as plantation forestry, will reduce the availability of surface runoff that could be available for abstraction for downstream domestic or industrial use (Calder, 1999; Bosch & Hewlett, 1982). Estimating how much households value a river resource against other alternatives provides policy guidance on compensation measures for allocating high water-consumption (evaporation) land use options in upper catchment areas that contribute to economic growth against negative social impacts downstream. For example, if dry season flows in a river system are likely to be significantly reduced compared to the average condition would this represent a significant change in household welfare (utility) for downstream users? If not, allocating surplus water above the Ecological Reserve to industry, inter-basin transfers or plantation forestry could promote national productivity and local employment.

Linked to land use and domestic water supply is interest in the productive uses of domestic water as a poverty reduction intervention (IRC, 2003; Thompson *et al*., 2001.). The lobby that promotes increased IWS provision (from 50 lcd up to 200 lcd, see IRC, 2003) feeds into the narrative that increasing water supply reduces poverty. However, the debate on domestic water quantity has moved from quota or rights-based arguments of 20-50 lcd to recognise that accessibility defined by domestic water service levels is the more significant issue (WHO, 2003: 24-25). Generally, the level of access to water determines the quantity used[4]. For example, in a study in Uganda, traditional sources and communal street taps lead to average consumption rates of 16 lcd, a yard tap increases use to 50 lcd, and a house connection raises use to 155 lcd (WELL, 1998). Though, the utility of water above a certain threshold is likely to exhibit a diminishing marginal rate of utility for domestic purposes this

[4] Issues of reliability, flow rate and cost recovery are often considered to be of secondary importance though vary by situation

does not necessarily hold true for productive uses such as dry season kitchen garden irrigation for food security or income-generation. Concern over whether these productive uses will be adopted are highlighted by studies that report households with house taps undertake domestic activities with increased water quantities (washing, laundry, flush toilets) and adopt more amenity uses (lawn-watering) (WHO, 2003). Further, water use for productive purposes in rural areas in Kenya, Tanzania and Uganda was found to be low (<3 litres/day) and equivalent for both piped and unpiped households (Thompson *et al*., 2001: 32).

This study explores these issues to evaluate the trade-offs between water attributes in two rural communities in Limpopo Province, RSA. The specific problems that the research addresses are:

What are household preferences to different domestic water sources?
How much relative utility does water quality improvement deliver?
Will a reduction in dry season river flows affect household welfare?
What is the utility of dry season kitchen garden irrigation?

3. Research methods

3.1 Choice experiments

Choice experiments (CE) (or stated preference methods) are commonly-used in marketing, transportation, psychology, environmental valuation, municipal planning and, more recently, valuing animal genetic resources (Scarpa, Ruto, Kristjanson, Radeny, Drucker & Rege, 2003; Haider & Rashid, 2002; Willis & Garrod, 1998; Adamowicz, Boxall, Williams & Louviere, 1995). The value of CEs is that an evaluation of alternative trade-offs can be made. In the case of estimating the behaviour of the rural poor to domestic water policy, the stated preference method permits investigation of a range of attributes that are currently being considered but not yet available to potential users. Analysis of the stated preferences of potential users to the set of alternatives may assist policy-makers make better-informed decisions.

The appeal of CE in economic analysis is that it is based on random utility theory (Ben-Akiva & Lerman, 1985; McFadden, 1974). Choice variations are explained by a random preference component:

(1) $$U_i = V_i + \varepsilon_i$$

where U_i is the unobservable but true utility of alternative *i,* V_i is an observable systematic component of utility, and ε_i is the random component. The probability that respondents choose a particular alternative, say the i^{th}, from the set of competing alternatives is modelled as

(2) $$p(i/C) = p\left[(V_i + \varepsilon_i) > (V_j + \varepsilon_j)\right], \forall j \in C$$

where p(i/C) is the probability of choosing alternative *i* from the set of competing alternatives C. If it is assumed that the stochastic elements of the utilities follow a Gumbel distribution, the multinomial logit (MNL) model can be specified as:

(3) $$p(i \text{ chosen}) = e^{Vi} / \sum e^{Vj}$$

There are several advantages of using CE approach to elicit passive use values (Louviere, Hensher & Swait, 2000; Willis & Garrod, 1998; Adamowicz *et al*., 1995). First, CEs are based on attributes, which allow valuation of the attributes as well as situational changes. In particular, in situations of trade-offs, compensating amounts of other goods (rather than compensating variation based on money) can be calculated. This was of particular value in this study as the pilot survey discovered that a money-metric attribute dominated the response pattern. Removing this attribute resulted in no one attribute dominating each choice set though this constrained financial evaluation of the attribute trade-offs. Second, 'strategic voting', a common and distorting influence in contingent valuation methods, may be reduced as respondents are asked to chose between several scenarios. Changes in attribute levels change across the sets of choices, which limits any clear signal of which is the 'right' alternative. Third, 'embedding' occurs when a good is assigned a lower value (often, willingness-to-pay) if it is inferred from a more inclusive good, than when it is evaluated on its own. For example, a domestic water supply attribute embeds preferences of water quantity, water quality, water source, reliability and flow rate within the overall category.

There are limitations in the application of CEs due to statistical design criteria, information provision, survey design and survey administration. In contrast to revealed preference data, CE data are generated by a systematic and planned design process in which attributes and their levels are pre-defined from exploratory research and varied to create preference or choice alternatives. A 16 choice set, main effects orthogonal design procedure was generated for this study from a $4^4*4^4*2^2*2^2*2^2$ factorial design (Table 1). Design property specifications were improved by restricting attribute levels to factors of two (Louviere *et al*., 2000: 120). Four versions of the survey were generated from the design with three choice sets offered to each respondent: 1) status quo (no choice scenario); 2) option one, which followed the main effects design sequentially; 3) option 2, a random pairing from the main effects design that did not match option one (*ibid*: 132). For example, household one would be offered choices labelled 1-4, household two offered choices 5-8, household three offered choices 9-12, and household four offered choices 13-16; the sequence would resume with household five starting with the same options as household one. Each household responded to four choice sets in total plus a dummy set to establish the procedure had been sufficiently well-understood (Figure 1).

Table 1 Attributes and levels used in Choice Experiment

Attributes	Levels			
Domestic water source	River	Groundwater	Street tap	House tap
Domestic water quantity[1]	12.5 lcd	25 lcd	50 lcd	75 lcd
Domestic water quality	Same	Improved		
Dry season river failure	Current (1 in 10 years)	Worse (1 in 3 years)		
Irrigate kitchen garden in dry season	No	Yes		

[1]Respondents were shown a total household quantity based on a 6 person average occupancy

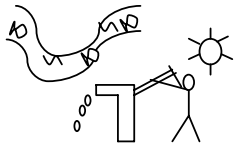
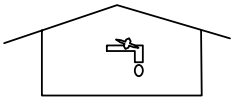
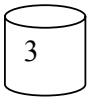
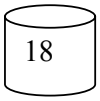
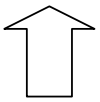
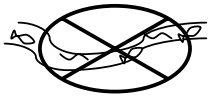
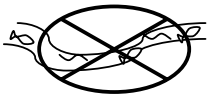
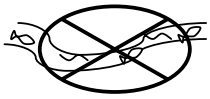
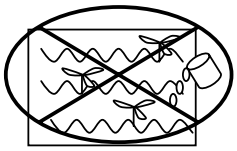
ATTRIBUTE	STATUS QUO	OPTION 1	OPTION 2
HOUSEHOLD DOMESTIC WATER SOURCE			
HOUSEHOLD DAILY DOMESTIC WATER USE (25 LITRE CONTAINERS)	CURRENT	 3	 18
HOUSEHOLD DOMESTIC WATER QUALITY	=	=	
RIVER FLOW **FAILURE** IN OCTOBER	 1 IN 10 YEARS	 1 IN 3 YEARS	 1 IN 10 YEARS
IRRIGATE KITCHEN GARDEN CROPS IN **DRY** SEASON	CURRENT		
TICK ONE BOX	☐	☐	☐

Figure 1 Dummy card from choice experiment

3.2 Study location

Two communities reliant on river and/or groundwater for domestic water supply were identified following reference to a RSA Department of Water Affairs and Forestry (DWAF) GIS database and ground truthing in a scoping phase (Figure 2). Ha-Matsika is located at the confluence of the Luvuvhu and Mutshindudi rivers. It is reached by a gravel road, approximately 5km off the sealed road to the main urban centre of Thohoyandou (circa. 40 km). The population is estimated at 594 people. The community is served by two boreholes installed in the mid 1980s. Respondents indicated that groundwater was preferred to river water as it tasted better. The boreholes have never run dry though mechanical failure does occur with government repairs taking up to five months. There is no institutional management of the groundwater resource. Notification of failure is made to the local municipality through the headman and civic structure.

Figure 2 Location of study communities in the Luvuvhu catchment, Limpopo Province

Lukalo is located downstream of Ha-Matsika on the Luvuvhu river close to the Kruger National Park. The community is approximately 60 km from Thohoyandou, 10 km off the sealed road. The population is estimated at 951 people. The community is served by three boreholes, which again have never run dry. Informants indicate that groundwater is the preferred water source due to proximity though river water is also used in the dry season when runoff pollutants and sediment are reduced.

3.3 Survey instrument

The survey instrument (SI) elicited parsimonious socio-economic data to provide an indication of the representativeness of the sample to a larger catchment survey and illustration of basic data. The pictorial format assisted many illiterate household members being able to fully participate in the survey. Forty households from each community were randomly sampled over a two week period in October 2003. Households voted on four choice sets per household, which produced a total CE sample of 320. The sampling strategy followed cardinal points' transect walks across the communities with systematic sampling every n^{th} household. No household refused permission and many reported enjoying selecting the choice sets.

4. Results and discussion

4.1 Sample representativeness

Comparison of the CE sample with data collected in a catchment household survey in 2002 is presented in Table 2. Descriptive analysis indicates that the CE households have more members, poorer access to water supplies and sanitation, have greater reliance on fuelwood for cooking, own more land and cattle but generate less income than the catchment sample. A one sample t-Test of interval-level, variable means records no significant difference between household size and cattle but a significant difference between mean annual income and dryland at a 95% confidence interval. No conclusive evaluation of representativeness can be drawn though the CE communities appear both generally income poorer and less well-served with basic services than the larger catchment sample.

	CE survey (n=80)	Luvuvhu (n=552)
Household size	6.04 (2.62)	5.89 (2.70)
Adult education (years)	6.83 (3.35)	n/a
Proportion of households <200 metres from water source	0.11	0.47
Proportion using woodfuel as main cooking source	0.98	0.77
Proportion with no sanitation	0.46	0.29
Dryland field (ha)	0.98 (1.55)	0.68 (1.20)
Cattle	1.66 (4.25)	1.37 (6.53)
Annual household income (US$/pa)*	1,759 (2,031)	2,680 (3,450)

Table 2 Comparative analysis of CE sampled households to catchment data

Standard deviations in brackets for interval data. Exchange rate: US$=7Rands. n/a indicates that the data are not comparable. *Including state remittances (pension and Child Support Grant) and all other reported income

4.2 Drawers of Water

Descriptive data was collected on household domestic water collection. The mean household domestic water consumption was estimated at 22 lcd. This is thought to be an upper estimate as households were restricted to a discrete choice set of alternatives that matched the later choice options. Hope, Jewitt and Gowing (2003) report household collection as 14 lcd, which fits well with rural domestic collection quantities of unconnected, rural African households (Thompson *et al*., 2001). The dominant collection method was by head or hand (80%) with the remainder using a wheelbarrow. Households spent an average of 59 minutes each day collecting water. 97% of household water collectors are female with an average of 1.7 collectors per household. The average age of water collectors is 31 years[5] with the youngest 20% below 21 years and the oldest 20% above 44 years.

The health impact of water consumption was estimated by occurrence of diarrhoea in children (<16 years) and adults in both the last week and the last month. Diarrhoeal diseases attributed to poor water supply, sanitation and hygiene are reported to account for 1.73 million deaths each year (WHO, 2003). No cases of diarrhoea were reported for either group in the last week. Within the last month, 15% of households reported one child having diarrhoea, 4% reported two child cases and 1% reported three cases. 8% of households reported one adult having diarrhoea and 1% reported two adult cases.

4.3 Results of the Choice Experiment

Table 3 presents the multinomial logit (MNL) results of the CE model. The goodness-of-fit is defined by the log likelihood at convergence, equal to -115.516. There is a high likelihood ratio index (or pseudo-R^2) of 0.520 without adjustment for degrees of freedom, and 0.514 after adjusting for degrees of freedom (Louviere *et al*., 2000:158). This suggests the

[5] Median = 27 years; standard deviation = 13 years.

constants contribute little to the reduction in the log likelihood (equal to 0.007 of 0.520) in comparison to the attributes. The high likelihood ratio may be explained by strict design criteria and respondent familiarity with the attributes under investigation. All attributes and levels have the expected sign and are significant at the 95% confidence interval except for the river water source. The status quo option was rejected in over 99% of the choice sets. This reflects the design of the CE to evaluate the preferences of rural households to water supply improvements.

Table 3 Attribute utility parameters from MNL estimation

	Utility parameters	t-Statistic
Water source: River	0.693	0.112
Water source: Groundwater	3.882	5.159
Water source: Street tap	4.163	5.436
Water source: House tap	8.104	8.427
Water quantity (lcd)	0.032	3.655
Water quality improvement	1.164	3.453
Increased dry season streamflow failure	-1.180	-2.777
Irrigate kitchen garden in dry season	1.065	2.596
Number of observations = 320		
Log likelihood function = -115.516		
Likelihood ratio (pseudo-R^2) = 0.52		

Evaluation of the trade-offs between the domestic water sources illustrates the low incremental utility gain between groundwater and street tap provision. The coefficients are almost identical with a marginal rate of substitution between the alternatives equal to 9 lcd. For example, a household with six occupants would gain an additional utility of 54 litres/day from street tap provision. Alternatively, the additional utility from provision of house taps is double that of groundwater or street taps. If groundwater is taken as a base-line, then the incremental utility of a house tap supply is equal to 65 lcd or 391 litres/day for an average household. The utility estimates identify upgrading groundwater supply to house tap as the only intervention that will result in significantly increased welfare. Upgrading domestic water service level from groundwater to street tap will provide little additional utility gain.

The water source utility coefficients support findings that there are distinct levels in water consumption, which are moderated by domestic water service level (WELL, 1998). 'Threshold effects' in water use may partly explain the dominance of the water source attribute in the CE (Figure 3). The 'threshold effect' sequence follows:

river water is rejected in preference for groundwater;
street taps are preferred to groundwater with a marginal welfare gain due to similar effort, time and drudgery factors;
house taps provide the biggest welfare gain as the convenience of and opportunity to use water is no longer constrained by physical effort, which results in increased domestic, productive and amenity uses.

The water quantity attribute can be converted into lcd units to reflect household utility from consuming 25 lcd; this is equal to a utility parameter of 4.736. The estimated quantity collected of 22 lcd would derive a similar household coefficient of 4.224. This value is greater than both the groundwater and street tap estimates, and four times the water quality estimate. The comparatively high water quantity utility estimate suggests that the Human Reserve of 25 lcd will provide a high level of welfare to rural households. However, the utility function for domestic water consumption is unlikely to be linear and it would be misleading to

promote higher domestic water consumption based on extrapolations of the water quantity estimate. But, it clearly indicates here that households prefer quantity of water above quality of water.

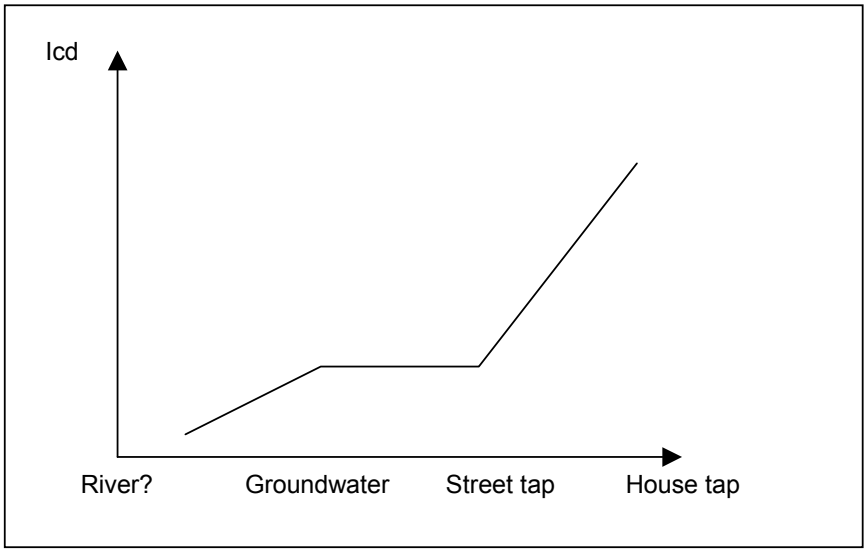


Figure 3 Threshold effects of domestic water service levels on water use

The comparatively modest welfare estimate for water quality suggest that groundwater quality is acceptable and that little incremental utility will be derived from effort to improve its quality. WHO (2003:8) note that "a 'zero-risk' scenario for public (water) supplies is not achievable and evidence points to the need to define tolerable risks, commonly based on estimates of numbers of excess cases per defined population size". The preferences of this sample would concur with this finding through trading-off higher water quantity than improved water quality.

The negative utility associated with an increase in streamflow failure from 1 in 10 years to 1 in 3 years is equivalent to the positive utility estimate for an improvement in water quality. Though households would suffer a utility loss if upstream water abstraction were to increase the loss is relatively small. The attribute characterisation was not limited to domestic water collection but embraced all household uses. The low parameter value suggests that downstream communities may be willing-to-accept compensation for increased upstream water use. Upgrading water supply from groundwater to street taps would not be sufficient compensation.

The utility estimate for irrigating a kitchen garden in the dry season is the lowest of all the discrete attributes. It is positive and provides welfare equivalent to a water quality improvement and one quarter of a water quantity provision of 25 lcd. Approximately 18% of respondents recorded currently irrigating kitchen garden crops in the dry season. This suggests that some empirical knowledge of the relative gains from this activity were known by the respondents and traded-off against the other attribute levels. Whilst it would be logical to initially prefer a more convenient water source rather than water uses based on access to the source, the utility parameter suggests that households would derive little improved welfare from this activity. This suggests modest welfare improvements from adopting productive uses of domestic water.

5. Conclusion

The results of the CE model indicate four inter-related policy findings. First, the largest increase in household welfare occurs when groundwater is upgraded to a house tap. Second,

water quality provides a relatively low level of utility, particularly in comparison to water quantity. Third, increased dry season river failure will result in a small loss in welfare that suggests opportunities for compensation mechanisms from upstream productive users.

Fourth, the welfare estimate from irrigating kitchen garden crops in the dry season suggests a low adoption rate that may limit poverty reduction impacts.

Upgrading groundwater supplies to street taps will provide little additional welfare to rural households. The trade-off which provides the greatest welfare gain is the change from groundwater to house tap. This finding has significant implications for domestic water policy that is broadly premised on delivering water within 1km to 200 metres of the home. It is argued that allocation of resources to provide street taps under current domestic water policy will result in modest welfare improvements, in relation to groundwater provision, for rural households.

The high utility estimate for a home connection suggests that 'convenience' is a dominant variable in domestic water supply preferences. The incremental welfare that is derived from a home tap compared to street tap or groundwater indicates that the physical effort, time and drudgery of water collection results in substantial disutility for rural households. Whilst this has long been recognised the relative magnitude of the inconvenience of water collection has been difficult to accurately estimate. This study estimates the disutility of water collection at 391 litres/day for an average household. The comparative value and magnitude of this attribute identifies where the greatest welfare gains could be made in domestic water policy and how resources can be seriously misallocated.

Water quality preference will vary by situation but the finding here is that groundwater quality is acceptable with a low inferred rate of health impacts from the reported adult and child diarrhoea occurrence. The design of the CE forced respondents to explicitly trade-off contentious domestic water attributes such as quality and quantity variables to allow a legitimate insight into the actual preferences of rural households rather than science-based prescriptions. The result allows a clearer understanding of the minimal welfare gain from improving water quality. Current groundwater water quality is considered by the users to be of a 'tolerable risk' and of a lower priority than a minimum threshold quantity (25 lcd). The basic water service level already achieved suggests that additional health gains will not result from access to higher quantities of water but from improved hygiene practices: "many of the health benefits ultimately accrue form proper water usage and good hygiene behaviours and simple provision of infrastructure alone is unlikely to maximise health gains" (WHO, 2003: 25).

The estimated low utility parameter derived from an increase in dry season river failure may contribute to the debate and development on the efficient and equitable water allocation mechanisms in water-scarce countries. The Reserve in RSA provides a useful methodological approach to allocate surplus water above the Human and Ecological components. If downstream rural water users' preference for low flows is small, there appears opportunity to allocate surplus flows through market demand for direct consumption (crops), inter-annual storage locally, or inter-basin transfers regionally, to allow a more efficient exploitation of the productive potential of water-yielding catchments. Taxing or levying these activities could fund mechanisms to compensate downstream communities. Though water is defined in RSA as an "indivisible national asset" and downstream users do not have land-based rights to streamflow they do have small-scale productive rights (Schedule 1 uses, see RSA, 1998). Streamflow utility estimation offers a potential tool in assisting how to evaluate and estimate social impacts of water resource allocations in the current development of catchment management plans.

Growing interest in the productive uses of domestic water has advocated increasing domestic supply from 50-200 lcd to facilitate poverty reduction (IRC, 2003). Allocation of limited development funds to deliver this level of service in rural areas has to be evaluated against realistic gains. The positive but low utility parameter estimated indicates that dry season crop irrigation is a secondary preference to households compared to water quantity and water source convenience, and of equivalent preference to a water quality improvement. With almost one in five households from the sample undertaking dry season kitchen garden irrigation, the findings would suggest caution in the likely uptake and impact of this initiative for household food security. This finding is consistent with wider research in Africa that note: "unsubstantiated assumptions about user demand for water can lead to large investment mistakes" (Davis, Kang, Vincent, & Whittington, 2001).

This study has illustrated the interrelated issues of domestic water supply for rural communities in evaluating welfare estimates, which in turn may contribute to policy-makers understanding of and response to these preferences in improved domestic water policy. The findings provide defensible estimates of the magnitude and direction of the utility gain/loss from water attributes that allows a more evidenced-based understanding of rural households' preferences to water policy interventions. These results demonstrate that water policy interventions implemented without understanding livelihood preferences may not achieve postulated welfare gains or poverty reduction in rural communities in the developing world.

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Hydropolitics: an Overview with Special Focus on the Farakka Barrage

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"*Whisky is for drinking, water is for fighting over*"
- MarkTwain

"*If the wars of this century were fought over oil, the wars of the next century will be fought over water*"

- Ismail Serageldin[6], The World Bank.

Introduction

Frontiers are one of the strange inventions of human beings. Nature does not respect national borders. She does not care to endow every place or geographical entity of the earth with an equal or proportional amount of resources. This Natural 'injustice' unleashes competition for acquiring the 'gifts' of nature. Power and international politics have been increasingly significant in the access to natural resources like water, most importantly. Some experts believe that the mobility of water makes it more lucrative than other resources such as coal, oil, forest and soil or solar energy (Clarke, 1991).

The history of conflicts over water dates back more than four thousand years ago although religious myths and legends have common roots even in the earlier years[7] (Hatami and Gleick, 1994). Some historians claim that the Mesopotamian cities of Lagash and Umma were in dispute over water as early as 4500 BC (Clarke, 1991). Nevertheless, there is no disagreement about the scarcity of water and how confrontational the world would be in the future if water crises are not managed either by treaties and agreement or by the all out cooperation of people.

In 2000, the world's population was 6.1 billion. According to the UN medium projection,[8] the number might rise to 9 billion in the next 50 years. Researchers estimated that the demands for freshwater would increase by about 64 billion cubic meters a year, an amount almost equal to the annual flow of the river Rhine, largely because of the population growth and industrialization (The United Nations, 1998). Naturally, states become involved in sheer competition for freshwater that lead to international crises between the countries which share common rivers geographically. In terms of population and effects, the most significant and disputed international drainage basins are the Parana-La Plata, Nile, Jordan, Euphrates-Tigris, Ganges-Brahmaputra-Barak and Mekong. This essay will shade some light on these river basins generally in terms of the Hydrological point of view and elaborate on the sour relations between Bangladesh and India because of the squabble related to the Farakka Barrage, which has threatened disaster to the people of Bangladesh since 1975.

[6] Serageldin, I, the Vice President of World Bank said in an Interview with Newsweek, August 24, 1998.
[7] Please see, Hatami, H. and P. Gleick (1994) "Water, war, and peace in the Middle East" in *Environment,* Vol. 36, No. 3, pp.6-on. Heldref Publishers, Washington, for a chronology of conflicts over water.
[8] The United Nations, *World Population Prospects, The 1998 Revision*; and estimates by the Population Reference Bureau.

What is Hydropolitics?

The term Hydropolitics is self-explanatory; it means politics over water. Hydropolitics is a new phrase for an age-old problem. As water is so vital for human life, like other precious resources, it becomes a political affair. Hydropolitics is the investigation and the uncovering of tension amongst competing interests through the study of water conflicts. It addresses the political reality of freshwater sharing, predominantly the issues of international rivers[9] (e.g. the Danube, the Nile, the Ganges).

Hydropolitics is characterized as one of the most complex arenas of interaction between states that share international river basins. The level of complexity even increases with the level of interdependence among riparian countries and the interdependence increases as the demand for water grows (Elhance, 2002).

International Water Law

Though countries are becoming belligerent over the issue of water sharing, the United Nations has failed to pass any generally accepted international river law. The UN Watercourses Convention, adopted in May 1997, and ratified so far only by six parties[10], is nothing more than a global framework of guidelines that tries to 'ensure the utilisation, development, conservation, management and protection of international watercourses' (The United Nations, 1997a). The International Law Commission (ILC) has worked for almost two decades since 1970 (The United Nations, 1970) to organise a set of rules and regulations for the access and the use of the international watercourses (mostly, rivers). In 1997, ILC research resulted in the Law relating to the Non-Navigational Uses of International Watercourses that was first discussed in the Working group and then was adopted by the UN General Assembly. It was a two-step typical voting exercise in the UN. In the Working Group, 42 states voted for the Convention, 3 were against and 18 abstained (The United Nations, 1997a). Noticeably, China, France and Turkey voted against the convention while India abstained from voting. Finally, the Convention on the Law of the Non-Navigational Uses of International Watercourses was adopted by Resolution of the UN General Assembly on 23 May 1997. In the General Assembly, 104 States voted in favour, 26 States abstained and again China and Turkey, as well as Burundi, (all upstream states) voted against. Though not voting against the Convention, upstream countries like India and Pakistan abstained from voting (The United Nations, 1997b).

International Conflicts over Water

Freshwater scarcity is a serious threat to regional stability and peace (Wouters, 2003). The development of international law in the field is quite recent. Although the substantial treaty practice that has developed over the last century could solve some of the water crises, disputes over water persist worldwide. Most of the crises are related to upstream/downstream controversies. Typically, the upper riparian country withdraws water by constructing dams and digging feeder canals. This is in part, the primary cause of the sour relations between India and Bangladesh is the Farakka Barrage over the river Ganges.

In the Middle East, Israel and the Palestinians continue to negotiate about their respective rights and obligations concerning their shared waters[11]. Allocation of the uses of the limited

[9] The river either flowing through the territory of two or more countries or separating the territory of two states is referred to as an international river.

[10] The parties are Finland, Jordan, Lebanon, Norway, South Africa and Syria. The signatories include Côte d'Ivoire, Germany, Hungary, Luxembourg, Paraguay, Portugal, and Venezuela. *http://www.un.org/Depts/Treaty/final//ts2/newfiles/part_boo/xxviiboo/xvii_12.html* (16 November 1999).

[11] The 1993 Israeli-Palestinian Declaration of Principles proposed the joint management and "equitable utilisation of joint water resources."

waters of the Jordan River, shared by Lebanon, Syria, Israel and Jordan, is of a particular concern to the downstream States: Israel and Jordan. In 1965, a dispute arose when Israel wanted to divert the water of the river Jordan for its own use. Unfortunately, no agreement was reached despite long discussions; Israel, then, carried out the diversion unilaterally. In response, Syria and other upstream Arab states planned to divert water into other friendly states depriving Israel of some of its water supply (Clarke, 1991). Besides, longstanding Arab-Israel differences, many other countries of the Middle East are in disagreement over water. The countries on the banks of the Nile, the Jordan and the Yarmuk rivers namely, Syria, Libya, Jordan, Turkey, Iraq and Egypt are in dispute over water and understanding between and among the states make the situation more fragile and dramatic.

Four deltaic countries Vietnam, Cambodia, Laos and Thailand share the water of the Mekong River by an agreement signed recently. However, increasingly powerful China has plans to build dams in its territory that may cause adverse environmental effects for the whole Indochina. In South Asia, the relations between Bangladesh and India had been soured several times due to the Farakka Barrage that India constructed on the Ganges to keep Kolkata port alive. Its construction has been threatening the very existence of the people of Bangladesh where agricultural production still predominantly depends on irrigation water.

The disintegration of Soviet Union has caused a potential for struggle in Central Asia. The rivers like Amu-Daria and Sir-Daria have become international overnight. Almost land locked countries (such as, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan) which were once friendly neighbours inside the Union have discovered them bitter rivals for the hold of “shrinking and polluted” Aral Sea basin waters resources and the lakes of Eastern Europe (Vinogradov, 1993). Failing to reach in an agreement between them, Hungary and Slovakia had to go before the International Court of Justice (ICJ) regarding the water sharing of the river Danube although they had a long history of cooperation in this regard. After the Court decision, three years passed by. The parties have yet to reach agreement on the debated issues (Wouters, 2003).

Interestingly, Africa has an impressive record of treaty practice. Egypt and Ethiopia are still in dispute over the allocation of the Blue Nile water. Despite a number of treaties, states continue to be involved in conflicts over water use, mostly because of non-pursuit of some terms and conditions of treaties.

There are increasing transboundary water quality and quantity problems in both North and South America, despite a long history of cooperation and a large number of international water agreements. The waters of the Colorado are shared by the USA and Mexico and provide an excellent example of cooperation over water sharing. Due to the demands of the green lobby, the dams on the Columbia River are being removed in the lower reaches.

Thirty-six of South America’s rivers flow through more than one country and about 100 million people live in the region’s shared river basins. However, the legacy of basin-wide watercourse agreements has been jeopardised by unilateral actions of some states.

Farakka Barrage: The Other Side of the Coin

It is often said that no river in the world plays a more important economic, social and cultural role in the lives of more people than the Ganges. The Ganges is not just a river, rather a symbol of life and purity to Indian Hindu society. The river basin is one of the most fertile and densely populated in the world. It runs for 2500 kilometres from the Himalayas all the way to the Bay of Bengal. Bangladesh lies at the end of the tributaries of the Ganges and the Brahmaputra rivers while almost ninety percent of the watershed rests outside its geographical territory, within the countries of China, India and Nepal.

The dispute over the Ganges erupted when India decided to construct a barrage in West Bengal, known as the Farakka Barrage, close to the point where the main flow of the river enters Bangladesh (about 11 miles from the then India-Pakistan border). The dam, India claimed, was needed to divert the water to the Hooghly river to make it navigable, and thus keep Kolkata port alive; this was important not only for India, but also for her land-locked neighbours: Nepal and Bhutan. The forthcoming problems of her eastern neighbour were understood, but never were considered.

The decision to construct a Barrage at Farakka was made in 1951. Despite continued protests of the then Pakistan government, the actual work was started in 1961 and was finished by 1971. The feeder canal from the Barrage to Hooghly was completed in 1975 and the barrage finally came into operation in April 21, 1975.

The Farakka Barrage has been the meaning of survival for the Kolkata Port on one hand, but has been threatening the existence of the people of Bangladesh on the other. The unilateral withdrawal of water during the dry season causes both long-term and short-term effects for people living along the lower banks of the river. Due to the shortage of irrigation water, agricultural production has been shrinking along the western part of the country. In addition, some of the tributaries of Ganges have already run dry; some have lost their natural courses, having hardly any water in the summer. This leads to many problems like transport lag, reduction in aquatic creatures and increase of salinity in the other rivers. As a result, the poor people of the adjacent area who have been making their bread and butter from these river resources find themselves somewhat like vulnerable wildlife.

The future is thought to be even more depressing. It is estimated that one fourth of the agricultural land could become wasteland due to continuous water scarcity. The industrial activities of the southwest part of the country could be hampered. The lives of almost thirty million people could be affected because of the probable environmental and economic damage. It is reported that the existence of a country named Bangladesh might face a serious blow in the near future.

Some measures, though hardly fruitful, were taken at different levels to get rid of the serious hazard. Between 1951 and 1971, negotiations between India and Pakistan delivered no meaningful outcome. India played a significant role in 1971 in Bangladesh's war of independence against Pakistan and therefore it was thought to be indecent to get involved in a squabble against such a trusted ally on an issue like Farkka. After 1975, the architect of the nation was murdered with his family members. The subsequent leadership put up the issue in the United Nations General Assembly in 1976. A five-year Agreement was signed in 1977 assuring Bangladesh of 34,500 cusec of water in the lean season. After several shorter extensions, the Treaty lapsed in 1989. Then in 1996, the friendly regimes of India and Bangladesh agreed on a comprehensive water sharing treaty for 25 years. The euphoria from the treaty eroded soon afterwards. According to observers, in the following years Bangladesh has not been getting the share of the water agreed upon in the Treaty especially during the season that water is much needed for agriculture.

Recently, reports say, India has planned a 120 billion dollar project that will re-channel 170 cubic metres of water a year to Uttar Pradesh and Karnataka states: this might cause even more serious problems for Bangladesh. It is now imperative for the government of Bangladesh to monitor the progress of the new project and take sensible action in this regard. Engaging the United Nations and other Inter-Government organisations might open path to some practical solutions for all concerned.

Conclusion

Water is a finite and renewable resource. The growth of world population means the decline of availability per head. The scarcity of freshwater can be addressed by both improving supply and by conservation technology. It requires cooperation among states to manage the amount of water and to have sympathy with the needs of other states that share the same river basin. The water sharing issue can make a 'win-win' situation instead of a 'win-loss' scenario for all the riparian states if proper management and cooperation can be ensured.

The end of Cold War has created a different global context for the conduct of hydropolitics in the third world. In the absence of superpower rivalry, the involvement of a third party can be of value if the concerned states find no agreeable solution by themselves. Finally, however, no matter how sophisticated the mediation techniques of the third party are, no matter how supportive and sympathetic they are, the peaceful conduct of hydropolitics depends upon the willingness, attitudes, efforts, mutual respect and understanding among the concerned parties.

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