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Implementing the nexus at various scales: Local and regional perspectives

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Abstract: Many issues in the water, energy and agricultural sector are in fact crosscutting issues, which can only be solved by a nexus approach. A nexus approach means that management solutions account for synergies and tradeoffs between the sectors. Critical issues emerging across the three sectors ask for different policies at different governance levels. However, at each level of policy making the impact at local level should be an important point of reference. In line with this, the case of the Aral Sea Basin in Central Asia exemplifies how international energy politics affect local farmers' access to irrigation water. Moreover, a comparative study of three states in India shows that local differences in the implementation of the nexus approach can lead to different outcomes in terms of groundwater and electricity use for agriculture. These two examples underline that to implement a nexus approach; the local perspective should not be overlooked, even when policies are designed at higher governance levels.

Keywords: water-energy-food nexus, scale, local perspective, Aral Sea Basin, groundwater management

1 Introduction

Many issues in the water, energy and agricultural sector are in fact crosscutting issues, which can only be solved by a nexus approach. A nexus approach means that management solutions account for synergies and tradeoffs between the sectors. A good example is to address problems of groundwater over-extraction by restricting electricity access needed for pumping [1], or to steer farmers' water use by implementing agricultural policies which promote low water demanding crops [2]. Critical issues emerging across the water, energy and agricultural sector ask for different policies at different governance levels [3]. As such, national policies can help to prioritize water use for national food security or transboundary agreements can help to equally allocate water and energy resources between countries within one river basin. However, at each level of policy making, whether national, regional or even global level, the local impact should be an important point of reference. On the one hand, actions on the international level (international investments, donor assistance) can have an important impact on the local level. On the other hand, local differences render management solutions to be relevant in one context, but irrelevant in another. Particularly when issues cut across sectors which are primarily managed at different governance levels (e.g. hydropower dams at national level versus irrigation systems at village level), it is crucial to keep in mind the local perspective.

2 Why does a local perspective matter?

First, higher level policy making can have a significant impact on local realities. Whereas hydropower investments often involve decisions by international donors and national governments to secure energy generation, the construction of dams can have a significant impact on the access to water for local stakeholders. Particularly when hydropower development takes place in transboundary river basins, cross-sectorial problems and policy options are intermeshed at different levels. The case of the Aral Sea Basin shows how international politics played out in the energy sector affect local farmers' access to water for agriculture. The Aral Sea Basin lies within five Central Asian countries: Kazakhstan, Uzbekistan, Turkmenistan, Tajikistan and Kirgizstan. In the 1990s there have been many attempts to draft an agreement on balanced energy supply in the winter and summer seasons between the countries. However, as cooperation failed, uncoordinated (international) investments in

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hydropower dams have determined the distribution of water and energy resources over the last decade. As a result local farmers are confronted with reduced access to irrigation water in the cropping season (VictorDukhovny, presented at the International Conference Sustainability in the Water-Energy-Food Nexus. Synergies and Tradeoffs: Governance and Tools at various Scales, Bonn, Germany, on 19th and 20th of May 2014). There is a need for agreements between countries and a code of conduct for donor agencies to protect the water use rights of local stakeholders.

Second, local level policy implementation can lead to significantly different outcomes. A study of three different states in India shows how synergies and tradeoffs between the water, energy and agricultural sector highly depend on the locally defined political economy (Aditi Mukherji, presented at the International Conference Sustainability in the Water-Energy-Food Nexus. Synergies and Tradeoffs: Governance and Tools at various Scales, Bonn, Germany, on 19th and 20th of May 2014). Since the 1970s, groundwater use for irrigation by smallholder farmers has spread rapidly across India. In response to problems of overdraft politicians have tried to control unsustainable groundwater use through interventions in the energy sector. In West Bengal (Eastern India), pricing based on electricity metering replaced flat rates. The new method reduced groundwater use, as farmers no longer need to sell water in order to reimburse flat rate expenses. In Punjab (Northern India), electricity feeders for agricultural use have been separated from feeders for domestic electricity use. This allows rationing of agricultural electricity use, and thus groundwater pumping, to a few hours per day. Whereas it reduces the number of pumping hours, the access to electricity during those hours has become more secure. In Karnataka (Southern India), there have been similar attempts to separate agricultural and domestic electricity feeders. However, agricultural electricity use is hardly metered which leads to poor results. Although the link between groundwater pumping and electricity has initially been the same in the three different states, the uneven implementation of a nexus approach has led to different outcomes.

Table 1 Cases requiring a nexus approach

Case	Policy coordination	Intervention in electricity sector	Effect on irrigation sector
Aral Sea Basin	NO	Investments in hydropower dams	Reduced access to water in cropping season
West Bengal	YES	Electricity price based on metering instead of flat rate	Reduced selling of groundwater
Punjab	YES	Segregating agricultural and domestic electricity use Rationing agricultural electricity use	Groundwater use efficiency increased
Karnataka	NO	Failing to meter and segregate electricity use	Continuous increase in groundwater use

3 Conclusion

To address issues in the water, energy and agricultural sector we do not only need to be aware of overlap across sectors but also transmission across scales. The case of the Aral Sea Basin shows that governance at an international level has an important impact at the local level. At the same time, the study of energy policies regarding groundwater use in India shows that the local political economy determines the effectiveness of management solutions. Therefore, the local perspective should not be overlooked, even when policies are designed at higher governance levels. Connections between different sectors at different scales can cause unintended tradeoffs, but they can also be mobilized to exploit welcome synergies.

This report is based on the Session D06 at the International Conference Sustainability in the Water-Energy-Food Nexus. Synergies and Tradeoffs: Governance and Tools at various Scales held in Bonn, Germany, on 19th and 20th of May 2014.

Session chair: Felino Lansigan, Global Water System Project (GWSP)
Speakers:

- "Political Economy of water-energy-food nexus in India: Insights from three Indian states" presented by Aditi Mukherji, ICIMOD
- "Water and land tenure security in the Nexus" presented by Jan Cherlet, International Land Coalition
- "Optimal policies for water-energy-food security in Asia Pacific region" presented by Makoto Taniguchi, Research Institute for Humanity and Nature
- "How the nature and irrigation sector could survive under water menace?" presented by Victor Dukhovny, Director of Scientific Information Center of the Interstate Coordination Water Commission in Central Asia

References

[1] Mukherji, A., Shah, T., 2005. Groundwater socio-ecology and governance: a review of institutions and policies in selected countries. Hydrogeology Journal 13, 328-345.

[2] Mejías, P., Varela-Ortega, C., Flichman, G., 2004. Integrating agricultural policies and water policies under water supply and climate uncertainty. Water Resources Research 40, W07S03.

[3] Gupta, J., Pahl-Wostl, C., 2013. Global Water Governance in the Context of Global and Multilevel Governance: Its Need, Form, and Challenges. Ecology and Society 18(4): 53