River basin game – Lessons learned

© 2011 Arjen Y. Hoekstra, e-mail: a.y.hoekstra@utwente.nl
Twente Water Centre, University of Twente, Enschede, the Netherlands

Cooperation or tragedy

In the introduction we have provided sufficient information to calculate the optimal group benefit. If you had carefully studied the case and if you had come to an agreement with your fellow-farmers about fair water sharing, you could have performed very nicely, probably much better than you have actually done. The problem however, in reality, is that people do not know the facts so well, do not calculate the optimum, and – even if they do – they do not succeed to cooperate.

The tragedy of the commons:

1. Within one river basin compartment, water can be regarded as a 'common pool resource', which means that the farmers in that compartment have equal access to the water in that compartment and that additional water use by one is at the cost of the group as a whole.
2. Within one river basin compartment: Σ(individual optima) ≠ group optimum.
3. At all times there is the risk of one or more free riders.
4. Cooperation does not easily establish itself, although this is - in the end - in the interest of all.

The tragedy of the commons in a dynamic system:

1. There is a tendency to go for short-term benefits, at the cost of long-term benefits.
2. Due to the dependency of one year on the previous year: Σ(year-optima) ≠ optimum over period of years.
3. It is difficult to recover from poverty and environmental degradation, because environmental restoration (e.g. recovering of the groundwater table) requires temporarily strongly reduced use while the poverty conditions do not allow for that.
4. Assessing what is the optimum becomes more difficult if not only dependency between years does exist but also differences between years (e.g. variability in annual rainfall).

The tragedy of the commons in an upstream-downstream setting

1. The upstream users have the advantage of having the first opportunity to use the water.
2. The upstream water footprint subtracts from downstream water availability, but upstream users do not account for that in their decisions about water use.
3. Σ(compartment-optima) ≠ river basin optimum

In general:

1. Full knowledge of the natural system is insufficient to solve the problem. The problem is not only about resource scarcity, but also about how to come to forms of cooperation (institutional arrangements) that improve group performance.
2. Full knowledge is a utopia anyhow, making decisions and cooperation even more difficult.
3. Creative solutions are possible, but (1) find them, (2) get everybody committed, and (3) don't forget to agree on enforcement mechanisms.

A few possible solutions:

1. Create a forum for sharing information. Agree on making abstractions publicly known.
2. Internalise externalities. This means: let the upstream farmers cover the additional costs incurred by the downstream farmers as a result of upstream water abstractions.
3. Impose water quota to the upstream farmers. Consider (possibly partial and/or temporary) compensation of the upstream farmers for their lost benefits by the downstream farmers.
4. Agree on the leave of half of the farmers (there seems to be little place for all of them) and pay them a few years so they can develop other work…