STUDENT HANDOUT

1. Case study title:

Socio-environmental synthesis of a water conflict

2. Case study summary:

Des Moines Water Works (DMWW), a public utility company providing drinking water for approximately 500,000 residents in Des Moines, the capital city of Iowa, and its surrounding areas, filed a federal lawsuit against 10 upstream drainage districts in March 2015. The lawsuit claimed that the drainage districts were channeling high levels of nitrates into the Raccoon River, a source of drinking water for the downstream residents in Des Moines and its surrounding areas. The lawsuit contended that agricultural drainage tiles were disrupting the natural conditions that otherwise treat nitrates and keep them from entering downstream waterbodies. Damages and penalties were sought from the drainage districts for the costs incurred by the utility company in removing nitrates from drinking water. The lawsuit also sought to have farmers regulated under the federal Clean Water Act, as point source of pollution. The lawsuit was dismissed by a federal judge in March 2017.

While interviewing Richard[1], a farmer in Iowa, he quipped, *"…. I'm trying to, piece by piece, let's get it* [the water] *cleaned up before Ames* [a downstream city] *gets on us!"* Richard was describing his efforts[2] to reduce nonpoint source pollution runoff from his farmland. As per scientific estimates, it will cost $1.2 billion annually over five decades for farmers like Richard to establish the conversation infrastructure needed to offset environmental impacts associated with Iowa's intensive farming (Iowa Drainage District Association, 2015). Iowa is the leading producer of corn, soybean, egg, pork and beef in the country. Richard's quip was shortly followed by his recollection of the lawsuit filed by the Des Moines Water Works. He said, *"…You might want to shut your tape recorder off if you get me talking about that* [lawsuit]*…"* The palpable anger and frustration is a classic example of response from an upstream stakeholder on getting blamed by a downstream stakeholder for the quality of water downstream. Emphasizing the importance of everyone to cooperate in solving the collective action problem of managing water quality, Bryan, another farmer from Iowa, mentioned, *"…cooperation is better than lawsuits…because if you get sued-- I haven't heard too many farmers that have had anything good to say about* [the Des Moines Water Works lawsuit]. *But I think doing something for water quality is important. But by the same token, in this area, you got to have tile drainage in order to make the land productive. So then you got to decide, ""Well, is nitrate in the water worse than starving to death?""*

[1] Any names used in the case study, including this one, unless stated along with their official designation, is fictional.

[2] Such efforts include, but are not limited to adoption of conservation practices such as cover crops, buffer strips, etc. These practices have benefits such as improved soil health, reduced nutrient runoff, etc.

Keeping the DMWW lawsuit at the core, a classic case of water quality conflict involving upstream-downstream stakeholders, the following case study aims at enabling students understand the complexity and interconnectedness of the environmental and social components of water quality management. Using stakeholder analysis, creation of mental models, and role-play activity, students will develop an understanding of how a situation of conflict unfolds when water users face collective action problems. The case study also situates the Iowa water quality conflict within the broader context of the Gulf of Mexico dead zone.

3. Case study learning objectives:

This case is designed to help students achieve the following learning outcomes:

- Students will develop an understanding of how water quality conflict unfolds.
- Students will be able to identify stakeholders in a S-E system and how their actions affect each other.
- Students will develop an understanding of water quality management dynamics involving upstream-downstream stakeholders.
- Students will be able to identify factors driving farmers' adoption of conservation practices and farmers' participation in conservation programs.
- Students will be able to put themselves in the shoes of other stakeholders and find solutions to complex environmental issues.
- Students will be able to think about environmental issues as S-E systems, i.e. develop/nurture systems thinking ability.

4. Case study classroom management:

Class 1. Who are the stakeholders in the water conflict?

Pre-class activities:

1. Watch the following video:

    1.1 Iowa's water quality lawsuit explained. The Des Moines Register. Duration: Approx. 1 minute. Available online at: https://www.desmoinesregister.com/videos/money/agriculture/2017/03/23/iowa's-water-quality-lawsuit-explained/83347402/

2. Complete the following readings:

    2.1 Prokopy, L. S., Floress, K., Klotthor-Weinkauf, D., & Baumgart-Getz, A. (2008). Determinants of agricultural best management practice adoption: Evidence from the literature. *Journal of Soil and Water Conservation*, *63*(5), 300-311.

    2.2 Reimer, A. P., & Prokopy, L. S. (2014). Farmer participation in US Farm Bill conservation programs. *Environmental management*, *53*(2), 318-332.

2.3 Brianne, P., & Donnelle, E. (2018). Key achievement or drop in bucket? What $282 million water quality bill means for Iowans. *The Des Moines Register*. Available online at: https://www.desmoinesregister.com/story/news/politics/2018/01/27/iowa-water-quality-what-282-million-bill-means-iowans/1068634001/

2.4 Reed, M. S., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J., ... & Stringer, L. C. (2009). Who's in and why? A typology of stakeholder analysis methods for natural resource management. *Journal of environmental management*, *90*(5), 1933-1949.

Class activities:

Students will work in groups of 3-4, utilizing the rainbow diagram in the article (Reed et al., 2009; Fig. 2; pp. 1938). This activity will take about 20 minutes and help students identify the relevant stakeholders in the water conflict. Students will then tape their rainbow diagram to the black/white board of the classroom.

Class 2. Socio-environmental synthesis of the water conflict

Pre-class activities:

1. Watch the following video:

Gulf of Mexico 'Dead Zone' Largest Ever Measured. National Centers for Coastal Ocean Science. Duration: Approx. 2 minutes. Available online at: https://cdn.coastalscience.noaa.gov/csvideo/GOMEX_Dead_Zone_update_2017-SM.mp4?_=1

2. Familiarize yourself with mental modeler software:

Both the students and the instructor should download the mental modeler software (available at http://www.mentalmodeler.org/) and familiarize themselves with it. There are several helpful tutorials about using mental modeler on this website (available at http://www.mentalmodeler.org/#resources). Please bring laptop to the classroom.

Class activities:

Working in groups of 3-4, students will create a mental model wherein the goal would be to understand the interconnectedness of social and environmental drivers of the water conflict and the dead zone in the Gulf of Mexico. This activity will take about 20 minutes.

Class announcement: There will be a role-play activity in the class, and that students should come prepared. Specifically, students should be able to apply their knowledge from the stakeholder analysis (in class 1) and mental model (in class 2) to come to a mutually agreeable strategy (or not!) to deal with the water quality issue in Iowa.

Class 3. Working together in the wake of a water conflict

Class activities:

You will be randomly assigned to one of the four stakeholder groups whose voice you will be representing in the role play activity. The instructor will provide you with a role description to help you get started.

After the activity, we will watch the video: 'Common Ground, Common Water' (available at https://iwrrc.org/commongroundcommonwater/, click on the "View the video" link; also available on YouTube at https://youtu.be/qzrp2OfrfLk). This video is approximately 12 minutes long.