

Prepared for delivery at the Workshop on the Ostrom Workshop (WOW6) conference, Indiana University Bloomington, June 19–21, 2019. © Copyright 2019 by E. Kellner and C. Oberlack

Emerging collective action to resolve sustainability trade-offs in polycentric governance systems: Evidence from Trift, Switzerland

Elke Kellner^{1,2}, Christoph Oberlack^{1,3}

¹ University of Bern, Institute of Geography, Switzerland

² University of Bern, Oeschger Centre for Climate Change Research

³ University of Bern, Centre for Development and Environment

Abstract

Recent scholarship on polycentric governance has called for increased attention of processes of cooperation, competition and coercion in order to better explain the varying performance of polycentric governance systems. This need is particularly acute in situations with strong trade-offs between sustainability goals (e.g. environment vs. economic development) and competing claims on natural resources (e.g. renewable energy infrastructures in landscapes deserving protection). This paper presents an analysis how processes of cooperation, competition and coercion influence the emergence of collective action in the face of sustainability trade-offs. We analysed polycentric governance processes around a planned hydropower dam in the Trift area in the Swiss Alps between 2008 and 2017 as an exemplary case study. The data are from 24 semi-structured interviews, participatory observation, transect walks and analysis of policy documents, laws, meeting minutes and media news. The results show that the planned construction of the Trift reservoir is expected to create trade-offs among sustainability goals, as evidenced through positive expected impacts on eight targets of the Sustainable Development Goals (SDG) and adverse expected impacts on seven other SDG targets. These sustainability trade-offs correspond to diverse actor claims on natural resource held. Despite this difficult starting point, collective action emerged during a five-year process. We trace the detailed processes of cooperation, competition and coercion that account for this emerging collective action in the face of sustainability trade-offs. We find that the combination of a participatory process with separate spaces for knowledge creation and engagement with local mayors was directly instrumental in building collective action. Preparations for the popular vote on the Swiss national energy strategy and learnings from earlier experiences with hydropower projects as well as with former participatory processes were processes that indirectly facilitated emerging collective action in this unlikely situation. We conclude by showing that situations of sustainability trade-offs imply important new directions in the study of collective action by broadening the set of evaluative criteria and by focussing on interdependent processes of cooperation, competition and coercion in polycentric systems.

1. Introduction

This study contributes to the ongoing debate about processes of cooperation, competition and coercion in polycentric governance systems (Heikkila et al., 2018; Thiel et al., 2019). This paper presents a case study of polycentric governance associated with the planned hydropower dam of Trift in the region of Oberhasli, canton of Berne, Switzerland.

The negotiations around the proposed Trift dam faces major trade-offs between sustainability goals. The dam, if constructed, would particularly affect sustainable development goals for clean energy, life on land and climate action. Goals on economic growth, consumption, infrastructure and partnerships are also affected in both synergistic and trade-off ways. These trade-offs and synergies between sustainability goals translate into diverging claims of actors on the natural and economic resources in the Trift area.

This study analyses how processes of cooperation, competition and coercion unfold over five years in this difficult context. Specifically, we demonstrate how interdependent processes of cooperation, competition and coercion enabled the emergence of collective action in the face of the mentioned sustainability trade-offs.

The research question is: How do cooperation, competition and coercion influence the emergence of collective action in the face of sustainability trade-offs of the Trift dam project?

Methodologically, we adopt a case study approach choosing the Trift dam project as an exemplary case that clearly displays the effects of research interest. The data was collected between 2016 and 2018 through 24 semi-structured interviews, participatory observation and analysis of policy documents, laws, meeting minutes and media news (Kellner et al., 2019, under review). Analytically, we start by identifying the sustainability trade-offs and actors' resource claims in the Trift case. We then utilize the Network of Action Situations approach rooted in the Institutional Analysis and Development (IAD) framework to analyse simultaneous and dynamic patterns of cooperation, competition and coercion, which explain why collective action emerged in this unlikely situation.

2. Sustainability trade-offs, resource claims and collective action

The globally negotiated and ratified 2030 Agenda implies a major shift in the concept of sustainability. It has extended the concept from the commonly adopted three dimensions of ecological, social, and economic sustainability (UN, 1987) towards seventeen dimensions – articulated as 17 Sustainable Development Goals (SDGs). The goals are further decomposed into 169 targets (UN, 2015). The contemporary debate on the SDGs demonstrates that trade-offs and synergies among sustainability goals are ubiquitous in all policy fields and operational areas (Fuso Nerini et al., 2018; Le Blanc, 2015; Nilsson et al., 2018; Weitz et al., 2018). Actions and projects hardly ever influence all dimensions of sustainability in uniform ways.

In contexts of natural resource governance, sustainability trade-offs typically correspond to complicated constellations of actor interests. The presence of real trade-offs implies that win-win solutions among goals are not readily available, and these trade-offs among sustainability goals typically correspond to contested actor claims on resources (Bowen et al., 2017). For instance, some actors might call for the extractive use of natural resources in a given area, while others prioritize the conservation of nature and yet others stand up to protect land rights (Lundsgaard-Hansen et al., 2018).

Collective action theories are one particularly productive stream of research to explain how, why and under what conditions actors can resolve contested resource claims (e.g. Ostrom 1990, for an overview e.g. (Cox et al., 2016). However, most empirical and theoretical analyses of collective action in the legacy of (Ostrom, 1990) have focused on one or few outcomes (Chhatre and Agrawal, 2009). This focus can overlook how governance and institutions are leading to important trade-offs among different outcomes (Agrawal 2014). For instance, (Klain et al., 2014; Oberlack et al., 2015) presented two studies showing how the compliance with the design principles for community-based collective action (Ostrom 1990) can lead to ecological sustainability but at the expense of social justice. (Newton et al., 2016) identified trade-offs between carbon, biodiversity and livelihoods in forest commons. These studies clearly demonstrate the need to go beyond unidimensional notions of success by considering a range of evaluative criteria and the associated trade-offs. There is a need to analyse how cooperation, competition and coercion are shaping how trade-offs play out (Partelow et al., 2019). The SDGs and targets may be a useful analytical frame for such purposes. For instance, (Dell'Angelo et al., 2017) used the SDGs to assess the multi-dimensional impacts of large-scale land acquisitions on sustainability. Here, we take a similar analytical route by utilizing the SDGs as a framework to assess the expected impacts of the proposed Trift dam on sustainability.

3. Case and context

The case study region is located in the alpine region of Oberhasli, canton of Bern. A complex system of power plants has been built over the years by the local hydropower company Kraftwerke Oberhasli (KWO): In total, 195 mill. m³ of water is stored in eight reservoirs. In 2012, KWO proposed to build a new dam in front of the retreating Trift glacier at an altitude of 1767 m.s.l. (Figure 1). It would transform the new formed lake in front of the Trift glacier into a hydropower reservoir of 85 mill. m³. The first project ideas started in 2008 with feasibility studies through the Swiss National Research Programme 61 “Sustainable water management” (Haeberli et al., 2013).. Based on the results of the studies and on experience with former projects, the canton and KWO established a broad participatory process with different groups prior to the main formal procedure to prevent objections and stalemates. Participants of the process, which lasted from 2012 to 2017, were actors from the KWO, the cantonal administration, affected municipalities and NGOs who could potentially file an appeal to a granted concession. One NGO did not participate in the process and lodged an appeal against the project together with a local grassroot organization (Bütler, 2018).



Figure 1: Planned hydropower dam at the Trift glacier in Swiss Alps, with the glacier in 1948 (left), lake in the glacier forefield in 2008 (middle) and with proposed full reservoir (right). (Source: Kraftwerke Oberhasli AG).

4. Sustainability trade-offs, resource claims and emerging collective action in the Trift area

4.1. Sustainability trade-offs of the Trift dam

The proposed Trift dam affects sustainability goals in fifteen different ways (Table 1). Specifically, the dam would contribute to the SDGs in eight qualitatively different ways, but the expected impacts also include adverse effects on SDGs in seven different ways. Based on our stakeholder interviews and impact assessment (Hayes, 2019; Müller et al., 2018), the most important sustainability trade-off is between the dam’s contribution to clean energy and economic growth at the expense of various dimensions of life on land.

SDG	Target	Expected effects of proposed Trift reservoir on SDGs
7. Clean energy	7.2	Contribution to share of renewable energy based on hydropower
8. Economic growth	8.1	Economic value of electricity provision
	8.5	Regional development (employment effects in construction phase)
	8.9	Potential decline of tourism due to destruction of aesthetic landscape
9. Infrastructure, innovation	9.4	Construction of infrastructure (e.g. tunnel, dam, pipelines)
12. Responsible consumption and production	12.2	Energy from renewable energy sources, which is accepted by energy consumers
13. Climate action	13.1	Flood protection 1: flood protection for downstream riparians
	13.1	Flood protection 2: risk of dam failure
15. Life on land	15.1; 15.4	Change of terrestrial, mountain and inland freshwater ecosystems by flooding of glacier forefield; of downstream meadows; downstream ecological systems; potential tourism-related overcrowding, waste and pollution due to easier access to mountain areas
	15.3	Flood protection 1: flood protection for downstream riparians
	15.3	Flood protection 2: risk of dam failure
	15.5	Degradation of natural habitats, putting rare species at risk
	15.9	Impacts of artificial residual flow on invasive species
	17. Partnership	17.17

Table 1. Expected effects of proposed Trift reservoir in terms of Sustainable Development Goals. (Source: Author assessment based on interview transcripts and document analysis. Note: SDG: Sustainable Development Goals of the UN 2030 Agenda (UN, 2015). Green colour: positive effect in terms of SDGs. Red colour: negative effect in terms of SDGs.)

4.2. Claims of actors on natural resources in the Trift area

The sustainability trade-offs correspond to diverse claims of actors on natural and economic resources in the Trift area. Table 2 identifies the main actors and their main interests involved in the governance of Trift dam plans.

Actor	Main interests (with regard to resources in Trift area)
KWO _{project}	Use of the proglacial lake and the forfield of the Trift glacier for hydropower. Agreement on a draft concession and no appeals against the formal concession granted by the canton of Bern for the new dam of Trift. The focus is on the agreements about contents of the draft of the concession which affect the profitability of the dam project.
KWO _{nature}	Finding practical solutions between nature conservation and hydropower use. Agreement on a draft concession and no appeals against the formal concession granted by the canton of Bern for the new dam of Trift. The focus is on the agreements about environmental topics.
Canton of Bern	Agreement on a draft concession and no appeals against the formal concession granted by the canton of Bern for the new dam of Trift. The focus is on the agreements regarding: <ul style="list-style-type: none"> • Contribution of the dam project to the national end cantonal energy strategy • Profitability of the dam project, because the canton is a shareholder of the KWO • Profitability of the dam project, because the canton receives water taxes
Regional Conference	Implementation of the new dam project as a chance for regional development.
WWF _{national}	Agreement on a draft concession with a focus on: <ul style="list-style-type: none"> • minimising the environmental impact of the dam project • maximising the nature compensation measures • prohibiting small hydropower plants
WWF _{local}	Agreement on a draft concession with a focus on: <ul style="list-style-type: none"> • minimising the environmental impact of the dam project • maximising the nature compensation measures • prohibiting small hydropower plants
SAC _{national}	Agreement on a draft concession and simultaneously: <ul style="list-style-type: none"> • minimising the environmental impact of the dam project • preservation of the landscape • preservation of the accessibility to their mountain huts
SAC _{local}	Implementation of the new dam project as a chance for regional development and stronger cooperation with the KWO, which maintain the trails to three SAC mountain huts in the region. Furthermore, they are interested in the touristic attraction of the dam project and regional development through new jobs.
Swiss Foundation for Landscape Conservation	Agreement on a draft concession with a focus on: <ul style="list-style-type: none"> • minimising the environmental and landscape impact of the dam project • maximising the nature compensation measures • prohibiting small hydropower plants

Fisher Association _{national}	Agreement on a draft concession with a focus on minimising the environmental impact for downstream waterbodies of the dam project.
Fisher Association _{regional}	Agreement on a draft concession with a focus on minimising the environmental impact for downstream waterbodies of the dam project as well as regional development through new jobs.
Aqua viva and Grimselverein	Opposition to the project based on: <ul style="list-style-type: none"> • Interest to protect the landscape at the Trift area. • Conviction that such an area cannot be compensated by individual nature compensation measures.

Table 2. Actors and main interests

4.3. The puzzle of collective action in 2012

The sustainability trade-offs and the diverse actor claims on natural and economic resources provided for a difficult starting point for the plans of the Trift reservoir in the early 2010s. In particular, the main barriers to collective action for the dam include, firstly, a deep trade-off with regard to existing commitments on the side of environmental NGOs. The undeveloped natural terrain unit with nature water bodies as a project site. Developing a dam in this site would contradict statutes and fact sheets of the involved NGOs (aqua viva, 2012; SAC, 2013; Umweltallianz, 2011). A second main barrier for collective action is that several trade-offs are deep trade-offs, i.e. win-win solutions among different goals and claims are not possible due to ecological and technical conditions. For instance, a hanging rope bridge, modelled after Nepalese high wire bridges, is installed over the natural proglacial lake with spectacular views on the Trift glacier (myswitzerland, 2010). The bridge has developed into an important touristic attraction for the region. If the dam would be realized, the bridge would have to give way, which can pose problems for tourism (Haeberli et al., 2013). A potential win-win solution that would allow the bridge to exist further, is technically not feasible. Another case in point concerns the damage for downstream meadows and ecosystems that cannot be fully avoided for technical reasons. Third, many of the actors involved in the Trift debate have a shared and long history of three decades of contestations around the expansion of the dam of the Lake Grimsel. Located in the same region of Oberhasli as the proposed Trift dam, this conflict remains unresolved until today, potentially overshadowing debates in the Trift question.

4.4. Collective action outcomes by 2017

Despite this difficult starting point, collective action on the Trift reservoir emerged during a five-year process between 2012 and 2017. The most visible output of this collective action was a draft of a concession, which was agreed and submitted in December 2017. While this draft concession was agreed among a large majority of actors, two NGOs submitted a formal objection. Table 4 characterizes the extent to which this collective action generated mutual gains, resolved conflicts, and found acceptance on the side of addressees and the competent authority.

Indicator	Indicator description	Score [Range]	Score description
Mutual gain	Degree to which win-win solutions were developed during the process (i.e. degree to which the output provided mutual gains).	3 [0-4]	Output provided high gains for the actors in the expert commission and the municipality group who supports the project in general, but not for the opposing NGOs who wants to prohibit the project.
Conflict resolution	Degree to which an existing conflict was resolved or worsened, or a new conflict developed. Consider the nature of change in any pre-existing conflict of values and/or distribution.	2 [-4-4]	All conflicts in the expert commission were fully resolved in finding compromises like the agreement on the high of the dam, residual water and compensation measures. The conflict with the opposing NGOs could not be resolved, because they were against the project in general.
Addressees acceptance	Acceptance of the decision on the part of those actors who had to comply with and implement the decision.	2 [0-2]	The decision was accepted and supported by the KWO.
Competent authority acceptance	Acceptance of the decision on the part of the competent authority.	2 [0-2]	The decision was accepted and supported from the cantonal authorities in the Expert Commission. The final decision regarding legal conformity is still pending.

Table 4. Characterization of collective action in 2017 (adapted from Newig et al. (2013))

5. Emergence of collective action through cooperation, competition and coercion in the face of sustainability trade-offs in the Trift area

We find that collective action emerged as a result of thirteen interdependent processes of social interactions in the Trift area and in adjacent action situations (Figure 2).

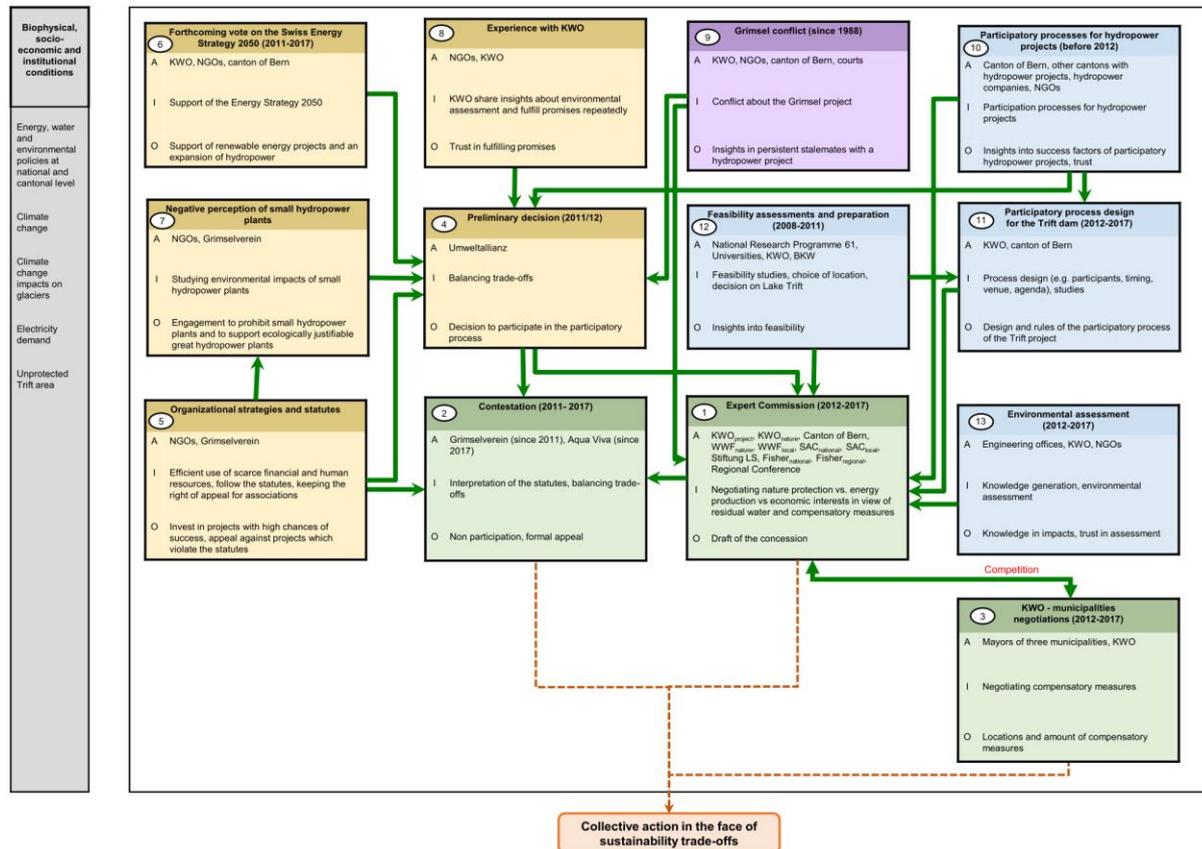


Figure 2. Social interactions explaining the emergence of collective in the Trift area.

5.1. Immediate processes: Shaping collective action on the Trift dam

(1) Expert Commission

As noted, the most immediate indication of collective action on the Trift dam is the construction and submission of a draft concession for the dam. It is the main outcome of an Expert Commission. In the Expert Commission, representatives of five NGOs, the Regional Conference Oberland Ost¹, the hydropower company and the canton met every second month to deliberate and negotiate the draft of the concession between 2012 and 2017. During the process, the participants negotiated around their resource interests, disclosed their respective values and preferences and tried to minimize their perceived trade-offs. The meetings also made all relevant information about the project and its environmental impact accessible to all participants. Participants developed mutual trust further from earlier collaborations and built collective ambitions for a common agreement on the draft of a concession. The proposed concession was iteratively developed by KWO with feedback by participants. Group decision-making was preceded by processes of interaction, exchange and mutual learning. Agreements are based on rational arguments, laws and the environmental assessments. As the Expert Commission aimed at a unanimous decision, the negotiations took place in the shadow of the veto power

¹ The regional conference promotes and coordinates regional cooperation and represents an important link between the communes and the cantonal and federal authorities.

of the NGOs. The dynamics within the Expert Commission were influenced by a set of processes in adjacent action situations.

(2) Municipalities – KWO negotiations

The mayors of the affected three municipalities are interested in the economic development of the region. Therefore, they were interested to preserve the touristic attractiveness of the region. Their second main concern was to avoid overly many restrictions arising from compensatory measures for nature protection, which were negotiated in the Expert Commission. On the other hand they are pleased with notable job opportunities in their region expected at least during the construction phase of the dam. KWO and municipalities negotiated these concerns in a separate roundtable. There was two-way information exchange between this negotiation process and the Expert Commission. The negotiations and information exchanges resulted in a mutually agreeable formula on the locations and amount of compensatory measures for nature protection. Thus, these negotiations were instrumental in generating support by municipal authorities for the dam project.

(3) Contestation

One NGO and one grassroots organisation disagreed with the project. The grassroots organization was opposing the project from the beginning, whereas the NGO left the decision open up to the end. Both of them seek to preserve the landscape in the Trift area in all its beauty. Their opposition is based, firstly, on their conviction that the dam intervention cannot be compensated by individual compensation measures elsewhere. Secondly, it is based on their statutes. According to them, the two organizations are committed to the comprehensive protection and enhancement of water bodies, floodplains, wetlands, water body and moor landscapes throughout Switzerland (NGO) and the Oberhasli region (grassroots organisation), respectively. The NGO does not pursue goals for climate protection and therefore, they did not face trade-offs regarding clean energy and nature protection (aqua viva, 2012). The grassroots organisation has defined goals for clean energy in its statutes, but it also has the explicit goal to protect the Trift area (Grimselverein, 2000). They had to balance that the project is against their statutes but to file an appeal needs a lot of financial and human resources because the other NGOs did not support the contestation. Despite repeated invitations by KWO, they declined to participate in the Expert Commission and decided to file an appeal. In their appeal, they want to prohibit the project and in the event of a concession being granted, they request to use only the existing natural lake volume, the amendment of existing basic reports as well as of various conditions and requirements. Furthermore, they want to prohibit small hydropower plants in general.

This contestation shows that the collective action for the dam project is not based on full unanimity. While the Expert Commission was able to find solutions in the face of trade-offs for all participating actors, the NGO and grassroots organization concluded that they would solve the trade-offs in different ways. In their appeal, they aim to prohibit the dam. If a concession would be granted by the public authorities, they request to use only the existing natural lake volume, the amendment of existing basic reports as well as of various conditions and requirements.

5.2. Underlying processes I: Shaping potentially critical positions of NGOs

These three processes with immediate relevance for collective action in Trift area would not have taken place in this manner, if they were not shaped by the following processes in decisive manners.

(4) Preliminary decision on the Umweltallianz position in 2011/12

One main conjuncture over time was the decision by all involved NGOs and the grassroots organization on the question of whether they engage in the Expert Commission. In 2011/12, the group of NGOs “Umweltallianz” conducted a balancing of trade-offs. The Umweltallianz is an association of the NGOs WWF, Greenpeace, VCS, Pro Natura. The NGOs organized through the Umweltallianz decided to participate in the Expert Commission of the Trift project. They mandated WWF to represent their voice in the Expert Commission in two positions (WWF_{nature} and WWF_{local}).

This preliminary decision was based on three linked processes: organizational strategies and statutes of NGOs, the forthcoming vote on the Swiss Energy Strategy, a debate around small hydropower plants as part the cantonal water strategy as well as experiences with KWO.

(5) Organizational strategies and statutes by NGOs and the grassroots organization

Each NGO had to balance the emerging trade-offs in the Trift project in the light of their organizational strategies and statutes. The NGOs have scarce financial and human resources and have to use them in an efficient way. Furthermore, they have the right of appeal for associations and want to keep that in showing a high success rate. To take this into account, they invest primarily in projects with high chances of success. Simultaneous, they must balance the success rate with their statutes. They appeal against projects which violates their statutes.

The Umweltallianz has decided to participate in the participatory process because they have energy and environmental protection goals in their statutes and the Trift area is a not (yet) a protected area. With the support of the dam project they directly support the vote on the energy strategy. In addition, with the construction of the Trift dam they want to prohibit further environmentally harmful small hydropower plants.

The one NGO has decided not to participate in the Expert Commission, because they have no energy goals in their statutes, but the protection of water bodies. The grassroots organisation decided the same. They have clean energy goals in their statutes, but they have the explicit goal to protect the Trift area.

(6) Forthcoming vote on the Swiss Energy Strategy 2050 (2011-2017)

As a consequence of the nuclear disaster in Fukushima 2011, the Federal Council has been working since 2011 to develop a new energy strategy. The Swiss Energy Strategy 2050 targets in its Energy Act to increase renewable energy production like hydropower (BFE, 2013). The Swiss Energy Strategy 2050 was approved through several stages by votes in parliament and the successful public vote was at the end of the participatory process in May 2017. The canton’s willingness to carry out a time-consuming participation process with the goal to develop a draft of a concession is attributable to its obligation to contribute to the national Swiss Energy Strategy 2050 and the cantonal Water Strategy. The Trift reservoir would meet or exceed the target of the cantonal Water Strategy, which envisages an increase of 300 gigawatt hours per year.

The NGOs also supported this approach because they have been advocating the phase-out of nuclear power for many years and therefore feel obliged, shortly before the vote on the new Swiss Energy Strategy 2050, to support the expansion of renewable energies such as hydropower. The new Swiss Energy Strategy 2050 requires an ecologically justifiable expansion of hydropower and the NGOs did not want to be seen as obstructionist.

The popular vote on the Energy Strategy was expected since 2011. This overarching goal to achieve the aims of the Swiss Energy Strategy 2050 led to a high willingness among NGOs to support hydropower

projects. It was a major aspect in favour of the Trift dam while making the preliminary decision in 2011/12 as well as throughout the negotiations in the Expert Commission between 2012 and 2017.

(7) Negative perception of small hydropower plants

In 2008, a new instrument for the financial support of renewable energy projects was adopted (kostenorientierte Einspeisevergütung, KEV). This led to a boom of new small hydropower plants with negative environmental impacts. As these impacts of small hydropower plants became rapidly visible after the introduction of KEV, the NGOs of the Umweltallianz support ecologically justifiable great hydropower plans and are engaged in prohibiting small hydropower plants.

(8) Experiences of NGOs with KWO

The NGOs trust in the hydropower company because they fulfilled their promised compensatory measurements repeatedly. In addition, the transparent sharing of insights about environmental assessment and the direct contact between the NGOs and the engineering offices who perform the assessment built trust between NGOs and KWO.

5.3. Underlying processes II: Preparing the ground for a participatory process on the Trift dam

The participatory process in the Expert Commission has become possible in the phase

(9) Grimsel conflict

KWO aims to increase the level of an existing dam in the same region. Due to conflicts among resource users, the case ended up repeatedly at the court. Even three decades after initial plans for dam expansion, this conflict is ongoing. The long conflict between KWO, canton of Bern and the NGOs provided insights in a process with persistent stalemates with a hydropower project.

(10) Participatory processes for hydropower projects beyond Trift

Experiences with hydropower projects across Switzerland showed that they can lead to intense conflicts and project stalemates. Based on these experiences, a number of Swiss NGOs, hydropower companies and cantons tested new processes with a participatory approach (Vetterli, 2012). Learning from these successful participatory processes, the canton of Bern together with KWO experimented with the same approach in another hydropower project in the Oberhasli region (KWOplus). These processes gave insights into success factors of and build trust between the involved actors.

(11) Participatory process design for Trift dam

The success of former participatory hydropower projects motivated the canton of Bern and KWO to establish the same approach for the dam project of Trift. They established rules and designed the process.

(12) Feasibility assessments and preparation

At a very early stage between 2008-2011, scientific actors elaborated feasibility studies for a hydropower dam at the lake Trift as part of the large Swiss National Research Programme 61 “Sustainable water management” (Haeberli et al., 2013). Based on the results, KWO decided to start a new project for a hydropower dam at this location. Furthermore, the studies pointed out that such a project could lead to conflicts because of environmental and touristic interests at this location.

(13) Environmental assessments

A protection and utilisation plan adapted to the Oberhasli region and recommended by the Federal Office for the Environment was carried out by KWO for the former project KWOpplus (Schweizer et al., 2012b). This method has been successfully applied and KWO applied it again in the Trift project. Furthermore, KWO enabled a direct exchange between the engineering offices who performed the assessment and the NGOs. This led to knowledge about the environmental impacts of the projects and trust in this method.

5.4. Biophysical, socio-economic and institutional conditions shaping all processes

A range of biophysical, socio-economic and institutional conditions provided important contextual conditions, under which collective action could emerge.

Energy, water and environmental policies at national and cantonal level

Relevant national laws and regulations regulating uses of the hydroelectric landscape are the Protection of Waters (SR 814.20, 1955), Protection of Nature and Cultural Heritage (SR 451.0, 1966), on Spatial Planning (SR 700, 1979), on the Protection of the Environment (SR 814.01, 1983), on Hydraulic Engineering (SR 721.100, 1991), on Fisheries (SR 923.0, 1991), and the Energy Act (SR 730.0, 1998), renewed in 2016, which promote hydropower as a renewable energy. Relevant laws and regulations on cantonal level are the Cantonal Building Law (BSG 721.0, 1985), Cantonal Law on Water Body Maintenance and Hydraulic Engineering (BSG 751.11, 1989), Cantonal Act on Water Protection (BSG 821.0, 1996), Cantonal Act on Water Use (BSG 752.41, 1997), Cantonal Strategy of Energy (RRB-BE 589/2006, 2006), Cantonal Strategy of Water (RRB-BE 1811/2010, 2010) and the Cantonal Energy Act (SR 741.1, 2011). It should be noted that with the construction of dam Trift, the goal of the Cantonal Strategy of Water, which envisages an increase of 300 gigawatt hours per year, will be exceeded (Rüetschi et al., 2017).

Climate change

Climate change has impacts on the alpine cryosphere, hydrosphere, and biosphere (Beniston et al., 2018) which calls for mitigation actions through renewable energy production.

Climate change impacts on glaciers

Because of shrinking glaciers and decreasing snow covers due to climate change new proglacial lakes arise in glacier forefields (Haeberli et al., 2016). Such lakes could be used for mitigation measures such as hydropower production (Farinotti et al., 2016).

Electricity demand

The power plant produces electricity that is needed in times of transition from non-renewable to renewable energy sources, namely storage electricity, winter electricity and flexible electricity (Rüetschi et al., 2017).

Unprotected Trift area

The area of the project is not (yet) protected (WWF, 2018), but it is expected that the forfield of the glacier would receive a protective status in some years. The glacier has retreated so quickly that no succession has yet taken place. The dam would flood the area and no succession can take place.

6. Discussion

6.1. Collective action in situations of sustainability trade-offs

The 17 Sustainable Development Goals (UN, 2015) provide important new directions for the study of collective action in polycentric governance systems. One important direction concerns the evaluative criteria for assessing the effects of collective action on sustainability. The SDGs provide a set of evaluative criteria, which has been globally negotiated and ratified. They innovate the very concept of sustainability along 17 goals. Trade-offs among the sustainability goals are the norm rather than the exception (Le Blanc, 2015; Weitz et al., 2018). These trade-offs correspond to competing claims by actors about land, development, natural and societal resources.

Situations of sustainability trade-offs have implications for the ways of theorizing collective action. Specifically, the notion of social dilemmas or collective action dilemmas becomes insufficient (Ostrom et al., 1994) even though it is still one of the most prominent theorizations of collective action in institutional analyses. Social dilemmas imply the existence of solution that are mutually beneficial for all involved actors, but achievement of this solution is undermined by incentives for defective individual action (Ostrom, 1990). If trade-offs among sustainability goals are real, a solution that is clearly mutually beneficial for all claims, is not present. Instead, it is subject to processes such as negotiation, power struggles, reframing (Clement, 2010). Thus, advanced theorizations of the actor's positions, interests, action spaces, control in trade-off situations is needed to advance institutional analysis of collective action beyond dilemmas. Integrating collective action theory with theories of political ecology may be particularly suited in this regard (Clement, 2010; Gruby and Basurto, 2013; Villamayor-Tomas and García-López, 2018).

A second implication of trade-off situations for collective action theory concerns the action situations, in which trade-offs are negotiated, struggled over, or reframed. Collective action in the face of trade-offs may not evolve in one main arena, but in interdependent processes of collective action at multiple scales and in multiple places. In the Trift case, we have identified thirteen action situations that explain the emergence of collective action in this context-specific trade-off situation. Thus, assessment of sustainability trade-offs encourages the analysis of interdependent processes of cooperation, competition and coercion in polycentric systems.

6.2. Cooperation, competition and coercion in the Trift case

Figure 2 displays the network of action situations that explains how interactions of cooperation, competition and coercion lead to collective action in the face of sustainability trade-offs. We distinguish between social interactions that occur within action situations and causal interactions that occur between action situations.

The NGOs have been advocating the phase-out of nuclear power for many years and therefore feel obliged, shortly before the vote on the new Swiss Energy Strategy 2050, to support the expansion of renewable energies such as hydropower. The new Swiss Energy Strategy 2050 requires an ecologically justifiable expansion of hydropower and the NGOs do not want to be seen as obstructionist. This overarching goal to achieve the aims of the Swiss Energy Strategy 2050 leads to a high willingness to participate in the expert commission and to compromise in developing a draft of a concession. Additionally, the NGOs oppose the new instrument for the financial support of renewable energy projects which led to a boom of new small hydropower plants with negative environmental impacts. The NGOs agreement on the Trift project was contingent on halting the future development of small hydropower plants in the canton of Bern. However, most of the organizational strategies and statutes of the NGOs require a support of renewable strategies and an engagement in successful projects in order

to deal with scarce financial and human resources. As the Trift area is not (yet) protected, it seems to be not successful being opposed to the project. Because the NGOs gained bad experience with conflicts with the Grimsel project and good experience with other hydropower projects which were performed in a participatory way (Schweizer et al., 2012a; Vetterli, 2012), the NGOs appreciate the participatory approach. This background described above leads to a high **cooperation** of the NGOs in the Expert Commission.

Some of the mentioned actions, in particular the forthcoming vote and the organizational strategies and statutes of the NGOs can be described not only as a driver of cooperation but also as a form of **coercion**. The NGOs are forced by these circumstances to support the Trift project, even though the dam might be seen as inconsistent with some of their statutes. With this perspective, it is not only a form of cooperation, but it is a possibility to decide in the face of the trade-offs among sustainability goals. Through their participation, they can negotiate environmental impacts like the residual water, the high of the dam and the compensation measures.

For many years the hydropower companies were not interested to enter into a dialogue with the environmental NGOs. After repeated experience with conflicts which led to stalemates they have tried new ways of working together and have gained experience with successful participatory processes (Vetterli, 2012). Additionally, the results of the feasibility studies indicated possible conflicts regarding nature protection and touristic demands (Haerberli et al., 2013). As a consequence, KWO and the canton of Bern decided to design the Trift process in a participatory way (Marti and Baumberger, 2016). Furthermore, KWO decided to carry out the environmental assessment in a very transparent way and to allow the NGOs to have a direct contact to the engineering offices, which perform the assessments. Additionally, the NGOs trust in the promised compensatory measurements of KWO. All these issues led to a high willingness for **cooperation** of all actors in the Expert Commission.

Competition exists between the NGOs which want to minimise the environmental impact of the dam project through the extent of compensatory measures and the mayors of the municipalities who want to minimise the extent of compensatory measures. This form of competition is mediated indirectly through KWO who have multiple roles (e.g. designer, facilitator) in both the Expert Commission as well as the negotiations with mayors.

Apart from that, one NGO and a grassroot organization **do not cooperate** and disagree with the Trift project because of their organizational strategies and statutes which require a resistance.

7. Conclusion

The polycentric governance processes of the Trift project show how cooperation, competition and coercion interdepend and interact simultaneously and dynamically in governing natural resources. The determinants of the interactions arise from experience with former hydropower projects, from political context factors like the forthcoming vote on the Swiss Energy Strategy 2050 and a newly introduced financial instrument to support small hydropower plants with negative environmental impacts and from limited financial and human resources of the NGOs as well as their statutes.

Acknowledgements

Funding by the Institute of Geography and Dr.-Alfred-Bretscher-Fonds, University of Bern, Switzerland is gratefully acknowledged. This paper benefitted greatly from debate at the workshop “Competition, Cooperation, Coercion: understanding coordination in polycentric governance of Social-Ecological Technical Systems” at the Centre for Global Cooperation Research, University of Duisburg-Essen, Germany.

References

- aqua viva, 2012. Statuten Aqua Viva, 4 pp.
- Beniston, M., Farinotti, D., Stoffel, M., Andreassen, L.M., Coppola, E., Eckert, N., Fantini, A., Giacona, F., Hauck, C., Huss, M., Huwald, H., Lehning, M., López-Moreno, J.-I., Magnusson, J., Marty, C., Morán-Tejeda, E., Morin, S., Naaim, M., Provenzale, A., Rabatel, A., Six, D., Stötter, J., Strasser, U., Terzago, S., Vincent, C., 2018. The European mountain cryosphere: A review of its current state, trends, and future challenges. *The Cryosphere* 12 (2), 759–794.
- BFE, 2013. Botschaft zum ersten Massnahmenpaket der Energiestrategie 2050 (Revision des Energierechts) und zur Volksinitiative «Für den geordneten Ausstieg aus der Atomenergie (Atomausstiegsinitiative)». Bundesamt für Energie (BFE), Bern, Switzerland, 196 pp.
- Bowen, K.J., Craddock-Henry, N.A., Koch, F., Patterson, J., Häyhä, T., Vogt, J., Barbi, F., 2017. Implementing the “Sustainable Development Goals”: towards addressing three key governance challenges—collective action, trade-offs, and accountability. *Current Opinion in Environmental Sustainability* 26-27, 90–96.
- Bütler, M., 2018. Einsprache Projekt Trift, Zurich, Switzerland, 35 pp.
- Chhatre, A., Agrawal, A., 2009. Trade-offs and synergies between carbon storage and livelihood benefits from forest commons. *Proceedings of the National Academy of Sciences* 106 (42), 17667–17670.
- Clement, F., 2010. Analysing decentralised natural resource governance: proposition for a “politicised” institutional analysis and development framework. *Policy Sci* 43 (2), 129–156.
- Cox, M., Villamayor-Tomas, S., Epstein, G., Evans, L., Ban, N.C., Fleischman, F., Nenadovic, M., Garcia-Lopez, G., 2016. Synthesizing theories of natural resource management and governance. *Global Environmental Change* 39, 45–56.
- Dell’Angelo, J., D’Odorico, P., Rulli, M.C., 2017. Threats to sustainable development posed by land and water grabbing. *Current Opinion in Environmental Sustainability* 26-27, 120–128.
- Farinotti, D., Pistocchi, A., Huss, M., 2016. From dwindling ice to headwater lakes: could dams replace glaciers in the European Alps? *ENVIRONMENTAL RESEARCH LETTERS* 11 (5), 54022.
- Fuso Nerini, F., Tomei, J., To, L.S., Bisaga, I., Parikh, P., Black, M., Borrion, A., Spataru, C., Castán Broto, V., Anandarajah, G., Milligan, B., Mulugetta, Y., 2018. Mapping synergies and trade-offs between energy and the Sustainable Development Goals. *Nature Energy* 3 (1), 10–15.
- Grimselverein, 2000. Statuten Grimselverein.
- Gruby, R.L., Basurto, X., 2013. Multi-level governance for large marine commons: Politics and polycentricity in Palau's protected area network. *Environmental science & policy* 33, 260–272.
- Haerberli, W., Buetler, M., Huggel, C., Friedli, T.L., Schaub, Y., Schleiss, A.J., 2016. New lakes in deglaciating high-mountain regions – opportunities and risks. *Climatic Change* 139 (2), 201–214.
- Haerberli, W., Bütler, M., Huggel, C., Müller, H., Schleiss, A., 2013. Neue Seen als Folge des Gletscherschwundes im Hochgebirge - Chancen und Risiken: Formation des nouveaux lacs suite au recul des glaciers en haute montagne – chances et risques. *Forschungsbericht NFP 61*, Zürich, 309 pp.
- Hayes, D.S., 2019. Kräftemessen zwischen Wasserkraft und Ökologie. *aqua viva* (1), 8–12.
- Heikkila, T., Villamayor-Tomas, S., Garrick, D., 2018. Bringing polycentric systems into focus for environmental governance. *Environmental Policy and Governance* 28 (4), 207–211.
- Kellner, E., Oberlack, C., Gerber, J.-D., 2019, under review. Polycentric governance compensates for incoherence of resource regimes: The case of water uses under climate change in Oberhasli, Switzerland. *Environmental Science and Policy*.
- Klain, S.C., Beveridge, R., Bennett, N.J., 2014. Ecologically sustainable but unjust? Negotiating equity and authority in common-pool marine resource management. *E&S* 19 (4).
- Le Blanc, D., 2015. Towards Integration at Last? The Sustainable Development Goals as a Network of Targets. *Sust. Dev.* 23 (3), 176–187.

- Lundsgaard-Hansen, L., Schneider, F., Zaehring, J., Oberlack, C., Myint, W., Messerli, P., 2018. Whose Agency Counts in Land Use Decision-Making in Myanmar? A Comparative Analysis of Three Cases in Tanintharyi Region. *Sustainability* 10 (10), 3823.
- Marti, A., Baumberger, E., 2016. neuer see, neues glück. *Grimselweltmagazin*, Innertkirchen, 3 pp. <https://www.grimselstrom.ch/wp-content/uploads/2016grimselweltmagazin.pdf>.
- Müller, S., Sieber, U., Estoppey, R., Haertel-Borer, S., Leu, C., Schärer, M., 2018. Schutz und Weiterentwicklung der Gewässer. *AQUA & GAS* (4), 20-28.
- myswitzerland, 2010. Trift Bridge – a spectacular footbridge. <https://www.myswitzerland.com/en/experiences/route/trift-bridge-a-spectacular-pedestrian-bridge/>. Accessed 26 May 2019.
- Newton, P., A Oldekop, J., Brodnig, G., Karna, B.K., Agrawal, A., 2016. Carbon, biodiversity, and livelihoods in forest commons: synergies, trade-offs, and implications for REDD+. *Environ. Res. Lett.* 11 (4), 44017.
- Nilsson, M., Chisholm, E., Griggs, D., Howden-Chapman, P., McCollum, D., Messerli, P., Neumann, B., Stevance, A.-S., Visbeck, M., Stafford-Smith, M., 2018. Mapping interactions between the sustainable development goals: lessons learned and ways forward. *Sustainability science* 13 (6), 1489–1503.
- Oberlack, C., Walter, P.L., Schmerbeck, J., Tiwari, B.K., 2015. Institutions for sustainable forest governance: Robustness, equity, and cross-level interactions in Mawlyngbna, Meghalaya, India. *International Journal of the Commons* 9, 670–697.
- Ostrom, E., 1990. *Governing the commons: The Evolution of Institutions for Collective Action*. Cambridge Univ Press, Cambridge MA.
- Ostrom, E., Gardner, R., Walker, J., 1994. *Rules, Games, and Common-Pool Resources*. University of Michigan Press, Ann Arbor, MI.
- Partelow, S., Abson, D.J., Schlüter, A., Fernández-Giménez, M., Wehrden, H. von, Collier, N., 2019. Privatizing the commons: New approaches need broader evaluative criteria for sustainability. *International Journal of the Commons* 13 (1), 747–776.
- Rüetschi, J., Ryser, J., Meyer, M., Zybach, H., 2017. Trift: Ein grosses Werk, damit weitere Gewässer verschont bleiben, 1 p.
- SAC, 2013. Position Wasserkraftprojekt Trift, 4 pp.
- Schweizer, S., Zeh Weissmann, H., Ursin, M., 2012a. Der Begleitgruppenprozess zu den Ausbauprojekten und zur Restwassersanierung im Oberhasli. *Wasser Energie Luft* 104 (1), 11–17.
- Schweizer, S., Zeh Weissmann, H., Wagner, T., Brechbühl, S., 2012b. Ökologische Bilanzierungsmethode für die Schutz- und Nutzungsplanung im Oberhasli. «Wasser Energie Luft» – 104. Jahrgang, 2012, Heft 1, CH-5401 Baden 104.
- Thiel, A., Baldwin, E., Stephan, M., Villamayor-Tomas, S., 2019. Guidance note for the Workshop: “Competition, Cooperation, Coercion: understanding coordination in polycentric governance of Social-Ecological Technical Systems”, 20 pp.
- Umweltallianz, 2011. Faktenblatt Wasserkraft. http://www.umweltallianz.ch/fileadmin/user_upload/Energiezukunft/Faktenblaetter/Faktenblatt_Wasserkraft.pdf. Accessed 25 May 2019.
- UN, 1987. *Our Common Future: Report of the World Commission on Environment and Development*. World Commission on Environment and Development, 247 pp.
- UN, 2015. *Transforming our world: the 2030 Agenda for Sustainable Development: Resolution adopted by the General Assembly*. <https://sustainabledevelopment.un.org/post2015/transformingourworld>. Accessed 24 May 2019.
- Vetterli, L., 2012. Konzessionsverfahren beschleunigen dank Zusammenarbeit. *Thema Umwelt: Die Rolle der Wasserkraft in der Energiestrategie 2050* (1), 22–23.
- Villamayor-Tomas, S., García-López, G., 2018. Social movements as key actors in governing the commons: Evidence from community-based resource management cases across the world. *Environmental Governance and Policy* 53, 114–126.

Weitz, N., Carlsen, H., Nilsson, M., Skånberg, K., 2018. Towards systemic and contextual priority setting for implementing the 2030 Agenda. *Sustainability science* 13 (2), 531–548.

WWF, 2018. Grosswasserkraftwerk Trift: Energiepolitischer Kompromiss. WWF Magazin, Bern, Switzerland, 8 pp.