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Schulz, Christopher; Martin-Ortega, Julia; Ioris, Antonio A.R.; Glenk, Klaus

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# **Applying a ‘Value Landscapes Approach’ to Conflicts in Water Governance: The Case of the Paraguay-Paraná Waterway**

*Christopher Schulz<sup>a,b,c</sup>, Julia Martin-Ortega<sup>c,d</sup>, Antonio A.R. Ioris<sup>e</sup>, Klaus Glenk<sup>b</sup>*

<sup>a</sup> School of GeoSciences, University of Edinburgh, Drummond Street, Edinburgh EH8 9XP, United Kingdom

<sup>b</sup> Land Economy, Environment and Society Group, Scotland’s Rural College (SRUC), Peter Wilson Building, Nicholas Kemmer Road, Edinburgh EH9 3FH, United Kingdom

<sup>c</sup> Social, Economic and Geographical Sciences Group, The James Hutton Institute, Craigiebuckler, Aberdeen AB15 8QH, United Kingdom

<sup>d</sup> Sustainability Research Institute, School of Earth and Environment, University of Leeds, Leeds LS2 9JT, United Kingdom

<sup>e</sup> School of Geography and Planning, University of Cardiff, Glamorgan Building, King Edward VII Avenue, Cardiff CF10 3WA, United Kingdom

## **Corresponding author contact information:**

Christopher Schulz  
The University of Edinburgh  
School of GeoSciences  
Drummond Library G.22  
Surgeon’s Square  
Drummond Street  
Edinburgh EH8 9XP  
United Kingdom

[P.C.Schulz@sms.ed.ac.uk](mailto:P.C.Schulz@sms.ed.ac.uk)

## **E-mail addresses co-authors:**

Julia Martin-Ortega: [J.MartinOrtega@leeds.ac.uk](mailto:J.MartinOrtega@leeds.ac.uk)

Antonio A.R. Ioris: [IorisA@cardiff.ac.uk](mailto:IorisA@cardiff.ac.uk)

Klaus Glenk: [Klaus.Glenk@sruc.ac.uk](mailto:Klaus.Glenk@sruc.ac.uk)

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# **Applying a ‘Value Landscapes Approach’ to Conflicts in Water Governance: The Case of the Paraguay-Paraná Waterway**

## **Abstract:**

Values have been identified as important factors to estimate preferences within water governance and to assess the political legitimacy of water governance in a given time and location. The present study applies an interdisciplinary ‘value landscapes approach’ to water governance in the state of Mato Grosso, Brazil, using conflicts around the construction of the Paraguay-Paraná Waterway as a case study. Using material from interviews with major stakeholders in the region, the results demonstrate that supporters of the waterway hold similar ‘value landscapes’ around economic values of water, efficiency, order, and economic development, while opponents’ ‘value landscapes’ centre on cultural and non-economic values of water, social justice, solidarity, conservation and tradition. This suggests that persistent conflicts around the Paraguay-Paraná Waterway are only an expression of much deeper value conflicts that are also relevant to other water governance issues. Moreover, values expressed through the planned construction of the Paraguay-Paraná Waterway disproportionately reflect values of powerful stakeholder groups such as the agribusiness sector, which significantly undermines its political legitimacy.

## **Keywords**

Environmental values; water governance; political ecology; value landscapes; Paraguay-Paraná Waterway; Mato Grosso; Brazil

## **1 Introduction**

Values are one key element in understanding conflicts (and cooperation) within water governance (Groenfeldt 2013; Hermans et al. 2006; Ioris 2011; Schulz et al. 2017). This includes both values that serve as transsituational goals or guiding principles for human behaviour (Glenk & Fischer 2010; Schwartz 1996; Steg et al. 2014) and values of the environment, i.e. how we value for example water resources (Gibbs 2010; Groenfeldt 2013; Ioris 2011). A recent conceptual contribution of Schulz et al. (2017) introduced a novel framework, which aims at identifying “value landscapes” of stakeholders in water governance scenarios. Value landscapes can provide a deeper understanding of processes and conflicts in water governance and they also serve to evaluate political legitimacy of water governance projects. These value landscapes take into account stakeholders’ positions and preferences within water governance in relation to their values, from more abstract guiding principles to the values that they assign to water resources.

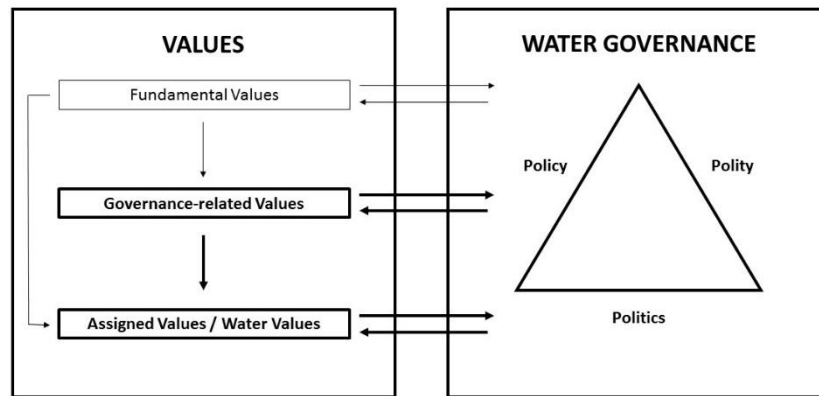
This paper applies the value landscapes approach outlined in Schulz et al. (2017) to a concrete water governance context. In particular, the paper seeks to investigate value landscapes of the main stakeholder groups affected by the plans to construct the Paraguay-Paraná Waterway in the Brazilian state of Mato Grosso, which is expected to especially benefit the agribusiness sector (in terms of facilitating commodity exports and the transportation of agricultural inputs), but may as well have environmental and social impacts (as in the case of the disruption of the regional hydrological regime). The construction and extension of the Paraguay-Paraná Waterway has long been very contentious, as it would potentially affect hydrology, ecology and biodiversity of the Pantanal wetland, the largest continental freshwater wetland in the world and recognised by UNESCO as a biosphere reserve (Calheiros et al. 2012; Gottgens et al. 2001; Hamilton 1999; Wantzen et al. 2008). This in turn may have repercussions for the livelihoods of communities of subsistence fishermen in the Pantanal. The current state government (under the administration of Governor Pedro Taques, elected in 2014) aims at reviving this idea (Arévalo 2015), which had first been proposed over 100 years ago and received renewed interest in the 1980s and 1990s (Gottgens et al. 2001), as it would facilitate the export of agricultural products to world markets, especially soybean, one of the principal products of the state of Mato Grosso (ANTAQ 2013; Richards et al. 2015). Since the end of the 1990s, Mato Grosso is the main soybean producer in the country and one of the global centres of production (Ioris 2016).

Given its importance to the agribusiness sector and the regional economy, on the one hand, and its impacts on hydrology, biodiversity and local communities in the Pantanal, on the other hand, the potential construction of the Paraguay-Paraná Waterway interrelates many aspects relevant to water governance and state politics more generally. It thus can serve as a worthwhile case study to apply the conceptual framework proposed by Schulz et al. (2017). To the best of our knowledge, the present study is also the first that adopts an interdisciplinary social science perspective on this infrastructure project as existing academic literature is mostly published by concerned ecologists and biologists (e.g. Gottgens et al. 2001; Hamilton 1999) or enthusiastic engineers (e.g. Pires & da Silva 2009; Pompermayer et al. 2014).

## **2 Value Landscapes and the Value Base of Water Governance**

Different authors have highlighted the need to study values to better understand water governance (Glenk & Fischer 2010; Groenfeldt 2013; Hermans et al. 2006; Ioris 2011). In this context, Schulz et al. (2017) have proposed a new conceptual framework, rooted in natural resource governance, ecological economics, and the study of environmental values more generally (see e.g. Jones et al. 2016; Lockwood et al. 2010; Martinez-Alier 2002; O'Neill et al. 2008; Seymour et al. 2010). Following Treib et al. (2007), Schulz et al. (2017) conceive of (water) governance as the combination of polity, politics, and policy, i.e. the institutions, the power relations between political actors, and the instruments to achieve

certain outcomes. With regard to values, they propose looking specifically at three categories which may be relevant for understanding water governance: fundamental values, governance-related values and assigned values or water values, which differ by their locus, i.e. where the valuing person locates them. Figure 1 captures the multiple links that exist between these categories.



*Figure 1: The Value Base of Water Governance*

*(Source: adapted from Schulz et al. 2017; elements investigated in this study in bold)*

The concept of fundamental values has its origin in social psychology and refers to values as transsituational goals that a person aims to realise in decision-making (Schwartz 1996). These values, such as power, security, benevolence or self-direction are located inside the valuing person or group and have also been termed “held values” (Lockwood 1999) and are sometimes categorised along two opposing pairs of dimensions, i.e. self-transcendence vs self-enhancement and openness to change vs conservation (Schwartz 1996). Governance-related values are usually dealt with in normative work on good (water) governance (e.g. Ingram 2011; Tortajada 2010) and have been proposed as a separate category e.g. by Glenk & Fischer (2010). They encompass desirable characteristics of governance, such as sustainability, solidarity or efficiency. Thus values can be located in elements of water governance, such as power relations, institutions, policies and processes, but also within (stakeholder) groups who consider these values desirable, even if they may not be able to realise them.

Assigned values or water values refer to values attached to water resources, such as for domestic use, irrigation, recreation, navigation, biodiversity, aesthetics, spirituality and culture, which are nowadays often categorised in the ecosystem services framework (Grizzetti et al. 2016). This perspective is most prevalent in environmental and ecological economics (e.g. Wu et al. 2012; Young & Loomis 2014) and human geography (e.g. Gibbs 2010; Ioris 2011), but has occasionally also been taken in environmental psychology (e.g. Seymour et al. 2010).

Several authors have suggested that water governance should reflect stakeholders’ values to gain political legitimacy (e.g. Edelenbos et al. 2011; Hill et al. 2008), often in the context of discussing participatory

governance. However, the authors' understanding of the term 'value' often remains vague and it is unclear, what kind of values exactly should be addressed. Nevertheless, if we accept the premise that water governance outcomes should reflect stakeholders' values, a comparison between different stakeholder groups' desired values and the values expressed in actual water governance translates into an evaluation of political legitimacy of water governance. Such a comparison also points to power relations between stakeholders, e.g. where there is a mismatch between desired values and actual values in water governance, while distinguishing between the different types of values that have been described theoretically should offer additional insights beyond unspecific calls to address different values.

Broadly summarising debates on values and water governance, the conceptual framework introduced by Schulz et al. (2017) suggests two main hypotheses: 1) if we know stakeholders' or people's values in a given time and location (or value landscapes, i.e. groups of values that are interrelated), this can help us understand their preferences and behaviour in water governance and 2) if we compare the values that are expressed by stakeholders with the values expressed by actual water governance (i.e. the ways in which water governance actually takes place "in reality"), we can make statements about the distribution of political power, as well as the legitimacy of actual water governance in this particular time and location (a perspective which connects well to political ecology). Furthermore, it should be clarified that the value landscapes approach is a *relational* approach, i.e. values are not studied in isolation, but are seen as interrelated among each other, as well as related to preferences, decisions and actions in water governance. Also, values are *dynamic*, i.e. they may change over time, depending on the social context of a person for example. However, they are considered to be the most stable theoretical construct e.g. in environmental psychology research, if we compare them to attitudes or beliefs for example (Dietz et al. 2005). Changes in values are thus expected to occur over longer time periods.

Schulz et al. (2017) claim that studying the value base of water governance can help to clarify our understanding of conflicts in water governance, an argument that is similar to Groenfeldt's (2013) "values approach" situated within water ethics. Groenfeldt (2013) formulated his conceptual framework in view of identifying practical solutions for pressing water management issues under the assumption that values within the four domains of economics, culture, society, and environment tacitly and explicitly guide decision-making. While said value domains could be understood as types or subcategories of assigned values in Schulz et al.'s (2017) framework, more abstract principles, such as equity, that Groenfeldt equally invokes in his discussion, could be described as examples of governance-related values. The application of either of the two frameworks helps to avoid remaining at the concrete level of favouring or opposing a certain policy, for example privatisation of urban water supply. A study of stakeholders' values, for example, can inform us about the actual locus or nature of a conflict; in the categories of the latter framework, whether it concerns assigned values, governance-related values, and/or fundamental values. In this sense it can serve as a diagnostic tool to identify sources of conflict and their severity. Thus applying a value landscapes approach as in the present study can have relevance

for policy-makers, which may be forced to question whether policies sufficiently address values at different levels.

### 3 The Paraguay-Paraná Waterway

The Paraguay-Paraná Waterway stretches 3442 km from Cáceres in Mato Grosso, Brazil to the port of Nueva Palmira in Uruguay, connecting the Paraguay and Paraná River Basins, which are part of the greater La Plata basin and partly within the countries of Paraguay and Argentina (ANTAQ 2013: 3; see figure 2). Sometimes a stretch of the Cuiabá River, an important tributary of the Paraguay River, is included, which would see navigation passing through the capital of Mato Grosso, Cuiabá, up until Rosário Oeste to the north (ANTAQ 2013). Historically, the Paraguay and Paraná rivers had been used for navigation by local indigenous people and early colonisers, leading to the foundation of several towns and cities along these rivers (Calheiros et al. 2012). During most of the 19<sup>th</sup> century, navigation along the Paraguay and Cuiabá rivers was the main means of



Figure 2: The Paraguay-Paraná Waterway in South America [USE COLOUR ONLINE ONLY, NOT IN PRINT]

transportation to Mato Grosso and its main cities (Corumbá and Cuiabá) and disputes for the control of the waterway triggered the largest conflict ever fought in South America: the so-called Paraguayan War (1864-1870) (Bethell 1996). Currently, traffic concentrates on the segments from the Brazilian town of Corumbá, in the state of Mato Grosso do Sul, downstream, with more than 98% of the load being iron ore produced in mines in said municipality which is then exported mostly to Argentina (ANTAQ 2013: 12).

The modern waterway was conceived of as a motor for economic integration of the La Plata Basin countries of Argentina, Bolivia, Brazil, Paraguay and Uruguay through improved trade and navigation, an idea that has existed well over a hundred years (Gottgens et al. 2001). At some point, the Paraguay-Paraná Waterway was even part of a gigantic plan to connect all major South American river basins through waterways, the 'Great Waterway Scheme', transforming isolated and remote areas of the Plata, Amazon and Orinoco river basins into motors for social integration and economic development across South America through trade (Gioia 1987).

The controversy around the Paraguay-Paraná Waterway concerns the segment between the towns of Cáceres and Corumbá, a large part of which is located in the state of Mato Grosso and is currently usable only by relatively smaller groups of barges carrying up to 8,000 tons (ANTAQ 2013: 29). During about four months of the year, during the dry season, water levels drop significantly and prevent most commercial navigation (Calheiros et al. 2012). To allow year-round navigation with large barges would require several major engineering works, including dredging of shallow sections, straightening some curves, and removal of rocks (Hamilton 1999). This would impact the hydrology of the Paraguay River and affect the flood pulse of the Pantanal wetland, which in turn is strongly linked to the sustainability of its biodiversity and seems to be vulnerable to even minor changes (Junk et al. 2006). Some of the likely negative impacts would be a significant reduction in floodplain area at low water, thus reducing refuges for aquatic fauna; increased water velocity and reduced water storage in the floodplain, which would potentially lead to flooding downstream; as well as water quality reductions, which may be exacerbated through pollution with fuel and mining products (Gottgens et al. 2001). This could also impact riparian communities in the Pantanal, whose culture and social structure are closely related to subsistence fishing, one of their main sources of livelihood (Wantzen et al. 2008).

While previous attempts to extend the waterway were framed as means to improve regional integration between Mercosur countries (the commercial and administrative integration between five South American countries established in 1991), as described by Gottgens et al. (2001), the current revival of interest in the Paraguay-Paraná Waterway is clearly driven by the agribusiness sector (Arévalo 2015), given its interest in lowering the cost of soybean exports to the world market, especially China (ANTAQ 2013), and expected reductions in freight cost by 30% (Arévalo 2015). In Mato Grosso alone, the market value of the soybean harvest was US\$ 7 billion in 2008 (Richards et al. 2015: 4) and Mato Grosso harvested 27.8 % of Brazil's national production of 74,815,447 tons in 2011 (IBGE, cited in Rausch 2014: 280). In some ways, the fate of the waterway may thus be tied to economic development in China, given not only the importance of its demand on soybean production and Mato Grosso's position in this market, but the state's economy more generally (Richards et al. 2015).

As of 2016, the waterway has passed a technical, economic, and environmental impact assessment (EVTEA, in Portuguese) carried out by a respected national university (UFPR/ITTI 2016), and an eventual implementation seems plausible (although the project would certainly be impacted by the



serious national economic crisis and dwindling public funds since 2015, which may prompt novel forms of public-private association, still to be discussed). The actual go-ahead is still uncertain, as both supporters and opponents revive old arguments on the benefits and negative impacts of the waterway (see e.g. Portos S.A. 2016; Schlesinger 2014), citing the likely associated expansion of soybean plantations as a positive or negative development. Building the waterway would also involve the construction of a new port in Morrinhos, Cáceres, about 70 km from the town centre of Cáceres (Jornal Oeste 2014), possibly in conjunction with a special economic zone for processing and export (ZPE) which would give tax and tariff exemptions for industrial production and import of raw material. The ZPE has been approved already in 1990, but not implemented due to its controversial impacts and lack of political appetite (da Mota Menezes 2014).

#### **4 Methodology**

The present paper followed a qualitative, exploratory research approach. 24 semi-structured interviews were conducted between October and December 2014 both in Cuiabá, the capital of Mato Grosso, and in Cáceres and nearby communities in the Pantanal with representatives from different stakeholder groups within the broader water sector, including academics, members of the state government and staff of government agencies, as well as representatives of NGOs, the agribusiness, fishing, navigation and tourism sectors. The interviews touched upon more general issues around water governance in Mato Grosso, visions for the future and development of the region, which would help to get an understanding of people's values, as well as more specific questions around the construction of the waterway and its implications. Interview transcripts were examined with a content analysis software, the Discourse Network Analyzer or DNA (see Leifeld 2011 for an overview) to identify argumentative categories used by interviewees, including different types of values, as well as statements made on different water governance issues, including the Paraguay-Paraná waterway.

Following the conceptual framework outlined previously, we specifically screened interview transcripts with the DNA software for statements on 1) fundamental values; 2) governance-related values; 3) assigned values or water values; as well as preferences or positions regarding water governance issues, covering 4) water policy, i.e. instruments and the material dimension of water governance 5) water politics, i.e. the power relations between different actors within water governance, and 6) water polity, i.e. the institutional setting in which water governance takes place. Using these six primary coding categories, it could be identified which stakeholder group expressed which values and how they evaluated different water governance issues, such as the Paraguay-Paraná Waterway. Very few interviewees made statements in relation to fundamental values, probably due to the fact that fundamental values are located at a deeper level and people generally would not typically reflect on them in conversation. This left us with insufficient data to deepen their analysis, therefore this paper

focusses on governance-related values and assigned values, this representing one of the limitations of this study.

## 5 Results and Discussion

For clarity this results and discussion section is divided into a sub-section on policy, polity and politics (i.e. water governance aspects) on the one hand, and a sub-section on the value aspects on the other hand. While interviewees would not usually establish links between their values and their preferences and actions in water governance themselves, we discuss how different value landscapes may have shaped the conflict between supporters and opponents of the Paraguay-Paraná Waterway at the end of this section of the paper, thus linking both sides.

### 5.1 Policy, Polity and Politics Aspects

First of all, the interviews with the agribusiness sector confirmed that this stakeholder group is unambiguously in favour of the waterway under the assumption that it will improve transport logistics, which is the main issue of the public debate about the future of crop production in the state. The agribusiness sector was joined in its support by government representatives as well as members of the navigation and logistics sector. With regard to the politics behind the construction of the Paraguay-Paraná Waterway, it could be confirmed through interviews with the agribusiness sector itself that there are strong links between the logistics and agribusiness sectors and the state government, and that the renewed attempts at building the waterway are thus the direct result of lobbying or even capture of the state government by these sectors:

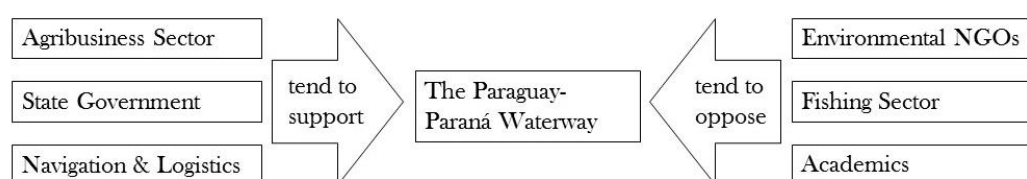
*“About the government I would say [...], who is going to become a secretary of logistics is one of our executive directors [...] so I believe that these questions around logistics, with regard to the use of railroads, highways, and waterways [...], as a direct consequence, we are going to have positive change.”* (Representative of the Agribusiness Sector)

These findings on the politics behind the construction of the Paraguay-Paraná Waterway and water governance more generally confirm previous research by Safford (2012) who cited that agribusiness organisations view aggressive government lobbying as a legitimate strategy to advance agricultural production in the state. However, since he conducted his research (between 1998 and 2002), this has been taken to a level in which the state government itself is partly composed of members of the agribusiness sector, thus speaking of “lobbying” may be an understatement. Similar developments could be observed more recently at the level of the federal government, too, with the appointment of senator

Blairo Maggi, Mato Grosso's so-called "soybean king" and former governor as the Minister for Agriculture in 2016 (HuffPost Brasil 2016). Mato Grosso's agribusiness sector thus has exerted great influence on the federal government, which is strategic as national agencies will be in charge of implementing the modern waterway (this is a constitutional requirement, given that it would involve national rivers and the work will stretch through more than one state).

The main opponents of completing the Paraguay-Paraná Waterway in Mato Grosso (which pertains to the policy dimension of water governance) were representatives of environmental NGOs, the fishing sector, some academics and local communities in the Pantanal who feared severe ecological and hydrological impacts on the Pantanal. However, there was some hope that government plans could be disrupted through national and international NGO activism, as had happened in the 1990s. Finally, some interviewees, for example from the tourism sector, were more differentiated in their response to the waterway, supporting it, but specifying conditions such as that ecological impacts should be minimised.

Figure 3 summarises the stylised politics behind the Paraguay-Paraná Waterway:



*Figure 3: Stylised Politics behind the Paraguay-Paraná Waterway*

With regard to institutional or polity aspects, several interviewees discussed their engagement with official forums, especially river basin committees, which are supposed to deal with all water governance issues around rivers in Brazil that affect multiple stakeholders (Magrini & dos Santos 2001; Veiga & Magrini 2013). However, while these so-called 'water parliaments' were mostly described as the correct way forward on paper, in practice, they have not had much impact in most river basins in Mato Grosso. This is mostly because they have been set up only very recently or not yet all and suffer from a lack of funding. Another reason for the lack of impact was that members did not see them as a place where compromises can be reached between different ideological positions.

## 5.2 Assigned (or Water) Values and Governance-Related Values

While the previous section served to provide a brief overview of the politics, policy and polity aspects behind the Paraguay-Paraná Waterway, this section discusses the value dimension of the conflict between supporters and opponents, who are not just characterised by different inherent interests in

favour or against the waterway, but different ‘value landscapes’ which shape their preferences and behaviour. In the interviews, stakeholders were asked to reflect on the importance of the local rivers and the Pantanal for the people and the state of Mato Grosso to elicit what assigned values or water values they associate with these.

All interviewees cited strong general importance of the rivers and Mato Grosso’s water resources; however, responses differed with regard to further assigned values beyond the obvious importance of water for human survival. Members of the agribusiness sector cited exclusively economic values, such as the importance of water for agricultural production, cattle ranching, fishing, aquaculture, navigation and tourism, which is interesting in the sense that they did not just cite economic values that were of their own concern, such as water use for agricultural production; rather, they did attempt to describe wider water values, such as for tourism, that were not related to their own business, but did not mention the wide-ranging cultural, historical and other non-economic values of water in the river basin. Clearly, thinking in economic terms and viewing water mainly as an economic resource was prevalent among interviewees from this sector (in fact they often preferred the term “water *resources*” to refer to our interview topic, which captures a distinct worldview linguistically).

Members of the local communities and representatives of the fishing sector, in turn, expressed only non-economic values, with the unsurprising exception of fishing as an assigned value. These non-economic values included aesthetic, cultural and ecological values. There was little overlap with the values of the agribusiness sector interviewees as the fishermen did not acknowledge the wide-ranging economic values that water has in the region and instead focused on their own immediate surroundings. Living near and of the water has shaped local culture over the centuries, with subsistence fishing and cultural traditions merging to become one (lifestyle). Assigning economic values to water had never been a necessity, given the traditional abundance of fish that would comfortably sustain local communities, although with declining fish numbers, circumstances and perceptions are slowly changing. Generally, however, the cultural values of water seem to still dominate local people’s perception. The relationship of traditional communities and culture with the river has been well-documented e.g. by Loureiro (2006) who gives an overview of religious festivities that often involve washing the figure of a saint in the river.

The assigned values of the Pantanal specifically were especially well captured in the following statement by a representative of the tourism sector, which explained the popularity of fishing tourism in the Pantanal:

*“The first touristic aspect of the Pantanal is landscape appreciation. A guy comes to fish in the Pantanal not just because there is pacu, dourado, tucunaré... [local fish species], but because the visual aspect is magnificent. Because a photo taken in the Pantanal is a different reality. Because you’re fishing here and you can encounter an anaconda that is wanting to catch the same fish, the caiman, too.”* (Tourism Guide)

Besides mentioning the aesthetic, ecological, and economic values of the Pantanal for fishing tourism, the quote also demonstrates the strong interrelatedness of these values, which could all come under threat with the construction of the Paraguay-Paraná Waterway. The Pantanal has long been a popular destination for fishing tourism for wealthy Brazilians who would travel far for an opportunity to experience it, although nowadays there are many concerns about overfishing and fish decline (Martin-Ortega et al. 2011).

With regards to governance-related values, the agribusiness and navigation sectors mainly expressed values such as economic efficiency, effectiveness or pragmatism, and order (in the sense of legal certainty, security and ability to plan more generally). For example, when asked to reflect on the challenges of the Paraguay-Paraná Waterway, a representative of the navigation and logistics sector was mainly concerned with its economic efficiency, citing its length and resulting reduced competitiveness as the main concern. Closely related to economic efficiency, i.e. thinking about achieving something at minimum cost and generally focusing on costs and benefits as guiding principles, is the governance-related value of effectiveness, i.e. focusing on the outcomes of policies and whether they achieve what they set out to achieve. Effectiveness, in turn, is closely related to pragmatism, i.e. a principal focus on the practical (outcomes of water governance). For example, representatives of the agribusiness sector cited a lack of effectiveness and pragmatism among other actors as the main reasons for inaction within river basin committees.

The governance-related value of order was expressed in statements such as the following:

*“We need to put rules in places, implement rules, and follow rules [...]. We need rules in the Pantanal, to have a bright future there.”* (Member of the State Government)

The lack of order seemed to be a common source of frustration among several interviewees, especially the agribusiness sector, but also researchers and government representatives. This strong desire for rules and enforcement of (environmental) laws stands in contrast to the social phenomenon popularly known as *“jeitinho”* (i.e. creative strategies to avoid complying with rules and regulations), supposedly an integral part of Brazilian culture (DaMatta 1986). According to anthropologist DaMatta, there is a constant mismatch between the Brazilian legislation and actual social relations, which is considered to be the normal state of affairs. Calls for order thus represent a typical, almost reflex-like reaction to the perceived normality of everyday disregard for the law. To call for order also implies some sort of moral and political authority and gives legitimacy to one’s own water governance preferences over other stakeholder groups’ preferences. Interviewees connected these governance-related values with a vision for Mato Grosso of conventional economic development that also implies a rejection of traditional lifestyles. One could classify this “development” as one of the guiding principles that would favour the construction of the Paraguay-Paraná waterway.

Governance-related values of activists, the fishing and NGO sectors were remarkably different. Their statements expressed values such as social justice, equity, and solidarity, also in regard to the Paraguay-Paraná Waterway. Social justice concerned mainly issues of distributive justice, typically in a narrative in which small agribusiness elites appropriate Mato Grosso's natural wealth and do not share it with the majority of society.<sup>1</sup> In this context, it should also be noted that exports of primary products, such as soybean, are tax and tariff free since 1996, potentially adding to social and distributive justice concerns (Laval 2015). Social justice also broaches the issue of power imbalances, where said elites grow their wealth at the expense of politically insignificant groups, such as local communities, for example through building the Paraguay-Paraná Waterway.

Solidarity more specifically, in the sense of respecting other stakeholder group's needs and interests, and accepting compromises was not extended to the agribusiness sector, but rather to local actors within the community, such as tourism operators. This is very likely because equity was an equally important guiding principle, which is violated by the agribusiness sector (following the dominant view among local and NGO actors). The absence of the governance-related value of equity was seen as one of the major factors to blame for water governance problems in the state, which could also explain why the Paraguay-Paraná Waterway is still high on the state government's agenda, despite its benefits for a small economic group only. Unsurprisingly, values such as equity and solidarity were not expressed in the same way by the agribusiness sector, since they are the main beneficiaries of the unequitable policies of the state. If "development" is one of the guiding principles for the agribusiness sector, among the local communities and opponents of the waterway, it could be conservation (of the status quo) or traditions. Valuing conservation above all, and viewing any changes to the Pantanal as negative, is a widespread view among environmentalists and local communities, which is why they frequently experience value clashes with agribusiness representatives and their allies, for whom change and development are the more important values.

### 5.3 Synthesis and Discussion

As an overview of our results, we suggest that opposition and approval of the Paraguay-Paraná Waterway can be interpreted as a clash of value landscapes, as seen in figure 4. In this case, this concerns not just the question whether there will be a waterway or not, but much wider associated land-use changes that would ensue with its construction. Improved infrastructure has been identified as a major driving force behind land values in the Pantanal and surrounding areas (Lourival et al. 2008) and one could expect an expansion of soybean production as a direct consequence of building the waterway,

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<sup>1</sup> It should be noted that contrasting narratives exist: see e.g. Richards et al. (2015) who claim that on the whole, the activities of the agribusiness sector have been beneficial for Mato Grosso economically, even when taking into account the negative impacts of deforestation and related environmental destruction.

a radically different land-use than the current cattle ranching and native vegetation. Different stakeholder groups not only differ in the ways they value water resources, if we compare, for example, the value of water for aquaculture vs. the value of water for subsistence fishing, which occur in a completely different institutional and social context. Stakeholder groups also differ in their underlying governance-related values.

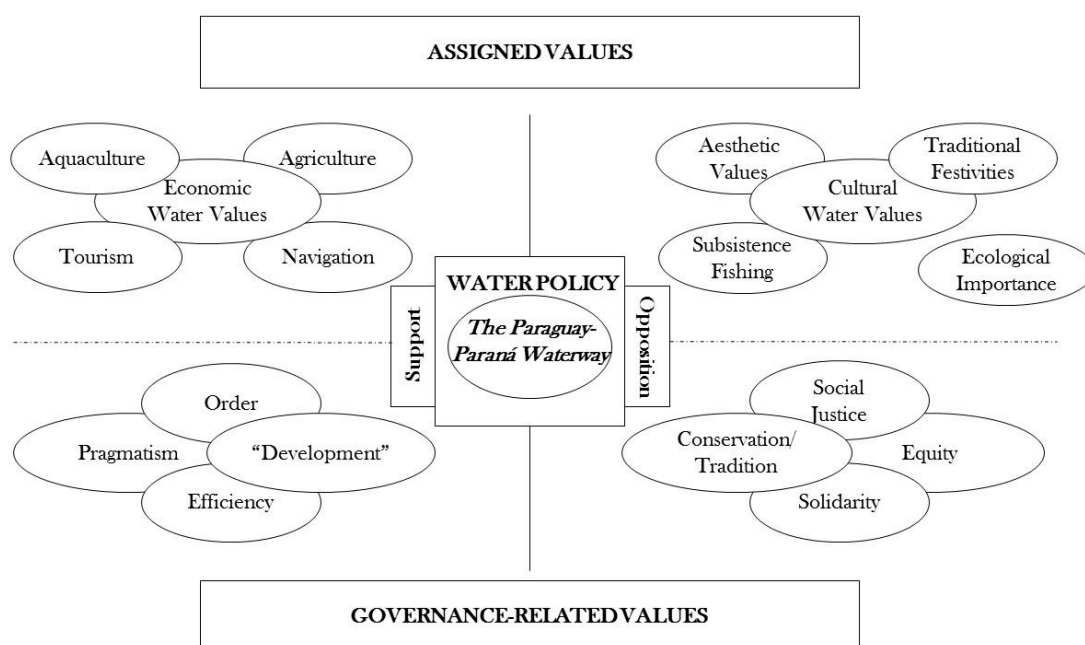


Figure 4: Clashing Value Landscapes around the Construction of the Paraguay-Paraná Waterway

The value landscapes we identified should not be seen as an absolute statement, in the sense that a member of a fishing community could never think about efficiency or development, whereas a member of the agribusiness sector may not occasionally be concerned about aesthetic values. Rather these value landscapes are meant to represent the dominant values within the respective groups, which eventually shape opinions on the issue of the Paraguay-Paraná Waterway. While the broad fault line lies between fishermen and environmental NGOs and the agribusiness and logistics sector as we have outlined in section 5.1 and visualised in figure 3, individual members seemed to break out of this pattern, with one fisherman advocating the installation of heavy industry in Cáceres and one NGO member cautiously supporting the waterway and accusing other NGOs of a lack of pragmatism. This shows that values are not completely homogenous within different groups of society and differences may produce alternative opinions that counter the dominant position in these groups.

Different value landscapes might not just be related to each stakeholder group's role in society, but they may also relate to their origins in migration patterns in the state of Mato Grosso, in which traditional communities have persisted over centuries on subsistence fishing and traditional cattle ranching, whereas relatively recent newcomers from the south of Brazil have been the most active in expanding agribusiness in the state (Rausch 2014). These groups often live in separate spaces, and some cities and

towns in Mato Grosso are known as “Southerner’s towns”, which differ considerably from neighbouring traditional towns.

To address conflicting values in the case of the Paraguay-Paraná Waterway seems challenging, given all the differences outlined previously. Firstly, we would argue that the conflict is not just located at the concrete level of building the waterway or not, but in fact concerns assigned values, governance-related values and might even concern fundamental values; in this scenario, reaching a compromise is highly unlikely. Clearly, the waterway would have to be implemented in such a way that it allows local communities to maintain their traditional culture and livelihoods, while also channelling some resources gained through the construction from the agribusiness sector to them, for example through taxation and redistribution. This could possibly be seen as an efficient strategy by the agribusiness sector, if international pressure or pressure by their main buyers was strong enough. Alternative solutions to bridge the divide between different value landscapes that have been suggested include a switch by Mato Grosso’s agricultural sector to higher value agricultural products, which would reduce the relative significance of transport costs, new barge designs that would function at very low water flows, as well as the introduction of a sustainability label that gives soybean farmers credit for saving the Pantanal and would fetch higher prices on the market.<sup>2</sup>

This draws us to our second point, i.e. that any major decision in water governance, as part of the politicised organization of water management, is inevitably going to benefit some and disadvantage others. The fact that the current state government is clearly supporting the Paraguay-Paraná Waterway means that they have taken the side of the more powerful stakeholder groups in Mato Grosso. Despite the rhetoric of participation and stakeholder engagement that surrounds water governance in Brazil following the 1997 water law no. 9,433 (Magrini & dos Santos 2001; Rodrigues et al. 2015), economic and political influence of small elites still dominates and persists, and conventional and structural solutions such as the Paraguay-Paraná Waterway are still favoured by the political system. The waterway could hardly be considered to be an innovative approach, given the long time it has been under discussion; but equally it can be said that water reform in Brazil perpetuates existing power imbalances, given, for example, that river basin committees can hardly step in to make water governance more balanced without independent funding. Our identification of value landscapes has, however, made some aspects of the political conflict more transparent, and could serve as an input or starting point e.g. for process-based strategies involving participatory workshops and facilitation between stakeholders to eventually identify a compromise between stakeholders.

## 6 Conclusions

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<sup>2</sup> We gratefully acknowledge the contribution of an anonymous reviewer for these suggestions, which are in line with the idea of Groenfeldt (2013) to always connect the identification of underlying values to potential actions.



As we hope to have demonstrated in this paper, a “value landscapes” approach can help to provide a more in-depth understanding of conflicts in water governance. Studying the value base of water governance involves identifying different types of values, such as assigned (or water) values, governance-related values, fundamental values, and the different elements of water governance, i.e. policy, polity, and politics. In the present case, it could be shown that disagreements on the construction of the Paraguay-Paraná Waterway in the Brazilian Pantanal are not merely defined by a simple approval/opposition dichotomy. Rather, different stakeholder groups also expressed different values. In the case of governance-related values, social justice, solidarity, equity and conservation/tradition were expressed by opponents (mostly fishermen, environmental NGO representatives, and some academics), and economic efficiency, effectiveness and pragmatism, order and “development” were expressed by supporters (mostly representatives from the agribusiness, navigation and logistics sectors, as well as the state government). On the level of assigned or water values, the difference concerned the contrast between economic values on the one hand, and cultural/ecological values on the other hand.

Thus, the conflict around the waterway is very deeply rooted, since it concerns several levels of values; it seems unlikely that a compromise could be found which would satisfy the opposing stakeholder groups. We would argue that the conflict is not limited to this concrete project, but rather, we are witnessing a deep clash of different value landscapes. This may be one of the reasons why this conflict has persisted for so long, over several decades and is periodically revived without any solutions or compromise.

From a political ecology perspective, it appears that powerful political and economic elites dominate water governance, in a coalition between the agribusiness and logistics sectors and the state government. These stakeholder groups’ values are overrepresented in Mato Grosso’s water governance and the values expressed through the construction of Paraguay-Paraná Waterway are clearly more representative of the elite’s values, as opposed to the values of the less powerful opponents. Linking value landscapes to a discussion of political power in a given historical and geographical context thus adds important insights.

Concrete policy implications of our study could be that participatory institutions need to be improved to address some of the power imbalances and strengthen the inclusion of value landscapes of less powerful stakeholder groups, if we consider political legitimacy a worthwhile objective of water governance. A river basin committee for the Upper Paraguay River Basin is just being set up and it remains to be seen whether it can contribute to the debate about the waterway, which also depends on the federal government. Furthermore, strategies need to be identified that can help to overcome the gridlock between supporters and opponents and their respective values by either reducing the need for a waterway altogether or reducing its potential impact, this way addressing both value landscapes as well as possible. Finally, we believe that the present study demonstrates that a value landscapes approach can serve as an entry point to broader debates around political power, and that the hypotheses suggested here would be a worthwhile subject of further quantitative research regarding these links. These have

not only academic relevance, but potentially also have repercussions for major policy-making and for improving stakeholder participation in water management.

## References

- ANTAQ = Agência Nacional de Transportes Aquaviários (2013): Relatório Técnico: Bacia do Paraguai, in: ANTAQ, UFSC = Universidade Federal de São Carlos, & LabTrans = Laboratório de Transportes e Logística (eds.): *Plano Nacional de Integração Hidroviária: Desenvolvimento de Estudos e Análises das Hidrovias Brasileiras e suas Instalações Portuárias com Implantação de Base de Dados Georreferenciada e Sistema de Informações Geográficas*, Brasília & Florianópolis, SC: ANTAQ/UFSC/LabTrans.
- Arévalo, D. (2015): *Vice-governador discute hidrovia com investidores dos EUA*, Government of the State of Mato Grosso, online: <http://www3.mt.gov.br/editorias/infraestrutura/vice-governador-discute-hidrovia-com-investidores-dos-eua/135529> (last accessed 9/2/2017).
- Bethell, L. (1996): *The Paraguayan War (1864-1870)*, London: Institute of Latin American Studies, University of London.
- Calheiros, D.F., de Oliveira, M.D., & Padovani, C.R. (2012): Hydro-ecological Processes and Anthropogenic Impacts on the Ecosystem Services of the Pantanal Wetland, in: Ioris, A.A.R. (ed.): *Tropical Wetland Management: The South-American Pantanal and the International Experience*, Farnham, UK: Ashgate Publishing, 29-57.
- da Mota Menezes, A. (2014): A importância da ZPE, in: *gazetadigital*, online: <http://www.gazetadigital.com.br/conteudo/show/secao/60/materia/436993/t/a-importancia-da-zpe> (last accessed 9/2/2017).
- DaMatta, R. (1986): *O que faz o Brasil, Brasil?* Rio de Janeiro: Editora Rocco Ltda.
- Dietz, T., Fitzgerald, A., & Shwom, R. (2005): Environmental Values, in: *Annual Review of Environment and Resources*, vol. 30: 335-372.
- Edelenbos, J., van Buuren, A., & van Schie, N. (2011): Co-producing knowledge: joint knowledge production between experts, bureaucrats and stakeholders in Dutch water management projects, in: *Environmental Science & Policy*, vol. 14: 675-684.
- Gibbs, L.M. (2010): “A beautiful soaking rain”: environmental value and water beyond eurocentrism, in: *Environment and Planning D: Society and Space*, vol. 28: 363-378.

- Gioia, C.J. (1987): The Great Waterways project of South America, in: *Project Appraisal*, vol. 2(4): 243-250.
- Glenk, K. & Fischer, A. (2010): Insurance, prevention or just wait and see? Public preferences for water management strategies in the context of climate change, in: *Ecological Economics*, vol. 69(11): 2279-2291.
- Gottgens, J.F., Perry, J.E., Fortney, R.H., Meyer, J.E., Benedict, M., & Rood, B.E. (2001): The Paraguay-Paraná Hidrovía: Protecting the Pantanal with Lessons from the Past, in: *BioScience*, vol. 51(4): 301-308.
- Grizzetti, B., Lanzaova, D., Liqueste, C., Reynaud, A., & Cardoso, A.C. (2016): Assessing water ecosystem services for water resource management, in: *Environmental Science & Policy*, vol. 61: 194-203.
- Groenfeldt, D. (2013): *Water and ethics: A values approach to solving the water crisis*, Abingdon, UK & New York: Routledge.
- Hamilton, S.K. (1999): Potential Effects of a Major Navigation Project (Paraguay-Paraná Hidrovía) on Inundation in the Pantanal Floodplains, in: *Regulated Rivers: Research & Management*, vol. 15: 289-299.
- Hermans, L.M., Kadigi, R.M.J., Mahoo, H.F. & van Halsema, G.E. (2006): Conflict Analysis and Value-focused Thinking to Aid Resolution of Water Conflicts in the Mkoji Subcatchment, Tanzania, in: Perret, S., Farolfi, S. & Hassan, R. (eds.): *Water Governance for Sustainable Development*, London & Sterling, VA: Earthscan, 149-165.
- Hill, C., Furlong, K., Bakker, K., & Cohen, A. (2008): Harmonization versus Subsidiarity in Water Governance: A Review of Water Governance and Legislation in the Canadian Provinces and Territories, in: *Canadian Water Resources Journal/Revue canadienne des ressources hydriques*, vol. 33(4): 315-332.
- HuffPost Brasil (2016): 'Rei da soja': Blairo Maggi confirma convite para ministro da Agricultura de Temer, 07/05/2016, online: [http://www.brasilpost.com.br/2016/05/07/rei-da-soja-agricultura-temer\\_n\\_9863008.html](http://www.brasilpost.com.br/2016/05/07/rei-da-soja-agricultura-temer_n_9863008.html) (last accessed 9/2/2017).
- Ingram, H. (2011): Beyond Universal Remedies for Good Water Governance: A Political and Contextual Approach, in: Garrido, A. & Ingram, H. (eds.): *Water for Food in a Changing World*, Abingdon, UK & New York: Routledge, 241-261.
- Ioris, A.A.R. (2011): Values, meanings, and positionalities: the controversial valuation of water in Rio de Janeiro, in: *Environment and Planning C: Government and Policy*, vol. 29: 872-888.

- Ioris, A.A.R. (2016): Rent of agribusiness in the Amazon: A case study from Mato Grosso, in: *Land Use Policy*, vol. 59: 456-466.
- Jones, N.A., Shaw, S., Ross, H., Witt, K., & Pinner, B. (2016): The study of human values in understanding and managing social-ecological systems, in: *Ecology and Society*, vol. 21(1): 15.
- Jornal Oeste (2014): Setor produtivo de Cáceres se une pela construção do Porto de Morrinhos, 25/04/2014, online:  
[http://www.jornaloeste.com.br/noticias/exibir.asp?id=30677&noticia=setor\\_produtivo\\_de\\_caceres\\_se\\_una\\_pela\\_construcao\\_do\\_porto\\_de\\_morrinhos](http://www.jornaloeste.com.br/noticias/exibir.asp?id=30677&noticia=setor_produtivo_de_caceres_se_una_pela_construcao_do_porto_de_morrinhos) (last accessed 9/2/2017).
- Junk, W.J., Nunes da Cunha, C., Wantzen, K.M., Petermann, P., Strüssman, C., Marques, M.I., & Adis, J. (2006): Biodiversity and its conservation in the Pantanal of Mato Grosso, Brazil, in: *Aquatic Sciences*, vol. 68: 278-309.
- Laval, E. (2015): Luites au sein du régime alimentaire néolibéral : résistance et émergence politique des producteurs de soja du Mato Grosso, in: *Canadian Journal of Development Studies/Revue canadienne d'études du développement*, vol. 36(3): 296-312.
- Leifeld, P. (2011): *Discourse Networks and German Pension Politics*, PhD Dissertation, Konstanz: Department of Politics and Public Administration, University of Konstanz.
- Lockwood, M. (1999): Humans Valuing Nature: Synthesising Insights from Philosophy, Psychology and Economics, in: *Environmental Values*, vol. 8: 381-401.
- Lockwood, M., Davidson, J., Curtis, A., Stratford, E., & Griffith, R. (2010): Governance principles for natural resource management, in: *Society & Natural Resources*, vol. 23(10), 986-1001.
- Loureiro, R. (2006): *Cultura mato-grossense: Festas de Santos e outras tradições*, Cuiabá: Entrelinhas.
- Lourival, R., Caleman, S.M.d.Q., Villar, G.I.M., Ribeiro, A.R., & Elkin, C. (2008): Getting fourteen for the price of one! Understanding the factors that influence land value and how they affect biodiversity conservation in central Brazil, in: *Ecological Economics*, vol. 67: 20-31.
- Magrini, A. & dos Santos, M.A. (2001): O Modelo Brasileiro de Gerenciamento de Recursos Hídricos, in: Magrini, A. & dos Santos, M.A. (eds.): *Gestão Ambiental de Bacias Hidrográficas*, Rio de Janeiro: COPPE/UFRJ, 101-113.
- Martinez-Alier, J. (2002): *The Environmentalism of the Poor: A Study of Ecological Conflicts and Valuation*, Cheltenham, UK & Northampton, MA: Edward Elgar Publishing.
- Martin-Ortega, J., Ioris, A., & Glenk, K. (2011): *Preliminary exploration of stake-holders perception*

- of the environmental state and changes in the Pantanal wetland*, Pantanal International Network, online: <http://www.macauley.ac.uk/pantanal/Preliminary-stakeholder-analysis-report080511.pdf> (last accessed 9/2/2017).
- O'Neill, J., Holland, A., & Light, A. (2008): *Environmental Values*, Abingdon, UK & New York: Routledge.
- Pires, M.A.F. & da Silva, P.J. (2009): Hidrovia Paraná-Paraguai: um eixo de desenvolvimento, integração e sustentabilidade para a América do Sul, in: *Engenharia*, vol. 592: 132-136.
- Pompermayer, F.M., Campos Neto, C.A.d.S., & de Paula, J.M.P. (2014): *Hidroviás no Brasil: Perspectiva Histórica, Custos e Institucionalidade*, Texto para Discussão 1931, Rio de Janeiro: IPEA.
- Portos S.A. (2016): ANTAQ debate navegação na Hidrovia Paraguai-Paraná, 10/08/2016, online: <http://portossa.com/destaque/antag-debate-navegacao-na-hidrovia-paraguai-parana/> (last accessed 22/11/2016).
- Rausch, L. (2014): Convergent Agrarian Frontiers in the Settlement of Mato Grosso, Brazil, in: *Historical Geography*, vol. 42: 276-297.
- Richards, P., Pellegrina, H., VanWey, L., & Spera, S. (2015): Soybean Development: The Impact of a Decade of Agricultural Change on Urban and Economic Growth in Mato Grosso, Brazil, in: *PLoS ONE*, vol. 10(4): e0122510.
- Rodrigues, D.B.B., Gupta, H.V., Serrat-Capdevila, A., Oliveira, P.T.S., Mendiondo, E.M., Maddock III, T., & Mahmoud, M. (2015): Contrasting American and Brazilian Systems for Water Allocation and Transfers, in: *Journal of Water Resources Planning and Management*, vol. 141(7): 04014087.
- Safford, T. G. (2012): Organizational Complexity and Stakeholder Engagement in the Management of the Pantanal Wetland, in: Ioris, A.A.R. (ed.): *Tropical Wetland Management: The South-American Pantanal and the International Experience*, Farnham, UK: Ashgate Publishing, 173-198.
- Schlesinger, S. (2014): *Pantanal por inteiro, não pela metade: Soja, hidrovia e outras ameaças à integridade do Pantanal*, Mato Grosso: Ecosystem Alliance.
- Schulz, C., Martin-Ortega, J., Glenk, K., & Ioris, A.A.R. (2017): The Value Base of Water Governance: A Multi-Disciplinary Perspective, in: *Ecological Economics*, vol. 131: 241-249.
- Schwartz, S. (1996): Value Priorities and Behavior: Applying a Theory of Integrated Value Systems, in:

- Seligman, C., Olson, J.M., & Zanna, M.P. (eds.): *The Psychology of Values: The Ontario Symposium*, Volume 8, Mahwah, NJ: Lawrence Erlbaum Associates, 1-24.
- Seymour, E., Curtis, A., Pannell, D., Allan, C., & Roberts, A. (2010): Understanding the role of assigned values in natural resource management, in: *Australasian Journal of Environmental Management*, vol. 17(3): 142-153.
- Steg, L., Perlaviciute, G., van der Werff, E., & Lurvink, J. (2014): The Significance of Hedonic Values for Environmentally Relevant Attitudes, Preferences, and Actions, in: *Environment and Behavior*, vol. 46(2): 163-192.
- Tortajada, C. (2010): Water Governance: Some Critical Issues, in: *Water Resources Development*, vol. 26(2): 297-307.
- Treib, O., Bähr, H., & Falkner, G. (2007): Modes of governance: towards a conceptual clarification, in: *Journal of European Public Policy*, vol. 14(1): 1-20.
- UFPR/ITTI = Universidade Federal do Paraná/Instituto Tecnológico de Transporte e Infraestrutura (2016): *Hidrovia do Rio Paraguai: EVTEA – Estudo de Viabilidade Técnica, Econômica e Ambiental*, Informativo, Edição Única, Curitiba: UFPR/ITTI.
- Veiga, L.B.E. & Magrini, A. (2013): The Brazilian Water Resources Management Policy: Fifteen Years of Success and Challenges, in: *Water Resources Management*, vol. 27: 2287-2302.
- Wantzen, K.M., Nunes da Cunha, C., Junk, W.J., Girard, P., Rossetto, O.C., Penha, J.M., Couto, E.G., Becker, M., Priante, G., Tomas, W.M., Santos, S.A., Marta, J., Domingos, I., Sonoda, F., Curvo, M., & Callil, C. (2008): Towards a Sustainable Management Concept for Ecosystem Services of the Pantanal Wetland, in: *Ecohydrology & Hydrobiology*, vol. 8(2-4): 115-138.
- Wu, J., Wu, J., Wang, X., & Zhong, M. (2012): Securing water for wetland conservation: A comparative analysis of policy options to protect a national nature reserve in China, in: *Journal of Environmental Management*, vol. 94(1): 102-111.
- Young, R.A. & Loomis, J.B. (2014): *Determining the Economic Value of Water: Concepts and Methods*, 2<sup>nd</sup> ed., Abingdon, UK & New York: RFF Press.