

Kerschbaumer, L. and Ott, K. 2013. Maintaining a river's healthy life? An inquiry on water ethics and water praxis in the upstream region of China's Yellow River
Water Alternatives 6(1): 107-124



Maintaining a River's Healthy Life? An Inquiry on Water Ethics and Water Praxis in the Upstream Region of China's Yellow River

Lilin Kerschbaumer

Philosophisches Seminar, Christian-Albrechts-Universität zu Kiel, Kiel, Germany; kerschbaumer@philsem.uni-kiel.de

Konrad Ott

Philosophisches Seminar, Christian-Albrechts-Universität zu Kiel, Kiel, Germany; ott@philsem.uni-kiel.de

ABSTRACT: Sustainability of freshwater has become one of the most prominent issues in Chinese river basins. Recently, the Yellow River Conservancy Commission adopted the approach of 'Maintaining the Healthy Life of the Yellow River' (HLR) as the top principle in its management scheme. We locate arguments by HLR advocates in an ecocentric line of reasoning within Environmental Ethics. In view of crucial problems of ecocentrism, we conclude that HLR might be better grounded in the paradigm of Strong Sustainability (StS). With the case of the Hetao Irrigation Area at the upstream of the Yellow River, we recommend a StS-scenario with suggestions for policy reforms.

KEYWORDS: The Yellow River, ecocentrism, water ethics, sustainability, Hetao irrigation area, China

INTRODUCTION

Often said to be the cradle of the Chinese civilization, the Yellow River has a long history dating back to 12-13 million years BCE. It originates from the Bayan Har Mountain and runs eastwards till it enters the Bohai Sea. It is a vivid example of, borrowing from Economy (2004: 36-37), the Chinese history of "continual cycles of social transformations, including war, population growth, economic development, and eco-environmental change". Chinese rivers have a long history of utilisation intertwined with the Chinese civilization (Wittfogel, 1931). For most of the time in the Yellow River's history, harnessing floods was central to the human-river relationship. Today, however, the scene has changed. Water in the Yellow River Basin has become extremely scarce, and its quality is ever deteriorating. Although ranking as the second longest river in China (5464 km), the Yellow River has an annual water resource of 74 billion cubic metres (Bm³) in total, which account only for 3% of the total annual water resource of China (MoWR, 2011: 21). With such a scarce resource, it supports its basin of 795,000 km² that is home to a population of 100 million with 13 million ha of farmland (Ge and Hu, 2007: 2). Qualitatively speaking, almost 30% (YRCC, 2011) of the total length of the river has a water quality of 'V-'.¹ Between 1972 and 1998 the mainstream Yellow River fell dry 22 times (mostly in the downstream Shandong

¹ According to China's National Water Quality Standard (see MoEP and QSIQ, 2002), water quality is classified into five classes: I – suitable for water source and national nature protected area; II – for 1st grade protected living areas, habitats for rare aquatic organism, spawning sites for fish and shrimp, and forage for larvae and juvenile etc.; III – for 2nd grade protected living areas, fishery and swimming; IV – for general industrial use and entertainment without direct human contact with water; and V – for agricultural use and general water landscape. Water with a quality of V- has a lower quality than V, and is deemed highly polluted.

province, leading to intrusion of seawater), and the situation is worsening (Xu et al., 2010). The ecological and hydrological state of the river is in a severe crisis.

How to deal with such a challenge has become one of the most heated issues in today's China. The introduction of integrated water resources management (IWRM) into the Yellow River Basin is far from sufficient (Li et al., 2004). With increasing environmental-ethical awareness, a recent development concerning river management is the adoption of 'Maintaining the Healthy Life of the Yellow River' (HLR) by the Yellow River Conservancy Commission (YRCC) as the top principle to deal with water crisis in the river basin. According to Li Guoying (2009: 15), Director of YRCC from 2001 to 2010 and currently Assistant Minister of the Ministry of Water Resources, "to see rivers as vital beings indicates we humans recognize the initiative, teleonomy, and creativeness of rivers, which means that rivers also have inherent value(s) and are subjects of right".² He acknowledged, "[e]xpanding the object of moral concern to natural beings like rivers (mountains) is highly controversial both in academia and the public" (ibid: 28). Therefore, he called for further efforts to establish a systematic river ethics. It is clearly stated here that HLR must find ethical groundings. Where, then, should the search for ethical groundings start? In fact, as early as in 2007, YRCC already completed a research project on river ethics, with research results published in a series of books ('the 2007 books', see Annex). Li's call from 2009 suggests the search for ethical groundings of HLR did not end with the 2007 books but is open to further elaboration. This prompts our inquiry into this direction. As we agree with Ioris (2012: 144), "[t]he challenges to improve water management are not restricted to reverting impacts on the quality and quantity of water, or to the provision of better public services, but above all constitute a clash of competing valuation approaches seeking legitimisation". The question about 'right' values and valuations is inevitably an ethical one. In the context of grounding a river ethics and a water culture, the discipline of Environmental Ethics is a proper entry point for such an inquiry.

We take for granted that, within Environmental Ethics, there is no unified and well-established theory but a deep divide between anthropocentric and physiocentric approaches. These approaches differ from each other mainly with respect to the demarcation problem and its consequences (see next section). Any ethical approach that may serve as guidance for policy-making should be carefully reflected and assessed. It seems fair to say that HLR rests on an ecocentric approach in Environmental Ethics that gives inherent moral value to ecosystems *as such*. We organize this discussion according to the following four questions (Q):

- Q1: Is a river to be seen as a living and vital being or as an integrated river basin whose conditions affect the well-being of many living beings, including humans, for better or worse? Q1 is an ontological question, asking what kind of entities rivers 'are'.
- Q2: Should entities like rivers be regarded as having inherent moral value? This is a genuine ethical question that requires some ethical analysis of the so-called demarcation problem.
- Q3: Can the concept of health be properly applied to rivers or is 'health' nothing but a metaphor with respect of rivers? This is an epistemic question at the intersection of ecology and medicine.
- Q4: What practical consequences occur under a genuine ecocentric HLR? How coherent is the relationship between HLR approach and more specific water policies? These are practical questions, which place a scientific position into policy-making.

These four questions will be addressed in the next section, while Q4 will also be explored in more detail in the ensuing section. We will show, while the noble environmental intuitions of YRCC should by no means be discarded, that an ecocentric reasoning of HLR by its advocates turns out to be highly unattractive in both theory and practice. Given that a) HLR rightly points at the urgent need for

² In this paper, the translation from original literature in Chinese into English was done by the authors.

environmental improvements of the river, b) HLR requires a reliable ethical grounding other than ecocentrism, and c) an alternative ethical grounding (i.e. the concept of strong sustainability) seems viable and feasible as suggested later with the case of Hetao Irrigation Area (located in the upstream Yellow River), there are sound reasons for water authorities in the Yellow River Basin to replace the ecocentric ethical grounding of HLR with this alternative concept. The premises of this overall argument are addressed in the rest of this article. The final section gives the conclusions.

GROUNDING HLR IN ECOCENTRISM

As mentioned above, in 2004, YRCC officially put forward a river management concept of 'Maintaining the Healthy Life of the Yellow River' (HLR). We strongly affirm the underlying idea of the HLR approach that any such grounding must be (in some sense) an ethical one. This idea overcomes a purely technological and economic approach in water management. What then, does HLR presuppose and imply at a closer ethical look?

The answer to this question can be read as two different positions: under HLR, a river is taken to be a living being with interests of its own right (P_1), or to be full of living beings, having only functional value with respect to living beings, perhaps even only humans (P_2). This involves the so-called demarcation problem, which asks to which entities moral persons have sound reasons to attribute inherent value.³ The term 'inherent value' is often also interchangeable with 'intrinsic value' within environmental-ethical debates. To avoid terminological confusion, in this paper we use 'inherent value' to mean 'inherent moral value', while 'intrinsic value' is interpreted as eudaimonistic value that is not directly morally relevant. An entity with inherent value is recognised to possess direct moral standing, and is independent of any interests that humans may take in such an entity. This is the very meaning of the slogan that an entity should be respected 'for its own sake'. The different solutions to the demarcation problem are constitutive of the anthropocentric-physiocentric divide in environmental ethics. Anthropocentrism attributes inherent value only to humans, while physiocentrism attributes inherent value to some or all natural beings. There are, at least, four variants of physiocentrism. Sentientism (or pathocentrism) attributes inherent value to sentient organisms, biocentrism to all living beings, ecocentrism to natural wholes as such, and strict holism to all single and all collective natural entities. Thus we draw a distinction between ecocentrism and holism because holism would attribute inherent value even to rocks and clouds while ecocentrism would not. The decisive ethical move of ecocentrism is its attribution of inherent value not only to individual organism but to natural wholes as such. To ecocentrism, ecosystems are not just valuable as providers of ecosystem services or as habitats for wildlife, but more importantly are holders of inherent value.

What difference would it make to base HLR on anthropocentric or non-anthropocentric (physiocentric) groundings? Would it not be enough to support environmental improvement, nature protection and conservation if we broadened and prolonged the scope of human interests in a sufficient way, as Norton (1992) argued? It may be well the case that anthropocentrism and ecocentrism may converge with respect to some practical consequences. With respect to many environmental disasters, environmentalists can pull at the same rope despite theoretical divergences on the demarcation problem. But such convergence will be only partial since ecocentrism is far more demanding than anthropocentrism. In the following discussion, we will firstly reconstruct arguments from HLR advocates. Then, we will critically reflect on those arguments.

To begin with, the word 'life' catches our foremost attention. At the very core, HLR advocates tend to define life as a dynamic process instead of a static state. For example, Li (2005: 52) maintained that "[r]ivers fully reflect the changes, harmony and unity of and among the matter, energy and information in the course of life motion process". Rivers are deemed to be self-regulating entities, with intrinsic

³ A more detailed analysis of how to attribute inherent value is given in Ott (2008).

teleonomy to maintain themselves (Qiao, 2007: 31). Hou and Li (2007: 23) claim that "[a] river's life course is the circulation process of river's water system according to a certain direction and path". Ye (2007) drew upon works by Feinberg and Shapiro (1980), in which life was broadly (and circularly) defined as biospherical activities. He then pointed out that ecosystems have intrinsic teleonomy: "the natural selectiveness that drives the systematic whole towards optimal structure" (ibid: 43). Rivers as ecosystems are no exception. A river's natural life means that "[a] river as an ecosystem has life, with the properties of interdependence, interaction and continuous coordinated evolution between different aquatic species and their aquatic environment" (ibid: 51). Lei (2007: 19) stated that river ecosystems possess some basic features similar to life due to their holistic function – "a dynamic organic whole resulting from interactions among water flows, aquatic lives, microorganism, and the environment". "River pushes the continuous evolution of riverbank's shape and river ecology through water circulation", therefore, he concluded, "[a] river is a living being" (ibid: 20). In these statements, we find a whole 'eco-ontology' that borrows from different sources. A detailed analysis of this 'eco-ontology' that would address problems of linguistic translation is beyond the scope of this paper. We just hold that HLR claims rivers to be dynamic organic wholes with intrinsic teleonomy.

Besides 'natural life' as argued above, the concept of life is expanded qua 'cultural life'. Ye (2007: 195), for example, proposed the concept of a river's cultural life as "the capability of influencing and shaping human's spiritual and material life (...)". Qiao (2007: 46) also proposed a river's cultural life as "a river's effect on shaping human cultures". It falls within the family of life forms, because "within a culture, there are processes of existing, growing, improving and withering" with "features of continuity and self-duplication", which resembles life (in the natural sense) (ibid: 46-47). "A river's cultural life is the result of mutual contacts, dialogues and interpretations between humans and rivers" (ibid: 52). In conclusion, Qiao asked for an enlargement of the moral community, saying that "All beings within the scope of nature belong to the moral community (...)" (ibid: 333). Ye (2007) also argued in favour of enlarging the moral communities. He maintained that humans are the "moral subject and agent of river life", while river ecosystems and their environment the "moral patient"; "[t]heir [river ecosystems and their environment] interests could be threatened or their intrinsic good or teleonomy could be harmed by humans, which, at the same time, could endanger present and long-term human interests" (ibid: 63). All the above arguments lead then to the conclusion that rivers have inherent value, e.g. systematic value (Lei, 2007: 80-86). They are right holders; for example, rivers have the right to subsistence (Li, 2005; Cai, 2007; Lei, 2007). "Proceeding from acknowledging the inherent value of rivers, we should safeguard and respect rivers' rights to subsistence, which should become an important moral standard of the human being. (...) We should tell the world aloud that any action to kill the life of [a] river is immoral" (Li, 2005: 55). Here, rivers appear as living beings with some moral rights that must be respected.

A lot of ontological, epistemic and moral presuppositions are thus invested in HLR. To HLR advocates, 'life' is the foremost criterion by which inherent value is attributed, and one of the sufficient conditions for being a 'life' is deemed to be '(intrinsic) teleonomy'. Since rivers (seen as ecosystems) have the important feature of '(intrinsic) teleonomy', they should be attributed with inherent value. The holding of such inherent value(s) endows rivers with certain basic moral rights, and imposes certain standards of moral conduct on humans. These premises stem, at least in part from ecological science but, as we believe, might be highly contested in contemporary ecology. Most ecologists today would deny that ecosystems have intrinsic teleonomy or are teleologically structured (see Botkin, 1992; Steverson, 1994; Bastian and Steinhardt, 2002, Chapter 2). All in all, the problematic surrounding of HLR concerns four interrelated questions as outlined earlier: (Q1) attributing inherent value and teleological arguments; (Q2) the basis for attributing inherent value and moral rights; and (Q3) the notion of 'ecosystem health'. The fourth question refers to practical consequences of ecocentrism (Q4), which will be addressed in the last part of this section (the practical consequences of ecocentrism in general), as well as in the

Section 'The case of Hetao' (the practical consequences of ecocentrism in water policy-making, in particular). We shall discuss these four questions further in the following.

(Q1) HLR advocates are keen to draw on influential works of environmental ethics developed mainly during the 1980s and 1990s in the U.S. Upon invoking Paul Taylor's (1986) notions of 'teleological centres' and the 'good' of living organisms, Lei (2007: 70) maintained: "[e]ach living being is its own goal, and therefore has its own good. (...) The inherent value of a living system is ends and not means oriented; (...) such inherent value is not only objectivist but also independent of instrumental utility to humans". To Taylor (1986: 45), inherent value has to be recognised in "teleological centres of life" – "a unified system of organized activity, the constant tendency of which is to preserve its existence by protecting and promoting its well-being". Similarly, Regan (2004) defended his case for animal rights with the 'subjects-of-a-life criterion'. The 'subjects-of-a-life' are *experiencing* subjects of a life, having "beliefs and desires; perception, memory, and a sense of the future (...); an emotional life together with feelings of pleasure and pain; preference- and welfare-interests; (...)" (2004: 243). The individualistic view from Regan (as well as from Taylor) places extreme difficulties on assigning inherent value to holistic entities like population, species, or ecosystems. Individualistic approaches such as sentientism (Regan) and biocentrism (Taylor) attribute inherent value only to single organisms. Ecocentrism is different in that it enlarges an individualistic position for natural wholes. This enlargement of the moral subject makes a moral and even political difference.

Some HLR advocates seem to sympathize with such a conceptual enlargement, which has a long history in environmental ethics. Goodpaster (1978: 310) made an attempt to suggest the criterion of being alive "could admit of application to entities and systems of entities heretofore unimagined as claimants on our moral attention (such as the biosystem itself)". He diverts from an individualistic position by not denying moral considerability to larger systems (biosystems) that display approximating features of a living system. More recent efforts to attribute inherent value to nature and/or natural entities on teleological grounds can be found in the works of Johnson (1992, 1993). Johnson's central thesis is that natural entities have goods of their own and "[i]n all of their variety, natural entities, ourselves included, endeavour to live their own lives according to their own nature and potential" (ibid: 41). Rationality, "taken as the ability to think cognitively", is for him "not a necessary condition for being morally considerable" (ibid: 55). Refuting defining interests in terms of preferences or prudent desires, Johnson argued that "interests are a function of our well-being needs", and that "well-being of the whole person/animal/life process (...) counts as one's central good (ibid: 141-142). Subsequently, "a living being's intrinsic good is a good life – good as measured according to the inherent well-being requirement of that life" (ibid: 147). Any ecosystem is deemed to be a life process with its own well-being interest. However, the problem with Johnson's claim and other efforts to extend the teleological arguments to include ecosystems (e.g. HLR) lies in what Krebs (1999) suggested as confusing the 'practical meaning' and the 'functional meaning' of ends. The former is defined as "that state of affairs which an agent wants to bring about by his or her *action*", in which "an *action* is something where the agent could have acted otherwise and can be held responsible" (ibid: 102). Functional ends, on the contrary, are "final states of *causal processes or events*", in which the being involved is not responsible for its functions and does not care about such ends (ibid: 103). In this sense, rivers as ecosystems, as far as we know, follow 'functional ends' but not 'practical ends'. They might have a 'good' or 'goods', as Johnson would argue and as HLR advocates claimed, but such 'good' is only in the functional sense. Whether functional ends are morally relevant is a further question, which we will address in Q2: the basis for attributing inherent value and, as a consequence, moral rights.

To sum up our argument with respect to the first question: The idea of regarding rivers as living beings faces grave problems. It is more parsimonious to perceive rivers as wholes, which are integrated by water-related ecological processes along a river basin, which has been formed in the history of nature and in most cases, modified by human action. The ontological status of a river basin is different

from any single living being. Taking rivers into account comprehensively does not require a presupposition that rivers are living beings.

(Q2) Do rivers as such hold an inherent value? Ecocentricists would say 'yes'. From our inquiry into arguments by HLR advocates, HLR clearly relies on ecocentrism – to be exact, classical ecocentrism. In its classical variant (Callicott, 1980, 1999), ecocentrism sees the moral value of individual organisms (humans, animals, and plants) as relative to the health, flourishing and, perhaps, integrity of natural wholes. As Callicott (1980: 324-325) wrote, "the good of the community as a whole (...) serves as a standard for the assessment of the relative value and relative ordering of its constitutive parts (...)". Taking this standard seriously, individual humans are not well protected within an ecocentric ethics. The integrity of the ecosystem as such deserves moral priority over any interests of single beings, be they human or non-human. Callicott did not exempt humans from this standard of assessment. If so, humans might be sacrificed, displaced, and evicted for the sake of ecosystems. From such unpleasant conclusions, a furious debate emerged about the so-called 'ecofascist' consequences of stringent ecocentrism (Zimmerman, 1995). Ecocentrism, thus, belongs to a type of ethical theory in which the rights of all individuals can be downplayed against the flourishing or well-being of larger communities (as tribes, states, companies, churches, political parties, or even ecosystems). After the Second World War, this type of ethics lost any moral credit among most Western ethicists. Mainstream ethics argues that moral agents have obligations against individuals in the first instance, while all presumptive duties against cultural, political, and natural wholes are derivative to those primary obligations. Any attempt to reverse this ranking of obligations comes at a high price, as Callicott had to concede. In his later writings, Callicott (1987) has modified his ecocentric ethics to avoid such ecofascist consequences but his revised concept was no longer *ecocentric*. In his revised concept, Callicott relied on a (Darwinian) 'closeness' model of moral commitments. Under this 'closeness' model, obligations against ecosystems as such are located at the outer layer and are trumped by obligations against other beings which are closer to the moral agents, such as spouses, children, members of family, friends, neighbours, colleagues, compatriots, and so on. Within this model, morality is not 'centred' around ecosystems any more. In this revised concept, the practical difference to prudent practical holism becomes very small while the ontological, epistemic and ethical problems of attributing inherent moral value to ecosystems as such remain. The revised variant has found little support in environmental ethics.

Having adopted ecocentrism, HLR advocates similarly face a series of moral conflicts between the inherent value of rivers as such and human interests. Such concepts now have to be assessed *within* an ecocentric approach. While assigning rivers the status of 'moral patients', HLR advocates (e.g. Hou and Li, 2009: 243) suggested a "value sequence" in which "we can make our moral decision according to how close or distant a natural being is to humans" (recall Callicott's 'closeness' model). Conflicts between a river and local people are addressed by Cai and Lei in terms of needs, harm and interests: "[w]hen rivers' basic need conflicts with that of humans, i.e. humans and rivers face, at the same time, basic survival need and there is no other choice (e.g. conflict between ecological water need for rivers and human drinking water need), human needs precede" (Cai, 2007: 67). "In the case that human interests inevitably conflict with the interests of rivers and other living beings, while realizing self-interests, humans should take the interests of rivers and other living beings into sufficient consideration, and minimise the harm to rivers and other living beings as far as possible" (Lei, 2007: 169). But, one may ask, do rivers as such have needs and interests, be they basic or non-basic? Can rivers as such be harmed? The overall way to address conflicts under an ecocentric approach still rests, first, on the ontological assumptions that rivers are living beings which have needs and interests and can be harmed (see Q1) and, second, that, on the one hand, ecosystems as such hold inherent value but on the other, humans are prioritised in case of conflicts (anthropocentrism).

Our discussion up to this point suggests it is very difficult to establish a river ethic on an ecocentric base in general and on a life-centred view in particular – no matter how attractive it appears at first glance. A 'river's life' seems, then, metaphorical. But what about the notion of '(ecosystem) health'?

(Q3) Can rivers be said to be 'healthy' (or 'sick')? One has to ask here if 'health' with respect to ecosystems is just a metaphor that is associated with human medical conditions, or if it endows meanings which might lead to non-ignorable ethical consequences? HLR advocates, like Lei (2007) and Ye (2009), stated clearly the side that a river's health is not a strictly scientific concept but finds significance in evaluation of river management practices. In their book *On Rivers' Healthy Life*, Hou and Li (2007: 86) stated: "[a] healthy river should be a dialectical unity of natural properties like ecological environment and social properties like service functions; it should be an ecologically sound river as well as a river where humans and water get along harmoniously". Here, the concept of 'dialectical unity' supposes a Hegelian/Marxist ontology of dialectical unities, which is not made explicit at all.⁴ Further, the reference to 'dialectical unities' obscures the problem of 'ecosystem health'. The authors were quite aware of the dividing opinions as to whether 'health of river ecosystems' is an 'objective' or 'subjective' ('relativistic') judgement: "[r]egarding the health of river ecosystems, (...), one opinion takes health as the capability to support and maintain major ecological processes and biotic communities (...) in a pristine state free of human interference; the other opinion takes health as dependent on social values, (...), which include ecological integrity and human values" (ibid: 86). Since the authors propose scientifically measurable items such as 'health' index or criteria (i.e. runoff continuum, maximum flood discharge capacity, water quality, wetlands, aquatic lives, water supplying capacity, etc), it is reasonable to say that they tend to focus predominantly on 'objective' judgement. Such 'objectivity' of ecosystem health is in line with ecocentrism. But, if the concept of river health is "a dialectical unity of natural properties (...) and social properties", the health criteria as proposed by the authors are obviously insufficient, lacking measurement on the 'subjective' properties, especially social values. When the social dimension comes in, 'health' is no longer 'objective' but imprinted with various human values and aspirations.

Since the concept of 'ecosystem health'⁵ is essential in understanding HLR but the ethics of such a concept is nowhere specified in arguments from HLR advocates, a brief reminder of relevant debates within environmental ethics is appropriate. Environmental ethicists are sceptical regarding the ethical implication of 'health' used within the contexts of ecosystems to manage the environment or conserve nature. For instance, Holland (1995) doubted the practical usefulness of such a concept. Jamieson (1995: 340) warned against an uncritical use of "the language of ecosystem health in attempts to objectify our appreciation of certain kinds of ecosystems". Nelson (1995) argued in a pivotal article that health and illness are 'thick' evaluative concepts prescribing a certain range of responses with moral assessment of the agent and the patient. Emphasising the objective existence of value in nature, he suggested: "what is needed is not simply a more refined system of indicators of health status for ecosystems. (...) [C]linical ecology must stand on a conception of the goodness of insentient, abiotic systems that explains why we ought to take them with moral seriousness" (ibid: 320). This is exactly why HLR advocates appeal to the concept of (ecosystem) health – for its (morally) motivational force. However, even an ecocentricist like Callicott (1995) conceded that with respect to organisms, health can be taken literally, but with respect to ecosystems it is nothing but a metaphor. It is only "by metaphorical extension" (ibid: 350) that health can be said to be an objective condition of ecosystems. It comes at a great surprise that Callicott on the next page of his article bluntly states that "'health' is", to some degree, "an objective condition of ecosystems" (ibid: 351). There is no argument to be found in the article that explains the sudden shift from 'health' as a metaphor to 'health' being an objective condition of ecosystems. From such unwarranted 'objectivity' Callicott derives the ethical position that humans should value ecosystem health for its own sake, not merely in the functional sense. At the end of his article, ecosystem health has become an objective condition of ecosystem and a high-ranked objective for nature conservation. HLR advocates should consider closely whether they take ecosystem health literally or metaphorically.

⁴ The problem to which kind of entities the term 'dialectical' may or may not refer is outside the scope of our discussion.

⁵ See Rapport et al. (1998) for an overview of the concept 'ecosystem health'.

Different from being taken literally (with potential problems outlined above), the concept of 'health' taken as a metaphor might be translated into the ecological concept of resilience, which is a practical guideline of strong sustainability (see next section).

(Q4) Turning now to the practical consequences of ecocentrism, new problems occur. Since the integrity of an ecosystem is mostly identified in its natural or pristine state (Hettinger and Thorpe, 1999), ecocentrism is close to the ideal of wilderness. The consequences of ecocentrism are quite harsh for human systems. Most ecocentrists have affirmed rigid consequences against modern human civilisation and have idealised pre-modern and even tribal lifestyles. To them, ecocentrism may look over-demanding only from a lifestyle-perspective that is used to all the soft comforts and conveniences of modern civilisation. The most prominent example of practical ecocentrism is the 'Wildland Project' which conceives a re-wilding of North America within this century (see Westra, 2001). Such projects must be kept in mind if one wishes to apply ecocentrism to rivers seriously. In principle, all rivers should run unconstrained. In reality, rivers might be modified by human interference all along the river basin or in its parts or they might be not. Therefore, all unmodified rivers should be kept intact in their pristine state. There is no other moral option given other than strict and rigid preservation. But what about highly modified rivers as they prevail in China and in many other countries (like USA, Germany, and India, etc)? To strictly consider ecocentrism, Chinese 'hydro-logical' civilisation – a culture that has controlled river flows for thousands of years and has intensified control over rivers in recent decades – looks nasty from the moral point of view.

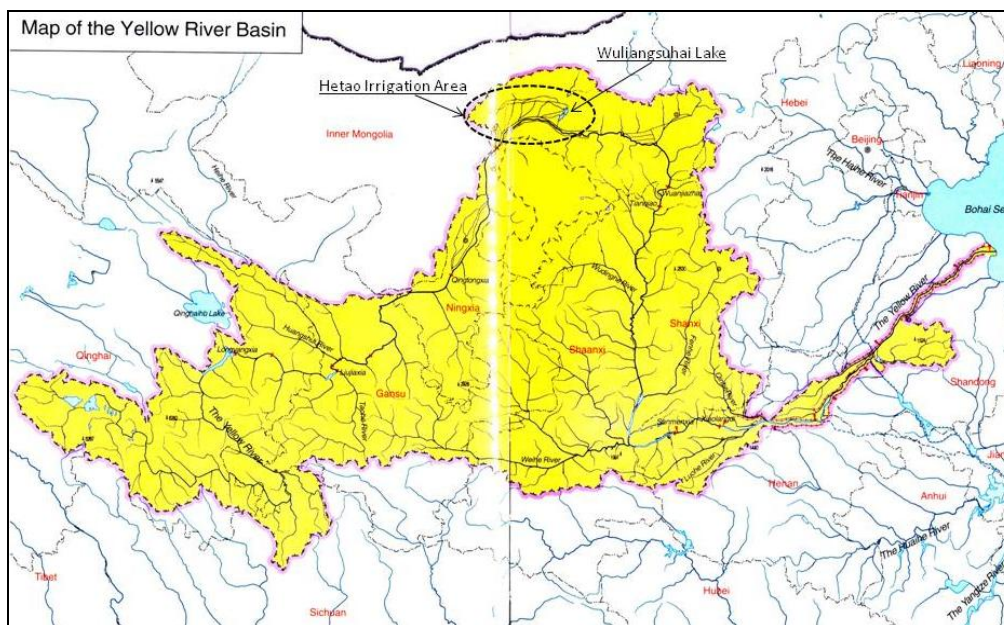
With respect to modified rivers, ecocentrism is clearly more demanding than anthropocentrism. To its proponents, rivers as such have been wronged (harmed, victimised) by human interference. If so, there is a *prima facie* moral obligation of restitutive justice to relieve rivers from such wrongful modifications (see case study). If the current state prevails, the wrongdoing also continues. If so, both new and existing dams, canals, irrigation schemes, harbours and the like, are morally repugnant since they impair the integrity of the ecosystem. This problem is further complicated when rivers are further assigned with (moral) rights, as HLR advocates have claimed. Although moral rights are hierarchical, some override others in conflicts. For example, the right to survival, or the 'right to life'/'right to subsistence' as HLR advocates put it, may override farmers' property right on water in the river and the praxis of diverting river water for irrigation schemes would not be permissible any more. Can ecocentrists permit diverting a large fraction of water from the river to irrigate fields? Would HLR advocates really adopt an abolitionist attitude against water-related infrastructures along the river? Would such an abolitionist position make them outsiders in the political realm? To address the second part of Q4, namely the practical consequences of HLR in specific water policies, we will discuss water praxis in the Hetao Irrigation Area, upstream of the Yellow River as a paradigm case in the next section.

THE CASE OF HETAO

Our case study refers to the Hetao Irrigation Area (see Figure 1), Bayannur City, Inner Mongolia, China. Thus, we wish to combine ethical reflections on HLR with a specific site that we have investigated in our research project SuWaRest (2010-2013). Hetao has been utilising water from the Yellow River for irrigation since the Han Dynasty (202 BCE-220 CE). Throughout its long history, Hetao was utilised interchangeably for cultivation by the agrarian Han people, and for grazing by the more pastoralist Mongolian nomads (Chen, 2007). Ultimately, agrarian civilisation was firmly established in the 20th century. In Hetao, a proverb says: "*Huang he bai hai, wei fu yi tao*" ("The Yellow River causes hundreds of disasters, making rich only Hetao"). This is something Hetao people were historically very proud of. At present, however, Hetao has to compete with other regions along the Yellow River for the scarce water resource; it also has to deal with increasing water demand within the whole region. In terms of water quality, although still enjoying relatively good quality of water due to its superior geographical location in the upstream, Hetao has lasting impacts on downstream regions. Wastewater from

farmlands, industrial and residential areas in Hetao is the main water source for the Wuliangsuhai Lake ('Wuliangsuhai'), which also serves as a buffering zone for the Yellow River. Thus, water from Wuliangsuhai flows back to the Yellow River during years of low flows and vice versa during years of high flows. Historically, Wuliangsuhai was part of the Yellow River. Around 1850, the Yellow River's course moved southwards, and herewith Wuliangsuhai was formed as a lake. Hetao is, therefore, an integral part of the overall Yellow River Basin. From a political perspective, YRCC is the highest administrative authority on the river basin level, and its guidelines steer the direction of water utilisation schemes at the local level, Hetao included. HLR has, hence, binding force on Hetao, too.

Figure 1. The Yellow River Basin and the Hetao Irrigation Area.



Source: Li, 2003; with the authors' addition indicating the Hetao region and Wuliangsuhai Lake.

One of the most dominant problems facing Hetao is the environmental deterioration in Wuliangsuhai. Such a change is closely linked with agricultural development in Hetao. In about 1930, Wuliangsuhai was around 800 km². Then, it shrank to ca. 400 km² during the 1960s and further to ca. 227 km² during the 1970s, and stays at ca. 293 km² since the mid-1970s (HIAAB and BWCB, 2010). At the same time, the irrigated area in Hetao increased steadily from 3780 km² during the 1960s (completion of the Sanshenggong Water Station) to 5400 km² in the 1990s (Yu, 2004). Besides expansion of the area, cultivation has also been intensified but fertiliser efficiency and canal efficiency never caught up with the rapid expansion and intensification. As a result, surplus nitrogen and phosphorus were washed down to the drainage canals, ending up in Wuliangsuhai. At the same time, the rapid industrialisation and urbanisation in Hetao led to an ever-increasing rate of pollutants released into Wuliangsuhai. Currently, the lake is highly eutrophic, bordering the edge between a grass (reed) and an algal type of lake. Furthermore, due to water over-consumption in the farmlands, the amount of wastewater draining into Wuliangsuhai has decreased, leading to shrinkage of the lake. Increased shrinkage of the lake has brought about concern that the lake might disappear in the coming decades. This pressing environmental problem has caught the attention of the Chinese Central Government. A *Wuliangsuhai Comprehensive Treatment Plan* (BCPG, 2010) was initiated with investment from the World Bank. Major measurements in this plan include wastewater treatment, lake vegetation control, and water circulation improvement, etc. Despite some improvement, significant change is yet to be seen.

Conservation of Wuliangsu Hai as a lake or letting the lake shift to a marsh ecosystem is a crucial point of water policy in the Yellow River Basin.

That the progress to restore the lake is slow is not surprising. The overwhelming orientation towards technical solutions focusing predominately on Wuliangsu Hai or Hetao's farmlands fails to adopt a comprehensive view that HLR presumably holds. However, with that said, Hetao, especially Wuliangsu Hai, would not benefit much from an ecocentric HLR. To begin with, many current practices sabotage HLR in multiple ways, and should be put to an end. As already mentioned, diverting water from the Yellow River would not be permissible, because such practices impair the integrity of the river ecosystem (see: Q4 in the second section). The strategy of upgrading irrigation facilities into ones with higher water-saving potential, which is the most important measure from the Bayannur Government to reduce water demand in the farmlands, would not be considered ultimately appropriate. Under an ecocentric HLR, the appropriate strategy would be to stop water diversion once and for all. Even if this very strict criterion is loosened to allow the diversion of a small fraction of water from the Yellow River or pumping groundwater in the concerned ecosystem, the current scale of farming in Hetao needs to be considerably downsized. So do industrial activities. A simple mathematical calculation tells that supplying $0.592 \text{ Bm}^3/\text{y}$ is reasonable with respect to distributive justice for the total residents in Hetao,⁶ not the current $4 \text{ Bm}^3/\text{y}$. If all the above were to be implemented, how should the living standards of the locals be maintained?

Furthermore, current water right transfer (WRT) projects in Hetao would have to be halted. Such projects were initiated by YRCC and have been implemented since 2003 in YRCC's efforts to relieve water conflicts in the Yellow River Basin. As YRCC's Director, Li Guoying (2010) stated, one grave problem with current WRT projects is that such projects could potentially lead to environmental change during construction of irrigation channels, like decreasing of groundwater table, and degeneration of vegetation. An ecocentric HLR disallows such damages. Even the popular practice of assigning budgets for ecological compensation is out of the question, because the 'health' of the river ecosystem has priority, the damage to which would not be allowed in the first place. In case that such damage has been already done, the "principle of restitutive justice" (Taylor, 1986) is applicable (see below).

Finally, regarding Wuliangsu Hai, the lake's heavy degradation is deemed to be the result of humans having conducted moral wrongs to Wuliangsu Hai in the past. To redress that, an ecocentric HLR would ask for suitable reparation and compensation according to the 'principle of restitutive justice' (Taylor, 1986: 304-307) or, in a more popular term, restorative justice. While urging the restoration of the lake, an ecocentric HLR would bring up demands that are very harsh for the local residents as well. Similar to the case of Hetao's farmlands, human interference is to be limited. For instance, fish catch and tourist activities should be minimised, if not totally banned. Wastewater from Hetao's farmlands, industries and households is not to be drained into Wuliangsu Hai before being properly treated – 'proper' in the sense that no ecological damage of any kind is possible. Due to technological and scientific uncertainties, even our best guess would not be able to assure that the treated wastewater is safe for the lake. Even if such assurance is possible, the costs of treatment plants and monitoring would be unbearable for the locals. There is no mention of the locals who would still have to struggle for a decent living, as their economic activities (e.g. farming and fishing) are to be largely confined.

In all, our long journey into the theoretical foundation of HLR shows that HLR might be better presented with notions of 'health' and a river's 'life' as metaphors. The case study of this section strongly indicates that environmental and ecological improvement of this part of the river basin will not profit much from the ecocentric rhetoric but will require strong long-term reforms that address cultural

⁶ According to the water allocation regulation currently in force (see NDRC and MoWR, 1998), $21 \text{ Bm}^3/\text{y}$ are needed for ecological conservation. If this amount is correctly set, $37 \text{ Bm}^3/\text{y}$ of water resource are left for disposal. If each of the $0.1 \cdot 10^9$ residents in the river has equal entitlement of the rest of that freshwater, the $1.6 \cdot 10^6$ residents in Hetao are entitled to get $37 \cdot 1.6 \cdot 10^6 / (0.1 \cdot 10^9) \text{ Bm}^3/\text{y} = 0.592 \text{ Bm}^3/\text{y}$ of water in total.

and institutional root causes of the problem. If a sustainable river basin is deemed as the ultimate goal of river conservation, HLR could and should search for alternative concepts from, as we suggest, sustainability sciences.

To sum up our discussion up to now: Altogether, HLR clearly rests on ecocentric lines of argumentation, which as we have seen, are questionable from ontological, epistemic, ethical and practical perspectives. On a second look, ecocentrism might not be very attractive for Chinese environmentalism. This critique is not directed against the intuitions that motivated conservationists to adopt HLR or against the environmental and ecological improvement of Chinese water bodies. The noble moral idea of HLR that humans should establish a community of guardians of rivers can be maintained without the supposition that the river as such has inherent values as 'integrity' and 'health'. Maybe, behind the notion of 'maintaining the healthy life of the Yellow River', there could be other and more promising lines of reasoning, which can cover the intuition of stewardship and caring for rivers? The case study of Hetao shall serve as a real-world argument in favour of our final claim that HLR should rest on different ethical groundings.

HLR: A STRONG SUSTAINABILITY PERSPECTIVE

Sustainable development and sustainability are concerned with the question of how various types of natural capital should be distributed between current and future generations, and between humans and non-human beings (Dobson, 1996). Within the diversified scientific debates, one can roughly distinguish five groups of answers to the above distribution question: from very weak, i.e. continued growth of GDP (e.g. Beckerman, 1995) to very strong sustainability (VStS), i.e. respect for inherent value of natural entities. Between these two extremes, the paradigm of weak sustainability (WS) advocates a genuine saving scheme that keeps a constant total amount of capital (herewith a constant level of benefit flows) (e.g. Atkinson et al., 1997).⁷ Intermediate sustainability (InS) asks for conservation of 'critical' natural capital (e.g. Lerch and Nutting, 1998; Hediger, 1999; Steurer, 2001). Strong sustainability (StS) endorses the Constant Natural Capital Rule (CNCR), and requests conservation of natural capital and investments in those capitals (e.g. Daly, 1996; Ott and Döring, 2008). Being based on ecocentrism, HLR would belong to the camp of VStS. We have already outlined the problems regarding such a position in the two previous sections. Furthermore, the current environmental problems in the river basin, particularly in Hetao, show how inadequate the position of very weak and weak sustainability is. In this section, we recommend StS, instead of WS or InS, as a viable and (ethically) proper stance. We will illustrate that by placing StS in the Hetao case.

The theoretical concept of StS was proposed by Daly (1996) and has been adopted and refined by Ott and Döring (2008). Its central rule, CNCR, asks for non-decline of natural capital in its physical amounts per capita over time. Such a rule is ethically sound, because, besides overcoming the problems with WS and InS (see below), CNCR also complies with the precautionary principle in face of risk, and leaves greater freedom of choice for future generations (see Ott et al., 2011). StS regards natural capitals as protective goods, which can be divided into 'stocks' that can be built up or broken down (like coal and oil), and 'funds' that are able to reproduce ('living' funds like fish and trees) or regenerate ('non-living' funds like air and water) themselves. CNCR does not require each kind of natural capital to stay absolutely constant, but allows limited substitution among natural capitals. For example, when stocks are consumed, renewable resources are to be increased which deliver comparable flows of benefits. In terms of funds, the consumption rate is not to exceed their own regeneration rate so that over a period of time they remain constant.

⁷ According to this scheme, China is weakly sustainable due to high GDP growth and high saving rates of the Chinese population at large.

As mentioned in the introduction, Hetao's most pressing problem related to water is the environmental degradation in Wuliangshuai due to reduction and pollution of inflow of water. Within a WS concept, it is permissible to further increase agricultural production in Hetao and let Wuliangshuai shift into a marshland that might be used for biomass-production (reed), if the long-term risks of such an increase and shift are found acceptable – 'acceptable' in the sense that the total amount of capital remains constant. The first problem with this guideline is that some stakeholders benefit from Wuliangshuai's environmental deterioration, like providers of fertiliser (used in Hetao farmlands) and aquatic plant products (e.g. *Phragmites australis*). In case their benefits (increase of manmade capital) outrun the environmental damage (decrease in natural capital), WS would support such a trade-off. The question here is whether Wuliangshuai's diversified ecosystem services (ESS), particularly cultural ESS, can be replaced by the alternative ecosystem. Recent concerns from all walks of society about the possible disappearance of the lake as well as various rescuing and restoration efforts clearly suggest that Wuliangshuai exhibits cultural significance instead of being merely an economic resource. The disappearance of the lake means not only the loss of living basis to the local people and living beings, but also, or maybe even more, a grave vitiating of cultural identity and deprivation of chances of developing certain human capabilities for the current as well as future local population. Naturalness has its unique irreplaceable charm, be it from aesthetic (beauty of nature) or eudaimonistic (a good human life) perspectives. The same is also true regarding rivers. That recent incidents of the Yellow River falling dry have raised unprecedented concerns⁸ in the Chinese society further confirms such a thesis. Lakes and rivers are units of natural capital that should be maintained.

It might be argued that Wuliangshuai (and the river), especially the freshwater contained in the water bodies, should be conserved as a 'critical' natural capital (i.e. the position of InS). Critical natural capital is deemed to perform fundamental ecological functions for which no substitutes exist (Ekins and De Groot, 2003). The complexity of ecological processes and more importantly the interlinkage between ecological components, however, make it difficult to draw a clear line between 'critical' and 'non-critical' natural capital. Our scientific knowledge is only reliable to a limited extent in face of uncertainties. Because of this, many proponents of InS have shifted to supporting StS (Lerch and Nutzinger, 1998; Hediger, 1999).

Hetao has been over-consuming its natural capital in recent decades – mostly freshwater. This over-consumption has resulted in environmental deterioration of Wuliangshuai. With HLR based on StS, we propose a StS-scenario⁹ with the main focus on freshwater praxis. On a macro level, this StS-scenario addresses a potential land-use scheme with 'health' of the Yellow River and Wuliangshuai interpreted as conforming to CNCR, i.e. a constant amount of usable freshwater within the region (given a stable population). HLR based on StS supports many current practices (like water diversion and utilisation of Wuliangshuai for various purposes) that are not to be permitted by an ecocentric HLR. The StS-scenario is not concerned with detailed calculation so much but focuses instead on principles to guide praxis. The major goal for water management in Hetao, being set from our sustainability perspective, is to maintain Wuliangshuai at 293 km². This is only possible with major revisions, especially in the agricultural praxis of Hetao.

On Hetao's farmlands: To lower water demand for irrigation, the total area of farmlands is not to be expanded anymore but confined to, or limited to less than, the current level of 5740 km². Under this

⁸ In 1998, when the Yellow River had experienced annual falling dry since 1990, 151 members of Academia Sinica issued an urgent call 'Take action, save the Yellow River' (China Green Times, 1998).

⁹ Within the interdisciplinary research project Sustainable Water Management and Wetland Restoration in Settlements of Continental-arid Central Asia (SuWaRest, 2010-2013), four qualitative scenarios have been developed: (a) green development, (b) strong sustainability, (c) worst case, and (d) shift to marshland. The StS-scenario in this session is based on scenario (b). Due to the focus of the current paper, the StS-scenario only outlines the guidelines and principles proposed in scenario (b), leaving the more detailed questions aside.

precondition, a long-term shift to organic farming is endorsed (see IFOAM, n.d.). An alternative plantation scheme is promoted for cultivating drought-resistant crops like pearl millet, sorghum and grain legumes. Because farmers might resist such a new praxis due to uncertainty about profitability of organic products, such a transition needs to be first enforced by local authorities, say, for a period of 5-10 years. During the transition, the state sets strong incentives (e.g. preferential tax) for agricultural companies or forces them to buy organic crops from farmers at a fixed price. The government also implements assistance programmes to market such products to end users. End users in the eastern coastal regions of China, where the living standard is much higher and the residents' environmental awareness and concerns for health are spread widely, are likely to become target consumers of such products (see Sirieix et al., 2011). Farmers will be likely to accept organic farming voluntarily at a later stage if they profit. The pilot project in Dengkou county of Hetao has proven that organic farming is feasible in Hetao: its profitability matches conventional farming, but it is more environmentally friendly (Su et al., 2003). Under this StS-scenario, the state actively promotes the above outlined agricultural shift even if influential pressure groups might oppose it. The background assumption is this: It would be prudent for Chinese authorities to spend a fraction of its overall investments into the realm of natural capital.

A further measure to improve water use efficiency in Hetao's farmlands might be to establish a water market, where surplus water is exchanged for other products or purchased by the Bayannur Government. Furthermore, local NGOs (e.g. Boya Cultural Association) are to be encouraged to support the capacity building of farmers to shift to water-saving agricultural praxis.

On Hetao's industries: Regarding industrialisation, industries with high water demands or with high potential of water pollution are clearly not to be favoured in view of the limited water resources in the region. Therefore, the establishment of such industries is to be restricted. Existing ones are to be either phased out or be upgraded to an 'ecologically friendly' level. Hetao's demand on products from heavy industries could be met through importing those products from water-rich regions in China. It is recommended to set up a local fund of industrial water users based on the 'polluter pays' principle. Since the point source of water pollution is relatively easy to monitor and measure, contribution to the fund from individual industries should be based on the amount and degree of treatment costs. Although this scenario allows a certain degree of water pollution from industries, a limit should be preset where wastewater is deemed irreversibly degraded. Industries with expected water impact exceeding this limit are not to be set up or are to be phased out. This local fund could be integrated in ecological compensation budgets of WRT projects.

On Wuliangsu Hai: The above transition might result in some people losing their livelihoods. However, the successful restoration of Wuliangsu Hai would create new jobs in e.g. Wuliangsu Hai's fishing and most importantly eco-tourist industry. From a broader conservationist perspective, Wuliangsu Hai has the ecological and cultural potential to become a Ramsar site as a wetland of international importance. Furthermore, the general objectives of the Convention on Biological Diversity (CBD) should be fulfilled, namely conservation of biodiversity, sustainable use of its components, and fair access and benefit-sharing. In using the biological resources at Wuliangsu Hai, some minimum catch or harvest standards should be set up in order to maintain such living-funds constant. All the above goals require systematic restoration projects on the one hand, and these projects should advance public participation in the decision process alongside capacity building in dealing with environmental challenges, on the other.

On Hetao's socio-cultural aspects: It is worth noting that hydrological problems are 'wicked' problems, for which there is no 'true-false' solution but only a 'better-than' solution (Norton, 2005). It is essential within this context to take the perspectives of local stakeholders seriously. These stakeholder perspectives include water ethics as embedded in the local water culture in the contemporary times. The popular concept of ESS, put forward by the Millennium Ecosystem Assessment (MEA, 2005), includes cultural values as one of the four groups of ESS. The idea of cultural ESS is very close to eudaimonistic arguments that emphasise the role of cultural values, including traditional ones.

Traditional cultural values associated with water could be socially effective in river conservation. Therefore, values that stem from spiritual and religious traditions should find a proper role in environmental discourse even if not all rational persons will adopt such values. Without cultural and spiritual values, the anthropocentric perspective on rivers might be narrowed to purely economic consideration of efficient allocation of water as a scarce resource.

The Hetao region is inhabited by various ethnic and cultural groups. The majority Han have Confucianist/Daoist traditions. In Daoism, water is regarded as the embodiment of Dao, and the quiet character of water as the ideal state of life (Yang and Liu, 2006). Yu Mouchang (2006: 56-57), the pioneer of establishing environmental ethics as an academic discipline in China, proposes a return to concepts by ancient philosophers, like Laozi's "water is so near to the Dao", Confucius' "the wise enjoy waters, the benevolent enjoy mountains", Guanzi's "origin of all", and Zhang Zai's "humans as countrymen, non-humans as the same kind". He maintained that water and rivers as living beings is a concept rooted in traditional Chinese philosophies, which he elaborated into contemporary practices of ecological compensation, and social and environmental justice. Besides the majority Han ethnic group, Hetao has large minority groups like the Mongols and Tibetans with Buddhist traditions, and the Hui ethnic group with Islamic traditions. For example, Mongolian tradition bans practices that might pollute water in rivers, while it promotes frugal use of water (see Ge, 1997; Jiang, 2004; Ma, 2007). Plateau Tibetans worship various lakes, and hold reverence towards the Dragon God, master of water in nature (Suo, 2007). The Muslim Hui people also view water as sacred, the wasting of which is rendered unethical (Nuerman and Maxiaozhi, 2005). These local cultural traditions also play an important role in placing sustainability in the region.

All in all then, HLR within a StS framework to manage rivers, lakes and their containing freshwater has several advantages over one based on VStS (e.g. an ecocentric HLR). As shown in the above case of Hetao-Wuliangsu Hai, StS regards natural capital as a protective good instead of a holder of inherent value. It covers very well the intuition of stewardship to nature, while allowing wise and sustainable use of such natural capital. Secondly, CNCR requiring non-decline of natural capital in its physical amounts per capita over time with commitments to invest in natural capitals promotes sustainability from a comprehensive perspective that HLR presumes to be. Under CNCR, a diversified range of principles (e.g. those from Ramsar and CBD), which are internationally recognised and widely applied, can be combined to guide the praxis of reforming water policies. Borrowing from Dryzek's (1997: 14) classification of environmental discourse, our sustainability perspective is both reformist and imaginative. It gives a long-term orientation within the realm of the possible.

CONCLUSION AND OUTLOOK

Most experts will agree that river basin management needs comprehensive approaches. We believe that HLR is an inspiring example of such approaches. The case of Wuliangsu Hai in Hetao shows that the overwhelming orientation towards technical solutions focusing either on Hetao's farmlands or Wuliangsu Hai is unlikely to restore Wuliangsu Hai, and that integration of social-environmental goals from a comprehensive perspective is urgently needed. HLR entails such integration. However, our critical analysis of ecocentrism leads us to move away from such an ecocentric stance, and claim instead that HLR based on StS is a more promising way for water sustainability in the river basin.

Our overall argument has been established in the previous sections: HLR rightly points at the urgent need for environmental improvements of Chinese rivers. The HLR approach requires a reliable grounding in environmental ethics. Ecocentrism, we have argued, does not provide such sound and firm grounding. An alternative concept of strong sustainability is viable and feasible on the ground level of our case study. Given these premises, there are reasons for YRCC to replace the ecocentric ethical grounding of HLR by this alternative concept.

If our StS-approach seems viable to a part of the river, a similar approach might serve as a general framework for freshwater management in other regions of the Yellow River Basin as well as in other river basins.

ACKNOWLEDGEMENTS

We sincerely thank Yogi Hendlin for linguistic improvements, and Niels Thevs, Jan Felix Köbbing, Lieske Voget-Kleschin, and Christian Baatz for their valuable comments.

REFERENCES

- Atkinson, G.; Dubourg, R.; Hamilton, K.; Munasinghe, M.; Pearce, D. and Young, C. 1997. *Measuring sustainable development – Macroeconomics and the environment*. Cheltenham: Edward Elgar Publishing Limited.
- Bastian, O. and Steinhardt, U. 2002. *Development and perspectives of landscape ecology*. Dordrecht: Kluwer Academic Publishers.
- BCPG (Bayannur City People's Government). 2010. Wuliangshuai comprehensive treatment plan (wuliangshuai zonghe zhili guihua). Bayannur City: BCPG.
- Beckerman, W. 1995. How would you like your 'sustainability', Sir? Weak or strong? A reply to my critics. *Environmental Values* 4(2): 169-179.
- Botkin, D.B. 1992. *Discordant harmonies: A new ecology for the twenty-first century*. Oxford: Oxford University Press.
- Callicott, J.B. 1980. Animal liberation: A triangular affair. *Environmental Ethics* 11(4): 311-338.
- Callicott, J.B. 1987. The conceptual foundations of the land ethics. In Callicott, J.B. (Ed), *Companion to a sand county almanac*, pp. 186-220. Madison: University of Wisconsin Press.
- Callicott, J.B. 1995. The value of ecosystem health. *Environmental Ethics* 4(4): 345-361.
- Callicott, J.B. 1999. *Beyond the land ethics: More essays in environmental philosophy*. New York: State University of New York Press.
- Chen, E. 2007. Effect of water conservancy development in Hetao Area through the ages on the agricultural civilization and nomad civilization (shilun hetao lidai shuili kaifa dui nonggeng wenming yu youmu wenming xianghu jiaorong de yingxiang). *Journal of Hetao University (hetao daxue xuebao)* 4(3): 31-35.
- China Green Times. 1998. Take action, save the Yellow River (xingdong qilai zhenjiu huanghe). *China Green Times (zhongguo lüse shibao)*, 1 January 1998.
- Daly, H. 1996. *Beyond growth: The economics of sustainable development*. Boston: Beacon Press.
- Dobson, A. 1996. Environmental sustainabilities: An analysis and a typology. *Environmental Politics* 5(3): 401-428.
- Dryzek, J.S. 1997. *The politics of the earth: Environmental discourses*. Oxford: Oxford University Press.
- Economy, E. 2004. *The river runs black: The environmental challenge to China's future*. Ithaca: Cornell University Press.
- Ekins, P. and De Groot, R. 2003. Identifying critical natural capital. *Ecological Economics* 44(2-3): 277-292.
- Feinberg, J. and Shapiro, R. 1980. *Life beyond earth*. New York: Morrow.
- Ge, M. 1997. On the ethical outlook on the grassland ecology of the Mongols. *Journal of Inner Mongolia Normal University (Philosophy & Social Science)* 5: 1-7.
- Goodpaster, K. 1978. On being morally considerable. *The Journal of Philosophy* 75(6): 308-325.
- Hediger, W. 1999. Reconciling 'weak' and 'strong' sustainability. *International Journal of Social Economics* 26(7/8/9): 1120-1143.
- Hettinger, N. and Throop, B. 1999. Refocusing ecocentrism: De-emphasizing stability and defending wildness. *Environmental Ethics* 21(1): 3-21.

- HIAAB (Inner Mongolia Hetao Irrigation Area Administration Bureau) and BWCB (Bayannur Water Conservancy Bureau). 2010. Disappearance of the ancient Tushen Lake and protection of Wuliangshuai in the contemporary time (gudai tushenze de xiaoshi yu dangdai wuliangshuai de baohu). www.htgq.gov.cn/ajax/docshow.asp?id=2140 (accessed 15 October 2012)
- Holland, A. 1995. The use and abuse of ecological concepts in environmental ethics. *Biodiversity and Conservation* 4(8): 812-826.
- Hou, Q. and Li, X. 2009. *Ecological civilisation and river ethics (shengtai wenming yu heliu lunli)*. Zhengzhou: Yellow River Conservancy Publishing.
- Hu, J. and Ge, Yan. 2004. Water allocation and coordination systems in the Yellow River (huanghe shuiziyuan de fenpei moshi yu xietiao jizhi). *Management World (guanli shijie)* 8: 49-58; 66.
- IFOAM (International Federation of Organic Agriculture Movements). n.d. The principles of organic agriculture. Bonn: IFOAM. www.ifoam.org/about_ifoam/principles/index.html (accessed 6 August 2012)
- Ioris, A.A.R. 2012. The positioned construction of water values: Pluralism, positionality and praxis. *Environmental Values* 21(2): 143-162.
- Jamieson, D. 1995. Ecosystem health: Some preventive medicine. *Environmental Ethics* 4(4): 333-344.
- Jiang, M. 2004. On the ecological ethics in the ancient Mongolian prairie culture (gudai menggu caiyuan wenhua de shengtai lunli guannian). *Yinshan Academic Journal (yinshan xuekan)* 17(6): 41-45.
- Johnson, L.E. 1992. Toward the moral considerability of species and ecosystems. *Environmental Ethics* 14(2): 145-157.
- Johnson, L.E. 1993. *A morally deep world: An essay on moral significance and environmental ethics*. Cambridge: Cambridge University Press.
- Krebs, A. 1999. *Ethics of nature*. Berlin: Walter de Gruyter GmbH & Co. KG.
- Lerch, A. and Nutzinger, H.G. 1998. Nachhaltigkeit. Methodische Probleme der Wirtschaftsethik. *Zeitschrift für Evangelische Ethik* 42(2): 208-223.
- Li, G. 2003. *Ponderation and practice of the Yellow River control*. Zhengzhou: Yellow River Conservancy Publishing.
- Li, G. 2005. *Maintaining the healthy life of the Yellow River*. Zhengzhou: Yellow River Conservancy Publishing.
- Li, G. 2009. River ethics (heliu lunli). *China Water Resources (zhongguoshuili)* 20: 13-15;28.
- Li, G. 2010. Achievements of water right transfer in Yellow River Basin and its further developing objectives and measures (huanghe shuiquan zhuanhuan chengxiao ji jinyibu kaizhan de mubiao yu cuoshi). *China Water Resources (zhongguoshuili)* 3: 9-11.
- Li, R.; Van Beek, E. and Gijssbers, P. 2004. Integrated water resources management for the Yellow River in China: A discussion of scientific and ethical approaches. In Proceedings of the UNESCO/IAHS/IWHA symposium, pp. 150-159. Rome, Italy, December 2003. http://iahs.info/redbooks/a286/iahs_286_0150.pdf (accessed 3 October 2012)
- Ma, G. 2007. On the ecological philosophy in the Mongolian prairie culture (shixi menggu caoyuan wenhua zhong de shengtai zhexue sixiang). *Science, Technology and Dialectics (kexue jishu yu bianzhengfa)* 24(4): 20-23.
- MEA (Millenium Ecosystem Assessment). 2005. *Ecosystems and human well-being: Current state and trends assessment*, Volume No. 1. www.maweb.org/documents/document.766.aspx.pdf (accessed 12 March 2011)
- MoEP (Ministry of Environmental Protection of the People's Republic of China) and State Administration for Quality Supervision and Inspection and Quarantine (QSIC). 2002. Environmental quality standards for surface water. Beijing: MoEP and QSIC.
- MoWR (Ministry of Water Resources of the People's Republic of China). 2011. China Water Resources Bulletin 2011 (2011nian zhongguo shuiziyuan gongbao). www.mwr.gov.cn/zwzc/hygb/szygb/qgszygb/201212/P020121217531238597482.doc (accessed 16 September 2012)
- NDRC (National Development and Reform Commission of the People's Republic of China) and MoWR (Ministry of Water Resources of the People's Republic of China). 1998. Plan on annual allocation of water and plan on mainstream water regulation of the Yellow River (huanhe kegong shuiliang fenpei fangan ji ganliu shuiliang diaodu fangan. Beijing: NDRC and MoWR. Cited in Hu and Ge (2004).

- Nelson, J.L. 1995. Health and disease as 'thick' concepts in ecosystemic contexts. *Environmental Ethics* 4(4): 311-322.
- Norton, B. 1992. Epistemology and environmental value. *The Monist* 75(2): 208-226.
- Norton, B. 2005. *Sustainability: A philosophy of adaptive ecosystem management*. Chicago: The University of Chicago Press.
- Nuerman, M. and Maxiaozhi, Y. 2005. *Islamic ethics*. Beijing: Religion culture publishing (zongjiao wenhua chubanshe).
- Ott, K. 2008. A modest proposal on how to proceed in order to solve the problem of inherent moral value in nature. In Westra, L.; Bosselmann, K. and Westra, R. (Eds), *Reconciling human existence with ecological integrity*, pp. 39-59. Sterling: Earthscan.
- Ott, K.; Muraca, B. and Baatz, C. 2011. Strong sustainability as a frame for sustainability communication. In Godemann, J. and Michelsen, G. (Eds), *Sustainability communication: Interdisciplinary Perspectives and Theoretical Foundations*, pp. 13-25. Dordrecht: Springer.
- Ott, K. and Döring, R. 2008. *Theorie und Praxis starker Nachhaltigkeit*. Marburg: Metropolis-Verlag.
- Rapport, D.J.; Costanza, R. and McMichael, A.J. 1998. Assessing ecosystem health. *Trends in Ecology & Evolution* 13(10): 397-402.
- Regan, T. 2004. *The case for animal rights*. Berkeley: University of California Press.
- Sirieix, L.; Kledal, P.R. and Sulitang, T. 2011. Organic food consumers' trade-offs between local or imported conventional or organic products: a qualitative study in Shanghai. *International Journal of Consumer Studies* 35(6): 670-678.
- Steurer, R. 2001. Paradigmen der Nachhaltigkeit. *Zeitschrift für Umweltpolitik und Umweltrecht* 4: 537-566.
- Steverson, B.K. 1994. Ecocentrism and ecological modeling. *Environmental Ethics* 16(1): 71-88.
- Su, Z.; Shang, X.; Dai, F. and Lü, R. 2003. The feasible research on organic agriculture development project of Sino-German cooperation western arid area in Dengkou County (zhongde hezuo zhongguo xibu ganhan diqu dengkouxian youjinongye fanzhan xiangmu chubu yanjiu baogao). *Inner Mongolia Environmental Protection (neimenggu huanjing baohu)* 15(4): 80-83.
- Suo, D. 2007. Penetrating the ecological ethic of the plateau Tibetans from folk beliefs layer – Taking the field study in Huangnan Tibetan areas of Qianghai as an example (cong mingjian xinyang cengmian toushi gaoyuan zangzu de shengtai lunli – yi qinghai huangnan zangqu de tianye yanjiu weili). *Nationalities research in Qinghai (social sciences) (qinghai minzu yanjiu)* 18(1): 42-46.
- Taylor, P.W. 1986. *Respect for nature – A theory of environmental ethics*. Princeton: Princeton University Press.
- Westra, L. 2001. From Aldo Leopold to the Wildlands Project: The ethics of integrity. *Environmental Ethics* 23(3): 261-274.
- Wittfogel, K.A. 1931. *Wirtschaft und Gesellschaft Chinas*. Leipzig: C.L. Hirschfeld.
- Xu, Z.; Fu, Y.; Chen, L.; Sun, Y.; Zhu, T. and Li, J. 2010. *Supply and demands of water resources in the Yellow River Basin: Opportunities to save water (huangheliuyu shuiziyuan gongxu: jieshui de jiyu)*. Washington: International Food Policy Research Institute. www.ifpri.org/sites/default/files/publications/ybnote02ch.pdf (accessed 8 August 2011)
- Yang, J. and Liu, M. 2006. Philosophy of water before Qin dynasty (lun xianqin 'shui' de zhaxue yiyun). *Journal of North China Institute of Water Conservancy and Hydroelectric Power (Social Science)* 22(4): 106-109.
- Ye, P. 2009. Methodology to study a river's life (heliu shengming yanjiu de fangfalun). *The Yellow River Post (huanghe bao)*, 5 November 2009.
- YRCC (Yellow River Conservancy Commission). 2011. Yellow River Water Resources Bulletin 2011 (huanghe shuiziyuan gongbao 2011). www.yellowriver.gov.cn/other/hhgb (accessed 18 November 2012)
- Yu, F. 2004. Study on water management in Hetao Irrigation Area of Inner Mongolia (neimenggu hetaoguanqu shuiziyuan guanli wenti yanjiu). In *Proceedings of 6th Members' Congress of Ecological Economics in China and Symposium on Ecological-economic Theory and Practice (zhongguo shengtaijingji xuehui diliujie huiyuan daibiao dahui ji shengtaijingji lilun yu shijian yantaohui)*, pp. 193-202. Kunming, China, 1 October 2004.

- Yu, M. 2006. Change on water utilisation concepts and bring forth new development ideas (zhuanbian yongshui guannian chuangxin fazhan moshi). *Water Resources Development Research* 9(1): 56-59.
- Zimmerman, M. 1995. The threat of ecofascism. *Social Theory and Practice* 21(2): 207-238.

Annex: The '2007 books'

- Cai, S. 2007. *River ethics and river legislations (heliu lunli yu heliu lifa)*. Zhengzhou: Yellow River Conservancy Publishing.
- Ge, J. and Hu, Y. 2007. *Historical perspective on the Yellow River and rivers' civilization (huanghe yu heliu wenming de lishi guancha)*. Zhengzhou: Yellow River Conservancy Publishing.
- Hou, Q. and Li, X. 2007. *On rivers' healthy life (lun heliu jiankang shengming)*. Zhengzhou: Yellow River Conservancy Publishing.
- Lei, Y. 2007. *On values and ethics of rivers (heliu de jiazhi yu lunli)*. Zhengzhou: Yellow River Conservancy Publishing.
- Qiao, Q. 2007. *On rivers' cultural life (heliu de wenhua shengming)*. Zhengzhou: Yellow River Conservancy Publishing.
- Su, X.; Liu, H. and Wu, G. 2007. *The concept of nature in river ethics (heliu lunli de ziranguan jichu)*. Zhengzhou: Yellow River Conservancy Publishing.
- Ye, P. 2007. *On rivers' life (heliu shengming lun)*. Zhengzhou: Yellow River Conservancy Publishing.

THIS ARTICLE IS DISTRIBUTED UNDER THE TERMS OF THE CREATIVE COMMONS *ATTRIBUTION-NONCOMMERCIAL-SHAREALIKE* LICENSE WHICH PERMITS ANY NON COMMERCIAL USE, DISTRIBUTION, AND REPRODUCTION IN ANY MEDIUM, PROVIDED THE ORIGINAL AUTHOR(S) AND SOURCE ARE CREDITED. SEE [HTTP://CREATIVECOMMONS.ORG/LICENSES/BY-NC-SA/3.0/LEGALCODE](http://creativecommons.org/licenses/by-nc-sa/3.0/legalcode)