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Economic and Ecological Transformation Processes in East German Water Management Regimes: The Role of Property Rights and Governance Structures

CHRISTIAN SCHLEYER*
Department of Agricultural Economics and Social Sciences
Faculty of Agriculture and Horticulture, Humboldt University of Berlin, Luisenstr. 56, D-10099 Berlin
Germany

ABSTRACT / As in many fen land regions in East Germany, long-standing intensive arable farming—enabled by reclamation—has caused soil deterioration and high water runoff in the Schraden region. The more than ten years of economic and political transformation that followed the breakdown of the socialist regime has worsened the situation and even added new problems. The visible consequences are droughts in the summer, waterlogged plots in the spring, and worn-down water management facilities that operate in an uncoordinated or even unauthorized way. Given the local public-good character of some features of the fen land, the common-pool character of the ecosystem's intermittently scarce resource water, and the conflicting interests of regional stakeholders, it is argued that the reallocation of property rights over reclamation systems, together with ineffective coordination mechanisms, have caused the physical and institutional failure of the water management system and so impeded appropriate land use.

As in many fen land regions in East Germany, long-standing intensive arable farming—enabled by reclamation—has caused soil deterioration and high water runoff in the so-called Schraden, a fen land area in the south of the state of Brandenburg. The more than ten years of economic and political transformation that followed the unification of East and West Germany in 1990 has worsened the situation and even added new problems. The visible consequences are droughts in the summer, waterlogged plots in the spring, and dilapidated water management facilities operating in an uncoordinated or even unauthorized way.

This paper is based on empirical material collected within the context of the GRANO project between July 2000 and February 2002. The GRANO project was a cooperative project of research institutions from Berlin and Brandenburg. Its objective was to develop and implement approaches for sustainable agricultural production in northeast Germany, taking into account economic, sociocultural, ecological, and environmental concerns (Müller and others 2002). The activities focused on two research regions—one of them was the fen region Schraden. In this region, 12 qualitative, semistructured interviews were conducted with farmers, local environmentalists, and the regional Water Association as well as with representatives of the agricultural, environmental, and water administration at the district and state levels. Furthermore, notes taken during seven meetings of the regional Agri-Environmental Forum (AEF) between November 2000 and February 2002 were analyzed. The AEF had been initiated by the GRANO project and regularly assembles 19 regional actors to discuss options in overcoming the problematic situation of water management (Arzt and others 2002). Moreover, available planning materials, regional statistics, and other local information available for the region were consulted.

This paper aims to explore the reasons for the physical and institutional failure of the present water management system in the Schraden. More precisely, I will investigate the process of change that has led to an institutional structure that has been unable to successfully deal with the problems. In the area of resource protection and agri-environmental coordination in transition countries, institutional change can be seen as a reaction to technological, environmental, and economic change, on the one hand, and to societal and political changes, on the other (Gatzweiler and Hagedorn 2002). In order to analyze institutional change, Hagedorn and others (2002) suggest an explorative concept focusing on four groups of determinants: The first group consists of the features and implications of the transactions—such as excludability, rivalry, and complexity related to nature and the ecosystem. The

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*Author to whom correspondence should be addressed, *email:* christian_schleyer@gmx.de

second group comprises the characteristics and objectives of actors—such as the values, attitudes, and social embeddedness involved in those transactions. These two groups of determinants in turn affect the third group—namely, the design and distribution of property rights on nature attributes—as well as the fourth, which pertains to the corresponding governance structures necessary in guaranteeing the rights and duties and their use in coordinating transactions. (For a more comprehensive discussion of this framework, see Sikor in this issue.) In the paper, this analytical framework will be used to structure the empirical material and to explore the causalities that led to the physical and institutional failure of the water management system.

The paper will proceed as follows: The next section will introduce the fen region Schraden, focusing on the ecosystem's characteristics, the changes of land use, and their respective impact on the environment. The following section will center on the relevant stakeholders and their interests concerning water management in the region. Next, the changes in property rights on land and on reclamation infrastructure following unification will be described and critical aspects highlighted that greatly contributed to the failure of the water management system. The same procedure will be applied to the subsequent two sections, in which the changes of the governance system at the local and at the governmental level, respectively, will be addressed. The final section will then summarize the results of the analysis of the institutional change in the Schraden water management system and relate them to the literature on similar phenomena in other transition countries in Central and Eastern Europe.

Ecosystem Characteristics and Land Use

The Schraden fen land is a 15-km-long section of the moderately sloped Breslau-Magdeburg glacial valley located 89 m above sea level in the west and rising to 94 m above sea level in the east; it covers approximately 11,400 ha. The first reclamation measures in this former wetland were carried out in the fourteenth century and consisted of small ditches equipped with weirs. By 1755, approximately 1,850 ha were permanently being used as grasslands. Arable farming, however, was still restricted to as little as 62 ha (Dietz 1755 in Grundmann 2001, appendix B). Reclamation activities intensified in the second half of the 19th century, mainly for the extension of grassland farming in an area that was still dominated by inaccessible alder forests and swamps. Furthermore, it was intended to reduce the often-disastrous effects of seasonal floods on the villages and towns in the region and to minimize health risks associated with extensive swamps, such as malaria. Hence, the major watercourses were straightened and diked, small water arms back-filled, and extensive drainage works (ditches) built. These activities, indeed, reduced the danger of flooding substantially, but, because the water table almost immediately sank by about 1 m and because there were no more annual floods in the spring bearing fertile sediments, the grassland yields rapidly decreased. Most of these dry plots were then turned into arable land (AVP 1998). In 1920, 4,000 ha were used for arable (or dry) grassland farming, whereas the intact fen land had been irreversibly reduced to only 2,000 ha due to bog subsidence (Berger 1931).

In the 1960s and 1970s, reclamation measures reached their peak in the so-called complex melioration carried out in the German Democratic Republic (GDR). (Generally, *complex melioration* measures are all activities that lead to a sustainable increase of productivity and cultivability of areas used for agriculture or forestry (Könker 1993). This also includes [rural] road construction and land structuring. Only *hydromelioration* measures such as drainage and irrigation are being discussed in this paper. For convenience, they will be subsumed under the term *reclamation* in the remainder of the paper). Large drainage systems—mostly open ditches up to 3 m below ground, but also various forms of title drainage—were installed to lower the groundwater table. This system of ditches and channels was also equipped with weirs and pumping stations to enable irrigation by flood and even by infiltration, if necessary. By 1997, there were 330 ditches and small channels totaling approximately 300 km in length and equipped with about 170 weirs, which were able to regulate the water table within the entire Schraden.

Presently, as much as 88% of the area is used as agricultural land, 78% of which is used for arable farming. Forests cover only about 3% (AVP 1998, p. 33ff). As a consequence, the long-standing and intensive arable farming of the fen land has led to an increasing, nearly irreversible degradation of soil (e.g., bog subsidence). The soils run dry during arid periods, losing more and more fertile soil and organic matter due to wind erosion. Generally speaking, these negative effects of drainage on Brandenburg fens had already been officially observed in 1987, when Lehrkamp (1987) noted that soil degradation had caused the average yield of arable farming to fall back to the prereclamation level in some areas in the Randow-Welse-Bruch. Based on interviews with farmers and independent observations carried out in 1998, the authors of a so-called agristructural preplanning study (AVP) described a similar trend for the Schraden and concluded that continued

intensive drainage and arable farming would make agricultural land use impossible in the medium or long run (AVP 1998, p. 73f).

From an economic standpoint, the environmental problems described are strongly related to both the fact that certain components of the resource 'fen' can be regarded as a local public good and to the existence of external effects. For example, a farmer nonintensively using his (wet) grassland also "produces" a habitat that is home to diverse plants and animals typical for this type of (wet) grassland, which in turn might please visiting hikers or be valuable for biologists. On the one hand, excluding hikers or biologists from these benefits is costly, if not impossible. On the other hand, long-standing drainage and intensive arable farming of the same plot could result in external costs—or a "public *bad*"—simply by depriving future generations of their "stock of fen land." The biodiversity "produced" or retained by farming the fen land in a habitat-adapted manner might be highly valued by society. Due to its public good character, however, biodiversity cannot typically be allocated appropriately by price mechanisms on markets. Consequently, a farmer maximizing the return on his asset "fen land" might prefer arable farming and a low water table, thus reducing the biodiversity and further degrading the fen's soils.

The AVP also pointed out that degradation combined with soil compaction from the use of heavy machinery has resulted in the soil's almost complete inability to hold water; thus, a high level of water runoff will be experienced if not held in check by well-functioning and coordinated weirs (AVP 1998). For reasons explored in more detail in sections below, however, water management facilities in the Schraden are often degraded and operate in an uncoordinated way. Of 108 weirs examined more closely in 1998, 42 were found to be out of order (AVP 1998, appendix 10). The significance of this fact becomes apparent when one considers that the climatic water balance in the Schraden is negative (Landgraf 2001) and the average annual rainfall is fairly low (573–631 mm from 1951 until 1980) (AVP 1998, p. 20). As a consequence, plots with a relatively low (natural) groundwater table frequently suffer from drought periods in the summer, resulting not only in negative income effects for farmers, but also in negative environmental effects for the plants and animals that depend on a particular groundwater level. Since 1990, water-intensive crops such as potatoes have become increasingly replaced by maize and rape as well as rye and barley (Hanspach and Kissro 2001). The issue of an (at least temporary) scarcity of water enables a recasting of elements of the observed problem as a common-pool resource problem often connected with irrigation systems. Distributional issues become important, as common-pool resources have limited flows of resources and one person's use subtracts from the quantity available to others (Ostrom and others 1994). Hence, common-pool problems seem to be both "more prone to conflict spirals and less prone to solution through institutional mechanisms designed to alleviate market failure than public good problems" (Barkin and Shambaugh 1996, p. 429).

Stakeholders' Characteristics

In the GDR, one of the central objectives was the intensification of agricultural production in order to reach (national) subsistence farming targets and to subsequently export agricultural products. The logical consequence was therefore "to eliminate obstacles that slow down (agri)industrial production" (AVP 1998, p. 8f, author's translation), such as the annual flooding or waterlogging of land, and to turn wetlands often used as grassland into more productive, arable land. The reclamation infrastructure that was installed in the Schraden was designed to cover the entire area and to meet the needs of large agricultural firms farming very large plots. The relatively low number of weirs compared with the total length of the ditches (see the previous section) indicates that there was no need to regulate the water table for small plots. Indeed, there were only four large agricultural cooperatives farming the agricultural land in the Schraden by 1976 (Hanspach and Kissro 2001). As pointed out in every interview, all interests regarding the management of the reclamation system were dominated by agricultural production goals defined by the central planning system up until the unification in 1990.

The interests, however, became significantly more diverse after unification. First of all, the respective requirements primarily concerning the groundwater table of the newly restructured and reorganized agricultural firms have become quite heterogeneous and now greatly depend on farm size and location (e.g., upstream or downstream), crop structure, and economic performance. Apart from a few part-time farmers with small plots, there are 13 different agricultural enterprises—one of which is a tree nursery—with various legal forms and ownership structures predominantly farming on leased land (AVP 1998, p. 78; Hanspach and Kissro 2001). Here, farm size varies between 320 and 1,870 ha (AVP 1998, p. 102).

Secondly, interests regarding nature conservation have become much more prominent since 1990. These interests are predominantly represented by the respective environmental administrations, such as the Bran-

denburg Environmental Agency at the state level and the Lower Environmental Agency at the district level. Nongovernmental environmental associations, however, are still of lesser importance at the regional or local level. Nevertheless, it became clear during the interviews that these environmental interests are not homogenous; they have diverse aims. For some environmentalists, the dominant strategy is to bring the degradation of the fen land to a halt or even to reverse the process. This can only be achieved by sustaining very high groundwater tables all year round, making agricultural land use impossible. Another group of environmentalists aims at preserving the species and habitats typical for extensively used (wet) grassland. They demand a comparatively high groundwater table during the winter, too, but only moderate water levels during the summer, thus allowing for extensive grassland farming. In this case, a high water table sustained all year round would have negative effects on both agricultural production yields and species typical for wet grassland (Vogel 2002). Hence, the interests of agriculture and environmental protection are not necessarily diametrically opposed, but conflicts in resource use persist.

Other interest groups—such as forestry, industry, housing, construction, and transportation services—also demand "safe" groundwater tables to avoid flooding and other damage. Operators of gravel pits in this region, for example, require sufficient flood protection to make opencast mining possible, yet they also need a sufficiently high groundwater table in order to use floating excavators. In contrast, private and professional fishers prefer high water tables all year round. It therefore became clear during the interviews that agriculture and nature conservation are not the only divergent interests but are clearly the dominant and most powerful ones.

Property Rights on Land and Reclamation Systems

Apart from big landowners, whose land had been appropriated during Soviet occupation in the years before 1949, as well as some exceptional cases, land belonging to a vast majority of East German private farmers and landowners was not formally expropriated during collectivization (Peinemann 1995, Laschewski 1998); they were, however, forced to bring their assets into collectively organized production units (Swinnen and Mathijs 1997). Hence, these agricultural firms were only allocated usage rights and were integrated into the central planning system. This essentially meant that landowners had little or no influence regarding their own interests (Schüler 1991). Furthermore, formal property rights became meaningless, as land rent went unpaid. As a result, the formal ownership of land remained fragmented—almost as it was in the 1950s—while the agricultural firm structure underwent immense changes (Laschewski 1998). As can be observed in the Schraden, these changes were often linked to comprehensive land consolidation measures and extensive reclamation measures. In other words, plots that had little infrastructure were suddenly *enriched* by ditches and weirs. These assets of the newly built reclamation systems were regarded as collective property.

Shortly after unification, collectivized land in the Schraden was restituted to the legal owners, who received full property rights. This step revived the fragmented land ownership structure. Most of the new/old landowners quickly leased their land to the newly restructured and reorganized cooperatives; these are now joint stock companies, limited liability companies, or producer cooperatives. In 1994, the Brandenburg Water Act (BbgWG) finally replaced the GDR Water Act, formally reorganizing the responsibilities and rights for rivers, channels, and ditches and dividing them into two categories. Only those bodies of water belonging to the (new) first category were declared state property and thus the responsibility of Brandenburg. As regards the reclamation infrastructure in the Schraden, only a few of the former main ditches now belonged to this first category. That which remained—i.e., all open waters of the second category, including the weirs—were to become legal property of the owners of the bordering properties.

The remainder of this section highlights two critical aspects of the property right reallocation process that greatly contributed to the water management system's continued failure.

Legal Insecurities

The future legal status of the reclamation system—and hence the rights and responsibilities for maintenance and operation—were unclear following unification. The Brandenburg Water Act was introduced in 1994 but did not solve the problem. The reasons were manifold: First, the related Federal Law on Melioration Plants (MeAnlG) of 1994 explicitly ruled only on the property rights of *drainage* works at waters of the second category, which now belonged to the respective landowners whose property bordered on these open waters. Most weirs, however, were intended and built for *irrigation* use not covered by this clause (Pollack 1991). The same law determined that the ownership of these *irrigation* works should only be turned over to the landowners in the year 2000. Second, as the interview with

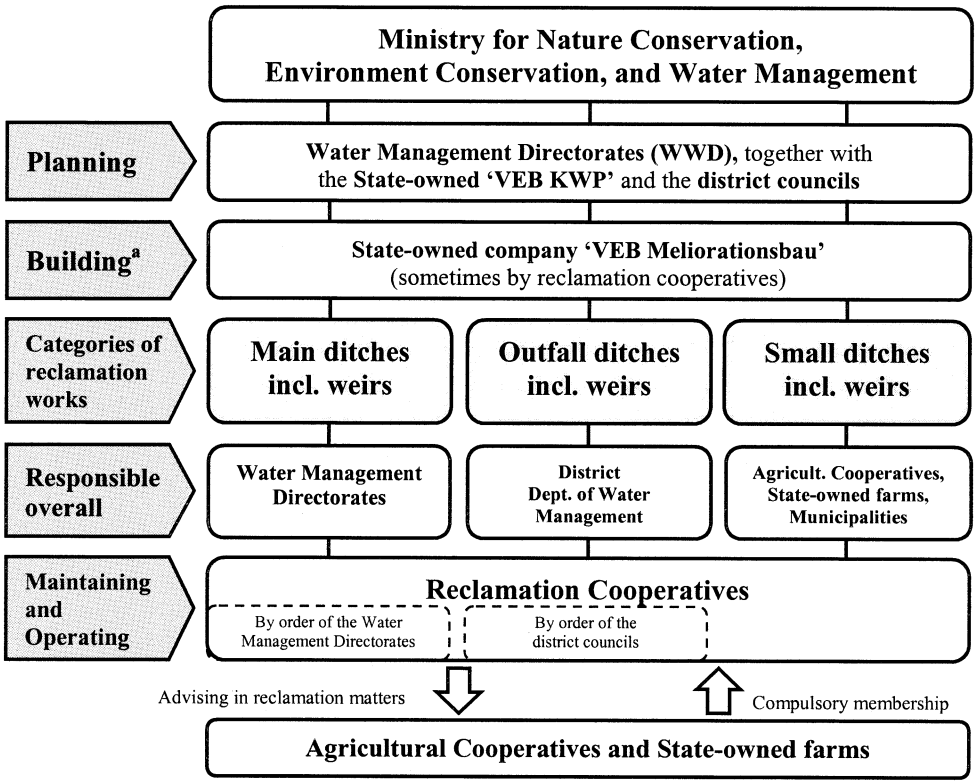

Figure 1. Allocation of responsibilities with regard to reclamation systems in the GDR.

a representative of the Lower Water Agency revealed, water authorities are as yet unable to enforce the related duties and responsibilities, because landowners cannot be held legally responsible for assets found on their land—such as ditches or weirs—that they neither wanted nor built. Here, the issue of "successors in interest" to the organizations and administrative authorities once responsible for the reclamation infrastructure before 1990 was and still is unresolved.

Fragmented Land Ownership and Leasehold

After the restitution of land in the Schraden, the majority of owners decided to lease their land to the new agricultural enterprises instead of starting their own farming business or using the land for other purposes. According to the statements of interviewed tenants, most landowners do not know about the reclamation works on their land or are not aware of the related (legal) rights and duties. What is more, many owners no longer live in the region, have nothing to do with the farming business, and own only very small plots. There are also cases in which the owners are not known, cannot be found, or ownership is legally disputed. In all cases, however, the owner of a section of the reclamation infrastructure, such as a weir, would have to explicitly agree to any maintenance or operating measures to be carried out. Otherwise, the activity would be regarded as illegal. Only recently have most new or renewed lease contracts contained some clause transferring all rights and duties related to the reclamation works to the tenant for the time of the lease.

Governance Systems: The Local Level

As stated above, the reclamation works that were built in the GDR in the 1960s and 1970s were regarded as collective property. Nevertheless, firm responsibilities and rights for specific system categories—rather than formal property rights—had been allocated to different organizations and administrative levels, as outlined in Figure 1. Figure 1 shows that planning, building and, in part, financing responsibilities were predominantly aggregated at administrative levels above the local. In contrast, most of the maintenance and operation activities were delegated to local reclamation cooperatives with compulsory membership for all agri-

cultural firms. As members of the reclamation cooperative and with the support of the water management directorates (WWD) and the departments of water management at the district level, these large-unit firms could easily provide the necessary technical infrastructure, human resources, and financial means to maintain and operate the lion's share of the infrastructure. Increasing agricultural production was the overriding goal defined by the central planning system and was binding for all firms alike. In addition, a well-functioning reclamation infrastructure safeguarded high production yields. As a result, the interests among firms regarding maintenance and operation were rather homogeneous. Coordination of such activities was also facilitated by the large size of the production units. As stated time and again in interviews, local actors perceived this structure as operating smoothly.

After 1990, the large agricultural cooperatives at the local level disintegrated into smaller and more focused enterprises with different legal forms and ownership structures (Wiegand 1994, Laschewski 1998). Consequently, the reclamation cooperatives—interfirm organizations of enterprises that began competing directly on the market—were soon dissolved without substitutes. In order to ensure the necessary water runoff and to avoid damage by floods or a high groundwater table, the maintenance and cleaning duties of second category ditches were formally assigned to the regional water associations in 1995. These water associations had been established shortly after the unification. The Kleine Elster-Pulsnitz Water Association is responsible for the Schraden area and is supervised by the Brandenburg Environmental Agency. Membership in the associations is compulsory for all municipalities representing those landowners subject to land rates. As interviews with farmers confirmed, the tenants effectively pay the membership fee as an implicit part of the rent. Other beneficiaries (e.g., railway companies) can be voluntary members.

Financial Limitations

Like other water associations in Brandenburg, the activities of the regional Kleine Elster-Pulsnitz Water Association are financed solely by membership fees, as there are no regular subsidies from the state. Representatives of the water association stated that the available funds are only sufficient for the compulsory tasks—i.e., maintaining and cleaning the ditches. Noncompulsory measures, such as maintaining or operating the weirs, are only carried out occasionally and if auxiliary funds are available. Means to mitigate the problem include state support programs, which can be used for project-related maintenance tasks but not for basic operating costs. Some programs, however, require water associations to match this funding with up to 50% of their own funds. Here again, the scarce capital resources of water associations are stated as the limiting factor.

Solidarity Principle

Another way to ease water associations' financial limitations would be to increase membership fees in order to make the care of the weirs financially "profitable" as well. Interviews, however, indicate that contributors perceive these fees as high for the region, and a further increase seems politically unacceptable. This is especially true since membership fees do not correspond to the actual distribution of benefits from the association's activities. While the Federal Water Associations Act (WVG) allows for this differentiation, a solidarity principle was adopted for the Brandenburg Water Act; in other words, the membership fees can only be proportionate to land size.

Governance Systems: Governmental Organizations

In 1994 the Brandenburg Water Act established a new administrative structure for water management and planning, which follows the example of the former West German states and emphasizes self-government at the communal level. Figure 2 gives a brief overview of the various administrative layers of water authorities and water agencies in Brandenburg in relation to the district Elbe-Elster, where the Schraden is situated.

Complete Restructuring

In interviews with representatives from the Lower Water Agency in the Elbe-Elster district, restructuring was described as a drastic, complete, and bumpy process. Almost all relations among the various levels of the newly established water authorities had to be rebuilt from scratch. This process has not yet been completed and still reduces interauthority communication to the absolute minimum. Interviewees described the process of long-standing and new civil servants acquiring competency with newly established laws and rules and exploring new space for maneuvering as time and energy consuming. The same holds true for the relations among the water authorities and water users, water associations, interest groups, other administrative agencies, the municipalities, and the general public.

Transboundary Interrelations

The aspect highlighted in the previous paragraph was certainly exacerbated by the fact that the restruc-

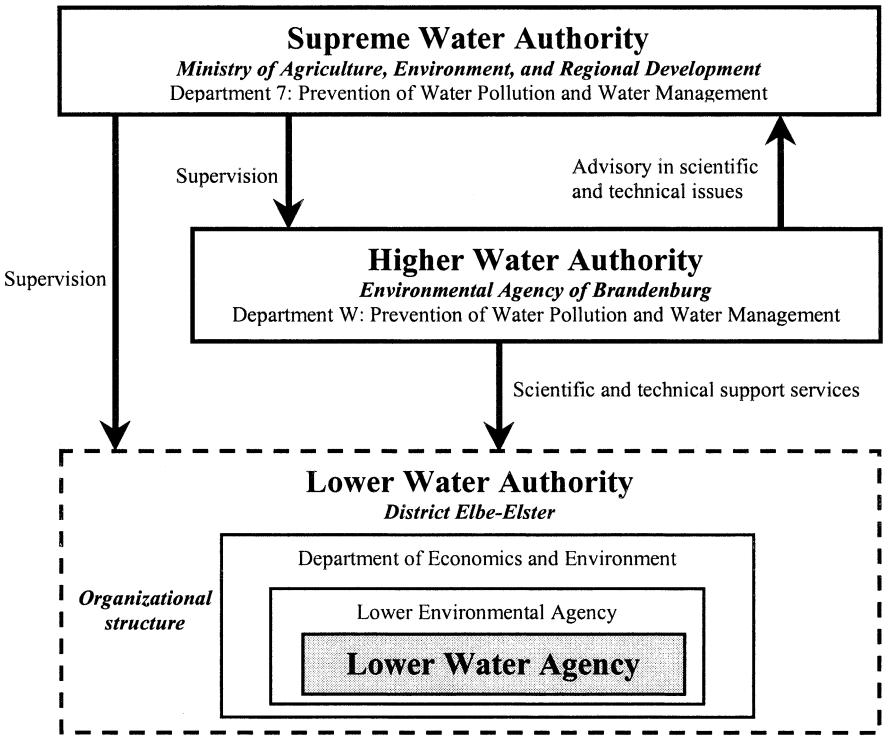

Figure 2 Administrative layers of Brandenburg's water authorities and water agencies in relation to the district Elbe-Elster.

turing followed completely new political and administrative borders. What is more, one might suspect that this impedes or even hinders the efficient and coordinated handling of a complex, transboundary biophysical system like the landscape water regime. Then again, one should not underestimate the implications of introducing or strengthening river basin management for existing institutional configurations and organizational structures (Göhler 1997; for a general discussion on problems of fit and problems of interplay, see Moss 2001). In fact, the water regime of the Schraden is greatly determined by the water inflow from the neighboring district Oberspreewald-Lausitz as well as from the state of Saxony. Interviews with the Lower Water Agency, however, revealed that there are almost no joint activities, informational exchanges, or coordination meetings among the respective water authorities.

Organizational Subordination

As shown in Figure 2, the Lower Water Authority operates at the district level. Hence, nearly all decisions related to water management are made from the viewpoint of the district as a whole; in other words, this field's eventual decision-making power rests with the (political) head of the district administration. The Lower Water Agency, which is responsible for the practical work and professional input, is organizationally subordinate to the district's Lower Environmental Agency, which is in turn subordinate to the district's Department of Economics and Environment. With regard to statements made by the Lower Water Agency, this organizational structure is somewhat delicate in its conduciveness to executive decisions that are politically opportunistic rather than purely professional. This also holds true in the choice of key issues, thus largely reflecting political priorities. Accordingly, it was presumed that this constellation might have contributed to the water authorities' prioritizing of "more urgent" issues, such as improving the public wastewater disposal system and ensuring the public water supply, which would have required substantial financial, human, and technical resources.

Water Management Plans

Water management (framework) plans based on hydrological analysis are a necessary prerequisite for actively and efficiently shaping and regulating complex water management systems, which ideally integrate the interests of all water users. The Federal Water Management Act (WHG) takes this into account in requiring a state's supreme water authority to provide such plans for all river basins. In Brandenburg, however, there are few drafts for water management framework plans, even fewer drafts for detailed water management plans, and no drafts available in the case of the Schraden. The water authorities inevitably react rather incidentally to

the acute problems or demands of interest groups, other agencies, or the public. This is certainly fostered by the fact that only the main canals or ditches are equipped with devices to measure the water table. Reliable monitoring and sanctioning is thus nearly impossible.

Summary and Conclusions

This paper has attempted to illustrate the reasons behind the failure of the present water management system in the Schraden. More precisely, the process of change that has resulted in an institutional structure unequipped to successfully deal with the problems was investigated. Intensive arable farming and reclamation measures undertaken decades ago have led to the soil's deterioration and its increasing inability to hold water. Existing weirs, however, cannot prevent the resulting high water runoff; more often than not they are degraded and operated in an uncoordinated manner. Given the local public good character of some features of the fen land, the common-pool character of the intermittently scarce resource water within the ecosystem, and the conflicting interests of regional stakeholders, it has been argued that the reallocation of property rights over reclamation systems, together with ineffective coordination mechanisms, have caused the physical and institutional failure of the water management system and thus impeded appropriate land use. More precisely, the combination of legal uncertainty accompanied by enforcement problems, fragmented land ownership structure, and a high number of short-term lease contracts has reduced the incentives for the majority of farmers to maintain the reclamation works. Due to limited statutory rights in conjunction with limited funds, the present water association appears to be an inadequate local coordination mechanism. Furthermore, the complete and time-intensive restructuring process at all levels of water administration has resulted in cumbersome or even nonexistent interrelations between various governmental layers as well as in rare transboundary contacts. A lack of water management plans and the organizational subordination of the Lower Water Authority also impede effective administrative work.

Severe environmental problems caused by reclamation measures—such as drainage and irrigation—have also been observed in numerous other countries. They "are not solely restricted to increasing pollution or loss of habitat for native plants and animals; they cover the entire range of environmental components, such as soil, water, air, energy, and the socioeconomic system." Some of those measures even "threaten the long-term productivity of the irrigation and drainage projects themselves, as well as the natural resource base" (FAO 1995, p. iii). In particular, drainage can be seen as a "source of cumulative [environmental] effects because of its temporally repetitive and spatially expansive nature" (Spaling and Smit 1995, p. 99). Some of the environmental effects, however, are more indirect. In many cases, reclamation measures only enable intensive, arable land use—e.g., on former fen lands, wetlands, etc.—accompanied by soil erosion, soil compaction, pollution with nitrates and pesticides, often monotonous field structures, and a loss of biodiversity (Turnock 1998). These effects are especially severe in transition countries, where successes in agriculture are often based on the "plundering of natural resources" (Turnock 1998, p. 385).

The second and third sections highlighted the local public good character of some features of the fen land, the common-pool character of the intermittently scarce resource water in the highly complex and dynamic ecosystem, and the prevalent conflicts among large numbers of regional stakeholders. In view of these characteristics of transactions and actors, there is extensive literature suggesting that those governance structures could be preferable solutions that include some form of local cooperation and participation (e.g., Hanna 1995, Hanna and others 1996, Hagedorn 2002, Knox and others 2001, Ostrom 1998, OECD 1998, Vermillion 1999). Indeed, the aforementioned Agri-Environmental Forum (AEF)—essentially a "round table" initiated by the GRANO project in the Schraden—can be seen as a step in this direction with encouraging initial results. So far, the participating regional stakeholders have developed and agreed on a broad concept, which includes concrete measures such as weir repairs or changes in land use, to improve the water retention in the region (Arzt and others 2002).

Indeed, such cooperative forms of local governance are badly needed in the case of water management systems in Central and Eastern European transition countries. Here, as in the Schraden case, the reclamation infrastructure had been designed to serve large collective farms, whose production goals were determined by the central planning system. After the breakdown of the socialist regimes, property rights on land were privatized or restituted (i.e., made effective), thus resulting in or revitalizing highly fragmented land ownership. The transition process has also resulted in substantially smaller agricultural production units with heterogeneous interests, different production portfolios, and economic potential. Not surprisingly, the technical infrastructure cannot be adapted easily—if at all—to such structural changes. The problem of low exclud-

ability—common with local public goods and common-pool resources—is consequently aggravated. Thus, the incentives of individual (small) landowners or farmers to maintain and operate their parts of the infrastructure are very weak since *private* investments would most certainly result in *public* benefits. This also holds true in the case of clearly defined private property rights. As Penov shows for Bulgarian irrigation systems (Penov 2002 and in this issue, see also Theesfeld 2001, 2002) and Busmanis (2001) for drainage systems in Latvia, no appropriate forms of (local) governance have yet been developed to deal with these problems. Thus, local irrigation canals and local drainage ditches have not been maintained for years and are now dilapidated.

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References

Arzt, K., E. Baranek, C. Berg, K. Hagedorn, J. Lepinat, K. Müller, U. Peters, T. Schatz, R. Schmidt, J. Schuler, and I. Volkmann. 2002. Dezentrale Bewertungs-und Koordinationsmechanismen *in* . Pages 29–96 *in* K. Müller, V. Toussaint, H.-R. Bork, K. Hagedorn, J. Kern, U. J. Nagel, J. Peters, R. Schmidt, T. Weith, A. Werner, A. Dosch, and A. Piorr. Eds, Nachhaltigkeit und Landschaftsnutzung: Neue Wege kooperativen Handelns. Margraf-Verlag, Weikersheim.

AVP. 1998. Agrarstrukturelle Vorplanung Wasserbewirtschaftungskonzept Schraden (Entwurf). Planungsbüro für Natur und Siedlung Lindenau/ PL3 Planungsbüro für ländliche Regionalentwicklung Berlin. Im Auftrag des Ministeriums für Ernährung, Landwirtschaft und Forsten vertreten durch das Amt für Flurneuordnung und ländliche Entwicklung Luckau, 150 pp.

Barkin, J. S., and G. E. Shambaugh. 1996. Common-pool resources and international environmental politics. *Journal of Environmental Politics* 5:429–447.

Berger, S. 1931. Landeskultur und Provinzialverband. Denkschrift des Landeshauptmanns der Provinz Sachsen, Merseburg 264.

Busmanis, P., A. Zobena, I. Grinfelde, and I. Dzalbe. 2001. Privatisation and Soil Drainage. *in* . Pages 117–121 *in* F. Gatzweiler, K. Hagedorn, and R. Judis. Eds, Sustainable agriculture in Central and Eastern European countries: the environmental effects of transition and needs for change. Proceedings of the ACE Phare Seminar. Shaker Verlag, Aachen.

FAO (Food and Agriculture Organization). 1995. Environmental impact assessment of irrigation and drainage projects. Irrigation and Drainage Paper 53. FAO, Rome, 74 pp.

Gatzweiler, F., and K. Hagedorn. 2002. The evolution of institutions of sustainability in transition. *in* . Pages 3–16 *in* F. Gatzweiler, K. Hagedorn, and R. Judis. Eds, Sustainable agriculture in Central and Eastern European countries: the environmental effects of transition and needs for change. Proceedings of the ACE Phare Seminar. Shaker Verlag, Aachen.

Göhler, G. 1997. Wie verändern sich Institutionen? Revolutionärer und schleichender Institutionenwandel. *in* . Pages 21–56 *in* G. Göhler Eds, Institutionenwandel. Westdeutscher Verlag, Opladen.

Grundmann, L. 2001. Der Schraden: Eine landeskundliche Bestandsaufnahme im Raum Elsterwerda, Lauchhammer und Ortrand. Böhlau Verlag GmbH & Cie., Köln 310.

Hagedorn, K. (2002) *Co-operative arrangements to cope with agri-environmental problems.* Edward Elgar, Cheltenham, UK, pp 385.

Hagedorn, K., K. Arzt, and U. Peters. 2002. Institutional Arrangements for Environmental Co-operatives: a Conceptual Framework.*in* . Pages 3–25 *in* K. Hagedorn Eds, Co-operative arrangements to cope with agri-environmental problemsr. Edward Elgar, Cheltenham, UK.

Hanna, S. 1995. Efficiencies of User Participation in Natural Resource Management *in* . Pages 59–68 *in* S. Hanna, and M. Munasinghe. Eds, Property rights and the environment: social and ecological issues. World Bank, Washington, DC.

Hanna, S., C. Folke, and K.-G. Mäler. 1996. Rights to nature. Island Press, Washington DC 313.

Hanspach, D., and R. Kissro. 2001. Gebietsstruktur und Landnutzung.*in* . Pages 48–60 *in* L. Grundmann Eds, Der Schraden: Eine landeskundliche Bestandsaufnahme im Raum Elsterwerda, Lauchhammer und Ortrand. Böhlau Verlag GmbH & Cie., Köln.

Knox, A., Swallow B. and Johnson. N. 2001. Conceptual and methodological lessons for improving watershed management and research. CAPRI Policy Brief 3. IFPRI, Washington, DC, 4 pp.

Könker, H. 1993. Neue Aufgaben für das Meliorationswesen in den neuen Bundesländern. *Zeitschrift für Kulturtechnik und Landentwicklung* 34:147–156.

Landgraf, L. 2001. Chancen für den Landschaftswasserhaushalt in Brandenburg. Pages 205–223 *in* . . Eds, Proceedings of the Berlin Interdisziplinäre Fachtagung Nachhaltige Entwicklung in der Wasserwirtschaft - Konzepte, Planung und Entscheidungsfindung, 27–28 June 2001. Berlin. Schriftenreihe Wasserforschung 7. Wasserforschung e.V. Interdisziplinärer Forschungsverbund, Berlin.

Laschewski, L. 1998. Von der LPG zur Agrargenossenschaft:

Untersuchungen zur Transformation genossenschaftlich organisierter Agrarunternehmen in Ostdeutschland. Ed. Sigma, Berlin 208.

Lehrkamp, H., 1987. Die Auswirkungen der Meliorationen auf die Bodenentwicklung im Randow-Welse-Bruch. Dissertation. Humboldt-Universität zu Berlin, Berlin, 99 pp.

Moss, T. 2001. Solving problems of 'fit' at the expense of problems of 'interplay'? The spatial reorganisation of water management following the EU water framework directive (draft). Published by the Institute for Regional Development and Structural Planning, Erkner. Available at http://www.irs-net.de/download/workpaper3.pdf. . .:.

Müller, K., V. Toussaint, H.-R. Bork, K. Hagedorn, J. Kern, U. J. Nagel, J. Peters, R. Schmidt, T. Weith, A. Werner, A. Dosch, and A. Piorr. 2002. Nachhaltigkeit und Landschaftsnutzung—Neue Wege kooperativen Handelns. Margraf-Verlag, Weikersheim 410.

OECD 1998. Co-operative approaches to sustainable agriculture. OECD, Paris.

Ostrom, E. 1998. The Institutional Analysis and Development Approach. *in* . Pages 68–90 *in* E. Tusak-Loehman, and D. M. Kilgour. Eds, Designing Institutions for Environmental and Resource Management. Edward Elgar, Cheltenham, UK.

Ostrom, E., R. Gardner, and J. Walker. 1994. Rules, games, and common-pool resources. The University of Michigan Press, Ann Arbor 369.

Peinemann, B. 1995. Rechtsprobleme in der Praxis der Privatisierung ehemals volkseigenen landwirtschaftlich genutzten Grund und Bodens. *Agrarrecht* 25:225–232.

Penov, I. 2002. Irrigation and Water Usage in Bulgaria during Transition. *in* . Pages 123–127 *in* F. Gatzweiler, K. Hagedorn, and R. Judis. Eds, Sustainable agriculture in Central and Eastern European countries: the environmental effects of transition and needs for change. Proceedings of the ACE Phare Seminar. Shaker Verlag, Aachen.

Pollack, P. 1991. Entwicklung und Stand des Meliorationswesens in den fünf neuen Bundesländern. Köllen Druck + Verlag GmbH, Bonn, 29 pp.

Schüler, R. 1991. Zur Entwicklung des landwirtschaftlichen Bodenrechts der ehemaligen DDR beim Übergang zur sozialen Marktwirtschaft. *Agrarrecht* 21:34–38.

Spaling, H., and B. Smit. 1995. A conceptual model of cumulative environmental effects of agricultural land drainage. *Agriculture, Ecosystems and Environment* 53:99–108.

Swinnen, J. F. M., and E. Mathijs. 1997. Agricultural Privatisation, Land Reform and Farm Restructuring in Central and Eastern Europe: a comparative analysis. *in* . Pages 333–373 *in* J. F. M. Swinnen, A. Buckwell, and E. Mathijs. Eds, Agricultural privatisation, land reform and farm restructuring in Central and Eastern Europe. Ashgate, Aldershot, UK.

Theesfeld, I. 2001. Constraints for collective action in Bulgaria irrigation sector. CEESA Discussion Paper No. 5/2001.

Theesfeld, I. 2002. Constraints on collective action in Bulgaria's irrigation sector—empirical results from the village of Varbiza. *in* . Pages 169–174 *in* F. Gatzweiler, K. Hagedorn, and R. Judis. Eds, Sustainable agriculture in Central and Eastern European countries: the environmental effects of transition and needs for change. Proceedings of the ACE Phare Seminar. Shaker Verlag, Aachen.

Turnock, D. 1998. Privatization in rural Eastern Europe. The process of restitution and restructuring. Edward Elgar, Cheltenham, UK 427.

Vermillion, D. L. 1999. Property rights and collective action in the devolution of irrigation systems management. Pages 183–219 *in* . . Eds, Proceedings of the international conference on collective action, property rights and devolution of natural resource management—exchange of knowledge and implications for policy. 21–25 June 1999. Puerto Azul, The Philippines.

Vogel, T. 2002. Nutzung und Schutz von Niedermooren. Empirische Untersuchung und ökonomische Bewertung für Brandenburg und Mecklenburg-Vorpommern. Der Andere Verlag, Osnabrück 196.

Wiegand, S. 1994. Landwirtschaft in den neuen Bundesländern—Struktur, Probleme und zukünftige Entwicklung. Vauk, Kiel 248.