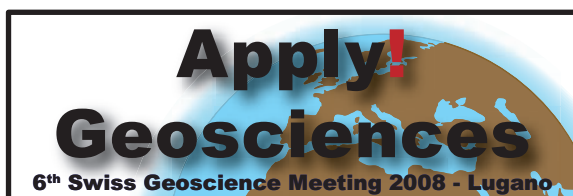




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# 11. Who Cares About Water? - Social Aspects of Water + Environmental Challenges of Border Regions

Walter Leimgruber, Patricia Felber + Doris Wastl-Walter, Béla Filep

*Swiss Geography Association*

*IGU Commission Geography and Public Policy*

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## 11.1

### Consuming mountain space

Environmental costs of urban sprawl in the French-Swiss Jura.

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The Jura mountain offers geomorphologic continuity on both sides of the border between France and Switzerland: a region characterized by rigorous winters, formerly in a relative isolation due to difficulties of transportation across the mountain relief pleats. The borderline is placed along the crest line of the Jura in the South near Pontarlier, then runs North-East along the Doubs river towards Basel.

The recent growth of the watch industry transforms today the border zone into urban centres in Switzerland, and suburbs in the still-rural France. The cost of life and land is lower in France, and the Swiss salaries higher: therefore more and more employees of firms in Switzerland tend to reside in France, increasing the land pressure. According to the Observatoire Statistique Transfrontalier de l'Arc Jurassien, the number of border zone workers has increased of 55% between 1998 and 2005: the French region, dominated economically by its Swiss mirror (Moine, 2003), welcomes more and more new residents, progressively transforming for this purpose farmland into suburbia.

Thus the French Law (Code de l'Urbanisme and Code de l'Environnement) has a series of instruments to limit or even stop the space consumption: there are laws, so-called "lois paysage", to avoid urban scattering, urban sprawl, and preserve the quality of town entrances. Additionally to this main protective frame, special features apply to places recognized for their natural or cultural value, in reference to the notion of heritage: loi montagne, loi littoral, loi de 1930 (sites classés et inscrits), Grands Sites, Unesco, Directives de Paysage, ZPPAUP, ZICO, Natura 2000, ZNIEFF, etc.

In spite of these laws, when pressure is put on the land as here on the border, housing developments multiply rapidly, spreading with similar design and organization regardless of the land's particularities. The low density housing answers the quantitative needs: the demand of private housing meets local political wish of population expansion and economical trans-border opportunity.

In this centralized country that is France, legislative frames are formalized in Paris and then applied in all scales of the national, regional, departemental, communal and then individual (private) level.

A few examples can illustrate differences between the legislator's wish and the result on the field: environmental diagnostics are minimized at the scale of the commune (Plans Locaux d'Urbanisme); urban coherence and adaptation to the ground are absent of housing developments, as well as architecture adequate to the local particularities; landscape integration is neglected almost completely for individual constructions (Permis de Construire).

The environmental costs are of several levels, deriving from space consumption of individual houses in the middle of a gardened parcel. The quantitative level includes energy and primary goods consumption (building the houses and the numerous asphalt roads leading to them, heating and maintenance), water flow acceleration (direct consequence of wide asphalt roads and driveways in mountain areas) or subsidence (topography issues appear when building). The qualitative level is one of preservation of landscape and heritage coherence: it calls for a planning that is larger than the communal level, one that can include both urban centre and rural edges.

The border is so far preventing such an organization: structures authority stop at the borderline, regardless of the evident trans-border logics.

One site, though, offers an alternative to the main pattern: an exceptional natural landscape, visible and accessible from both countries. Identified by both countries as worth protecting, it has brought the French authorities to develop a visiting facility according to national design orientations. Now the Swiss counterpart is engaging into the same process. Although placed directly on the borderline and therefore split into two sets of development codes, this particular place will nevertheless stay one coherent entity.

We propose to discuss the issues of space consumption of low density housing, land pressure and historical landscape, in this case of French-Swiss rural border, with the orientation of town and country planning.

Relationship between sold plots and number of border zone workers.

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Observatoire Statistique Transfrontalier de l'Arc Jurassien: <http://www.ostaj.org/>

## 11.2

### Domestic water as means of masculine domination. An analysis from the High Atlas Mountains

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The domestication of water in the sense of taming and controlling the supply of drinking water on the one hand and making water available at the domicile on the other hand, represents progress to many rural Moroccan households. Especially women do benefit of the new facilities by saving them many efforts of fetching water outside the village. But this undeniable technical improvement for rural areas can also be analyzed in the light of the re-islamization of society and profound social change as a means for men to reify their domination in a context of threatened masculinity. This paper will show, following Bourdieu's and Baudrillard's early works, the political and symbolic logics and meanings which are lying underneath the modernization of rural water supply emphasizing the dialectical relationship between evolving waterscapes and dynamic gender relations.

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## 11.3

### Increasing sustainability of irrigated urban agriculture in southern countries by Participatory Education and Action Research (PEAR) among small producers: case study of Dakar, Senegal

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Urban agriculture in Senegal, as in most developing countries, relies on extremely vulnerable small production units. In the region of Dakar (Fig. 1), the lack of access to adequate water for drinking and irrigation, poor soil fertility and invasive pests, lead to the use of unauthorized fertilizers and pesticides (Fig. 2, Tab. 1): Using untreated waste water for irrigation and excessive pesticide spraying are widespread practices. A participatory education and action research (PEAR) - type process within an ecosystem health framework has been used to investigate different positions of stakeholders and especially the producer issues. Several individual inquiries upon 50 producers revealed the different agricultural practices and the producer perceptions of environment and health before (March 2005) and after educational sessions (March 2006). Results show (Tab. 1 and 2): 1) extremely various agricultural practices (irrigation with waste water or saline ground water, fertilizer and pesticide use) depending mostly on short term decisions, based on financial and market availabilities; 2) low perception of long term soil fertility management and of health impacts associated with pesticide and waste water exposure 3) after interactive workshops and training, significant increase of health risk perception has been observed, marked e.g. by the use of protective equipment when treating with pesticides. The PEAR approach has been shown to be effective. However, several barriers still exist, such as security of land tenure, access to credit, fear related to decrease in productivity, lack of training and information in the use of alternatives to chemical agriculture. Regular workshops will certainly help to reach sustainability.

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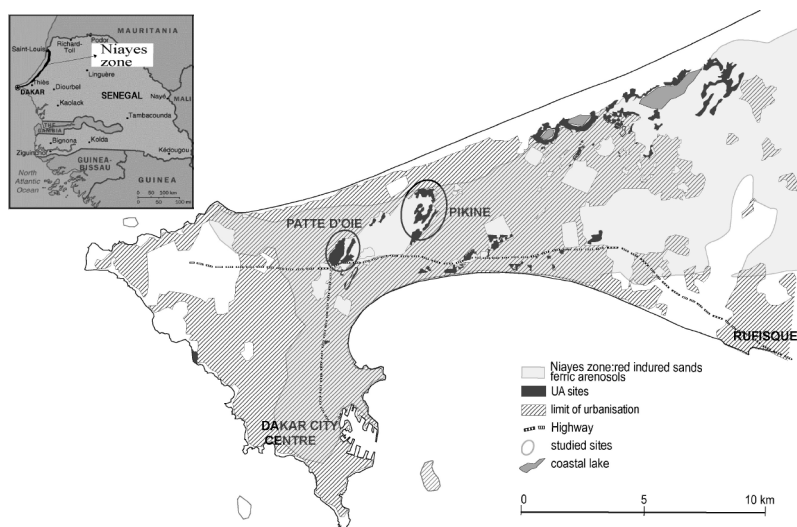


Fig.1. Main areas of urban agriculture in the region of Dakar

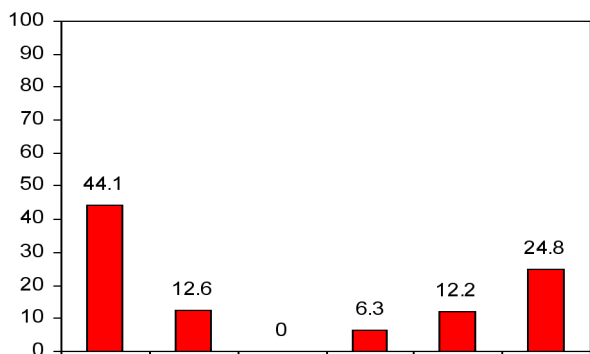


Fig.2. Frequency of pesticides application (%)

Pesticide used	March 2005 N=50	March 2006 N=49
Dimethoate (organophosphorus), II	48 % (24/50)	47 % (23/49)
Dicofol (organochlorine), III	42% (21/50)	29 % (14/49)
Lanate (methomyl, carbamate) IB	40 % (20/50)	29 % (14/49)
Malathion (carborox, carbofos, organochlorine) III	44 % (22/40)	33 % (16/49)
Mocap (ethoprophos)	28 % (14/50)	22 % (11/49)

WHO Hazard Classification: IA-extremely dangerous, IB-highly hazardous,

II-moderately hazardous, III-slightly hazardous,

Tab.1. Change in frequency of pesticide used

Other Methods of Pest Control than Chemical	March 2005 (n=50)	March 2006 (n=49)
Yes	16 % (8/50)	39 % (19/49)
No	82 % (41/50)	31 % (15/49)
sometimes	-	20 % (10/49)
No response	2.0 % (10/49)	10 % (5/49)

Tab.2. Change in the use of alternative methods of pest control

## 11.4

# Nitrogen leaching in groundwater from periurban agrosystems in Senegal: is fertilization contributing to the high nitrate groundwater contamination?

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Urban Agriculture (UA) can be considered as a border- somehow contentious- region, as urban and rural activities and issues are mixed without regulation. In Dakar, the UA area constitutes the only green belt and provides important fresh food and employment, but it is often perceived as an important source of nitrates, pesticides and pathogenic bacteria and parasite contamination in the environment and foodstuffs. Without integration in urban planification, UA might be banished and transformed in densely inhabited zones. Periurban districts are not equipped with adequate sanitation facilities and therefore contribute to the shallow groundwater contamination in nitrogen, organic matter (Tandia 2000; Becaye, Mbeguere et al. 2005) and possibly in microbial pathogens (Ndiaye 2008). This study deals with the contribution of periurban agriculture to nitrate groundwater contamination and will allow a better comprehension of the nitrogen cycle in UA and fertilizer management.

Several methods were used: 1) The N-balance were calculated with an input and output estimation, based on inquiries about fertilizer use and rotation management, yield data and nutrient analyses. 2) Nitrates from groundwater at dry/rainy season have been sampled in 25 piezometers and wells inside the UA sites and in surrounding townships and analysed with ionic chromatography. 3) The N-leaching rate were simulated with models as a function of soil and crop management characteristics (soil temperature, moisture content, organic matter, texture, bulk density, fertilization, irrigation, crop rotations). 4) Nitrogen and oxygen isotopes in  $\text{NO}_3$  from groundwater are measured to determine the origin of nitrates, according to the method of Silva, Kendall et al. (2000). Specific signatures of mineral fertilizers, manure and sanitation sludge can be distinguished (Shomar, Osenbruck et al. 2008).

Inquiries of 53 smallholders in October 2005 permitted to estimate Nitrogen inputs into the agrosystem of  $5 \text{ t N ha}^{-1} \text{ y}^{-1}$  (Tab.1). Groundwater surveys in October 2006 and March 2007 show extremely high contents in nitrates, up to several hundreds mg/L (WHO guideline of 50mg/L for drinking water). More important concentrations are found during the dry season (mean 248 mg/L) than the rainy season (mean 156mg/L). Fig. 1 shows the data from two piezometers sampled before and shortly after N-P-K mineral fertilization (250 kg/ha) on ferric arenosol (hydraulic conductivity:  $1.1 \text{ m s}^{-1}$ , measured with double ring infiltrometer).  $\text{NO}_3$ -leaching at 4m depth, in the groundwater, is not immediate.  $\delta^{15}\text{N-NO}_3$  from selected piezometer in October 2006 and February 2007 are in the range +8 to +35‰ (Fig.2) and indicate a major organic origin of N in the township samples. Sludges from septic tanks and animal manure have similar  $\delta^{15}\text{N}$  signature, but  $\delta^{18}\text{O-NO}_3$ , actually in progress, will hopefully give more sensitive results. Modelling of nitrogen leaching is in progress, using PHREEQ-CI and MACRO for correlating results.

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Table 1. Estimation of annual inputs in Pikine (57ha) and Patte d'Oie (79ha). Source: 53 individual inquiries and field inventory, 2005

N INPUTS	Local aubergine (0.5 y <sup>-1</sup> )	Tomato (0.5 y <sup>-1</sup> )	Salad (5 y <sup>-1</sup> )	TOTAL	Nitrogen input (kg ha <sup>-1</sup> y <sup>-1</sup> )
Urea (kg ha <sup>-1</sup> y <sup>-1</sup> )	300	210	40	455	150
NPK (kg ha <sup>-1</sup> y <sup>-1</sup> )	600	480	60	840	210
Organic manure (t ha <sup>-1</sup> y <sup>-1</sup> )	20	10	15	90	1800
Irrigation wastewater (m <sup>3</sup> ha <sup>-1</sup> )	23 % total surface 200mg/L N			8500	1700
Irrigation groundwater (m <sup>3</sup> ha <sup>-1</sup> )	77 % total surface 30mg/L N			30000	1000

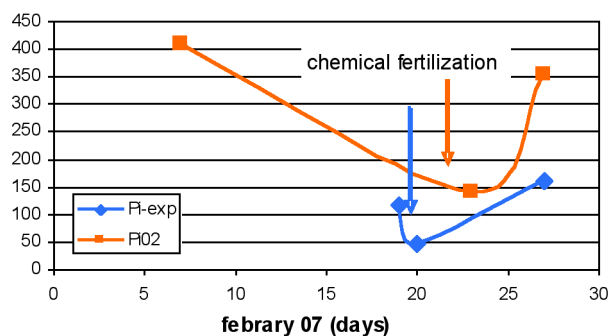
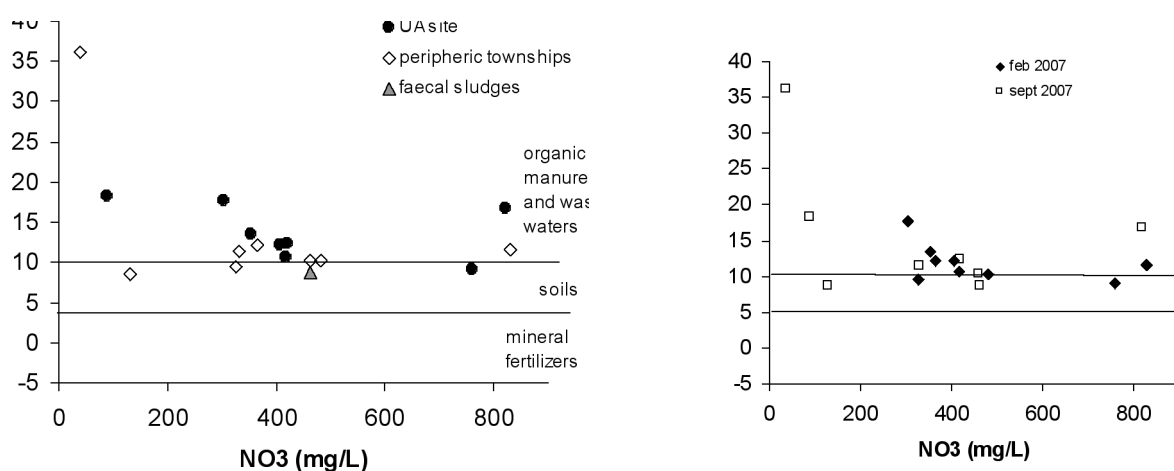
Fig. 1. NO<sub>3</sub> in 4m depth-groundwater before and after mineral fertilization

Fig 2. delta 15 N isotopes in nitrates.

## 11.5

### Water violence, governable spaces and the state's frontier

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This paper explores the genealogy of water violence in Somali region, Ethiopia, a contested political space at the margins of the Ethiopian state. Somali region has experienced repeated outbursts of violence related to the access to pasture and water among different Somali clans and between Somali clans and the Ethiopian state. Often, such conflicts are attributed to a form of “eco-violence,” whereby increasing scarcity of natural resources (due to overpopulation, drought, environmental degradation) fosters contestation between different water user groups. We posit that such approaches under-estimate the political economy of water violence and its historical genealogy. Arguably, two inter-related processes are key in explaining these types of resource related conflicts that we observe in Somali region: first, the increasing penetration of the state into the pastoralist and agro-pastoralist spaces of Somali region as a project of modernization and taming of the state's frontier and, second, new economic opportunities that emerge at the interface of state penetration, porous borders with Somaliland and transnational contraband flows. We illustrate our argument with different case studies stemming from ethnographic research in various parts of Somali region. On the one hand, we will study the “politics of the water pump” whereby competition over the access to irrigation technology becomes a focal point of inter-group conflict. We indicate how such contestation is played out in a complex pattern of clan patronage and the capture of state and aid resources. On the other hand, we scrutinize how privatization of the pastoral commons produces unequal opportunities to monopolize access to water through technical artefacts. While this creates intra-clan resentment, it also disturbs historically long-established inter-clan cooperation around water access in times of distress. Arguably, such examples indicate the political ecology of water violence – it is not material resources or their scarcity that produce social conflict around water, but such conflicts are largely embedded in much longer-term social relationships and political struggles.

## 11.6

### Microbiological quality of groundwater related to urban agriculture of the Dakar area (Senegal)

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Urban agriculture (UA) has existed in the Dakar area since 1937 and plays an important role for food security and local economy. However, due to the lack of water due to climatic change and the increase of the demand, untreated waste water and manure are used by farmers to increase the yield. The agricultural production is mainly based on vegetables with a rapid turnover. The study area is located in the topographically low-laying remnants of the natural Niayes ecosystem, comprising dunes and lakes, 10 to 15km in width, which extends 150 km to north (Fig. 1). About 200 farmers work on 0.5 km<sup>2</sup> surrounded by the rapidly growing town. Several small lakes with elevated salt contents still persist and the groundwater level is shallow, which makes it very vulnerable to contamination. In the town quarters around, water for drinking and cooking still stem largely from hand dug wells and tube pumps. To evaluate the risk for the population and the environment, a long term survey of the microbiological quality of the various waters was started: 1) waters used for irrigation (untreated wastewater, shallow groundwaters called “Ceane” water) and 2) deeper groundwaters from wells, piezometers and pumps were sampled. A fluorescence in situ hybridization (FISH) procedure was developed to analyse viable *Salmonella* spp, and *E. coli* in water samples. The preliminary results show the presence of *E. coli* in all the categories of water within and around the UA sites (Fig. 1). Also, *Salmonella* spp is detected in ground and surface water (≈1.5 m depth) within the site of Patte d'Oie) and around the sites of Patte d'Oie and Pikine (Fig. 2). Although, UA is an important source of food and income for a large city such as



Dakar, the use of untreated wastewater and manure bears considerable risks of microbial contamination for the environment and humans.

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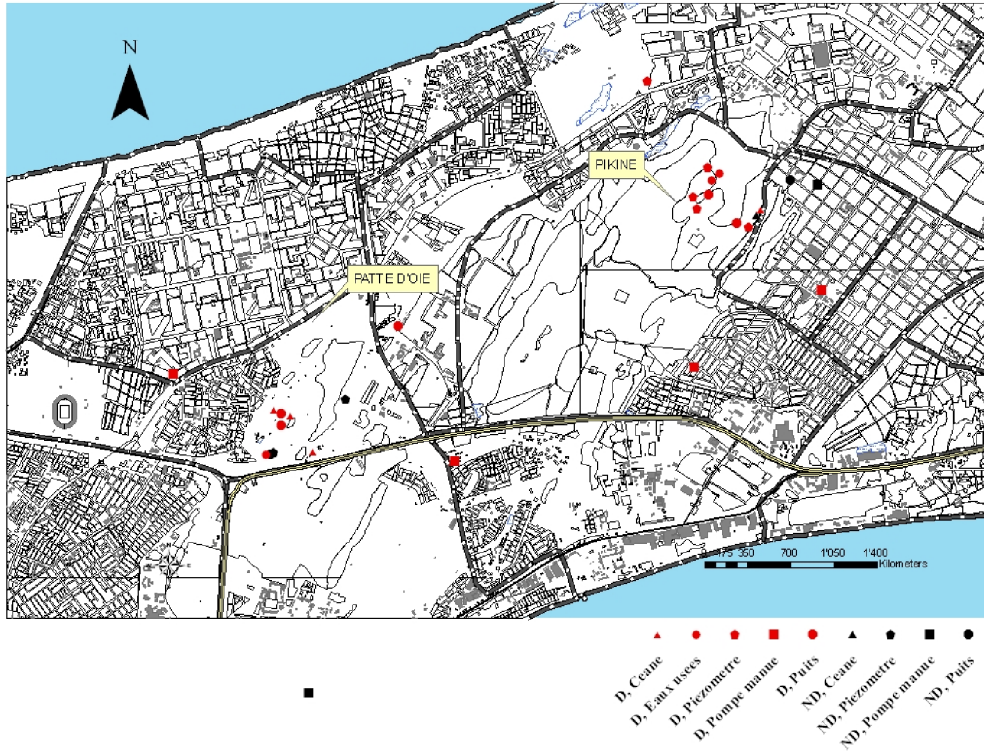


Fig.1. Spatial distribution of E. coli (D: detected, ND : non detected)

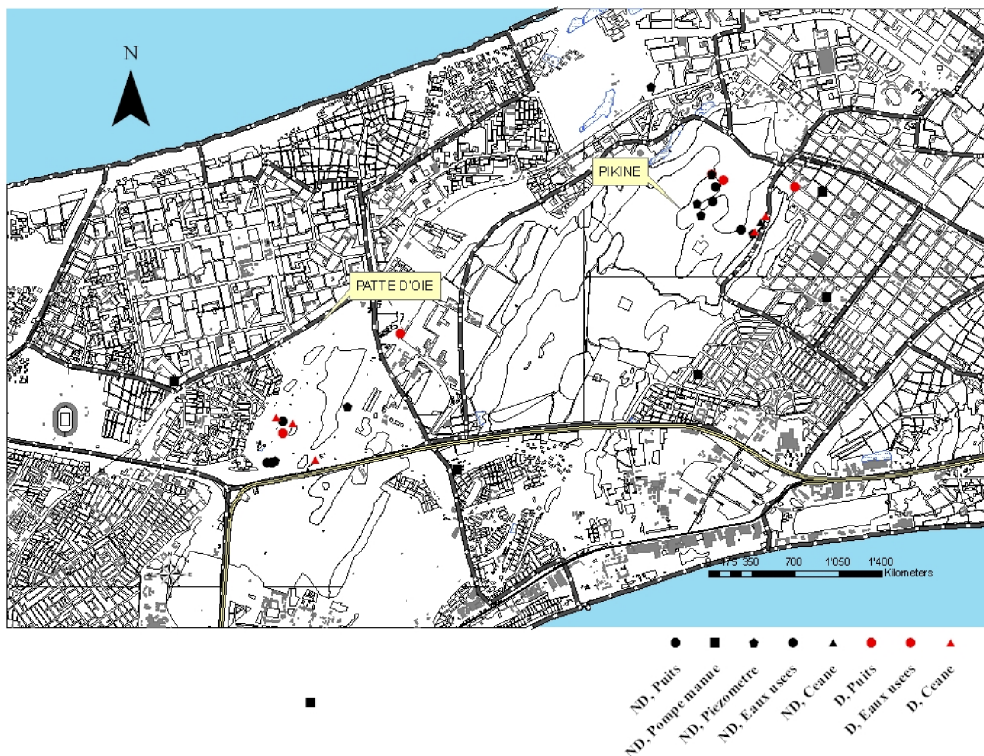


Fig.2. Spatial distribution of Salmonella spp

## 11.7

## Recovery of lake Lugano (Switzerland-Italy): a differentiated strategy for a complex challenge

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Lake Lugano is a deep, dendritic subalpine lake situated at the border between Switzerland and Italy. The basin is highly eutrophic as a result of the discharge into the lake of waste water from the urban centres in the watershed. The complex morphology and geology of its catchment required a differentiated recovery strategy: in the seventies the first waste water collectors and sewage treatment plants began to be constructed, with the result that there was a sharp drop in the phosphorus load conveyed to the lake. In 1976 sewage produced by the town of Lugano, naturally burdening the northern basin, were diverted to the treatment plant located in the southern basin nearer the outflow. In addition, new legislation was passed in Switzerland to reduce the polyphosphate content of domestic and industrial detergents (1986). All these interventions have halted the eutrophication and are slowly improving the condition of the lake. However, the complete recovery of the lake will depend to a large extent on the behaviour of the nutrient deposits which have been accumulating in the lake for around 50 years, both in the deep hypolimnion of the northern basin and the sediments. Two consecutive cold and windy winters in 2004/2005 and 2005/2006 erased the chemical stratification of the northern basin and led to two exceptionally strong mixing events: for the first time in decades convective mixing reached the bottom of the lake. The consequences of these events were that between 2004 and 2006 in northern basin deep water (layer 100 m–bottom) temperature has lessened by 0.5 °C, total phosphorous content decreased from 642 to 489 t P (-25%), while oxygen balance has become positive increasing by more than 14'000 t O<sub>2</sub>. Lake Lugano has now entered a new stage of its long way towards complete recovery.

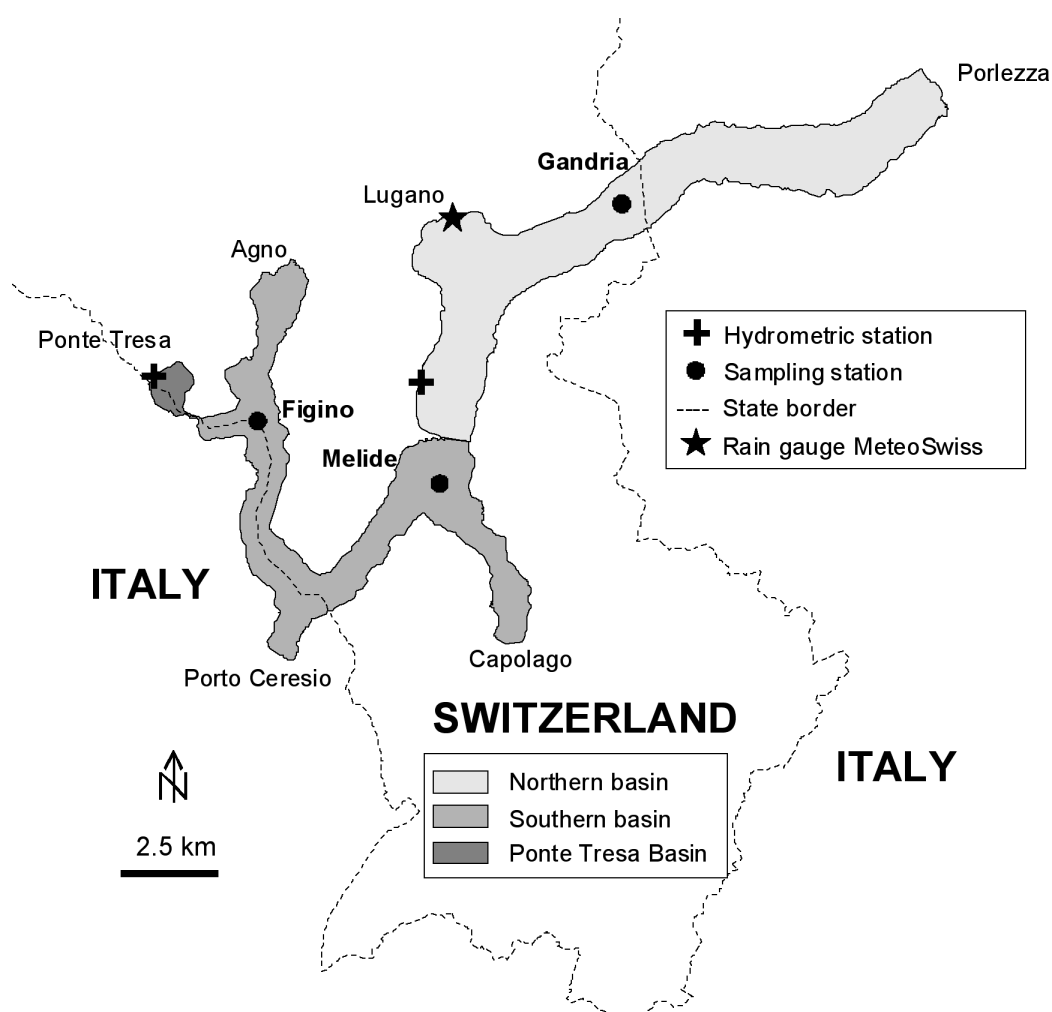


Figure 1: Lake Lugano (Switzerland-Italy), location of sampling sites

## 11.8

### Cross-border environmental conflicts: Struggling for political participation across borders

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The Austrian-Hungarian-Slovenian border region is a remote area constantly undergoing geopolitical change, with the political borders mainly following an ethnic and language border. Over the last century, the region has been subjected to major geopolitical changes, shifting from being the periphery of the Austrian-Hungarian Monarchy to becoming the national border between Austria and Hungary in 1921, to being divided by the so-called Iron Curtain. After the opening of the borders in 1989 and the long period of silence, slowly contacts and economic relations were taken up.

As there had never been any atrocity, war or fighting between the neighbours, the relations of the neighbours were friendly, which allowed joint investments like the Heiligenkreuz-Szentgotthárd Industrial Park to start.

However, after 2006, differences about development and conflicts about future investments arose. In the Austrian part of this border region, the opening of an incinerator is planned. There are clear, legal procedures to be followed for the installation of such a plant, and Austrians see the incinerator only in economic terms and insist on the legality and correctness of the activities. Their Hungarian neighbours, however, see it as an environmental and political issue and claim the right to participate in decision-making as neighbours.

We analyse the competing public discourses and visual representations of the different stakeholders as they express the diverse positions and views of the people involved. The Hungarians' positions are mainly critical, not only about the incinerator, but also because they feel they are neither sufficiently informed nor included in the decision-making, and are now claiming equal rights as citizens of a neighbouring EU state.

As there are also Austrians who are very critical of the planned incinerator, new alliances have been formed across the state borders. This has led to a new neighbourhood concept and neighbourhood discourses across the political, ethnic and language borders that are no longer the main dividing lines. Now, symbolic borders arise from different ideologies and value systems.

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## 11.9

### Peasant Border Cases

How peasant principles enhance competencies of farmers at the Swiss-French border to maintain good neighbourhood relationships and the impact of different national agricultural and environmental law on these relationships.

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There are Swiss farmers in the border region to France who also cultivate land in France. This situation has historical reasons and is influenced by the changing legal background of the two states and the financial situation of the farmers. One question is central to the farmers: How can they assure the further cultivation of their land in France? As for some farmers cultivation of this owned or leased land in France is vital. The long-lasting strengthening of the nation-states and more recent the EU-membership of France complicated the informal relationships to the neighbourly farmers in France. Different agricultural and environmental legal foundations intensify the construction of "Self" and the "Other" along the transnational borderline. However, good neighbourhood relationships are crucial for a further cultivation of land in France.

As seen in a qualitative research project, using the methods of narrative guided interviews and participant observation, so called peasant principles play an important role in shaping those relationships. By using the theoretical background of structuration theory by A. Giddens (1984), its adaptation for social geography by B. Werlen (1997; 1999) and its extension with the concepts of social and cultural capital by P. Bourdieu (1983) and the empirical findings of R. Girtler (2002) there can be shown the important role of tradition-based knowledge farmers can use today as capital in the maintenance of neighbourly relationships.

This leads to the following conclusion: To enhance the transnational cross-border understanding and cooperation, as a counterbalance to the mentioned separating tendencies by the concept of nation-states and understood as an opportunity for dialogue between the EU and Switzerland, the still existing peasant principles of farmers in the Swiss-French border region should be recognized and strengthened so that they can be used as a source of common identity.

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