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Abstract: This is an abridged version of a Eurocores proposal submitted to the Inventing Europe program in Sept. 2006. Though the proposal did not get funded, participants decided to utilize their collective momentum to produce an edited volume. Editors are Cornelis Disco and Eda Kranakis. The present text is the take off point for this project. The basic idea is that in the politically small-scale European context both large natural features as well as transnational infrastructures can assume dynamics of transnational commons. The emphasis in the project is to ascertain the role of technologies in constituting and governing such transnational common property regimes and so contributing to the hidden integration of Europe.

The Hidden Integration of Europe: Technologies and Transnational Commons

Preamble

The idea for this collaboration emerged out of the Tensions of Europe Network, in particular the Eindhoven-based project on Transnational Infrastructures. During a workshop of the latter project in 2006 a number of us became interested in how one might treat large and extensive natural features within Europe as settings for special kinds of "nature-based" transnational infrastructures and as arenas of transnational negotiation and coordination. We soon hit on the idea of "commons" as an organizing concept and submitted a proposal in the framework of the ESF Eurocores project "Inventing Europe."

Although the ESF described the proposed collaboration as "internationally competitive" and recommended that it be funded, the complexities of the Eurocores financing structure ultimately precluded direct financing of the research. We have had to reassess our collective ambitions in the light of much more limited support by ESF and are now officially a Tenions of Europe project with close links to Inventing Europe.

Our immediate aim is to produce an edited volume on the basis of the original project proposal, assuming that the necessary additional research can be funded by other agencies or local universities. We are now in the midst of exploring what that book might look like and so this project description is necessarily somewhat tentative, just because it is largely based on the original Eurocores project proposal. As we go along it is more than likely that projects will be modified, ambitions adjusted to fit the format of a book chapter, and that additional projects will come on board to complement or replace existing projects.

Our first dedicated book workshop will take place in Lisbon in October 2008. We hope that this workshop will define the contours of the book and provide a clear agenda for proceeding with the historical-conceptual framework as well as with the individual more empirically grounded chapters.

Resources and commons

The project on technology and transnational commons in Europe aims to shed light on an important facet of what Thomas Misa and Johan Schot have called the "hidden integration of Europe." Their message is that the making of Europe is not only a relatively recent political, economic and cultural phenomenon; but also a quite venerable but ill-studied process of technological and infrastructural integration. An essential part of this "material integration" of Europe has involved arrangements for the international husbanding and exploitation of productive resources. In this small and politically fragmented continent such resources have frequently transgressed the boundaries of individual nation-states, fostering international contention about entitlements and use. In some cases transnational "commons" or "common property regimes" have emerged as a sustainable way to go forward and as an alternative to conflict and war. As we propose to demonstrate, both the actual production of the common resources as well as the possibility of their transnational exploitation are heavily shaped by prevailing technologies and dedicated innovations. Think of the technological practices underlying the extraction, processing and transportation of mineral ores on the one hand or the technological arms race in the monitoring of fish stocks and the activities of fishing vessels on the other. In effect, then, such common property regimes are doubly intertwined with the "hidden integration" of Europe: in the first place as sites for the development and application of transnational technologies and in the second place as sites

for the emergence of transnational institutions (considerably predating those associated with "official" European unification).

The inspiration for this project on technology and transnational commons in Europe is that, in a continent with such small-scale political subdivisions, entitlements (i.e. use-rights) to many resources have often been legally and politically ambiguous. Some resources, like air and fish, are so mobile and ubiquitous that no one can lay an unambiguous claim to their unlimited use. Others, like international seas, rivers and mountain ranges extend across or between a number of nations and the resources they harbor cannot be said to unequivocally "belong" to any one nation. Yet others; like industrial standards, weather forecasts, the European power grid, patent systems, internet and even the common market; are innately products of transnational practices and *ipso facto* reach beyond the confines of private or national jurisdictions. We therefore argue that in addition to all kinds of claims to private and public property, the history of the husbanding and exploitation of resources in Europe has been shaped by the development of institutionally regulated transnational commons. The aim of this research project is to investigate how the emergence of such regulated transnational commons as solutions to struggles over entitlements (i.e. rights of use and abuse) to resources has been a major dynamic in the "hidden integration of Europe" over the past two centuries. It is in fact no exaggeration to assert that the history of European integration begins with the institutionalization of these sorts of transnational commons: e.g. the founding of the International Commission for the Navigation of the Rhine by the Congress of Vienna in 1815.

"Commons" or "common property regimes" as they are sometimes called, have been the object of extensive theorizing and empirical research ever since the publication of Garret Hardin's seminal essay, *The Tragedy of the Commons*, in 1968 (Hardin, 1968). Though the "tragic" conception of commons can be traced back to the ancient Greeks, Hardin breathed new life into this old theme by coupling the idea with the resurgence of neo-Malthusian concerns about human survival on the planet. Hardin assumed that shareholders in the common good individually pursued their own short-term advantage with no eye for the long-term common weal. On these assumptions common property arrangements inevitably invited abuse and overuse of the common good and ultimately the degeneration and collapse of the common good itself. In subsequent critiques Hardin was taken to task for an overly pessimistic portrayal of the human potential for reflexivity and self-regulation and he was confronted with empirical examples of "working commons." A consensus soon emerged that common property regimes were a viable and legally robust form of managing entitlements to resources, along with more usual "default" forms like public and private property.

Hardin's essay and the field of commons research it spawned, or at least fertilized, concur in viewing a "commons" not merely as some specific material resource, but in the first place as a particular mode of social organization and of access to and use of a resource. In the most abstract sense commons are characterized by open access to some resource and the freedom of use (and abuse) of that resource by the members of some community. But commons are not simply "given" by the resource in question; in a world like the Europe of the past two centuries where private and public property have held sway, commons have inevitably emerged as ideological, ethical and technological projects to maintain or establish free access to resources and to manage use under such conditions. That said, there are certainly conditions under which privatization or nationalization of a resource is inappropriate and which are conducive to the establishment of commons. Highly mobile and ubiquitous natural resources, those that span more than a single nation, or resources that are products of transnational practices are examples of resources with ambiguous and problematic entitlements that may encourage actors to establish institutions to regulate use in common.

What kind of obstacles must be overcome to establish and maintain such commons; that is, what obstacles stand in the way of a robust and sustainable commons? Three of these deserve mention here. The major problem, signalled by Aristotle and Hardin alike, is the problem of egotistic abuse of a common resource. Without regulation or self-regulation, all actors will try to maximize their own short-term profit – if necessary at the general expense and ironically in contradiction to their own long-term interests. The outcome is

overuse and ultimately deterioration, depletion and the possible demise of the resource. The virtual elimination of Cod from the Grand Banks off the coast of Newfoundland due to overfishing is one example; the glut of e-mail spam on the internet is another. Closely related to such classic "tragedies" of the commons is the ubiquitous problem of "free-riding" in respect to managing common resources. Sustainable commons require investments in maintenance and repair and there is always the problem of maintaining an equitable distribution of this burden of upkeep. Certain central sections of the "European" highway system, for example, are heavily burdened by transit traffic which profits from the (nationally funded) roadways without, in general, contributing to the costs of construction or maintenance of the roadways that this extra use requires. A third obstacle is closely related to the free rider problem, namely the ethical question of a just and moral regulation of access to the common resource. In the understanding that a common property regime is a contested and negotiated arrangement for the management and exploitation of resources, the question of who should participate, who is a "commoner" and who is not, inevitably comes to the fore. There will be insiders and outsiders of different degree and in some cases sustainability of the commons will be served by admitting outsiders and sometimes by keeping them out. Quite aside from questions of justice, there is also the question of the actual capacity to exclude outsiders making claims on a common resource shared by insiders.

Technology

These three themes and related topics have been and remain perennial topics of debate within scholarship on the commons. They are the province of political scientists, sociologists, economists, philosophers, historians and psychologists and have contributed a great deal to our understanding of the dynamics of commons as struggles around entitlements and responsibilities. In this book project on the history of European commons, we would like to enrich this scholarship by focussing on a relatively neglected aspect, namely the role of technologies in the emergence and governance of (transnational, European) commons. Given the crucial role of technologies in defining and exploiting resources as well as in the quotidian management of sustainable commons, the lack of attention in mainstream commons research is surprising. In order to indicate where we think technology fits in, a brief excursion into contemporary commons theory is necessary.

"Commons" or "common resources" are currently defined as resources for which exclusion is difficult or costly. Any member of a community can use them. Private or public resources, by contrast, allow for easy exclusion. Only the legal owner is entitled by law to enjoy the benefits (or at least hold them in trust for others to enjoy). These two extreme "access" conditions are the poles of an "entitlement" axis. A second axis orthogonal to the first is defined by the degree of "subtractability," i.e. the degree to which the resource is depleted or damaged by use. The extreme poles of this second axis are "public goods" which are (regarded as) limitless and impervious to the wear and tear of use (e.g. the air in former days) and "common pool resources" which are "subtractable," i.e. consumed or damaged by use and hence vulnerable to degradation and depletion when they are overused or inadequately maintained (oil, fish, internet, Alpine meadows, the arctic, airspace). (Keohane & Ostrom, 1995; Ostrom, 1977). Recent commons scholarship acknowledges that resources can in fact move along these axes through time depending on shifts in entitlements and subtractability. The most tragedy-prone type of resources are Hardin's case: common pool resources. It now appears that there are two possible routes of escape from tragedy in this case: either alter the conditions of entitlement to the resource, i.e. regulate access, or alter the terms of its subtractability, i.e. regulate use. Again, mainstream commons scholarship has concentrated on cultural, political and legal possibilities for effecting these escapes and virtually ignored technology.

However, newer trends in commons scholarship, studying global commons in relation to environmental degradation, have perforce had to revise the existing parochial view of the role of technologies, but have not yet developed a consistent perspective. In an important

watershed volume published in 2002, "technological change" is listed under a section titled "Key Understudied Issues." It is ruefully noted that "technological change is an important part of the context of resource management institutions" and, sagely, that "technological change is not exogenous to social institutions" (Ostrom et al., 2002: 477). This suggests that the present proposed collaborative enterprise must be based on cross-fertilization between the discipline of history of technology, presently well represented in our ranks, and the social sciences. Contemporary history of technology is of course already committed to "contextual" and "constructivist" approaches that view technologies as inherently social (and economic and political phenomena). We are also interested in exploring more direct forms of cooperation with leading scholars of the commons.

We see techology as having had basically three different roles. First, technologies were the medium through which natural phenomena became resources in the first place. Airspace became a resource only after aircraft became capable of regular international flights; weather reports became a resource only after measurement technologies and communications networks could guarantee reliable predictions. Even at this stage the scripts embedded in different technologies helped to shape specific structures of entitlement and subtractability. Second, technologies (but also scientific knowledge) were instrumental in moving common resources along the "subtractability" axis, i.e. in the first place in transforming limitless "public goods" into scarce and threatened "common pool resources." This had an "objective" and a "subjective" modality. "Improved" technologies of exploitation objectively increased pressure on public goods by increasing crowding and degradation of resources. More capacious and faster ski-lifts in the Alps inevitably hastened the destruction of Alpine slopes. The mechanization of offshore fisheries and new technologies for the localization and conservation of fish have transformed marine fish populations from inexhaustible "public goods" to worrisome and non-renewable "common pool resources." But also, improved scientific models and more subtle measurement techniques made people aware that resources previously thought to be public goods were in fact limited and vulnerable common pool resources. The "discovery" of transnational air pollution is a case in point. Third, technologies have been crucial components of all regimes to regulate access to (entitlement) and use (subtractability) of problematic common pool resources, i.e. of all reflexive strategies to escape tragedies of the commons. Technologies of monitoring, surveillance and apprehension are crucial for regulating access to commons, that is, to enforcing authoritative regimes of limited entitlement. Countertechnologies of stealth and evasion may also be cultivated, of course, by those with no interest in the prevailing order, resulting in a kind of "arms race." Likewise, manipulating the subtractability of a common pool resource to mitigate tragic outcomes is heavily dependent on innovations in technologies of exploitation. For example new flight control technologies have consistently allowed closer spacing of airplanes in air corridors and around airports, hence effectively increasing the capacity of the local airspace commons and effectively reducing crowding and the risk of accidents – up to a point of course.

Europe

Traditionally, commons research has focussed on small-scale, face-to-face communities where rules for access and use are part and parcel of the local culture and jurisprudence. However, the concept has also proven to be applicable to social arrangements governing the use of certain types of resources in the context of nation-states, where the community of "commoners" is congruent with national citizenship. This national scale of institutionalized commons is embodied in regimes of access and use for resources like seacoasts, national parks, information retrieval services, highway systems and so on. There is also, of course, considerable ethical debate regarding the extent to which natural resources like forests, fossil fuels etc. should be seen as national commons rather than as commodities for the production of private profit. In the same vein, as a concomitant of globalization on numerous fronts, "global commons" have recently become a hotly debated

topic as well. On this view, resources like the ozone layer, rain forests, the atmosphere, big rivers, the oceans, the internet, the stock market system, or international air corridors are resources shared by all of us as commoners, simply by virtue of being inhabitants of the planet Earth.

Clearly, commons are contested and sometimes sustained at several (nested) levels, all of which have by now been studied in considerable depth (with the caveat that technologies have been largely ignored). However, our proposal to study commons at a continental or regional, i.e. European, level is relatively novel and requires some justification. Although research indicates that the overriding metaphor and the basic game dynamics are invariable as the scale changes, the underlying mechanisms, strategies and actors are decidedly different. Local commons are shaped by the strategies of individual actors, cultural norms and tacit understandings, and depend on appropriate technologies. National commons rely on conceptions of citizenship, on the legal enforcement of regimes of access and use by the nation state, and on ever more refined technologies of maintenance, extraction and surveillance. In global commons, as the most expansive form of transnational commons, the relevant actors are not community members or citizens, but the governments of nation states as placeholders for their citizens or national elites. Here, because comprehensive cultural and legal frameworks are a less self-evident resource for organizing common property regimes, the management of commons depend on legal agreements like treaties and on the transnational institutions they underwrite. Such treaties and institutions depend on trust; hence the standardized monitoring of use and abuse and of free riders becomes essential – monitoring that is increasingly butressed by sophisticated technologies of surveillance -.

Local, national and global commons seem sensible scales at which to study the problems of shared resources, but what is the sense of studying them at a European level? To suggest that something we might want to call a “European commons” has existed in the past is probably anachronistic and verges on the sorts of Whig history that are often trotted out to legitimate the European Union as manifest destiny. Rather, what we see over the past two centuries is at best the emergence of sub-European transnational commons among shifting groups of European nations in the context of the progressive “hidden integration” of the continent – but also of course in the context of endemic conflicts and wars. The scope of such commons has depended, for example, on the scope of particular geographical features harboring resources; for example, the North Sea, the Rhine, the Arctic, or the Alps have all been objects of transnational regimes to husband and exploit the resources they contain. In each case there has been a different group of countries involved depending on geographical location or particular stakes in the resources. But not only geographical features, also various new technologies have generated new resources and new political spaces for the establishment of transnational commons. The gradual coupling of national transportation and energy systems has produced various continent-spanning commons: for example, institutions to regulate transnational train or air traffic within Europe. In the same vein, the viability of different information systems like weather forecasting, stock markets, Interpol, or ticket reservations systems have depended on the institutionalization of various types and scales of transnational commons among European nations.

We see these shifting, partial and heterogeneous transnational commons as important building-blocks for the “hidden integration” of Europe. It is not so much that “Europe” is some kind of arithmetic sum or inevitable outcome of all these commons. Rather, we view the increasingly numerous instances in which European nation-states have overcome the prisoners’ dilemma of isolated self-interest (with the inevitable sub-optimal outcomes) and come to terms about arrangements for the common exploitation of resources as a collective learning process about the preconditions for transnational pragmatics and ethics. The experience of establishing robust transnational commons under various degrees of duress has produced political and technological capacities and moral dispositions without which European unification as we know it would have been impossible.

In studying these “European” transnational commons we should nonetheless bear in mind that the “European” level is only one in a range of nested levels of commons and is

both constituted by and in turn constitutes other levels . A village on the Rhine may have a common quay, the nation-state to which it is subject may declare the Rhine a “national river” with free access for all citizens, the community of riparian nations may have binding agreements about common use of the river’s resources (and common management of its threats), the European Union now has its own notions about the Rhine as “European river” or “transport axis,” and finally the Rhine is seen as part of the global water cycle and an element of the global commons that must be wisely husbanded. It is impossible, in short, to study “European” commons in isolation from these other levels of common organization. A major historical question in this regard is how and to what extent transnational commons in Europe have been reinforced (or weakened?) by underlying local and national commons. A more pragmatic question is to what extent “European” solutions for framing the use of common resources can serve as an inspiration for similar arrangements at a global level.

Conclusion

Heading off tragedies of the commons and fighting injustice by changing conditions of entitlement or subtractability depends extensively on (and stimulates) technological innovation. Regulating transnational common pool resources in order to avert or mitigate tragedy requires the implementation of reliable and trustworthy “regimes of access” and “regimes of use.” All of these strategies are heavily mediated by technologies and technological change. We can lay bare an important aspect of the making of Europe by tracing out how European nations gradually came to terms over the ownership, exploitation and governance of transnational common pool resources. In the process, we shall inevitably have to confront the role of technological change in the making of Europe as well. It goes without saying that understanding these processes is not only of academic, scholarly interest but is crucial for proceeding intelligently with the making of Europe in the future.

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DESCRIPTION OF THE COLLABORATION

What specific expertise will be developed in each project, what are the objectives and how does this contribute to the goal of understanding the place of commons in European integration? In a pragmatic sense the collaborative goal can be defined as the production of an excellent book, but in order to produce these, it will be necessary to provide answers to four orders of research questions. Briefly we want to know how specific commons have been negotiated, what the role of technology and scientific knowledge has been, how these negotiated commons fit into European history as traditionally understood, and whether there is a European style of managing commons (which might serve as a model for negotiating global commons). Every chapter/project will address each of these points in some way, but they will each have specific strengths allowing them to cast more light than others on certain issues. In what follows, these specific strengths are briefly highlighted. More detailed descriptions of each of the projects can be read in the final section.

1. Disco, University of Twente. "Flows and Frontiers. Inventing, Exploiting and Governing Common Resources on the Danube and the Rhine, 1850-present."

This project will investigate interlocked transnational resources embedded in, on, and along the Danube River. There is also a subproject on transnational governance and shifting national borders in three river basins. Rivers are not only ensconced in the landscape but also relatively autonomous from it (the river as "route" and "flow" through, and "rupture" in the landscape). Hence riverine resources exist in an ambiguous space between local/national sovereignty and cosmopolitan connections and effects both upstream and down. Big rivers like the Danube contain a great number of different interlocked resources, which affect exploitation of and negotiations on any one of them. Special foci are thus the conflict between national and local interests vs. cosmopolitan interests, i.e. "nested commons," the "heterogeneity" of national actors (different positions and practices - different interests), dealing with complex "arrays" of resources embedded in the same physical structures. Riverine navigation is arguably also the oldest form of explicitly governed transnational commons in Europe (1815); hence this project also looks back relatively far into the past of European integration.

2. Andersen, Norwegian University of Science and Technology NTNU, Trondheim. "Transformation Through Technology (TTT): The North Sea as European Common"

Coastal seas like the North Sea are a very different physical form of water than rivers, the main difference being that there are no consistent upstream and downstream positions attached to the bordering nations. This has made for a more level playing field in terms of interests and opportunities and probably encouraged mutual regulation. This project proposes to investigate common resources in the North Sea: on the surface (shipping), in its waters (fish), and on the bottom (oil and gas). The research design thus allows for controlled comparisons among these very different kinds of marine commons in regard to the role of technologies and styles of negotiation. Special issues raised in the project include the dynamics of extraterritorial/territorial commons, in this case, who could do what in coastal zones and harbors; the question of "mulitplexed" commons; and the unusually pervasive role of technology and scientific exploration in discovering and defining resources and in managing their common exploitation.

3. Kaijser, Royal Technical University Stockholm, "Under Acid Skies. Negotiating Air-borne Pollution in Europe"

While water could be more or less sharply defined with respect to national territories and landscapes; the air in Europe, which is the object of this project, was everywhere and apparently limitless and free for all to use as they saw fit. Although after the industrial revolution there were serious issues of local air pollution, little thought was given to effects further afield, certainly not to transborder pollution. However with the development of increasingly refined measurement techniques and the discovery by meteorologists of specific circulatory patterns in the European atmosphere it became possible in the 1960s to map conduits of transborder pollution and with it "downstream" victim countries of pollution and "upstream" polluting countries. Though polluters resisted attempts at regulation, the victims persevered, (surprisingly) resulting in a European anti-pollution treaty not too long after. The IP traces this history and attempts to explain the hidden antecedents of the treaty, especially in the form of national regimes of air pollution control. Specific strengths of this project will be insight into: the dynamics of "nested levels" of commons regimes: national, European, global; the important role of scientific knowledge in creating a scarce resource, i.e. clean air; and finally the important role of European institutions in facilitating transnational regimes.

4. Korjonen, Lappeenranta Technical University, "Constructing Commons: The Vuoksi River"

As a river, the Vuoksi exhibits the same geophysical mulitplexing of resources and asymmetries as the Danube, so many of the same lessons can be drawn. However it is also largely a constructed river based on a series of lakes and it has only been a transnational river since the Winter War of 1940 when most of it came under Soviet rule. The Vuoksi is an exemplary case of constructed resources and provides clear insights into the way border changes deconstruct national commons regimes and present an alternative between unproductive chaos or a new transnational regime.

5. Michelsen, Lappeenranta Technical University, "Weather Forecasts and the Making of Modern Europe"

The project on weather forecasts introduces a novel element into the collaboration, namely a commons that is thoroughly man made, although based on measuring and monitoring the atmosphere. The project explores how weather forecasting, dynamized by a number of key technological innovations like the radiosonde, expanded its scope from national to transnational monitoring and forecasts and how this generated pressure for transnational cooperation in the production of weather forecasts as a public good, first on a European and later on a global scale. However, there was also restricted and even secret weather for specific social groups like the military and so the project also promises to provide insights into how some specific and accurate weather forecasts were "privatized" and withdrawn from the public sphere.

6. Kranakis, University of Ottawa, "Europe's Airspace Commons: Technology, Modes of Governance, and the Process of European Integration

This project, like projects 3 and 5, is about the air. But rather than dealing with the air as a substance, this project deals with the air as a spatial resource for civil and military aviation. With the spread of aviation after WW1 there was a general move to nationalize airspace, partly in response to the military uses of aviation as developed in WW1. With the development of bigger, faster and higher-flying airplaines; and despite new technologies of flight control that enabled greater aircraft densities, it gradually became clear that governance of airspace based on national sovereignty over territorial airspace was inadequate to ensure safety and productivity. This led to the "single-skies" initiative proposed by the EU in 2001, whereby what had effectively been a commons now would also became explicitly recognized and governed as such. This project provides an unusually clear example of how new technologies (aviation) created a new common resource (airspace). It is also provides a comparative case for studying how technologies are developed in order to avert or mitigate crowding and degradation of a commons. Finally, we

can learn a lot about the relation between sovereignty, transnationality and physically extended techological practices from this case.

7. Hevly, University of Washington, "Technology, Polar Nationalism and the Arctic Commons: Conditional Sovereignty and the Command of Common Space"

In this project the relationship between territorial and extraterritorial geographical space (and concomitant resources) is again at issue, as it is in the case of the North Sea and more ambiguously for the international rivers. Extraterritorial space like the European arctic is by definition common space, but the question is who are the commoners and to what extent do national claims on polar territories and other polar resources compromise these commons. The nature of the claims and resources vary over time and are mediated by technological innovations and scientific research. This project will specifically contribute insights on two important points: first, how entitlements in extraterritorial common space are negotiated in relation to the different resources to be had (with all the technological implications involved) and, second, what specific role scientific research had, both in terms of inventing and managing common polar resources as in buttressing national claims to polar territory.

INDIVIDUAL PROJECT DESCRIPTIONS

Project 1

"Flows and Frontiers. Using and Governing Common Pool Resources on the Danube, Rhine, and Vuoksi: 1850-present."

Cornelis Disco, University of Twente

Aims and Objectives

The project aims to produce a novel history of the Danube River as a transnational site for multiple common resources. This approach to the Danube's history provides an excellent window into analyzing how technologies are involved in the tension-ridden processes of European integration, especially at its volatile southeastern frontier.

The Danube is chosen as an eastern counterpart to the Rhine, about which latter much has already been written. The Danube, winding across some 2,800 km of central and eastern Europe from the Black Forest to the Black Sea and (currently) passing through or along 13 countries, makes for a revealing comparison to the Rhine when it comes to transnational integration. While the Danube, like the Rhine, has also been technologically reconstructed, i.e. turned into an "organic machine" (White, 1995) by virtue of which it bears a number of multiplexed resources exploited in common by riparian and other nations, there are two important differences; first, the Danube is embedded in a completely different geo-political and geo-economic context. Second, it has proven much more difficult to institute credible regimes of transnational governance on the Danube than it has on the Rhine. The crux of the research will be to investigate the relationship between these two differences, across time, paying special attention to the role of technology in inventing common resources and creating or blocking conditions favorable to transnational governance of such resources.

Not all commons are created equal. Those embedded in rivers have their own peculiarities and entanglements. At any point along a river, resources like water (for drinking, cleaning, flushing, and cooling) fish, hydropower, breathtaking views, and ships laden with cargo are of course simply present and by default under the jurisdiction of the local sovereign power. The resources are there for the taking, using, or taxing. But Heraclitus' famous aphorism,"You cannot step into the same river twice, for fresh waters are ever flowing in upon you," suggests there is much more at stake. Rivers are not only topographical features, but also *flows* through the landscape and riverine resources are embedded in those flows. It is these (transnational) flows in combination with the relatively static geophysical and geopolitical structure of the river that *nolens volens* transform the resources of a river like the Danube into transnational common pool resources – instead of apparently inexhaustible public goods. While each state may claim undiminished rights of use and abuse of riverine resources in its own territory, all local (and nationally sanctioned) uses of these flows that quantitatively diminish them, or qualitatively degrade them in some way, have cosmopolitan effects upriver and down. They especially disadvantage users in "downstream" states. Under certain conditions this has created incentives to flex national muscles and sometimes violent efforts to exert unilateral control over other riparian actors. But in the long run it has eventuated in agreements and protocols for the transnational management of common pool resources and so contributed to the making, rather than the unmaking, of Europe.

This project fits well within the overall collaboration because it squarely addresses the role of technological change in the invention, exploitation and regulation of common pool resources. Though international politics is highly salient for these territorially based riverine

histories, they are also fundamentally *techno*political histories. Various forms of river engineering, from dams and locks to channel reconstruction; new technologies of use, such as water purification and steamships; as well as technologies of measurement, control and monitoring; have been mobilized by specific powers to change the rules of the commons game to their advantage and ultimately to the advantage of something like the common good. Results from this research will contribute directly to each of the four themes described in the overall proposal, as well as the related workshops and the proposed book chapters. However, the peculiar nature of rivers, with their complex arrays of intertwined flow-based resources and their subtle territoriality make them a rich research site both for examining how actors invent and regulate "multiplexed commons" and how space and territoriality are implicated in the invention and management of common resources.

White, Richard. 1995. *The Organic Machine: The Remaking of the Columbia River*. New York: Hill and Wang.

Methodology

In this project I want to illuminate the role of *technologies* in making, constructing and de-constructing riverine commons. This is the basic guiding question. Hence, the focus will be specifically on how technological change: 1. fosters and is fostered by the emergence of new resources and the transformation of those resources into common pool resources 2. fosters awareness that a putative public good is in fact becoming a common pool resource 3. shapes strategies of states and empires toward other states sharing a common pool resource, i.e. either monopolizing/privatizing an erstwhile common pool resource or working toward agreements for the collective regulation of access to and use of the common pool resource. These three aspects of the technological co-construction of commons provide the matrix for the main research questions.

The research burden can be further reduced by selecting a limited number of resources for study. There are a number of criteria: relevance to the research questions, ease of investigation, and continuity through time, to name just a few. Preliminary research will be necessary to make a definite decision on this point. However the following are certainly among the candidates: inland navigation, hydro-electricity, waste sink, water supply, and pristine nature. Tourist sites will be the special object of the second sub-project.

Finally we can define different periods during which the process of formation or fragmentation of riverine commons took on a specific shape. For the Danube these are: 1) 1840-1870. Crimean War to halt Russian incursions into the Danube basin and the subsequent creation of a "European Commission of the Danube" to manage the Danube Delta as well as a so-called "Riparian Commission" by the Paris Peace Treaty of 1859. Navigability as resource. 2) 1890-1914. German *Mittel-Europa* scheme with Danube linked to Rhine and Elbe via new canals to form the navigational backbone of German-dominated central European commercial empire. 3) 1918-1938. Defeat of Germany and collapse of Austria-Hungary; plans for the Danube Confederation; reconstitution of European Danube Commission plus addition of new "International Commission for the Danube" on upper reaches. 4) 1938-1945. Subjection of Danube to Hitler's *Ostpolitik*. 5) 1945-1991. Cold War. Splitting of Danube in eastern and western blocs, sundering of navigational commons. After 1970 emergence of environmental sensibility and discovery of new common resources like clean water and pristine nature in the west. Emergent riverine environmentalism in the east, partly as proxy for generic political protest. 6) Post-*Wende*. New nations and borders. Extension of EU to the east and export of Rhine models of riparian commons management to Danube basin.

Project 2

"Transformation Through Technology (TTT): The North Sea as European Commons"

Håkon With Andersen, Norwegian University of Science and Technology (NTNU)

Aims, objectives and problems

The North Sea is usually the name of the ocean bordered by The British Isles, Belgium, Netherlands, Germany, Denmark, Sweden and Norway. It is a matter of definition if one wants to include Northern part of France or the Faeroe Islands – here we for the sake of simplicity do not want to make strict definition, we don't need it.

This ocean or sea has for centuries been a commons for all to use, and used it they have. The North Sea is the busiest sea of all and very rich in resources, be it fish, oil or gas. Around the periphery of the sea some of the world's most busy harbours are located. The ways it has been used have however varied dramatically in accordance with types of technology available or technology that has been developed to make better/more efficient use of the resources in this common. It is the main theses of this IP that the commons has changed characteristics as new and different technologies have been introduced and challenged the established way of governing the commons to the degree that it has been governed, managed and controlled.

The project will focus on the transformations of the commons; that is the dynamic changes related to the use of resources and what was considered as resources. We will study the role of technology in this changing process and we will study the dynamics over a long time period, from mid. 19th century until today. In this study we also have to analyze the borderlands of the commons, the unclear zones, and the "grey" areas where the commons meets the national jurisdiction or sovereignty. These areas are often the most challenging and also the areas where one can best study the differences and changes: commons versus legal ownership, transnationality versus the national or the regional. Such liminal zones might be the harbours, the near coastal waters; the seabed. This is a surprising history of negotiations and agreements, not always accepted and signed, but silently accepted, often after a time and after violent protests. Would this be the mark of a particular European style in managing and supervising commons as technologies shifts? Even after devastating wars the agreements have resurfaced silently in peacetime.

The resources in the common are many, but we can rather crudely divide them into three categories depending on their physical attributes. Traditionally the surface of the sea is the place where things happen, where ships cross and sea-wars are fought. As a commons it is more of a public good than a common pool resource. The second group of resources belongs not on, but in the sea: all sorts of animals that might be harvested (from whales via fish to shellfish). Here we also have the opposite problem: the emptying of resources and of course the pollution of the common sea. Third and last: resources below the sea, in the seabed. Typical examples here are of course oil and gas, but there are a lot of still unexplored resources here (minerals?). The last point reminds us that we are not at the end of history and that there might be new chapters to write in the book of the North Sea as commons in the future.

These three basic physical locations: the surface, the bulk of the sea and the seabed give rise to different border zones: the harbour, the fish processing plant and the oil and gas lines and processing terminals. And of course to a continuous discussion about jurisdiction of the near coastal waters (how close to the coast and what kind of sovereignty), of fisheries (how far out to the sea) and of course: who shall control the seabed. The national attempts to control all these fields have been met with international and transnational negotiations – some times they have succeeded, sometimes not. However, the results have been silently accepted in the longer run.

This project will stick to these three main groups of resources based on the physical location: Ship traffic and harbours on the surface, fishing and fish processing in the sea and oil and gas with pipelines and terminals based on the sea bed and on shore. These three perspectives on the North Sea gives rise to rather different concepts of the commons, with transitions between commons regarded as public good or as common pool resources as well as commons taken apart and added to national sovereignty. Changing technology played a major part in these transitions. The development of oil- and gas resources is the most obvious example. In each of these three main areas we will address the four major research themes of the collaboration.

The surface: shipping and harbours

Starting in the mid-nineteenth century our project arrives rather late with respect to the seagoing traffic on the North Sea. However, as we enter the second half of the nineteenth century capitalism makes shipping less and less dependent on personal knowledge and shipping becomes a trade in its own right, not necessarily a part of the export or import business. This raises the question of how to manage shipping on the North Sea. Famous attempts to set standards are Samuel Plimsoll and his mark to avoid the overloading of ships. The problem was of course that it could only apply to ships from the nation that had adopted it in its laws – and once the ship was out of national waters they were no longer under national jurisdiction. The problem of jurisdiction had several implications: It created a way of privately managing the commons. The international classifying companies were created mostly as a help for insurance companies. However, they could only assess the structure of the hull, its solidity and strength. How the ship was managed was quite another matter. Plimsoll's reform was a start. When technology changed, ships grew larger and more complicated; navigating also became more dangerous. The Titanic triggered a more classical type of international convention called the SOLAS conference (Safety of life at sea – postponed several times and finally held in 1926). Later on, the United Nation's International Maritime Organisation challenged the classification companies as an overseer of safety at sea. The problem still remained: ships moved outside national jurisdiction as in the North Sea. On another continent, the US coast guard tried to enforce uninational rules for seafaring traffic but without much success. The fight for the double-bottomed tanker from the 1970s illustrated clearly how difficult it was to manage the transnational common.

The North Sea is not only transnational waters, it has also border zones: the large international harbours that line its circumference. Here the problem is the opposite: It has to be a transnational commons in spite of being under strict national jurisdiction. The harbour has also changed in this way, both with regard to management, control and technology. The establishment of international zones, transition zones, grew with the increased specialisation that followed from both changing scale and changing technologies. Harbours changed in both directions: some became monospecialized large scale transport facilities like container harbours, car import harbours or oil terminals. Others underwent even more dramatic changes and became shopping malls or restaurants and living areas.

The bulk of the sea: the fisheries

Fisheries in the North Sea are a very old activity, of course. The North Sea has always had extremely rich fisheries. However, at the outset each mans fishing did not influence the others very much. As fishing increased, and changing technology with it, it was recognized that this would threaten the common resources. As early as the 1870s efforts were made to set up an international convention to regulate the fisheries in the North Sea. In 1882 (with an addition in 1887) an international convention established a common supervision of the fisheries in the North Sea. The signatory nations were Belgium, Denmark France, Germany and Great Britain. This very early agreement was followed by several others covering all aspects of fisheries and territories in the North Sea, in 1908 concerning territorial limits and in 1946 on the width of fishing-net mazes. In the later years of the twentieth century the situation changed. Due to new technology and larger fishing ships the North Sea declined in

importance. Instead, the agreements were subsumed under the agreement for the fisheries in the North-East Atlantic.

Fisheries in the North Sea have been much contested, particularly with the expansion of the different national territories, from three miles (1882) to four miles and up to 20 miles in the 1960s. This expansion of national sovereignty on behalf of the transnational common was not without costs. The idea that if one only could control fisheries inside the national boarders everything would be fine turned out to be a big lie. Transnational agreements were needed in whatever perspective this was considered. The next expansion of national borders, the so called 200 miles "economic" zones, were in a way a recognition of that. It put in place a kind of policing authorities, but at the same time it was amenable to agreed quotas from other nations. A solution not unlike the one agreed upon for the harbours. A necessary companion to the 200 miles zones had to be international agreements on quotas. Without it, it would have been meaningless.

The steady increase of zones and their parallel denationalisation clearly corresponded to new fishing technology. Aside from better and larger ships, e.g. production equipment on board so the ships could stay at sea for a longer period, also fishing technologies changed: a steady increase in efficiency and in both scale and scope of the fisheries put pressure on the resources, transforming something that was regarded as a public good in the near coastal waters to scarce common pool resources in the entire ocean. Changing technology also changed the power balance of managing the resources and as in so many other European commons, negotiations and agreements followed that most often involved a reduction of exclusive national authority with the benefit of getting access to other countries' waters.

The Sub sea – oil and gas

There was, however, a third commons that was almost not in use: the seabed and below. For many years people had been dreaming of what sort of resources it might hide. In 1958 a temporary agreement was reached between some of the countries to divide the bottom of the North Sea according to the mid-line principle, but only down to 200 meter's depth. Germany and Norway were not content with this solution. For Germany the conflict was solved by the international court in Den Haag in 1970. Norway also came to an agreement with its neighbours later on. In 1959 the large gas field outside Groningen was discovered and around the mid-1960 the first oil was found.

However, for this commons there remained serious problems. three aspects were particularly important: The danger of serious pollution threatened every nation along the shores of the North Sea. Safety was an issue in one of the roughest seas in the world. Secondly there was the question of how to handle the oil and gas fields that covered two or more national areas. Thirdly: oil and gas lines had to cross foreign grounds to reach shore and the processing plants. All these issues had to be negotiated and solved and all were highly technology sensitive. Without new technology there would have been no interest for the continental shelf and no contested resources.

New technology also reduced the problems that it originally created. Sub sea production units (on the sea floor) have today taken over for the surface platforms. Horizontal drilling has also increased the efficiency of the fields and has been applied in many fields (particularly on the border between the British and the Norwegian sector). Together with agreements it has meant a much higher yield than could be obtained from only one side of the border line.

Project 3

"Under acid skies. Negotiating Airborne Pollution in Europe."

Arne Kaijser, Royal Institute of Technology, Stockholm

Aims and Objectives

In November 1979 the Geneva Convention on Long-range Transboundary Air Pollution was signed by representatives from 34 countries under the auspices of the United Nations Economic Commission for Europe, UNECE. Article 2 in this Convention stated: "The Contracting Parties, taking due account of the facts and problems involved, are determined to protect man and his environment against air pollution and shall endeavour to limit and, as far as possible, gradually reduce and prevent air pollution including long-range transboundary air pollution"

This was the first Convention of its kind. For the first time pure air was recognized and treated as an international Common Pool Resource (CPR), and representatives from many countries made an agreement to jointly reduce air pollution. The Convention signified the establishment of an *international commons regime*. It set up principles and rules for the future handling of this CPR by the participating countries. In the following decades it provided an arena and a framework for further negotiations, which have resulted in eight specific protocols. In these, the signing nations have made concrete commitments in terms of reducing emissions of a certain substance in a certain period of time.

This project proposes to study the negotiating of air-borne pollution in Europe. Its **primary aim** is to investigate the "discovery" and the subsequent mapping of long-range transboundary air pollution in Europe, as well as the international negotiations leading to an international commons regime based on the Geneva Convention and its subsequent protocols. The emergence of this regime is in many ways an astonishing "success story". In a surprisingly short period of time and in the midst of the Cold War, more than 30 nations were able to reach agreement on an issue of a totally new kind. How was this possible? A number of political scientists (Gehring 1994, Levy 1993, Bäckstrand 2001) and sociologists (Sundquist et al. 2002, Lidskog and Sundqvist, 2002) have studied the emergence of this regime focusing primarily on a rather limited time span and dealing with the actors directly involved in the research projects and negotiation efforts. The basic assumption of this project is, however, that this process can only be understood if it is placed in a longer and wider context. Some of the basic questions to be dealt with are: How did various actors come to a realization that the air above Europe has the character of an international common pool resource, which is vulnerable to emissions of a number of pollutants? What role did scientists play in clarifying the mechanisms of longe range pollution and the options for reducing it? How did politicians and diplomats develop institutions for handling these new international political issues? How were new technologies for abatement of different kinds of emissions developed? Were inventive efforts spurred by the negotiations on emission control and did availability of improved technology in turn influence agreements about concrete measures and targets for emission reduction?

Another basic assumption is that the international regime should be seen in relation to national regimes. A prerequisite for the establishment of the international commons regime was that there already existed national regimes as well. When nations signed protocols about reducing emissions, such commitments only made sense if there were national regimes, which could enforce the reductions. The national and international regimes can thus be seen as "nested levels" to use a concept coined by Elinor Ostrom (Ostrom 1990, Keohane and Ostrom 1995)). An **additional aim** of the project is to investigate the emergence of national regimes in a few European countries and to study their interrelations the international one.

Today there is a broad understanding that the sky is a natural resource of vital importance for all life on earth: That it provides oxygen for breathing, gives protection from ultraviolet rays, shields the earth from asteroids and meteors, maintains the earth's temperature within a suitable range, and constantly replenishes fresh water supplies. There is also a growing realization that some of the most basic physical and chemical processes in the sky are vulnerable to the effects of human activity, in particular the rapidly increasing emissions from industrial processes and transports. Many people are in fact seeing the sky as the largest and most precious common resource on earth, a resource that is seriously threatened with a "tragedy of the commons," a continuation of emission growth because too many individuals, companies and nations are not prepared to make short term sacrifices if they are not certain that all others will be doing the same (Barnes 2001).

It is easy to forget that this awareness of the sky as a vulnerable global commons is fairly recent. Until the 1960s air pollution was seen as primarily a local or provincial problem, that should be handled at local or if necessary at a national level. It was not until the late 1960s that cross-boundary air pollution emerged as a phenomenon of major importance. Scandinavian scientists convincingly argued that oil and coal combustion in power plants and industries in the UK caused acid rain in Norway and Sweden, with severe environmental consequences for lakes, rivers and forests (Lundgren 1998). In the following years many international research projects were initiated in order to get a better understanding of the diffusion patterns of pollutants and of the sensitivity of soils and lakes in different parts of Europe.

This research made it clear that the European air space is an asymmetrical Common Pool Resource, due to the distribution of industrial plants, the dominating wind directions (from the west) and the varying soil qualities (lime content). A kind of geopolitics of pollution emerged, with a strong tension between net importers and net exporters of pollution. The former were eager to reach international agreements, the latter were not. Given this tension it is rather surprising that it took only 10 years from the discovery of large-scale transboundary pollution until the Geneva Convention was signed.

This convention focuses on air pollution of a "regional" or European scope, that is on pollutants that only stay a few days in the air before they are deposited on the surface of the earth. Sulphur and nitrous oxides were the first to be addressed; later also volatile organic compounds, heavy metals, and persistent organic compounds were included. The regional scope is the reason why this issue has been dealt with in the context of the United Nations Economic Commission for Europe (UNECE).

During the 1980s and after growing attention has been given to "global" air pollution, that is pollutants that stay for very long (in the order of a century) in the atmosphere and are thus spread all over the globe. Carbon dioxide, methane and CFCs like freon are typical examples of such global pollutants that have been found to affect the long term climate and the ozone layer in the stratosphere. The UN has dealt with this pollution on a global level, as it was essential to include as many nations as possible in the negotiations. Experiences of negotiations on the European level in the 1970s seem to have been an important stepping-stone for the global negotiations in the 1980s.

This project has a very clear relevance to the CRP as a whole. It deals with a common pool resource of European scale, and the negotiations on air pollution have involved almost all European nations. The project will deal with all four of the common research themes in the CRP.

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Project 4

"Constructing Commons. River Vuoksi."

Kristiina Korjonen-Kuuspuro, South Karelian Institute, Lappeenranta University of Technology

Aims and objectives:

This IP project has two aims. The major aim is to study independently the evolution of one major river as a "multiple commons," i.e. as a matrix of interlocking common resources. The River Vuoksi is not just a river, but a massive natural stream of water that connects Europe's two largest lake districts, Lake Saimaa and Lake Ladoga. The Vuoksi also connects Finland and Russia/Soviet Union and therefore it links Europe to the Russian Empire/Soviet Union. The focus of the study is on the invention, exploitation and management of the river as a matrix of common resources. As described below, the Vuoksi was invented as a river, modified to support industrialization and urbanization and increasingly managed as a national and transnational common.

In the following paragraphs we will define the periodization of the projects and describe briefly the main issues in each period to be studied:

1. Inventing the Vuoksi River; 1800-1860

In the beginning of the 19th century the Vuoksi was not really a river, but a combination of waterfalls, rivers and lakes. This approximately 150 kilometres long network of waterways directed almost 600 cubic meters of water per second from Lake Saimaa to Lake Ladoga.

At the time it was almost impossible to manage the river and small fishing and farming communities along the river suffered from frequent floods. Therefore, farmers along the river welcomed the enlightened idea of altering the direction of the river to improve drainage. The first efforts were made already in the late 18th century, but on one dark evening in 1817 the farmers dug a small creek through the narrow neck of land that separated the river from Lake Ladoga. During the night the river penetrated through the soft soil and formed a new channel that was later called River Taipale.

Four decades later the direction of the Vuoksi was changed again. This time the narrow neck of land was broken in Kiviniemi, about 80 kilometres down stream. The idea was to create a new common resource on the Vuoksi, a navigable shipping route from the Vuoksi to Ladoga. The project was managed by professional engineers and authorized by Tsar Alexander II himself. This Kiviniemi project was accomplished in 1857. The water level lowered significantly and more than 10.000 hectares of new land was added for agricultural use. However, no shipping route was established, because the passage proved to be too dangerous.

The modification of the Vuoksi changed the natural course of the river. The Vuoksi became a River with capital letters. It was no longer a network of different kinds of waterways, but a large natural stream of water emptying waters from Lake Saimaa to Lake Ladoga. This renewed form of the river helped people to visualize the Vuoksi as a river and identify themselves as users of its resources.

2. Contested River; 1860 – 1945

In the period between 1860 and 1945 Finland was first an autonomous part of the Russian Empire and following the Russian Revolution in 1917 an independent nation. The Karelian Isthmus, a region between Finland and Russia became the cradle of Finnish culture during the nation-building era in the late 19th century. Later, the Karelian Isthmus played a major role in the Finnish industrial revolution. Much of that could be attributed to the Vuoksi river that runs through the Karelian Isthmus. It became one of the most important complex of resources in the region.

Until the late 19th century the Vuoksi was more or less an uncontested public good. Along the river hundreds of fishermen used the river for source of living. Famous artists came to paint the splendid landscapes and wild waterfalls and writers documented peculiar Karelian mentalities in the Vuoksi river basin. Upper class tourists from St. Petersburg and many other European countries came to Imatra to experience Europe's biggest waterfall. The river was wild, free and open for everyone.

However, the industrial revolution changed the nature of the river. The Vuoksi's hydropower resources together with massive forest resources of the Karelian Isthmus attracted private capital from Finland and Russia. The Imatra water fall and other major water falls were harnessed and river banks were cleared for factories and mills. Intensive technology transfer from Western Europe brought paper machines, water turbines and high speed saw blades to the Vuoksi river basin.

As a result, the Vuoksi river ceased to be an unproblematic public good. Different stake holders competed against each other for more rights to the river and its hydro power resources. Fishermen could no longer catch the valuable salmon, because the wild fish couldn't by-pass the dams and power plants. Tourists disappeared, because the Imatra waterfall and other falls were silenced and the divine landscape had been destroyed for good. The water of the river was directed to the new hydro power station in accord with the ideals of the modern industrial age. The Vuoksi River became 'The Finnish Ruhr'. Several state enterprises were established to utilize the hydropower (Imatran Voima) and the forest resources (Enso-Gutzeit). The romantic values that characterized the Vuoksi River in the 19th century were replaced by the values of the modern industrial age.

During the middle of the 1930's the Finnish Army launched a large scale construction project, the so called Mannerheim Line, on the Karelian Isthmus. Its aim was to seal Finland from the Soviet Union in case of war. Several heavy duty concrete bunkers were erected on the defensive line that stretched from Lake Ladoga to the Gulf Finland. The Vuoksi River became one of the cornerstones of the Mannerheim Line. It was a natural border and heavy fortifications made the river the ultimate obstacle to anyone trying to invade the country. Now the Vuoksi, like many other rivers, had also been enrolled as a military resource.

There was a conscious effort to maintain the Vuoksi River as a freely accessible public good although industrialization, urbanization and militarization changed the nature of the river. These efforts were somewhat successful and at least in the minds of the people the Vuoksi River was still the Great Karelian River and as such a free public good rather than a contested cluster of industrial-military resources.

3. Divided commons; 1945 – present

After the traumatic wars of 1940-45, the Vuoksi's resources again became objects of transnational contestation. This was, of course, against the will of the Finns. The new border between Finland and the Soviet Union sliced the former Finnish Karelian Isthmus in half, leaving only 15 kilometres of the Vuoksi river on the Finnish side of the border. The rest of the river belonged to the Soviet Union, that declared the Karelian Isthmus as a closed border area.

The Vuoksi river as a free public good was irretrievably lost. On the Soviet side of the border the access to the River was limited to those with special permission. Meanwhile, in

Finland the river was mostly used for hydro power production and other industrial purposes. Common people on both sides of the border lost interest in the river and the old collective resource was forgotten.

However, the border couldn't stop the flow of the water and in fact the Vuoksi's resources became transnational ones.: it drained a good deal of Finland, supplied Lake Ladoga with fresh water and served as a source of hydropower. Some sort of coordination and management was needed to regulate the flow of water and to guarantee optimum production of hydropower on both sides of the border. The first agreement between Finland and the Soviet Union was signed in 1964 and a Joint Commission was established in 1965.

The collapse of the Soviet Union changed the nature of the Vuoksi as a common-pool resource once more. The closed era ended and the people again had free access to the river. However, old structures were lost and most of the Russian side of the river had been left in peace for almost five decades.

The border issues have also changed radically. Today Finland is a part of the European Union and the Finnish-Russian border is also the border line between the European Union and the Russian Federation. Because of this, several new transnational regulations have been issued to control the use of the river. In the future the European Water Frame Directive will also cause changes in the means of controlling the Vuoksi.

Project 5

"Weather Forecasting and the Making of Modern Europe"

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Aims and objectives:

This project investigates how a commonplace thing, such as the weather forecast, becomes a public good, available for everybody. Modern weather forecasting depends on sophisticated scientific knowledge and specialized technological instruments. In addition, modern information and communication technologies are used for broadcasting weather information to the general public. Today, weather forecasting is a global enterprise and internet and global communication networks broadcast accurate weather information 24 hours a day. However, during the 19th and early 20th century, weather forecasting played a central role in the making of modern Europe. Nation states established national weather services and built national networks of observatories and weather stations. Weather forecasts focused on 'national' weather and only rarely were references made to broader geographical areas.

Hence, the first question for project is an obvious one: What was the role of science and technology in making modern weather forecasting and how did reliable weather forecasts influence nation building in Europe during the 19th and 20th century? Subsequently, the project will investigate the nature of weather forecasting in more detail. It seems evident that weather information is, indeed, open to everyone and since the development of telegraph, telephone, radio, television and the internet, weather information could be transmitted almost instantly even to most remote parts of the world. Weather forecasts therefore seem to be public goods and available for everyone, but there are 'other' weather forecasts, which are broadcast only to special groups in society. From very early on the military required separate weather forecasts. Similarly aviation, shipping, railroad and road managers were offered more specific weather information.

The project will, therefore, investigate how weather forecasting becomes specialized and how different groups in society are served with different kinds of forecasts. These questions were crucially important during WW I and even more during WW II, when Europe was turned into a battleground and modern technological armies marched against each other. Weather information became an important strategic asset. It is a well known fact that the Allies were able to surprise the Germans in Normandy because the British weather service provided General Eisenhower secret information about the weather conditions in the British Channel.

National borders are political constructions and, in fact, they have nothing to do with scientific meteorology which studies the dynamics of the atmosphere. There are, of course, no political borders or geographical boundaries in the atmosphere. However, this was not fully appreciated until the late 1930's when new meteorological instruments were invented and for the first time meteorologists had a chance to observe the dynamics of the upper atmosphere. Soon it became clear that it was the upper part (above 15 kilometres) that determined the weather on the earth's surface. The lower atmosphere was also important, but it only reflected the dynamics of the upper levels. These discoveries changed the nature of meteorology and weather forecasting. In order to produce reliable weather forecasts, the network of observatories and weather stations had to be extended throughout the globe (including the North Pole, Antarctica and the Oceans). National weather services had an important role, but they had to work together to get accurate information.

Hence, the project will investigate how weather forecasting moved from the national level to the transnational level after WW II. This process was shaped by radiosondes, radars, weather satellites and automatic weather stations. They collected accurate weather

information from the earth's surface to an altitude of 40 kilometres. However, modern meteorological technology was a double edged sword. It could be used to provide accurate weather forecasts to almost everyone, but the same technology was also used in modern high technology weapons. Missile guiding systems depended on radars and weather satellites as did supersonic bombers and fighter planes.

The final question the project investigates is the interplay between public good and closed and segregated knowledge. The demand for global weather forecasts increased when travelling, tourism and business began to transgress national borders. At the same time, however, the ailing super powers tried to maintain their hegemony in the world. This clash of interests lasted until the early 1990's when the Cold War suddenly ended and the world system took another shape. Global information systems started to broadcast weather forecasts on-line.

Project 6

Europe's Airspace Commons: Technology, Regimes of Governance, and the Process of European Integration

Eda Kranakis, University of Ottawa

Aims and Objectives

This project will explore the role of technology in the governance of Europe's airspace commons. The challenge of regulating Europe's transnational commons has contributed materially and symbolically to European integration. Yet technology's role in shaping regimes of access and use of common pool resources (CPRs) has been little studied and remains poorly understood. Airspace offers an important example of the interaction of technology and CPRs; it is a commons that was effectively created through technological change. In an abstract sense, of course, airspace has been around forever, like the oceans, rivers, and the atmosphere, but it became a formally recognized commons only when technologies to exploit it internationally emerged, notably aviation technology. Today, exploitation and management of this commons depends on many technologies—from the aircraft that use the airspace, to the air traffic control and satellite navigation systems that manage the safe routing of traffic through it, to the airports and other infrastructures that influence patterns of air traffic density and flow.[1]

Airspace also offers a unique example of the technopolitics of European integration. Technological developments in aviation and the use of airspace have interacted continuously with regimes of European and national governance (not only with respect to airspace but also with respect to, e.g., markets). And regimes of governance, national and European, have shaped technological decision making in aviation and airspace management. This dynamic interaction between technology and governance is a fundamentally political process in which the interests of diverse actors have been balanced, including the flying public; airlines and their employees; transportation, air safety and air traffic control authorities (such as Eurocontrol, the European Civil Aviation Conference, the Joint Aviation Authority, and the European Aviation Safety Agency); unions (like the national and European unions for pilots, air traffic controllers, and flight attendants); military authorities; regional, national, and transnational levels of government; airports; companies that produce the diverse aviation and air traffic control technologies used in Europe; and international aviation and airspace regulatory agencies like the International Civil Aviation Organization (ICAO), the International Air Transport Association (IATA), the Airports Council International (ACI), and the Association of European Airlines (AEA).

The historical, evolutionary drift of European airspace as a commons is clear. When aviation emerged as a practical reality in the years leading up to WWI, national governments attempted to negate the reality of this new commons (or at least control it) by declaring national sovereignty over airspace. This approach was formalized in a treaty signed at the Versailles Peace Conference following WWI. However, the trend since then has been toward increasing transnational use of this nationalized commons and toward greater organizational accommodation to such use. In 1930, the number of passenger-miles flown annually in European airspace was less than 50 million. By 2001, the number had reached 133 billion, an increase of more than 2,500 percent, and the number continues to grow by some 9% per year. Convinced that existing governance regimes were no longer adequate for these conditions, Europe's air traffic controllers began warning publicly that use of the

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[1] There is, as yet, no general study of airspace as a commons, although Susan J. Buck devotes several pages to the topic in her book, *The Global Commons: An Introduction* (Island Press, 1998).

continent's airspace was reaching a saturation point, threatening passenger safety. The mid-air collision in 2002 over Lake Constance, between a Boeing 757 and a Tupolev-154 (carrying over 50 Russian schoolchildren), made this threat real: a "crisis of the commons" was at hand. Many saw further European integration as the necessary solution. A *Guardian* headline said bluntly: "Euroskepticism won't keep us flying safely."[2]

The EU responded to this crisis by implementing a "single-sky" program embodied in a series of regulations passed in 2004. They began formally de-nationalizing European airspace. In particular, the Single Sky initiative established a new *legal regime* for upper airspace, taking it out of the realm of national sovereignty for the purposes of civil aviation. Acknowledging that "airspace is a common resource for all categories of users that needs to be used flexibly by all of them, ensuring fairness and transparency," the regulation stipulated that "airspace should be designed, regulated, and strategically managed on a European basis." It mandated that Europe's upper airspace be divided into "functional blocks" that would no longer necessarily follow national boundaries, but that might map out new transnational regions. Within each block, a single, unified system of air traffic management would prevail. In response to this revised legal framework, new, integrated technical systems for air traffic control, to be used Europe-wide, are currently under development.

The aim of the project is to reveal how and why this path of growing transnational use—leading toward de-nationalization of airspace—occurred as it did. To what extent was this path of change "technology driven"? Who were the key decision makers involved? And how were the competing interests of various actors balanced? How were perceived national interests balanced against interests of transnational users of the resource? How have military and civilian uses of airspace been coordinated? How have patterns of airspace use been affected, either by technological changes or by policies regarding ticket pricing, airport slot allocation, hub-and-spoke or other routing systems, cabotage rules (that specify whether a carrier from country C can carry air passengers between countries A and B), etc.?

Commons scholar David Bollier has remarked: "there is not likely to be a unified-field theory of the commons any time soon. Each commons bears the distinctive imprint of its own resource domain, culture, history, legal system and scale of operation."[3] This statement carries a dual challenge, which this project takes up. First, it will explore the uniqueness of European airspace as a specific commons and, second, by coordinating a deeper understanding and analysis of this commons with the results of the partner projects, our collaborative research will help to establish a theory of Europe's commons, their role in building European community and governance, and the role of technology in this process.

Methodologies and Work Plan

The key challenge in carrying out this research project is to manage its complexity. I will follow three methodological strategies for collecting and organizing the necessary data. The first strategy is to distinguish between airspace *access* regimes, and airspace *management* regimes (while taking stock of how these overlap). Access regimes involve the systems that determine who uses Europe's airspace and under what conditions. A first division lies between military and civil access. Within the domain of civil access, it is necessary to distinguish between scheduled commercial airlines, charter airlines, and private aircraft (including corporate aircraft). It is beyond the scope of this project to consider access regimes for all of these categories. I will concentrate on the regimes for military aircraft, and for commercial and charter airlines, since they are at the heart of the airspace congestion problem. Historically, military aircraft have had preferential use of their national airspace, but growing congestion has initiated new efforts to coordinate military and civil access regimes so as to optimize airspace use overall. Access regimes for commercial and charter

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[2]Will Hutton, "Euroskepticism Won't Keep Us Flying Safely," *Guardian* (7 July 2002).

[3] David Bollier, "Public assets, private profits: reclaiming the American commons in an age of market enclosure," National Press Club Seminar, Washington, 12 March 2001. See Bollier's *Silent Theft: The Private Plunder of Our Common Wealth* (Routledge, 2002).

airlines are shaped by competition rules, aircraft capabilities, size and location of airports, rules for airport slot allocation, and so on. I will explore how these diverse factors are prioritized and balanced, and how they interact.

Airspace *management* regimes comprise technological and organizational systems for monitoring and controlling air traffic. Air traffic control depends both on technologies like radar or satellite navigation systems and on organizational variables like the use of specific air corridors, particular routing systems (such as hub-and-spoke), and the establishment of separate regimes for controlling traffic around airports, in lower airspace, and in upper airspace (e.g. above 24,000 feet). These variables and their evolution are linked to other technological changes as well. For example, the elaboration of upper airspace management regimes emerged with the advent of jet aircraft, which flew at greater heights and speeds.

The second and third strategies to manage this project are to identify the principal events and actors in airspace use and governance, and to establish a periodization of the main eras of European airspace governance. I will consider how the perspectives and demands of various actors were balanced in each era, and how balance between different levels of governance (local/regional, national/international) was established. The history of key organizations involved in European airspace governance will be traced, as well as laws, regulations, and treaties on which airspace governance was based. For example, Eurocontrol—the international organization for European aviation safety and air traffic management—was established through an international convention signed in 1960, in response to the new safety and airspace issues raised by the advent of jet aircraft. This convention was revised in 1970, 1978, 1981, 1986, 1997, and 2002, steadily expanding the organization's role and importance. It is a key player in the single-sky initiative and in the establishment and management of the transnational, functional airspace blocks.

Project 7

"Technology, Polar Nationalism and the Arctic Commons: Conditional Sovereignty and the Command of Common Space"

Bruce Hevly, University of Washington

Aims and Objectives

By the end of the twentieth century, the islands and oceans of the Arctic had emerged as a contentious region, characterized by disputes over sovereignty claims and claims to resources that had developed in important ways over the preceding century, although they extend back to the early 1600s. In approaching this history, a vital part of the history of the recognition and the exploitation of a European commons, it is useful to think about the Norwegian experience in particular, and the Scandinavian case more generally, for the relevant insights offered. This case speaks to at least three important issues: the complex process of border making, the uses of technology and science as cultural capital in making sovereignty claims, and the tensions between internationalism and nationalism.

Like the Rhine and the Baltic, the polar waters north of Norway became a zone of international investment characterized by conditional sovereignty. Claimed by Norway, Sweden, Denmark, the Netherlands, Britain, and the United States (at least), Svalbard/Spitzbergen and the surrounding waters became the subject of fierce competition, particularly after the discovery of coal in the archipelago. Since these events at the beginning of the twentieth century, the importance of the region has only increased, with Norway's creation of a self-image as a polar nation (given important territorial holdings in both the Arctic and the Antarctic), the ongoing discovery of undersea oil deposits in the region, the dependence of the Soviet Union and the Russian Federation on arctic fisheries as a protein source, and the prospects inherent in climate change. Both Norway and Sweden used their scientific research efforts in the region as justifications for their territorial claims, a form of investment recognized by the League of Nations in making a grant of sovereignty to Norway in the Svalbard Treaty after World War I. Norway's administration of the region, though, amounted to only conditional sovereignty, a state in which the region had to be kept open for continuing scientific research and for some kinds of economic exploitation by non-Norwegians. While science and technology were used to help establish borders, then, these borders were extraordinarily malleable. Here nationalism and internationalism were established in tension, with the Svalbard Treaty creating a kind of enforced commons.

This tension persists to the present, and the history of the arctic commons is an open-ended one. While its status as a "useful neutral" to the victorious powers in World War I helped make the case to the League of Nations for control of Svalbard, after World War II Norway's leaders came to feel that neutrality was an untenable position, and Norway joined the North Atlantic Treaty Organization (NATO) upon its creation. The arctic seascape and its small land outposts north of Norway then represented prime strategic territory on the sea lanes to the Soviet Union, subject to negotiation between the two countries concerning the extent to which Norway would undertake research or deploy technologies at the behest of the United States and against Soviet interests. International Law of the Seas treaties in the late 1950s did not altogether resolve competing territorial claims in the region north of Norway, and since the 1970s those claims have been more pressing because of the potential value of petroleum and natural gas resources in the area, the great importance of this segment of the Norwegian economy, and the perhaps even greater importance of arctic fisheries to the Russian national food budget, coupled with the overwhelming efficiency of modern

technology for locating, capturing, and processing fish. Because both undersea drilling and factory fishing raise the danger of extensive environmental damage, and represent potential threats to the common good, the question arises of how best to manage resource exploitation for all concerned. In the management of ocean resources, it been assumed that international management regimes were best suited to *avoid* the "tragedy of the commons," for example by applying international scientific expertise under the aegis of the International Council for the Exploration of the Sea (ICES), but arguably in the Barents Sea, characterized by Norwegian-Russian competition for oil and fish stocks, nationalist efforts have proven to be more effective at environmental preservation.

In brief, then, it remains to study and understand the story outlined above. How did scientific research function as a kind of cultural capital to buttress sovereignty claims, and, in turn, how did technologies for the investigation and the delineation of arctic nature reflect the nationalist and strategic commitments of the principals as they changed over time? How did technology help to manage the conditional sovereignty characterizing this arctic commons, and how did it mitigate the undercutting of nationalist aspirations? Did internationalist organizations invest in technological systems that were markedly different from national systems?

Thus the goal of this Associated Project is to understand the ways in which technologies applied to the problem of defining and understanding the arctic region in the area north of Norway extending to the Svalbard/Spitzbergen archipelago helped to create an arctic commons that has existed in tension with polar nationalism. Beginning in the late nineteenth century and extending through the Cold War, this story, in addition to contributing to the cooperative effort described in this proposal, also contributes to the overall theme of "Inventing Europe" by being attentive to a historically marginal European region, but one that was characterized by both the effort to carry the establishment of territorial borders to a very great extent and by a relatively early establishment of a conditional sovereignty that has allowed for persistent competing claims to resources and to other forms of access.

Methodologies and Work Plans

My general method is to combine insights from the history of modern physics and the history of technology and, in particular, to look for the ways in which strategic commitments were reflected in the choice of research instruments developed for use in polar research. In particular, research along these lines can demonstrate the ways in which the knowledge of nature's boundaries, characteristics and potentials was cast into useful terms. I have undertaken this line of argument in earlier work on the history of ionospheric physics, and I think the approach can be broadened in this case, and can contribute to the other studies to be undertaken under the aegis of this proposal as well as my own.

Three specific research programs to be examined come immediately to mind. First, the analysis of the circulation of arctic seawater formed a long-term intellectual commitment within Norwegian ocean science, pursued in a series of expeditions from the late nineteenth century through the 1930s and extended to Antarctica in the postwar period. But this topic was also intimately connected to the establishment of political boundaries and to the question of the management and the sustainability of fisheries in the far north. Second, radio propagation research in the far north also presented a long-term research program that linked research in physical sciences to technological commitments and to the extension of national control. By enlisting radio research in the general program for auroral studies, and by building up institutions for such research in the far north (in this case, Tromso as a research site), Norway simultaneously built up its cultural and governmental investments in the north and pursued research that would extend more reliable communications systems over the region. (Here the parallel to the United States development of Alaska, including the

radio research station at Fairbanks that preceded the establishment of a territorial university, is clear.) After World War II, this tradition of dual-purpose research became important as Norway emerged as a junior partner to the United States in the strategic polar north. With certain activities forbidden or at least questionable under the conditional sovereignty obtaining in Norway's arctic possessions, scientific research in ionospheric physics by means of advanced radio equipment and by other means became defensible in negotiations with the Soviet Union. Thus the constraints on sovereignty inherent in NATO membership – that is, by relationships with European partners as well as with the United States – overlay the post-World War I restrictions on sovereignty written into the Svalbard Treaty, and the technological systems developed must have reflected attempts to broker among these competing demands. Third, the establishment of borders after the Law of the Sea accords of the late 1950s and more recent international negotiations over the responsible development of natural resources in the arctic commons should be connected to the technological systems that have been deployed to represent state interests. The geology of the sea floor has become a crucial topic both because it can be made responsive to the boundary-making function – establishing connections between offshore formations and the Continental Shelf, which the treaty uses as evidence of territorial rights – and because an understanding of undersea landslides such as those which led to Atlantic tsunamis in the past can be used as a model for the possible worst-case consequences of undersea drilling. All of these cases exemplify the importance of understanding technology-based science in the framework of competition nationalist visions and enforced internationalism in the region of the arctic commons during the course of the twentieth century.