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Tradable permit schemes in environmental management: Evolution patterns of an expanding policy instrument

Sounding study

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Content

1. Introduction

This report provides an overview of various instances of the implementation of tradable permits schemes (TPS).[1] It shows how this policy instrument is expanding its use across various domains of environmental and resource policies and across jurisdictions on different levels of political organisation, from local authorities to international regimes. The report follows up on research on the innovation journey of emissions trading (see Voß 2007). From there, it broadens out, widening the focus of analysis from a particular line of policy design in the field of air emissions to study the whole "family" of policy instruments that refer to the concept of tradable permits. This includes evolving policy designs in diverse domains of application such as regulation of water quality, land development planning, waste management, fishery management and protection of biodiversity.

Tradable permit schemes can be defined as institutional arrangements (or 'modes of governance') that entail the construction of markets to trade a specific form of rights – usually rights to exploit a natural resource or to emit harmful substances into the environment. With the establishment of tradable permit schemes it becomes possible to offset the emission of polluting substances or to compensate for the exploitation – and destruction – of a natural resource. This principle has been increasingly implemented in the past three decades in environmental management throughout the world.

In the course of my research I created a database which comprises information about historical and current tradable permit schemes and their legal frameworks on a local, national and international level. The database does not provide a complete overview of all tradable permits schemes which have been established all over the world, but rather contains most important experiences with this policy instrument not only in the OECD countries but also in developing countries. This report, and particularly the database, is based on internet research. Interviews have not been conducted. Information on the various TPS are mainly sourced from websites and legislation. The sources listed in the bibliography, mainly papers, were used to write the report only.

This report builds on the database by presenting the main features of tradable permit schemes (TPS) in comparison. The report distinguishes between two types of designs for TPS: credit trading and cap-and-trade. A key focus is placed on specific designs of TPS that are linked to different fields of application and adaptations that occur when TPS 'travel' to new problem domains and/or new jurisdictions. The 'family-tree' that can be constructed from the database (Annex 1) shows that the instrument does not develop in a linear fashion, not even within a single problem domain. This points towards the importance of studying turning points and linkages at which the design is translated to a new field of application. The overview thus focuses on the most influential schemes and on innovative schemes that have not spread out to a great extent up to now. An exhaustive analysis cannot be undertaken in the scope of this "sounding study"; the goal is rather to convey supplementary perspectives for future research.

The guiding questions of this paper are summarised as follows: *How does the idea of tradable permits extend to both new domains and new countries? And how does the design of tradable permit schemes change during this process?*

In the first part of this report the concept of tradable permits is defined in more detail based both on theory of policy design and cases of policy practice as collected in the database. The main part of the report reviews the implementation of TPS for each domain of application, providing an overview of evolution over the years and across countries. In conclusion, further research questions will be proposed with regard to the study of innovation processes in governance.

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[1] The report is the result of a research internship at the Öko-Institut in Berlin (half-time, three months). The internship was supervised by Dr. Jan-Peter Voß in the course of preparing a larger research project on the historical development of novel policy instruments (www.innovation-in-governance.org). I thank Vanessa Cook for checking my writing in English.

2. Definition of tradable permits

Tradable permits can be defined as marketable rights that allow the emission of polluting substances or the use – or even destruction – of a common resource. Every tradable permit scheme is based on permits (or rights) granted by a regulatory authority to participants to the scheme (usually companies who wish to exploit resources or emit polluting substances). Permits may be traded (or transferred) between participants who pay the most for it in order to gain the right to exploit resources or pollute. In this way a legal standard for environmental protection (limitation of emissions or resource use) can in theory be achieved in the most cost-efficient manner.

TPS are advocated on the basis of economic modelling exercises, which show that they are more effective and cost-efficient than alternative policy instruments such as command-and-control regulation or environmental taxes (Tietenberg, 1974). TPS have been implemented in environmental policy since the 1970s as a means to tackle the "tragedy of the commons" (Garrett Hardin, 1968). Their popularity increased as skepticism towards the state started to grow, economic pro-market theories were flourishing in policy analysis, and environmental awareness was increasing at the same time. Since then pollution sources tended to be directly regulated by the state through upper pollution limits. This regulatory regime increasingly drew criticism, mainly on the part of industry, economists and economic growth-oriented politicians. In 1960 the economist Ronald Coase pointed out in a seminal paper that it was more cost-effective to install private property rights and make them transferable to let the market determine their price rather than to impose general limits on pollution or fixing a price by installing environmental taxes (Coase, 1960). The general model of tradable property rights was applied to environmental management a few years later, by T. Crocker (1966) for air emissions and by J. Dales (1968) for water pollution. A major shift from direct regulation (termed 'command-and-control') to market-based policy approaches occurred in the 1980s in the USA and Chile, and a little later in the United Kingdom and New Zealand. In the 1990s this shift continued to proceed on a global scale. Today, tradable permit schemes are best known in connection with the reduction of emissions of Greenhouse Gases (GHG) in Europe and the reduction of emissions of NO_x and SO_2 in the USA. However, TPS have been implemented within a much wider spectrum of implementation fields.

Two types of tradable permit schemes can be differentiated: credit trading programs and cap-and-trade schemes. Table 1 provides an overview of their main features.

Tradable permit schemes are implemented (a) to manage the use of a common resource that might be overexploited or depleted if there was no regulatory protection (e.g. fish, ecological habitat) or (b) to curb the quantity of pollutants emitted (e.g. air and water pollution). In the first case, a tradable permit may attest the right to use a predetermined quantity of a common resource (water rights, fisheries, hunting) or the right to interfere with unspoiled and hence protected ecosystem (biodiversity credits, wetland conservation). In the second case, the permit attests the right to emit a predetermined quantity of pollution (air pollution, water pollution, and landfill).

Table 1

	Credit trading	**Cap-and-trade**
Name of the permit	Credits	Allowances
Emission target	Standard/baseline for individual unit (polluting or resource depleting installation)	Global standard/cap for a collectivity of units (sector, branches of industry), divided into a number of allowances
Environmental effectiveness	Upper limit for each unit: if number of units increases, total emissions also increase	Upper aggregate limit: total amount of emissions or resource use cannot be exceeded within the scheme
Flexibility of compliance behavior	Emissions/resource use above standard/baseline for individual units are possible through use of credits from over-complying units	Emissions/resource use above the aggregate standard is prohibited, individual units can buy and sell as many allowances as they want
Generation and allocation of permits	Credits are granted to individual units for over-compliance compared to the baseline (technological standard or 'without-measures scenario')	Allowances are generated by legal authority and distributed to units on the basis of historical production volume or emissions (grandfathering), auctions, first-come-first-served

(Inspired by Tietenberg (1998))

There is a third category – certificates – which I consider to be on the margins of the definition of TPS, as presented in the Box below.

Box 1: Tradable certificate systems for phase-in programs

Another particular case which bears similarities to tradable permit schemes is that of tradable certificates. Certificates can attest activity towards meeting a legislative standard such as energy efficiency measures, production of electricity from renewable resources or mixing fuel from biomass with fossil fuels. Certificates do not deliver a right, i.e. they do not authorise emission or use of a common resource.

Green certificates, for example, certify that a certain amount of electricity has been produced from new and additional renewable sources. If there is a standard requirement for utilities to produce a certain share of electricity (e.g. 10%) from renewable sources, these standards can be met by acquiring certificates instead of producing green electricity themselves. Through transferable certificates the average standard may be met in the end. This system is sometimes referred to as a "floor system": the aim is to slowly "raise the floor" towards a desired production standard. Certificates are actually a specific form of credits insofar as they represent tradable units relative to a legal standard. However, certificates belong to a phase-in logic whereas classical credits belong to a phase-out program. Let's compare for instance green certificates and Ozone Depleting Substances (ODS) phasing-out programs. The former promote the use of renewable sources (RES) for the production of electricity: it is a phase-in program, the target of which is an increasing average use of RES. In contrast, ODS schemes are phase-out programs: they aim at progressively banning the use of ODS. The crucial difference consists in the nature of the traded "permit": while in an ODS phase-out program, credits (i.e. rights to emit ODS) are exchanged, certificates (i.e. attestations of the use of RES) are traded in a green certificate program.

The difference might appear slight; however it is more than a language trick. Phase-out programs fit in our definition of tradable permits insofar as they represent allowances, authorisations: they are *right-based* approaches whereas phase-in programs rather belong to an extended understanding of tradable schemes called "certificate trading scheme". The same scheme is also applied to energy efficiency ("white certificates"). Although it contributes to a decrease in air pollution in the end, it cannot be understood under the term "permit".

The database lists many features of TPS, which can be used to develop different kinds of typologies, according to different interests and foci. For this report, I have chosen a simple binary differentiation between credit trading and cap-and-trade in order to allow for a better understanding of the schemes. Other typologies would have also made sense. The OECD uses a more differentiated typology comprising four types of TPS (OECD, 2001): quotas (cap-and-trade or minimum limits and trade), emission reduction credits (baseline and credit for emission reduction), averaging (possibility of trade within a bubble to average emissions), and transferable rights. The use of typologies and the definition of classifying terms depend on the context in which they are employed.[2]

In the following part, TPS are reviewed per domain of application according to the distinction between credit trading and cap-and-trade. Furthermore, the review provides information about the evolution of schemes and some specific design features that go beyond a broad classification as credit trading and cap-and-trade.

3. Review of tradable permit schemes per domain

3.1. Air pollution – the (American) origin of credit trading and cap-and-trade

These TPS originate in the USA, particularly at the US EPA, and then spread out worldwide, starting from local air pollution problems, via Acid Rain to global problems such as ODS and GHG. They mainly evolved from credit trading schemes into cap-and-trade programs. A one-way evolution cannot be proved since in some cases credit trading remains preferred.

The current and most famous concept of the tradable permit scheme developed in the air pollution domain in the late 1970s at the US Environmental Protection Agency (US-EPA created in 1970) (the following is based on Voß 2007). The first regulations of air pollution were based on the Clean Air Act (amendments from 1970). This has been a classical command-and-control policy. It set national ambient standards for air pollutant emissions. The EPA was in charge of translating these into standards for individual installations. This approach was soon adapted by the introduction of 'flexible regulation', which allowed for the compensation of under-compliance at one unit by over-compliance at another unit. Thus, a credit-trading program was de facto created, first for intra-firm compensation (bubble concept, 1972-75) and then for inter-firm compensation (offset mechanism, 1976). In 1977 the CAA was amended to give formal legal status to these practices of credit trading. In parallel, the Lead Banking Program (1982-87) was set up to phase-out lead in gasoline representing a pre-form of cap-and-trade: "Although not strictly a cap-and-trade system, the phasedown included features, such as trading and banking of environmental credits, that brought it closer than other credit programs to the cap-and-trade model and resulted in significant cost-savings." (Stavins, 2008) Later on, Project 88, a coalition of policy entrepreneurs, brought the principle of cap-and-trade to the open discussion, trying to bring together environmental actors and industrials. This contributed to the creation of the US Acid Rain Program, based on the CAA Amendments of 1991 and launched in 1993, which is known as the 1st successful model of cap-and-trade (Tientenberg, 2006).

In the meantime, global awareness of air pollution grew globally. International protocols were ratified to curb emissions of ODS by phasing them out through a flexible structure under the Montreal Protocol in 1987, completed by the Conference of London three years

[2] This concerns for example "offsetting", the definition of which used in climate conferences differs from the one employed by the US EPA. I have chosen not to distinguish offsetting within a regulated area (e.g. US EPA bubbles for air emission) from offsetting enabling the compensation of pollution emissions of parties that are not under a binding regulation (e.g. CDM). This is because the grand majority of TPS listed use the first understanding of offsetting in my study. Only some forms of TPS for water pollution correspond to the second definition. Therefore, I did not want to make the typology more complex for only a few cases.

later. No cap-and-trade scheme was globally established, but the Protocol comprised general rules for the implementation of a TPS (including the possible permit trading among the parties) if the parties would chose this option to meet their targets. This heralded the start of international conferences and conventions on air pollution mitigation, which led to the Kyoto Protocol in 1997, promoting a cap-and-trade approach for GHG. Even if no international framework has been achieved yet, these conferences helped spreading out Emissions Trading Schemes (ETS) for GHG. They first appeared within the European Union (Denmark and the United Kingdom were pioneers), and then developed on a transnational scale with the EU ETS that has become a key reference point, and lately it has spread out overseas (e.g. New Zealand, Western Climate Initiative). Although these ETS have different features, GHG emission mitigation has tended to use the cap-and-trade approach internationally.

According to Tietenberg, there has been a shift from credit trading to cap-and-trade schemes over the years, with the newer programs following a cap-and-trade approach (Tietenberg, 1998). However, there are some exceptions: the clean air legislation in Canada (2001), the Filipino Air Act (1999), the VOC and NO_x regulation in Basel, Switzerland (1993) and the mobile source pollution mitigation in the USA (under development since 1990). They are all recent examples of credit trading programs.

A short look at these schemes reveals some similarities among them, particularly in terms of the contexts in which they are embedded. The clean air legislation in Canada began with a pilot program (PERT) on a local level (in Ontario). PERT was an industry-led initiative in the first jurisdiction of Canada experimenting with emissions trading. Although they were inspired by US initiatives, they opted for credit trading. In Switzerland NO_x and VOC were regulated on a local level as well (in the Basel area). The credit trading has been put into force as a flexible mechanism, i.e. as an economic incentive, after the legislation on air emissions was set up. The Filipino Air Act counts among the first tradable permit schemes established in the Philippines.

Since these three examples are located outside the USA, it could be assumed that the shift from credit trading to cap-and-trade has only taken place in the USA. Yet TPS for emissions from mobile sources in the USA refutes this hypothesis: credit trading schemes are set-up in this domain since the early 1990s. A phase-out program started with heavy-duty motor vehicles. Automakers could fall back behind phase-out prescriptions by using credits from other companies who over-complied with the prescription. In 2000, US EPA allowed averaging, banking, and trading for automakers to achieve NO_x standards. In the meantime a new form of credit trading developed in California for the phase-in program of clean vehicles (so-called “Zero-Emission-Vehicles” – ZEV). Since then such schemes are being developed in other states, but not yet on a federal level. This new form of TPS complements cap-and-trade and usual credit trading by supporting the development of clean technologies. This could actually give rise to a new branch of the family tree: TPS in technology diffusion policy.

Finally, the design of the mode of allocation in cap-and-trade schemes evolved, blurring the boundary between such schemes and credit trading. In the Netherlands there is a NO_x trading scheme in place with a relative cap, i.e. the cap is not formulated as an absolute amount of emissions, but rather is relative to turnover of the industry. This allows emissions to grow with economic activity. In terms of (lower) environmental effectiveness, it comes close to a credit trading scheme where total emissions increase with the number of polluting units being installed.

More generally, grandfathering, which is the most widespread mode of allocation, tends to evolve over time into a more flexible mechanism than the original “one-off” allocation of US schemes. This can take the form of a regularly updated base year or of a formula, which is updated over time (Burtraw, Palmer and Kahn 2005). This is the case with the European Emissions Trading Scheme (EU ETS). “Allocation plans are decided for one commitment period at a time, with repeated negotiations about the allocation for the following period” (Neuhoff Martínez and Sato 2006)

3.2. Water pollution – TPS as an expanding tool managing all sources of pollutants

Pretty similar to TPS for air emission, Water Quality Trading makes the compliance to standards more flexible, using both cap-and-trade and credit trading. Combinations of both types of TPS are used to include point and non-point sources.

Water quality trading (WQT) schemes are mainly implemented in the USA, Canada and Australia and address the same kind of problems as air emissions schemes. WQT enable to offset higher levels of water pollution than generally permitted by law (e.g. solvent or nutrient, phosphorus). This comprises point sources that "discharge from a defined route" (e.g. sewage pipe of industries) and non-point sources that "have diffuse discharges" (mainly fertilisers and pesticides brought out by farms) (Rousseau, 2001). The costs for controlling the same pollutant on a watershed may differ depending on the sources. Trading promises to achieve the most cost-efficient solution.

In the USA, WQT takes place in the context of the Clean Water Act, which established Total Maximum Daily Loads (TMDL) and authorised National Pollutant Discharge Elimination System (NPDES) permit programs in 1972. These legislations established limits for the discharge of pollutants. TMLD can be understood as an overall pollutant cap, representing the maximum amount of pollutant that a watershed can assimilate without exceeding water quality standards. These standards are established by the states to protect water bodies.

In 1996, US EPA published a Draft Framework for Watershed-Based Trading, which has been replenished in 2003 by the Water Quality Trading Policy. It is difficult to distinguish cap-and-trade schemes from credit trading for WQT. The TMLD represent an overall cap, which means that these schemes would be cap-and-trade (see Rousseau, 2001). However, US EPA states that point sources "may receive more stringent discharge limits based on a TMDL" (US EPA, 2004). This assumes that standards may be set at a local level based on TMDL, but sources distinguished from each other by setting different levels of standard. Consequently, this would be an individual baseline based on a standard, i.e. a credit program. Both models are implemented in practice.

Three types of WQT schemes exist: among point sources, among non-point sources, and among point and non-point sources. WQTs among point sources are the most widespread model. It works like any other offset program: credits are traded among industries discharging pollutants in the water so as to meet a standard for individual units derived from TMDL. Alternatively, TMDL are taken to establish an overall cap for a water body, which is then directly distributed to different parties in the form of proportionate allowances.

Some WQT schemes include non-point sources by creating economic incentives. Non-point sources cause the greatest part of water pollution. In this way, it represents a considerable advantage over the classical legislation, which was not able to include non-point sources. Such kinds of WQT are shaped as project-based credit schemes similar to the Clean Development Mechanisms: point sources receive credits (against 'without-measures' scenario) from a regulatory authority by funding pollution reduction projects from non-point sources. US projects like Cherry Creek and the Tar-Pamlico Basin work following this model.

The US and Australian EPAs launched pilot programs to test the efficiency of such a TPS. Seeing that they were successful (e.g. in Australia, the Hunter River Salinity Scheme) guidelines were established to promote this mechanism. WQT often remains within local initiatives, run by both public and/or private actors, as a way to meet a standard or a target established by the State. Many projects are to be found in the USA (see Annex 2 for an US EPA review). "EPA believes that as awareness of the potential benefits of water quality trading grows, National Pollution Discharge Elimination System (NPDES) permittees will be more interested in water quality trading and request permitting authorities to incorporate trading provisions into their permits."[3] The success of WQT in the USA is presumably caused

[3] http://ecosystemmarketplace.com/pages/article.news.php?component_id=5788&component_version_ id=8374&language_id=12

by three factors (Woodward, Kaiser and Wicks, 2002): the success of air emission trading schemes, particularly SO_2 programs; the new emphasis of the US EPA on TMDL; and the failure of NPDES to address non-point sources pollution.

3.3. Fisheries – a complex closing of the commons and introduction of transferable rights

Fisheries are complex forms of TPS with highly regulated transactions. The transferability of quotas is not always given and its introduction often provokes social resistance, even if transfers might already be taking place informally. Accordingly, the role of fishermen is crucial in this political process.

In the fisheries only one type of tradable permit scheme has been implemented: a cap-and-trade-system with allowances called 'rights' and an upper cap, the Total Allowable Catch (TAC). The 'rights' represent shares of the TAC.

Before going into more detail, a brief historical background is necessary to understand the development of TPS in this area. Fisheries represented a typical case of the 'tragedy of the commons' (Hardin 1968). They have long remained unregulated, leading to a "race for fish" which resulted in the overexploitation of fishing stocks. Every fisherman had access to fish stock without restriction. The ocean was an open space. Since fish resources were large and the level of fishing activity long remained relatively low, the problem of extinction of some species only appeared dramatic in the mid 20th century.

The first measures undertaken to protect fish resources often consisted of input controls. This frequently took the form of 'effort management', i.e. numbers of days at sea are authoritatively constrained. Output controls in the form of restrictions on the quantity of fish taken out of the sea were often introduced later and sometimes while effort management was still in force, as part of a policy mix. The introduction of Total Allowable Catch (TAC) was most of the time followed by the introduction of quotas. IQ is the first step towards Individual Quotas (IQ), which are portions of TAC allocated to individual units of the fishing industry (companies, vessels, collectives of fishermen). The last step towards TPS then is the introduction of transferability of IQs.

The complexity of fishery management first expresses itself in the variety of terms employed to designate TPS. Remarkably the term cap-and-trade, or even trade, never appears in the literature or in the legislation on fisheries. The denomination "quota" is preferred, but the term "fisheries quota" alone means the TAC whereas the shares of the TAC are generally called "Individual Quotas" (IQs) or "Individual Transferable Quotas" (ITQs). So the simple use of "quota" is not sufficiently precise. There are many different systems and denotations depending on the country and on the management system:

- Individuals Quotas (IQs), common appellation, or Individual Fishing Quotas (IFQs), which do not assure that the rights are tradable
- Individual Transferable Quotas (ITQs): the equivalent of the classical appellation "allowances"
- Statutory fishing rights: the legal appellation of ITQs in Australia
- Individual Vessel Quotas (IVQs): per vessel and not per fisher or fishing firm. Like the IFQs, they are not *per se* transferable. E.g. in the Norwegian fisheries, the IVQ system comprises two kinds of rights that have different characteristics: access rights and fishing rights.
- Community Development Quotas (CDQs), cooperative quotas or Enterprise Allocation (EA): collective management of the rights within a firm (EA) or within voluntary organisations of fishers.

Not only is the appellation often subject to litigation, but also the legal status of the quotas.[4] Four legal statuses in the fisheries can be distinguished: open access, state property regime, private property rights and common property regimes (Dross, 2008). The USA and Canada illustrate the confusion about the legal status of fishery quotas. In the USA, ITQs are not understood as property rights by virtue of their state-created value. It means that the state still owns the property right of the commons. In some cases, the legal status remains ambiguous. On the other hand, Canadian legislation does not specify if ITQs represent property access or not.

Two kinds of transferable quota management can be distinguished. The most widespread instruments are Individual Transferable Quotas (ITQs) and Individual Vessel Quotas (IVQs). Both first appeared in Iceland, followed closely by Australia, New Zealand, Canada and the USA, in the late 1970s and early 1980s. This means that transferable rights in the fisheries were established before tradable permits were widely implemented in the domain of air pollution. Moreover, the first schemes of ITQs come from Individual Quotas that were already implemented but not transferable (e.g. Iceland, Canada, and the Netherlands). It is interesting to note that in some cases (e.g. the Netherlands from 1976 to 1985) transfers took place although it was not allowed, so that the rights were *de facto* real ITQs (see Boxes below) (Smit, 2000).

The other main types of transferable permits are Community Development Quotas, Cooperative Quotas or Enterprise Allocation. These are allocated to groups of fishermen or local communities. Contrary to ITQs, allocation and regulation is undertaken collectively. This form of regulation can be compared to bubbles (or pools) in the domain of air emissions – it is a TPS on a local scale. In this case, however, allowances are traded rather than credits. The community or the enterprise decides how the rights are allocated among its participants: in what amount, according to which criteria, for how long, etc. This is a decentralised management of fisheries. Examples are to be found in Canada since 1989, in the Netherlands since 1993 and in Alaska since 1992.[5]

Generally, the use of ITQs has grown over the years, and has proved itself, but it is still subject of reflection concerning its effectiveness, particularly regarding the protection of biodiversity. Nowadays the management through a TAC has become the standard policy for fisheries. Yet the transferability of fishing rights has not been achieved worldwide for various reasons. Although rights should theoretically be freely transferable to achieve the best allocation with the minimum costs, it appears that fisheries management calls for much regulation. We can speculate that fishery policies cannot be as flexible as air emission policies because they deal with fish species, which are likely to move but which are also embedded in ecosystems. Consequently, TPS often concern a particular fishery, or set different rules for the different fisheries and/or geographical areas. ITQs transfers might be authorised only among similar vessel categories, and/or within restricted areas. Both the monitoring and the regulation are strengthened: transfers are registered and might require an authorisation from the regulatory authority. Furthermore, ceilings (maximum IQ/ shares of TAC holdings) are commonly implemented to avoid trusts. At last, moratoria have taken place on the improvement of their design (e.g. USA 1996-1999), and TPS might be included in a policy mix (e.g. use of fees, effort quota systems).

Since fisheries represent an interesting domain for the study of TPS evolution patterns, particularly their genesis, I would like to present three examples in this field: the Netherlands,

[4] Since the resource is common, many argue that it cannot be possessed. As a result, there is often litigation between the two major legal statuses as “property rights” and “user rights”. The same problem appeared as the rights-based approach was introduced in air policy. In the fisheries ITQs are commonly described as a particular form of property rights because they comprise the right of usufruct, that is, the legal right to use and derive profit or benefit from property. The form of these property rights depends on four factors: security (or quality of title), durability (permanence), transferability, and exclusivity. FAO. (2000) The state of world fisheries and aquaculture. Sofia.

Namibia and Norway. More precisely, it is interesting, when discussing tracking genesis processes, to focus on transition periods. It has been observed that IQ systems "tend to evolve over time into fully-fledged ITQs" (Hatcher, Pascoe, Banks and Arnason, 2002). Taking a look at the family tree for fisheries confirms this statement: in Canada, Iceland, and the Netherlands, for instance, quotas were first introduced and became transferable after a period of time.

A special focus is put on informality as a key transition period. In these cases, an illegal transfer does not occur since it is allowed by law. Rather informal transfers take place so as to circumvent the rigidity of IQ systems. In most of the cases the transfer is not forbidden in a straight-forward sense; it is rather a case of a sort of ITQ with a tight restriction on transfers. Other informal, even illegal techniques have been practiced, mostly illegal landings. However, they differ from informal quota transfers insofar as they express a total rejection of the spirit of the quota management. It shows the reluctance of any change in the management, or even of any kind of regulation. Against this, the development of an informal trade through quasi-authorised ways shows the willingness of fishermen to adjust the policy to their needs, highlighting weaknesses of the legislation.

Box 2: Netherlands – unofficial transfers became gradually official

The Netherlands is one of the first countries in the world which has introduced a quota system. Prior to the setting of a TAC and quotas, the fisheries had generally remained unregulated; even input controls had not been used. The North East Atlantic Fisheries Conference (NEAFC) had only led to the establishment of directives of herring landings in the North Sea. In 1975 the countries participating in the NEAFC agreed on the introduction of TACs and national quota, giving the legal framework and starting impulse to policy changes in the Netherlands (Smit, 2000).

The first regulations concerned only flatfish (more precisely sole and plaice) since the fleet catching these species represents the biggest sector of North Sea fisheries. The Minister of Fisheries along with representatives of the industry and research institutes set up a vessel quota system that came into effect on 1 April 1976. Quotas were "allocated as IQs to vessels on the basis of historical catch shares and vessel capacity measured in terms of engine power. Quotas were attached to specific vessels and transferable only with the vessel." (Anarson, 2002) Hence, no relevant trade of quota was probably expected. Both the leasing and selling of quotas outside a vessel trade were forbidden. The government feared that transfers would lead to complications in the administration of the scheme, and a concentration of the quotas in a particular area, which might result in biological issues and economic prejudices.

As was the case in many other countries, the implementation of a quota system was followed by a period of adaptation. In the Netherlands, after initial dissatisfaction had been appeased, the practice of "dodging" and informal trading developed. The original weak enforcement measures that were put in place made it possible to partly circumvent the law. Monitoring of compliance consisted of reports of the fishermen themselves ("vessel's reports") and in a dockside sampling. The particularity of the Dutch fisheries is the rapid development of "unofficial" transfers, or "quota-hopping". According to a report by the FAO (Shotton ed., 2001), "the flatfish IQs introduced in 1976 were, up to the mid-1980s, not much more than just 'a piece of paper'". Still "informal trade of these notes at that time, and the introduction of official transferability, demonstrated their growing importance around 1985."

Three possibilities enabled the introduction of flexibility in the vessel quota scheme. First, since quotas were (and still are) associated with vessels, unofficial transferability occurred by the trade of vessels: one would buy a vessel to get the quota associated to it. The second possibility consisted in merging or splitting firms to acquire or cease quotas linked to vessels, and the third in individual vessel owners switching from one firm to another.

The practice developed in the field and gradually became official. Management of it adapted in 1985 when the possibility of leasing and selling was introduced, with the singular restriction that quotas are not divisible. This means that a fisherman who wants to sell quotas has to sell them in their entirety. Nowadays, a central clearing institution governs the trade

(Smit, 2000). Fishermen have also acquired a high level of self-management through the creation of fishing groups in 1992 whose boards control the transfer of ITQs.

Box 3: Namibia – sitting on the fence

The Namibian fisheries policies have developed much more recently, given that Namibia gained its independence only in 1990. Prior to this, the history of Namibian fisheries was characterised by the overexploitation of its fishing resources by many foreign States (e.g. European countries, the Soviet Union, Cuba). This massive, uncontrolled fishing provoked the near collapse of many stocks.

At independence, Namibia gained jurisdiction over its fish resources, declared its Exclusive Economic Zones (EEZ), and endeavoured to establish a national fisheries policy. This resulted in the Sea Fisheries Act (1992) which establishes fishing licenses and quotas. These two rights are distinct from each other. Fishing licenses are rights of exploitation of marine resources and have a duration of 7 to 20 years, depending on the level of Namibian ownership. The only purpose of fishing licenses is to restrict the access to fish stocks, particularly by foreign vessels, as a way of protecting the Namibian fishery industry. These licenses do not confer rights to quota allocations.

The Namibian quotas are considered as a weak form of ITQs because of their poor security and transferability (Anarson, 2002). They are not secure rights because it is not guaranteed that they will receive the same quota allocation as the previous year. Moreover, the transferability of fishing quotas is very much restricted. First of all, quotas may be transferred only "in association with the sale of a vessel and with the approval of the Minister" (Ministry of Fisheries and Marine Resources, 1993). Second, only one transfer per year is allowed. This transfer may occur either among vessels of the same owner or among different rights holders.

It is important to highlight that this quasi non-transferability is due to the foreign overexploitation of Namibian resources. As the country gained independence, its first act was to secure its national fisheries. A "Namibianisation" took place, setting criteria on the level of Namibian ownership with regard to licenses and quotas allocation. Transferability as practiced in New Zealand or Iceland was regarded as a possible threat. With shares that could change ownership, the original profile of a company could rapidly change and foreign industries could menace Namibian fishermen either via "flag-hopping" or "quota-hopping".

Facing these rigid rules, Namibian fishermen found ways to circumvent the law and introduce some flexibility. First, as is the case in the Netherlands, a vessel trade led to a quota trade since quotas are associated to vessels. Second, entitlements may be traded through the merging of fishing firms. Trade for money has also been observed. The particularity of the informal trade in Namibia lies in the tacit approval of the Ministry. Indeed, each quota transfer has to be authorised and registered by the Namibian Ministry of Fishery since it conveys the annual allocation. Moreover, both license and quotas transfers require this consultation. This probably stems from the Ministry wanting to tackle foreign exploitation of Namibian stocks and protect its fisheries, whilst at the same time tacitly recognising the advantages of flexibility of an ITQ system (as regards financial and other incentives to give in to multi-national pressure to open national fishing grounds to the international market).

Box 4: Norway – the vanishing resistance of fishermen

The Norwegian fisheries long remained under common property but with limited access[6]. The closing of the coastal fishery occurred late (in 1988/89), as the overexploitation of the cod became dramatic. As the cod crisis arose, it appeared that the TAC has initially been set too high. Two alternatives to ITQs were then proposed: the first based on an enterprise allocation, the second consisting in regional TACs and individual quotas freely transferable within these regions. Both proposals still faced resistance from both fishermen and local political representatives. The introduction of ITQs failed even though the Norwegian Fishermen's Association (NFA) took part to the elaboration of the proposal.

The alternative solution which was adopted was an IVQ system with little flexibility. It was first implemented during the 1990 season as a temporary measure to tackle the resource crisis. All parties tacitly expected that open access would be re-established once the crisis averted. This IVQ system was highly complex: it comprised access rights and fishing rights that did not have the same characteristics. Furthermore, among fishing rights, i.e. vessel quotas, two categories of vessel owners (Group I and II) got different rights.[7]

Three options were there for transferring rights. First, even if access rights and fishing rights were distinct, "holding an access right generally qualified for a fishing right" (Hersoug, Holm and Ranes, 2000). Therefore, by buying an access right, one got a fishing right. Despite this possibility, the Norwegian system was characterised as an "individual transferable access-rights" because "while these access-rights give the owners fishing-rights (or quotas), it is not the fishing-rights or quotas *per se* that are transferable."

Second, some flexibility has been introduced from the beginning without being characterised as a real transferability. Indeed one could switch from a group to another by buying vessels. Over the years, a recruitment system was even established to regulate these movements. Vessels in Group I had to fish at least 40% of their allocation to stay in this category. Otherwise they would be excluded and vessel quotas would become available to vessels from Group II. This led to a real movement of vessels and hence to a kind of quota trade.

Third, although fishermen claimed to be against an ITQ system, many fishermen seemed to make use of the flexibility it offered in practice. Accordingly, even if officially no trade for money took place, rather obvious transfers were practiced. For instance, a vessel would be traded with quotas and the next day the vessel would be sold back to its prior owner but this time without quotas and for a lower price (Holm and Nielsen, 2006). Advertisements for quotas transfers even appeared in the press using coded sentences.

This system, which should have been only a response to a critical situation, became permanent instead. In parallel a shift in the fishermen's standpoint occurred. While the idea of transferability was initially greatly criticised, it found acceptance and even support. However, we should wonder how this change appeared, for instance to what extent this is due to the change of the fisheries structure, i.e. to the shift from familial enterprises to fishery trusts. There has been a change in the conception of fishing: it evolved from a "way of life" into a "normal industry". This new kind of fishing, which has probably become dominant, is therefore more likely to accept the introduction of market-based instruments than previously.

Further, this IVQ system created the apparition of a group of privilege rights holders over the years (Group I). Now this group appeared to be overrepresented at the NFA, which took part in the political process producing amendments to the IVQ system. Consequently, the political degree of the closing of the commons should be taken into account. In this case, the NFA played an important role in the rejection of the first project in 1990 (ITQ), representing

[6] According to the 1947 Ownership Act, only active fishermen were allowed to own fishing vessels.

[7] Access rights were freely transferable within a county whereas fishing rights were not divisible and not exclusive, i.e. they were competition quotas instead of guarantee ones. Moreover, the most active vessels (regarding the period 1987-89) belonged to the Individual Quota group ("Group I") and were given exclusive quotas whereas the less active vessels were allocated a common quota and should then fish competitively (Maximum Quota group, or "Group II"). Group I had a considerable advantage over Group II and 80% of the total amount of quotas was allocated to it. For more information on this IVQ system I recommend reading the paper referenced in footnote 32.

the skepticism and fears of the fishers, then in the establishment of a "temporary" system, and at last in its continuation and evolution into a more flexible management. Simultaneously, the last opponents to an ITQ system or to the privatisation of the commons and the transferability of rights were poorly organised, hence more and more political power was lost.

Since then the legislation has actually been amended in that regard. The Fisheries Minister proposed measures that entered into force in 2004, addressing the development of informal trades by formalising a quota market. This new framework established a program that, despite some restrictions, allowed permanent and temporary quota transfers among vessels.

These three examples provide illustrations of the different phases of evolution from IQs to ITQs. While some of them show the willingness of fishermen to make the right-based system increasingly flexible, others reveal their spontaneous skepticism towards market-based instruments. However, they include at some point the same common element: informal trading of quotas.

Regarding the semi-acceptance of transferability by the policymakers, the theoretical arguments provided by economists and the trading practice of fishermen, it could be asked why the transition towards ITQs takes so long in some countries. It should be highlighted that closing the commons is not a simple economic transition resulting in an artificially implemented instrument, but a real political process. By observing these three cases it can be assessed that fishermen play a considerable role in the evolution of an ITQ system. Governments that undermined this dimension faced strong social resistance. Beyond this, the request of transferability often has to come first from the fishermen themselves (or from their representatives) to enable amendment of the policies. Fishermen, however, should not be considered as a homogeneous group, but rather as a mix of familial and industrial enterprises that do not share the same expectations and power. Therefore, a study focusing on the sociological dimension of the genesis of TPS in the fisheries is necessary to study this "push for the transferability", or at least the support of flexibility in more depth.

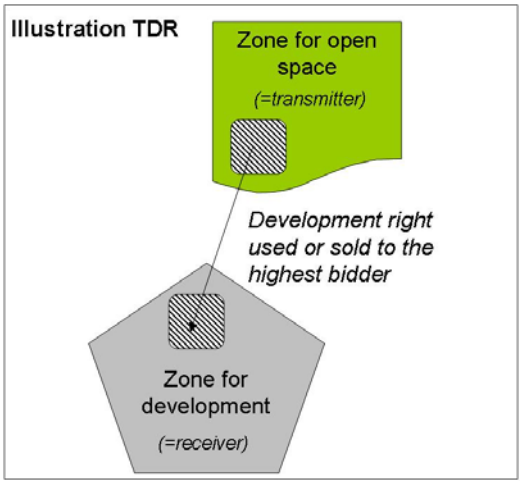
3.4. Land management – from urban planning to biodiversity protection

The expansion of tradable permits to land management occurred only recently. This is not a domain classically ruled by market principle. However, the global ideology combined with successful examples of tradable permits in other domains led to the implementation of tradable rights for managing land development. Various forms of right-based schemes are to be observed: tradable development rights, conservation and wetland banking, and tradable quotas for land use. All of them result from the decentralisation of land management. The state delegates this task to private actors handling according to market rules.

Tradable development rights (TDR) were first implemented in 1961 in NYC but the concept of exchanging rights for urban planning purposes appeared with the 1916 Zoning Resolution (Stinson 1996). They have also been implemented in the 1980s in New Zealand to manage urban development and the maintenance of listed buildings. The concept has been adapted to environmental management in the 1980s, principally in the USA, but also in France with the Urban Development Reform (1976) (Renard, 2007)[8]. The focus shifted from urban management to the protection of ecosystems from the harmful consequences of such development.

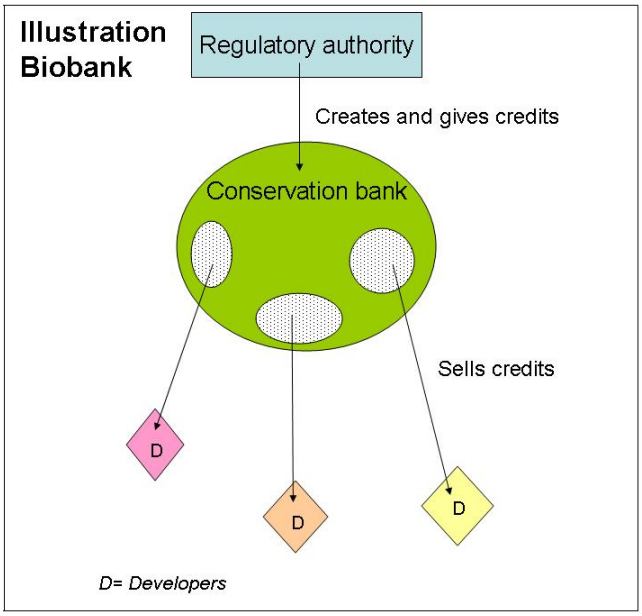
[8] Whereas the principle of zoning had been enforced for many years in the USA (see *Village of Euclid v. Ambler Realty Co., Federal Supreme Court, 1926*), France had adopted the principle of no compensation. Consequently the Urban Development Reform represented a greater change in French than USA law. In practice TDRs are applied the same way, but only a few successful examples can be found in France.

The guiding principle of TDR differs from emission rights insofar as the right is sold permanently or for a very long period. TDR is based on the distinction of two separate areas: a transmitter and a receiver zone. Development rights are restricted in the transmitter zone (e.g. for nature protection or heritage) while in the receiver zone development is allowed and promoted. “Once the development rights are transferred, the sending area loses its rights to develop and the land is permanently preserved” (Messer, 2007). TDRs represent economical incentives for the development of receiver zones rather than transmitter ones. Landowners may trade-in development rights in the transmitter zone to support developments in the receiver zone. In this way, parcels of land can be preserved from harmful consequences of development while minimising the intervention of the State (and avoiding compensation from public budgets). TDR programs may be voluntary or mandatory. Consequently the success of TDRs depends on the structure in which they are embedded and of the advantageous prices set on the market. However, further research would be needed to establish if TDRs are only financial compensations to the loss of a building right or if they also enable to achieve the best allocation of building rights through the market mechanism.



A similar logic, particularly the zoning dimension, has been applied to the protection of biodiversity through biobanking. This comprises both conservation banks and wetland banks. It aims at helping conserve particular species or ecosystems through a credit trading, which enables the offsetting of (urban or agricultural) development by nature protection at another place. Credits are required to build in a particular area or may also be acquired voluntarily (e.g. for marketing purposes).

Conservation banks manage listed sensitive species (i.e. endangered, threatened or at-risk species), by offsetting impacts to these species on non-bank areas. Both private landowners and state actors may create conservation banks; they only have to be certified. Regulatory agencies confer credits depending on the amount and the variety of species counted on the parcel of land. These credits are then sold to developers to counterbalance unavoidable impacts caused by a specific building plan. The credits certify that a determined quantity of species is protected, but is used to allow the destruction of the same quantity elsewhere (see illustration on right). In this way, habitats and species become economic assets and are traded like any other good. Owners of banks might invest in areas full of protected species for economic reasons. In exchange of credits they must at least maintain the parcel of land. They might enhance it or extend the bank area to acquire more credits. The mechanism of biobanks seems to develop rapidly, particularly in California (which has established about 68 of 78 conservation banks since 1995). There are newly promoted schemes in Australia as well, for instance through the “Biodiversity Banking and Offsets Scheme” in New South Wales.



Contrary to conservation banks, Wetland banks are only to be found in the USA. They come under both the Clean Water legislation and the Endangered Species Act. They are based on the duty to protect wetlands according to the section 404 of the Clean Water Act (1973), which originally only established "404 permits": developers who planned to damage wetland, could get a permit only by proving that this destruction is unavoidable. Since the 1970s this concept evolved into a more flexible and functional system. Developers requiring these credits may buy them from mitigation banks or wetland banks. The bank owners are responsible for creating, restoring, or enhancing the function and value of wetlands. In exchange they receive a certain amount of credits, which they can sell to developers who must fulfill the conditions of the Clean Water Act. Prior to the establishment of this tradable permit scheme developers had to build wetland conservation projects for themselves on a case-by-case basis. These projects were smaller and more isolated. Wetland banks therefore increase habitat value of wetlands. A specific legislation only appeared in the 1990s, first with the US Wetland Plan under the Clinton administration, then with the Federal Guidance for the Establishment, Use and Operation of Mitigation Bank in 1995.

TDRs and biobanks follow the same logic but differ in the determination of baselines. In TDRs schemes landowners of the transmitter (protected) zone gain credits by delocalising development to the receiver zone. The baseline is determined by inherited development rights and a particular zoning approach. Biobanks seem to use credit trading with business as usual as baseline assuming that habitat will be destroyed if biobank is not established. However, little information was found on the establishment of the baseline for biobanks. Further research on that point would be needed in order to better characterise the functioning of these banks. This also holds for the temporal validity of biobank credits. This would also enable better evaluation of the effectiveness of TPS in protecting ecosystems.

A specific form of TDR has recently been discussed in Germany to reduce land use: tradable quotas for land development planning (Walz, Toussaint and Fraunhofer-Institut für System- und Innovationsforschung, 2005). This instrument would be implemented to meet the target of reducing depletion of virgin land to 30 ha a day by 2020. The design for this scheme distinguishes itself from TDRs by the omission of zoning. Moreover, it works at the level of local authorities who are in charge of establishing development plans and designate areas for development, not at the level of individual landowners. Municipalities would require permits to develop a new area. Each municipality would originally be given a certain amount of credits. If it lacks credits for a planning project, it must either reduce the surface of the project to the number of credits at its disposal, or buy the lacking credits from another municipality which does not plan to use its whole budget (or 'recycle' brownfields to gain additional credits). Promoters of the instrument refer to the success of TPS in other domains such as the European ETS and US experience with land management. The specific features of the scheme, including initial allocation and market regulation have not yet been defined.

A similar discussion takes place in Switzerland. In this case, zoning and two types of permits would be established to set a ceiling on constructional areas. This system would combine mandatory and voluntary programs. Certificates would be obligatory for building in newly zoned constructional areas. Additional certificates can be gained by giving up surface of another constructional area. Certificates would be tradable among municipalities.

3.5. Water rights – a new old management of water sources

TPS have not spread widely in the domain of water use. In most countries water is publicly owned and is managed in a central manner by the state. Still in some countries there has been a shift towards a private property rights. Transfer of water rights (WR) remains highly regulated, except for some exceptions. Remarkably, some TPSs emerged already some hundred years ago and progressively evolved into full-fledged WR markets.

To begin with, water markets should be distinguished from transferable water rights. The difference lies in what is being traded. In some cases it is the right to abstract water from a river or groundwater source; in other cases it is gallons or cubic meters of water that are being traded. In the latter case there is no permit; just the good itself is traded as, for example, in the case of water banks in California that store water and are sold in times of drought.

Another important distinction is between water rights that are attached to a piece of land and are not tradable ("water entitlements") and water rights which entail the right to use water for a specific period ("water allocations"). In addition to transferable water rights, water charges (mainly called "abstraction charges") are often levied so that TPS for water rights may be part of a policy mix.

Very few systems allow water right trading without further regulation and restrictive measures. The freest market is probably in Chile (established in 1981 by the Water Code). Property rights are traded with public registration as the only regulation. In most of the countries the definition of water rights as property rights is much criticised. They are rather understood as rights of use. Transactions may then be allowed only for certain types of use (e.g. Alberta's Water Act, Canada, 1998) or within a certain category of uses (e.g. in Colorado the Court's or State's approval is required when a transaction implies a change of use).

On the other hand, water right trading is not a new practice. In several countries in the Americas, it has taken place for more than hundred years, evolving at the limits of legacy. These were not fully-fledged markets; nevertheless communities were organising themselves to use common resources following market principle and a right-based approach. This is the case of the TPS in the state of Cearà in Brazil which seems to have been in place since 1854. Rights could be inherited and this market functioned on a very little scale. It is interesting to observe that the idea of an abstract market of water rights appeared much earlier than the beginning of environmental policies. Today a World Bank program promotes the establishment of a "real" market for water rights through a Water Resource Management Project in Brazil, replacing the former informal one. Similarly some water trading schemes in the USA have developed over a time frame of many years. But they are often on the margins of water trading, water right trading and water markets.

When studying the evolution process of water rights schemes, the heterogeneity of the many legal systems presents difficulties in terms of understanding. In the USA the development occurred through many legislation changes and court's amendments. Some schemes take place in several states, which complicates their ruling. However it is noticeable that the trading of water rights has not been a part of legal frameworks for a long time and was informally in force. As environmental policies based on market principles increasingly appeared in the 1980s, water right trading became gradually promoted. This enabled to tackle the problem of the third parties who were not represented in many informal schemes. Transnational organisations, mainly the World Bank, set up programs in developing countries both to secure water backup and promote right-based approaches.

3.6. Others

3.6.1. Green Electricity – a recent and promising tool

Green certificates, also known as Renewable Energy Certificates (RECs), "green tags", Tradable Renewable Certificates (TRCs) and Renewable Obligation Certificates (ROCs), have recently been developed in OECD countries through quota obligation schemes. The guiding idea is to support the use of clean sources of energy for the production of electricity by setting a minimum of electricity coming from renewable sources. Consequently this is rather a "floor system" (or phase-in system) than a cap-and-trade approach. Both renewable and traditional plants put electricity in the grid. Since one cannot distinguish "green"

electricity from the traditional sort, electricity suppliers are issued certificates for each kWh of electricity from renewable energy sources (RES). The total amount of certificates represents the quantity of renewable energy in the electrical grid. The interesting principle of this scheme is the separation between the certificate and the good produced ('greenness' of production process and the electrical energy which is homogeneous across different means of production). In this way, electricity suppliers can comply with the requirement to supply green electricity without producing it in their own installations.

Green certificates embrace various features. They may belong to mandatory or voluntary schemes, and the obligation to produce certificates for a share of electricity turnover may either lie with the producer or the end consumer. Some states in the USA established Renewable Portfolio Standards (RPSs), which stipulate that each company must produce a certain amount of green electricity per year – but electricity companies may trade certificates to meet their assignment. On the other hand, consumers from states which do not have any RPS can still voluntarily choose to buy electricity from renewable energy generators by buying certificates.

Within the European Union (EU), the Renewable Directive of 2001 set up a goal for the EU (that 21% of energy would come from renewable sources by 2010), but it did not establish a market for green certificates. The EU only encouraged the deployment of RPS by the Member States. It also developed Renewable Energy Certificate System (RECS) as a standard for the certification of green electricity production across Member States to trade across borders. TPS for electricity have been established at a national level so far, for instance in Belgium, Austria, Denmark, the Netherlands, Sweden and the UK. Consequently there is no homogeneous form of TPS for green certificates. They may be mandatory to meet the national objective according to the EU RES directive; or to "fulfill legal requirements on green generation ratios"[9]. They may also be voluntary, i.e. with no legal requirement, for electricity suppliers to develop a green image (e.g. in Germany and Switzerland). In this case, buyers decide to use green electricity by buying green certificates. A proposition for a new directive (2008) makes the EU regulation evolve towards a market for Guarantees of Origins. They may be traded on two levels: first, among Member States to meet their requirement, and second among private actors across the MS borders.

This scheme is on the fringes of the definition of TPS, which makes its classification difficult. First, green certificates match a phase-in logic therefore raising the typology issues depicted in the Box on Certificates (see second part of Box 1). Second, this TPS functions with a "floor" rather than a cap, and through the emission of credits. So it does not easily fit into the binary typology of credit trading and cap-and-trade.

3.6.2. Landfill management – UK pioneering

Only a few examples of tradable permit schemes are to be found for landfill management. This domain remains dominated by state regulations without market flexibility. Only the UK and the Netherlands experimented with TPS for landfill management.

In the UK, two different systems are in force. The first one, the Landfill Allowance Trading Scheme (LATS), is similar to any pollution emission scheme. Each authority is given a limit of biodegradable municipal waste. Municipalities may choose to cooperate by establishing a pooling system, but each authority remains responsible for ensuring that its own target is met. LATS is framed by the Waste and Emissions Trading Act (2003), to comply with the Article 5(2) of the EC Landfill Directive. This logic matches closely the one under elaboration in Germany to reduce land use. In both schemes, the state tries to decentralise the policies management by setting up flexible incentives to facilitate the compliance with the target.

The second scheme, Packaging Recovery Note, functions like a certificate trading. This instrument enables to meet the requirements of the UK packaging waste (producer responsibility) regulations, and on a higher level, to meet the EU Directive on Packaging and

[9] http://www.landsvirkjun.com/EN/category.asp?catID=472

Packaging Waste. Packaging Recovery Notes are issued to certify that wastes of a firm were recycled and/or recovered. Companies may comply individually or join one of the "compliance schemes".

In both cases, they were national initiatives, enforced at a regional level, to comply with EU directives. Moreover, both schemes set a cap but do not oblige waste producers to use the scheme to meet their targets.

3.6.3. Manure – Dutch failure

The Dutch experiment to manage manure production (the Dutch Phosphate Quota Program) faced criticism. A traditional system of limits per farmer evolved towards a right-based system 7 years after the first regulations on manure. Each farm had been ascribed a reference amount based on the inventory of animals and standards for their manure production, which was converted in 1994 into manure production rights. Trade was geographically restricted to avoid over-polluted regions. The Government decreased the cap by buying rights back. The success of this scheme, which seems to have ended in 2002, is very controversial.

3.6.4. Hunting – seldom TPS

Hunting does not belong to the classical domains for TPS. Hunting rights have existed for a long time and tend to be distributed and regulated by the State in a command-and-control approach. Two examples of transferable rights are to be found in the Americas. Information about trading hunting rights in Alberta (Canada) remains scarce. We only know that about 8800 rights are delivered through auctioning.

The second example is located in Mexico, in Baja California Sur. Its particularity lies in the possible trade across the Mexican boarders of the rights regulating the hunt of big-horned sheep in this region. Communities which own hunting licenses sell the rights to hunt on their land, but not the license itself. The rights are also allocated through auctioning.

4. Conclusion

This paper has conveyed a global overview of TPS in various problem domains. We studied not only traditional resource management responding to the tragedy of the commons, but also more innovative domains such as land management. The main conclusion of this report is that TPS increased to expand over the last decades. This is in line with the spreading of market-based instruments in general (e.g. also privatisation and liberalisation of publicly regulated utilities). The starting point of the expansion of TPS can be mainly located in the 1980s, even if some schemes had been in force for longer. By the end of 1980s, many local TPS have been set up. National and international frameworks were then established in the 1990s and since 2000 the concept of TPS seems to have been included in many policies. The last part of the evolutionary process seems to include improvements of the design of already implemented TPS, the search for more homogenous schemes at a transnational level, and the further liberalisation and/or decentralisation of environmental management in new problem domains.

The shift from command-and-control to tradable rights-based policies seems to have been achieved in many countries, especially in the Anglo-Saxon world (USA, Canada, and Australia) where TPS has been implemented the most. Nonetheless, it should be highlighted that there is no linear innovation journey. The development of TPS might encounter difficulties in some problem domains or areas. It can be concluded that no one unique form of TPS has turned out to be especially successful and then spread out to all problem domains and geographic areas; even within the same problem domain different types of TPS

are to be found. Instead, different types of TPS can be listed which have different backgrounds.

A short review of the problem domains delivers an overview of the state of development of TPS. Air pollution definitely represents the origin of the most famous TPS nowadays: cap-and-trade. It also shows a typical evolution pattern: the expansion from the USA pioneering in the conception of market-based instruments to Europe and other countries in the world. Europe has become a pioneer of climate protection by TPS rather than the USA and therefore conceptualises new TPS in this domain (e.g. linking of cap-and-trade scheme of the EU ETS with credit trading under the Clean Development Mechanism). Even in the USA credit trading still has a promising future notably through the increasing use of a particular form of credit trading: certificates through phase-in programs.

Benefitting from the success of (American) SO_2 trading schemes, water quality programs are spreading out, particularly in the USA and in Australia. A key factor is the potential to include non-point sources that have hitherto been excluded from the regulations. Australia, Canada and the USA have been pioneers in this domain in the last twenty years.

Fisheries have a complex innovation journey. The introduction of transferability in this domain provoked resistance while, informally, quotas had often been exchanged on a grey market. This problem domain shows the complexities involved in closing the commons and the underlying political tensions. Regulations of permit markets are still strong, working against complete liberalisation.

Skepticism towards marked-based regulation is also palpable in the domain of water rights. Chile remains an exception of ultra-liberalism in the water rights management, which must be put into its specific political and economic context. Nevertheless, Chile serves as a model for global economic organisations such as the World Bank, which supports programs using TPS for water rights in developing countries. Further, in some countries (Brazil, the USA) the logic of trading has been developing for hundred years and has been replaced by more formal frameworks over the last twenty years.

Some other problem domains contain only a few cases of TPS. Some deliver successful and promising designs of TPS, while others remained undeveloped and failing. One promising scheme is green certificates, the framework of which is increasingly developing into a transnational scheme in Europe and spreading to new states in the USA.

The same kind of design has been implemented in the UK to comply with regulations on waste recycling; the UK has developed interesting and pioneer schemes in the landfill domain. If they prove their efficiency over time, they might spread out within the European Union as a new instrument to meet EU goals. On the other hand some schemes proved too complex or not efficient enough. This is the case of manure rights in Netherlands.

Finally, the last innovative problem domains for TPS are land use and biodiversity protection. These schemes require further research on their features – baseline, time validity, classification – so that we develop a better understanding of how they function and their potential to efficiently tackle environmental issues. They seem to represent the latest form of implementation of the compensation logic. Nevertheless, on the basis of the information found, the extent to which they can durably provide solutions to protect endangered ecosystems can be pondered.

This leads us to final questions that underlie this report. By reviewing various schemes of TPS some interesting points arose, which would require further research. I would like to put the focus on questions relative to the two perspectives considered in this report: a possible typology and the characterisation of development patterns.

The typology based on the distinction between cap-and-trade and credit trading proved effective to convey an overview of TPS. Some features of these categories require further research. It would be interesting to consider the certificates excluded here from the narrow definition of permits in terms of the implementation of phase-in programs in the last years, mainly for the support of electricity from renewable sources (green certificates) and for the introduction of “clean cars” in the USA. Certificates can be considered as the latest limb of the TPS tree, that is, as a hopeful innovative mutation of TPS that might spread out in the

coming years. They do not correspond to the usual logic of TPS, i.e. right-based policies to manage the destruction of the commons. They rather could be categorised as instruments of a “technology diffusion policy”. They promote the development of new technologies (e.g. renewable energy, clean cars, recycling) through a mandatory minimum that must be achieved on average (possibility of trade for the compliance) and that is likely to increase over time. Will this potential limb evolve into a robust branch in the years ahead? A closer look at the framework for phase-in programs would deliver necessary information on that potential mutation.

This report provided information on innovative schemes and/or new problem domains for TPS. This area turns out to be particularly promising for further research. The study of new limbs of the family tree enables discovery of the latest features’ mutations and the potential of future expansion. However, this sounding study also revealed some weaknesses and/or misunderstandings in the design of some schemes, particularly in the case of the adaptation of Tradable Development Rights to environmental protection and biobanks. How is the baseline defined in these two cases? To what extent can we expect this recent adaptation of market-based instruments to biodiversity protection to be successful and not only lead to the “marketisation” of nature? More generally, without putting the success and the ethical foundation of these instruments, they make the classification of TPS evolve. How should the development of market- and rights-based instruments be integrated for compliance matters and not for offsetting reasons?

Concerning the second perspective (i.e. development patterns), two points prove to be essential relative to innovation journeys and should therefore be deepened: the genesis of TPS and transition periods. The introduction of TPS does not only represent an economic decision, but is rather a political process that embraces many tensions. This interlacing of political tensions is paramount in understanding the reason why some features of TPS are put into force in some domains and/or areas and not in others. Generally, the study of TPS should not only embrace an economical approach. Although TPS are basically economic instruments, their elaboration is embedded in a political process that should be further tracked. Some cases, like the fisheries, proved particularly interesting under this perspective (see Boxes in 3.3). Their study nevertheless requires more material and on-site investigations to reveal the most important factors of these processes.

Furthermore, this sounding study revealed two patterns of evolution: first, the establishment of standards and then the artificial creation of tradable rights that bring flexibility into the compliance with the regulation (e.g. pollution emission policies), and second the evolution of rights to common resource into tradable permit schemes by becoming (gradually) transferable (e.g. fisheries, water rights, land use). Two questions arise. First, could these two patterns represent ideal-types that would embrace all TPS innovation journeys? Second, what are the political forces within these two patterns of evolution? The latter question is relevant to improving the classification of innovation journeys. It would additionally reveal common prerequisites that underlie the development of TPS, which would allow for discovery of where TPS are likely to develop in the years ahead, i.e. which frameworks would facilitate their deployment.

This report provided the basis for further research work on TPS. I have listed some interesting points relative to the perspective of innovation journeys. Many more questions could be deepened. It should not be forgotten that TPS are still under evolution. Innovation journeys have not come to the end; on the contrary, the abundance of TPS nowadays and the constant evolution of their features shall strengthen interest in their further study.

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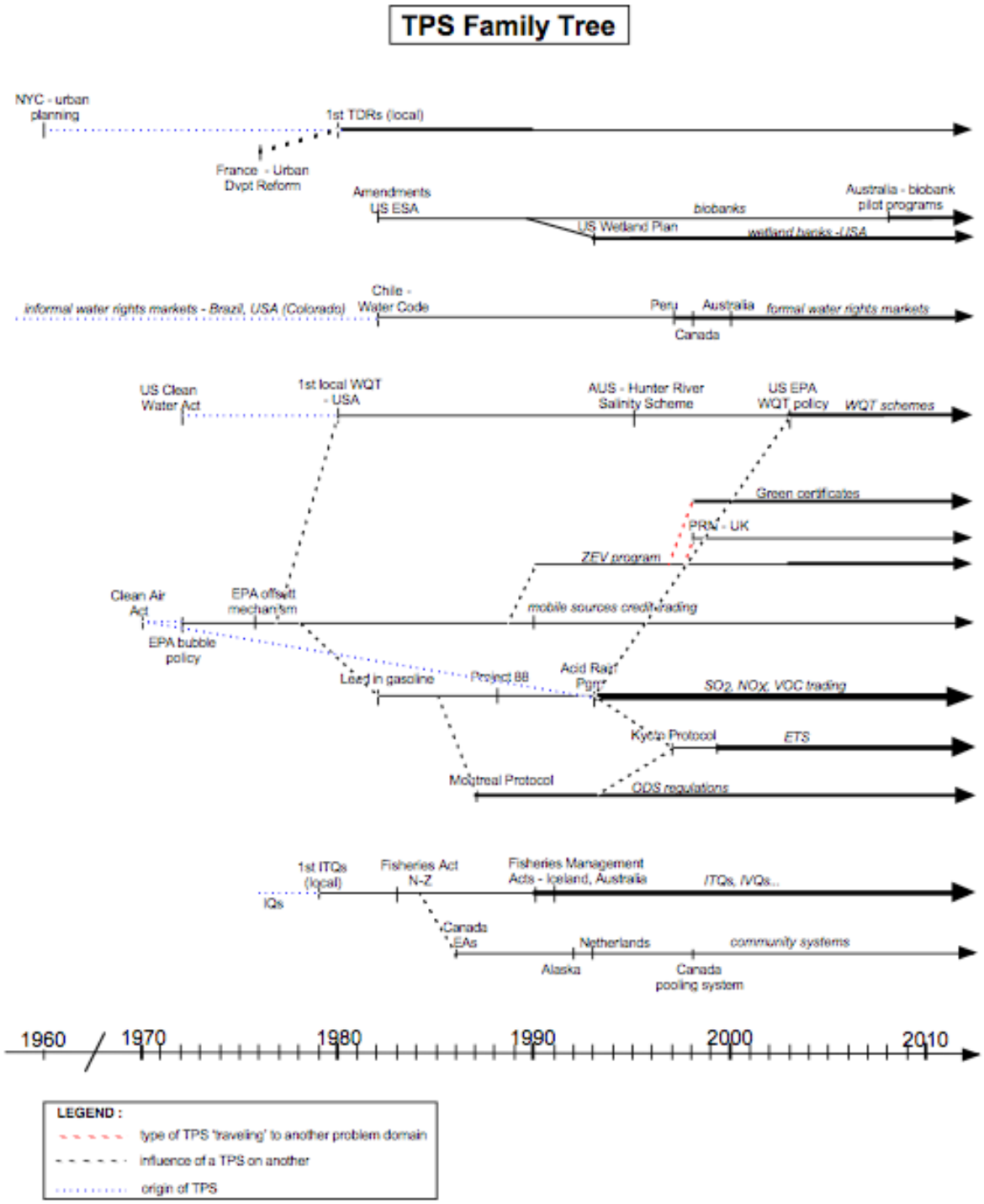
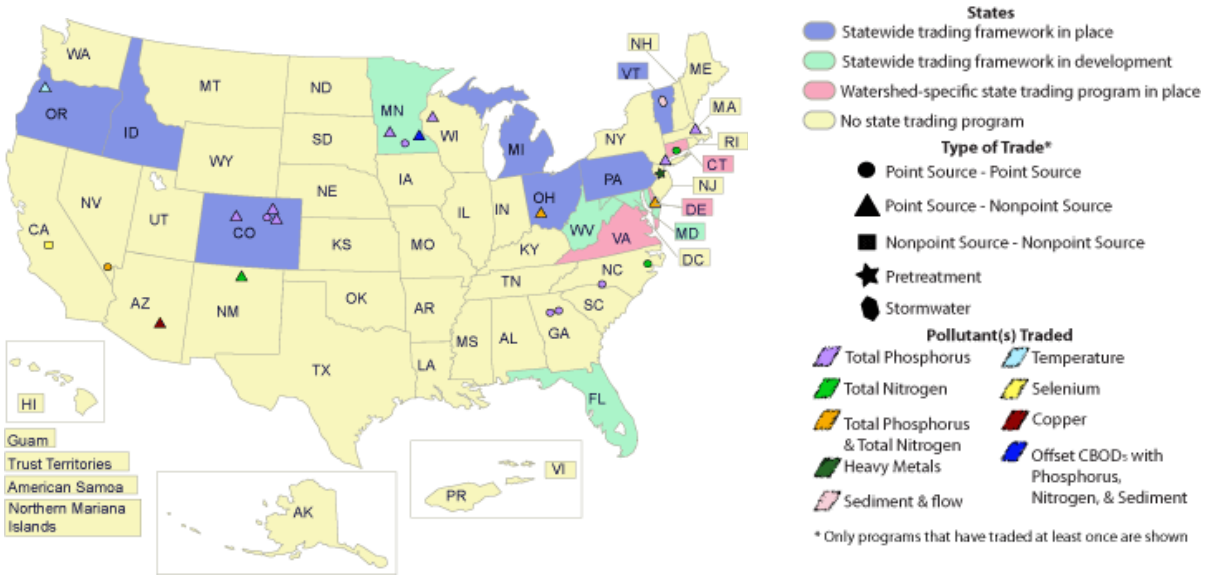
Annexes

Annex 1: "TPS Family Tree"
Self-made graphic illustration of the evolution of TPS



Annex 2: Water Quality Trading in the USA (USEPA)



Source: Website of the US EPA