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Cost Effective Measure for Agricultural Nutrient Reduction Implemented by Concerted / Joint Action in the Danube River Basin

Provision of Technical Support to Develop a Preliminary Concept for Tradable Water Pollution Rights for Nutrient Reduction from Agricultural Sources

UNDP GEF

WORKING FOR THE DANUBE AND ITS PEOPLE

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1. THE ISSUE AT STAKE

There is still increasing interest in the sustainability of nutrient management in the Danube Basin although recent reports and publications indicate 'an improvement of the Black Sea environment due to the economic breakdown in the eastern countries and the consequent decrease of nutrient emissions (Lampert et al., 2004)'. However, there is a widespread agreement that the current situation will reverse during the coming years, meaning that an increase of nutrient emissions is anticipated in the foreseeable future as a consequence of the process of economic growth the majority of the countries of the Danube River Basin (DRB) are currently undergoing. Based on past experience nobody will probably be questioning that changes in agricultural production, in particular in the lower Danube countries, must be expected considering the current relatively low level in per capita livestock and use of mineral N-fertilisers as compared to the upper Danube countries, Austria and Germany (see data presented in the Annex of van Gils et al., (no date given)).

In this context it is helpful to state that the Danube Regional Project (DRP) has been established to contribute to the sustainable human development in the Danube River Basin (DRB) through reinforcing the capacities in the basin to develop effective co-operation to ensure the protection of the Danube River. The objective of the DRP is to complement the activities of the International Commission for the Protection of the Danube River (ICPDR) to provide a regional approach to the development of national policies and legislation and the definition of actions for nutrient reduction and pollution control in the DRB. Considering this overall objective of the DRP it is of great relevance to mention that a specific aim of the DRP is the 'Reinforcement of monitoring, evaluation and information systems to control transboundary pollution, and to reduce nutrients and harmful substances'.

This document sets up the background / framework and the rationale of a future project studying possible reactions of national governments in the DRB on dealing with the increase in nutrient emissions from agricultural sources and what policy measures can be implemented. The focus is solely directed on nutrient emissions caused by the agriculture sector (i.e. nutrient emission from diffuse – non-point – sources). The novelty and originality of the proposed project idea is to analyse policy measures to be implemented in collective action. The underlying principle and rationale of the study is to show that collective action may be cost effective in the sense that the total costs are lower if measures are introduced under the 'burden sharing' principle – a principle nowadays well known in the field of European climate policy (see for a more detailed discussion on this principle: EEA, 2005)- as compared to the situation in which each country reduces its nitrogen load from agriculture. Such an approach follows the overwhelming interest in addressing water quality issues through the use of economic instruments and the role of using some form of trading mechanisms to achieve a political objective in a cost-effective manner[2].

[2] In 2003 the DRP commissioned a study under the title 'Danube Study on Pollution Trading and Corresponding Economic Instruments for Nutrient Reduction' carried out by a consortia led by NIRAS. The aim of this study was to review international experience in relation to pollution trading. The findings of this study may be of interest as they provide an analysis of the underlying economic, legal and regulatory frameworks as well as the study discusses the nutrient framework in more detail (see for the more information: http://www.undp-drp.org/drp/activities_4-4_economic_instruments_pollution_trading.html).

2. POLITICAL ASPECT OF THE STUDY

'The Danube River System is the main controller of the eutrophication of the North-western Black Sea (NWBS) as the main load of N and P comes via the Danube (NIRAS, 2005, p. 12)'. Although studies indicate that the present ecological status of the NWBS is close to be assessed "good", the future does not look so bright as it would require that the current nutrient load has to be 'frozen' as the sustainable nutrient loading for the NWBS (NIRAS, 2005, p.12).

Economical reality looks different as it must be expected that agriculture nutrient emissions will not remain constant at the current, rather low level – in particular compared to the levels observed before the collapse of the economic systems of the former Central and Eastern European countries.

Water quality management in the Danube River Basin is regulated by two conventions: *The Convention on the Protection and Use of Trans-boundary Water Courses and International Lakes* and *the Danube River Protection Convention.*

As mentioned above the nutrient load of the Danube River System is highly significant for the ecological status of the Black Sea culminating in the Memorandum of Understanding (MoU) between the ICPDR and the International Commission for the Protection of the Black Sea (ICPBS) of 2001 establishing a framework for implementing common strategic goals. Specifically, the two parties agree to the following common goals aiming 'to safeguard the Black Sea from a further deterioration of the status of its ecosystem' (ICPDR, 2001):

- *The long-term goal in the wider Black Sea Basin is to take measures to reduce the loads of nutrients and hazardous substances discharged to such levels necessary to permit Black Sea ecosystems to recover to conditions similar to those observed in the 1960s.*
- *As an intermediate goal, urgent measures should be taken in the wider Black Sea Basin in order to avoid that the loads of nutrients and hazardous substances discharged into the Seas exceed those that existed in the mid 1990s. (These discharges are only incompletely known.)*

An increase of the application of nitrogen fertilisers in agriculture resulting in an increase in N-emissions is a real challenge Danube River countries are facing in the future. The usage of fertilisers dropped significantly after the collapse of the economic systems in almost all Danube countries in the early 1990s. However, fertiliser use in the two upper Danube countries, Germany and Austria, remained more or less constant over the last two decades meaning that all measures implemented under the EU Common Agricultural Policy (CAP) - and transposed into national legislation - have not influenced fertiliser use in these countries significantly (see Figure 1). Therefore it can be assumed – with a rather high probability – that the current rather low use of mineral N-fertilisers in lower Danube countries will increase as their use is currently below the average (see for example van Gils et al., no date given, Annex 1 and danubs, 2005 – see Table A1 in the Annex)[3]. A similar result is reported in the context of the numbers of livestock which is also a major source of nutrient emissions from agriculture. The indicator of surface specific livestock shows that the numbers in lower Danube countries are also below the Danube average (see van Gils et al., no date given, Annex 1) and again it can be expected that the number of livestock will increase in due course leading to an increase in nutrient emissions.

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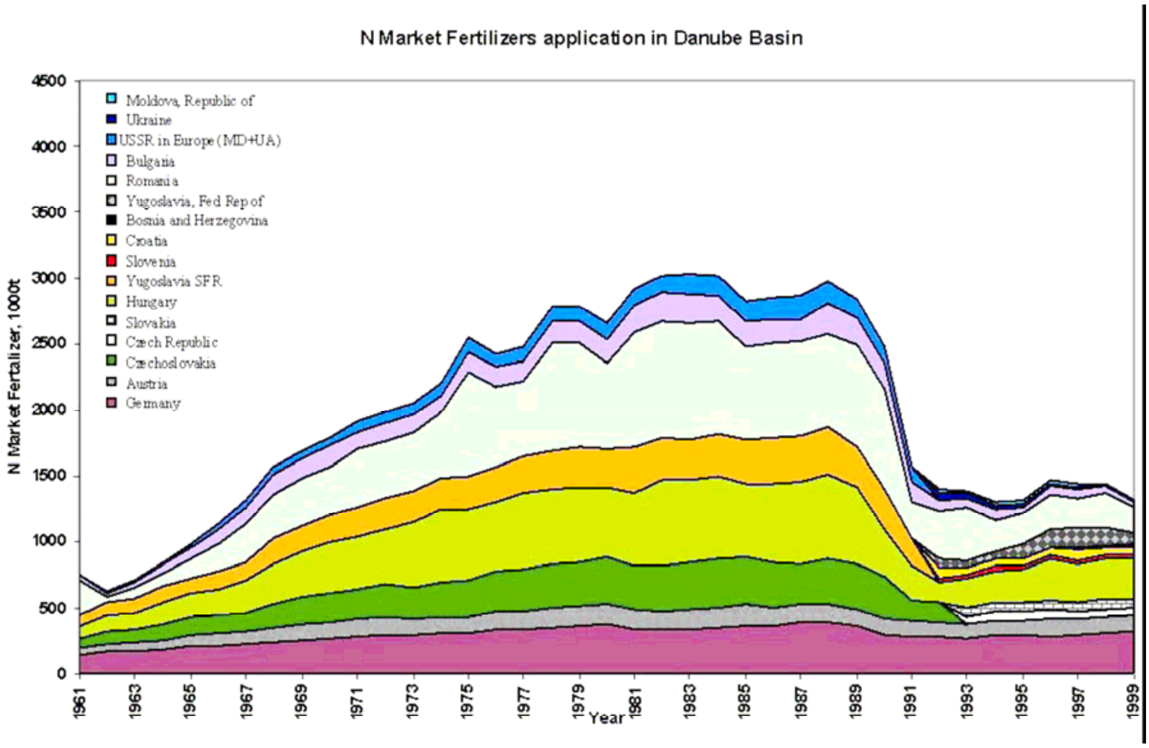
[3] A recent study assessing cost efficient nutrient reduction measures for the Baltic Sea estimated the 'optimum' use of fertiliser to be in the range of 111 kg N per hectare (Schou et al., 2006, p.31). This figure should only be seen as an indication but when compared to the data presented by Gils et al. concerning the use of mineral N-fertilisers in Danube countries it is rather obvious that an increased use can be expected as the average use was calculated to be 31 kg N per hectare in 2000 in the Danube countries. This rather low figure may also be set in the context of the EU limit of 170 kg nitrogen per hectare as laid down in the EU nitrates directive.

Based on this appraisal it can be said that the future situation looks slightly grim with regard to keeping the nutrient emissions at the 1997 level considering that agricultural N-emissions are around 45 percent of all N-emissions at the DRB level. The share of agricultural emissions differs between countries significantly (see danubs, 2005, Figure 17). Although the focus of this project idea is solely on agricultural N-emissions the future development of other sources of N-emissions must be considered as further reduction of these emissions (resulting from an increase in wastewater treatment plants - including N and P removal - along the Danube) may offset any increase in agricultural emissions. This possibility clearly exists but the project and approach respectively should be seen as indicative as it examines only the potential policy measures aiming to reduce agricultural N-emissions. It should rather be seen and assessed as a test case for analysing this concept of undertaking joint efforts, i.e. implementing policy, economic, technical measures jointly as opposed to unilateral actions, with the aim of achieving a common policy objective in a cost-effective way. Furthermore, it must be kept in mind that the concept of undertaking efforts jointly is definitely not limited to water quality problems in the Danube alone but could also find wider, i.e. worldwide, application when assessing transboundary water policy issues.

The discussion of the political aspect of this study must undoubtedly take into account the politics established at the European Union level as the policies and regulations / directives developed are affecting national legislation in the majority of the Danube River Basin countries to a large degree. The most significant directives in the context of nutrient emissions in water resources are the Nitrates Directive (Council Directive 91/676/EC concerning the protection of waters against pollution caused by nitrates from agricultural sources) and the sister Directive 91/271/EEC (Urban Waste Water Treatment). In the context of this project the Nitrates Directive is of importance as it establishes some threshold levels, i.e. concentration levels, with regard to the use of fertilisers per agricultural production area. It is probably not wrong to assume that the concentration values of the Nitrates Directive will not have the desired effect in the sense that they will limit the use of N-fertilisers in the Danube countries so that the policy objectives established in the two conventions and the MoU between the ICPDR and the ICPBS (see above) will be achieved, in particular when assessing the rather large range of the 2000 data concerning the use of mineral N-fertilisers between the Danube countries as presented in Table A1 in the Annex. It can be expected that the lower Danube countries are clearly able to extend the use of mineral N-fertilisers in the coming years and still be under the threshold level as laid down in the Nitrates Directive. This is a clear sign that the Nitrates Directive alone will not suffice to achieve the 'desired' result. Therefore it would be rather surprising if the Danube countries would not be interested and willing to undertake further collaboration and thereby sharing the common burden as they all – as signatory states of the Danube conventions - are obliged to achieve the self-determined policy target at the Danube River Basin level

Figure 1: N Market fertilisers application in Danube Basin



Source: NIRAS, 2005

The political dimension of the study centres around the question whether policy measures implemented in concerted / joint action are cost-effective (i.e. reducing the overall costs necessary to achieve the common – Danube River Basin-wide – goal of reducing nutrient emissions) as compared to measures implemented unilaterally. As pointed out by NIRAS the concept of trading in water quality policies would be possible in the DRB. However, the necessary condition that such a system may be executed would be that (NIRAS, 2005):

- all involved parties (all riparian countries) agree on a clearly defined water quality level / goal in NWBS; and
- all involved parties (all riparian countries) agree on the principle for sharing the burden of meeting the political goal.

3. ENVIRONMENTAL CONSIDERATION

The environmental problems associated with the nutrient emissions have been discussed in many publications and reports of the ICPDR and research institutes (see for example, ICPDR, 2005, WFD Report and danubs, 2005, van Gils et al., no date given) stating that these emissions have led to severe ecological problems including the deterioration of groundwater resources and the eutrophication of rivers and lakes. As these environmental problems are studied in detail the project is not required to analyse these effects in detail. Specific aspects may be relevant as some of N-emissions are part of the whole water circle, i.e. the retention/removal of nitrogen in the soil/groundwater passage and in the river system of the Danube Basin, i.e. around 40 percent of all N-emissions are not reaching the Black Sea (personal communication with Zessner, 2006).

However, the focus of the project is clearly not directed to assess the exact effects of agricultural nutrient emission including retention and removal of N but to develop a framework of the cost implications of nutrient trading between riparian Danube countries. This implies that issues, such as agreeing to the overall system and data to be used as the starting point for the analysis (quantification of nutrient fluxes) and agreeing with regard to indicators as benchmark for nutrient management (e.g. surpluses on soil, cattle density, emissions to surface waters, loads to the Black Sea), must be clarified in advance and agreed by all involved parties (riparian countries). Probably one of the main problems in defining a common understanding and methodology of the burden sharing approach is how to assess / evaluate the environmental effects of N-emissions caused by upstream countries vs. those caused by downstream countries with regard to the nutrient load reaching the NWBS (i.e. a problem of 'normalising' the effects of a ton of N-fertiliser used in an upstream country as compared to the use of the same fertiliser in a downstream country).

This most likely requires quite detailed and lengthy political negotiation between all involved parties as it can be seen in the context of the political discussion associated with the establishing of the EU Emission Trading Scheme (ETS). As this project must be seen as an indicative example, all these – clearly important – discussions and decisions are not required. However, all assumptions (policy measures, data, etc.) must either be based on scientific knowledge or made in a transparent manner so that they can easily be understood and reproduced respectively.

4. ECONOMIC APPROACH

One of the motivations of this project is to assess the correct level of water quality management to achieve water quality goals in a cost-effective manner. Thereby the correct level can be defined at the basin level (between riparian countries) or at the national level[4]. The main task of this project is to shed some light on the question whether collective action between riparian countries is cost-effective in achieving a predetermined reduction goal as compared to national actions.

The mitigation of diffuse pollution from agricultural practices remains a challenge for policymakers as well as economists. A whole range of agri-environmental policy measures have been implemented in recent years including some form of environmental taxes (for example, fertiliser taxes in Denmark and Sweden, see Nordic Council of Ministers, 2006 and EEA, 2005), the manure production trading quota system in the Netherlands (OECD, 2006) or water quality trading systems / system of tradable discharge permits (NIRAS, 2005 and Kraemer et al., 2004). Currently there is a tendency in environmental policy in general to use more and more tradable systems as they are seen to offer a great deal of flexibility to polluters and thus are often construed to be cost effective. However, such tradable water quality systems have - to our knowledge - not been introduced at such a large river basin like the Danube and also the underlying principle between trading schemes which have been introduced mainly in Australia and the US differ (see for a more detailed analysis: NIRAS, 2005).

As mentioned above the rationale behind this study is to assess agri-environmental nutrient reduction policy measures in terms of their cost-effectiveness at the river basin, i.e. Danube, level. It is worthwhile to mention that studies analysing exactly this problem have been undertaken, in particular related to the Baltic Sea. The institutional set-up shows some clear similarities to the ICPDR and in particular to the ICPBS manifested in the Helsinki Convention of 1974 and the establishment of HELCOM, the administrative body of the convention, who is also responsible for co-ordinating activities.

[4] The further subordinated level would be on the farm level (agricultural emissions) or between industries. This level is not considered in the study as the methodological difficulties are even bigger and detailed information and data at the farm level are not available for the majority of the Danube countries.

Box 1: The Baltic Sea experience

The countries surrounding the Baltic Sea have made a ministerial agreement on reducing nitrogen loads to the Baltic Sea by 50 per cent (Helcom, 1988). The agreement did not specify any reduction requirements for each of the nine countries. As demonstrated in Gren et al. (1997), total costs increase by four times if each country reduces its load by 50 per cent, as compared to an overall reduction. The main reason is the differences in abatement costs among countries.

	Nitrogen		
	Optimal		Proportion
Region	Mill SEK	% reduction	Mill SEK
Sweden	1 535	42	1 913
Finland	1 542	41	1 657
Denmark	1 007	46	1 859
Germany	526	15	43 340
Poland	3 221	59	1 119
Estonia	423	54	303
Latvia	1 321	66	261
Lithuania	742	58	241
Russia	1 637	57	709
Total	11 956	50	51 402

The table above indicates the 'optimal' solution in terms of costs and reduction measures by the individual country (i.e. joint actions among the countries) as compared to a situation where each country is responsible for a proportional nutrient reduction by 50 percent (unilateral actions). It is not surprising that there are 'net winners' in terms of lower costs, such as Germany, and 'net losers', such as Poland when comparing the outcomes of the two scenarios.

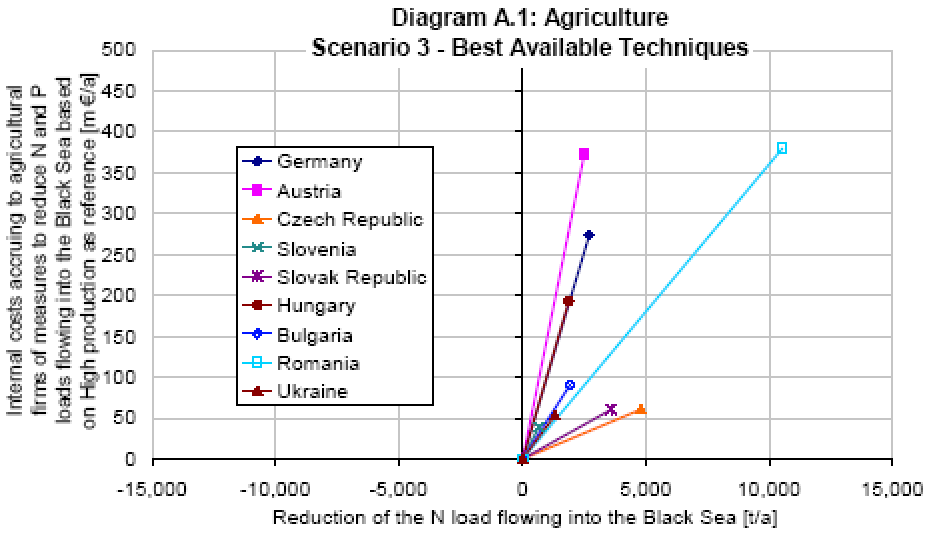
Source: Gren et al., 1997 and 2003.

It is expected that the project will draw up a list of agri-environmental policy measures all aiming to address agricultural nutrient emissions which may be based on existing research studies and information compiled by riparian countries in the context of implementation of the requirements laid down in the EU Water Framework Directive (WFD)[5].

For example, as part of the danubs project such a list of potential measures has been developed and the comparison of measures is presented in Figure 2.

[5] Directive 2003/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

Figure 2: Comparison of agri-environmental policy measures in terms of reduction potential and associated costs



Source: danubs, 2005, p.56

The figure demonstrate that collective action would reduce the overall reduction costs as there are differences in the abatement costs between countries, i.e. the criterion 'cost-effectiveness' could only be achieved if countries would co-operate and acting jointly.

However, the possible implementation of collective actions may be hampered because of different obstacles. The proposed project must address these obstacles and should illustrate ways how to solve / overcome them. One of the most obvious obstacles is linked to the question of how to combine the costs of implementing policy measures with the principle of burden sharing, i.e. country A implements a whole range of policy measures thereby exceeding the national reduction target (compared to the reference case of proportional reduction efforts) and from this it follows how country B where the abatement costs are higher than in country A may fund / reimburse the extra reduction effort in country A (i.e. there are some clear similarities to the CDM and JI measures under the EU ETS)[6].

The project must furthermore assess potential funding mechanism for reduction measures between countries. For example, the potential of the EU Common Agricultural Policy (CAP) and its forthcoming reform may be an instrument worthwhile to analyse in detail. Agri-environmental measures (AEMs) of the CAP are incentives encouraging farmers to protect and enhance the environment on their farmland and farmers are paid in return for a service. It is reported that 'AEMs go beyond usual good farming practice. The mid-term review of the 2000–2006 Rural Development Plans showed that AEMs improved soil and water quality, although it was difficult to quantify all benefits. In addition to AEMs, afforestation, including planting of trees on agricultural land, was encouraged. According to the review, the average agri-environmental payment was EUR 89 per hectare and year (ranging from € 30 to € 240) and € 186 per hectare and year for organic

[6] As discussed above (see Box 1) Germany would be a 'net winner' in terms of saved costs under the joint action approach as compared to the proportional approach and Latvia would be a 'net loser' – the question would be what political, economical, technical mechanism would be required to compensate the higher costs incurred by the 'net loser' countries, such as Latvia, by the 'net winner' countries, such as Germany.

farming (ranging from € 40 to € 440). Annual grants to compensate for the loss of income due to change of land use were made available, for example, in Denmark, Germany, Greece, Italy and Spain (UNECE, 2006)'. The question arises – and must be examined in the proposed project - whether funds available under this EU policy programme could be used by individual EU member states for offsetting the costs of nutrient reduction measures in foreign countries (i.e. other EU member states).

Another example could be the widespread implementation of Best Agricultural Practice (BAP) in all riparian countries. A recent study analysing farm practices in Serbia - commissioned by the Danube Regional Project (DRB)- undoubtedly show BAP is an effective tool to reduce nutrient emissions but it requires transfer of skills and knowledge (Danish Agricultural Advisory Service, 2006). This transfer is again connected to costs and it would be interesting to analyse whether and how the payment of these advisory services could be a potential reduction measure and funded by foreign governments.

5. ANTICIPATED RESULT / OUTCOME – ISSUES TO BE ADDRESSED IN THE RESEARCH PROJECT AND IMPLEMENTED DURING THE DIFFERENT PROJECT STAGES

The overall purpose of the proposed project is an attempt to acquire experiences and thereby to fill the gap of knowledge by calculating the costs associated with achieving predetermined nutrient reduction target in the Danube River Basin. The novelty of this project is to determine the cost-effective reduction measures for nutrient emission from agricultural production, i.e. a comparison of the costs entailing under the assumption that the target value has to be achieved proportionally (each Danube country will reduce nutrient emission by XX percent) and the reduction target will be achieved by joint actions among the riparian countries as compared to unilateral actions (i.e. reference scenario).

To our knowledge such a study has not been carried in the Danube River Basin level. However, similar studies have been undertaken for the Baltic Sea (see for example: Gren et al., 1997, Gren, 2001, Schou et al., 2006 – see also the Ad hoc Task Force for HELCOM Baltic Sea Action Plan (BSAP) at www.helcom.fi). These modelling approaches are broader as they include nutrient emission from transport and also include measures, such as the construction of sewage plants, as means to reduce the nutrient load. However, the modelling framework applied in the Baltic Sea studies is static which is in contrast to this project of cost effective measures for nutrient reduction from agricultural sources in the Danube Basin. It is anticipated that the project has to begin with developing scenarios indicating the evolution of nutrient emissions in view of the changing economic conditions, in particular with regard to the agricultural sector. This means that a dynamic cost minimizing modelling framework is required when the project is being implemented.

The following aspects are assumed to be critical for successful project implementation:

- Develop scenarios with regard to nutrient emissions: what is a realistic increase in N-emissions from agriculture in the Danube countries in the medium- to long-run by taking into account future economic development (distinction between countries; relevant indicators may be the consumption of fertilisers (but considering the requirements laid down in the EC Nitrates Directive) and development of livestock (surface specific livestock).
- Develop a list of agri-environmental policy measures addressing reduction of nutrient emissions[7]. The following nutrient reduction measures may be considered (these measures can be found in similar exercises (see for example Gren et al., 1997 and Schou et al., 2006) or are discussed in the UNDP/GEF project – however this list of potential measures is not closed / exhaustive and other measures may also be considered):
    - Reduced fertiliser use
    - Livestock reduction in agriculture
    - Wetland restoration

[7] Although phosphorous seems to be the limiting nutrient meaning that phosphorous reduction measures should be on the forefront the project will deal with nitrogen (Niras, 2005, p.12)! Some of the nutrient (nitrogen) reduction measures to be analysed are simultaneously leading to a reduction in the other nutrient (i.e. phosphorous).

  - Introduction of catch crops in agriculture
  - Implementation of best agricultural practices (BAPs[8])

- Reduction target – what is a realistic reduction target for the Danube River Basin – based on the findings of the scenarios of future economic development (in particular related to agriculture) as a whole and how can the target be 'translated' into national reduction targets (country-specific targets) based on the burden sharing principle (either countries are getting different percentage reduction target based on clearly defined assumptions or the same percentage reduction target will be applied to all riparian countries). Thereby it is necessary to decide about the base year (important for national allocation). The concept of trading is not new in EU policy as the Urban Waste Water Treatment Directive includes such a provision (see for example: Kraemer et al., 2004, p.11).
- Determine the costs of unilateral actions of riparian countries vs. the total costs under the assumptions collective action to achieve the predetermined reduction target. Cost effective nutrient reduction are determined by the costs of nutrient reduction measures and their impacts on the nutrient loads – what is in particular of interest in the context of the Danube region is the fact that we can expect that the costs of nutrient reduction measures are quite country-specific (see for example danubs 2005)[9].
- The allocation of national reduction target must include a discussion of the effects of environmental pollution in upstream countries as compared to downstream countries (i.e. some form of 'normalisation'). The allocation of nutrient reductions and the associated costs between Danube countries are depending by the total load of nutrients, the availability of different reduction measures and the associated costs.
- Discuss of how such trades in N-emission reduction between riparian could be financed; it could be helpful to look into CDM and JI measures and how they are funded at the national level (the study excludes trades between farms at this stage of the project because of the associated complexity of such trading arrangements).
- European Union Common Agricultural Policy (EU CAP) – what may be the consequences of the CAP reform in terms of increase of nutrient loads but also the possibility of funding mechanisms to support such a coordinated cost-effective nutrient reduction policy in the Danube River Basin (see for example: Mohaupt et al., 2006).
- Which regulatory, institutional and legal framework is required and the report should study the political willingness and requirements (which should / has to be in place) to fund nutrient emission reduction in foreign countries.

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[8] See for example the study 'Reduction of pollution releases through agricultural policy change and demonstrations by pilot projects' undertaken as part of the UNDP/GEF Danube Regional Project.

[9] Only direct costs are of interest at this stage of the project – also secondary environmental effects as a consequence of the implementation of reduction measures are of no interest!

6. A FINAL REMARK – A CAVEAT – AND THE NEXT STEPS

Empirical studies have impressively shown that joint actions among riparian countries can lead to the implementation of cost-effective nutrient reduction measures. However, the real problem is whether countries will agree to take part as it is unquestionable that some countries will be losing and other winning in terms of the cost burden under concerted / joint action as compared to unilateral action as it is often the case when policies are addressing international environmental problem. This project will definitely not solve this issue and it is also not the aim of the project. However, the project findings will provide some detailed and comprehensible information on the costs of potential nutrient reduction programmes in the agricultural sector based on a transparent modelling framework. These findings may hopefully be used in the political decision making process but as Schou et al. are mentioning (Schou et al., 2006, p. 42):

When presenting the results to policy makers it should be stressed that although the result is presented as an aggregate cost estimate for the countries in the Baltic Sea region this should not be interpreted as an indication of which countries that eventually should bear the costs. This is important to note when passing the results to policy makers, as the model prescribes how the effort should be mixed in order to reach the least cost solution but not how this solution is reached in a financial and political economic context.

This paper is only a sketch of a potential project analysing joint efforts to reduce agricultural nutrient emissions in a cost-effective way in the Danube River Basin. To bring such a project alive would require the interest of a donor to fund a project along the lines drafted above. It has to be stated that the idea of undertaking such a project is currently rather academic. However, as seen in the context of the climate policy, the concept of burden sharing what is the key principle of this project idea has been implemented in the context of 'transboundary' pollution. Furthermore, the concept of trading in water rights and water pollution is also nothing new and is implemented in the Chile, US and Australia – only to name some countries – and as mentioned above the idea of implementing jointly emission reduction measures in an international water is also to the fore in the Baltic Sea. This project idea is therefore not something complete academic rather it could serve as some form of raising the awareness of policy makers in Danube countries leading to further collaboration between the countries.

Implementation of the project following the tasks as listed above would require a quite large team of experts with different academic background (water science, agriculture, economics and to a lower significance politics and law). In addition, it would require a very international team as the compilation of country specific data is a necessary requirement for establishing the baseline scenarios as well as developing a list of potential agri-environmental measures (i.e. costs and reduction level). The most time-consuming tasks would be the collection of all data which should be undertaken in a coordinated and consistent manner. It is anticipated that the project could be completed within two years after signature.

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ANNEX

Table A1: Overview of per capita livestock (second column) and use of mineral N-fertilisers in the Danube Basin countries

	2000	2000
	AU/cap	kgN/haAA/y
Germany	0.28	117.06
Austria	0.35	35.00
Czech Republic	0.22	51.12
Slovak Republic	0.18	29.79
Hungary	0.18	44.04
Slovenia	0.28	69.00
Croatia	0.16	37.89
Bosnia&Herzegovina	0.14	14.20
Serbia and Montenegro	0.26	23.65
Romania	0.27	16.90
Bulgaria	0.18	19.82
Moldova	0.18	23.47
Ukraine	0.29	8.81
Average	0.24	31.33

Source: van Gils et al., (no date given), Annex 1