



Background paper for the PURPLE conference on 26 May 2010

‘Fostering biodiversity and sustainable water management in peri-urban regions, a new CAP to face new challenges’

Water and agriculture in peri-urban areas

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Summary

This paper deals with the subject of sustainable water management and climate change in peri-urban regions. It underlines the changes already surrounding us, and points out what aspects of agriculture in peri-urban regions could be affected. As most of the impacts of climate change on agriculture will come through water management, it is crucial to understand its impacts and be able to anticipate. More than creating adversaries competing for grounds, agriculture could very well present itself as an ally of urban areas. Some examples are given how this could be looked upon and organised (water governance), thus anticipating the Conference discussions on these aspects.

1. Short overview of relevant EU-legislation

There is an number of EU-directives relevant in the case of water management in peri-urban areas (focussing on spatial aspects of water policy): the Energy Directive [4]¹, the Water Framework Directive [7], the Groundwater Directive [8], the Nitrate Directive [9] and the Floods Directive [10]. Quite typically, all of these EU-directives share the aspect of member states being asked to define the actual status, set their objectives and subsequently put together a coherent programme of measures to reach these objectives. The general public is to be encouraged to participate in the policy making process and a monitoring system should be put into place at prescribed moments in time. In between member states, a system of inter-calibration is used to harmonize relevant aspects, leaving individual member states limited time and space to stray from the prescribed path. Those who do risk being appealed in front of the EU court in Luxembourg.

2. EU-policy developments in the area of water and agriculture

The EU Common Agriculture Policy (CAP) aims at providing a stable market for farmers and secure and safe food production for consumers at reasonable prices. Also, subsidizing farming in

¹ Numbers refer to the reference section, where a short description of these directives is given.

regions that are handicapped by natural conditions (such as moors, mountains) in the form of compensation is provided to enhance a level playing field. In order to counter adverse side effects of agricultural production, the 2003 CAP reform has shifted financial support from intensive production towards more sustainable forms (second pillar). Concerning the First Pillar, cross-compliance now links direct payments to the farmers to make them respect environmental and other EU-legislation.

The subsequent Health Check of the CAP (2008) also introduced and formalised payments for agro-environmental services, being a system of marketable rewarding of farmers for realisation and maintenance of (extra) social values in rural areas (such as Landscape, Environment, Animal Protection, etc). On order to avoid legal consequences, a catalogue of so-called Green Blue Services (payment for supra legal efforts) has been developed and approved.

As a result of changing climate conditions, the EU has set out to adapt its legislation and related policy making, especially in relation to water issues. As a result, member states have agreed that climate effects will be incorporated in the river management plans put together under the Water Framework Directive (WFD). The WFD focuses on the improvement of water quality from an ecological and chemical point of view. Water agencies have set goals and measures to reach these goals. For agriculture this means in general that the discharge level of nutrients to the surface water has to be reduced. In peri-urban areas this is no different. However, especially in the peri-urban areas, agriculture has opportunities in the field of Green Blue Services to support water agencies to reach the goals of the WFD.

Further more, climate change does not support reaching ecological and chemical objectives in peri-urban area and other rural areas. There are some exceptions though. For instance, the purifying effect of a marshland increases under higher temperatures, thus enhancing the effect of that specific type of measures. As it is only recently that definitive river basin management plans have been reported to the Commission, and not all member states have succeeded to do so in time, it is too early to make some comparisons between member states or to draw conclusions in this aspect.

3. Effects of climate change

Most of the impacts of climate change on agriculture will come through water management [1]. Three aspects illustrate this:

a) Changing farming conditions

As scientists may differ in their opinion regarding the magnitude of climate change and its impacts on society, it is generally agreed upon that in the South of Europe it will become warmer and drier and in Northern Europe it will become warmer and wetter. The map on the next page from the EU Commission DG Agriculture [1] shows these effects in more detail.

Predictions are also that climate conditions will be more extreme than nowadays: there will be longer periods of drought (water scarcity) followed by intense rainfall and subsequent erosion of fertile soil.

So even though Northern Europe may become wetter on average, there also will be a greater demand for water in dry periods as they become more frequent. This is even more so in the South of Europe.

From an agricultural point of view, several impacts are expected:

- **Water shortages.** The annual water availability will decrease in many parts of Europe. The differences between regions is strong: in southern Europe this will be a year round effect; in the northerly regions merely a summer effect. Climate change will cause significant changes in the quality and availability of water resources. More than 80% of agricultural land is rain-fed. Limited water availability already poses a problem in many parts of Europe and the situation is likely to deteriorate further due to climate change, with Europe's high water

stress areas expected to increase from 19% today to 35% by the 2070's. This could also increase migration pressures [3].

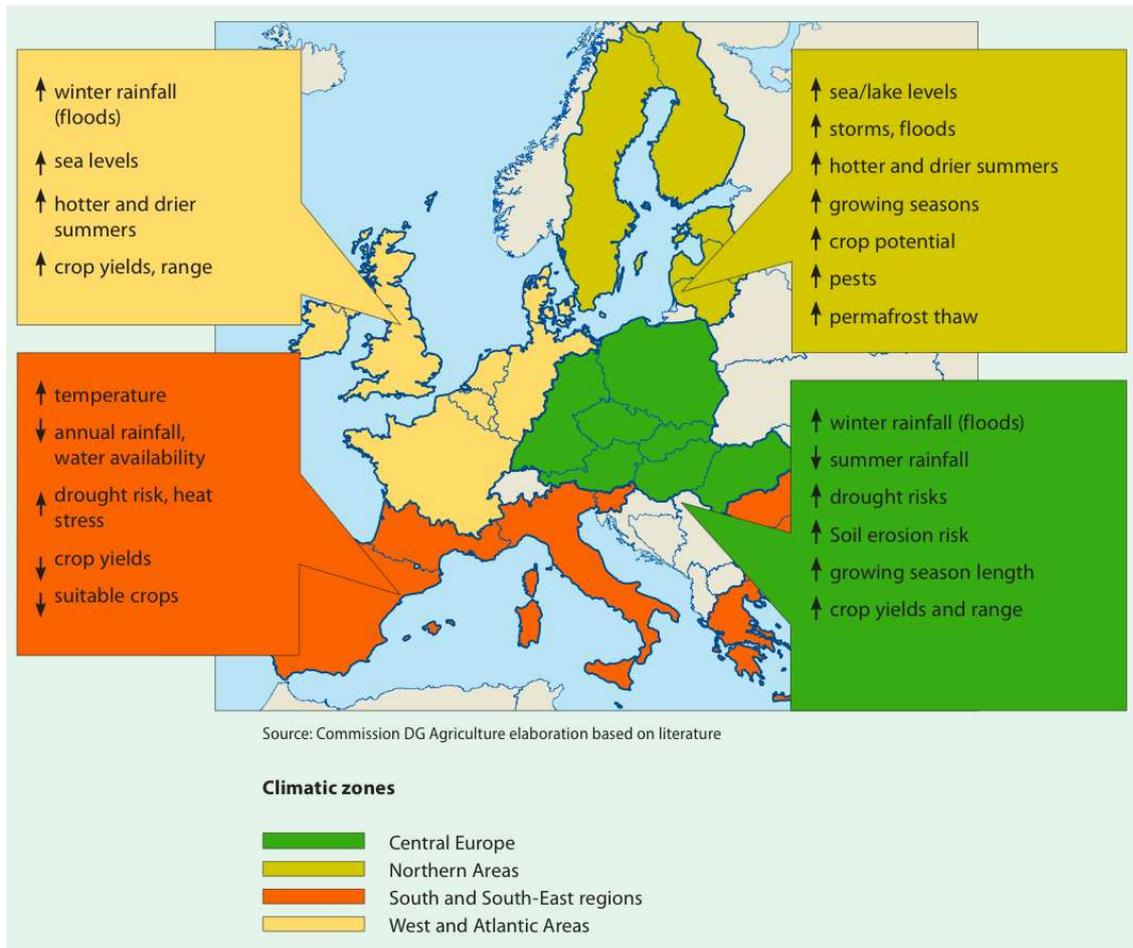


Figure 1 Projected impacts from climate change in different EU regions

- **Weather hazards.** The impacts of extreme weather conditions like storm events, floods, hail, heat waves and drought will be felt stronger throughout Europe;
- **Increased pest problems.** Due to higher temperatures and humidity it is likely that farmers will face increased pest problem, or more pests;
- **Impact on crop yields and distribution.** The stability of crop yields will be less assured and production locations will change as agro-climatic zones are likely to shift to more northern latitudes [1].
- **New production possibilities.** Climate change has also a positive side as it leads to new production possibilities of crops which need a warmer climate.

In short, circumstances for farmers are changing, with higher risks for existing crops and new challenges to address these risks.

b) Greater demand for flood protection / spatial aspects

Extreme climate events cause huge economic and social impacts. Infrastructure (buildings, transport, energy and water supply) is affected, posing a specific threat to densely populated areas. Densely populated flood plains will be under greater threat due to an increased risk of storms, intense rainfall and flash floods leading to widespread damage to farmland, infrastructure and built-up areas.

The situation could be exacerbated by the rise in sea level. A more strategic and long-term approach to spatial planning will be necessary, both on land and on marine areas, including in transport, regional development, industry, tourism and energy policies [3]. Ecosystem services such as flood protection are directly linked to climate change and healthy ecosystems are an essential defence against some of its most extreme impacts. A comprehensive and integrated approach towards the maintenance and enhancement of ecosystems and the goods and services they provide is needed.

Flood protection plans will very likely contain measures to enhance flood defence infrastructure (dams, dikes etc) and also – to a lesser extent probably – to make spatial reservations for water retention in the event of heavy rainfall and flash floods. Much is expected here from the EU Floods Directive which will come into effect by 2015. As the most severe impacts of climate change may be not noted until 2050, more extreme conditions however are to be expected to occur much earlier (such as floods), to become more severe, to occur more frequently and in more parts of Europe. Actions are needed on the short term to avoid infrastructure and densely populated areas to be affected.

c) Conversion to a low carbon economy

Europe has set ambitious goals to face Climate Change: the so-called 20-20-20 Agenda of the Energy Directive [4]. Apart from this, there is a certain civic movement in society to realize a low carbon society. One example is the **Covenant of Mayors** (see reference list under [5]). This new ambition is expected to lead to more production of bio-energy crops, more efficient use of bio materials in the agricultural / food industry and innovative concepts. The production of bio-energy crops for large scale production however may not be easy to combine with peri-urban areas, as these are crops especially suitable for large scale agricultural production.

Also relevant in this aspect is the possibility of competing claims. When bio-based economies will import their basic materials at a certain scale, this could lead to substantial loss of natural resources in other countries (woodlands, farming grounds, natural areas). This side-effect of any bio-based economy stretches beyond European boundaries and may effect land use and biodiversity on a global scale.

4. Impacts on (agricultural) water management

Climate change thus implies a double challenge for farmers:

- On the one hand, EU-legislation is in place to reduce emissions (not just the evident greenhouse gasses but also preventing leaching of nutrients, pesticides), which is aimed at mitigation.
- On the other hand, farmers are being confronted with climate becoming more extreme and the need to adapt to these shifting conditions. This provides a major challenge for agriculture, especially in the present economic situation where margins / revenues are small and room for investment is low.

As some EU regions may benefit from the projected climate change impacts - it could provide more suitable production conditions - it is likely that most impacts are adverse and will occur in regions already under pressure from socio-economic and environmental factors, such as water scarcity. This uneven effect is expected to amplify regional differences in agricultural conditions between PURPLE-members.

Focussing on agricultural water management, climate change will have the following impacts:

- Greater water scarcity and water stress in the summer;
- Greater need for more water effective farming methods;
- Higher risk of flooding in the winter period;
- Greater pressure on water resources in delta and low land areas.

Many of peri-urban regions thus face a dilemma: changing agricultural practices towards less water-consuming crops and/or crops that are more resilient to chloride may be a solution here, providing that consumers are willing to pay a higher price or could provide the necessary market for these salt-resilient species. But change takes time – and there are limits to what farmers can cope with.

A greater need for freshwater supply may very well result in more groundwater abstraction. In coastal zones and areas that are sensitive towards the intrusion of chloride, this may cause the groundwater quality to decline. The intrusion of chloride is further enhanced by sea level rise (in coastal zones): many of peri-urban regions may suffer double in this aspect². Changing crops towards less water-consuming types and/or types that are more resilient to chloride may be a solution here, when consumers are willing to pay a higher price or could provide the necessary demand for these salt-resilient species.

5. Agricultural water management in peri-urban areas

Where urban and rural areas are closely connected, the impacts of climate change on water management can be considerable. In the current situation, the urban pressure (housing, industry and infrastructure) of an expanding city on agriculture is high, causing high land prices. Consequently, a competing claim could very well arise between agriculture trying to adapt to changing conditions and expanding urban areas, leading to even more higher land prices in the near future, creating a great pressure on returns on agricultural investment.

All additional spatial pressure that arises from climate change is therefore primarily regarded as a potential threat to the future of agriculture in peri-urban areas. For instance, the main centres of green house production in the Netherlands (such as ‘Westland ‘ and ‘Aalsmeer’) suffer from a lack of space for scaling up. This effect is found in all peri-urban areas, as there is not just a high spatial stress, leave alone too little space for the needed extra water retention, albeit that differences may occur between PURPLE-members. It provides a challenge for this agricultural industry, the Regional Government and Waterboards to develop a sustainable solution for this problem.

Water management

In Spain the water stress is already higher than in Northwestern Europe. Water is largely retained in reservoirs and as much as 80% of it is used for agriculture which is largely depending on it. In Catalunya however it is seen as a basic right to have fresh water and the farmers are not charged for the use of water. Some of the overall water management costs are ploughed back in the drinking water prices. This does not seem to be wise as it concerns a scarce natural resource but it also does not stimulate farmers to be more “water effective”.

Around the wetland Doñana in the south (near Sevil) there is a conflict of interest on the scarcity of water. Around the Doñana agriculture with a high water level consumption is carried out causing a decrease of the Natura 2000 area. An innovative project on “water corridors to the Doñana” and “water effective strawberries cultivation” was initiated and carried out with success for both ecology and economy.

² In the current situation in the Netherlands for example 40 m³ of fresh water from the Meuse/Rhine is needed to feed 1 m³ of ditchwater in a polder area in the province of South-Holland. The main part of the available water is used to control salt intrusion [6].



Climate change is not restricted to rural areas. Urbanised areas will also be affected and will rely more and more on less inhabited areas to create a buffer for extreme events. Relating to water management, it has already been worked out in some cases that more water needs to be retained upstream (i.e. away from urban areas) in the event of floods, and/or the reverse effect of large volumes of discharge water flowing from developed areas to its surrounding grounds. In the current situation in several densely populated areas water agencies already have set different criteria for urban and rural areas. In the western Netherlands for example rural, grassland areas have been given a “risk for flooding” of 1 time every 10 years, while urban areas has been set at 1 time every 100 years. This method of differentiated risk analysis in water management will become more common in the coming decades in peri-urban areas. When looked upon from a distance, this provides opportunities for the creation of large delta-like landscapes [see ref 2]. For the individual farmer though, it only intensifies the pressure already put upon him by climate mitigation and adaptation.

6. Challenges

Is there a starting point to find a new balance between urban and rural interests, to forge new coalitions between urban and rural stakeholders, between public and private partners to confront these challenges?

Agriculture in peri-urban areas – as everywhere - is bound to its environmental circumstances. Given the financial, urban and recreational pressure in these areas – as shown before – agriculture is not always a logical factor anymore in the peri-urban areas. It is seen as an activity which can offer interesting side effects such as green open spaces. When areas for new urban developments are needed, these values often do not suffice to withstand urban pressure. Climate change will only enhance this pressure as more area is needed for flood areas and water storage. The challenge for agriculture and agricultural entrepreneurs in peri-urban areas consist of:

- To develop more water-effective and less polluting production methods;
- To take position as “good landlords”: area managers that maintain sustainable production methods, keep the area green and open and have an eye for the interest of society;
- To position itself as an ally of society against the threat of climate change, through:
 - being more self sufficient in water management, meaning to create flooding areas and water supplies as part of the agricultural production areas;
 - producing food nearby with a smaller CO2 footprint.
- To position itself more as an ally of the urban areas instead of competing with it for space and resources, by:
 - Focussing on food production for the nearby city in stead of a focus on large scale production for the world market
 - Focussing on deliver real and accessible green spaces in the neighbourhood of the cities.

Example to the challenges of agriculture

Agriculture being part of the solution for expanding cities could very well consist of the following components:

1. **Commercial, highly intensive agriculture: partner for the low carbon city.** Built-up areas such as cities –especially those co-operating under the PURPLE network - have a high ambition to reduce CO2 levels. In order to do so, biomaterials, bio fuels etc are needed but also possibly some CO2 compensation programmes. The agricultural sector could be the one to deliver this. Examples are the conversion of biogasses from animal manure for green public transport in the city; and glass houses producing (residual) energy to heat houses.



Figure 2 Innovative concepts: energy producing glass house (InnovationNetwork) and biogas from manure

2. **Water effective agriculture: best protection against flooding.** Climate change will provoke more intensive precipitation with higher risks of flooding for the cities. Agriculture can provide a “safety service” to the city. Furthermore, there will be less water in the summer. Agriculture in peri-urban areas should therefore innovate and be more self sufficient and effective with water (closing water cycles, develop innovative techniques for irrigation etc). Surplus water could thus be stored in the winter and used in the summer to supply general water resources.
3. **Agriculture: Partner for the green city & citizens.** Agriculture in peri-urban areas is often of a smaller scale than elsewhere and also delivering other services – on a local scale: landscape, green environment, nature and recreational area. In the face of the challenge of the climate change, agriculture should consider to become a “climate partner” of the city:
 - **Producing food nearby** with low amount of logistics, so low energy/carbon local produce;
 - **Creating a Landscape – CO2 service:** creating a service were citizens can compensate their CO2 production in their own surroundings in a service that is supporting for the quality of the country side, for example trees, wooded bank etc.
 - **Creating Environmental Services as a beautiful landscape nearby.** For instance small hiking paths.



Figure 3 Walking and cycling path in Midden Delfland, The Netherlands

7. Water governance

Traditional *economic instruments* that have been put into place by member states to achieve these policy objectives are public funding and tax measurements (stimulating good agricultural practices). To go beyond this, a mixture of both private and public instruments appear to be suitable, such as:

- creating regional funds. As regional funds would contain both private and public money, it is likely to provide more long-term security when compared to subsidizing mechanisms by the government. This could be co-funded by European agricultural and water policies;
- Making green/blue investments tax-deductible (lower return on investment compensated by tax benefits);
- Certification of good practices. A private mechanism that would make consumers of agricultural products pay extra for sustainable production and/or services;
- Compensation for the loss of agricultural value and /or for sustainable achievements;
- Trade mechanisms for water issues (water abstraction rights and/or water emissions).

This mixture of public and private interests also expands to the level of water management (*organizations*). Some examples are:

- upscaling of environmental objectives. Not each of the individual farmers is responsible for reaching targets, but on a regional scale collective rural organizations are taking up the task of addressing these issues (self regulating). This requires both clear objectives and a good monitoring system in place.
- Reinforcing local government (bottom-up). A regional committee is put into place to close the gap between public and private representatives, and to contract farmers to take sustainable measures on their land.
- Expanding existing control mechanisms. In the Netherlands, the regional water boards have proven to be a key factor for water related interventions in the past. As their mandate is restricted to water issues, it could prove to be efficient to have these regional water boards a) in other PURPLE-member states and b) to consider handing them some influence over spatial issues (integrated water management).

8. Discussion³

1. Currently CAP expenditure is increasingly (through e.g. progressive modulation) used as a financial instrument to achieve other policy objectives, such as concerning water management. This is an inappropriate use of CAP funds. Instead separate European budget should be allocated for these objectives. Farmers, as one of the group of land users, are among the potential beneficiaries.
2. What, in the light of the subsidiarity principle, is the appropriate level of public intervention to develop and implement water management policies, especially concerning peri-urban areas where the interests of urban and rural stakeholders run the greatest risk of conflicting each other?

³ The questions do not represent in any way the views or positions of the authors. They are also not necessary consistent with each other. They serve merely to open the debate during the conference.

3. Agri-environmental schemes and other CAP measures aimed at sustainable water management are usually aimed at the individual farmer or land user. Like biodiversity sustainable water management needs an integrated, territorial approach. It would be better to encourage land users to form collective entities with whom contracts will be made to reach water management objectives for the area in question.
4. The creation of regional funds, containing both public and private money, could form an effective instrument to engage urban stakeholders (public and private) to co-invest in appropriate water management practices.

References and background

- [1] Fact sheet on climate change: the challenges for agriculture. EU Commission on Agriculture and Rural Development, 2008
- [2] Randstad Urgent, Structuurvisie, Government Rule, The Netherlands 2006
- [3] EU White Paper: Adapting to climate change, towards a European framework for action, 2009
- [4] Energy Directive, 2006/32/EC. The EU ambitions on energy conservation consist of 3 aspects: 20% less CO₂ production by 2020, 20% more sustainable energy by 2020 and 20% more energy efficiency by 2020. Linked to this, the EU has as well set a legal requirement to mix normal mineral fuel with bio fuel. This is set at 2% to be raised to 5-10% over the next years.
- [5] Covenant of Mayors; www.eumayors.eu: An ambitious and expanding European partnership with currently 1.680 members which has a commitment by signatory towns and cities to go beyond the objectives of EU energy policy in terms of reduction in CO₂ emissions through enhanced energy efficiency and cleaner energy production and use. Amsterdam for example is a member and has an even higher ambition: to be CO₂ neutral in 2020.
- [6] WWF , for a living planet campaign
- [7] Water Framework Directive (2000/60/EC): providing a framework for member states to undertake all actions needed to reach good chemical, quantitative and ecological status for (ground-)water bodies. Its spatial implications are depending largely on the scope of the programme of measures, which member states have been outlining in the river basin management plans (2009). Relevant in this case may also be the register of protected areas, which poses restrictions on land use that are a potential threat to the (future) use of water.
- [8] Groundwater Directive (118/EU/2006): this directive contributes to the general outlines for groundwater in the WFD and states the importance of protective measures for groundwater used for human consumption (being both public and industrial extractions). Member states are asked to define special protection zones with subsequent monitoring and protective measures (such as land use restrictions, but also limiting contamination and leaking of toxic fluids from landfills, former industrial sites and mines).
- [9] Nitrate Directive (91/676/EC). Aims at controlling nutrient leaching towards both surface water and groundwater. It also contains guidelines about measurements of nitrates in surface and ground water. Action Programmes are put forward to deal with this problem of nitrates (and phosphates) in order to widen Good Agriculture Practice (CGMC). PURPLE members have taken different strategies to implement the Nitrate Directive; progress is being monitored by the EU (four-year planning cycle).
- [10] Floods directive (2007/60/EC): to protect inhabitants of coastal zones and floodplains, all member states are asked to initiate flood protection plans in accordance with the river basin management plans (WFD). To prevent flooding and its impacts (both in terms of economical damage and human casualties), protective measures must be in place (such as strengthening dikes but also securing escape routes in the event of floods). Spatially this may result in reserving areas for water retention (see below) and altering the level of vulnerable infrastructure.