Assessment of Policy Impacts on Sustainability in Europe

The impact of hydropower generation on river basins in Austria

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1. Introduction

1.1 Background and problem description

The case study "the impact of hydropower generation on river basins in Austria" is based on the hydropower related conflict between climate protection and nature (especially water) protection targets. Hydropower with its advantages and disadvantages is able to affect both of these environmental policy targets. On the one hand, renewable hydropower generation causes almost zero greenhouse gas emissions, thus contributing to climate change mitigation and renewable energy targets. On the other hand every hydropower plant impacts the environment by creating hydromorphological pressures and impacts on natural rivers systems, thus possibly counteracting nature (especially water) protection targets. As a consequence, this conflict results in debates concerning hydropower permissions world-wide, thus making them a controversial issue also in EU environmental policy.

The aim of this case study is to assess the outcomes of the European environmental policy framework affecting hydropower related decision-makings at Member State level by covering both, renewable energy increase as well as nature (especially water) protection. The policy framework is in particular characterized by the implementation of the Water Framework Directive (WFD)[1] adopted in 2000 and by the implementation of the European Directive on the promotion of electricity produced from renewable energy sources in the internal energy market in 2001 (amended by the Renewable Energy (RES) Directive[2] in 2009). Additionally, when ecologically sensitive areas are intended to be a location for hydropower plants thus, in addition to the water ecology itself, endangering also the water bodies' surrounding biodiversity, the policy framework related to hydropower decision-making includes also the Habitats and the Birds Directive, together forming the cornerstone of Europe's nature conservation legislation.

Besides, in some Member States hydropower decision-makings regarding the enhancement of nature conservation are additionally also subject of the application of the Environmental Impact Assessment Directive, which is intended to be applied on projects with possibly significant environmental impacts by verifying or hampering their realisation already at the outset. However, whether projects listed in Annex II of this directive, including also installations for hydroelectric energy production, need to be subject to environmental impact assessments is left to the particular Member States by applying either case-by-case examination or specific thresholds and criteria.

Regarding this policy framework, hydropower decision-makings may possibly be on the one hand crucial for the performance of the WFD, the Habitats and Birds Directive, thus if resulting in (non-avoidance of) significant ecological impacts of hydropower plants on affected water bodies. However, on the other hand, hydropower decisions to approve newly planned projects/ to improve the efficiency of already existing plants and a corresponding increase in hydropower generation help EU Member States to achieve their RES targets set

[1] The WFD aims to improve the status and to prevent further deterioration of all water bodies within the EU, including surface and groundwater, by 2015 (2027 at the latest). (2000/60/EC)

[2] The RES Directive pursues a 20% increase of the share of renewable energies in gross final energy consumption until 2020. (2009/28/EC)

by the Renewable Energy Directive, thus contributing also to the achievement of overall climate change mitigation and renewable energy targets. As a result, already at the level of EU legislation a possible policy conflict in the context of hydropower decision-making arises and is reflected in the implementation of European legislation in Member States.

In this case study it will be demonstrated in which way the "hydropower conflict" arises at the Member State level in Austria, focusing on the implementation of hydropower plants on the one hand and the WFD as well as nature conservation on the other hand.

Austria has generally been characterised as a European Member State with a historically and ongoing high focus on hydropower generation. Currently more than 50% of total electricity produced in Austria originates from hydropower plants, whereas the share of hydropower regarding total electricity produced from RES sources amounts almost 90% (Kampa et al., 2011). As a consequence of the long history Austria has with hydropower generation, this technology in general has also a quite high acceptance in society. Therefore, despite a large hydropower expansion from the 1960's to the 1990's which was shrinking hydro potential, there are still ongoing plans to increase hydropower production also in future. However, since Austria's large hydro potential is already widely developed, and possibly also after strong public resistance against new large hydropower plants in the 80ties, a high potential for further expansion is seen in the construction of small- and mid-sized hydropower plants, which are also planned to contribute to the achievement of Austria's 2020 RES target (Kampa et al., 2011).

Nonetheless also in Austria, environmental and rather water protection became more and more important in the recent past, thus possibly negatively affecting the generally "good image" of hydropower generation in the country and therefore increasingly causing a "hydropower conflict" in political decision-makings. As a result a challenge to reach multiple environmental objectives given by the environmental policy framework related to hydropower decision-makings in Austria occurs, thus possibly resulting in performance failure of various national environmental policy instruments acting either in the policy area nature/water protection or renewables expansion/climate change mitigation.

In this case study therefore it will be explored how effective and efficient the environmental policy framework related to hydropower decision-making in Austria currently is and expected to be in the near future. While for the overall assessment the entire sector small- and mid-sized hydropower plants (plants with a maximum capacity up to 20 MW[3]) in Austria will be considered, a specific example in the province of Styria, located in a European nature conservation area and therefore also affecting ecological sensitive areas, will be the starting point for assessments: the planned small hydropower plant "Kraftwerk Schwarze Sulm"

[3] The definition of small- and mid-sized hydropower plants (regarding maximal capacity) is based on Austrian legislation (green electricity act BGBl. I Nr. 75/2011).

The case study example: The planned hydropower plant "Kraftwerk Schwarze Sulm"

The power plant would have an installed capacity of 4.92 MW. It is affected by the national implementation of EU directives forming the policy framework related to hydropower decision-makings, namely by the WFD and the Renewable Energy Directive but also by the Habitats Directive since the projects is additionally also planned to be located within a displayed Natura 2000 area. These directives are together presenting a challenge in reaching multiple environmental objectives in the hydropower permission process. The small hydropower plant "Kraftwerk Schwarze Sulm" is used as an example for a possible "hydropower conflict" in Austria since its authorization procedure lasted almost over 10 years due to high resistance against the power plant and administrational difficulties and disagreement to give it a permission. In March 2012 in spite the various difficulties officially permitted (however by closure of case study research still under legality investigation), the "Kraftwerk Schwarze Sulm" became a major public case concerning hydropower decisions for the whole country.

The story behind the hydropower plant:

- **2002:** Project submission
- **2006/2007:** Official federal permission by the regional government according to the nature conservation act as well as the national water act
- **2007:** Appeal of original jurisdiction lodged by the Styrian authority of water management and starting of EU infringement procedure regarding to the hydropower plants permission according to the national water act – thus based on the authorities decision to authorize the project by justifying an exemption based on the hydropower plants higher public interest compared to goals of WFD
- **2009/2010:** Refusal and annulment of original official federal permission by the regional government by Austrians federal ministry of agriculture, forestry, environment and water management and stopping of EU infringement procedure
- **March 2012:** Administrative appeal of project investors and unconstitutionality declaration of the Styrian authority for water management which in succession made the 2007 given permission according to the water act again lawful
- **May 2012:** Starting of §21a (§21a of the national water act as assignment to burst legal force if after the authorization of a project the situation ensues that due to the authorization overall public interest is not adequate secured) procedure for project examination
- **May 2013:** Start of construction of the hydropower plant
- **September 2013:** Completion of §21a procedure: Regional government gave the permission again after degrading the status of the river from very high to good, and thus not seeing the need any more to make an exemption according to 4.7 WFD
- **April 2013:** EU reminder regarding the reopening of the 2007 started infringement procedure and administrative appeal lodged by the federal minister of agriculture, forestry, environment and water management regarding the administrative office of Styria's governor

(for more detail on the case of the "Kraftwerk Schwarze Sulm" see appendix 1)

By means of this example, desk research and interviews with relevant stakeholders, possible barriers for achieving the desired outcomes of the environmental policy framework related to small- and mid-sized hydropower generation in Styria/Austria were surveyed and assessed.

1.2 Methodology

The case study applies the APRAISE 3E method (Tuerk et al., 2012) aiming to enable the context - specific assessment of effectiveness, efficacy and efficiency (3Es) of individual environmental policies and policy instruments; and, as part of the 3Es' assessment, an analysis of the interactions between two or more assessed environmental policy instruments. When similar policies or policy instruments are compared in different EU Member States, the outcome can differ widely depending on the presence or absence of favourable or unfavourable factors. These factors can result from:

- the broader contextual factors such as the environment, economic, social, and technological factors
- national barriers (i.e. institutional factors) that prevent the efficacious transposition and implementation of EU Directives as well as policy specific context such as policy instrument design, operation and enforcement; and
- interactions between policies and policy instruments, where one policy instrument could potentially reduce the effectiveness of another instrument or joint implementation of policy instruments could result in synergies.

The concept of efficacy as defined in APRAISE takes account of these differences as it denotes the potential optimal outcome of a policy instrument, and includes the expected mechanisms through which the instrument would bring about its desired effects taking into account the above mentioned factors. Efficacy thereby serves as a reference for the effectiveness of an existing policy instrument. In order to assess the role of policy interactions regarding the understanding of the effectiveness, efficiency and efficacy of a policy and the related policy instrument(s), APRAISE adopts a systems approach, whereby **policy instruments are examined as part of a policy and stakeholder system operating within a broader context**. The analysis of policy interactions pays particular attention to the orientations and motivations of the involved actors and actor constellations acknowledging that interaction can take place through the changed behaviour of targeted stakeholders as a result of policy instruments.

Furthermore, the APRAISE 3E method applies the concept of a theory based evaluation in order to create a "theoretical" picture of how a policy or a policy instrument was expected to achieve its objectives and targets; This is followed by an empirical assessment of the actual implementation and operation of policy instruments, including the role of contextual factors (including environmental, economic, social, and technological factors) and interactions in particular at the stakeholder level; The empirical findings are then compared with the theory and verified through stakeholder consultation and assess why a policy instrument has operated or failed to do so in a given context; Finally the method aims to allow drawing conclusions on the efficiency, effectiveness and efficacy of national policy instruments and EU policies and their trade-offs and in order to help to improve policy design, both nationally and at EU level.

2. From EU directives to national policy instruments

2.1 EU Directives and corresponding national policy instruments

Starting point for the assessment of the environmental policy framework related to small- and mid-sized hydropower permissions in Styria/Austria are the three EU environmental directives, which are affecting the Austrian case study example "Kraftwerk Schwarze Sulm" and are key players within the "hydropower conflict" in reaching multiple environmental policy targets:

- **The Water Framework Directive (2000/60/EC)** contributes to protecting nature (water) by demanding the achievement of a good ecological and chemical status/potential for surface water, a good chemical and quantitative status for ground water until 2015 (2027 at the latest) and the prevention of further deterioration of all water bodies in Europe. (Small- and mid-sized) hydropower decision-makings need to ensure the coherence with environmental objectives given by the WFD by closely considering ecological impacts of hydropower plants on affected water bodies. This is not only affecting newly planned projects (prevention of further deterioration) but also the reconstruction of old plants which are no longer in line with the new implemented policy requirements/policy targets (achievement of a good status/potential of all surface water bodies within the EU).

- **The Renewable Energy Directive (2009/28/EC)** - *amending the directive on the promotion of electricity produced from renewable energy sources in the internal energy market in 2001* - contributes to the climate protection (emission saving) target due imposing individual RES target achievement obligations for different Member States. It follows the 2008 decided package of energy and climate change legislation of the European Commission, which includes the targets to decrease greenhouse gas emissions by 20% based on the 1990's level and to increase the share of renewable energy sources (thus also electricity generated from small- and mid-sized hydropower plants, however not specifically) in final energy consumption to 20% until 2020.

- **The Habitats Directive (92/43/EEC)** contributes to the nature protection targets by aiming to halt and reserve the loss of biodiversity within Europe, thus also affecting river ecosystems. In regard to particular ecological sensitive regions, it claims the disclosing of nature conservation areas (so called "Natura 2000" areas) comprising both habitat sites and bird sites (thus indirectly also contributing to the aims of the Birds Directive). Within Natura 2000 areas undertakings with possible environmental impacts (such as small- and mid-sized hydropower projects) have to undergo a tight authorization process in order to secure zero (minimal) environmental consequences for protected habitats. (**note:** *In the following analysis the Habitats Directive is considered as it is being relevant in the case study example "Kraftwerk Schwarze Sulm", however not in all cases. It is therefore and additionally, because it was in comparison to other EU directives also less relevant for the case study example, considered on a more aggregate level than the two other EU directives*)

The Birds Directive as well as the Environmental Impact Assessment Directive are not considered in the further analysis as not being relevant for the case study example "Kraftwerk Schwarze Sulm" (e.g. hydropower projects in Austria are only subject to

environmental impact assessments if their capacity exceeds or rather achieves a given threshold – 15MW in general, however depending on other criteria this threshold may be lower) and also by not being identified as crucial key players causing the "hydropower conflict".

In Styria/Austria, the three selected key EU directives for small- and mid-sized hydropower decision-makings are implemented by national policy instruments listed in the table below:

Table 1: *National policy instruments forming the environmental policy framework related to small- and mid-sized hydropower decision-makings in Styria/Austria*

Environmental policy themes	Policy instruments				
	1	2	3	4	5
Energy	**Green electricity act** Ökostromgesetz BGBl. I Nr. 75/2011	**Law for the electricity market** Elektrizitäts-wirtschafts- und Organisationsgesetz BGBl. I Nr. 110/2010			
Climate					
Agriculture					
Air					
Waste					
Water and Bio-diversity	**National water act** (superior instrument above the next three) Wasserrechts-gesetz BGBl. I Nr. 82/2003	**River basin management plan** (decree) Nationale Gewässer-bewirtschaftungsplan VO BGBl. II Nr. 103/2010	**Quality target decree – ecology of surface water** QZVO – Ökologie Oberflächen-gewässer BGBl. II Nr. 99/2010	**National hydropower criteria catalogue** (promulgation) Österreichischer Wasserkatalog, Wasser schützen – Wasser nutzen BMLFUW – UW.4.1.2/0004 – I/4/2012	**Environmental support act – „water ecology"** Umwelt-förderungsgesetz Förderungsrichtlinie Gewässerökologie BGBl. I Nr. 34/2008
Biodiversity	**Nature conservation act** (different for each province) Steiermärkisches Naturschutzgesetz LGBl. Nr. 35/2000				

■ **Renewable Energy Directive (2009/28/EC)**
■ **Water Framework Directive (2000/60/EC)**
■ **Habitats Directive (92/43/EEC)**

The **green electricity act** provides subsidies for power generation plants based on renewable energy sources thus contributing to the implementation of the Renewable Energy Directive. For small- and mid-sized hydropower plants it provides either feed-in tariffs or investment incentives (depending on the size of the plant).

The **law for the electricity market** regulates the Austrian electricity market. For each federal state there are own specifications. In Styria, where the case study example "Kraftwerk Schwarze Sulm" is located, every hydropower plant with a maximum capacity ≥ 200kW has to undergo an authorization process according to the law for the electricity market. This law is highly important regarding hydropower decision-making, since it is the tool for bringing

energy and climate protection related interests (public interest in energy/electricity generation, energy supply security and the aim to increase the share of renewable energy sources in electricity/energy generation) into the decision making and permitting process (**note:** *the entire authorization procedure of hydropower plants in Styria/Austria consists of several individual approval procedures based on different environmental legislation: planned hydropower projects in Styria/Austria need permits based on water, environmental and electricity(energy) legislation)*

The **national water act** includes the national implementation of the WFD thus adopting also its general targets to improve the status/to achieve a good status of water bodies (good ecological/chemical status/potential for surface water, good chemical/quantitative status for ground water) and to prevent further deterioration. In some specific questions (e.g. definition of a good ecological or chemical status of water bodies) the national water act is specified by corresponding decrees or promulgations. Important in the context of (small- and mid-sized) hydropower decision-making are **the river basin management plan (decree)** *(most important policy instrument for the implementation of the WFD – status analysis, action plan)***, the quality target decree – ecology of surface water** *(ecological water status definition),* and **the national hydropower criteria catalogue** *(important supporting document in hydropower approval decisions according to the water law, especially regarding expected water status deterioration; it includes possible decision criteria considering ecological, energy management and water management issues)*. To not endanger the requested target achievements of the national water act, all usages which exceed the public use of water bodies (e.g. (small- and mid-sized) hydropower projects) have to undergo an authorization process.

The **environmental support act – "water ecology"** provides subsidies for measures to improve the ecological (hydromporphological) status of already existing hydropower plants and affected water bodies (e.g. measures to restore continuity (e.g. fish passes), measures to mitigate hydropeaking, diversion and backwater impacts, measures to improve habitat diversity, etc.) It pursues the support of the WFD in achieving a good ecological status/potential of surface waters by the end of the first river basin management plan, 2015.

The **nature conservation act** differs in Austria for different federal states. It covers all nature protection related questions and implements requirements given by the Birds Directive and Habitats Directive. In the case study area Styria, hydropower plants are generally (independently of its size) bound to undergo an authorization process according to the nature conservation act in order to secure coherence with nature conservation targets. The procedure is stricter if the planned project is located within a European nature conservation (Natura 2000) area.

The timeline of the European and national policy framework related to small- and mid-sized hydropower decision-making in Styria/Austria is shown in Figure 1 (base year 2000):

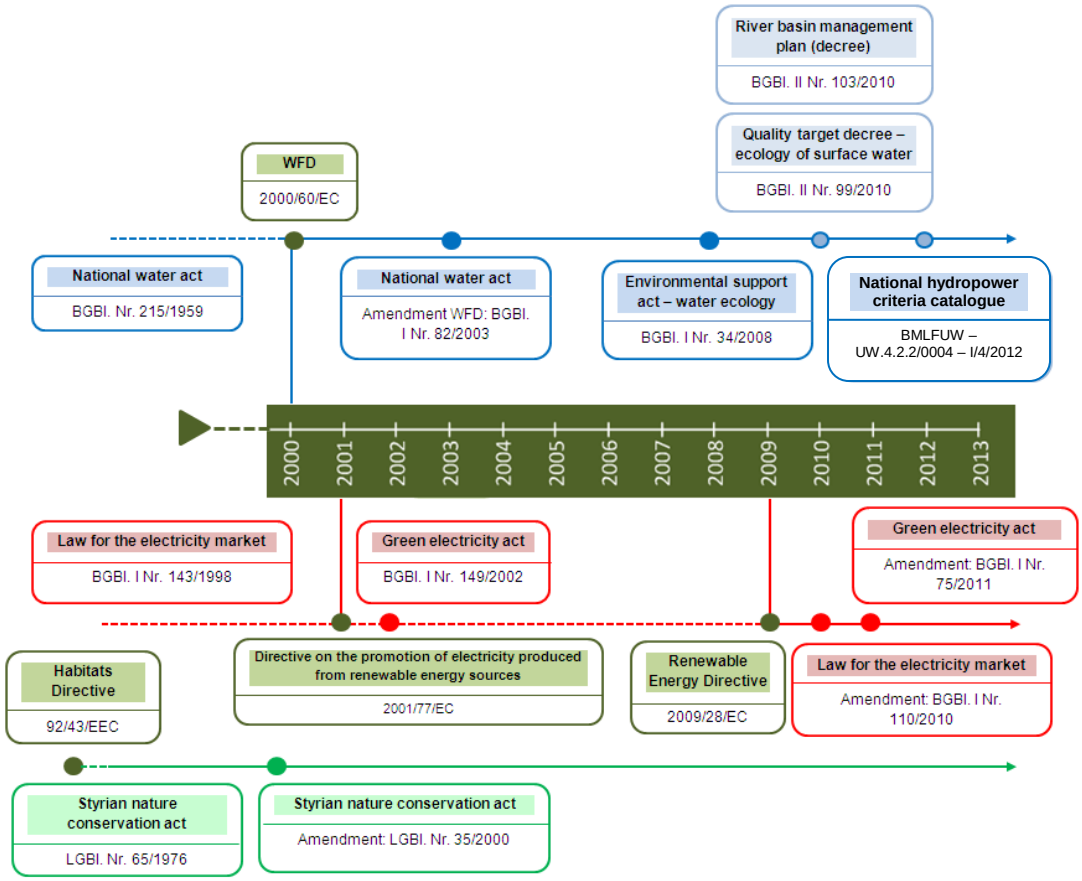


Figure 1: *Timeline of the European and national environmental policy framework related to small- and mid-sized hydropower decision-makings in Styria/Austria*

2.2 Selection of national key policy instruments and affected stakeholders

2.2.1 Selection of key policy instruments

In the following tasks (effectiveness/efficiency analysis (chapter 3) and corresponding system context and investigation of policy transposition (chapter 4 and chapter 0) the green electricity act as well as the national water act and corresponding specifications will be analysed in detail as they are the main carriers of the hydropower related conflict between climate protection/renewable expansion and nature (especially water) protection targets. The other instruments are analysed on a more aggregate level.

The law for the electricity market, as broader policy framework for including electricity (renewable energy) generation in hydropower decision-making procedures, will be integrated in the analysis of the green electricity act. Although, the law for the electricity market is – in contrary to the green electricity act – directly part of hydropower decision-making, it is the green electricity act which directly increases the motivation to invest in RES projects by providing incentives for electricity generated from renewable sources. Therefore it causes the "hydropower conflict" while the law for the electricity market is the legal framework for the permission of new hydropower plants.

The environmental support act – “water ecology” as well as the nature conservation act will be considered in the detailed analysis of the national water act and corresponding specifications. The environmental support act – “water ecology”, as supporting instrument for the ecological target achievement stated in the WFD/national water act (good ecological status/potential of surface water) is analysed in combination with the specific target settings and requirements of the national water act covering this subject. The aims of the nature conservation act are seen as part of the assessment of the national water act, since the national water act already takes into account prevention of water ecology deterioration, which is assumed as possibly being the main environmental issue in the context of hydropower generation. This assumption is based on the 1st implementation report of the WFD, which has concluded that hydropower generation is one of the main drivers to hydromorphological impacts on natural river systems (e.g. loss of connectivity, negative effects on fish population, etc.) (European Commission, 2007). In addition, such hydromorphological impacts have been already identified previously by the European Commission as being one of the most important risks for environmental objective achievement under the WFD (European Commission, 2006). Further environmental issues possibly caused by hydropower generation regarding e.g. the water bodies surrounding biodiversity are however assumed to be highly relevant only as soon as ecological sensitive areas (e.g. the before mentioned Natura 2000 areas) are getting involved. Since this is only the case for specific examples, the nature conservation act is analysed on a more aggregate level, however it is still being dealt within the detailed analysis of the national water act.

For the policy interaction analysis (chapter 6) which follows the system context and policy transposition investigation (chapter 4 and chapter 5) for completing the effectiveness/efficiency analysis (chapter 3), the assessed policy framework is then broadened again and national environmental policy instruments till then analysed on a more aggregate level are considered individually.

Policy Instrument 1: National water act and corresponding specifications

The national water act forms the key act in Austria of all water related questions. It exists already since 1959 and has been amended repeatedly in response to newly occurring water issues as well as in response to implementation and changes in EU legislation. Also the WFD (2000/60/EC) has been implemented in Austria via the national water act. A lot of the wording of the WFD has been adopted in the corresponding amendment of the national water act in 2003 and specific standards and requirements given by the WFD have been included in this act through the introduction of appropriate decrees and promulgations. However, while the overall target of the WFD to improve/achieve a good status/potential of water bodies and to prevent further deterioration has been in force right from the beginning of the amendment, specific decrees and promulgations which specify several target settings of the WFD/national water act, have been coming into effect not as recently after some years.

In addition, although the WFD has been a major revolution for the European water policy by bringing all Member States on the same path and to collectively protect the nature resource water in Europe for future generations, for Austria, the implementation of the WFD has not always been a benefit. Especially in the area of groundwater protection Austria’s legislation before the implementation of the WFD has been stricter. With the implementation of the WFD, controlling stations became fewer and groundwater protection experienced a decline.

However, in the context of surface water protection the implementation of the WFD brought a strong improvement. Especially with the requirement to achieve a good ecological status/potential and to prevent further deterioration of all surface water bodies, interventions into river ecology (e.g. the construction of hydropower plants) have become more challenging (Personal communication, 2012_a).

Thus, for small- and mid-sized hydropower projects planned to be realized, the implementation of the WFD brought a stricter authorization process with severe environmental requirements. For already existing hydropower projects the WFD brought newly obligations which need to be fulfilled within a given timeframe in order to be in line with WFD's environmental objectives. (**note:** *hydropower plants in general, had and have to comply with the requirements given by the national water act and within the surveyed timeframe with the requirements given by specific decrees or promulgations, however with the implementation of the WFD the process got more challenging*).

Policy Instrument 2: Green electricity act

In response to the European Directive on the promotion of electricity produced from renewable energy sources in 2001, Austria implemented in 2002 a new policy instrument: the "green electricity act" providing subsidies for electricity generated from renewable energy sources. Since then, according to changes in EU legislation (e.g. with the implementation of the RES Directive in 2009) the act was frequently amended. The support schemes as well as target-settings for electricity generation from various types of renewable energy sources have been modified on and off.

Hydropower, as a form of power generation with almost zero greenhouse gas emissions, originally fell into the scope of the act's application only if the plants maximum capacity has been below/at exactly 10 MW (small-sized hydropower plants). Since the amendment of the green electricity in 2006, besides small-sized hydropower plants, also mid-sized hydropower plants (maximum capacity between 10 and 20 MW) are eligible.

Support schemes for hydropower plants included feed-in tariffs (2002 until 2008, from 2012 up to now) and investment subsidies (from 2009 up to now). Currently, operators of small hydropower plants with a maximum capacity of up to 2 MW are able to choose between a feed-in tariff and an investment incentive. For operators of small- and mid-sized hydropower plants with a maximum capacity higher than 2 MW only an investment incentive is granted. The amount of the particular subsidy type is thereby varying with the hydropower plants size (maximum capacity).

Along with the on-going overall target to increase small- and mid-sized hydropower generation, within the timeframe 2002 to date, various specific hydro expansion targets have been set. Based on the national implementation of the 2009 RES Directive and the corresponding national RES target (to reach a share of renewable energies in gross final energy consumption of 34% in 2020), this is resulting in the current expansion targets for hydropower generation: An increase of overall hydropower generation based on the 2010 expansion level, of about 700 MW (3,500 GWh) until 2015, of about 1,000 MW (4,000 GWh) until 2020. Small- and mid-sized hydropower generation is thereby intended to cover the half of the expansion target (see green electricity act: BGBl. I Nr. 75/2011).

2.2.2 Directly affected stakeholder groups by (key) policy instruments

Policy Instrument 1: National water act and corresponding specifications

The republic Austria or rather national ***public administration/ specific governmental authorities*** is/are directly addressed by the WFD/national water act to perform measures and activities necessary for the target achievement. Thus the public administration/ specific governmental authorities is/are responsible for implementing the WFDs/ national water act's requirements and objectives in practice. Regarding small- and mid-sized hydropower plants the act implements command and control measures and grants or refuses authorizations to ensure the plants coherence with the WFD/national water acts environmental objectives and requirements. This affects both, newly planned projects and already existing plants.

Policy Instrument 2: Green electricity act

The green electricity act is granting investments subsidies or feed-ins for power generation plants based on renewable energy sources thus directly affecting (future) ***actors producing electricity*** (operating company/ operating individuals), by directly increasing its motivation to invest in small- and mid-sized hydropower plants.

However, although the motivation to invest of actors producing electricity is directly increased by the policy instrument itself, the achievement/compliance of the policy instruments related renewable expansion targets (including small- and mid-sized hydropower expansion targets) are the responsibility of the ***public administration/ specific governmental authorities*** of the republic Austria. Thus the public administration/ specific governmental authorities is/are responsible for the implementation of a subsidy system (subsidy volume, definition of eligible RES technologies including criteria specification, etc.) that is sufficient for the required target achievement.

Policy Instruments analysed on a more aggregate level: nature conservation act, law for the electricity market, environmental support act – "water ecology"

The nature conservation act and the law for the electricity market (also the national water act and corresponding specifications) as command and control instruments are directly addressing only to the ***public administration/ specific governmental authorities*** of the republic Austria, which is/are responsible for the practical implementation (e.g. granting or refusing authorizations, taking measures, etc.) of policy instruments to ensure the particular target achievement.

The environmental support act – "water ecology" which provides subsidies for measures to improve the ecological (hydromporphological) status of already existing hydropower plants and affected water bodies, has alike the green electricity act to be implemented by the ***public administration/ specific governmental authorities,*** however by granting subsidies it affects also directly ***actors producing electricity*** by directly increasing its interest to invest in revitalisation measures.

An overview of all directly affected stakeholder groups and specific policy instruments forming the environmental policy framework related to small- and mid-sized hydropower decision-makings in Styria/Austria that address them is given in the table below:

Table 2: *Overview of directly affected stakeholders regarding the environmental policy framework related to small and mid-sized hydropower decision-making in Styria/Austria*

Directly affected stakeholder	Policy instruments related to small- and mid-sized hydropower decision makings				
	Key policy instruments		Policy instruments analysed on a more aggregate level		
	P1 National water act and spec.	**P2** Green electricity act	**P4** Environmental support act – "water ecology"	**P5** Nature conservation act	**P3** Law for the electricity market
Public administration/ specific governmental authorities					
Actors producing electricity					

3. Effectiveness and efficiency of policy instruments

The following analysis assesses the effectiveness and efficiency of selected environmental policy instruments related to small- and mid-sized hydropower decision-makings. Therefore, specific policy targets of selected PIs are only considered in case of influencing small- and mid- sized hydropower decision-makings, other objectives pursued by the selected policy instruments are not taken into account.

3.1 Effectiveness

National water act and corresponding specifications (in combination with the environmental support act – "water ecology" and the nature conservation act)

Hydropower plants in general, had and have to comply with requirements set by the national water act. Hence, ever since the implementation of the WFD, hydropower plants also have to comply with thereby newly implemented environmental objectives. Therefore newly planned hydropower projects need to ensure prevention of further deterioration by complying with stricter environmental specifications and various old plants need to be restored (reconstruction commitments within a given timeline to restore ecological damages of hydropower plants no longer in line with environmental objectives of the WFD) to be able to improve the status/ to achieve a good status/potential of all water bodies until the deadline of the first period of the river basin management plan: 2015.

However, the definition of the general objectives under the WFD includes a number of possible exemptions (equally implemented in the national water act). Such exemptions allow:

- the extension of the deadline of the first river basin management plan up to 2027 at the latest (article 4(4) WFD) thus influencing water status improvement targets,
- the achievement of less stringent objectives (article 4(5) WFD),
- temporary deterioration in the status of water bodies (article 4(6) WFD) and
- the failure of the commitment to prevent further deterioration for new modifications and new sustainable human development activities (article 4(7) WFD), which especially is possibly relevant for the authorization of new hydropower plants.

As a consequence, exemptions foreseen in the WFD are related to hydropower decision-makings affecting both, the authorization of newly planned (small- and mid-sized) hydropower plants and necessary modification to existing plants.

In addition, in line with the WFD, exemptions are only possible under different certain conditions listed in article 4(4) – 4(7) WFD (2000/60/EC), thus specifying a varying individual list of required conditions for each of the possible exemption cases listed above (deadline extension, achievement of less stringent objectives, temporary deterioration and the failure of the commitment to prevent further deterioration).

Such conditions include e.g.:

- lack of technical feasibility
- disproportional high costs
- natural conditions not allowing timely improvement
- lacking of significantly better environmental options not entailing disproportional costs
- new sustainable human development activities
- impact mitigation
- the reasons for modifications are of overriding public interest and/or the benefits to the environment and to society of the WFD objectives are outweighed by the benefits of the new modification or alterations to human health, to the maintenance of human safety or to sustainable development,
- etc.

Although exemptions of the environmental objectives under the WFD/the national water act are legally allowed, depending on its degree of frequency as well as on its specific enforcement, they may become crucial for the nationals water act's effectiveness regarding (small- and mid-sized) hydropower generation by becoming e.g. the rule in practice. This makes them a main indicator for the national water acts effectiveness analysis related to hydropower permissions.

Thus, the analysis of the effectiveness of the national water act and corresponding specifications is based on the current target achievement level regarding ecological water status improvement as well as on the current compliance level of new approved hydropower plants regarding the commitment to prevent further deterioration, in which for both (the number of) taken exemptions has always been considered.

Additionally, in identifying the national water act's effectiveness regarding (small- and mid-sized) hydropower decision-makings, the current compliance level of the two overall targets of the WFD/national water act which are affected by (small- and mid-sized) hydropower generation – 1) good status achievement and 2) prevention of further deterioration of all water bodies – are considered separately:

<u>Achievement of a good ecological status/potential of surface water (reconstruction of old plants)</u>

Since the current cycle of the river basin management plan runs until 2015 and it is also possible to shift the target achievements to 2021 or rather 2027, the current effectiveness of the national water act (in the context of achieving a good ecological status/potential of water bodies), can just roughly be estimated. A first official detailed evaluation of the implementation of the WFD in Austrian legislation is planned to be accomplished not until 2015 (Personal Communication, 2012_b). Thus the assessment of the corresponding effectiveness is more based on on-going trends and implementation activities than on quantitative data and information.

However, what has according to stakeholders become apparent over a few years of the surveyed timeframe is that no Member State (including Austria) will be able to achieve the targets given by the WFD (good status/potential for a significant percentage of water bodies) until the end of 2015. Many Member States have therefore already shifted their target achievements to 2021 or 2027 (see country-specific assessments for EU Member States following the 3rd Commission report to the European Parliament and the Council on the implementation of the Water Framework Directive – River Basin Management Plans COM(2012)670[4]).

Also Austria decided to shift the target achievement for a significant proportion of water bodies to the last five years possible (2021-2027), thus based on a lack of technical feasibility, natural conditions not allowing timely improvement and disproportional high costs. The reason therefore is a long list of problems in the context of water bodies (from the ecological point of view: 2/3 of Austrian water bodies need to be improved), where the number of actions needed is very high. Until 2015 only 2% of the Austrian water bodies will be improved (however there is a prioritisation for 2015 starting with the largest water bodies in the country, which are highly affected by migration barriers due to impoundments and water abstraction relating hydropower generation and where in succession the most expensive investments are needed), following by 7% until 2021 and by 57% in the last five years possible (2021-2027) (Personal communication, 2012_b) (Umweltdachverband, 2010) (Kampa et al., 2011).

Although it is legitimate to expand the deadline of achieving a good status/potential of all water bodies to 2027, the shifting of a high share of activities to the last five years possible (over 50% in Austria as mentioned above) can be regarded as a target achievement delay. In addition it is also not guaranteed that it will be possible to solve all planned issues within the last five years, bringing high uncertainties on the target achievement agenda. Thus, the national water act (with regard to (small- and mid-sized) hydropower decisions) in the context of achieving a good status/potential of water bodies can be estimated as currently rather ineffective. Anyhow there is still the possibility that at the end of 2027 a good overall status/potential will be achieved, which is however not believed by public opinion consistently stated in various types of media.

In addition, to date also there was an insufficient demand for subsidies provided for measures which improve the ecological (hydromporphological) status of already existing hydropower plants and affected water bodies (subsidies provided by the environmental support act – “water ecology”) (Personal communication, 2012_b). Thus, although this subsidy system has been foreseen to support the national water act in enabling an early achievement of a good status/potential of water bodies, it currently also hasn’t brought forth a more efficient target achievement of the national water act regarding water status improvement.

Prevention of deterioration (approval of new small- and mid-sized hydropower plants)

Also, when it comes to the target - prevention of deterioration - in the context of (small- and mid-sized) hydropower decision-makings, the national water act and corresponding

[4] 3rd WFD implementation report and corresponding documents available under: http://ec.europa.eu/environment/water/water-framework/implrep2007/index_en.htm, retrieved March 24, 2014

specifications are not as effective as desired. While the water act allows exemptions regarding hydropower permissions for plants resulting in the failure of the commitment to prevent further deterioration in line with the WFD (national water act §104a - implementing and adopting the wording of article 4(7)/WFD[5]), already a significant number of exemptions in Austria have been applied, thus reasoning with the sustainable development of hydropower generation. The exact number of such exemptions can be found in the following section. For comparison in a European common implementation strategy workshop on water management, water framework directive & hydropower in 2011, only seven other Member States have been identified to actually having applied exemption procedures regarding article 4(7)WFD in regard to hydropower-decisions (Kampa et al., 2011).

In Austria however, e.g. a study of the Austrian environmental NGO "Ökobüro" (Wachter, 2012) states that in Styria all big hydropower plants currently planned to be or already located at the river Mur will need/have needed an exemption according to §104a of the national water act (within a short timeframe, four §104a procedures have been adopted: HP Gössendorf/Kalsdorf, HP Gratkorn, HP Graz Puntigam, HP St. Micheal). In addition, as reported by Wachter (2012), out of 67 currently planned hydropower projects in Austria, 23 projects (=34.33%) are foreseen to be only accepted if §104a will be applied, thus possibly allowing less stringent objectives in the near future.

In more detail, according to the Austrian minister for agriculture, forestry, environment and water management in office at the end of 2013 (Berlakovich, 2013), **since 2005 to date, 9 exemption procedures** according to §104a have been accomplished and concluded with an approval in Austria (however, some of them are still under appeal procedure; accurate data for the province of Carinthia are missing). Five exemption procedures have been taken place in Styria (one in 2007, two in 2008, two in 2012), one in Tyrol (2010) and three in Salzburg (2005, 2012, 2013), whereas five of the total quantity are related to the river Mur (one in Salzburg, four in Styria) (Berlakovich, 2013).

Based on these data the effectiveness of the national water act regarding the commitment to prevent further deterioration can also be described as rather ineffective. Exemptions can be assumed as becoming the rule in Austria especially in the case study area Styria based on

[5] **Article 4.7, WFD (2000/60/EC):**

Member States will not be in breach of this Directive when failure to prevent deterioration from high status to good status of a body of surface water is the result of new sustainable human development activities and all the following conditions are met:

"(a) all practicable steps are taken to mitigate the adverse impact on the status of the body of water;

(b) the reasons for those modifications or alterations are specifically set out and explained in the river basin management plan required under Article 13 and the objectives are reviewed every six years;

(c) the reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives set out in paragraph 1 are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development, and

(d) the beneficial objectives served by those modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option."

the numbers shown above. This is also already a cause of concern for the European Commission which states in its country specific assessment related to the 3rd WFD implementation report that Austria needs to take in future all necessary actions, thus to decrease the number of exemptions in the next cycles of the river basin management plan (European Commission, 2012).

In addition, when it comes to one of the required circumstances which have to be fulfilled in order to approve exemption procedures regarding article 4(7)WFD – *the overriding public interest of the planned (small- and mid-sized) hydropower project compared to the benefits to the environment and to society of the objective to prevent further deterioration, which in turn are also outweighed by the benefits of the planned hydropower project to human health, to the maintenance of human safety or to sustainable development* – in many cases the (small- and mid-sized) hydropower plants contribution to the achievement of the RES target is highlighted. However according to Kampa et al. (2011) generating renewable energy should not automatically be an overriding public interest. Rather when it comes to the weighing of interests the decision is to be based on the principle: the higher the ecological value of a water stretch the higher the energy output hast to be.

This however is not always observable in practice, as e.g. the caste study example "Kraftwerk Schwarze Sulm" shows:

> The case study example "Kraftwerk Schwarze Sulm" (for further information on this specific plant see appendix 1) was approved according to an exemption procedure under §104 national water act/ article 4(7)WFD. In its official approval it was stated that in its case the benefits to the environment and to society of the WFD objectives are outweighed by the benefits of the project to human health, to the maintenance of human safety or to sustainable development. More simple: in its case it was stated that the public interest in energy generation from renewable energy sources exceeds the public interest in nature conservation. However, in this specific case, already the European Commission disagreed, accusing Austria of an improper implementation ("bad application case") of the WFD regarding to article 4(7)/WFD, by stating the generation of renewable energy as overriding public interest despite of the plants low energy output (European Commission, 2013).

Independently of granted exemptions, also current data and statements regarding planned hydropower projects show that Austria has generally a high tendency to expand hydropower generation and in succession to possibly putting nature conservation targets into an underpart. E.g. Austria is not explicitly considering that new hydropower plants will lead to deterioration if applied in water bodies currently showing a good status, whereas other Member States do. Therefore Austria does not necessarily need the application of an exemption procedure (Kampa et al., 2011). This is assumed to make it possibly easier for (small- and mid-sized) hydropower plants to get permission despite of negative environmental impacts. In addition, Austria has also been identified in the European common implementation strategy workshop on water management, water framework directive & hydropower in 2011 for seeking to achieve the WFDs environmental targets with a minimum impact on renewable electricity generation and in addition to plan also a further expansion of hydropower plants in future, thus in order to achieve its national RES target (Kampa et al., 2011).

In more quantitative terms, since 2005, 430 hydropower plants have been approved in Austria; only 36 planned projects got refused (Berlakovich, 2013). Since March 31, 2013 further 244 hydropower plants were planned to be realized in future (thereof 205 hydropower plants with a maximum capacity ≤ 15MW) (Umweltdachverband, 2013).

Also on the nature protection side (including the nature conservation act) a high tendency of Austria to expand hydropower generation is noticeable. According to the Austrian NGO "Umweltdachverband" (Umweltdachverband, 2013) out of the above mentioned 244 planned hydropower projects, 32 (13%) are foreseen to be located within Natura 2000 or other environmental protected areas and 100 (41%) are foreseen to be located within water bodies, currently showing a high or good ecological status. 16% of overall planned hydropower projects are even foreseen to be located within both, environmental protected areas and water bodies showing a high or good ecological status. As a consequence, **if realized, 55% of all planned projects will be located in environmental sensitive areas.** This leads to the identification of possible inefficiencies of policy instruments not only in the context of water protection, but also of nature conservation.

To sum up: Based on the facts discussed above, the national water act in Austria can be currently identified as quite ineffective regarding (small- and mid-sized) hydropower decisions, for both, the water status improvement target and the commitment to prevent further deterioration.

However, although the implementation of the WFD in Austria regarding (small- and mid-sized) hydropower decision-makings was so far not able to comply with all environmental objectives given by the WFD, it should also not be forgotten that none the less it possibly was able to slow down water deterioration in general and thus in this respect it was an improvement compared to the national legislation in effect before Austria's EU entry. Without stricter environmental requirements, Austria would have likely continued to constantly expand its hydro potential (Personal Communication, 2012_a).

Green electricity act (analysed in combination with the law for the electricity market)

In order to achieve its 2020 target set by the RES Directive (for Austria: an increase in the share of RES in final energy consumption from 24.4% in 2005 up to 34% in 2020) Austria defined specific expansion targets for different RES technologies including (small- and mid-sized) hydropower generation. According to the green electricity act, until 2020, hydropower generation is intended to increase about 1,000 MW (corresponding to 4,000 GWh) from 2010, with the sub-ordinate target of an increase about 700 MW (corresponding to 3,500 GWh) until 2015. Small- and mid-sized hydropower plants should account for the half of the particular target. An overview of hydropower target settings is given in the table below:

Table 3: *Hydropower expansion targets stated in the green electricity act 2012 (required additional capacity/ generated electricity)*

	2015		2020	
	MW	**GWh**	**MW**	**GWh**
Hydropower generation (size-independent)	700	3,500	1,000	4,000
Small- and mid-sized hydropower generation	350	1,750	500	2,000

The current effectiveness of the green electricity act regarding small- and mid-sized hydropower decisions in Austria is then assessed based on the identification of the actual expansion of small- and mid-sized hydropower capacity by focusing on the timeframe from 2010 (base year of target settings) and the calculation of the corresponding annual rate of change, thus by considering the last recent years. In assuming the identified rate of change as being consistent also in the following years, a calculation of the possibility to reach the given expansion targets for 2015 and 2020 set in the green electricity act is carried out. Thereby not only a consistent rate of change but also consistent frame conditions (e.g. electricity market price, amount of sponsorship, etc.), which affects the former, are implied.

The data used for calculating the possibility to achieve the desired expansion level of small- and mid-sized hydropower capacity until 2015 or rather 2020 has been taken from the Austrian annual released report of the green electricity act in 2013 (native name: "Ökostrombericht 2013)[6]. This report includes also an own chapter covering target achievement estimation.

Provided data for target achievement estimation include small- and mid-sized hydropower capacity (MW) additionally contracted by the OeMAG (Austrians settlement centre regarding green electricity) between 2010 and 2013 (DATA SET 1). This data set is not only considering small- and mid-sized hydropower capacity supported via feed-in tariffs but also small- and mid-sized hydropower capacity supported via investment incentives, which are however usually not under ongoing long-term contractual relationship with the OeMAG.

In addition to DATA SET 1, within the annual report on the green electricity act 2013, also data regarding annual amounts of electricity generated (GWh) from small- and mid-sized hydropower plants and contracted to the OeMAG via the feed-in are provided (DATA SET 2). However this approach is generally excluding electricity generated by small- and mid-sized hydropower plants supported by investment incentives, as well as electricity generated by small- and mid-sized hydropower plants which have been already dropped out of the feed-in contract with the OeMAG, thus either voluntarily or due to the phasing out of the contractually agreed support period. Using this data set, electricity generated from such excluded plants does not count for the target achievement calculation although generating plants may be/ have been supported by the green electricity act and in succession contribute to the overall electricity generation from small- and mid-sized hydropower plants. Especially, the possible phasing out of the support period which will happen for the next time around 2015/2016 will be crucial also in future, thus for the achievement of the 2020 target, because by using DATA

[6] Available from: http://www.e-control.at/de/publikationen/oeko-energie-und-energie-effizienz/berichte/oekostrombericht

SET 2, electricity generated from such plants would be needed to drop out of the target achievement calculation. As a result using DATA SET 2, which is providing GWh, does not lead to an overall picture of the possibility to reach the small- and mid-sized hydropower expansion targets.

Anyhow DATA SET 1 which provides small- and mid-sized hydropower plants installed MW, has been identified to provide more reliable data, thus since including all small- and mid-sized hydropower capacity between 2010 and 2013 supported via the green electricity act, independent from its current contractual relationship to the OeMAG.

However, although the data sets have been identified to be entirely different and only one being quite reliable, the target achievement calculation has been carried out for both, thus resulting in two different outcomes, whereas each is clearly depending on the use of the particular data set:

- *DATA SET 1:* If in addition to small- and mid-sized hydropower plants supported via feed-in tariffs and therefore being currently under contractual relationship with OeMAG, also small- and mid-sized hydropower plants supported by investment incentives are considered, **the 2020 expansion target will likely be met, although the 2015 target will slightly be missed.** This is, as stated in the 2013 annual report of the green electricity act, explained due to the imbalance in the required expansion level, requiring a 70% installation of the total power capacity desired and 87.5% of the total desired electricity generated already until 2015.

- *DATA SET 2:* If considering annual generated electricity (GWh) of small- and mid-sized hydropower plants contracted to the OeMAG only, the target achievement will be **clearly failed for both, 2015 and 2020**.

An overview of both data sets, corresponding calculated annual rate of change which has been used for adjusting the growth in the following years, and the thereby gained discrepancy of desired expansion targets which has led to the particular outcome above are summarized in the table below:

Table 4: *Overview of data sets used for target achievement estimation regarding small- and mid-sized hydropower generation (based on E-Control, 2013: "Ökostrombericht 2013")*

DATA SET 1: Small- and mid-sized hydropower capacity (MW) additionally contracted by the OeMAG 2010 - 2013 (incl. plants supported by investment incentives)						
Directly supported capacity [MW]	Investment incentives [MW]	SUM [MW]	Full load hour	GWh	Calculated average annual change rate (*) [MW]	Calculated average annual change rate (*) [GWh]
14.388	158.724	173.112	4,000	692	57.704	230.67
Target achievement calculation						
2015 Target [MW / GWh]	2015 Calculated expansion level based on average annual change rate [MW / GWh]	**2015 target achievement level [MW / GWh]**	2020 Target [MW / GWh]	2020 Calculated expansion level based on average annual change rate [MW / GWh]	**2020 target achievement level [MW / GWh]**	
350/ 1,750	288.52/ 1,153.35	**- 61.48/ - 596.65**	500/ 2,000	577.04/ 2,306.7	**+ 77.04/ + 306.07**	
DATA SET 2: Annual generated electricity (GWh) of small- and mid-sized hydropower plants contracted to the OeMAG						
Base years 2010 [GWh]	2011[Gwh]	2012 [GWh]	Calculated average annual change rate (*) [GWh]			
1,258	988	1,095	107			
Target achievement calculation						
2015 Target based on 2010 value [GWh]	2015 Calculated expansion level based on average annual change rate adjusted from 2012 [GWh]	**2015 target achievement level [GWh]**	2020 Target based on 2010 value [GWh]	2020 Calculated expansion level based on average annual change rate adjusted from 2012 [GWh]	**2020 target achievement level [GWh]**	
3,008	1,416	**- 1,592**	3,258	1,951	**- 1,307**	

(*): The calculated average change rate for DATA SET 1 is based on dividing MW/ GWh additionally contracted within in the timeframe 2010-2013 per 3, thus resulting in the average annual growth in additional contracted MW/ GWh from 2010. The calculated average change rate for DATA SET 2 is based on the relation between GWh contracted to the OeMAG in 2011 and GWh contracted to the OeMAG in 2012.

As a result the effectiveness of the green electricity is currently identified as being rather ineffective, thus for sure regarding the 2015 target which will possibly be failed but not really for the 2020 target which will possibly be achieved. However by considering both targets as entity the possible effectiveness of one part does not cure the failure of the other. In addition, it is not guaranteed that frame conditions are consistent over time, which is however implied within this effectiveness assessment. Especially changes in market price for electricity, in the

amount of possible sponsorship, etc. may have an enormous influence on the possibility to achieve the required targets in 2015 but also 2020 and in succession on the identification of the green electricity act as being effective or rather ineffective regarding small- and mid-sized hydropower decision makings in Styria/Austria. This in succession leads to a high uncertainty in the truly outcome of the effectiveness of the green electricity act, however currently the expansion of small- and mid-sized hydropower plants is identified as not being fully on track.

3.2 Efficiency

3.2.1 Cost-effectiveness assessment

National water act and corresponding specifications (in combination with the environmental support act – water ecology)

The cost benefit assessment regarding the national water act and corresponding specifications refers to the question whether the planned budget (including the planned amount of subsidies provided under the environmental support act – "water ecology") will be generally sufficient to finance all needs to achieve a good ecological/chemical status of all water bodies and to prevent further deterioration until 2015.

According to the Austrian federal ministry of agriculture, forestry, environment and water management, the costs for all measures which need to be taken to ensure the target achievement of the WFD/national water act amount about 3 billion EUR. However, in February 2012, not more than 23.28 million EUR have been spent for measures (Rechnungshof, 2012). This possibly is because Austria has shifted its target achievement from 2015 to the last five years possible (2021-2027). As a consequence, till now, not many measures in accordance to the targets of the WFD/national water act have been implemented.

The main issue which occurs regarding such target shifting's in the context of efficiency is that how much longer the target achievement is delayed, the more difficult it will be to achieve the desired outcome. This means, since most measures are planned to be taken in the last five years possible there is no guarantee that the planned budget will be sufficient (e.g. as a result of unexpected events, as a result of changes of contextual factors, etc.).

In summary, although efficiency cannot be entirely assessed until the end of 2027, which is currently the latest deadline possible to achieve a good ecological/chemical status/potential for all water bodies, and it is therefore not yet possible to assess if the planned budget has been rightfully calculated, it can be assumed, based on the passage above, that it may not be possible to achieve the desired efficiency (financing all needs to achieve the target settings based at the amount of the planned budget or at lower costs) of the national water act until 2027. The main hindrance factor is the target shifting, including a lot of uncertainties about what may happen (unexpected events, changes in contextual factors, etc.) until measures are implemented.

Green electricity act

For the cost-effectiveness assessment in the context of the green electricity act two approaches can be distinguished:

- *Approach 1:* Efficiency considers the comparison of direct public expenses for small- and mid-sized hydropower projects and matches them with direct public expenses for other forms of renewable energies supported by the government
- *Approach 2:* Efficiency is analysed in combination with arising transaction costs by putting it into relation with the resulting outcome

Ad Approach 1:

Regarding funding provided by the government in 2011, small- and mid-sized hydropower generation has been identified in Austria as the cheapest RES technology to be supported. For comparison, an overview of weighted average support levels (on electricity supported) for different RES technologies in Austria based on Council of European Energy Regulators (2013), is given in the table below. The calculated value is thereby depending on the particular support scheme (feed-in tariff, investment incentive). For feed-in tariffs the weighted average support level has been calculated by balancing the average wholesale electricity price with the particular feed-in tariff, for investment incentives the weighted average support level was estimated by considering the operational lifetime of a plant or the payment period of a comparable feed-in tariff. In the case of both support schemes being effective for the same RES technology, an average value was calculated by using the energy supported for each instrument (Council of European Energy Regulators, 2013).

Table 5: *Weighted average support levels for different RES technologies eligible under the green electricity act (base year: 2011, source Council of European Energy Regulators, 2013)*

RES technology	Weighted average support level (€/MWh)
Small- and mid-sized hydropower	1.13
Wind	21.55
Biomass	81.15
Biogas and waste	98.20
Photovoltaic	263.64
Geothermal	-
TOTAL	***46.49***

In addition to the low value of the weighted average support level for small- and mid-sized hydropower generation the efficiency of the green electricity act concerning small- and mid-sized hydropower decisions was in the past also positively supported by a frequent dropping out of the feed-in contract of small- and mid-sized hydropower operators. Thus based on the from 2002-2008 highly increasing market price for electricity (the market price was exceeding the guaranteed feed-in tariffs), which made it within this period very attractive for operators to drop out of the contract and sell electricity at market prices (E-Control, 2013). As a

consequence the government was released from its duty to support small- and mid-sized hydropower operators, which positively influenced the efficiency of the green electricity act.

However after 2008, the electricity market price constantly decreased (E-Control, 2013), thus reducing the attractiveness of selling the electricity on market prices for small- and mid-sized hydropower operators and therefore balancing the positive influence of dropping out of the contract on the green electricity acts efficiency.

In addition such conclusions are however also just partially significant. For being able to receive an entire picture about the efficiency of the green electricity act also the timespan of the subsidy as well as the surrounding conditions (e.g. weather conditions influencing the flow conditions of rivers) are needed to be included. However due to different support schemes (investment incentives, feed-in tariffs) as well due to the complexity of various surrounding conditions (e.g. weather conditions), in this report these factors are neglected.

Nevertheless the efficiency assessment based on weighted average support levels for different renewable energy sources allows the first conclusion that the support of small- and mid-sized hydropower generation is more efficient than the support of most other renewable energy sources.

Ad Approach 2:

If transactions costs are included, the efficiency of the green electricity act may change. In some cases (e.g. in the case study example Kraftwerk Schwarze Sulm, where long legal proceedings have taken place until the hydropower plant got finally permitted (for more information see appendix 1)) the trade-off between climate protection and nature (water protection) leads to unexpected high additional costs (within the scope of 100,000s of Euros according to stakeholders). As a result the green electricity act and its intention to support the expansion of small hydropower plants become rather inefficient. However such high transaction costs are observed only in a few cases and are therefore not generalizable.

3.2.2 CO-Effects

Green electricity act

The primary effect of the green electricity act is the increase of the share of renewables with an increase of hydropower as part of this aim. The reduction of greenhouse gas emission is an important quantifiable environmental co-effect that is often an argument to further increase of hydropower in Austria. More renewables and less fossils in the fuel mix however also reduce air pollutants such NOx or fine particulates and it may increase energy security as electricity in Austria is also produced by gas-fired plants. The co-costs of hydropower expansion are often more difficult to quantify. They include for example fishery, biodiversity, or recreation. Getzner et al. (2011) suggest these benefits to amount to about 93 to 132 Mio. EUR per year for the Austrian river Mur.

4. Expected and observed system context

4.1 Defining the system context

Certain contextual factors related to small- and mid-sized hydropower decision makings in Styria/Austria have influenced the performance (effectiveness/efficiency) of the two selected key policy instruments both, in the past and now. An overview of these system context factors is given in the table below. System context factors are classified according to their main area of influence and specific system factors are explained in detail were needed:

Table 6: *System context related to small- and mid-sized hydropower decision making in Styria/Austria*

Type of factor	Main categories	Sub-factors	Description/measurable markers	Explanation
System Context factors	**Economic**	*Economic*	Economic development	-
		Energy	Price of electricity	-
			Gross final electricity consumption	-
			Importance of energy import independency	-
	Environ-mental	*Natural resources*	Theoretical hydropower potential	General possibility for hydropower generation regardless of any possible constraints (ecological, legal or various other social preconditions, etc.)
			Environmental (water) preconditions	Different EU Member States have different environmental (water) preconditions, meaning that while some Member States do still have to deal with chemical water quality problems or water availability, water quantity, other Member States don't.
	Socio-Political	*Political direction*	Political priority of case study topic (national level)	Different Member States have different political priorities. While in some countries hydropower expansion is highly on the agenda regarding the achievement of 2020 RES targets, some other countries are focusing on the expansion of other (non-hydro) renewable technologies, thus resulting in a possible de-escalation of the "hydropower conflict".

Type of factor	Main categories	Sub-factors	Description/measurable markers	Explanation
			Political program of provincial government	Independently of the political priority of case study topic on national level, ongoing political programs of provincial governments may have own, possibly different, priorities regarding hydro expansion, thus possibly resulting in an imbalance of the prioritisation of the case study topic inland.
			National legal preconditions	-
		Public/ governmental awareness	Awareness of climate change mitigation	-
			Awareness of biodiversity	-
		Regionalization	Decentralized, regional electricity supply	-
	Good Governance	*Monitoring*	Monitoring of national implementation of EU environmental legislation	-
			Enforcement of EU environmental legislation	When offenses of EU Member States have taken place, the reaction of the European Union may play an important role for the future behaviour of the same or other Member States. E.g. if the reaction of the EU turns out to be too modest, Members States may stop to make efforts.

4.2 Impact of context factors on effectiveness/efficiency of key policy instruments

In the following, previous listed system context factors, their development over time and corresponding influence on the effectiveness/efficiency of each of the selected key policy instruments are analysed and discussed. In this regard it is especially important that not all of the above listed system context factors impact both key policy instruments forming the policy framework related to small- and mid-sized hydropower decision-makings in Styria/Austria. Various specific system context factors may not be or are just slightly relevant in the context of one of the selected key policy instruments, but are very important in the context of the other. Therefore, the influence of specific system context factors on the performance of key policy instruments is discussed in terms of splitting the system context analysis into two parts, thereby considering and analysing the system context related to P1 (the national water act and corresponding specifications) first, and considering in consequence the system context related to P2 (the green electricity act).

P1: National water act and corresponding specifications

Economic

Economic development

Simultaneously with the national implementation of the WFD (required implementation into national law until the end of 2003, required establishment of a river basin management plan including planned measures to comply with environmental objectives of the WFD until the end of 2009) first signs of economic instability arose (fluctuating real GDP growth rates). This was already early in the WFD implementation process, confronting EU Member States, including Austria, with a high uncertainty in possible financing options for measures necessary regarding target achievements (especially regarding water quality improvement).

The appearance of the worldwide economic crisis in late 2008, the beginning of 2009, (almost simultaneously with the realising time of the national river basin management plans 2009), was resulting in economic instability much more intense than expected previously. GDP growth in various EU Member States, including Austria, decreased heavily. While in Austria from 2006 to 2007 the real GDP growth rate [percentage change on previous years] was about 3.7% it dropped to 1.4% in 2008 and further to -3.8% in 2009. (EUROSTAT, 2014)

As a consequence, based on the unexpected drop in economic development in Austria, investments regarding environmental target achievements of the WFD, thus likely also in the context of small- and mid-sized hydropower decision-makings (e.g. reconstruction of old (small- and mid-sized) hydropower plants in order to comply with newly implemented environmental objectives), have been assumed to be put on a quite higher risk as expected previously. Thus the WFDs/national water act's target achievement – water quality status improvement – is not guaranteed in time, which in succession may affect the national water acts effectiveness/efficiency negatively.

Gross final electricity consumption

Little fluctuation in gross final electricity consumption over the last year's in Austria resulted in little pressure of fast increase in electricity generation capacity. Thus a corresponding increasing public as well as governmental interest in (small- and mid-sized) hydropower generation, which may possibly endangering WFDs/national water acts target achievement – prevention of further deterioration, water quality status improvement – was not expected by stakeholders. To date, also no mentionable changes have been observable in gross final electricity consumption, resulting in any noteworthy influence on the national water acts effectiveness/efficiency.

However, based on the aimed 20% cut in Europe's annual primary energy consumption by 2020 (increase in energy efficiency), electricity based technologies may become highly important in future. Thus also gross final electricity consumption is assumed to possible increase in future, which in turn may possibly also increase the future public/governmental interest to invest in (small- and mid-sized) hydropower generation.

Importance of energy import independency

Based on the overall and ongoing increasing trend in prices for fossil fuel based energy (oil and coal prices) plus Europeans general dependence on energy imports (particularly of oil), over the last years importance of energy import independency experienced a high upward trend in the overall EU (EUROSTAT, 2013). Therefore also Austria is assumed to have expected an increase in the importance of energy import independency, thus generally favoring the expansion of domestic electricity generation capacity.

Since in Austria, in contrast to some other Member States, hydro potential is still on a relative high level (even it has highly decreased over years – intensive large hydropower expansion from 1960s to 1990s taking already a lot of the Austrian's originally existing potential) and in addition Austria looks back on a long "hydropower history" (see 1.1) and therefore showing a high level of acceptance for hydropower plants in Austrian's society in the past, an increase in the importance of energy import independency was expected to favor also the domestic expansion of hydroelectric installations. Thus it was expected by stakeholders that the effectiveness of the national water act in case of hydro power permissions may be influenced by the ongoing increasing importance of energy import independency quite negatively.

In practice, to achieve energy import independency was becoming even more important than expected (nuclear breakdown of Fukushima in 2011, appearance of the economic crisis around 2008, etc.), with the result that energy import independency currently influences the effectiveness of the national water act and corresponding specifications by increasing the public/governmental interest in (small- and mid-sized) hydropower generation quite more negatively than expected.

Table 7: *Economic context factors' impacts on effectiveness and efficiency of the national water act and corresponding specifications*

System context factor	Expected "impact"	Observed "impact"	Explanation of impact on effectiveness/ efficiency	Impact on effectiveness/ efficiency
Economic development	-1	-2	Unexpected sharp drop in economic development (economic crisis) has put required investments regarding the WFDs/national water acts target achievement, generally and therefore also regarding (small- and mid-sized) hydropower decisions, on risk	Highly negative
Gross final electricity consumption	0	0	To date ongoing little fluctuation in gross final energy consumption to not cause an increase in public/governmental interest in electricity generation capacity (incl. HPP) expansion	No impact

System context factor	Expected "impact"	Observed "impact"	Explanation of impact on effectiveness/ efficiency	Impact on effectiveness/ efficiency
Importance of energy import independency	-1	-2	Highly increasing public/governmental interest in domestic (small- and mid-sized) hydro expansion due to ongoing increase in importance of energy import independency	Highly negative

Environmental

Environmental (water) preconditions

In contrast to other EU Member States, Austria wasn't and sill isn't experiencing issues regarding water availability, water quantity or polluted (drinking) water. A focus on the improvement of the ecological water status required by the WFD/national water act was expected to be politically prioritised right from the beginning. This in turn was expected to result also in investments into measures necessary for improving ecological water conditions (e.g. the reconstruction of old hydropower plants, which are no longer consistent with newly implemented environmental objectives) and not only in measures to counteract water availability issues or polluted (drinking) water problems. No noteworthy influence of environmental (water) preconditions regarding (small- and mid-sized) hydropower decisions on the performance of the national water act regarding a good ecological status achievement of all water bodies was therefore expected, which also hasn't changed to date.

Table 8: *Environmental context factors' impacts on effectiveness and efficiency of the national water act and corresponding specifications*

System context factor	Expected "impact"	Observed "impact"	Explanation of impact on effectiveness/ efficiency	Impact on effectiveness/ efficiency
Environmental (water) preconditions	0	0	Austria wasn't and still isn't experiencing issues regarding water availability, water quantity or polluted (drinking) water, thus generally enabling a barrier-free implementation of measures to improve ecological water conditions, required by the WFD.	No impact

Socio Political/Technical

Political priority of (small- and mid-sized) hydropower generation (on national level)

Based on the European Union's target of 2008 to increase the share of renewable energies in gross final energy consumption about 20% until 2020 and corresponding mandatory individual targets set for Members States, Austria decided to focus for its target achievement inter alia also on (small- and mid-sized) hydropower expansion (Kampa et al., 2011). Therefore, in overall Austria currently (small- and mid-sized) hydropower expansion has

been/is often prioritized despite its negative environmental impacts. This in turn made/makes the political priority of (small- and mid-sized) hydropower expansion a possible driver for numerous approved (see 3.1) but also for future exemption procedures in Austria, which in succession affects the effectiveness/efficiency of the national water act rather negatively.

Based on a long "hydropower history" (see 1.1) and the corresponding high level of acceptance of and experience with hydropower in Austria's society in the past, as well as on the existence of a still quite high hydro potential (in comparison to other EU Member States, within Austria the potential has however decreased by and by (see: importance of energy supply security)), it was however already expected that hydropower expansion will be prioritized in future and in succession being used for contributing to the achievement of Austrians RES target until 2020.

Political program of provincial government

Political programs of governmental coalition (on national and federal state level) are generally assumed to influence the effectiveness/efficiency of the national water act either negatively or positively, by either prioritizing (small- and mid-sized) hydropower expansion adverse to its negative environmental impacts or vice-versa.

In the province Styria, where the case study example is located, during the last years already five exemption procedures regarding hydropower decisions have been taken place and closed with an approval of the particular hydropower plant (this is the highest number in province comparison, see chapter 3.1), thus resulting in the assumption that in Styria/Austria hydropower expansion is currently prioritized despite is adverse negative environmental impacts. As a consequence the effectiveness/efficiency of the national water act and corresponding specifications is currently influenced negatively by the political program of the Styrian provincial government.

Existing national property rights /National legal preconditions

To achieve a good ecological status of all water bodies as required from the WFD/national water act and corresponding specification, some old (small- and mid-sized) hydropower plants, which are no longer consistent with newly implemented environmental objectives, need to be reconstructed. However in Austria, duration of permits for (small- and mid-sized) hydropower plants are lasting over several decades (average 50 years), which makes it according to various stakeholders difficult for the government to schedule reconstruction plans. E.g. existing very old small hydropower plants: unlimited permission, however renewed permit in case of specific changes in water use, new large hydropower plants: 60-90 years maximum, new small hydropower plants: 30-40 years average (Kampa et al., 2011). As a consequence it is assumed that it was already expected in the early implementation process of the WFD that existing national property rights may become a problem in achieving corresponding environmental objectives. Hence possibly also the environmental support act – "water ecology", which provides subsidies for measures to improve the ecological (hydromporphological) status of already existing hydropower plants and affected water bodies was introduced, thus to stimulate the interest of operators to invest in the reconstruction of old hydropower projects and that the government in succession is not being forced to interfere in still existing property rights.

However, in practice, although such a subsidy system has been introduced it is still made too little use of this possibility (see chapter 3.1), thus existing property rights are still a big issue regarding the desired performance of the national water act and corresponding specifications.

Awareness of climate change mitigation

Climate change mitigation has constantly becoming a more and more important factor in current society. Therefore, since (small- and mid-sized) hydropower is a form of power generation which causes almost zero greenhouse gas emissions and thus contributing to climate change mitigation and simultaneously guaranteeing electricity supply, stakeholder expected a prioritization of (small- and mid-sized) hydropower expansion adverse to its negative environmental impacts already quite early in the implementation process of the WFD. This made/makes awareness of climate change mitigation another possible driver for numerous already approved (see 3.1) but also for possibly future exemption procedures in hydropower decisions, which in succession affects the effectiveness/efficiency of the national water act rather negatively. This in practice, also turned out as expected.

Awareness of biodiversity

Awareness of biodiversity was already expected by stakeholders to be a system context factor which generally supports the implementation of the Water Framework Directive and in succession the national water act and corresponding specifications in achieving its targets. Over the years it increased even more than expected, benefiting the achievement of the desired effectiveness of the national water act and corresponding specifications much higher than expected.

Table 9: *Socio-Political/Technical context factors' impacts on effectiveness and efficiency of the national water act and corresponding specifications*

System context factor	Expected "impact"	Observed "impact"	Explanation of impact on effectiveness/ efficiency	Impact on effectiveness/ efficiency
Political priority of (small- and mid-sized) hydropower generation (on national level)	-1	-1	To achieve its 2020 target Austria has planned to expand besides other renewable electricity generation capacity also hydropower capacity. Therefore hydropower expansion is assumed to be currently also politically prioritized adverse to its negative environmental impacts (assumption based on numerous approved exemption procedures).	Slightly negative

System context factor	Expected "impact"	Observed "impact"	Explanation of impact on effectiveness/ efficiency	Impact on effectiveness/ efficiency
Political program of provincial government	-2 or +2	-2	Current political program of government coalition in Styria/Austria prioritizes hydropower expansion adverse to its negative environmental impacts (assumption based on numerous approved exemption procedures) .	Highly negative
Existing national property rights/ national legal preconditions	-2	-2	The long duration of permits for (small- and mid-sized) hydropower plants (average 50 years) is a big issue regarding the necessary reconstruction of several old plants which are no longer consistent with newly implemented environmental objectives of the WFD.	Highly negative
Awareness of climate change mitigation	-1	-1	Climate change mitigation has constantly becoming a more and more important factor in current society thus leading to a general interest in RES expansion. This in turn is leading to a prioritization of hydropower expansion adverse to its negative environmental impacts (assumption based on numerous approved exemption procedures).	Slightly negative
Public awareness of biodiversity	+1	+2	Increase of public awareness of biodiversity benefits a barrier-less national implementation of the WFD	Highly positive

Good Governance

Monitoring of national implementation of EU environmental legislation

Due to generally limited staff means of the European Commission, stakeholders expected already early in the implementation procedure of the WFD, that it will not be possible for the EC to supervise and survey the implementation of EU water legislation everywhere properly and that the monitoring of the national implementation of the WFD is more object of complaints received by the Commission. Thus, offenses of Member States of the WFD are assumed to be taken more careless and in succession corresponding false steps are expected to not always be detected. As a result, a negative influence of weak monitoring of implementation of EU environmental water legislation on effectiveness/efficiency of the national water act and corresponding specifications was expected already early at the WFDs implementation procedure.

In practice, various stakeholders stated that Member States including Austria are even more often committing offenses of WFD/national water act targets than it has been expected

previously. Hence monitoring of the implementation of EU environmental water legislation is even weaker and in succession has a quite higher negative influence on the effectiveness of the national water act and corresponding specifications than expected.

***Infringement procedures against Austria in the case of the* planned hydro power plant "Kraftwerk Schwarze Sulm"**

When in 2007 the plant received its official federal permission by the regional government according to the water act the European Commission started an infringement procedure. The European Comission didn't agree with the Austrian region government's opinion that that hydro power is in higher public interest as it contribute to Austria climate targets justifying an exemption according to article 4.7 WFD. After the permission was rejected in 2009 the European Comission in consequence closed the infringement procedure.

The regional government gave the permission in 2013 again after degrading the status of the river from very high to good, and thus didn't see the need any more to make an exemption according to 4.7 WFD

The EU Commission sent a reasoned opinion to the Austrian government in November 2013 (EC(2013) 7853 final) stating that it doesn't accept the retroactive degradation of the status of the river from very high to good. Therefore an exemption to 4.7 WFD would be needed. The EU Commission repeated its view that it is not convince on the higher public interest of the plant compared to the goals of the WFD. Public interest would have to be argued in a very detailed level weighing the produced electricity against the targets of the WFD. Arguing with the general need to meet Austria's climate targets is insufficient to grant an exemption according to 4.7 WFD (European Commission, 2013).

Enforcement of EU environmental legislation

Handling of offenses by the EU is expected to influence the effectiveness of the national water act and corresponding specifications either positive or negative, depending on its sternness and authority. Since the first cycle of the river basin management has not ended yet, the actual influence of handling of offenses by EU on the effectiveness of the national water act and corresponding specifications can't yet be defined.

Table 10: *Good Governance context factors' impacts on effectiveness and efficiency of the national water act and corresponding specifications*

System context factor	Expected "impact"	Observed "impact"	Explanation of impact on effectiveness/ efficiency	Impact on effectiveness/ efficiency
Monitoring of national implementation of EU environmental water legislation	-1	-2	Weak monitoring of national implementation of EU environmental water legislation results in offenses of WFD/national water act targets	Highly negative

System context factor	Expected "impact"	Observed "impact"	Explanation of impact on effectiveness/ efficiency	Impact on effectiveness/ efficiency
Enforcement of EU environmental legislation	-1 or +1	-	Deadline for the first period of the river basin management plan: 2015	Not yet observable

P2: Green electricity act

Economic

Economic development

Ever since the implementation of the subsidy system to support the expansion of electricity generated from renewable sources in 2002 it becomes more and more apparent that an economic recession will be unavoidable. Therefore a decline in investment in (small- and mid-sized) hydropower plants was expected by stakeholders already in the past.

In practice, economic development dropped much more than expected. GDP growth in Austria depleted heavily. While in 2007 the real GDP growth rate [percentage change on previous year] was about 3.7% it dropped to 1.4% in 2008 and further to -3.8% in 2009. (EUROSTAT, 2014) This was resulting in a quite higher decrease in (small- and mid-sized) hydropower investments than expected based also on a corresponding cut of subsidies, provided by the government to support the expansion of electricity generated from renewable sources (including small- and mid-sized hydropower generation). This in turn was leading in less money being available for possible small- and mid- sized hydropower operators. As a consequence, the effectiveness/efficiency of the green electricity act is currently influenced by the unfavourable economic development quite more negatively than expected.

Additionally, an opposing trend of an unstable economic development regarding small- and mid-sized hydropower generation could also be that investments in small and mid-sized hydropower generation increase (hydropower plants as retirement provision - amortization time: 7-10 years). However this trend is seen as rather secondary to the negative influence of the unexpected drop in economic development on the effectiveness/efficiency of the green electricity act as described above.

Price of electricity

(Small- and mid-sized) hydropower investments are generally connected to electricity price development. In case of low electricity prices it is assumed that the interest to invest in (small- and mid-sized) hydropower generation decreases, in case of rising electricity prices however it is assumed that the interest to invest in (small- and mid-sized) hydropower generation increases.

In Austria until 2008, the electricity market price experienced a constant upward trend, however afterwards resulting in a sharp drop (beginning in late 2008 from 84.95 €/kWh to 43.28 €/kWh in the second quarter of 2009). After a recurring slight upward trend from the third quarter of 2009, the electricity market price however started in the second quarter of 2011 to fall again. In the third quarter of 2013 it already reached the lowest value since 2005

(E-Control, 2013), thus based on the one hand surely on the appearance and ongoing development of the economic crisis, however also on Germanys high generation of electricity produced from renewable sources which is currently leading to an electricity surplus in Europe, thus dropping the electricity market price also in Austria.

Therefore various stakeholders stated that until 2008, any decrease in hydropower investment based on the market price development was expected, in contrary a constant increase was more likely to be awaited. However after the occurrence of an unexpected sharp drop of the electricity price in 2008 and the overall ongoing downward trend to date, the interest to invest in (small- and mid-sized) hydropower generation decreased constantly, thus leading to a challenge for the government to adapt subsidy systems in order to achieve hydropower expansion targets state by the green electricity act.

However although to date the interest to invest in (small- and mid-sized) hydropower generation started to rise again (starting in 2010, see chapter 3.1), this possibly based on an adaptation in the subsidy scheme (feed-in tariffs were replaced by investment incentives, however in 2012 feed-in tariffs for operators of small hydropower plants (≤ 2MW) were introduced again), an ongoing decrease in market price is still holding on the desired hydropower expansion for the green electricity acts target achievement. As a consequence the development of the electricity price hinders the green electricity act in performing as desired.

Gross final electricity consumption

Little fluctuation in gross final energy consumption over the last year's in Austria resulted in little pressure of fast increase in electricity generation capacity. Thus a corresponding increasing interest in (small- and mid-sized) hydropower generation was not expected by stakeholders. To date, also no mentionable changes have been occurred in gross final electricity consumption, resulting in any noteworthy influence on the green electricity acts effectiveness/efficiency.

However, based on the aimed 20% cut in Europe's annual primary energy consumption by 2020 (increase in energy efficiency), electricity based technologies may become highly important in future. Thus also gross final electricity consumption is assumed to possible increase in future, this in turn may possibly increase in future also the interest to invest in (small- and mid-sized) hydropower generation

Table 11: *Economic context factors' impacts on effectiveness and efficiency of the green electricity act*

System context factor	Expected "impact"	Observed "impact"	Explanation of impact on effectiveness/ efficiency	Impact on effectiveness/ efficiency
Economic development	-1	-2	Currently ongoing economic crisis decreases, generally and based on a cut in provided subsidies, hydropower investments	Highly negative

System context factor	Expected "impact"	Observed "impact"	Explanation of impact on effectiveness/ efficiency	Impact on effectiveness/ efficiency
Price of electricity	-1	-2	A currently low electricity market price hinders a sufficient increase in small- and mid-sized hydropower generation, which however would be necessary to achieve the green electricity acts hydropower expansion targets	Highly negative
Gross final electricity consumption	0	0	Little changes in gross final electricity consumption do not impact the interest to invest in (small- and mid-sized) hydropower generation	No impact

Socio-Political/Technical

Theoretical hydropower potential

Although Austria's hydropower potential decreased over years (intensive large hydropower expansion from 1960s to 1990s taking already a lot of the Austrian originally existing potential), it is still quite high in comparison to other Member States. Therefore an ongoing increase in the investment in (small- and mid-sized) hydropower generation was expected to continue.

However in practice, with ongoing increasing environmental awareness and the implementation of new European environmental directives (e.g. implementation of the WFD in 2000), in practise realisable hydro potential shrank. As a result the general realisable hydropower potential got limited based on environmental conditions, thus negatively affecting the required expansion rate of small- and mid-sized hydropower plants.

Awareness of climate change mitigation

Climate change mitigation has constantly becoming a more and more important factor in current society. Therefore, since (small- and mid-sized) hydropower generation is a form of power generation which causes almost zero greenhouse gas emissions and thus contributing to climate change mitigation and however simultaneously guaranteeing electricity supply, stakeholder expected an increase in the interest to invest in (small- and mid-sized) hydropower generation right from the beginning of this notice. Therefore, especially public awareness of climate change risk was expected to be able to stimulate people to invest in small hydropower plants. In practice according to various stakeholders public awareness of climate change risk does not really play a role in investment decisions regarding small- and mid-sized hydropower generation.

Awareness of biodiversity

Based on the ongoing increase in awareness of biodiversity, stakeholders expected already in the past a decrease in the realization of (small- and mid-sized) hydropower projects. Since every hydropower plant impacts somehow on the environment, a decrease in project realizations, based on a general flare up of a negative image of hydropower as well as on more challenging permission procedures in connection with environmental specifications, have therefore not been identified to be surprising.

In practice, public awareness of biodiversity increased much more than expected, influencing the image of small- and mid-sized hydropower generation and in succession the interest to invest in small- and mid-sized hydropower projects as well as the possibility to realize projects in a much higher negative way than expected.

Decentralized, regional electricity supply

In the past stakeholders have not expected that decentralized, regional electricity supply may become an important factor in the area of electricity generation in public opinion. Therefore it wasn't expected that this system context factor may have any influence on the effectiveness of the green electricity act.

However, since stakeholder stated that currently decentralized regional electricity supply has become much more important than expected (e.g. due to contributing to electricity supply security) the interest to invest in hydropower (especially in small hydropower projects) experienced a quite positive impulse.

Table 12: *Socio-Political/Technical context factors' impacts on effectiveness and efficiency of the green electricity act*

System context factor	Expected "impact"	Observed "impact"	Explanation of impact on effectiveness/ efficiency	Impact on effectiveness/ efficiency
Theoretical hydro potential	+1	-1	Limitation of realisable hydropower potential due to increasing environmental awareness and implementation of environmental EU legislation	Slightly negative
Awareness of climate change mitigation	+1	0	Public awareness of climate change mitigation does not play a significant role in investment decisions regarding small- and mid-sized hydropower generation	No impact
Awareness of biodiversity	-1	-2	Increase of public awareness of biodiversity, decreases the possibility/image of (small- and mid-sized) hydropower generation	Highly negative

System context factor	Expected "impact"	Observed "impact"	Explanation of impact on effectiveness/ efficiency	Impact on effectiveness/ efficiency
Decentralized, regional electricity supply	0	+1	Increase in the interest to invest in small- and mid-sized hydropower generation due to an increase in the importance of decentralized, regional electricity supply	Slightly positive

5. Expected and observed policy transposition and implementation

5.1 Expected and observed policy transposition and PI implementation

In addition to system context factors which influence the performance (effectiveness/efficiency) of the two selected key policy instruments forming the policy framework related to small- and mid-sized hydropower decision makings in Styria/Austria, also specific national policy transposition and implementation factors are able to have a relevant influence on the key policy instruments (national water act and corresponding specifications, green electricity act) desired performance. An overview of such policy transposition and implementation factors is given in the table below.

Table 13: *Policy implementation and transposition factors related to small- and mid-sized hydropower decision making in Styria/Austria*

Type of factor	Evaluation factors	Sub-factors
Policy context factors	**Political & Social Acceptance**	Motivation to invest
		Familiarity
		Adaptability
	Policy Coherence	Coordination among institutions
		Transaction costs
	Policy Consistency	PI consistency with Sustainable Development targets
	Implementability	Enforceability
		Administrative set up & legal certainty
		Financial feasibility
		Image

In the following, listed policy transposition and implementation factors, their development over time and corresponding influence on the effectiveness/efficiency of each of the selected key policy instruments is analysed and discussed. In this regard it is, alike with system context factors, especially important that not all of the above listed policy transposition and implementation factors impact both key policy instruments forming the policy framework related to small- and mid-sized hydropower decision-makings in Styria/Austria. Various specific policy transposition and implementation factors may not be or are just slightly relevant in the context of one of the selected key policy instruments, but are very important in the context of the other. Therefore, the influence of specific policy transposition and implementation factors on the performance of key policy instruments is again discussed in terms of splitting the policy transposition and implementation analysis into two parts, thereby considering and analysing the policy implementation and transposition related to P1 (the

national water act and corresponding specifications) first, and considering in consequence the policy transposition and implementation related to P2 (the green electricity act).

5.2 Impact of expected and observed policy transposition and PI implementation on effectiveness/efficiency of policy instruments

P1: National water act and corresponding specifications

Political & Social Acceptance

Motivation to invest in small- and mid-sized hydropower generation

Independently of incentives for investing in small- and mid-sized hydropower generation, motivation to invest was expected by stakeholders to be on a rather moderate level, thus based on Austria's long "hydropower history" and corresponding high level of acceptance as well as on, in comparison to other EU Member States, the still remaining high hydro potential (more information about Austrian's "hydropower history" and hydro potential can be found in chapter 4.2. and chapter 1.1.) Therefore, the priority of hydropower generation despite its possible negative environmental impacts within hydropower decision-makings and corresponding possible negative impacts on the implementation of the WFD/national water act has been expected already in the early stage of the WFD national implementation.

Today, motivation to invest in (small- and mid-sized) hydropower generation has highly decreased, based on e.g. increasing environmental awareness, unfavourable electricity market price development, several uncertainties such as legal uncertainty etc. Thus the risk that hydropower generation is prioritized despite its possible negative environmental impacts in decision-making processes has slightly decreased. A decreasing motivation to invest in small- and mid-sized hydropower generation is therefore rather positively affecting the WFD/national water acts effectiveness/efficiency by not facilitating the risk of letting exemption approvals becoming the rule.

Familiarity

Various policy areas (e.g. agricultural politics, energy policy incl. electricity industry, etc.) do not agree on all points required and instructed by the WFD/national water act. Thus achieving given environmental objectives may be thorn in side of the favourable development of such policy areas in various eventualities. As a result such policy areas are expected to try to push the national implementation of the WFD in their desired direction by any means possible. E.g. lobbying (on European as well as on national side) by different representatives of affected policy areas, which are e.g. not agreeing with environmental objectives given by the WFD/national water act, is a common possibility to bring their opinion into the WFDs implementation process. This is possibly affecting the performance of the national water act/WFD in a slight negative manner, which in succession was already expected in the past and also observed to date.

Table 14: *Political & Social Acceptance factors' impacts on effectiveness and efficiency of the national water act and corresponding specifications*

Policy context factor	Expected "impact"	Observed "impact"	Explanation of impact on effectiveness/ efficiency	Impact on effectiveness/ efficiency
Motivation to invest	-1	+1	Motivation to invest in small- and mid-sized hydropower generation has decreased slightly. As a result hydropower generation is assumed to not being necessarily prioritized adverse to its possible negative environmental impacts in decision-making processes, thus also not facilitating the risk of letting exemption approvals becoming the rule.	Slightly positive
Familiarity	-1	-1	Various policy areas do not agree on all points required and instructed by the WFD/national water act and these are therefore trying (e.g. due to lobbying) to push the national implementation of the WFD in their desired direction.	Slightly negative

Policy Coherence

Coordination among institutions

According to stakeholders in Austria implementation difficulties regarding coordination among institutions have been conceivable right from the beginning of the WFD's national implementation. A high complexity of necessary administration and management activities has been expected, thus slightly hindering the national water act in its desired performance.

In practice stakeholder stated that the complexity of necessary activities, especially regarding the WFD national implementation at lowest policy levels, has been however underestimated. Various details have been more complex than expected, several issues which have not been considered in the planning occurred during the implementation process:

Based on stakeholder discussion, several examples can be given:

- In Austria currently more than the half of big electricity companies is mainly owned by federal states. Thus several politicians of the federal states are often also members of the supervisory boards of concerned electricity companies. This may influence the authorization process of planned (small- and mid-sized) hydropower plants by resulting in electricity companies desired outcomes.

- Within the national water act an authority called "Wasserwirtschaftliches Planungsorgan" (§55 (2) WRG) was displayed. It is described as an institution which is able to appeal in water related decisions (its duty is to represent water related interests). In March 2012 this authority or better the authority's duty to appeal in water related decisions if necessary, was declared as unconstitutional, since the governor of the federal state is at

once head of the "Wasserwirtschaftliches Planungsorgan" authority and the administration responsible for water related authorization processes (unconstitutionality based on this double constellation).

Table 15: *Policy coherence context factors' impacts on effectiveness and efficiency of the national water act and corresponding specifications*

Policy context factor	Expected "impact"	Observed "impact"	Explanation of impact on effectiveness/ efficiency	Impact on effectiveness/ efficiency
Coordination among institutions	-1	-2	An even higher complexity of necessary administration and management activities has been observed than expected, thus resulting in a challenge for the coordination among institutions, which makes it in succession not possible to always guarantee the desired performance of the WFD/national water act.	Highly negative

Policy Consistency

PI consistency with Sustainable Development targets

It is assumed that it must have been already obvious at the design of the WFD that the formulated environmental objectives will be in some cases inconsistent with other sustainable development targets, e.g. with climate protection targets which desire an increase in renewable energy generation incl. hydropower generation. Thus a slightly negative influence on the effectiveness of the national water act and corresponding specifications was expected already at the beginning of the WFDs implementation process.

Today, this inconsistency has a much higher negative influence than expected. Stakeholder stated that is has led to a lack of criteria for the responsible governmental official responsible for hydropower permissions under the national water act (no sufficient specifications and guidance how to compare negative environmental impacts with the hydropower's effort of electricity generation). Thus in succession leading in a subjective decision regarding hydropower permits. As a consequence the outcome of the authorization process depends highly on the opinion of the person, which is responsible for hydropower permits.

Since recently a national criteria catalogue which is intended to serve as guidance for responsible authorities concerning hydropower permits, especially in the case of exemption procedures, and including criteria taking into account ecological, energy management and water management aspects has been introduced, it is assumed that this will limit subjectivity in future hydropower approval processes. However, according to stakeholders, its introduction hasn't yet changed much.

Table 16: *Policy Consistency context factors' impacts on effectiveness and efficiency of the national water act and corresponding specifications*

Policy context factor	Expected "impact"	Observed "impact"	Explanation of impact on effectiveness/ efficiency	Impact on effectiveness/ efficiency
PI consistency with Sustainable Development targets	-1	-2	Inconsistency of the WFD/national water acts leads to a lack of criteria for the responsible governmental official responsible for hydropower permissions under the national water act, thus resulting in rather subjective decision-makings.	Highly negative

Implementability

Enforceability

Enforceability was not expected by stakeholders to have any significant influence on the performance of the national water act and corresponding specifications. However in practice it had/has a quite negative influence on the performance of the national water act and corresponding specifications due to e.g. a quite large interpretation tolerance within the WFDs implementation.

Based on stakeholder discussion, several reasons for this assumption can be given:

- Conspicuous issue in Austria: Water quality of river basins in not defined as high, but rather as good (if it would be defined as high: the construction of hydropower plants would be generally forbidden).
- Definition of a "better environmental option": A better environmental option has not to be located in the same federal state (could be everywhere in Austria, or also in another country). However in Austria hydropower decisions are based on federal states: Energy providers of the federal state have their own territory, they do not want the better environmental option to be outside this territory
- In Austria the usage of water bodies is free of charge – in other EU Member States: There are interest rates for the use of water bodies. This money is then used for measures to improve the status of water bodies. Thus supporting a barrier-free and not-delayed national implementation of the WFD.

Table 17: *Implementability context factors' impacts on effectiveness and efficiency of the national water act and corresponding specifications*

Policy context factor	Expected "impact"	Observed "impact"	Explanation of impact on effectiveness/ efficiency	Impact on effectiveness/ efficiency
Enforceability	0	-2	Several enforceability issues due to a large interpretation tolerance within the WFD implementation	Highly negative

P2: Green electricity act

Political & Social Acceptance

Motivation to invest in small- and mid-sized hydropower generation

Independently of incentives for investing in small- and mid-sized hydropower generation, motivation to invest was however expected by stakeholders to be on a rather moderate level. Thus based on Austria's long "hydropower history" and corresponding high level of acceptance as well as on, in comparison to other EU Member States, the still remaining high hydro potential (more information about Austrian's "hydropower history" and "hydro potential can be found in chapter 4.2 as well as chapter 1.1). Therefore, with the introduction of incentives to invest in renewable power plants (incl. small- and mid-sized HPPs), it was expected that given feed-in tariffs/investment incentives increase the moderate motivation to invest, thus positively affecting the green electricity acts target achievement.

Today, despite of such stimulating incentives, motivation to invest in small- and mid-sized hydropower generation has highly decreased based especially on e.g. unfavourable electricity market price development, several uncertainties such as legal uncertainty etc. but also on increasing environmental awareness. Thus the (small- and mid-sized) hydropower expansion target given by the green electricity is put on risk.

Adaptability

Adaptability of the policy instrument to changing contextual factors was not expected to be a problem. However according to various stakeholders, in practice, the green electricity acts function (the overall support volume) was identified as being not changeable in short notice, which is a big problem in terms of suddenly appearing changes in e.g. the price of electricity, economic development, etc. As a consequence if this incentive schemes turns out to be too weak for simulating RES including small- and mid-sized hydropower investments it cannot be changed on demand, possibly resulting in a decrease in hydropower capacity expansion. Therefore currently low adaptability is having a high negative influence on the effectiveness of the green electricity act.

Table 18: *Political & Social Acceptance context factors' impacts on effectiveness and efficiency of the green electricity act*

Policy context factor	Expected "impact"	Observed "impact"	Explanation of impact on effectiveness/ efficiency	Impact on effectiveness/ efficiency
Motivation to invest	+1	-1	Today's motivation to invest in small- and mid-sized hydropower generation has slightly decreased. Thus the (small- and mid-sized) hydropower expansion target given by the green electricity is put on risk.	Slightly negative
Adaptability	0	-2	The green electricity act (overall support volume) is not changeable on short notice (low adaptability), thus possibly resulting in a decrease in hydropower capacity expansion if the current investment scheme is too weak for stimulating investment motivation.	Highly negative

Policy Coherence

Transaction costs

Transaction costs have been expected to be within limits. However today in some cases they have been much higher than expected due to high costs regarding legal proceedings according to the hydropower conflict: climate vs. nature (water) protection targets (see appendix 1: case study example "Kraftwerk Schwarze Sulm"), according to high up-front costs and connected neglected promises, etc. However, such cases cannot be generalized. Hence, in reality transactions cost to have a slightly (due to the ban on generalization) negative influence on the efficiency of green electricity act by making small- and mid-sized hydropower generation a more expensive renewable energy technology (based on the average compensation (cent/kWh) within the green electricity act small- and mid-sized hydropower generation would generally belong to the cheapest forms or renewable energy technologies).

Table 19: *Policy Coherence context factors' impacts on effectiveness and efficiency of the green electricity act*

Policy context factor	Expected "impact"	Observed "impact"	Explanation of impact on effectiveness/ efficiency	Impact on effectiveness/ efficiency
Transaction Costs	0	-1	In specific cases increase of transaction costs regarding small- and mid-sized hydropower projects results in an unexpected overall increase in cost of small- and mid-sized hydropower generation.	Slightly negative

Implementability

Administrative set up & legal certainty

In the past legal certainty wasn't expected by stakeholders to have a major influence on the effectiveness of the green electricity act/on the interest to invest in (small- and mid-sized) hydropower generation and in succession on the green electricity acts target achievement. However, over the years legal certainty couldn't be always guaranteed, thus it started to have a quite high negative influence by decreasing the interest to invest in (small- and mid-sized) hydropower generation. E.g. a governmental/official promise that a (small- or mid-sized) hydropower project is able to be realized and complying with all surrounding policy requirements already at the projects start of the planning may not be able to be kept until the end of the authorization process. This undermines legal certainty and therefore decreases the interest to invest in (small- and mid-sized) hydropower generation.

Financial feasibility

It was already expected by stakeholders that financial feasibility may have a rather negative influence on the interest to invest in (small- and mid-sized) hydropower generation, since problems with the target settings of the WFD and corresponding measures which need to be taken to achieve the given target settings have been expected right from the beginning of the implementation process. In practice the influence of financial feasibility on the effectiveness of the green electricity act has been much more negative than expected. E.g. the technical standard of fish facilities is adopted quite often; as a result operators of (small- and mid-sized) hydropower plants can't be sure that their built fish facility at the time of the plant's construction are still in accordance with the technical standard after some years. As a consequence operators get forced to rebuild their fish facility after some years resulting in an unexpected cost increase due to environmental requirements. Thus various appearing uncertainties in connection with the implementation of the WFD hinder the green electricity target achievement regarding (small- and mid-sized) hydropower expansion.

Image

The image of (small- and mid-sized) hydropower generation has been generally expected to remain stable with time and therefore having no noteworthy influence on the interest to invest in (small- and mid-sized) hydropower generation. In reality, with an increase in public awareness of biodiversity and corresponding awareness of the negative environmental impacts of (small- and mid-sized) hydropower plants, the image of (small- and mid-sized) hydropower generation decreased, resulting in a quite negative influence on the green electricity act's target achievement.

Table 20: *Implementability context factors' impacts on effectiveness and efficiency of the green electricity act*

Policy context factor	Expected "impact"	Observed "impact"	Explanation of impact on effectiveness/ efficiency	Impact on effectiveness/ efficiency
Administrative set up & legal certainty	0	-2	Legal certainty cannot be always guaranteed resulting in a decreasing interest to invest in (small- and mid-sized) hydropower generation thus putting the green electricity targets achievement on risk	Highly negative
Financial feasibility	-1	-2	Various appearing uncertainties regarding investment costs in connection with the implementation of the WFD hinder the green electricity targets achievement regarding (small- and mid-sized) hydropower expansion.	Highly negative
Image	0	-1	Decreasing image of (small- and mid-sized) hydropower generation due to e.g. increase in public awareness of biodiversity possibly causing a decrease in (small- and mid-sized) hydropower expansion	Slightly negative

6. Explore policy instrument interaction including an analysis of stakeholder behaviour within the application system

This chapter will assess policy instrument interactions based on a systems-based approach whereby policy instruments and their possible interactions are examined as part of a policy and stakeholder system operating within a broader socioeconomic context. Policy interactions are the result of different policy instruments influencing stakeholder behaviour that in turn is also influenced by the behaviour of other stakeholders. The analysis distinguishes between stakeholders directly target by the assessed policy instrument(s) and stakeholders indirectly targeted by the assessed policy instrument(s).

6.1 Expand and describe the stakeholder system

The political key issue regarding small- and mid-sized hydropower decision-makings, a hydropower plant's authorization process is embedded in a system of two specific direct and a bundle of various indirect stakeholder groups. The direct stakeholder groups are 1) **actors producing electricity** (operating company/ operating individuals of a small hydropower plant (DS1)) as well as ***public administration/ specific governmental authorities*** (responsible for the enforcement of political measures (e.g. authorization, granting subsidies) in the context of small- and mid-sized hydropower decision-makings (DS2)). DS1 is directly targeted by the green electricity act as well as by the environmental support act – "water ecology", whereas DS2 is directly targeted by all selected key PIs as well as by all PIs which have currently been analysed only on a more aggregate level (see chapter 2.2 and following).

In addition, a larger number of various indirect stakeholder groups are also part of the system. Among them are local interest groups (CS1), environmental NGOs (CS2), media (FS1), political parties (FS2) and service providers (FS3), which are able to influence the two direct stakeholder groups as well as their interdependencies: the actors producing electricity and the public administration/ specific governmental authorities. Table 21 gives an overview over the whole system and in Table 22 the key stakeholder groups are described more precisely and relevant relationships between them are identified and explained in more detail.

Table 21: *Overall system overview – key policy instruments and stakeholders*

Policies and enabling/limiting environment	**System actors**	
	Direct and indirect stakeholder groups	Facilitating/limiting actors
Selected PIs: • Green electricity act • National water act and corresponding specifications (river basin management plan, quality target decree – ecology of surface water, national hydropower criteria catalog) **PIs assessed on a more aggregate level:** • Nature conservation act • Law for the electricity market • Environmental support act – "water ecology"	**Direct stakeholder groups:** • Actors producing electricty (DS1) • Public administration (specific governmental authorities) (DS2) **Indirect stakholder groups:** • Local interest groups (CS1) • Environmental NGOs (CS2)	• Media (FS1) • Political parties (FS2) • Service providers e.g. planer, financing institutes, small hydropower associations (e.g. Small Hydro Austria, ESHA) (FS3)

Table 22: *Overview table describing key stakeholder groups and their role in the system*

Code	Name	Description	Key relationships
DS1	**Actors producing electricity**	Operating companies (however, most often only in the case of larger HPPs) or operating individuals (private investors mostly in the case of smaller HPPs) of hydropower plants are responsible for the planning, realization and operation of (small- and mid-sized) hydropower project as well as for the selling of the electricity produced. Actors producing electricity are targeted by the green electricity act as well as by the environmental support act – "water ecology" giving access to possible subsidies and underlie "command and control" measures conducted by the second direct stakeholder group: public administration/ specific governmental authorities.	**DS2:** Responsible for PI's transmission to DS1: project authorization, compliance monitoring, granting of subsidies, etc. **FS3:** Service providers support DS1 in the realization of a small hydropower project **FS1:** Media can be used as a medium for spreading/supporting the interests of DS1 CS1/ CS2: Only slightly relevant – it is assumed that DS1 does not care about the beliefs and opinion of CS1or CS2, it complies only with decisions and requirements given by the public administration
DS2	**Public adminis-tration/ specific govern-mental authorities**	In case study context the public administration covers different administrative authorities *For selected key PIs:* • Riparian rights authority (native name: "Wasserrechtsbehörde"): responsible for authorization processes according to the water law, it has the power above all national water bodies, riparian rights authority can be: a specific district authority (for HPPs with a max. capacity up to 500kW), the governor of the federal state (for HPPs with a max. capacity over 500kW) and the federal minister of agriculture, forestry, environment and water management (only in specific cases) • Authority for water management (native name: "wasserwirtschaftliches Planungsorgan"): responsible for coordinating and monitoring all water related questions in connection with economic development; it is important for (small- and mid-sized)HPPs due to its legal standing in all authorization processes according to the water act and its possibility to appeal water related authorizations • Nature conservation authority (native name: "Naturschutzbehörde"): responsible for authorization processes according to the nature conservation act (concerns all	**DS1:** has to comply with requirements and regulations mandated by DS2: project authorization, compliance monitoring, granting of subsidies **CS1/ CS2/FS1/FS2:** These stakeholder groups have the possibility of inducing pressure on public authorities of RS1 in order to influence the outcome of the overall authorization process according to their specific interest **FS3:** Service providers, e.g. lawyers in legal proceedings or (small) hydropower associations in general, are able to induce pressure on political decision makers (RS1)

Code	Name	Description	Key relationships
		HPPs independent from its size), it is either given by a district authority (HPPs beyond European conservation/Natura 2000 areas) or by the government of the concerned federal state (HPPs within European conservation/Natura 2000 areas) • Authorities, responsible for granting subsidies according to the green electricity act: responsible for accepting renewable power plants as "green electricity plants", for closing of contracts and for paying out of particular subsidies; more precisely the governor of the federal state is responsible for accepting, the E-Control Austria is responsible for monitoring compliance, the settlement center: OEMAG ("Abwicklungsstelle für Ökostrom AG") is responsible for the paying out subsidies and the federal minister of agriculture, forestry, environment and water management is responsible for closing contracts. *For PI's on a more aggregate level:* • Authority, responsible for the enforcement of the law for the electricity market: responsible for authorization processes according to the law for the electricity market, is the governor of the concerned federal state • Authorities, responsible for granting subsidies according to the environmental support act – "water ecology": responsible for closing contracts and for paying out of particular subsidies according to the environmental support act – "water ecology"; more precisely responsible for the enforcement of the law is the federal minister of agriculture, forestry, environment and water management, responsible for the payout of subsidies is the settlement centre "Kommunalkredit Public Consulting GmbH" in collaboration with concerned federal states, which are in succession also responsible for accepting applications	
CS1	**Local interest groups**	In case study context local interest groups are defined as groups which aim to bring their own interest and opinion into political decision making processes. In the context of (small- and mid-sized) HPPs such local interest groups are e.g. neighbours who live in the immediate surroundings of power plants, tourism and fisheries. Possibilities for bringing its interests into political decisions (forming of citizen's action groups, petitions) are functioning mostly via public relation in order to reach	**DS2:** Local interest groups are inducing pressure (via the help of public opinion e.g. due to petitions) on DS2, claiming them to decide about an authorization of (small- and mid-sized) HPPs in its interest **CS2:** If environmental NGOs are fighting for the same interests than local interest groups:

Code	Name	Description	Key relationships
		and influence public opinion and thus inducing pressure on political decision makers (public administration). If local interest groups aim to maintain restorative environment/ surrounding biodiversity they could become a competitor in political interests for operating companies of (small- and mid-sized) HPPs.	environmental NGOs are supporting CS1 in reaching its aims (NGOs are mostly bigger and better organized = higher influence) **FS1/FS2:** Media can be used as medium for spreading/supporting the interests of CS1 **DS1:** Slightly relevant – it is assumed that the production of electricity does not care about the beliefs and opinion of CS1, it complies only with decisions and requirements given by the public administration
CS2	**Environ-mental NGOs**	Environmental NGOs are focusing on environmental protection and aim alike local interest groups to bring this interest into political decisions. In the contrary to most local interest groups however, environmental NGOs are characterized by an organizational structure, by having employees, a certain budget and an official office. Important Austrian environmental NGOs are: • Environmental umbrella organization (native name: Umweltdachverband): covers e.g. the Austrian Alpine club (native name: Österreichischer Alpenverein), the nature protection society (native name: Naturschutzbund) and the friends of earth (native name: Naturfreunde); • Ökobüro: covers WWF Austria, Global 2000 and Greenpeace Austria; adjustor between policy, economy and environmental associations	**DS2:** Environmental NGOs are inducing pressure on DS2 in order that political measures are formulated and implemented on the basis of their ideas and beliefs **CS1:** Environmental NGOs are able to support local interest groups in achieving their aims **FS1/ FS2:** Media and political parties can be used as medium for spreading/supporting the interest of environmental NGOs
FS1	**Media**	The duty of all forms of media is to inform and "educate" the public about different political topics and events as well as to monitor and criticize public policy; Media is able to influence and form public opinion, which is an important means of pressure in the context of political decision makings (especially also in case study context concerning small- and mid-sized HPP authorizations)	**DS2:** Media monitors and criticizes public policy, it induces pressure on the public administration if applicable **DS1/ CS1/ CS2/ FS2:** Media is used as a medium for spreading/supporting the interest of the particular stakeholder group

Code	Name	Description	Key relationships
FS2	**Political parties**	Political parties as important key players in democratic states aim to bring their political views and beliefs into the political agenda. In contrary to environmental NGOs and local interest groups they are not only able to induce pressure on political decision makers, they have also the possibility (with sufficient votes) to nominate members for different political positions. This enables political parties to directly participate in political decision makings.	**DS2:** Political parties are inducing pressure on political decision makers/ are directly participating in political decisions in order that political measures are formulated and implemented on the basis of their ideas and beliefs **CS1/ CS2**: Political parties can support particular stakeholder groups (depending on its own interests and beliefs) in achieving their aims **FS1:** Media can be used as a medium for spreading/ supporting the interest of FS2
FS3	**Service providers**	In case study context service providers are defined as individuals or organizations which are somehow able to support the production of electricity in realising a small- or mid-sized hydropower project. Among them are e.g. lawyers (in the context of legal proceedings), planers, financing institutes and (small) hydropower associations (represent the interest of the production of electricity on a higher level; important within the EU: European Small Hydropower Association (ESHA), within Austria: Small Hydropower Austria)	**DS1:** Service providers support the production of electricity in the realization of a small- or mid-sized hydropower project **DS2:** Service providers, e.g. lawyers in legal proceedings or (small) hydropower associations in general, are able to induce pressure on political decision makers (DS2)

In the next section, this system of key stakeholders as well as the most important interdependencies and relationships among them are taken up for further analysis concerning policy interactions. In addition, to guarantee a full interaction analysis, in this section, PIs analysed on a more aggregate level in previous chapters (nature conservation act, law for the electricity market, environmental support act – “water ecology”) are included. For visual demonstration, the analysis includes system maps showing interrelations of key stakeholders at any possible scenario (influenced by a single policy instrument, by a policy mix (multiple policy environment including selected PIs as well as PIs slipped on a more aggregate level).

6.2 Identifying possible policy interactions based on impact on stakeholders

6.2.1 Expected impact of a single PI on direct stakeholders' behaviour

In this section the key stakeholder system related to small- and mid-sized hydropower decision-makings and its behaviour and coaction in the case of a single policy instrument framework is presented. Such a single policy framework is rather theoretical but sometimes represents what policy maker have expected; it forms the basis for further identification of possible policy interactions and their influence on stakeholder behaviour and interrelationships.

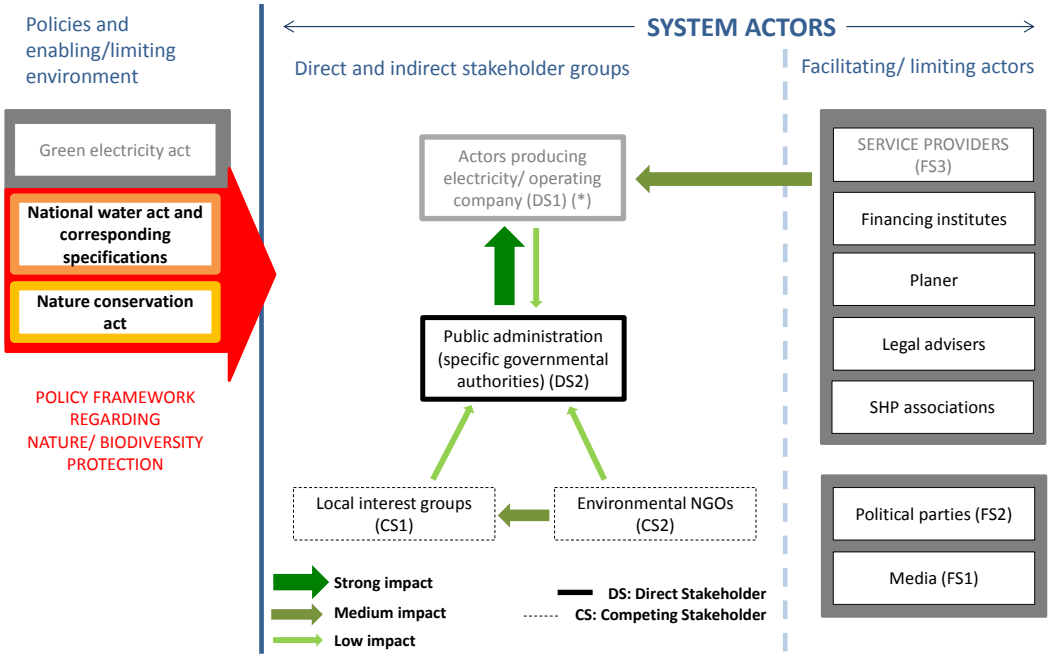
Starting and key part of this section is given by the impact analysis of single policy framework of selected key PIs, the single policy frameworks of PIs on a more aggregate level are analysed subsequently in a much shorter manner.

Single policy framework analysis of selected PIs

Starting with the analysis of the green electricity act, the influence of the national water act as well as of the nature conservation act will then be analysed in combination as part of an overall framework to protect environment. This is based on the two-fold objective of the case study, having nature protection and maintaining biodiversity on the one side and climate protection via the expansion of renewable energies on the other side. The national water act and the nature conservation act representing the nature protection side are assessed as single policy framework contrasting the aims of the green electricity act. Thus, influenced either by the national water act or the nature conservation act (policy framework of nature/biodiversity protection) the behaviour of the key stakeholder system stays the same. When however considering the green electricity act as the policy framework for renewable energy expansion and climate protection in contrast, various relationships and interdependencies among key stakeholder groups are changing.

Policy framework regarding nature/biodiversity protection

The following system map shows the impact of the national water act/ the nature conservation act (each policy instrument assumed as a single policy framework) on the before defined key stakeholder system. Interdependencies and relationships between key stakeholder groups induced by this single policy framework scenario are displayed as arrows.



(*): Actors producing electricity/ operating company are not directly affected by the policy framework regarding nature/ biodiversity protection, however they are direct stakeholders in the overall system and are also relevant within the policy framework nature/biodiversity protection

Figure 2: *Single policy framework regarding nature/biodiversity protection – system map*

In Table 23, relationships between system key stakeholder groups within a single policy framework regarding nature/biodiversity protection, visualized in the system map above, are explained in more detail and are characterized in addition concerning its strength.

Table 23: *Relationships between key stakeholder groups within a single policy framework regarding nature/biodiversity protection*

Connection	Impact/ Explanation	Strength
DS2-DS1 & DS1-DS2	Public authorities responsible for the implementation of the national water act and nature conservation act decide in reference of these policy instruments on a planned small- or mid-sized hydropower projects authorization – in order to get an authorization for their planned project actors producing electricity have to comply with several regulations and requirements given by a policy instrument and required by the enforcing public authority. In return actors producing electricity can in fact provide the public administration with detailed information about all aspects of the project and thus ensuring on accurate fact based decisions, however this stakeholder group is not directly able to participate in the decision making process.	Strong/ Low
FS3-DS1	Different services provided by stakeholder groups such as financing institutes, planers, legal advisers, (S)HP associations, etc. may help the actors producing electricity to realize a small- or mid-sized hydropower project. In most cases, the actors producing electricity are depending on the support of such groups to be able	Medium

	to get an authorization and realize a project. In the context of the policy environment of nature/biodiversity protection e.g. planers may support the actors producing electricity in the realization of a nature protection conform project installation.	
CS1/CS2-DS2	Local interest groups and environmental NGOs act as controlling part of the correct implementation of nature related policy targets within the system. Within a single policy environment it is assumed that is not infringed upon any nature protection regulations and requirements. Small- and mid-sized hydropower plants are only constructed if all nature specific regulations are met. Local interest groups and environmental NGOs are therefore not assumed to induce pressure on the public administration; however they keep the task as external supervisor.	Low
CS2-CS1	Local interest groups and environmental NGOs are acting together as external supervisor concerning the maintenance of nature/biodiversity protection policy targets in authorization processes of small- and mid-sized hydropower projects.	Medium

Policy framework regarding renewables expansion

The following system map shows the impact of the electricity act on the before defined key stakeholder system. Interdependencies and relationships between single key stakeholder groups are again displayed as arrows. The picture slightly differs from the influence of a single policy instrument belonging to the policy framework of nature/ biodiversity protection.

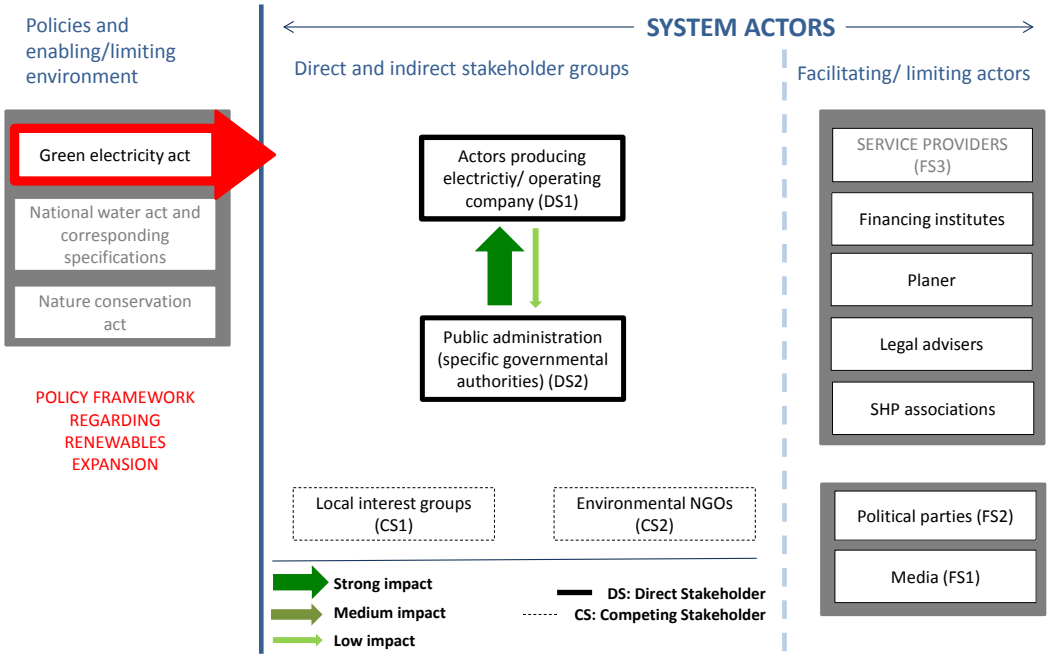


Figure 3: *Single policy environment regarding renewables expansion – system map*

In Table 24 relationships between key system stakeholder groups within a single policy framework regarding renewables expansion, visualized in the system map above, are explained in more detail and are characterized in addition concerning their strength.

Table 24: *Relationships between key stakeholder groups within a single policy framework regarding renewables expansion*

Connection	Impact/ Explanation	Strength
DS2-DS1 & DS1-DS2	A small- or mid-sized hydropower project hast to fulfill several requirements given by the green electricity act to get accepted as "green electricity plant" and thus being eligible under the corresponding incentive scheme– responsible authorities decide about the projects accepting and instructs the actors producing electricity about required duties and tasks. In return actors producing electricity can provide the public administration with detailed information about all aspects of the project, thus ensuring on accurate fact based decisions, however this stakeholder group is not directly able to participate in the decision making process.	Strong/ Low
FS3-DS1	Different services provided by stakeholder groups such as financing institutes, planers, legal advisers, (S)HP associations, etc. may help the actors producing electricity to realize a small- or mid-sized hydropower project. In most cases, the actors producing electricity are depending on the support of such groups to be able to get an authorization as "green electricity plant" thus enabling to grant subsidies. In the context of the policy environment of climate protection e.g. planers may support the production of electricity in the realization of a green electricity act conform project installation.	Medium

In this scenario, environmental NGOs and local interest groups are insignificant. Assuming that small- or mid-sized hydropower projects are accepted as green electricity plants not before its "general" (water and nature related) authorization, these stakeholder groups do bring in their interests already before the accepting under the green electricity act.

Single policy framework analysis of PIs on a more aggregate level

The single policy framework given by the law of the electricity market as well as the single policy environment given by the environmental support act – "water ecology", are resembling strongly the before described single policy framework regarding renewables expansion. In both scenarios, the actors producing electricity interact with particular public authorities as well as with service providers. In the first case, specific public authorities are responsible for the authorization of small- and mid-sized hydropower plants according to the law for the electricity market, in the second case specific public authorities are responsible for closing contracts and for paying out of particular subsidies according to the environmental support act – "water ecology". Thus as in the case of the green electricity act, the public authority is responsible for the enforcement of the particular policy instrument including major policy decisions, whereas the actors producing electricity however are not able to participate in the decision making process. In addition, also in both cases, service providers can support the actors producing electricity in realizing a project and environmental NGOs as well as local interest groups are insignificant (in the first case, because the law for the electricity market does not really include "nature relevant" topics – nature relevant topics in small- and mid-

sized HPPs authorization processes are covered by the national water as well as the nature conservation act; in the second case, subsidies according to the environmental support act – "water ecology" are granted not before a projects authorization where environmental NGOs and local interest groups had been already able to bring in their interests)

6.2.2 Expected impact of combined PIs on direct stakeholders' behaviour including indirect stakeholders

By implementing policy instruments relevant for the policy framework regarding nature/biodiversity protection in combination with the policy instruments relevant for the policy framework regarding renewables expansion in combination (including PIs on a more aggregate level, whereas the law for the electricity market may be accounted as relevant in the context of renewables expansion and the environmental support act – "water ecology" may be accounted as player of nature/biodiversity protection policy instruments), several relationships and independencies between key stakeholder groups within the theoretical scenarios of single policy frameworks changes. An important key factor: the conflict between these two policy environments or rather between hydropower as form of power generation which causes almost zero greenhouse gas emissions and thus contributing to climate protection and renewable expansion targets and hydropower as harmful encroachment in natural biodiversity appears in the political agenda.

In the following it is analysed how the stakeholder system reacts/ turns out by being affected of a bundle of PIs (national water act, nature conservation act, green electricity act, law for the electricity market, environmental support act – "water ecology"), how this affects small- and mid-sized hydropower projects and its realization in general and which specific policy interactions are responsible for the overall effects in stakeholder behaviour in the context of small- and mid-sized hydropower decision-makings.

The following figure displays the stakeholder system in the realistic scenario of a multi policy environment:

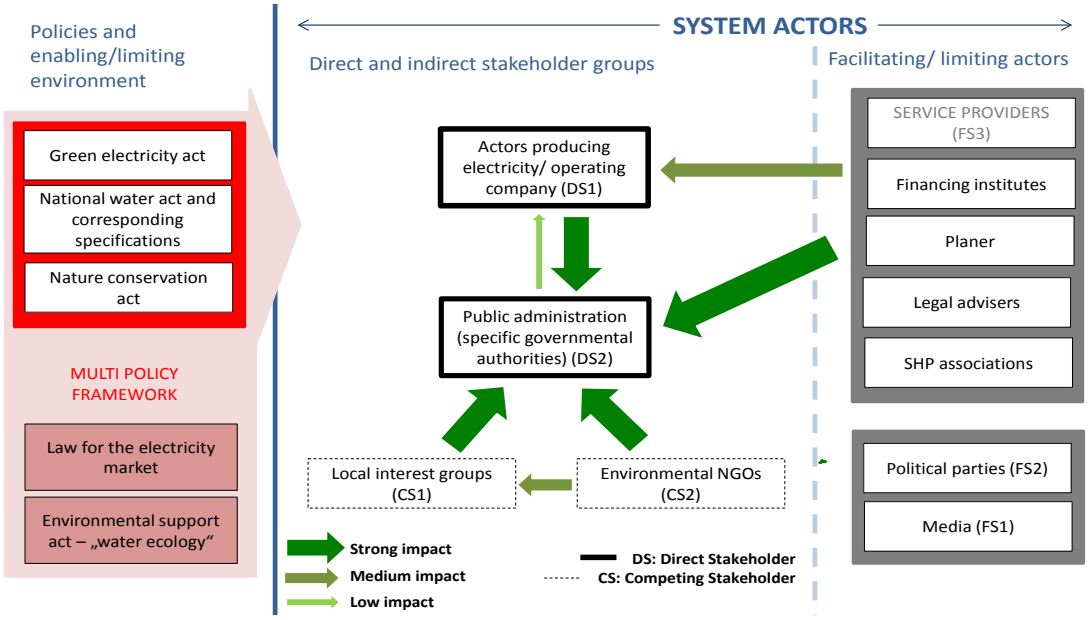


Figure 4: *Multi policy framework– system map*

In Table 25 relationships between key system stakeholder groups within a multi policy framework and how they have changed in comparison to the single policy framework displayed before are explained in more detail and again also characterized concerning its strength.

Table 25: *Relationships between key stakeholder groups within a multi policy framework*

Connection	Impact/ Explanation	Changes	Strength
DS2-DS1 & DS1-DS2	With the help of service providers such as legal advisers or SHP associations, the actors producing electricity get supported in realizing a project and in succession in bringing its interest or rather its point of view in the context of the "hydropower conflict" into political decisions. Its influence on the public administration gets stronger. This is due to inducing pressure on the responsible authorities with the help of particular service providers. In return the influence of the public administration/specific governmental authorities on the actors producing electricity is damped in praxis, although it should stay the same than in single policy environments.	Strength of relationships between DS2 and DS1 turns around	Low/ Strong
CS1/CS2-DS2	Based on the "hydropower conflict", environmental NGOs as well as local interest groups are inducing pressure on the public administration/specific governmental authorities in order to bring in their point of view into political decisions relating to hydropower projects authorizations (mostly contra (small- and mid-sized) hydropower projects)	Each group is inducing enormous pressure on the public administration/ specific governmental authorities to influence the political decision in the context of small- and mid-sized hydropower authorizations in their desired way	Strong
FS1/FS2-DS2	Based on the "hydropower conflict" political parties and media are inducing pressure on the public administration/ specific governmental authorities in order to bring in their point of view into political decisions concerning small- and mid-sized hydropower projects authorizations (these stakeholder groups are able to take both positions – pro or contra small- or mid-sized hydropower projects)		Strong
FS3-DS2	Based on the "hydropower conflict" service providers are inducing pressure on the public administration/ specific governmental authorities in order to bring		Strong

Connection	Impact/ Explanation	Changes	Strength
	in the interests of actors producing electricity into political decisions concerning small- and mid-sized hydropower projects authorizations (pro small- and mid-sized hydropower projects)		
FS3-DS1	Stays the same as in both single policy environments (see Table 23 and Table 24)	-	Medium
CS2-CS1	Stays the same as in both single policy environments (see Table 23 and Table 24)	-	Medium

Summarized, the multi policy framework related to small- and mid-sized hydropower decision-making in Styria/Austria leads to the appearance of the “hydropower conflict” on stakeholder level as this conflict was not prevented in policy design. Key stakeholders, except the public administration/ specific governmental authorities, are separated into two groups. The first group, favouring small hydropower utilization is rooting for the construction of hydropower plants whereas the second group is rooting against the authorization of small- or mid-sized hydropower plants. Thus, each group is imposing pressure on the responsible authorities of the public administration, trying to push the hydropower decision in its desired direction. The influence of the public administration/ specific governmental authorities on the production of electricity declines, since it is imposed on enormous pressure from all sides. Decision making may become very difficult for authorities as both sides’ opinions are directly or indirectly backed by EU environmental directives and sometimes there are insufficient criteria available to weigh hydropower expansion against nature/water conservation.

6.2.3 Conclusion on interaction analysis: Expected impact of stakeholder interaction in a multi-PI framework on the ability to achieve policy objectives

As a main result of the multi policy framework in the context of small- and mid-sized hydropower decision-makings the public administration/ specific governmental authorities is/are exposed to enormous pressure from all sides. This affects the desired outcome of the individual policy instruments when they are part of the policy mix. Meeting all policy instruments targets is however, in case they are contradicting, impossible in practice. One of the hydropower related policy targets: renewables expansion vs. nature protection will always be favoured. Independent from the nature friendly realization of a small- or mid-sized hydropower project, the construction of a plant will always be an encroachment in the surrounding biodiversity and river ecology. Therefore it is assumed that an authorization of a project refers to the support of the policy target renewable energy expansion whereas a refusal is assumed to oblige rather with the policy target nature protection. However since in future, compromises between key stakeholder groups, either pro or contra small- and mid-sized hydropower projects, could be found and an authorization of a plant could in future also please small- and mid-sized hydropower project opponents, in the current situation no key stakeholder group backs down and the public administration/ specific governmental authorities is/are induced on enormous pressure. Moreover although responsible authorities should theoretically be able to weigh the pros and cons of the planned project rather

objectively, in reality and based on the regulations and requirements given from policy instruments present in the multi policy framework related to small- and mid-sized hydropower decision-makings, this is not the case. In practice, even if the responsible administration tries to be as objective as possible, the decision whether a hydropower project is authorized or not will always be to a certain extent subjective, thus suiting one of the two stakeholder groups either pro or contra small- and mid-sized hydropower utilization. The weighing up of two so different environmental policy targets would require sufficient guidance which however is not (yet) available, therefore pressure from outside is able to get an important role within a decision process.

As a result the authorization process is of very longsome duration (the responsible administration/ specific governmental authorities tries/try to comply with all given regulations and requirements as good as possible), leading in a long waiting period and big expenses for the actors producing electricity. Thus in future less small- and mid-sized hydropower projects may be realized, since possible investors may no longer be interested to invest in small- or mid-sized hydropower projects. The European Small Hydropower Association mentions in this context that an average duration of an authorization process in Austria lies between 2-10 years, whereas the optimal time span according to the association should not excess two years (European Small Hydropower Association, 2012). This is a big problem which is also displayed in the case study example: Kraftwerk Schwarze Sulm, in this case the authorization procedure lasted over 10 years (for more information on the case study example “Kraftwerk Schwarze Sulm” see appendix 1).

The basis of the effects of the multi policy framework on key stakeholder behaviour and relationships between stakeholder groups within the system is given by three different policy interactions (formed by key PIs as well as by PIs on a more aggregate level), whereas only one plays a major role in the overall context. The other two are accounted as subordinated as they reinforce the effect of policy interaction 1. This effect, as well as more details about the three policy interactions and involved policy instruments can be found in the following section.

Table 26: *Characteristics of relevant policy interactions*

Comparison of individual policy instruments					
Parameter to compare	**P1 Green electricity act**	**P2 Law for the electricity market**	**P3 National water act and specifications**	**P4 Environmental support act – "water ecology"**	**P5 Nature conservation act**
Timeframe	Right before/after the construction of the plant	Mainly authorization process	Mainly authorization process	Right before/after the construction of the plant	Mainly authorization process
Policy objectives	Climate protection	Climate protection	Water (nature/biodiversity) protection	Nature/biodiversity protection – measures which improve the ecological status of water bodies	Nature/biodiversity protection
Type of instrument	Subsidies	Command and Control	Command and Control	Subsidies	Command and Control
Activity coverage	Energy	Energy	Water	Environment/Biodiversity	Environment/Biodiversity
Directly targeted stakeholders	Production of electricity	Production of electricity	Production of electricity	Production of electricity	Production of electricity

Policy instrument interaction categorisation			
Classification	**Interaction 1**	**Interaction 2**	**Interaction 3**
Policy interaction scope	External: P1(P2)&P3&P5	Internal: P1&P2	Internal: P3&P4&P5
Expected type of policy interaction	TRADE OF = Direct interaction: The three (four) overlapping policy instruments are directly influencing the same target group (actors producing electricity)	SYNERGY = Sequencing interaction: The actors producing electricity are switching after the authorization of their planned hydropower project from the first to the second policy instrument	SYNERGY = Sequencing interaction: The actors producing electricity are switching after the authorization of their planned hydropower project from the first to the second policy instrument

Policy Interaction 1: (National water act and nature conservation act vs. the law for the electricity market (green electricity act) – major policy interaction)

The interaction is caused by the green electricity act as an important instrument to increase renewable energy and represented in the authorization process by the law for the electricity market versus the national water and nature conservation act pursuing the nature protection (including water protection) goal. The law for the electricity market, the national water act, as well as the nature conservation act are acting at the same point in time. All are relevant during the authorization process where it is decided whether a small- or mid-sized hydropower project is allowed to be realized or not.

In addition, all of the three policy instruments are from the same type, are directly influencing the same target group but acting as part of different environmental policy frameworks. The interaction can therefore be classified as classical direct and external trade-off.

Policy interaction 1 forms or reflects the “hydropower conflict” and is therefore also the main driver for the impacts of the multi policy environment on key stakeholder behaviour and relationships related to small hydropower utilization, which were described at the beginning of this section. It is the major policy interaction within the system reinforced by policy interaction 2 on the climate protection side and policy interaction 3 on the nature/biodiversity protection side.

Policy Interaction 2: (Green electricity act and law for the electricity market)

Policy interaction 2 is caused by the green electricity act and the law for the electricity market. The two policy instruments reinforce each other. While the law for the electricity market aims at promoting environmental friendly energy supply, the green electricity act provides subsidies for small- and mid-sized hydropower projects (green electricity plants), which in succession increases the incentives for investors to invest in small- or mid-sized hydropower projects (green electricity plants). It is assumed that based on this policy interaction, more hydropower projects will be realized than in the case where the law for the electricity market is the only framework, however it is the law for the electricity market which brings energy related interests into the decision making process (see chapter 2.2)

Thus, since both policy instruments are pursuing the same objective and are surrounded by the same environmental policy area but differ in time, policy interaction 2 is classified as internal, sequencing synergy.

Interaction 2 reinforces the renewable energy side within the “hydropower conflict” formed or reflected by policy interaction 1.

Policy Interaction 3: (National water act, environmental support act – “water ecology” and nature conservation act)

Policy interaction 3 is caused by the national water act, environmental support act – “water ecology” and the nature conservation act. The three policy instruments reinforce each other as the environmental support act – “water ecology” provides subsidies for measures, which improve the ecological status of water bodies, and which in succession contributes to the

achievement of both: water and nature protection targets given from the national water act and the nature conservation act.

Thus, since both policy instruments are pursuing the same objective and are surrounded by the same environmental policy area but differ in time, policy interaction 3 is classified as policy interaction 2 as internal, sequencing synergy.

Interaction 3 reinforces the nature/biodiversity protection side within the “hydropower conflict” caused by policy interaction 1.

Conclusions

Since policy interaction 2 and policy interaction 3 are both reinforcing one side of the “hydropower conflict” formed by policy interaction 1 and thus more or less balancing each other out, they do not have own impacts on the effectiveness and the efficiency of key policy instruments. Thus policy interaction 1 is forming the key part in the interaction analysis, influencing the ability to achieve policy objectives in the context of small- and mid-sized hydropower decisions in Styria/Austria. In the following table, the impacts as well as it strength of policy interaction 1 on the effectiveness and efficiency of policy instruments are summarized.

Table 27: *Impact of interactions on effectiveness and efficiency of key policy instruments*

Policy interactions	Impact	Impact on effectiveness/ efficiency of key PIs
Policy Interaction 1	Policy interaction 1 leads to the outcome of the “hydropower conflict” on stakeholder level and results in a tight conflict between stakeholder groups, contending for different interests, all inducing pressure on the public administration, thus trying to push the decision process in their desired direction. As a result the duration of an authorization process is critically protracted.	Highly negative

7. Assessing the 3Es/Synthesis

Based on the knowledge gathered in the previous tasks, in the following chapter an overall assessment of 3Es of analysed policy instruments is made. Starting with a brief review on the assessed effectiveness and efficiency of selected key policy instruments, in the second step system context, policy implementation and transposition as well as policy instrument interaction factors, which have been identified earlier for being mainly responsible for the observed effectiveness and efficiency of key policy instruments are synthesized. This is resulting in a brief résumé of main drivers for policy instruments failure and success and leads over to the last step in this chapter: drawing overall conclusions on the performance of the environmental policy framework related to small- and mid-sized hydropower decision-makings in Styria/Austria.

7.1 Conclusion on effectiveness and efficiency

Environmental policy targets related to (small- and mid-sized) hydropower decisions are showing multiple characteristics by aiming to meet both, nature/ water protection and renewable energy expansion. This is resulting in a challenge for all policy instruments forming the environmental policy framework related to small- and mid-sized hydropower decision-makings in Styria/ Austria, to bring fourth their desired performance, individually as well as in combination. However, filtered out as main carriers of the “hydropower conflict” in Austria have been only two policy instruments: the national water act and corresponding specifications, implementing the EU WFD and thus aiming to achieve nature/water protection targets and the green electricity act, part of Austria’s effort to implement the EU RES Directive and thus aiming to achieve an increased renewables share while contributing to emission saving targets. While the nature conservation act also aims at preserving biodiversity it doesn’t play a significant role in hydropower decisions in Austria.

The national water act and corresponding specifications, as selected key policy instrument(s) on the nature/water protection side in this challenge of reaching multiple environmental policy objectives, aim(s) to prevent further deterioration and to improve the status of all water bodies by reaching at least a good status/potential within a given period (2027 at the latest). This is also supported by corresponding policy instruments analysed in previous on a more aggregate level (nature conservation act, environmental support act – “water ecology”), whereas the nature conservation act refers to prevent the loss of biodiversity in general, thus not only affecting water ecology but also land habitats. (Small- and mid-sized) hydropower decision makings have to secure meeting these targets for both, newly constructed but also existing plants.

The green electricity act, forming the main counterpart to the national water act in the “hydropower conflict”, aims to increase the share of renewable energies in gross final energy consumption in Austria to 34% in 2020 by providing incentives for specific RES technologies including small- and mid-sized hydropower generation. In this regard, for small- and mid-sized hydropower generation individually, an increase of overall hydropower generation capacity based on the 2010 expansion level, of about 350 MW (1,750 GWh) until 2015, of about 500 MW (2,000 GWh) until 2020 is pursued. While the green electricity act provides

incentives for RES technologies and therefore is the main driver for its expansion the permission process is governed by the law for the electricity market.

In the following, assessed effectiveness/efficiency of the two key policy instruments based on its target achievement level is summarized as short reminder:

National water act and corresponding specifications

Based on the required implementation of the WFD, the national water act has been amended in 2003. At that time the above mentioned targets of the WFD – to achieve a good status/potential and to prevent further deterioration of all water bodies – have been become effective in Austria. In more detail, based on the requirements given by the WFD, a good status/potential is required to be achieved until 2015, thus however with the possibility to expand the deadline under certain conditions until 2027 at the latest. Also the commitment to prevent further deterioration, legally binding in Austria since the WFD national implementation, can be lessened if specific circumstances e.g. the overriding of electricity generated from renewable sources in public opinion, are dominating. As a consequence, exemptions from the required target achievement are legal, however depending on its degree on frequency as well as on its specific enforcement; they may become crucial for the national water acts effectiveness regarding (small- and mid-sized) hydropower decision makings.

In the case study area Styria/Austria, in both cases – regarding the achievement of a good status/potential and the commitment to prevent further deterioration – it has already been frequently called on the possibility of exemptions. Regarding the target of offering a good status/potential of all water bodies, which generally affects the reconstruction of already existing (small- and mid-sized) hydropower plants in order to secure its enhancement with newly implemented environmental objectives, the deadline for its achievement has already been expanded to 2027. In this regard, mentioning a lack of technical feasibility, disproportional high costs and natural conditions not allowing timely improvement as main reasons. In more detail: 2% of Austrian water bodies are planned to be improved not until 2015, 7% not until 2021 and 57% not until the final deadline 2027. This plan to improve a very high percentage (over 50%) not until the last five years possible is assumed to be very crucial for the national water acts effectiveness by resulting in a high uncertainty concerning the general feasibility of necessary measures (e.g. unknown financial conditions etc.). Additionally, although due to the large timeframe until 2027 a timely target achievement is still possible, this is however commonly not believed. Also regarding the commitment to prevent further deterioration, which is mainly affecting the permission of newly planned (small- and mid-sized) hydropower plants, it was frequently reverted to the possibility of exemption approvals. Since 2005 nine exemption approvals in Austria (excluding Carinthia) have been reported, whereas five of them are related to the river “Mur”. Especially in the case study area Styria, a frequency of such exemption approvals was observable (five since 2005, including the case study example “Kraftwerk Schwarze Sulm”). Moreover such exemption approvals have been observed to be apparently also planned in future, however this not only in the context of the water law but most likely also regarding the nature conservation act. As a result the already existing and planned to be ongoing high frequency of such exemption approvals is crucial for the effectiveness of the national water act.

Therefore, the national water act regarding the case study area Styria and small- and mid-sized hydropower decision-makings is identified as currently being rather ineffective in both, achieving of a good status/potential and preventing further deterioration of all water bodies, thus based on the frequent and outbidding use of exemption possibilities. This is in addition also intensified by a general observable high tendency of Austria to expand hydropower generation.

In contrast to the clearly observable ineffectiveness of the national water act regarding small- and mid-sized hydropower decision-makings, to determine its efficiency is more challenging and affects rather only the water status improvement bond by referring to the question whether the planned budged will be generally sufficient to finance all necessary activities and measures until 2027, the end of the expanded deadline for the target achievement. Thus, the plan to improve a very high percentage (over 50%) not until the last five years possible is assumed to be very crucial also for the national water acts efficiency, because there is no guarantee that the planned budged, about 3 billion EUR, will be sufficient.

Green electricity act

With the implementation of the 2009 EU RES Directive and the corresponding required national target of Austria (an increase in the RES share in final energy consumption to 34% until 2020), the green electricity act has been adapted by introducing new expansion targets for under the support scheme eligible RES technologies. This includes also small- and mid-sized hydropower generation were an increase, based on the 2010 level, of 350MW/ 1,750GWh until 2015 or rather collectively of 500MW/ 2,000GWh until 2020 is required. Therefore the current effectiveness of the green electricity act regarding small- and mid-sized hydropower decision-makings has been assessed based on the identification of the actual expansion of small- and mid-sized hydropower capacity by focusing on the timeframe from 2010 (base year of target settings) and the calculation of the corresponding annual rate of change, thus by considering the last recent years. In doing so, two different data sets have been used to calculate the possibility to reach the given expansion targets. DATA SET 1 considers small- and mid-sized hydropower capacity (MW), DATA SET 2 considers annual amounts of electricity generated (GWh) from small- and mid-sized hydropower plants and contracted to the OeMAG.

As a result, by using DATA SET 1, which is also identified to be more reliable, the 2020 expansion target will likely be met, although the 2015 target will slightly be missed. Using DATA SET 2, the target achievement however will be clearly failed for both, 2015 and 2020.

As a result the effectiveness of the green electricity is currently identified as being rather ineffective, thus for sure regarding the 2015 target which will possibly be failed but not really for the 2020 target which will possibly be achieved. However by considering both targets as entity the possible effectiveness of one part does not cure the failure of the other.

However, the efficiency of the green electricity act shows a differentiated picture. In the first place it was identified as being quite efficient by considering the comparison of 2011 weighted average support levels for small- and mid-sized hydropower projects with 2011 weighted average support levels for other forms of renewable energies supported by the government, thus resulting in the identification of small- and mid-sized hydropower

generation as the cheapest form for electricity generation from RES technologies falling under the support scheme of the green electricity act. In addition, the observed efficiency of the green electricity act was in the past also supported by a frequent dropping out of the contract (guaranteed feed-in tariffs) of small- and mid-sized hydropower operators due to an until 2008 ongoing increase in the electricity market price, thus disburden the government from its legal contracted sponsorship. However after 2008, the electricity market price constantly decreased, thus reducing the attractiveness of selling the electricity on market prices and therefore balancing the positive influence of dropping out of the contract on the green electricity acts efficiency.

Secondly, the green electricity act however, has been identified as possibly being rather inefficient also, thus if high transaction costs are included. This is anyhow only the case in specific examples and are therefore not in generally crucial for the green electricity acts efficiency, but nonetheless in the case study example of Styria/Austria the “Kraftwerk Schwarze Sulm”.

Regarding co-effects, the expansion of renewable energy sources has major co-effects such as the reduction of greenhouse gas emissions. This is often an important additional argument for renewables energy expansion in Austria and of arguing that the expansion of a hydro plant is of public interest.

7.2 Synthesis on contextual factors, implementation factors and interactions

In this chapter, system context, policy implementation and transposition as well as policy interaction factors which have been identified in previous chapters to impact the effectiveness and efficiency of selected key policy instruments are brought together and are balanced in succession regarding to its importance for the currently observed appearance of key policy instruments performance. As a result, an overall picture including most crucial impacting factors which are relevant regarding the currently observed effectiveness and efficiency of key policy instruments is shown thus leading to overall conclusions on EU environmental policy implementation related to small- and mid-sized hydropower decisions in Styria/Austria.

In the table below, an overview of all system context, policy implementation and transposition factors as well as policy instrument interactions which have been identified in previous and impact the effectiveness/efficiency of at least one of the two key policy instruments is given. In addition, based on the different weighing of impacting factors in each category (system context, policy implementation and transposition, PI interaction) an overall assessment of the overall influence of each factor group has been carried out and shows in succession the overall importance or rather the intensity of each specific category for the performance of key policy instruments related to small- and mid-sized hydropower decision makings in Styria/Austria. Impacts on effectiveness and efficiency are thereby labelled by colours: dark green implies that a certain factor has been **“highly positive”** for effectiveness or efficiency, whereas dark red implies **“highly negative”** effects. Light green implies that a certain factor has been **“slightly positive”** for effectiveness or efficiency, whereas orange implies **“slightly negative”** effects. White columns indicate **“currently no observable impacts”**, a cross in a white column however indicates **“not relevant for this policy instrument”.**

Table 28: *Overview and synthesis on system context, policy implementation and transposition as well as PI interaction factors impacting effectiveness/efficiency of key policy instruments*

		PI1 "National water act"	P2 "Green electricity act"
		Effectiveness/ Efficiency	Effectiveness/ Efficiency
System context factors			
	Economic development		
	Price of electricity		
	Gross final electricity consumption		
	Importance of energy import independency		
	Environmental (water) preconditions		
	Hydro potential		
	Political direction of governmental coalition (federal state level)		
	Political priority of (small- and mid-sized) hydropower generation		
	Existing national property rights/ national legal preconditions		
	Awareness of climate change mitigation		
	Awareness of biodiversity		
	Decentralized, regional electricity supply		
	Monitoring of national implementation of EU environmental legislation		
	Enforcement of EU environmental legislation		
	OVERALL ASSESSMENT		
Policy implementation & transposition factors			
	Motivation to invest		
	Familiarity		
	Adaptability		
	Coordination among institutions		
	Transaction costs		
	PI consistency with Sustainable Development targets		
	Enforceability		
	Administrative set up & legal certainty		
	Financial feasibility		
	Image		
	OVERALL ASSESSMENT		
PI interaction factors			
	Hydropower conflict		
	OVERALL ASSESSMENT		

National water act and corresponding specifications

Each category (system context, policy implementation and transposition as well as PI interaction factors) is in holistic sense applying a highly negative pressure on the effectiveness/efficiency of the national water act. However, some of the identified impacting factors within a category are identified as being more crucial for the national water acts performance than others.

Within the system context, especially, the increasing **importance of energy import independency** together with the **governmental awareness of climate change mitigation** (governmental effort to reach climate or rather renewable expansion and emission saving targets) which are in succession causing the current observable high **political priority of small- and mid-sized hydropower generation**/ current **political program of provincial government** in the case study area Styria, have a quite high negative influence on the performance of the national water act.

However, also the **national existing property rights** in Austria are hindering the performance of the national water act/WFD quite negatively. Thus based on the very long duration of permits for small- and mid-sized hydropower plants which in succession is not enabling the government to reconstruct old plants no longer in line with environmental objectives becoming effective with the WFDs implementation.

Within the policy implementation and transposition context, especially the **coordination among institutions** as well as **PI consistency with Sustainable Development targets** and **enforceability** has been identified as being most crucial.

Coordination among institution is causing issues especially regarding the implementation of necessary activities, which are more complex than has previously expected. PI consistency with sustainable development targets however is resulting in a lack of sufficient criteria for the specific governmental official responsible for hydropower permissions under the national water act, thus resulting in rather subjective decision-makings. Enforceability is resulting in a quite large interpretation tolerance within the WFDs implementation, thus being in various examples (see chapter 5.2) crucial for the national water acts performance.

However as most crucial in the context of the national water acts performance has been despite identified the overall **“hydropower conflict”** (policy interaction factor), which actually has led to or reinforced the occurrence of the most of before given system and policy implementation and transposition context factors.

Green electricity act

Also regarding the green electricity act each category (system context, policy implementation and transposition as well as PI interaction factors) is in holistic sense applying a highly negative pressure on its effectiveness/efficiency. However, also in this case some of the identified impacting factors within a category are identified as being more crucial for the green electricity acts performance than others.

As the case study showed that the expansion of small and medium hydropower in Austria is not on track to meet the targets for 2020, main reasons have been identified as the **low electricity price** (system context factor) that doesn’t allow to recover the cost, but also **legal**

uncertainty (policy implementation and transposition) partly caused by the conflict between hydro power permission and the aim of the Water Framework Directive, and other nature conservation goals (**"hydropower conflict"**). In addition also **uncertainties in financial feasibility** is resulting in crucial impacts on the green electricity acts performance, thus by decreasing the attractiveness for possible future operators of (small- and mid-sized) hydropower plants to invest in projects.

7.3 Overall conclusions

This case study has examined the performance of the environmental policy mix regarding small- and mid-sized hydropower decision makings in Styria/Austria. As key policy instruments have been identified the national water act implementing the EU WFD as well as the green electricity act implementing the EU RES Directive, both being the main causes within the overall "hydropower conflict" between climate and nature/water protection targets. The case study has shown that both policy instruments are not on track of target achievement due to range of contextual factors and policy interactions that affected the effectiveness and efficiency of the policy instruments. Regarding the expansion of small and medium hydro power in Austria it is not on track due to the low electricity price that doesn't allow recovering the cost, but also legal uncertainty partly caused by the conflict between hydro power permission and the aim of the Water Framework Directive, and other nature conservation goals. The permitting procedures at the same time often use exemption clauses of the WFD and therefore undermine its proper implementation. Besides the policy interaction with hydro power expansion the implementation of the WFD is also slowed down by economic factors or insufficient coordination among institution. The costs of expanding hydro power in Austria can in some case such as the case example Schwarze Sulm be very high compared to the limited amount of electricity produced. While the case study showed that the assessed EU directives improved important areas of environmental policy making compared to previous national legislation, it also illustrated significant problems that can arise when implementing EU directives into national law some of which are caused by contextual factors not sufficiently expected when designing policies as well as inconsistencies of EU environmental directives. More guidance on EU level how to handle possible policy interactions at the national level would be of help to avoid possible conflicts and give more certainty to investors compared to the current system of ex-post prosecution of offenses against EU legislation on a case by case basis.

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9. Appendix I

The story behind the case study example: "Kraftwerk Schwarze Sulm"[7]

In the following, the story behind the case study example: the small hydropower project "Kraftwerk Schwarze Sulm", which is used as major example for a possible "hydropower conflict" in Austria is introduced. As short reminder: The plants authorization procedure lasted almost over 10 years due to high resistance against the power plant and administrational difficulties and disagreement to give it permission. In March 2012 in spite the various difficulties officially permitted (however by closure of case study research still under legal investigation), the "Kraftwerk Schwarze Sulm" became a major public case concerning hydropower decisions for the whole country. In the figure below a timeline including most important events of the hydropower plants authorization story is displayed, whereas subsequently the storyline to these events is introduced in more detail.

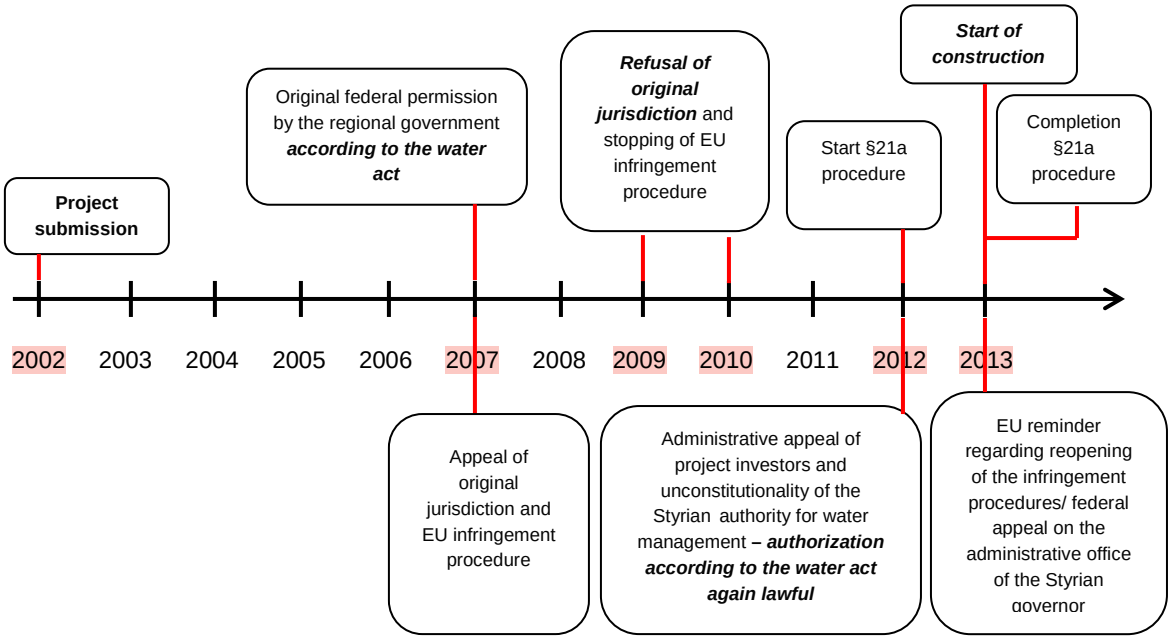

Figure 5: *Timeline of the story behind the case study example: "Kraftwerk Schwarze Sulm"*

[7] Information based on:
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► Project submission

In ***2002*** in Styria/Austria, two private investors submitted a small hydropower project (maximum capacity: 4.92 MW) planned to be located at the river "Schwarze Sulm". The river "Schwarze Sulm", a confluent of the river Mur, flows within the Austrian province Styria and is located within a Natura 2000 area disclosed by the European Habitats Directive, including the protection of surrounding habitats as well as the public water manor.

► Official federal permission by the regional government

In ***2006*** and ***2007***, the province of Styria accorded an authorization of the project according to the nature conservation act as well as the national water act.

The authorization according to the national water act, which will be most important in the sequel of the story, was approved based on a possible exemption procedure under §104 national water act, thus allowing, under specific circumstances, deviation of implemented environmental objectives given in the WFD (see chapter 3.1: national water act and corresponding specifications). Regarding the small hydropower project "Kraftwerk Schwarze Sulm", basically an exceeding public interest in the construction of the plant adverse to its assessed environmental influences has been emphasized, thus allowing the plant's construction despite the rivers high water quality status.

► Appeal of original jurisdiction and EU infringement procedure

In ***June 2007***, the Styrian authority for water management (native name: "wasserwirtschaftliches Planungsorgan"), responsible for coordinating and monitoring all water related questions in connection with economic development, gave notice of appeal to the Austrian federal ministry of agriculture, forestry, environment and water management regarding the hydropower projects original jurisdiction according to the national water act.

In ***autumn 2007***, also the EU expressed its disagreement with Styria's decision to approve the small hydropower project "Kraftwerk Schwarze Sulm" by initiating an infringement procedure against Austria, thus leaning on an incorrect implementation of exemption clauses included in the WFD. In this context the EU is accusing Austria of an improper performed implementation of the WFD regarding to article 4.7/WFD, by stating the generation of renewable energy as overriding public interest despite of the plants low energy output.

► Refusal of original jurisdiction and stopping of EU infringement procedure

Based on the appeal of the Styrian authority for water management, in ***2009*** the federal ministry of agriculture, forestry, environment and water management refused the original jurisdiction, by not opining an exceeding public interest in the construction of the small hydropower project "Kraftwerk Schwarze Sulm", thus annulling the 2007 given authorization.

As a result, in ***2010*** the EU stopped the infringement procedure.

► Administrative appeal of project investors and unconstitutionality of the Styrian authority for water management

Thereupon, the project investors gave notice of appeal to the Austrian constitutional court about the Styrian water management's appeal on the original jurisdiction.

In ***March 2012***, the Austrian constitutional court declared the Styrian water management's authorities duty to appeal in water related decisions as unconstitutional. Thus based on the double constellation of the governor of Styria, being at once head of the appealing authority as well as of the administration responsible for water related authorization processes.

As a result the original jurisdiction of 2007, which positively approved the small hydropower project "Kraftwerk Schwarze Sulm" according to the water law, got legally effective once again.

► National water act §21a proceeding

As a consequence in ***May 2012*** the Austrian federal minister of agriculture, forestry, environment and water management gave notice of appeal on the administrative office of the Styrian governor, thus forcing Styria to undertake a §21a procedure (§21a as assignment to burst legal force if after the authorization of a project the situation ensues that due to the authorization overall public interest is not adequate secured). According to the small hydropower project "Kraftwerk Schwarze Sulm" this especially based on the water quality status assessment according the quality target decree – ecology of surface water, which has not yet being in force in 2007 where the authorization was granted and a high water quality status was assumed.

However thus firstly rejected by the governor of Styria based on the late appeal, which already should have been taken in 2007, the §21a proceeding was in ***July 2012,*** after all initiated. An outcome was however not expected to be obtained until the end of 2014. In addition the governor of Styria also extended the hydropower projects construction completion period until 2016.

► Start of construction

Since, as long as the §21a proceeding is not concluded, the start of construction is lawfully allowed, the project investors started in succession in ***May 2013*** with the small hydropower projects construction.

As a consequence, in ***June 2013***, an authorised expert under the §21a procedure, informed that the recent start of the construction has led to significant disturbance of the surface water body "Schwarze Sulm", thus no longer allowing the evaluation of the original water quality status assessment regarding the authorization according to the national water act in 2007.

► Completion of §21a procedure

In ***September 2013*** the governor of Styria again approved the construction of the Kraftwerk "Schwarze Sulm" thus based on the outcome of the §21a procedure, which has concluded that due to drinking water extraction in the upper drainage basin of the river "Schwarze Sulm", a high water quality status of the surface water body according the quality target decree – ecology of surface water is not justified. As a consequence an exceptional approval proceeding according to §104a would not have been necessary.

► EU reminder regarding a possible reopening of the infringement procedure

However already in ***April 2013***, also the EU reacted with a reminder to possibly restarting the infringement procedure, thus also reinforced by a second reminder a few months later with an included deadline for reactions.

► Appeal of the federal minister of agriculture, forestry, environment and water management on the administrative office of Styria's governor

Thereupon, the Austrian federal minister of agriculture, forestry, environment and water management gave notice of appeal regarding the administrative office of Styria's governor, expecting an interfering reaction of the higher administrative court. However until closure of case study research, no results of that have been available, thus still leaving the case "Kraftwerk Schwarze Sulm" an unsolved issue for future.