University of Natural Resources and Applied Life Sciences,

Institute of Hydrobiology and Aquatic Ecosystem Management

Ecosystem Services on River Landscapes: A case study

River Enns from Mandling to Hieflau

Master Thesis

of Jan Oberdiek, Bachelor of Science

to obtain the academic degree “Diplom Ingenieur”

Vienna, August 13, 2013

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Declaration of Academic Honesty

I hereby declare that I have written this master thesis on my own, having used no other than the stated sources and aids.

All contributions from published as well as unpublished sources are marked as such.

This thesis, in same or similar form, has so far not been submitted to this or any other examination board.

I declare my consent to the University of Natural Resources and Applied Life Sciences, Vienna, that I agree that the university may open this thesis to the public.

Vienna, August 13th 2013

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(Jan Oberdiek)

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Abstract

Up to now the issue of “ecosystem services” on river landscapes is a rather unknown field of research in Austria. Different human impacts are leading to changes of riverine landscapes and affect the river’s ecological, physicochemical and hydromorphological status. This has an effect on the availability of river landscape functions as basis for “ecosystem services” that are provided by the river. The aim of the ongoing PhD thesis “Perception and assessment of ecosystem services on river landscapes” (Kerstin Böck) is to gain insights into this topic. The present diploma thesis is to be understood as an integrative part of this project.

Qualitative and quantitative surveys with representatives of different stakeholder groups and river users were carried out at the river Enns (Austria/Styria).The goal was to analyze the perception of availability as well as of importance of ecosystem services and of possible conflicts that may arise between different services.

The results of the surveys showed that many interviewees perceived the availability of supporting, cultural and regulating services higher than the availability of provisioning services in the study area. This could be found independent of the stakeholders’ age, gender and educational attainment. These results could also be determined for the perceived importance. The biggest part of perceived conflicts was found between “provisioning services” and “supporting services” followed by the conflicts between “provisioning services” and “cultural services”.

It is suggested that stakeholders and river users should be integrated more in river management. They do have a wide perception of the availability of ecosystem services and have an insight into their importance for the region. Moreover they can improve management decisions through their perception of possible conflicts. Further research will be necessary to determine whether the results of this study can be transferred to other river landscapes as well.

Kurzfassung

Bis heute ist die Thematik der „Ökosystemdienstleistungen“ am Beispiel Flusslandschaften ein eher unerforschtes Thema in Österreich. Das derzeit laufende Dissertationsprojekt: „Wahrnehmung und Ermittlung von Ökosystemdienstleistungen an Flusslandschaften“ (Kerstin Böck), welches im Rahmen des „Doktoratskolleg Nachhaltige Entwicklung (DOKNE)“ durchgeführt wird, zielt darauf ab diese Lücke zu schließen. Die vorliegende Diplomarbeit versteht sich als integrativer Teil dieses Projektes.

Qualitative und quantitative Umfragen mit VertreterInnen verschiedener Stakeholdergruppen und FlussnutzerInnen wurden an der Steirischen Enns (Österreich) durchgeführt. Das Ziel dabei war es, die Wahrnehmung der *Verfügbarkeit* und die *Bedeutung* von Ökosystemdienstleistungen zu analysieren, sowie das Konfliktpotenzial zwischen den einzelnen Dienstleistungen zu identifizieren.

Die Ergebnisse der Umfragen zeigten, dass viele der im Untersuchungsgebiet befragten Personen die derzeitige *Verfügbarkeit* von Basisleistungen der Enns-Flusslandschaft höher einschätzten als die der kulturellen und Regulierungsleistungen. Die Versorgungsleistungen wurden am wenigsten wahrgenommen. Die seitens der Befragten eingestufte *Bedeutung* der Leistungen ergab ähnliche Ergebnisse. Konfliktpotentiale wurden am häufigsten zwischen Versorgungs- und Basisleistungen genannt, gefolgt von Konflikten zwischen Versorgungs- und kulturellen Leistungen.

Es wird empfohlen, betroffene Stakeholder und FlussnutzerInnen vermehrt in Entscheidungsfindungsprozesse im Fließgewässermanagement mit einzubeziehen, da diese über relevantes regionsspezifisches Wissen verfügen. Weitere Studien sollten durchgeführt werden, um zu überprüfen, ob die gewonnen Ergebnisse auch auf andere Fließgewässer übertragbar sind.

Table of Content

1 Introduction

This master thesis is conducted within the framework of the PhD thesis of Kerstin Böck dealing with “Perception and assessment of ecosystem services on river landscapes”. The PhD thesis is conducted as part of the Doctoral School of Sustainable Development (“Doktoratskolleg Nachhaltige Entwicklung” dokne). The chapters 2, 3 and 4 were compiled in cooperation with Renate Polt, who is writing her master thesis "Stakeholder perception of an ecosystem service assessment for river landscapes: case study Enns river" to support the PhD thesis with a similar topic.

The issue of ecosystem services is highly discussed, especially in the scientific context. In the year 2005 the synthesis “Ecosystem and Human well-being: Wetlands and water” was published as part of the Millennium Ecosystem Assessment report (MEA, 2005). It stated that “the degradation and loss of wetlands is more rapid than that of other ecosystems. Similarly, the status of both freshwater and coastal wetland species is deteriorating faster than those of other ecosystems (FINLAYSON et al., 2005, MEA, 2005).” and that “[wetland] ecosystems, including rivers, lakes, marshes, rice fields, and coastal areas, provide many services that contribute to human well-being and poverty alleviation (FINLAYSON et al., 2005).”

Furthermore, different human impacts lead to changes of riverine landscapes and affect the river’s ecological, physicochemical and hydromorphological status. This has an effect on the availability of river landscape functions as basis for “ecosystem services” that are provided by the river (BÖCK, 2012).

In Austria the assessment of the ecological and hydromorphological status of rivers is required by law. However, the assessment of ecosystem services is poorly developed. This is for instance the case for the influences of anthropogenic pressures on services like recreation, flood protection and on habitats for animal and plant species (BÖCK, 2012).

Other countries in Europe like Germany and Switzerland have been more active in this field of research than Austria. However, two examples for Austrian studies can be mentioned. CHIARI, S. published her dissertation “Raumbedarf für multifunktionale Flusslandschaften – potentielle Synergien zwischen Ökologischen Erfordernissen und den Bedürfnissen der Freizeit- und Erholungsnutzung“ in 2010. In the course of this thesis the recreational use of rivers was investigated. Budin, H. has written a diploma thesis in 1990 where an assessment of fish waters under anthropogenic influences took place (BÖCK, 2012).

The focus of most studies dealing with ecosystem services lies on one specific ecosystem service, e.g. fresh water, fish or recreation, but they did not provide an overview of the available functions and services. This has only been done once in Austria at the river Mur by Getzner, Jungmeier et al. 2011 (BÖCK, 2012).

The ongoing PhD-project “Perception and assessment of ecosystem services on river landscapes” aims on contributing to close this gap through 1.) analyzing perceptions “ecosystem service concept”, 2.) detecting knowledge gaps and 3.) identifying the

practicability of this concept by the example of two case study rivers (Drau and Enns) in Austria. Therefore a survey, consisting of questionnaires and guided interviews, on this issue was carried out at the rivers Drau and Enns.

The focus of this master thesis is laid on the perception of availability of ecosystem services, the importance of these services for the future and possible conflicts which can arise between the services at the river Enns. The thesis can be seen as an integrative part of the PhD-project and shall help to work out the perception of availability of ecosystem services and to show ecosystem functions of regional importance.

1.1 Research questions

For this study three research questions have been defined and analyzed through qualitative and quantitative formats. The research questions address the study area along the river Enns from Mandling to Hieflau. The research questions are as follows:

1. Which ecosystem services at the river Enns are stakeholders and river users primarily aware of?

2. Which ecosystem services at the river Enns are stakeholders and river users less aware/unaware of?

3. Which conflicts between existing ecosystem services at the river Enns are perceived by different stakeholders and river users?

Based on the objectives and research questions for this study I hypothesize the following:

- “Provisioning services” are perceived the most important ecosystem services at the river Enns.

- “Supporting services” are perceived the most unimportant services at the river Enns.

- The majority of arising conflicts exist between provisioning and supporting ecosystem services on the river Enns.

2 Ecosystem Services

To give an overview of the growing research field of “ecosystem services” and the concept behind, this chapter serves as an introduction into this large topic. The focus of my study emphasizes perception, importance and trade-offs of ecosystem services. Most of the following is applicable to all kinds of ecosystems, not only running waters.

2.1 Basic concept of ecosystem services

Ecosystems are prerequisite for the relating services and defined as: “[…] a dynamic complex of plant, animal and micro-organism communities and the nonliving environment interacting as a functional unit” (ASH et al., 2010).

Literature provides various definitions of the term “ecosystem services” (ES). FISHER et al. (2009) identified definitions of DAILY (1997), COSTANZA et al. (1997) and of the MILLENNIUM ECOSYSTEM ASSESSMENT (2005) as some of the most commonly cited:

“Ecosystem services are the conditions and processes through which natural ecosystems and the species that make them up, sustain and fulfill human life. They maintain biodiversity and the production of ecosystem goods, such as seafood, forage, timber, biomass fuels, natural fiber, and many pharmaceuticals, industrial products, and their precursors. The harvest and trade of these goods represent an important and familiar part of the human economy. In addition to the production of goods, ecosystem services are the actual life-support functions, such as cleansing, recycling, and renewal, and they confer many intangible aesthetic and cultural benefits as well” (DAILY, 1997).

“Ecosystem services are the benefits human populations derive, directly or indirectly, from ecosystem functions” (COSTANZA et al., 1997).

Ecosystem services are “the benefits people obtain from ecosystems. These include provisioning services such as food, water, timber, and fiber; regulating services such as the regulation of climate, floods, disease, waste, and water quality; cultural services such as recreation, aesthetic enjoyment, and spiritual fulfillment; and supporting services such as soil formation, photosynthesis, and nutrient cycling” (MILLENNIUM ECOSYSTEM ASSESSMENT, 2005).

FISHER et al. (2009) themselves, defined ecosystem services as “the aspects of ecosystems utilized (actively or passively) to produce human well-being” (FISHER et al., 2009).

Despite some differences, all of these definitions agree on the same underlying idea and have a core anthropocentric view. For this thesis it is not relevant to choose one of the definitions above, because all of them are equally applicable.

It is essential, however, to distinguish between “ecosystem services” and “ecosystem functions” as these terms are easily used interchangeably. “Ecosystem functions refer variously to the habitat, biological or system properties or processes of ecosystems. Ecosystem goods (such as food) and services (such as waste assimilation) represent the benefits human populations derive, directly or indirectly from ecosystem functions” (COSTANZA et al., 1997).

Ecosystem functions become ecosystem services if humans benefit from them. Subsequently if humans did not exist, the ecosystem would still function but would not provide any services (FISHER et al., 2009).

DAILY (1997) conducted a very interesting thought experiment (as originally suggested by John Holdren, 1974). She tried to list services humans would need if they tried to live on the moon.

Based on the assumption that basic conditions for supporting human life are already provided (like an atmosphere and an earth-like climate), which of earth’s species would it be worth to take with? First it might be good to choose those, which would be of direct need and use like food, drink, spice, fiber and timber, pharmaceuticals, industrial products and so on. This list alone is bound to contain hundreds or even thousands of species. But of course, this would not suffice since adding the species needed to support those already listed. This is especially tricky, because no one knows which or how many species are required to support human life. Therefore it requires having a list of the entire life-support functions instead of listing individual species one by one (DAILY, 1997).

DAILY (1997) provided following preliminary list of services:

- purification of air and water
- mitigation of floods and droughts
- detoxification and decomposition of wastes
- generation and renewal of soil and soil fertility
- pollination of crops and natural vegetation
- control of the vast majority of potential agricultural pests
- dispersal of seeds and translocation of nutrients
- maintenance of biodiversity, from which humanity has derived key elements of its agricultural, medicinal, and industrial enterprise
- protection from the sun’s harmful ultraviolet rays
- partial stabilization of climate
- moderation of temperature extremes and the force of winds and waves
- support of diverse human cultures
- providing of aesthetic beauty and intellectual stimulation that lift the human spirit (DAILY, 1997).

We, as humans, know very little about ecosystem services and often take them for granted. Our existence heavily depends on these services, but we are reminded of nature's life-support systems only when they are disrupted or lost. Deforestation, for example, allows us to recognize the importance of forests in the hydrological cycle, the thinning of the stratospheric ozone layer, and the significance of its protection against harmful ultraviolet radiation (DAILY, 1997).

The value of ecosystem services can furthermore be made visible by trying to determine the cost of replicating a technologically produced, artificial biosphere. Experiments like the Biosphere II project in Arizona or manned space missions demonstrate the extreme complexity of such a proposition. In comparison, Earth (also called Biosphere I) is "a very efficient, least-cost provider of human life-support services" (COSTANZA et al., 1997).

Making the value of ecosystem services visible is a major part of the "Ecosystem Service Concept" or the "Ecosystem Service Approach". A European study, called "The Economics of Ecosystems and Biodiversity" (TEEB), describes it as "a way to link nature with economy" (TEEB, 2010).

The idea of ecosystem services is not a new one. SCHMUTZ et al. (2009) highlighted that the term "ecosystem services" and the first general concept behind was developed in the late 1960s by King (1969) and Helliwell (1969). Their concept defined a framework for synthesizing and structuring an understanding of the ecosystems of the earth and their functions for human well- being.

"In 1977, Westman (1977) suggested that the social value of the benefits that ecosystems provide could potentially be enumerated so society can make more informed policy and management decisions. He termed these social benefits 'nature's services.' Now we commonly refer to Westman's services as 'ecosystem services' — a term first used by Ehrlich and Ehrlich (1981)" (FISHER et al., 2009).

Figure 1 shows the increase of publications using the terms "Ecosystem Services" or "Ecological Services". It visualizes the growing importance of the relatively new concept of ecosystem services and the interest of researchers in this topic.

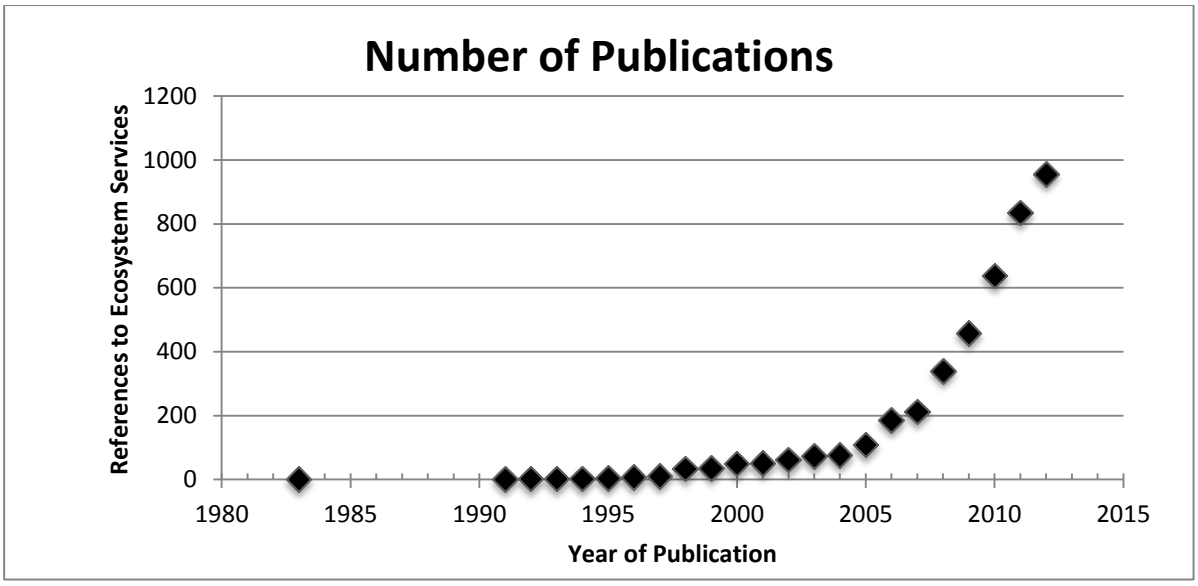


Figure 1: Publications using the terms "Ecosystem Services" and "Ecological Services" in an ISI WEB of Science search up to 2012 (ISI Web of Science, figure based on Fisher et al 2009)

The most important recent research in connection with ecosystem services is the "Millennium Ecosystem Assessment" (MEA) published in 2005. The MEA was an international process from 2001 to 2005 and it was considered to meet the needs of decision-makers for information on the connections between changes in the ecosystem and the human well-being. The literature focused on three topics: 1.) how changes in ecosystem and their services have influenced human well-being, 2.) how modifications in ecosystems may affect the people in future decades, and 3.) if there are types of responses which can be implemented on local, national, regional, or global scales to improve the management of ecosystems and in this manner subsidize human well-being (MILLENNIUM ECOSYSTEM ASSESSMENT, 2005).

In this thesis the term "ecosystem services" will be characterized as the actual use of the river landscape at the river Enns which also includes the ecosystems services in their actual state, without any further anthropogenic changes.

2.2 Human impacts on ecosystems and their services

According to the report of the MILLENNIUM ECOSYSTEM ASSESSMENT (2005) the actions humans take are fundamental and to a high extent permanent. This induces a change in diversity of the life on Earth and most of these changes are leading to a decrease of biodiversity. During the existence of mankind no changes in important components of the biological diversity have been faster than during the last 50 years and projects and scenarios point out that this fast rate will carry on or even accelerate in the future.

Trying to transfer this to aquatic ecosystems it can be seen that there is an ongoing degradation in these systems which is due to an increase of human population. These degraded ecosystems will lose their most important functions which are the ecosystem services on which the mankind is based and dependent on (SCHMUTZ et al., 2009).

The river and its surrounding landscapes have been used by mankind for settlements, infrastructure and production areas for thousands of years. Many rivers have been subjected to increased land use channelization, dam construction, floodplain separation, and hydropower (JUNGWIRTH et al., 2003).

All these changes and interferences have huge consequences on the ecology, physicochemical and the hydromorphological status of riverine landscapes. Since 2000 the EU Water Framework Directive sets new standards for these riverine parameters. By the year 2015 at least a good ecological status of all natural surface waters and a good ecological potential for all artificial and degraded surface waters should be obtained. To evaluate, several quality elements have to be investigated, including biological (phytoplankton, phytobenthos, benthic fauna and fish), hydro-morphological (water supply and consistency) and the physicochemical quality elements (synthetic/non synthetic pollutants) (JUNGWIRTH et al., 2003).

A shift in the existing functions and their related services are commonly identified. For example the use of hydropower energy changes significant ecological effects and cultural services like “recreation” and the “aesthetic value” of riverine landscapes (BÖCK, 2012).

To reduce the degradation of river-systems and increase the functionality of rivers and surrounding landscapes, some management measures have been implemented including limitations of use, conservation, restoration and a decrease in ecosystem degradation (JUNGWIRTH et al., 2003).

BÖCK (2012) stated that “[the] close relationship between different forms of influences on ecosystems and the availability of their functions and the related provision of their services has not been studied comprehensively and is therefore not known or recognized in ecosystem management.” A lack of stakeholder awareness regarding ecosystem functions and services in the decision making process, direct (e.g. water manager and decision makers) or indirect (e.g. users and residents), can be identified.

2.3 Identification of ecosystem services

Ever since the establishment of the concept and term “ecosystem services”, researchers and scientists have attempted to list and classify services in a systematic way.

A universal list would have to contain a vast amount of eco-regions from different ecosystem types and of various environmental units and entities.

One of the most commonly used classifications (FISHER et al., 2009) is provided by the MILLENNIUM ECOSYSTEM ASSESSMENT (2005), which identified four general ecosystem service categories: provisioning, regulating, cultural and supporting services.

- *Provisioning services* refer to the products that people obtain from ecosystems; examples for provisioning services in river landscapes are fish, fresh water and gravel.

- *Regulating services* include the benefits people obtain from the regulation of ecosystem processes; examples for regulating services are the climatic and hydrologic regulation of rivers.

- Nonmaterial benefits that people obtain from ecosystems can be summarized under *cultural services;* recreation, aesthetic experiences and cognitive development are examples for this category.

- S*upporting services* enclose all services necessary for the production of all other ecosystem services; examples are primary production, the production of oxygen and soil formation (MILLENNIUM ECOSYSTEM ASSESSMENT, 2005).

These categories need to, and are being adapted for different case studies and purposes (BUSCH et al., 2012). To meet the requirements of an ecosystem service classification for river landscapes CHIARI (2010) developed table 1 based on FINLAYSON et al. (2005):

Table 1: Ecosystem functions of flowing waters (based on CHIARI, 2010)

base function	function	examples
provisioning services	use of food sources	fish, fruits, wheat, etc.
	use of water	storage and retention of water as drinking water supply
		water abstraction for irrigation, industrial use, etc.
		energy production
		transport function (navigation, logging)
	use of raw materials	firewood, high grade wood
		peat
		other biomass (thermical use, animal feed)
		construction material (gravel, sand)
	commercial use of landscape	tourism
		watersport provider
		fishing
	use of genetic material	medical use, animal and plant breeding, etc.
regulating services	climate regulation	greenhouse gas regulation
		temperature regulation
		regulation of precipitation, groundwater and other climatic processes
		chemical composition of the atmoshpere
	hydrological regulation	aquifer filling, water storage for agriculture and industry
	pollutant and nutrient regulation	transformation and retention of pollutants and excess nutrients
	protection function	erosion protection, protection of the soil and other stabilizing functions
		flood protection
cultural services	recreation	possibility for touristic utilization and use for recreation
	aesthetics	appreciation of nature
	education	possibilities for formal and informal education and training
	identification	identification with running waters on an emotional level
	spirituality, religiosity and well-being	personal well-being and religious meaning
	room for playing	space for creative playing
supporting services	biodiversity	habitats for year-round and seasonal present species
	geodiversity	morphological diversity
	soil formation	retention and accumulation of sediments and organic material
	nitrogen cycle	storage, retrieval, transformation and allocation of nutrients

2.4 Assessment and valuation of ecosystem services

The connection between environmental matters and people is provided by ecosystem assessments. These assessments of ecosystem services have to consider both sides. On the one hand the ecosystem that the services are resulting of and on the other hand the people who are reliant on these services and who are affected by changes in the supply of these services. The assessment has different roles. It is for example applied, if it comes to the decision-making process like responding to decision makers' needs for information, demonstrating future prospects to avoid unexpected long-term consequences and emphasizing trade-offs between decision possibilities. It also provides critical judgment of options and uncertainty as well as building and communicating complicated information on relevant subjects for the decision makers. Even long before the final assessment results exist, they are important due to the process they affect, appealing and informing decision makers (ASH et al., 2010).

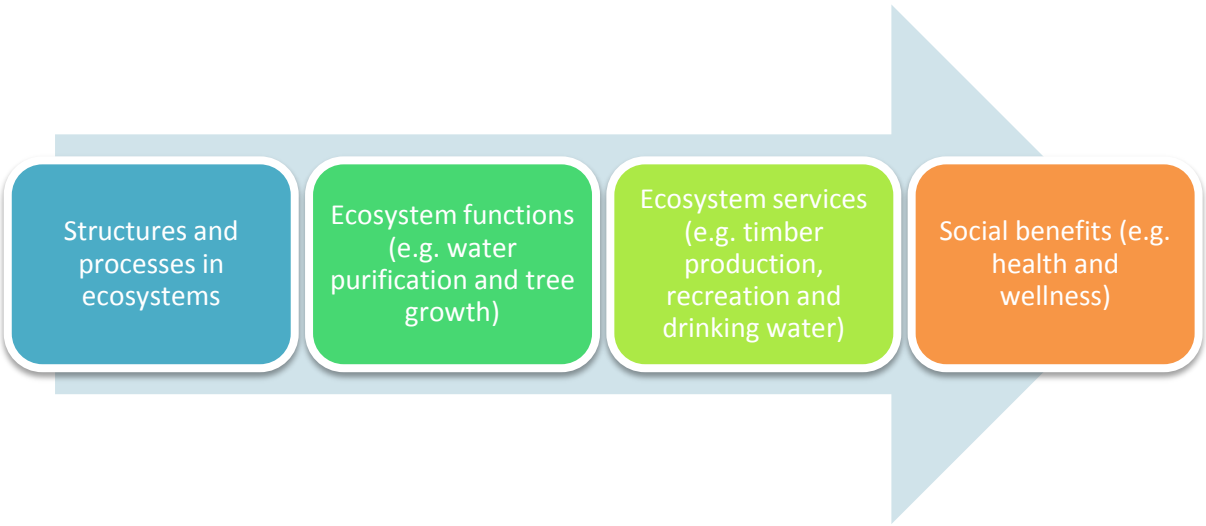


Figure 2: Connection between ecosystems and social benefits (figure based on MUHAR, A., s.a.)

"Assessments can provide credible and robust information on the links between ecosystems and the attainment of economic and social goals" (ASH et al., 2010).

BUSCH et al. (2012) stated that "[the] assessment of ecosystem services is a first step towards documenting changes in their nature and availability. It includes the identification of pressures acting on these services, and the identification of human populations that are most vulnerable to the effects of such changes." (BUSCH et al., 2012).

Modern assessment tools and comprehensive information as basis for valuations of ecosystem services allow us today to see a broader perspective of the challenges we have to deal with. For example even if a lot of individuals benefit from the system through actions and activities which are leading to a loss in biodiversity, the costs which are arising due to these actions are most of the time higher than the benefits. They will be borne and are already borne by the complete society. Therefore even the use of the precautionary approach may be reasonable in cases where our knowledge of benefits and costs is

inadequate as the costs which will result through ecosystem changes might be high or irreversible (MILLENNIUM ECOSYSTEM ASSESSMENT, 2005).

As mentioned above, new tools are available to calculate different values people set on biodiversity and ecosystem services, but there are systems and services much more difficult to value and to calculate. Therefore a lot of decisions are still going to be made without a complete analysis of the full benefits, costs and risks. Although many different methods and tools are nowadays available for estimating the diverse sources of value most of the time only the provisioning services are valued. Most of the supporting, cultural and regulating services are not considered as much as the provisioning ones, because the willingness to pay for this kind of services is not possible to detect and measure. This is due to the fact that they are not privately owned or traded. Furthermore many people do not think that it is possible to value biodiversity in conventional economic terms, because it has an intrinsic value (MILLENNIUM ECOSYSTEM ASSESSMENT, 2005).

“The question regarding which of these services is more important than the others – that is, the value of an ES – depends to a large degree upon the views and needs of stakeholders” (HAUCK et al., 2013).

“Once explained, the importance of ecosystem services is typically quickly appreciated, but the actual assigning of value to ecosystem services may arouse great suspicion, and for good reason. Valuation involves resolving fundamental philosophical issues (such as the underlying bases for value), the establishment of context, and the defining of objectives and preferences, all of which are inherently subjective” (DAILY, 1997).

Ecosystem services have an unlimited value for humans because without them human life would not be possible. An estimation of a slightly value of ecosystem services is necessary to determine the cost of losing – or the benefits of conserving – a given quantity or quality of services. To determine these values information is needed which is difficult to achieve and for many aspects of the services not available. Still, even if for many services the value is not given or cannot be calculated today, it is better to have some values than ignoring the ecosystem services (DAILY, 1997).

It is important to identify on the one hand which ecosystem service is provided by which kind of environment and on the other hand how much this service is worth, if someone wants to make rational choices between different uses of a given natural environment. Every time societies are going to choose among alternative uses of nature, they cannot ignore the value issue. They have to point out which alternative is considered to be worth more (DAILY, 1997).

Only few ecosystem services are traded in open markets and have fix prices. Most of them can be summarized as consumptive which means they are direct use values of the ‘provisioning services’. For example, these are services directly consumed by people like

crops, livestock, fish and water. The other values, the non-consumptive use values or non-use values have often been important in decision making. This includes for instance spiritual or cultural importance of a landscape or species. However, they are seldomly valued in monetary terms. Other ecosystem services like regulating services and in particular water purification; climate regulation and pollination have scarcely begun to be assigned economic values. They refer to indirect use values and remain mostly invisible in the everyday calculations of civilization (TEEB, 2010).

Two valuation approaches are described by BUSCH et al. (2012): 1.) The quantitative approach allows accounting and monetarisation of ecosystem services. The ecosystem services valued monetary are useful for analyzing the costs and benefits of changes in the ecosystems and to take non-market natural capital into consideration. 2.) The qualitative approach provides a detailed analysis of ecosystem changes and the resulting consequences. Qualitative assessments are useful for providing an overview, indicating trends and identifying trade-offs. They are important for strategic decision-making processes and influence assessment of ecosystem services on different spatial scales. Both approaches can be used to explore the impacts of alternative development options on ecosystems and to realize management options based on the state-of-the-art assessment. The correct assessment approach can be selected by decision-makers on a case-specific basis (BUSCH et al., 2012).

A cost – benefit calculation can be done if more than one service is known and if these services can be expressed in the same value (e.g. in monetary terms). Another important part is the estimation of a “dollar value” regarding to nonmarket ecosystem services (CARPENTER et al., 2009).

It is not negligible to identify how changes either in quantity or in quality of different types of natural capital and ecosystem services could have an influence on human welfare. These changes include small changes at large scales as well as large changes at small scales. In summary, one could say that, changes of ecosystem services will change the costs or benefits of maintaining human welfare (COSTANZA et al., 1997).

According to DAILY (1997) five critical challenges have to be taken into account regarding the valuation of ecosystem services: 1.) Lack of information – “The lack of information on the role, and value, of biodiversity in the supply of ecosystem services necessarily renders the characterizations overly simple and the valuations lower-bound, conservative estimates” (DAILY, 1997). The lack of information is in charge of decreasing the marginal value attributed to ecosystems. 2.) Determination of the value – the marginal value of ecosystems and the services they provide is infinite, but establishing conservation policies implies to define the cost of destroying the next unit of intact natural habitat and to analyze these values is difficult. 3.) Context-dependency – geographical as well as temporal. “Consider savanna ecosystems suited to grazing livestock. The service of supplying forage would be valued only in those geographic areas […] where human societies graze livestock. Moreover,

livestock have different economic […] values in different parts of the world – one must thus specify a particular value of livestock being used to make the calculation" (DAILY, 1997). Furthermore, current prices and social preferences are determining the monetary value of a service. 4.) Market prices – the challenge in market prices is that they are a poor indicator for the value of ecosystem goods and services, because they depend on trade restrictions, subsidies and external effects. 5.) Quantifying services – there are services for which it is not simple to transform them into market value (DAILY, 1997).

Two additional problems have to be faced dealing with the valuation and categorization of ecosystem services. The first one is related to the characterization. It is difficult to classify services into completely separate and independent conditions and processes. A clear separation does not always make sense as many services could not work without the others and would have no value in isolation. The second one is that the number of services leading to a basis of human benefits is randomly given (DAILY, 1997).

Summarizing it can be said that without an assessment and a valuation of ecosystem services no one would even recognize what is important and how important or valuable the different ecosystem services are to human welfare. The approach of assessing and valuing ecosystem services has also been the basis for this thesis.

2.5 Trade-offs and ecosystem services

Trade-offs in the field of ecosystem services are: "a choice that involves losing one quality or service (of an ecosystem) in return for gaining another quality or service. Many decisions affecting ecosystems involve trade-offs, sometimes mainly in the long term" (TEEB, 2010).

This implies that all trade-offs arise from management choices made by humans. Whether they are intentionally or unintentionally, they are changing the ecosystem services in type, magnitude and relative mix. To classify trade-offs three terms can be considered: 1.) Temporal scale – defines if the effects take place slowly or rapidly. 2.) Spatial scale – defines if the effects are local or further away. 3.) Reversibility – defines that a disturbed ecosystem service can return back to its original state if the disturbance ends (RODRÍGUEZ et al., 2006).

As already mentioned the economic values of ecosystem services can be an efficient help in achieving a better use of natural resources and it can also clarify the costs of reaching environmental targets. A valuation in these conditions is helpful for policy makers. They are able to approach trade-offs in a good way without the negative prejudices that private wealth and physical capital is of a greater importance than public wealth and natural capital (TEEB, 2010).

The most important trade-offs are between agricultural production and other ecosystem services (e.g. biodiversity, soil and water quality, and water availability). New technologies

and new progresses mitigate the trade-offs and make it easier to consider specific factors when making decisions. Nevertheless the trade-offs still need to be understood and acknowledged all the time during decision-making process (RODRÍGUEZ et al., 2006).

Decisions in trade-offs show a clear line in their importance. First provisioning services, followed by regulating services and in the end cultural services. This is due to the fact that the supporting services are taken for granted and the cultural services are mostly unquantified in scenario modeling. As a result "[…] the calculated model results do not fully capture losses of these services that occur in the scenarios" (RODRÍGUEZ et al., 2006). In the quantitative scenario model the services which are perceived most important (provisioning and regulating ecosystem services) by society are taken into account. This models do not capture the trade-offs of cultural and supporting services (RODRÍGUEZ et al., 2006).

In the TEEB-study 24 ecosystem services were examined and only four of them showed an improvement. Crops, livestock, aquaculture and carbon emission had an improvement, conversely 15 other service had been degraded (see table 2). These are for example; capture fisheries, timber production, water supply, waste treatment and detoxification, water purification, natural hazard protection, regulation of air quality, regulation of regional and local climate, regulation of erosion, and many cultural benefits. All these trade-offs have an influence on different people in different ways (MILLENNIUM ECOSYSTEM ASSESSMENT, 2005).

Table 2: Trends in the human use of ecosystem services and enhancement or degradation of the service around the year 2000 (based on ARGADY, T. et al. 2005)

	Ecosystem services	Sub-category	Human use	Enhanced or degraded
1. Provisioning services	Food	Crops	+	+
		Livestock	+	+
		Capture fisheries	-	-
		Aquaculture	+	+
		Wild plant and animal products	NA	-
	Fiber	Timber	+	+/-
		Cotton, hemp, silk	+/-	+/-
		Wood fuel	+/-	-
	Genetic resources		+	-
	Bio chemicals, natural medicines, and pharmaceuticals		+	-
	Ornamental resources		NA	NA
	Fresh water		+	-

2. Regulating services	Air quality regulation		**+**	**-**
	Climate regulation	Global	**+**	**+**
		Regional and local	**+**	**-**
	Water regulation		**+**	**+/-**
	Erosion regulation		**+**	**-**
	Water purification and waste treatment		**+**	**-**
	Disease regulation		**+**	**+/-**
	Pest regulation		**+**	**-**
	Pollination		**+**	**-**
	Natural hazard regulation		**+**	**-**
3. Cultural services	Cultural diversity		**NA**	**NA**
	Spiritual and religious values		**+**	**-**
	Knowledge systems		**NA**	**NA**
	Educational values		**NA**	**NA**
	Inspiration		**NA**	**NA**
	Aesthetic values		**+**	**-**
	Social relations		**NA**	**NA**
	Sense of place		**NA**	**NA**
	Cultural heritage values		**NA**	**NA**
	Recreation and ecotourism		**+**	**+/-**
4. Supporting services	Soil formation		**x**	**X**
	Photosynthesis		**x**	**X**
	Primary production		**x**	**X**
	Nutrient cycling		**x**	**X**
	Water cycling		**x**	**X**

Legend:

+ = Increasing/enhanced

- = Decreasing/degraded

+/– = Mixed (trend increases and decreases over past 50 years or some components/regions increase while others decrease)

NA = Not assessed

x = The categories of “human use” and “enhanced or degraded” do not apply for supporting services since, by definition, these services are not directly used by people. (Their costs or benefits would be double-counted if the indirect effects were included.)

“When tradeoff decisions are made within a well- informed, relatively homogeneous decision-making community, where the loss of one benefit is balanced by the gain of another, the community can be assumed to make nuanced value-based judgments regarding such tradeoffs without technical interventions” (CARPENTER et al., 2009).

Nevertheless, many tradeoffs of ecosystem services fail this kind of test, because the involved parties are not homogeneous and not well-informed. It often occurs that the benefits are not located in the area where the costs arise (e.g. more and more people are living in cities, but the ecosystem services they need to survive are created far away from these cities). Trade-off irregularity can even cause injustice over generations. Due to actions in the present, a loss of ecosystem services in the future can occur (CARPENTER et al., 2009).

“The selection of appropriate remedial and abatement strategies for contaminated sites, land use planning, and regulatory processes often involves multiple additional criteria such as the distribution of costs and benefits, environmental impacts for different populations, safety, ecological risk, or human values” (KIKER et al., 2005). Due to the fact that environmental concerns are based on moral and ethical principles which are not related to economic use and value, some of the mentioned criteria cannot easily be transferred into monetary value. Even if it was possible to define a common unit for these multiple criteria rankings, it might not the best to choose this approach because it can occur that the ability to track conflicting stakeholder preferences gets lost in the process. Choosing out of a lot of alternatives leads to trade-offs which are going to dissatisfy one or more stakeholder groups (KIKER et al., 2005).

Different trade-offs can occur due to the actors and economic properties involved. Whether an approach is more quantitative or qualitative has to do with the type and number of services involved and the standard analyzed. (BUSCH et al., 2012) ”The setting of normative priorities needs to be case-specific and spatially explicit, since priorities may change from one area to another and across scales” (BUSCH et al., 2012, RODRÍGUEZ et al., 2006).

“The indicators used to describe the “good ecological status” of water bodies in the EU Water Framework Directive […] are an example of a one-dimensional normative setting. The legally binding framework allows identifying distances between current status (measurements) and target (indicators) and the quantification of measures and costs to close the gap between the both” (BUSCH et al., 2012).

A major field for further research is related to concepts for reliable assessment of multiple ecosystem services, their synergies and trade-offs (BUSCH et al., 2012). Even if indicators can be defined, substantial challenges remain. “Quantification of tradeoffs among ecosystem services and their interactions with human well-being are among the most pressing areas for research” (CARPENTER et al., 2009).

Without a rational trade-off system the existing conflict potential - which will be relevant as long as there are humans who are depending on ecosystem services - might even increase due to an unregulated use and without seeing the pros and cons of the ecosystem services.

2.6 Ecosystem services in political strategies

This chapter serves to give a short overview and outlook about political strategies which are dealing with ecosystem services and are of importance in the study area as well.

The first strategy is the Directive 2009/28/EC of the European Parliament and of the Council from April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. The aims of this directive are to get 20% of the energy in the EU from renewable sources by 2020. Renewable sources are: 1.) wind, 2.) solar, 3.) hydro-electric and tidal power 4.) geothermal energy and 5.) biomass. Through using renewable energy the EU wants to cut greenhouse emissions and be less dependent on imported energy (2009/28/EC).

The first important statement in the directive says that even a growing demand on biofuels and the resulting incentives out of the directive to use these shall not lead to a destruction of biodiversity rich areas. Furthermore it states that these resources which are acknowledged through many international laws shall be further protected and it shall be granted by the responsible authorities that no biofuels will be generated out of areas with a high biodiversity (2009/28/EC).

The next statement relates to the Millennium Ecosystem Assessment Report and states that the report shall be taken into account because it contains data about areas which provide fundamental protective functions of ecosystems in critical situations. It further states that energy out of renewable sources shall be liable to clear rules, also the energy which derives from the sea and other water bodies. The last interesting statement is about hydropower which is generated through pumped-storage-power-plants. The electricity which results out of these power plants shall not be seen as electricity out of renewable energy (2009/28/EC).

This directive therefore does not contribute to an increase of negative effects on ecosystem services and no new conflicts due to trade-offs between existing ecosystem services can be identified.

The next strategy is the “Communication from the commission to the European parliament, the council, the economic and social committee and the committee of the regions” from 2011 about “Our life insurance, our natural capital: an EU biodiversity strategy to 2020”. The EU biodiversity strategy aims are 1.) to stop the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, 2.) to restore them as possible and to increase the EU contribution to prevent global biodiversity loss (COM, 2011).

The first target is to fully implement the Birds and Habitats Directives which shall stop the deterioration of the status of all species and habitats in the EU and improve their status in 2020. Target two comprises maintaining and restoring ecosystems and their services which implicates a restoration of 15% of degraded ecosystems. This includes also an improvement of knowledge of ecosystems and their services in the EU. Target three is about increasing the contribution of agriculture and forestry for maintaining and enhancing biodiversity,

followed by target four ensuring the sustainable use of fisheries resources. One action to reach this target is to eliminate negative impacts on fish stocks, species, habitats and ecosystems. The fifth target is about invasive alien species which shall be combated and the last target is to help avert global biodiversity loss (COM, 2011).

Some of these targets will affect the study area, but in what kind of extent is not clear yet. The Austrian environment agency already held workshops for the obligation and implementation of this new directive in Austria in the year 2012 and in the beginning of 2013.

The last policy strategy is a regional criteria-catalogue from the Styrian government. It is called “Kriterienkatalog zur Ausweisung naturschutzfachlich hochwertiger Fließgewässer in der Steiermark”. This catalogue shall help to investigate whether a river section is a high-quality section or not and serves as standardized objective basis for decision making of the nature conservation agency. It shall help the nature conservation agency to come to a decision before an applicant has to submit his plans for building a hydropower plant. The catalogue is not determined to account nature protection areas, but to evaluate single river sections. The approach shall be embedded in the nature protection preliminary examination, but the preliminary examination is no anticipation for the permission procedure. If an area where the hydropower plant shall be built is in a nature protection zone (e.g. national parks, natural monument and nature sanctuary) the criteria-catalogue will not be used (AMT DER STEIERMÄRKISCHEN LANDESREGIERUNG, 2008).

Due to the fact that this catalogue is only applicable for small waters and the Enns is explicitly mentioned as river where it cannot be applied, it is only interesting for all the small tributaries in the Enns region. It helps the nature conservation agency and the persons who want to build a power plant already in the run-up to the planning.

3 Study Area

Due to already existing data from other studies (HOHENSINNER et al., 2008) and (HOHENSINNER et al., 2010) the river Enns in the region from Mandling to Hieflau in Styria, Austria was chosen as study area. The study area was divided into four sections to compare river reaches with different river users. In the following, the river Enns as well as the four different sections and their individual circumstances will shortly be introduced.

3.1 The Enns

The river Enns is located in Austria. It has its source in the Radstädter Tauern in the federal state Salzburg and continues through the federal states Styria and Upper Austria. It has a catchment area of 6,080 km² wherefrom 350 km² are located in Salzburg, 3,950 km² in Styria and 1,780 km² in Upper Austria. The Enns flows from the Radstädter Tauern northeast till it disembogues into the Danube. The complete length of the river is 254.15 km and it has a difference in altitude of 1,497 m. The catchment area is limited in the north by the river Traun and the rivers Mur and Mürz and in the west by the Salzach (JUNGWIRTH et al., 1996).

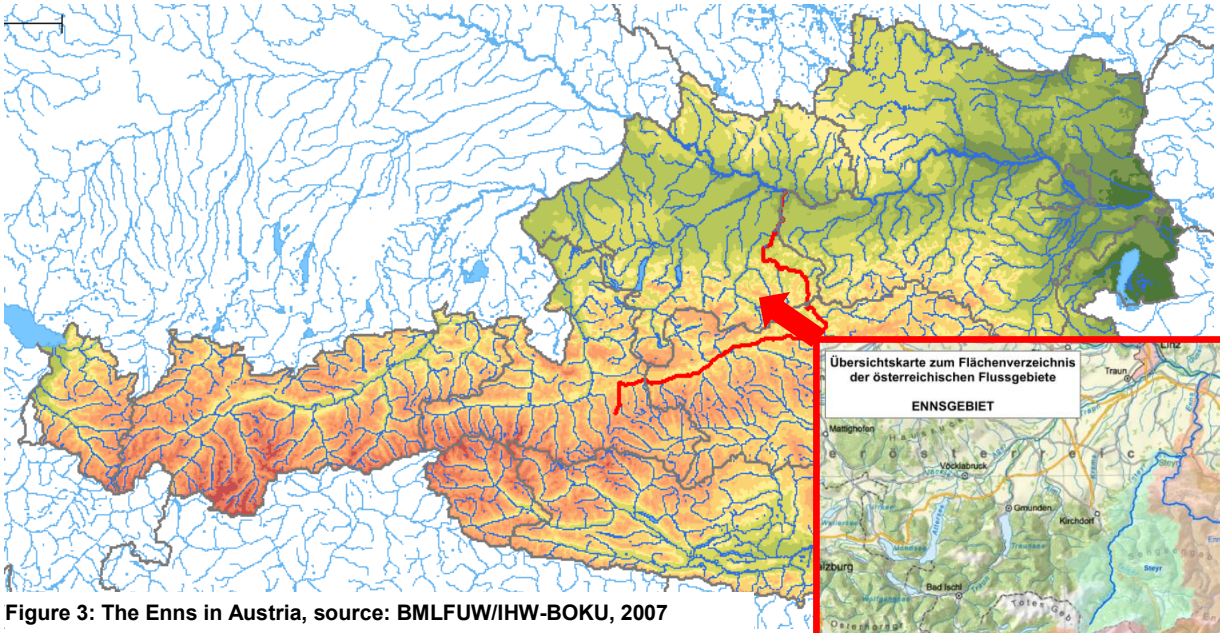


Figure 3: The Enns in Austria, source: BMLFUW/IHW-BOKU, 2007

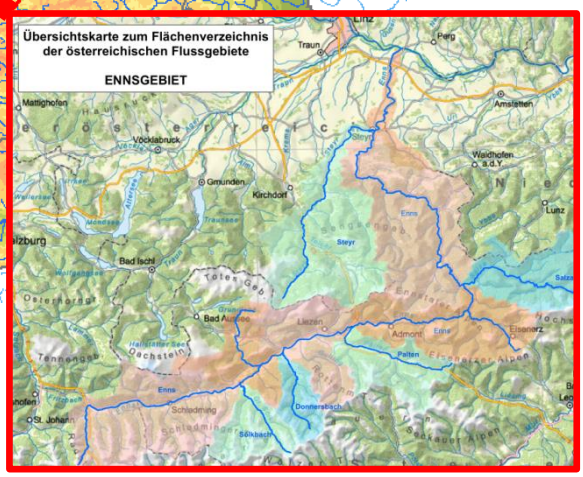


Figure 4: Catchment area of the Enns, source: HYDROGRAPHISCHER DIENST ÖSTERREICHS, 2011

According to PARDÉ (1947) the Enns is characterized by a nival regime in the mountainous countryside of Austria. The minimum discharge occurs during the winter months and the maximum discharge occurs during May, due to snowmelt (MADER et al., 1996). As a result of minor glaciers in this region (the Dachsteinglacier is draining mostly north) the discharge decreases after May. During summer and especially in August high flood events can occur due to severe rain events (HOHENSINNER et al., 2010).

The temperature for the upper Enns during the year is characterized by low temperature. The maximum value is 14.00 °C during summer and the minimum is during winter with a temperature of 0.0°C. The mean water temperature measured from 1981 to 1990 was at 6.3°C (HYDROGRAFISCHER DIENST IN ÖSTERREICH, 1994).

Prior to the mid-19th century, the Enns had minimal human regulation. The valley could be described as post glacial with swamps and floodplains. The valley was not considered for settlement and agricultural usage was rarely possible. To improve the agricultural situation an imperial resolution was made in 1859 to regulate the river Enns. A first investigation showed problems with bed-loads which were located in the torrents and tributaries, an insufficient slope for a quick transportation of water and bed-loads and a strong destructive influence of wood drift. In 1866 the wood drift was stopped which induced better working conditions for river engineering. To regulate the Enns within its complete length and to increase its' slope, the river was channelized with a width of 19 m. Due to the channelization many of the big river slopes were broken through. To ensure that the river had the same continuous width groynes were implemented and deposited sediments had to be secured with willow cuttings. Furthermore the banks were secured with fascines, revetments and riprap structure. A river bed incision of 1.5 meters was also initiated to secure the valley against flood events and allow drainage (JUNGWIRTH et al., 1996).

Today the upper Enns is one of the last longest free flowing river sections in Austria and no hydro-power plants have been built in this part of the river. Only some smaller plants are located in the tributaries. The morphological state of the river, however, is far from a natural condition (JUNGWIRTH et al., 1996).

Due to the regulation and 37 meander breakoffs, the river has lost nearly 20 km of its original length, which leads to another important fact. In most of these four sections the lateral connectivity of the Enns to other tributaries and oxbows is missing, as well as good habitats along and in the river itself. Another result of the regulation and straightening in the area is that the river has a decrease in access to old retention areas by 55% from 600 ha to 270 ha (HOHENSINNER et al., 2008, KLAPF, 1989).

These days the Enns is no longer considered a meandering, but rather an anthropogenic straightened river (MUHAR et al., 2004). A cultural technical drainage was done in the early 1910s and since then approximately 2200 ha have been drained which lead to a decrease in the swamp areas. Of formerly 1479 ha swamp 50 ha are left. The drain changed the swamps, the former meadows and the wetlands. They changed to frequently mown, heavily fertilized and profitable, but species poor pastures (JUNGWIRTH et al., 1996, KLAPF, 1989).

One section of the Enns is in good morphological condition. It is located in the national park Gesäuse and reaches the reservoir of the weir at Gstatterboden. During the last years several projects have taken place to ensure flood protection and to restore the river Enns and its natural habitats. For example two LIFE-projects and one LIFE + project have taken place, all located in the study area. Projects took place in the national park Gesäuse, Wörschach to the Gesäuse and its main project area in Öblarn and Admont (CHIARI, 2010, FLUSSLANDSCHAFT ENNS, 2013, LEBENSMINISTERIUM, 2013a, LEBENSMINISTERIUM, 2013b).

The complete study area has few possibilities with regard to usage distribution. There are single places with direct access to the river and some areas restored which are as well good to access. Also, the path along the river shows a high usage distribution. For example, horse riding, running and walking is popular. However, many river users do not directly get in contact with the river which is most likely due to lacking accessibility (CHIARI, 2010).

In the study area different habitat and land-use types can be identified. A map (of the Gewässerentwicklungskonzept, 2010) of this region gives information about the habitats and land uses. Especially in the area from Schladming to Aich nearly no biotopes are located. The first important areas occur close to Gröbmig where larger areas are defined as protected areas (NATURA 2000 areas), but without minimal interruption. In addition some nature reserves are accounted.

Another map “NATURA 2000 Pürgschachen-Moos und ennsnahe Bereiche zwischen Selzthal und Gesäuseeingang” from the province of Styria, from the year 2005, shows that most of the area close to the Enns is declared as species-poor meadows or as very species-poor meadows. There are only a few areas with swamp structures and some alluvial and spruce forests.

3.2 The four sections of the study area

The four sections are from Mandling to Aich, from Aich to Stainach, from Stainach to the entrance of the national park Gesäuse and from the entrance of the national park to Hieflau.

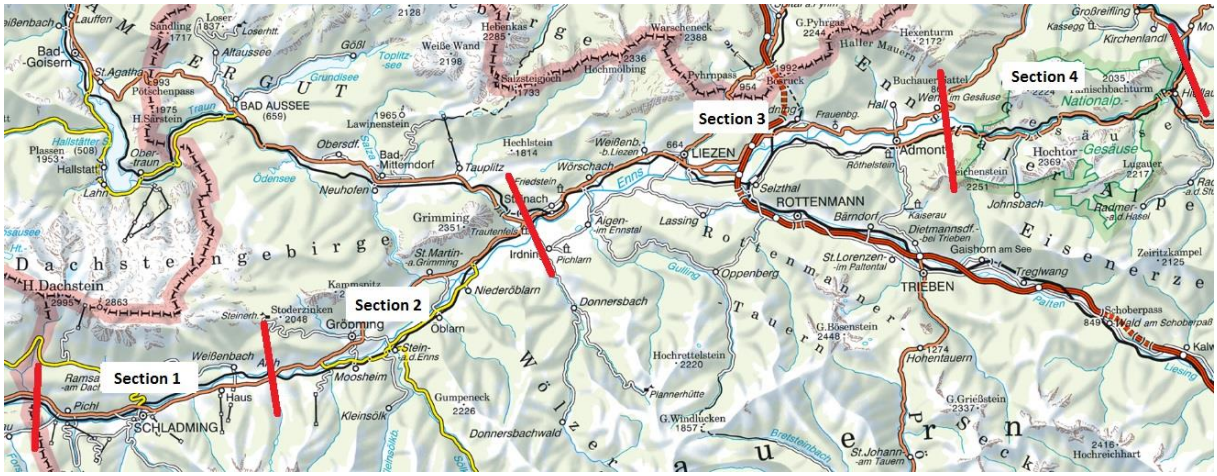


Figure 5: The study area of the Enns and the four sections, source: Austrian map Fly, ÖK 500, BEV-Bundesamt für Eich- und Vermessungswesen, 2012

3.2.1 The first section from Mandling to Aich

Mandling has approximately 1.000 inhabitants and belongs to two different communities and two federal states. It is divided by the river Mandling which is the border between Salzburg and Styria. One side of the Mandling is located in Salzburg in the community Radstadt and the other side belongs to Styria to the community Pichl-Preunegg (SALZBURG WIKI, 2013). The region is most famous for its tourism. During summer there are several nice hiking trails to different lakes and some via ferrates. During winter the Reiteralm is famous for its ski and snowboard area (PICHL – REITERALM, 2013).

The river Enns between Mandling and Schladming has its natural geomorphological characteristics. The flow velocity is very high: for that reason the substrate in the river is coarse-grained and only some woody debris exist in this section. River engineering measures are only implemented where cut banks occur and to protect the railway, pylons and the federal highway. Another influence on the river can be seen by the run-off-river plant Mandling in the Mandlingbach. It is located in this first section at the beginning and has an impact on the Enns due to hydro peaking (JUNGWIRTH et al., 1996).

The next largest city is Schladming with 4.432 inhabitants. The river Enns flows through the city and is due to safety reason regulated there. Impacts by the run-off-river plant Mandling and its hydro peaking can still be seen in Schladming (JUNGWIRTH et al., 1996). The city and the region are famous for its tourism. In 2012 the community had more than 123.000 visitors and more than 483.000 overnight stays. During winter there are several places for skiing and snowboarding and in February 2013 the FIS Alpine Ski WM took place in Schladming. During summer hiking, rafting and mountain biking are the most popular activities for visitors (STADTGEMEINDE SCHLADMING, 2013).

The river section from Schladming till Pruggern is hardly affected in its appearance. River engineering measures have been implemented resulting in cut banks similarly to the Mandling reach (JUNGWIRTH et al., 1996). Furthermore in the course of implementing flood protection measures, some restoration measures in Aich have been implemented as well. For example, a new side channel was implemented, the estuary of the Gradenbach was restored and a section of 250m on the Enns was widened and restored (HOHENSINNER et al., 2010).

Figure 6: Schladming and the Enns, source: 'Bild Hauer', 2007, on behalf of the Styrian government

Figure 7: The Enns close to Oberhaus, source: 'Bild Hauer', 2007, on behalf of the Styrian government

3.2.2 The second section from Aich to Stainach

The first municipality in this section, Pruggern, is located in the middle of the Styrian Enns valley and has an estimated 650 inhabitants. Even though it is a small village compared to Schladming, it has more than 80,000 overnight stays and one of the reasons why there are so many overnight stays is attributed to ski and snowboard possibilities which are close by at the Galsterberg (GEMEINDE PRUGGERN 2013). From Pruggern onwards the Enns has been heavily modified. Meander breakthroughs occurred and many tributaries were cut off. Due to these measures there was and is a high loss in bank structures, habitats and substrate diversity. Between the breakthroughs as well as the areas where groynes are located and fine sediment can deposit, the river's structure is a little bit better. Another run-off-river plant is present in this section in the Kleinsölkbach and the hydro peaking is affecting the river Enns (HOHENSINNER et al., 2008, JUNGWIRTH et al., 1996).

The next city Gröbming with approximately 2,800 inhabitants is located further downstream and also known for its tourism and landscapes (GRÖBMING 2013). It is followed by Öblarn which has close to 1,500 inhabitants and is located further downstream (ÖBLARN, 2013). Close to Öblarn two tributaries are planned to be restored as part of the LIFE+ project "Flusslandschaft Enns". The project includes an oxbow in Gersdorf with a length of 1,000m which shall be reconnected and where 0.8 ha of alluvial forest and 4,000 m² of pools shall be restored. The other component is the Walchenbach where 1.1 ha of alluvial forest shall be saved, 200 m of the brook itself will be restored, 2000 m² of pools are to be built or preserved

and 1.5 ha of the neighboring NATURA 2000 area will be enlarged (FLUSSLANDSCHAFT ENNS, 2013). Further downstream is the river Salza, where the next power plant is located and hydro peaking is affecting the Enns (JUNGWIRTH et al., 1996).

Figure 8: The Enns close to Trautenfels, source: 'Bild Hauer', 2007, on behalf of the Styrian government

Figure 9: The Enns close to Niederöblarn, source: 'Bild Hauer', 2007, on behalf of the Styrian government

3.2.3 The third section from Stainach to the entrance of the national park Gesäuse

The largest cities in the next section are Stainach with an estimated 2,200 inhabitants, Liezen with approximately 6,900 inhabitants and Admont with 2,500 inhabitants. Liezen is, with 3,280 km², the largest district in Styria. The alp Hinteregg is close to the city and famous for its numerous hikes and walks. In Admont the 1074 founded Benedictine Monastery is well known for its world largest monastic library (MARKTGEMEINDE ADMONT, 2013, STADTMARKETING & TOURISMUS LIEZEN, 2013, VERWALTUNG LAND STEIERMARK 2013a, VERWALTUNG LAND STEIERMARK 2013b, VERWALTUNG LAND STEIERMARK, 2013c).

The section of the river Enns from Stainach to Liezen is the most heavily regulated section in the project area. The shores are completely protected by rip raps and the riverbed is very monotonous with only some single groynes which lead to higher differentiation in the structure by depositions and woody debris. The effects of the power plant Salza are still seen in this section (JUNGWIRTH et al., 1996).

From Liezen to the entrance of the national park Gesäuse the Enns is still modified, but less than before. Several breakthroughs are located in this area and if settlements occur they reach the shores of the Enns. In between the breakthroughs gravel banks can be found and the breakthroughs themselves are not well ensured which cause an accumulation of woody debris leading to depositions of finer sediments (JUNGWIRTH et al., 1996, HOHENSINNER et al., 2010).

In the third section the LIFE-project “Securing wetlands in the Enns valley” took place from 1995 to 1998. It is located from Wörschach to the entrance of the national park and it served to preserve humid habitats like the „Pürgschachener Moor“, a raised bog, the „Wörschacher

Moor“ and some other wetlands. The main focus was to ensure the endangered areas by purchasing and leasing the areas and by exchanging more valuable areas with other ones (LEBENSMINISTERIUM, 2013a). Another LIFE+ project which was mentioned previously is also located in this section. The project “Flusslandschaft Enns” has five different project areas in this section and the measures will include reconnecting tributaries, enlarging and ensuring alluvial forest areas, widening of the Enns and creation and securing of pools (FLUSSLANDSCHAFT ENNS, 2013).

Figure 10: Stainach and the Enns, source: 'Bild Hauer', 2007, on behalf of the Styrian government

Figure 11: The Enns after Liezen, source: 'Bild Hauer', 2007, on behalf of the Styrian government

3.2.4 The fourth section from the entrance of the national park Gesäuse to Hieflau

With the beginning of the Gesäuse a change in the landscape can be determined. From a wide valley the landscape transfers to a fifteen kilometer long V-shaped valley in which the Enns has entrenched itself. The slope increases and the river becomes wilder and faster. The name Gesäuse is derived from; the whistling and roaring of the fast flowing water. Since 2002 the Gesäuse is the sixth and with a total area of 11,054 ha the third biggest national park in Austria. Most of the area is covered by forest (50%), followed by alpine regions (31%) and scrubland (13.5%). Five percent are pasture and only 0.5% are water areas. The only river engineering measures are located where the railway and federal highway are running. The sediment banks provide a special habitat for animals and plants. They occur more often in a natural river and these structures are extreme niches where only specialists can survive. The most important factors for these habitats are regular flood events, rearrangements of the sediment, high irradiations, high variations in temperature, limited access to nutrients and a temporary strong mechanical stress. At the end of the section the power plant Hieflau which was built in 1953 to 1963 dammed the Enns which is therefore heavily modified in this section (JUNGWIRTH, 1996, NATIONALPARK GESÄUSE GMBH, 2013).

One aim with the establishment of the national park was to protect nature and to improve and popularize the natural experience under the name “Gesäuse”. This brand is very important for the complete region and there already exists a broad touristic information and adventure offer that is trying to be compatible with nature. The main focus lies on alpine tourism and extensive summer tourism (HOHENSINNER et al., 2008).

To ensure a nature-compatible use of the national park, several actions for a visitor management system were established. The authorities of the national park together with the communities and alpine organizations developed a road/trail network where biking, mountain biking and horse riding are only allowed on designated ways and water habitats are only allowed to be entered at specific points (NATIONALPARK GESÄUSE GMBH, 2013).

The LIFE-project “Nature protection strategies for forest and river in the Gesäuse” took place during 2005 to 2010. The aim was to improve different habitats along the Enns and to create a better connection to its tributaries. Therefore, the forest and the different waters were in the main focus of the restoration. The forests, which were long used in favor of economic efficiency, were in some parts gently reduced to near-natural forests. The tributaries were more difficult to restore because the danger of avalanches, mudflows and floods had to be integrated in the project. For example the Johnsbach which flows in the Enns was heavily regulated and not easy to manage, but with new flood protection measurements in consideration, the aquatic ecology was leading towards a reasonable success (LEBENSMINISTERIUM, 2013b).

Figure 12: Ecological footprint labyrinth in the National Park Gesäuse

Figure 13: The Enns in the National Park Gesäuse

4 Methods

This chapter lists and describes the methods used to collect and analyze the data for this thesis. The data collection process was carried out in collaboration with Kerstin Böck and Renate Polt and serves as a database for three individual research studies. This chapter also clarifies the underlying data selection process for our research objectives.

4.1 Qualitative interviews

To collect the required qualitative data for our research we (K. Böck, J. Oberdiek, R. Polt) conducted 86 problem-centered guided interviews with stakeholders of the Enns river. This interview method was first introduced by A. Witzel (1985). The problem-centered interview is characterized by three main criteria: problem centering (the researcher's orientation on relevant social problems), object orientation (methods should be developed/modified based on the object) and process orientation (process orientation in the research process and the understanding of the object) (FLICK, 2007, WITZEL, A., 2000).

K. Böck carried out the main selection process of the interviewees. Instead of randomly selecting partners for our interviews, we chose the interviewees based on the method of purposive sampling (FIEDRICHS, 1990). The main idea of this method is that not every stakeholder of the river Enns had the same probability of being selected as an interviewee, but we rather chose them based on different selection criteria. We assumed that different categories of stakeholders, e.g. fishers, persons involved in nature conservation programs or water managers have different perceptions in the availability of ecosystems services and conflicts which might occur at the Enns and therefore we sought to include as many unequal stakeholders as possible to gain a broader insight. To achieve this we selected potential interviewees by researching the internet and by directly asking interviewed stakeholders whom else they would consider as promising and suitable interview partners in relation to our research questions. In order to ensure a balanced participation of interviewees from different organizational levels we clustered and selected them according to the following three categories:

- Strategists (Decision- and policy makers)
- Implementers (river managers)
- Users (organized/not organized public)

The MILLENNIUM ECOSYSTEM ASSESSMENT (2005) recommends including decision makers from three organizational levels, namely local, national and international levels. For this study, we decided to include national and local stakeholders only.

While contacting our potential interview partners (via E-Mail and telephone) we noticed that certain stakeholder groups were more interested and/or willing to participate than others. It was especially difficult to find stakeholders from the tourism sector to participate in the interviews which was on the one hand due to the FIS Alpine Ski WM 2013 where the tourist

agencies had a lot to do and to organize and on the other hand many tourist agencies stated that the Enns is not important for their work field or that they were not very familiar with it to give adequate interviews.

For this master thesis I chose 15 stakeholders of each stakeholder group from the overall 86 available interviews, making a total of 45 interviews as my sample size. As a selection criterion I chose the greatest possible variance between the stakeholders' professions and their relations to the Enns river. Table 3 gives a rough overview of the chosen interviewees and their river related activities/profession:

Table 3: Stakeholder interviewed

Stakeholder group	No.	Organizational level	Classification/Assignment area
Users	1	National	National Forest
	2	National	Citizen's Initiative
	3	National	Bird Protection
	4	National	Environmental Umbrella Organization
	5	Province	Energy production
	6	Province	Environment
	7	Province	Fishery
	8	Region	Energy production
	9	Region	Energy production
	10	Region	Water Sports and Tourism
	11	Region	Tourism
	12	Region	Local Agenda 21
	13	Region	National Park
	14	Region	Citizen's Initiative
	15	District	Agriculture
Strategists	16	National	National Water Management
	17	Province	Water Management, Resources, Sustainability
	18	Province	Planning of Water Management
	19	Province	Water Body Development
	20	Province	Building and land use regulation / land use law
	21	Province	Building and land use regulation / regional land use planning
	22	Province	Regional land use planning
	23	Province	Natural Hazard Management – Water
	24	Province	Natural Hazard Management – Water
	25	Province	Natural Hazard Management – Water
	26	Province	Natural Hazard Management – Water

	27	Province	Nature Protection
	28	Province	Nature Protection
	29	Province	Nature Protection / Environmental Protection Authority
	30	Province	Nature Protection / Environmental Protection Authority
Implementers	31	Province	Tourism
	32	Province	Land use planning, LIFE+ project participation
	33	Province	Torrent and avalanche control
	34	Province/Community	Mayor
	35	Region	Construction management, torrent and avalanche control
	36	Region	NATURA 2000 Project support
	37	Region	Water Body Ecology, technical bureau
	38	Region	Road construction and traffic engineering
	39	Region/Section	National Park “Gesäuse”, Nature Protection
	40	District	Hazard protection
	41	District	Enns river construction management
	42	District	Nature Protection
	43	Community	Mayor
	44	Community	Mayor
	45	Community	Vice Mayor

The interview guideline contained questions from the following main subject areas: Trends of the usage of ecosystem services, the ecosystem service approach and ecosystem service assessment. As an opening question, we asked the interviewees about their current river related activities and their professional field. This open question served as an ice-breaker, gave us an insight into the interviewee’s background and helped to initiate the narrative component of the interview. The complete interview guide can be found in appendix.

To ensure a detailed and correct recording of the interviews we not only made notes, but we also audiotaped them with the prior consent of the interviewee. This enabled us to draw up transcripts of the interviews later. The transcription process is very time consuming and expensive. KUCKARTZ (2010) estimates the transcription to take approximately five to ten times as long as the interview duration itself. He therefore states that it depends on the researcher and his or her research question to decide how thorough and detailed the transcription should be carried out. For our analysis it was not required to transcribe the entire interview word for word, therefore we mostly paraphrased the content from the audiotapes.

4.2 Standardized questionnaires

In general the term survey is defined as a communication between two or more persons. With the use of verbal stimuli (questions) verbal reaction (answers) is caused. The answers refer and show opinions and evaluations. In this thesis the quantitative survey consists of a semi-standardized questionnaire (see appendix) where the participants responded to open-ended questions and questions with multiple answer options. The questionnaire defines the content, the number and the order of the questions. It also sets the terminology of the questions and the manner of use of the response categories (ATTESLANDER, 2008).

The data collection for the quantitative data was done again by K. Böck, J. Oberdiek and R. Polt. The method was a semi-standardized questionnaire and to achieve a high number of participants, several different methods of conducting the interviews were applied. As one example we asked visitors at different places at the river. Secondly we combined the qualitative with the quantitative interviews and distributed questionnaires among the interviewees with the request to ask friends and colleagues to take part in our work and send the completed questionnaires by post. Telephone interviews were also used, where the participant got the questionnaire by e-mail prior to the interview.

The main area for our inquiries was the river Enns and the neighboring communities. Two main locations for target area surveys were the national park Gesäuse and Schladming. Furthermore many questionnaires, as mentioned above, were filled out by the interviewed people after the qualitative interviews.

The following table shows the interviewers, day, region, method and number of interviews conducted (several questionnaires not included were sent by post later).

Table 4: Interviews conducted 2012 and 2013

Name	Date	Area	Method	Total number of interviews
Böck/Polt	18.09.2012	Schladming - Admont	Questionnaires and interviews	5
Polt	28.09. – 29.09.2012	Schladming	Questionnaires	9
Oberdiek	29.09.2012	National Park	Questionnaires	11
Böck/Polt	30.10.2012	Liezen	Questionnaires and interviews	4
Böck/Oberdiek	05.11.2012	Graz	Questionnaires and interviews	6
Oberdiek/Polt	14.11. – 16.11.2012	Schladming - Liezen	Questionnaires and interviews	11
Oberdiek/Polt	09.12.2012	National Park	Questionnaires	22
Böck/Polt	08.01.2013	Admont – Stein	Questionnaires and interviews	5

The questionnaires were filled out by the interviewees themselves or by the interviewer and 165 questionnaires related to the Enns have been collected from the 01st of September to the 22nd of January. All questionnaires which have been transmitted later than the end of January (for example some stragglers by post) are not included in this thesis due to the lack of time, but they will be evaluated in the dissertation of K. Böck (2014).

The structure of the questionnaire can be seen in the following figure.

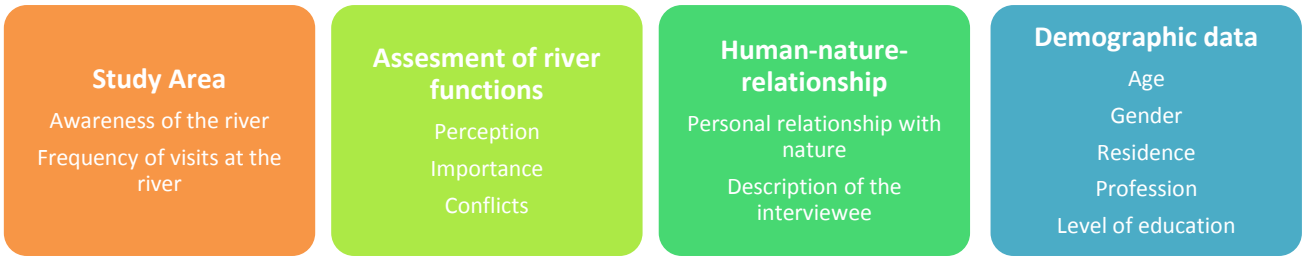


Figure 14: Subject areas of the questionnaires

The complete questionnaire comprised 15 questions; one interview took about 15 to 20 minutes. The questions can be defined as closed questions and questions where different answer options could be chosen by the interviewees. The main focus laid on the „perception of river landscape functions“ of the participants.

The interviewees were first asked if they knew anything about ecosystem services. If the response was “no”, a short introduction was given by us. The first question followed where the interview immediately was stopped if one of the interviewees did not know the region at all. This question therefore served as filter question.

Closed questions were formulated in the way that the interviewee was offered different possible answers and could choose the answers that were most suitable for him (ATTESLANDER, 2008). As an example of this kind of question, see question number 2:

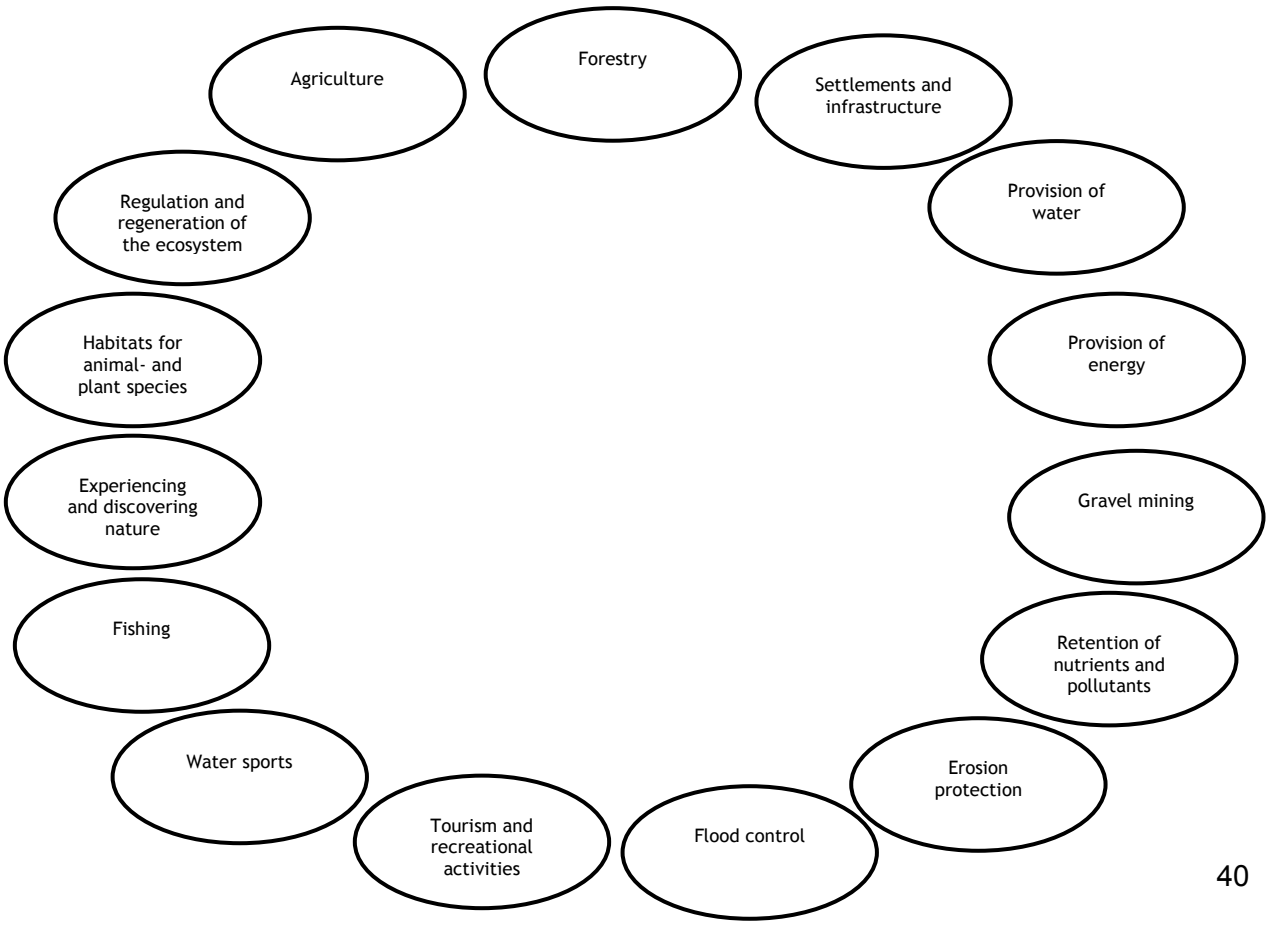
How often do you spend your time directly at the river?

	section 1 (Mandling – Aich)	**section 2** (Aich - Stainach)	**section 3** (Stainach – Gesäuseeingang)	**section 4** (Gesäuseeingang – Hieflau)
daily to several times a week	○	○	○	○
several times a month	○	○	○	○
several times a year and lessfrequently	○	○	○	○
I have never been there	○	○	○	○

According to ATTESLANDER (2008), three different forms of closed questions exist: the identification-type, the selection type and the yes-no-type.

The selection-type is a question with given alternatives. The interviewee can choose between one, two or several possible answers (ATTESLANDER, 2008). As an example see question number 4. 2:

Between different forms of use certain conflicts are possible. Where do you see the most important potentials for conflict in the section we just dealt with? *(please connect the respective potentials for use)*



The yes-no-type questions are simple, sufficient, and to be answered with “Yes” or “No” (ATTESLANDER, 2008). This was the case for question 4.3:

Is there another river section that you want to answer the same questions for?

yes	no
○	○

If yes => Please use supplementary sheets & fill out one table for each section

During the interview the participants also had to answer rating scales. A table had to be filled out where participants could choose available functions and their future importance for the region. Thee interviewees had to choose one out of five values on both questions. It was stressed beforehand that only their perception is being asked and not their knowledge. As example only one service is shown here from question number 4.1:

In the following, please indicate which functions are available at the river Enns and the adjacent area according to your perception in the river section you know best. Furthermore please indicate how important you think they are for the region’s future:

	function available						For the region’s future: How important is this function?					
	cannot tell	yes	rather yes	neutral	rather no	no	cannot tell	very important	important	neutral	less important	not important
opportunities for agricultural use	○	○	○	○	○	○	○	○	○	○	○	○

This question determined which ecosystem services were available and which of them were considered very important or not important.

Furthermore the questionnaire included questions considering the human-nature-relationship, but this data will only be used in the dissertation of Kerstin Böck. The complete questionnaire can be found in the appendix.

4.3 Software and analyzes

The input of the quantitative interviews and the first analysis of them were done via an online database, which was created for the processing of the questionnaires. The advantage of this online database was that more than one person was able to work on it at the same time. The data was afterwards one more time checked for completeness and plausibility and then transferred to SPSS for statistical analyzes. In SPSS first cross tables and significance test were carried out. Later on the data was transferred into Microsoft Excel and more analyzes and calculations were done, as well as tables were created and figures were set up. For example a residual test to determine whether the distribution of conflicts was typical or atypical was carried out.

Analyzes of the qualitative interviews were carried out using the software package, MaxQDA. MaxQDA is a software program to analyze qualitative data. It helps to manage the data clearly and search for certain text passages on the basis of selected search criteria (KOPP and MENEZ, 2005). The actual analyzes has to be done by the editor himself. The recorded qualitative interviews were anonymized and key response words and sentences were transcribed. The majority of the audiotape content was paraphrased and transferred into MaxQDA. The transcribed text data was coded computer-aided using a deductive category system. For the statistical analyzes of the qualitative data the software Microsoft Excel was used.

5 Results

The results can be divided into two parts. A bigger part stems from the quantitative survey data as most of the research questions will be answered by them. The other part is reserved for the qualitative interviews which serve as a second validation of some results. First of all the quantitative as well as the qualitative survey data will shortly be analyzed in terms of the socio-demographic data.

5.1 Socio-demographic data of the quantitative interviews

In the following chapter the 165 participants of the quantitative interviews are going to be characterized by chosen socio-demographic features.

5.1.1 Age distribution

Figure 15 shows the age distribution of all interviewed persons during the quantitative survey. As mentioned before, these included (unorganized) visitors of the river Enns as well as persons from different stakeholder groups.

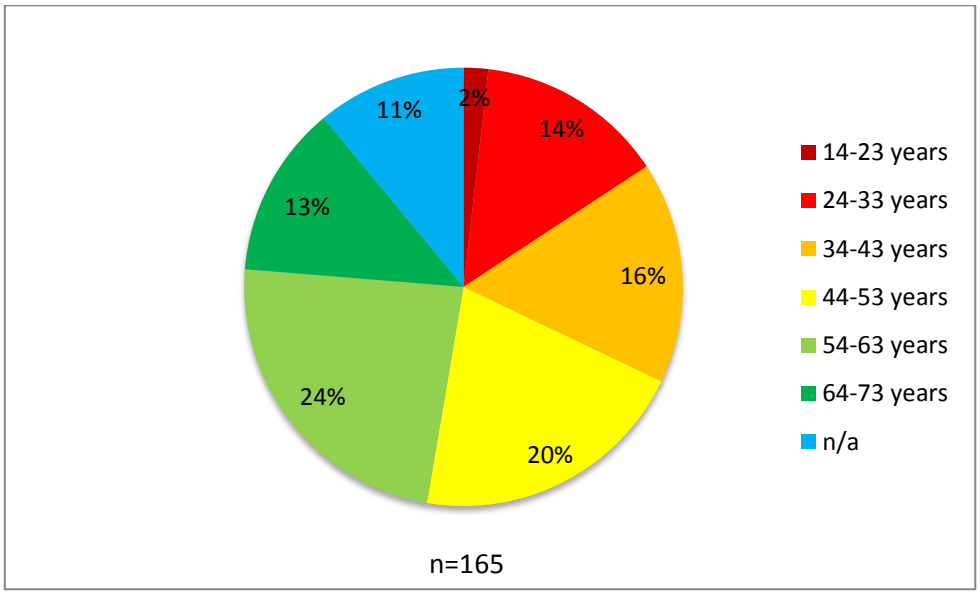


Figure 15: Age distribution of persons interviewed during the quantitative survey

The biggest part (nearly one quarter) of all interviewed persons was in the age range from 54-63 years with 24%. This was followed by the group of the 44-53 year old persons with 20% and the third group in the range from 34-43 years with 16%. The average age of the interviewed persons was 48.6 years; 11% of the interviewees did not declare their age. The group with the lowest number of persons interviewed was the one ranging from 14-23 years. This might be due to the fact that many people in higher job positions were interviewed which entails most of the time a higher age of the interviewees.

5.1.2 Gender distribution

The gender distribution is shown in the next figure. 67% of the interviewed persons were male and 33 % female.

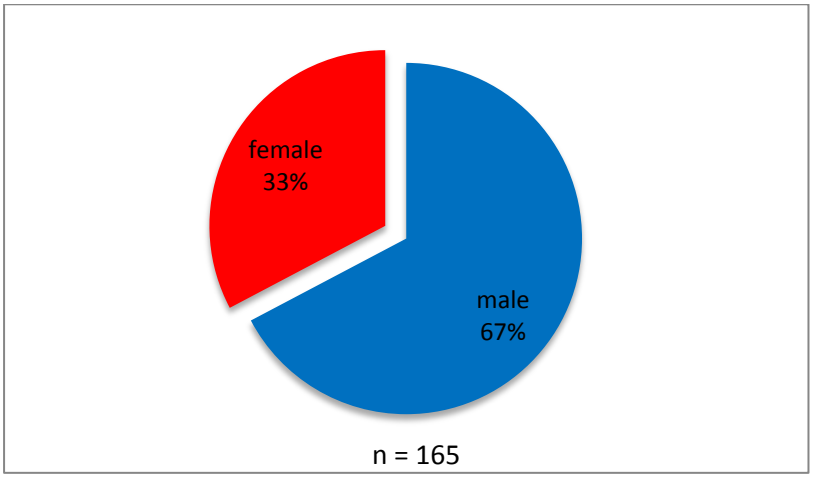


Figure 16: Gender distribution of persons interviewed during the quantitative survey

5.1.3 Highest educational attainment

Nearly half of the interviewed persons had a university degree which again is due to the fact that many people in higher job positions were interviewed. The second biggest group was with 16% persons with an apprentice training, followed by 10% of the interviewees which had a vet college degree and 5% of the interviewees did not give any indication.

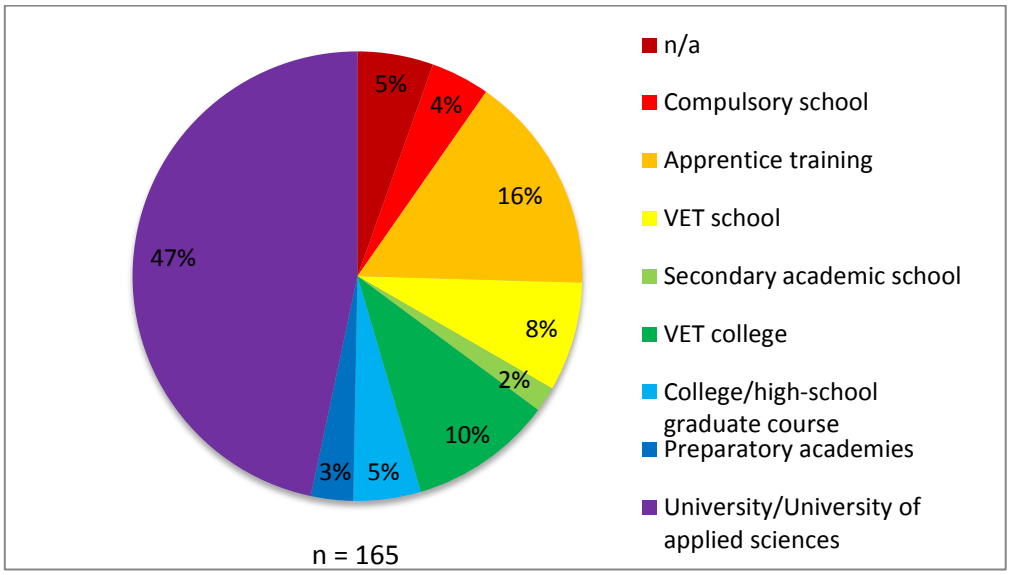


Figure 17: Highest educational attainment of persons interviewed during the quantitative survey

5.1.4 Main residence

Nearly half of all persons interviewed during the quantitative survey were living within a radius less than 3 kilometers around the project area. The second biggest part of all interviewed persons lived further away than 20 km which can be explained by the fact that some interviews have took place in Vienna and some in Graz where the provincial government has its residence.

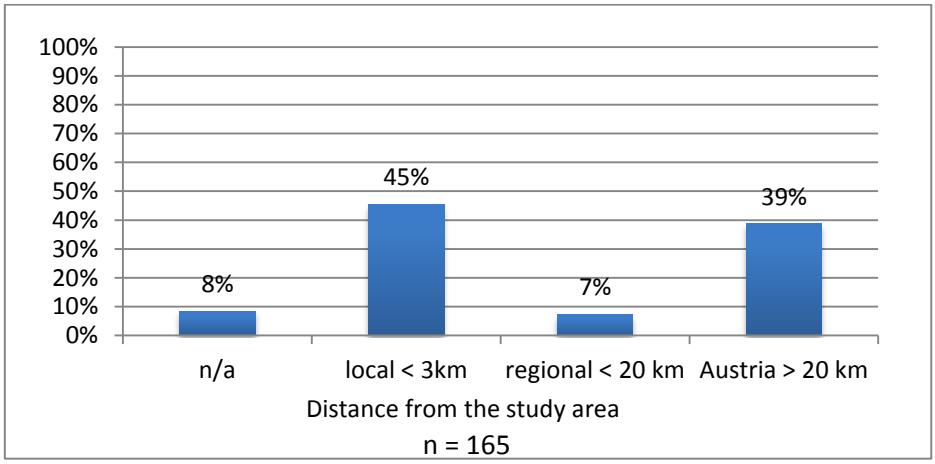


Figure 18: Main residence of persons interviewed during the quantitative survey

5.2 Socio-demographic data of the qualitative interviews

In the following chapter the 45 participants of the qualitative interviews are going to be characterized by chosen socio-demographic features. During the qualitative interviews this data was not consistently asked from the interviewees and is not relevant for the final conclusion, but it displays the difference in group composition.

5.2.1 Age distribution

The age distribution of the persons interviewed during the qualitative interview is shown in figure 19.

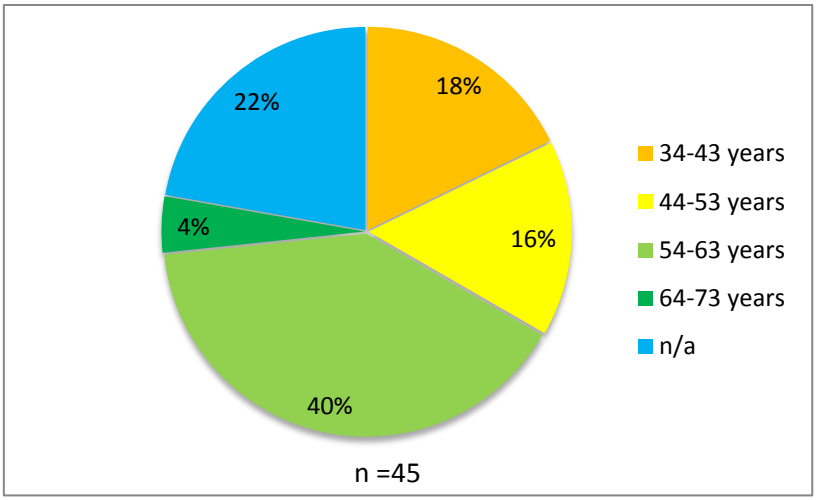


Figure 19: Age distribution of persons interviewed during the qualitative survey

Nearly half of the persons (40%) were between 54-63 years. The smallest group is in the age range from 64-73 years. 22% have given no answer. No one was younger than 34. This can be explained by the fact of the high educational attainment and the therefore high job positions these persons are in which can be seen in chapter “5.2.3 Highest educational attainment”. The average age was 52.7 years.

5.2.2 Gender distribution

The gender distribution for the qualitative survey part is shown in figure 20. 82% of the interviewees were male, 18% were female.

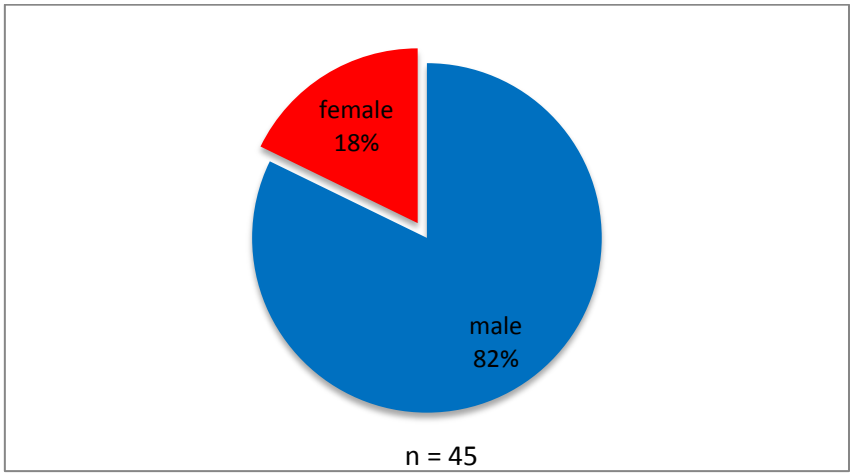


Figure 20: Gender distribution of persons interviewed during the qualitative survey

5.2.3 Highest educational attainment

Most persons that were interviewed for the qualitative survey had a university degree. The second biggest part with 11% had a degree from the vet college, followed by secondary academic school. 2% of the interviewees did not give any indication.

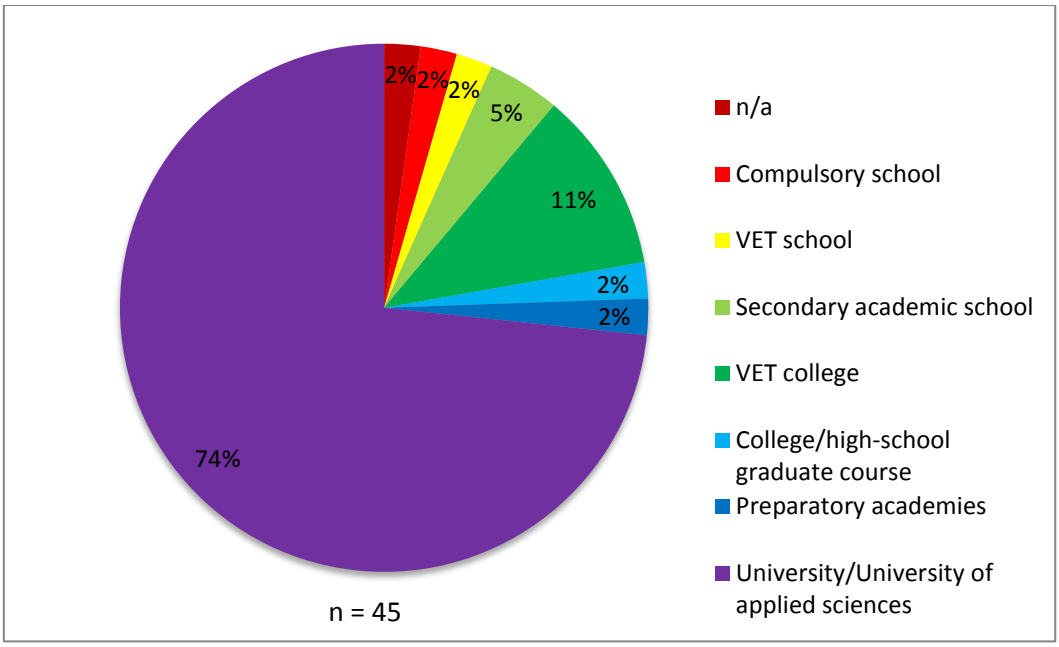


Figure 21: Highest educational attainment of persons interviewed during the qualitative survey

5.2.4 Main residence

Nearly half of the persons (49%) did not originate directly from the survey area. This is due to the fact that a lot of these persons have been working in higher positions at the provincial government in Graz. Still after all 31% live in the survey area. 16% of the interviewed persons did not give any information about their main residence.

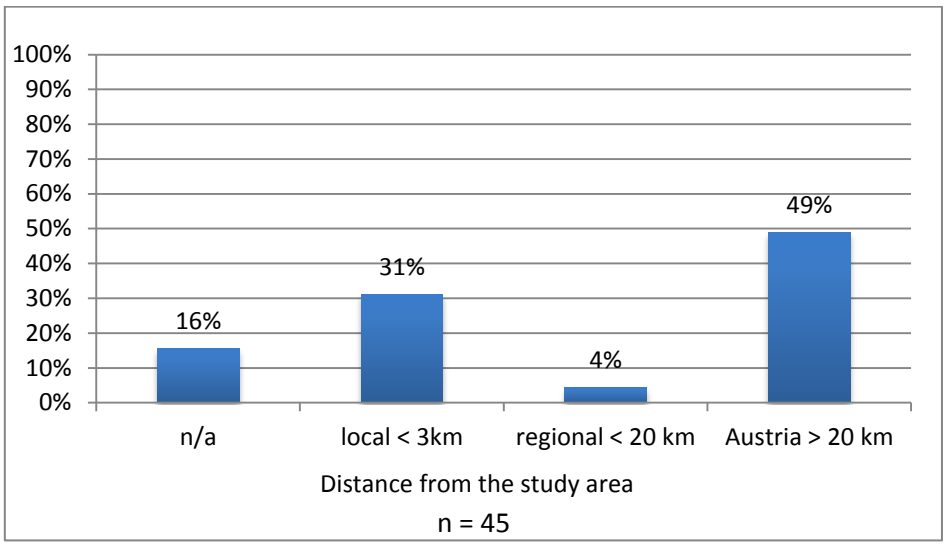


Figure 22: Main residence of persons interviewed during the qualitative survey

5.3 Perception of ecosystem services

For analyzing the perception of ecosystem services at the study site question 4.1 from the quantitative survey will be used. The interviewed persons had to indicate which functions are available at the river Enns according to their perception.

5.3.1 Perception of ecosystem services

The participants could choose from “yes” over “rather yes” to “neutral” continuing to “rather no” and “no”. They also could select “cannot tell”. These categories were to complete for 15 different ecosystem services which are summed up as provisioning, regulating, cultural and supporting services.

Table 5: Perception of availability of ecosystem services at the river Enns (n = 165)

	Ecosystem services	n/a	cannot tell	Yes	rather yes	neutral	rather no	No
Provisioning services	Agriculture	10.9%	3%	53.9%	11.5%	3.6%	7.3%	9.7%
	Forestry	10.9%	1.8%	33.9%	13.3%	3.6%	26.7%	9.7%
	Settlements and infrastructure	30.3%	12.7%	20.6%	9.1%	9.1%	10.9%	7.3%
	Provision of water	11.5%	4.2%	42.4%	12.7%	10.3%	12.7%	6.1%
	Provision of energy	12.7%	3.0%	33.9%	7.3%	7.3%	9.1%	26.7%
	Gravel mining	11.5%	12.1%	19.4%	10.9%	12.1%	17%	17%
Mean		**14.7%**	**6.2%**	**34%**	**10.8%**	**7,7%**	**13.9%**	**12.7%**
Regulating services	Retention of nutrients and pollutants	12.1%	15.8%	30.9%	15.8%	13.3%	5.5%	6.7%
	Erosion protection	12.1%	6.1%	36.4%	20%	11.5%	10.9%	3%
	Flood control	12.7%	1.8%	44.8%	21.8%	3.6%	10.3%	4.8%
Mean		**12.3%**	**7.9%**	**37.4%**	**19.2%**	**9.5%**	**8.9%**	**4.8%**
Cultural services	Tourism and recreational activities	10.3%	1.2%	71.5%	11.5%	3%	1.8%	0.6%
	Water sports	10.9%	1.8%	56.4%	15.8%	6.7%	6.7%	1.8%
	Fishing	11.5%	3%	61.8%	17.6%	2.4%	3.6%	0%
	Experiencing and discovering nature	10.9%	0.6%	69.1%	14.5%	3.6%	0.6%	0.6%
Mean		**10.9%**	**1.7%**	**64.7%**	**14.8%**	**3.9%**	**3.2%**	**0.8%**
Supporting services	Habitats for animal and plant species	10.9%	0.6%	68.5%	12.7%	3.6%	3.6%	0%
	Regulation and regeneration of the ecosystem	12.1%	4.2%	49.1%	21.2%	5.5%	4.2%	3.6%
Mean		**11.5%**	**2.4%**	**58.8%**	**17%**	**4.6%**	**3.9%**	**1.8%**

The highest value in the “yes” column was assigned for “tourism and recreational activities” with 71.5%, followed by “experiencing and discovering nature” with 69.1% and 68.5% for “habitats for animal and plant species”. Services which are not available in the perception of the interviewed persons are “provision of energy” with 26.7%, “gravel mining” with 17% and on third position “agriculture” together with “forestry” which both got 9.7%. The high value for settlement and infrastructure in the “no answer” column is due to the fact that in the first interview this ecosystem service was not available and was integrated in the survey later based on recommendations from several interview partners.

5.3.2 Perception of ecosystem services compared with the age distribution

Comparing the perception of the 15 ecosystem services with the age distribution in cross tables with the support of SPSS, only some unexpected significances could be identified as some examples will show. The significance boarder was at -1.96 or 1.96. Every value above or below showed a typical or atypical distribution of the answers. Only the columns with “no”, “rather no”, “rather yes” and “yes” have been taken into account. The complete table with all values can be seen in the appendix.

The ecosystem service *“forestry”* had one higher value than expected in the age class of the 24-33 year old interviewees and another higher value the age class of the 54-63 year olds. *“Settlements and infrastructure”* got a lower value in the age class of the 44-53 year old interviewees and one higher one than expected in the same age class. *“Gravel mining”* reached a higher value and a lower value in the age class 44 to 53. Furthermore the age class 64-73 showed another higher value than expected. The next deviation in the results was in the ecosystem service *“erosion protection”.* One higher value in the age class 64 to 73 was determined. *“Tourism and recreational activities”* had one higher value than expected in the age class 24-33 and another higher one in the age class 64-73. The two last ecosystem services where typical and atypical values occurred were *“experiencing and discovering nature”* and *“regulation and regeneration of the ecosystem”. “Experiencing and discovering nature”* got a higher value in the age class 24-33 and another higher value in the age class 64-73. *“Regulation and regeneration”* had in the age class 34-43 a higher and a lower value and in the age class 54-63 a higher value than expected.

All in all 17 out of 450 values showed a typical or atypical distribution. The rest showed a normal distribution without any unusual values or unexpected significances and the typical and atypical values which occurred were not extremely high. The highest deviation was with 3.7 in *“regulation and regeneration”* and in *“tourism and recreational activities”*. Therefore no significant differences in the answers of the perception of ecosystem service and the age distribution could have been determined.

5.3.3 Perception of ecosystem services compared with the gender distribution

Comparing the perception of the 15 ecosystem services with the gender distribution was done the same way the perception of ecosystem services got compared with the age distribution. Again only some unexpected significances could be identified and again the complete table with all values can be seen in the appendix.

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The first higher and lower values and therefore typical and atypical distributions occurred in the ecosystem service *"forestry"*. For the female interviewees one lower and one higher value occurred. The same occurred for the male interviewees. For the *"provision of water"* one value was higher than expected in the data of the female interviewees and it was lower than expected in the data for the male interviewees. The last ecosystem service where higher and lower values than expected occurred was the service *"experiencing and discovering nature"*. A lower and a higher value than expected was investigated for the female interviewees. The male interviewees had also one higher and one lower value than expected.

Only 10 out of 150 values had a typical or atypical value. Still most of all values of male and female interviewees showed a normal distribution without unusual values or unexpected significances. The highest deviation was in with 3.1 for the female and with -3.1 for the male interviewees in the ecosystem service *"provision of water"*. All in all no significant differences in the answers of the perception of ecosystem service and the gender distribution could have been determined.

5.3.4 Perception of ecosystem services compared with the educational attainment

Comparing the perception of the 15 ecosystem services with the educational attainment of the participants was done the same way the perception of ecosystem services got compared with the age and gender distribution. The only difference this time was that the interviewees with a different educational attainment than a university degree were combined in one group and the interviewees with the university degree have been the other group which got investigated. As before some unexpected significances could be identified and the complete table can be seen in the appendix.

The first ecosystem service where different values than expected occurred was the service *"provision of water".* Interviewees with a university degree had a higher value than expected as well as a lower one. The others had also one lower and one higher value. *"Erosion protection"* was the service with the next values which were higher or lower than expected. A higher value and a lower value occurred in the group of interviewees with a university degree and the same happened for the other educational attainments. *"Tourism and recreational activities"* had for the ones with a university degree a lower and for the others a higher value. The last two ecosystem services where other values than expected occurred were the services *"habitats for animal and plant species"* and *"regulation and regeneration of the ecosystem"*. The interviewees with a university degree had a lower value and the others had a higher value for *"habitats for animal and plant species". "Regulation and regeneration of the*

ecosystem" got a higher value and a lower value for the interviewees with a university degree. The others had a lower value and a higher value as well.

Still from 150 values only 20 had a typical or atypical value, but most of the values between the ones with a university degree and the ones with other educational attainments showed a normal distribution without any unusual values or unexpected significances. The highest deviation was ascertainable for *"erosion protection"* and for *"habitats for animal and plant species"* with -2.8 and 2.8. All in all no significant differences in the answers of the perception of ecosystem service and the educational attainment could have been determined.

5.3.5 Perception of the four general ecosystem service categories

This chapter serves to answer the research questions "Which ecosystem services at the river Enns are different stakeholders and river users primarily aware of?" and "Which ecosystem services at the river Enns are different stakeholders and river users less aware/unaware of?" Only the columns "yes", "rather yes", "rather no" and "no" have been investigated and taken into account for the following results (see table 5).

The most mentions of the availability of ecosystem services in connection with the perception at the river Enns in the field "yes" have been in cultural services with a mean of 64.7%. Supporting services were second and had a mean of 58.8%, followed by regulating services with 37.4% and provisioning services was mentioned least with 34%. The availability sorted by "rather yes" was with 19.2% most mentioned in regulating services, followed by supporting services with a mean of 17%. The cultural services reached 14.8% and the provisioning services got 10.8%.

The unavailability sorted by "no" was most mentioned in provisioning services with a mean of 12.7%, followed by regulating services with a mean of 4.8%. The supporting services reached a mean of 1.8% and the cultural services got a mean of 0.8%.

The most mentions of unavailability of ecosystem services in connection with the perception at the river Enns "rather no" have been provisioning services with a mean of 13.9%, followed by regulating services with 8.9% in mean. The supporting and the cultural services have been named with a mean of 3.9% and a mean of 3.2%.

5.4 Most important ecosystem services for the future

Analyzing the most important ecosystem services of the Enns region in the future which the interviewees stated in the quantitative surveys, will also be done based on question 4.1, but this time by the second part of the question. “Furthermore please indicate how important you think they [the functions] are for the region’s future”.

5.4.1 Importance of all ecosystem services in the future

The participants could choose again from “yes” over “rather yes” to “neutral” continuing to “rather no” and “no”. As for the previous part they could also choose “cannot tell”. These categories were then again to complete for the same 15 different ecosystem services.

Table 6: Importance of the ecosystem services at the river Enns

	Ecosystem services	n/a	cannot tell	Yes	rather yes	neutral	rather no	no
Provisioning services	Agriculture	11.5%	1.8%	31.5%	27.3%	9.7%	7.3%	10.9%
	Forestry	12.7%	0.6%	20%	13.3%	11.5%	19.4%	22.4%
	Settlements and infrastructure	30.9%	12.1%	10.3%	14.5%	10.9%	12.1%	9.1%
	Provision of water	11.5%	2.4%	33.9%	18.2%	13.3%	12.7%	7.9%
	Provision of energy	11.5%	3%	12.7%	16.4%	18.8%	12.7%	24.8%
	Gravel mining	12.7%	8.5%	1.8%	9.7%	17.6%	23.0%	26.7%
Mean		**15.3%**	**4.7%**	**18.4%**	**16.6%**	**13.6%**	**14.4%**	**17%**
Regulating services	Retention of nutrients and pollutants	13.9%	9.7%	22.4%	23.0%	15.2%	7.3%	8.5%
	Erosion protection	13.9%	4.8%	30.3%	27.9%	9.1%	7.3%	6.7%
	Flood control	13.3%	1.2%	52.7%	21.2%	4.2%	4.2%	3.0%
Mean		**13.7%**	**5.2%**	**35.2%**	**24%**	**9,5%**	**6.3%**	**6.1%**
Cultural services	Tourism and recreational activities	10.9%	1.2%	59.4%	23%	3%	1.8%	0.6%
	Water sports	10.9%	1.2%	21.2%	32.1%	20%	9.1%	5.5%
	Fishing	11.5%	3%	24.2%	29.1%	21.8%	7.9%	2.4%
	Experiencing and discovering nature	10.9%	0.6%	52.7%	29.7%	4.2%	1.2%	0.6%
Mean		**11.1%**	**1.5%**	**39.4%**	**28.5%**	**12.2%**	**5%**	**2.3%**
Supporting services	Habitats for animal and plant species	10.9%	0.6%	63.6%	21.8%	3%	0%	0%
	Regulation and regeneration of the ecosystem	12.7%	3.6%	58.8%	20%	3.6%	0.6%	0.6%
Mean		**11.8%**	**2.1%**	**61.1%**	**20.9%**	**3.3%**	**0.3%**	**0.3%**

The highest value in the “yes” column was given for “habitats for animal and plant species” with 63.6%, followed by “tourism and recreational activities” with 59.4% and 58.8% for “regulation and regeneration of the ecosystem”. Not as important services for the region in the future as the ones mentioned before in the perception of the interviewed persons were “gravel mining” with 26.7%, “provision of energy” with 24.8% and mentioned third “forestry” with 22%. Again the high value for settlement and infrastructure in the “no answer” column was due to the fact that in the first interview this ecosystem service was not available and was integrated into the survey later.

5.4.2 Importance of ecosystem services compared with the age distribution

Comparing the importance of the 15 ecosystem services with the age distribution in cross tables with the support of SPSS, only some unexpected significances could be identified as some examples will show. The significance boarder was at -1.96 or 1.96 every value above or below showed a typical or atypical distribution of the answers. Only the columns with “no”, “rather no”, “rather yes” and “yes” have been taken into account. The complete table with all values can be seen in the appendix.

The ecosystem service *“agriculture”* had a higher value than expected in the age class of the 64-73 years old interviewees. *“Settlements and infrastructure”* got a higher value in the age class of the 44-53 year old ones. The next service *“provision of water”* got a higher value in the age class 34-43 and in the same age class a lower value as well. Another lower value was in the age class 54-63. *“Gravel mining”* reached a higher value in the age class 64-73. The next deviation in the results was for the service *“retention of nutrients and pollutants”.* One higher value and one lower one was determined in the age class 34 to 43. Another lower value in the same ecosystem service occurred in the age class 44-53. *“Erosion protection”* got one lower value in the age class 34-43. *“Tourism and recreational activities”* had one higher value in the age class of the 34-43 old interviewees. The next service was *“water sports”* where in the age class 44-53 two higher values occurred and one in the age class from 64-73. The three last ecosystem services where typical and atypical values occurred were *“experiencing and discovering nature”*, *“habitats for animal and plant species”* and *“regulation and regeneration of the ecosystem”*. *“Experiencing and discovering nature”* got a higher value in the age class 14-23, a higher one in the age class 34-43 and a lower value one in the age class 54-63. *“Habitats for animal and plant species”* reached one higher value in the age class 34-43 and a lower value in the same age class. The last ecosystem service *“regulation and regeneration”* had in the age class 34-43 a higher value and in the same age class a lower value than expected.

All together 26 out of 450 values showed typical and atypical values, but the rest had a normal distribution without any unusual values or unexpected significances and the typical and atypical values which occurred were not extremely high. Only one extremely high value was determined for *“experiencing and discovering nature”* with 8.1. Summing up all in all it can be determined that no significant differences in the answers of the importance of ecosystem service and the age distribution were existing.

5.4.3 Importance of ecosystem services compared with the gender distribution

Comparing the importance of the 15 ecosystem services with the gender distribution was done the same way the importance of ecosystem services got compared with the age distribution. Again only some unexpected significances could be identified and the complete table can be seen in the appendix.

The first higher and lower values and therefore typical and atypical distributions occurred in the ecosystem service *"agriculture"*. For the data of the female interviewees a lower value occurred whereas for the data of the male interviewees a higher value than expected was investigated. The ecosystem service *"forestry"* had a lower and a higher value for the female data and the male data had a higher value and a lower one. For the service *"provision of water"* one value was higher than expected and one was lower for the data of the female interviewees. For the data of the male interviewees the same results were determined. The last two ecosystem services where higher and lower values than expected occurred were the services *"gravel mining"* and *"retention of nutrients and pollutants".* A lower value than expected for *"gravel mining"* occurred for the data of the female interviewees and a higher one as well. Whereas the male data had a higher value and a lower one. The *"retention of nutrients and pollutants"* was one data lower than expected and one higher than expected for the female interviewees. The male interviewees had a lower and a higher one than expected.

20 out of 150 values showed typical and atypical values. The rest of the values between male and female did show a normal distribution without any unusual values or unexpected significances. The highest unexpected value was with 3.3 for "forestry" in the female data and with -3.3 in the data of the answers of the male interviewees. Due to these results no significant differences in the answers of the importance of ecosystem service and the gender distribution could have been determined.

5.4.4 Importance of ecosystem services compared with the educational attainment

Comparing the importance of the 15 ecosystem services with the educational attainment of the participants was done the same way the importance of ecosystem services got compared with the age and gender distribution. Again like for the comparison between the perception of ecosystem services and the educational attainment the only difference was that the interviewees with a different educational attainment than a university degree were combined in one group and the interviewees with the university degree have been the other group which got investigated. Again only some unexpected significances could be identified and the complete table can be seen in the appendix.

Different values than expected occurred in the service *"settlements and infrastructure"*. Interviewees with a university degree had one lower value than expected and the others had a higher value. *"Provision of water"* had a lower value for people with a university degree whereas the others had a higher value. Interviewees with a university degree also had lower value in *"provision of energy"* compared to the importance of what the interviewees with another educational attainment did state. They had a higher value than expected. The ecosystem service *"fishery"* had a higher value for the ones with a university degree and a

lower one for the interviewees with an other educational attainment. The last ecosystem service, the *"erosion protection"* got one higher value in the group of interviewees with a university degree. The interviewees with other degrees had a lower value.

All in all 8 out of 150 values showed a typical or an atypical distribution. Still most of the values between the university degree and other degrees showed a normal distribution without any unusual values or unexpected significances. The highest typical and atypical values occurred with 2.8 and -2.8 in *"provision of energy"* and *"fishing"*. The results showed that no significant differences in the answers of the importance of ecosystem service and the educational attainment could have been determined.

5.4.5 Importance of the four general ecosystem services categories

To answer the first hypothesis "Provisioning services are perceived the most important ecosystem services at the river Enns." only the columns "yes" "rather yes", "rather no" and "no" have been investigated and taken into account for the following results.

Table 6 shows that most mentions in terms of "importance for the future" answered with "yes" were in the field of supporting services with a mean of 61.2%. Next were the cultural services with a mean of 39.4%, followed by regulating services with a mean of 35.2%. and with a mean of 18.4% provisioning services were perceived as least important.

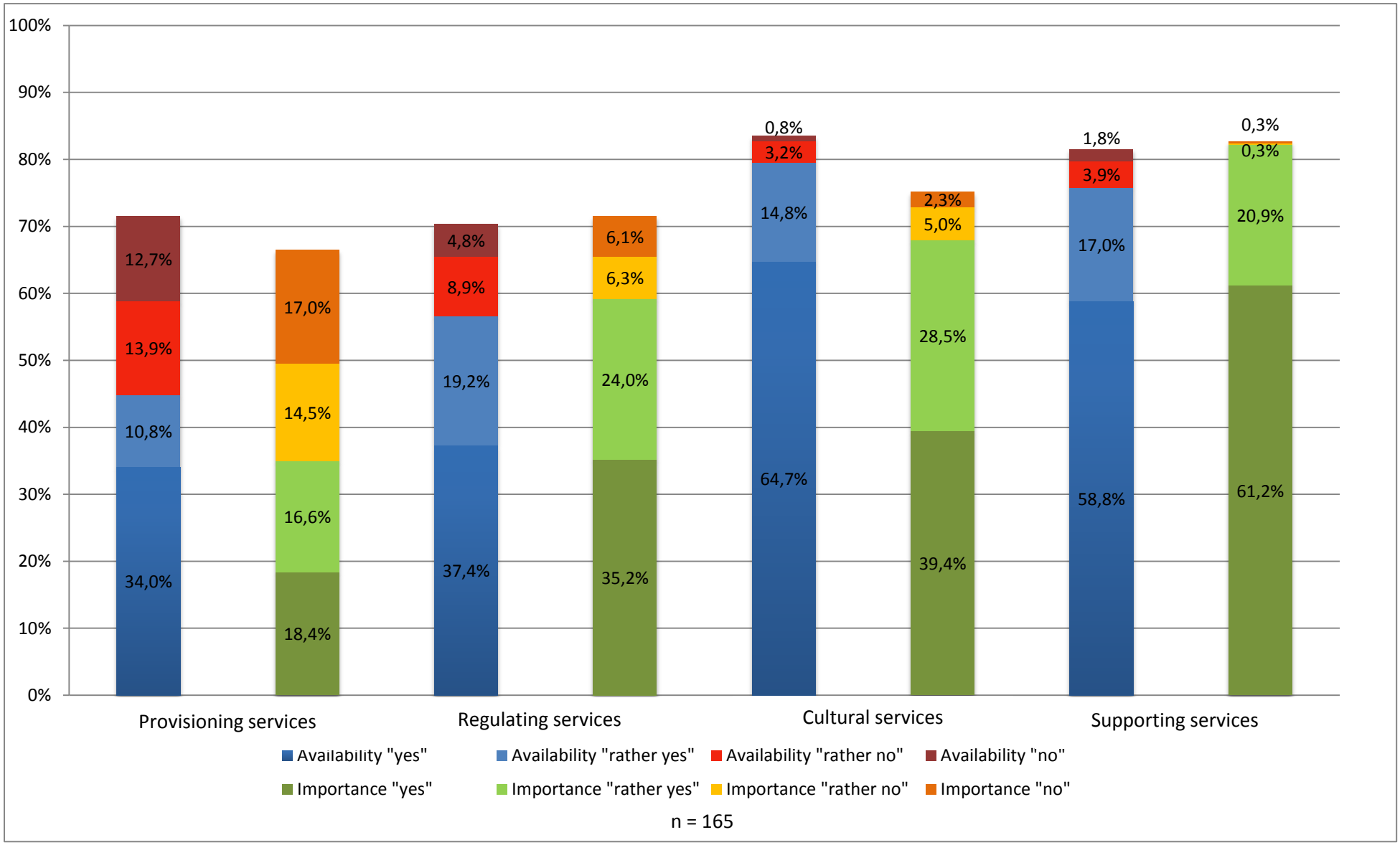
The importance sorted by "rather yes" was with 28.5% most mentioned for cultural services, followed by regulating services with a mean of 24%. The supporting services did reach 20.9% and the provisioning services got a mean of 16.6%.

The highest value for the unimportance sorted by "no" was with a mean value of 17% in provisioning services, followed by regulating services with a mean of 6.1%. The cultural services did reach a mean of 2.3% and the supporting services got a mean of 0.3%.

The most mentions in connection with the perception of unimportance of ecosystem services at the river Enns ("rather no") have been with mean of 14.5% the provisioning services, followed by regulating services with a mean of 6.3%. The cultural services have been named third with a mean of 5% and the supporting services were mentioned by 0.3%.

5.5 Comparison of the availability and the importance

In order to compare the availability and the importance for "yes" and "rather yes" of the functions and between the availability and the importance of "no" and "rather no" of the functions figure 23 was created.


100%
90%
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34,0%
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14,5%
16,6%
18,4%
4,8%
8,9%
19,2%
37,4%
6,1%
6,3%
24,0%
35,2%
0,8%
3,2%
14,8%
64,7%
2,3%
5,0%
28,5%
39,4%
1,8%
3,9%
17,0%
58,8%
0,3%
0,3%
20,9%
61,2%
Provisioning services
Regulating services
Cultural services
Supporting services
Availability "yes"
Availability "rather yes"
Availability "rather no"
Availability "no"
Importance "yes"
Importance "rather yes"
Importance "rather no"
Importance "no"
n = 165

The provisioning services experienced a decrease between the availability and the importance. 34% of the interviewees did mention with “yes” that provisioning services are available and 10.8% stated “rather yes”. The importance in comparison was for “yes” with a value of 18.4% and “rather yes” with 16.6%. Both “yes” and “rather yes” taken together into account the provisioning services are showing a drop from 44.8% down to 37% whereas the availability for “no” and “rather no” is increasing compared with the unimportance. “No” and “rather no” reached for availability a joint value of 26.6% and the importance for “no” and “rather no” reached 31.5%.

The other service group which experienced a decrease between the availability and the importance has been the cultural services. From “yes” and “rather yes” together with an value of 79.5% cultural services decreased by 12.6% down to 67.9%. The answers containing “no” and “rather no” did increase from 4% in availability to 7.3% in importance.

The two groups of services which are increasing have been the regulating services and the supporting services. The regulating services were mentioned as available by the interviewees with a value of 37.4% in “yes” and with 19.2% in “rather yes”. The increase in the importance is for both “yes” and “rather yes” together 3.6% higher than before and altogether up to 35.2% and 24%. Furthermore a decrease in the availability for “no” and “rather no” compared to the importance can be determined. The availability was given with 4.8% for “no” and 8.9% for “rather no” whereas the importance got the values 6.1% for “no” and 6.3% for “rather no”.

The supporting services got 58.8% for “yes” and 17% for “rather yes” in the perception of the availability of the interviewees. The answers for “rather no” were at 3.9% and for no at 1.8%. Compared with the importance an increase in “yes” up to 61.1% was determined and for “rather yes” the increase was with 3.9% up to 20.9%. A decrease between the availability for “rather no” and “no” and the importance for “rather no” and “no” was perceived. Both values experienced a drop down to 0.3%.

5.5.1 Single ecosystem services by comparison between availability and importance

Some single ecosystem services did show a significant change between the values for availability and importance. Following figure will show these changes.

Agriculture as one example had a drop from over 20% from “yes” available to “yes” important, but on the other hand an increase from “rather yes” with 11.5% for available to “rather yes” with 27.3% for importance. Forestry had a decrease with 33.9% for “yes” available down to 20% for “yes” available. Provision of energy had also a drop from over 20%. From 33.9% for “yes” the provision of energy is available to 12.7% “yes” it is important for the region in the future. Another decrease did happen for “yes” for the service gravel mining. The highest decreasing values were investigated for the services water sports with an approximately drop of 35% and fishing with a drop of approx. 37%, but both services did experience an increase for the “rather yes” answers with which they compensated the losses. Watersports from 15.8% up to 32.1% for “rather yes” and fishing from 17.6% up to

29.1% for “rather yes. The only service which actually had a growth in “yes” from availability compared with importance was flood control. It could register an increase from 44.8% up to 52.7% (see figure 25).

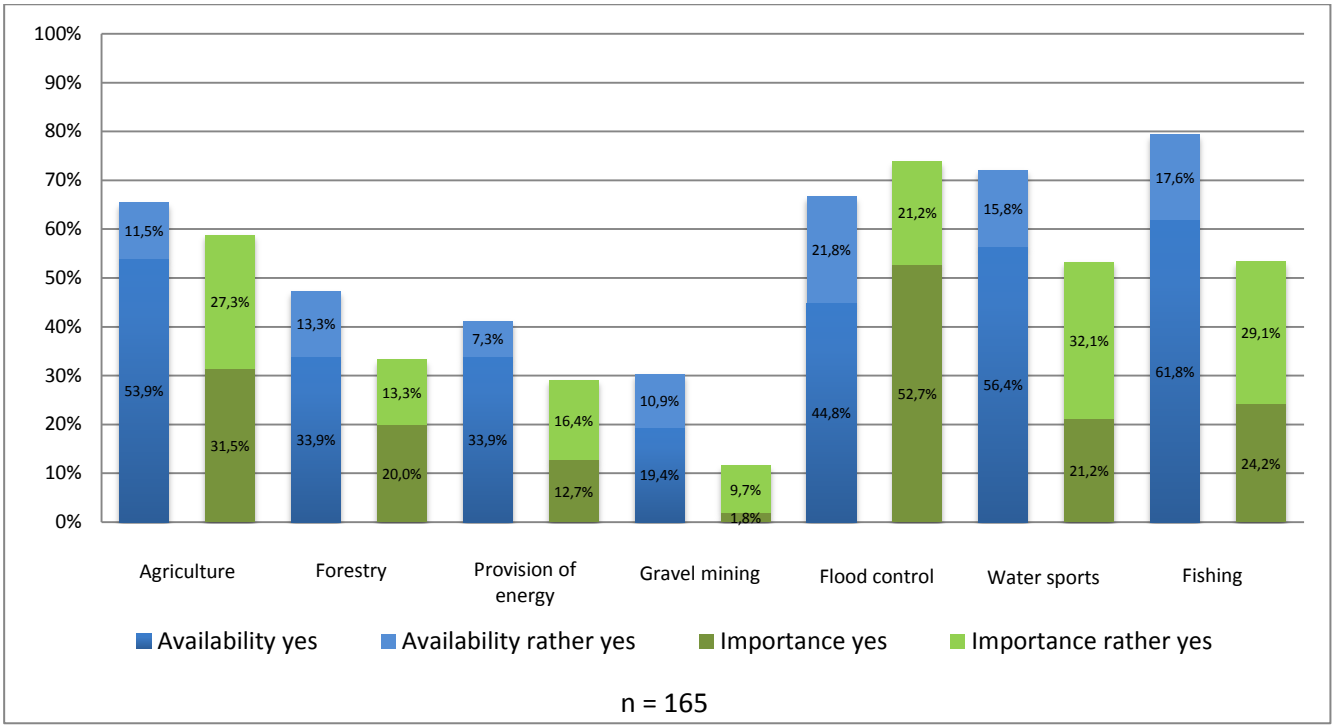

Figure 24: Single ecosystem services compared between availability and importance (yes and rather yes)

The only two services which had very high increases in the answers for availability “no” were forestry and gravel mining. Forestry had a value for availability of 9.7% and did grow up to 22.4% for importance for “no”. Gravel mining already had the 2nd highest value for “no” with 17% after provision of energy with 26.7% in the answers for availability, but increased to the highest value with 26.7% for “no” in the answers for importance.

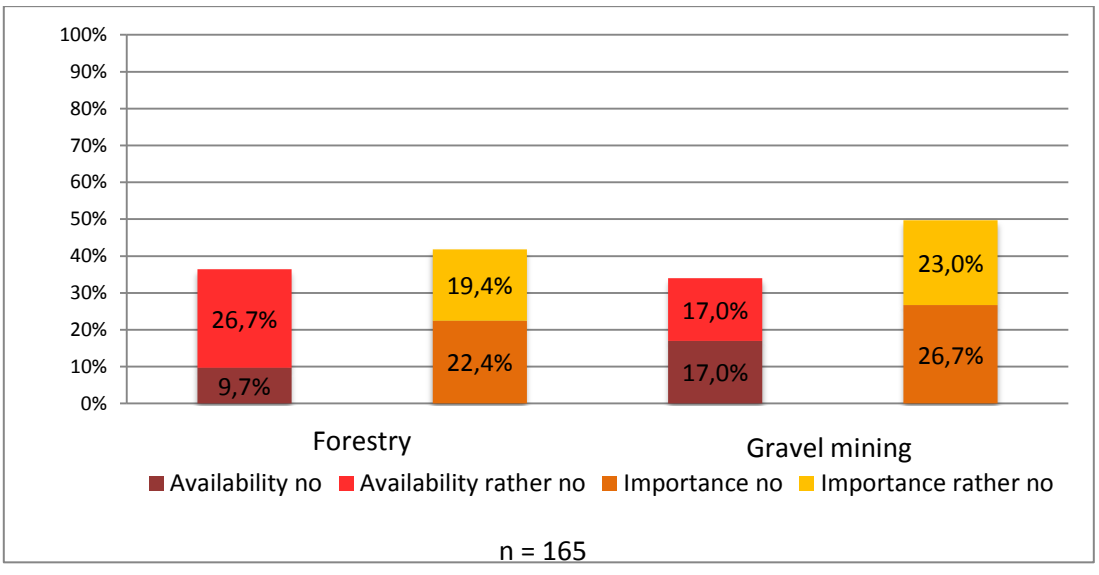

Figure 25: Single ecosystem services compared between availability and importance (no and rather no)

5.6 Conflicts in between ecosystem services at the river Enns

This chapter serves to answer the research question “Which conflicts between existing ecosystem services at the river Enns are perceived by different stakeholders and river users?” It is divided into two parts. The first part will analyze the answers of the participants from the quantitative surveys and the second part will analyze the answers of 45 chosen participants of the qualitative part, to see if there are significant differences between both groups.

5.6.1 Conflicts of the quantitative surveys

To determine the most important potentials for conflicts the participants had to answer 4.2. “Between different forms of use certain conflicts are possible. Where do you see the most important potentials for conflict in the section we just dealt with? (Please connect the respective potentials for use)” The participants could choose between 15 given ecosystem services as it can be seen in table 7.

Table 7: Conflicts named between ecosystem services of the river Enns

	Agriculture	Forestry	Settlements and infrastructure	Provision of water	Provision of energy	Gravel mining	Retention of nutrients and pollutants	Erosion protection	Flood control	Tourism and recreational activities	Water sports	Fishing	Experiencing and discovering nature	Habitats for animal and plant species	Regulation and regeneration of the
Agriculture	x														
Forestry	0	x													
Settlements and infrastructure	6	0	x												
Provision of water	4	1	2	x											
Provision of energy	2	1	0	2	x										
Gravel mining	2	1	2	0	0	x									
Retention of nutrients and pollutants	13	2	0	2	1	2	x								
Erosion protection	8	7	3	0	2	6	0	x							
Flood control	23	1	22	0	3	1	0	0	x						
Tourism and recreational activities	10	7	10	1	29	10	1	2	2	x					
Water sports	1	0	0	4	29	3	1	1	0	3	x				
Fishing	1	0	1	5	40	7	1	1	0	5	17	x			

Experiencing and discovering nature	7	4	18	2	33	20	0	0	2	4	3	0	x		
Habitats for animal and plant species	21	8	22	4	58	23	1	1	3	12	11	5	2	x	
Regulation and regeneration of the ecosystem	16	7	12	0	42	7	3	2	5	3	2	2	1	0	x

The highest amount of possible conflicts occurs between “habitats for animal and plant species” and “provision of energy” with a total number of 58, followed by 42 conflicts between “regulation and regeneration of the ecosystem” and “provision of energy” and 40 named possible conflicts between “fishing” and “provision of energy”. All in all 707 possible conflicts have been named by the participants.

5.6.2 Residual test

A “residual test” was carried out to analyze which conflict-combinations are dominant. Therefore the observed value got subtracted by the expected value and the result got divided by the root of the expected value ($z = (o-e)/\sqrt{e}$). To determine whether the difference was typical or atypical for the conflicts a significance barrier was given with the value -1.96 or 1.96. If a value was higher than 1.96 the significance was addressed as typical. If a value was lower than -1.96 the significance was referred to as atypical (BÜHL, 2010). The results of this test can be seen in table 8.

Table 8: Conflicts analyzed with the residual test (T=typical / AT=atypical)

	Agriculture	Forestry	Settlements and infrastructure	Provision of water	Provision of energy	Gravel mining	Retention of nutrients and	Erosion protection	Flood control	Tourism and recreational	Water sports	Fishing	Experiencing and discovering nature	Habitats for animal and plant species	Regulation and regeneration of the
Agriculture	X	-	-	-	AT	-	T	T	T	-	-	AT	-	T	T
Forestry	AT	X	AT	-	AT	AT	-	T	-	-	AT	AT	-	-	-
Settlements and infrastructure	-	-	x	-	AT	-	-	-	T	-	AT	AT	T	T	T
Provision of water	-	-	-	X	AT	AT	-	-	-	AT	-	-	-	AT	AT
Provision of energy	AT	-	AT	-	x	AT	-	-	-	T	T	T	T	T	T
Gravel mining	AT	-	-	-	AT	x	-	T	-	-	-	-	T	T	-
Retention of nutrients and pollutants	-	-	AT	-	AT	-	x	-	-	AT	-	AT	AT	AT	-
Erosion protection	-	T	-	-	AT	-	-	x	-	-	-	AT	AT	AT	-
Flood control	T	-	T	-	AT	AT	-	-	x	-	AT	AT	-	AT	-
Tourism and recreational activities	-	T	-	-	T	-	-	-	-	x	-	-	-	-	-
Water sports	AT	-	AT	-	T	-	-	-	-	-	x	T	-	-	-
Fishing	AT	-	AT	T	T	-	-	-	-	-	T	X	AT	-	-
Experiencing and discovering nature	-	-	T	-	T	T	-	-	-	-	-	AT	x	AT	AT
Habitats for animal and plant species	T	T	T	-	T	T	-	-	-	T	T	-	-	x	AT
Regulation and regeneration of the ecosystem	T	T	-	-	T	-	T	T	-	-	-	-	AT	AT	X

47 of all named conflicts show an atypical value. These conflicts are therefore underneath the expected value. 44 of all conflicts can be classified as typical. These conflicts are therefore above the expected value and show a high dominance. This means that they got more often named than it was to expect. Figure 28 shows the conflicts between the fifteen ecosystem services which have the highest typical value. The broader the arrow, the higher the value was above the expected value. It can be seen that “provision of energy” had the most typical values in conjunction to conflicts between the ecosystem services. Thus the ecosystem services “regulation and regeneration of the ecosystem”, “habitats for animal and plant species”, “experiencing and discovering nature”, “fishing” and “water sports” do have a much higher values in connection with “provision of energy” than it was to expect. The second ecosystem services which had higher typical values than it was to expect, is “agriculture” in connection with “flood control” and “retention of nutrients and pollutants”.

Figure 26: Highest typical value in conjunction with conflicts between the ecosystem services

5.6.3 Conflicts of the four general ecosystem services categories

To proof whether the hypothesis that “the majority of arising conflicts exist between provisioning and supporting ecosystem services on the river Enns.” is true or false the next tables have been designed.

Table 9: Total number of conflicts between the four general ecosystem services of the river Enns

	Provisioning services	Regulating services	Cultural services	Supporting services
Provisioning services	23			
Regulating services	96	0		
Cultural services	242	11	32	
Supporting services	220	15	38	0

The total numbers of table 9 originate from table 10 “Conflicts named between the ecosystem services of the river Enns” It shows that most conflicts have been named between cultural and provisioning services with a total of 242 conflicts, followed by supporting services vs. provisioning services with named 220 conflicts. The lowest amount of conflicts exists between regulating services themselves and supporting services themselves. Each had no conflict in between.

Table 10 shows the mean of the conflicts between the ecosystem services. Without these mean values false results would occur, due to the difference of total numbers of ecosystem services in each of the four general ecosystem service groups.

Table 10: Mean of the conflicts between the four general ecosystem services of the river Enns

	Provisioning services	Regulating services	Cultural services	Supporting services
Provisioning services	3.8			
Regulating services	10.7	0		
Cultural services	24.2	1.6	8	
Supporting services	27.5	3	4.8	0

The supporting services are now more often in conflict with the provisioning services than the cultural services with the provisioning services. The lowest ones are still between regulating services themselves and between supporting services themselves.

The next table (Table 14) is showing the same results as table 13. The only difference is that in table 11 the values are in percentage, to have a better comparability to the conflicts the interviewees have given during the qualitative surveys.

Table 11: Percentage of the conflicts between the four general ecosystem Services of the river Enns

	Provisioning services	**Regulating services**	**Cultural services**	**Supporting services**
Provisioning services	5%			
Regulating services	13%	0%		
Cultural services	29%	2%	10%	
Supporting services	33%	4%	6%	0%

5.6.4 Conflicts identified by the qualitative surveys

The conflicts of chosen 45 qualitative surveys as mentioned in chapter 4.1 “Qualitative interviews” are serving as a second validation of the results for the conflicts. This was possible, because the 45 interviewees did answer the qualitative surveys prior to the quantitative surveys and were therefore unaffected in their answers.

Table 12: Conflicts of the qualitative surveys

	Agriculture	Forestry	Settlements and infrastructure	Provision of water	Provision of energy	Aquaculture	Economy	Flood control	Microclimate	Water management	Regulation	Nutrient input and hazard substances	Interferences	Tourism and recreational activities	Fishing	Water sports	Nature protection	Society	Regulation and regeneration of the ecosystem	Habitats for a diversity of aquatic/terrestrial animal- and plant species
Agriculture	x																			
Forestry	1	x																		
Settlements and infrastructure	0	0	x																	
Provision of water	2	0	0	x																
Provision of energy	0	0	0	1	x															
Aquaculture	0	0	0	0	0	x														
Economy	0	0	0	0	0	0	x													
Flood control	2	0	4	0	1	0	0	x												
Microclimate	0	0	0	0	1	0	0	0	x											
Water management	0	0	0	0	0	0	0	0	0	x										
Regulation	0	0	0	0	0	0	0	0	0	0	x									
Nutrient input and hazard substances	0	0	0	0	0	0	0	0	0	0	0	x								
Interferences	0	0	0	0	0	0	0	0	0	0	0	0	x							
Tourism and recreational activities	1	0	2	0	7	0	0	2	0	1	0	0	0	x						
Fishing	0	0	0	0	2	0	0	0	0	0	0	0	0	0	x					
Water sports	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	x				
Nature protection	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x			
Society	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	x		
Regulation and regeneration of the ecosystem	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	x	
Habitats for a diversity of aquatic/terrestrial animal- and plant species	5	2	3	0	18	1	1	4	0	1	2	1	1	4	6	0	1	0	0	2

One difference which can be seen, in comparing table 12 to table 7 is that instead of 15 ecosystem services like in table 7 the 45 interviewees did mention 20 different ecosystem services. The highest amount of conflicts was named between “habitats for diversity of aquatic/terrestrial animal- and plant species” and “provision of energy” with a total number 18 conflicts. The second biggest conflict occurred between “tourism and recreational activities” and “provision of energy” with 7 conflicts. All in all 90 different conflicts have been named by the 45 interviewees.

Table 13: Conflicts between the four general ecosystem services of the river Enns after the qualitative survey

	Provisioning services	Regulating services	Cultural services	Supporting services
Provisioning services	4			
Regulating services	8	0		
Cultural services	21	3	1	
Supporting services	31	9	11	2

The total numbers of table 13 originate from table 12 “Conflicts of the qualitative surveys”. It shows that the most conflicts have been named between supporting and provisioning services with a total of 31 conflicts, followed by cultural services vs. provisioning services with 21 named conflicts. The lowest amount of conflicts exists between regulating services themselves with no mentioned conflict in between.

Table 14 shows again like table 13 the mean of the conflicts between the ecosystem services.

Table 14: Mean of the conflicts between the four general ecosystem services of the river Enns after the qualitative interviews

	Provisioning services	Regulating services	Cultural services	Supporting services
Provisioning services	0.6			
Regulating services	0.6	0.0		
Cultural services	1.8	0.3	0.2	
Supporting services	3.1	1	1.4	0.7

The supporting services are still most often in conflict with the provisioning services, followed by the cultural services which are with a mean of 1.8 in conflict with the provisioning services. The lowest one is still between regulating services themselves with a mean of zero.

The next table (table 15) is showing the same results as table 14. The only difference is that in table 15 the values are in percentage. The reason for this was as mentioned earlier the comparability of the quantitative surveys with the qualitative surveys.

Table 15: Percentage of the conflicts between the four general ecosystem services of the river Enns after the qualitative interviews

	Provisioning services	**Provisioning services**	**Provisioning services**	**Provisioning services**
Provisioning services	6,0%			
Regulating services	6,4%	0,0%		
Cultural services	18,3%	2,9%	2,1%	
Supporting services	32,5%	10,5%	14,4%	7,0%

The results show that the hypothesis “The majority of arising conflicts exist between provisioning and supporting ecosystem services on the river Enns” is correct. Not only in the quantitative data analyzes the provisioning services do have the highest amount of conflicts with the supporting services (33%), but also in the qualitative data analyzes the results are nearly the same with a conflict potential of 32.5% between these two ecosystem services.

6 Discussion

6.1 Summary of the results

The aims of this master thesis were to investigate, which ecosystem services at the river Enns different stakeholders and river users are primarily aware of and which ones they are less aware of. Another aim was the examination of different conflicts between existing ecosystem services at the river Enns which are perceived by different stakeholders and river users. As expected, the results of the qualitative surveys showed a broader answer variety than those of the quantitative surveys. Most of the answers and opinions of the interviewees of the qualitative survey met more or less the expectations existing prior the interviews. Yet some new aspects were mentioned. Hereafter the most important results, structured according the respective topics, will be summarized and shortly discussed. The first five topics are related to each other and are only analyzed based on the quantitative survey data.

1.) As the results of the first research question showed, the 165 interviewees stated that the perception of **availability** of ecosystem services at the river Enns is not highest for provisioning services as some might have expected. On the contrary, provisioning services were least with a percentage of 44.8% in “yes” and “rather yes” together. The highest availability was gained by cultural services of an altogether percentage of 80%, followed by supporting services with 76% and regulating services with 56.6%. As supplement the verification of the availability compared with the age distribution, the gender distribution and the educational attainment did show no significant difference in between the different validate groups. Only few age classes showed a typical or an atypical distribution for some single ecosystem services. The same occurred for the gender distribution where again only single atypical and typical values could have been investigated between male and female and the educational attainment compared with the availability did also show only singular variations in the expected values.

This shows that many of the interviewees had the perception that the availability of e.g. tourism and recreational activities, opportunities for water sports, opportunities for fishing as well as habitats for a diversity of aquatic/terrestrial animal- and plant species and the capability of the ecosystem to regulate and regenerate is higher than e.g. the availability of provision of energy, gravel mining, opportunities for agricultural use or opportunities for forestry independent of age, gender and educational attainment.

2.) Comparing the answers for “no and “rather no” of the 165 quantitative surveys following results occurred. With a total percentage of 26.6% for “rather no” and “no” the provisioning services are perceived least in the perception of **unavailability** of ecosystem services at the river Enns, followed by regulating services with a total of 25.9%. Supporting services reached with a total of 7.8% the third place in the perception of the unavailability and cultural services were named last with 5%. Again as addition the verification of the unavailability compared with the age distribution, the gender distribution and the educational attainment did show no significant difference in between the different validate groups. Only few age classes showed a typical or an atypical distribution for “no” and “rather no” for some single ecosystem services. It was the same case for the gender distribution where as well only single atypical and typical values could have been investigated between male and female for the answers “no” and “rather no”. In the end the educational attainment compared with the availability for

“no” and “rather no” did also show only singular variations in the expected values. Therefore it can be stated that independent of age, gender and educational attainment the perception of the unavailability is highest for provisioning services and lowest for cultural services. These results of the second research question confirm one more time the results of the first research question and will be discussed later.

3.) Not only taking the availability into account but also the importance of the ecosystem services for the region in the future, the perception of **importance** of ecosystem services at the river Enns was investigated by the 165 quantitative surveys as well. The attention renewable energy gets nowadays in many countries and the discussions about the pro and cons, as well as the first interviews did lead to the assumption that “provisioning services are perceived the most important ecosystem services at the river Enns”, although the ecosystem service provision of energy is actually existing only at smaller rivers and tributaries in the study area. Some statements from the interviewees during the qualitative surveys were for example: “Under the aspect of the renewable energy discussion a lot of pressure exists to expand hydropower.” as a representative of the national water management stated or “The wish to use the Enns for energy production did grow during the last years and is still actual.” as someone from the Styrian administration stated or as a implementer from the district stated “Energy use stands above everything else what has something to do with rivers at the moment.”.

The results show that the interviewee’s statements of the perception of importance of ecosystem services at the river Enns is quite similar compared to the perception of present availability. A shift in the lead did occur, which means that with a total in percentage of 82.1% the supporting services are of a greater importance for the region in the view of the interviewees than the cultural services which reached a total of 67.9%. The third most important services were the regulating services with 59.2%, followed by provisioning services with 35%. This result shows that supporting services are perceived even with a higher importance for the future of the region and provisioning services even less. As it was done with the availability a verification whether any significant typical or atypical values occurred was done with the importance as well. The age distribution, gender distribution and educational attainment got investigated again. Like for the availability only few age classes showed a typical or an atypical distribution for “yes” and “rather yes” for some single ecosystem services. It was the same case for the gender distribution where as well only single atypical and typical values could have been investigated between male and female answers and also the same for the educational attainment compared with the importance for “yes” and “rather yes”. All in all the importance compared with the three socio demographic values did show no significant difference in between the different validate groups.

4.) Due to the attention renewable energy and the other provisioning services received and due to the first interviews the hypothesis that “supporting services are perceived the most unimportant services at the river Enns” was formulated. However, as the results of the first research question already showed, the perception of availability of ecosystem services at the river Enns was not highest for provisioning services but for cultural and supporting services. The results of the perception of **unimportance** of ecosystem services at the river Enns showed like the importance a little shift in the distribution among the ecosystem services. Provisioning services were perceived as the ones with the lowest importance for the region’s future. They reached a total mean percentage in “no” and “rather no” of 21.5%, followed by regulating services with a mean of 12.4%. The cultural and the supporting services got the

mean value of 7.3% and 0.6%. As it was done before for the importance, a verification for the unimportance compared with the age distribution, the gender distribution and the educational attainment was carried out. Only few age classes showed a typical or an atypical distribution for “no” and “rather no” for some single ecosystem services. It was the same case for the gender distribution where again only single atypical and typical values could have been investigated between male and female and also the same for the educational attainment compared with the importance for “no” and “rather no”. All in all the unimportance compared with the three socio demographic values did show no significant difference in between the different validate groups.

5.) The last of the five connected topics is about the **comparison** of the availability and the importance as well as about the unavailability and unimportance, not only for the four main ecosystem service groups, but also for some selected single ecosystem services. The four main ecosystem service groups can be splitted into two groups for the matter of “yes” and “rather yes” or on the availability and importance. The one group showed a decrease from a higher availability to a lower importance and the other group an increase from a lower availability to a higher importance. The two ecosystem service groups which were decreasing were the provisioning services and the cultural services whereas the increasing groups have been the regulating and the supporting services. For the unavailability and unimportance it is the other way round. The regulating and supporting ecosystem services experienced both a decrease in the matter of “no” and “rather no”, whereas the provisioning and the cultural services happened to increase in their values for “no” and “rather no”.

The single ecosystem services, if comparing only the values for “yes”, had all except for one a decrease from availability to the importance. Only flood protection had an increase from the availability to the importance, but comparing “yes” and “rather” together more than one service experienced an increase. The highest drops in the matter of “yes” and “rather yes” from availability to importance occurred for the ecosystem services fishing, water sports and gravel mining and an increase in the matter of “no” and “rather no” for the unavailability and the unimportance happened for forestry and gravel mining.

Following statements from the qualitative surveys might serve as a possible explanation for the first results. “The river shall be recognized as habitat again and not any longer as threat (flooding events). Therefore it has to happen more work in the field of public relations.” as one person from the natural hazard management stated. Another statement by an implementer of the region was that “… during the 70s and 80s the agriculture got too intense in the valley area close to the river because the water management was giving the land to easy to them.” Other explanations for the high and not expected values of supporting and cultural services on the one hand and the low values of the provisioning services on the other could be for example the high efforts of some local citizen initiatives in connection with nature protection (see as one example http://www.zukunft-ennstal.at/) to foster the perception of importance of supporting and cultural services among the local population. Furthermore, the touristic sector of the Enns region is getting more and more important (e.g. FIS Alpine Ski WM). Therefore the population maybe acknowledges and supports the services for this purpose more. One last fact which might lead to a higher acceptance of the cultural and supporting services could also be the influence of the national park “Gesäuse”, because environmental education projects take place, nature protection and experience is very important and nice tracks for rafting and canoeing are given.

The perception of the most important **conflicts** between ecosystem services at the river Enns was analyzed, as already mentioned, based on the quantitative survey data as well as the qualitative survey data which served as a double check. Already the residual test showed first interesting results. The most typical conflicts were mentioned for “habitats for animal and plant species”, “provision of energy” and “regulation and regeneration of the ecosystem”.

In the 165 quantitative surveys 707 possible conflicts between 15 ecosystem services were mentioned whereas in the 45 qualitative surveys 90 possible conflicts between 20 different ecosystem services were named for the research area. The distribution in between the conflicts of the quantitative surveys as well as in between the qualitative surveys is similar. The biggest part of possible conflicts was found in the results of both methods between “provisioning services” and “supporting services” with a percentage of 33% and 32.5%. The conflicts between “provisioning services” and “cultural services” are in both analyzes on the second position with 29% in the quantitative and 18.3% in the qualitative survey results. Two values which were not as high in the quantitative survey as they were in the qualitative have been the conflicts between “provisioning services” and “cultural services” with 10% in the quantitative and only 2.1% in the qualitative survey. The second value was between “supporting services” itself where in the quantitative survey 0% was analyzed and in the qualitative 7%. This might be due to the reason that in the qualitative survey more ecosystem services have been named for supporting services than in the quantitative surveys.

However, the hypothesis that “the majority of arising conflicts exist between provisioning and supporting ecosystem services on the river Enns” is correct. It maybe became established due the fact that in the media many articles have been about the pros and cons of hydropower and renewable energy and that out of the first interviews one of the main information was that many small hydropower plants are going to be built which will be supported by governance programs. Another fact that should be considered is that especially the Enns region is characterized by the discussion about hydropower as it is one of the last bigger free flowing sections of Austrian rivers. Therefore it was very interesting to see the opinion of different stakeholders and river users on that issue.

6.2 Reflection of methods

The main methods to discuss and to reflect on are the quantitative and the qualitative surveys. Overall it can be said that both methods have been working in a good way to conduct the needed and asked information. None of the interview partners for both surveys mentioned any negative aspect of the surveys. They have not been too long in time or too complex to answer, but for both some suggestions for improvement (not only concerning the content but also concerning the circumstances of the survey) can be mentioned for the next interview phase along the river Drau.

Due to fact that the surveys were conducted during autumn and winter, river users participating in the research work were not easy to meet in the target area. Three facts led to the still high number of participants. Firstly, the possibility to conduct interviews during events that took place in the national park, secondly the idea to ask whether the interviewees of the qualitative survey could spread the quantitative survey among colleagues and other people interested in the river and send them later per post to us and thirdly that the interviewees of the qualitative interviews were asked to answer the quantitative survey as well. In particular the last point helped to conduct more than half of the quantitative survey data which will lead to another point to discuss later. As the next data collection phase will be carried out in the summer months, at least one of these problems won't occur then.

Another fact was that many of the interviewed persons have been on the one hand not from the research area and on the other hand did both surveys the qualitative survey as well as the standardized questionnaire, the responses are not representative and do not allow conclusions about preferences of the population in the four regions. However, since we did not aim for representativeness, i.e. drawing conclusions on a basic population, but rather aimed to explore different lines of argumentations and perspectives, we do not consider this as a problem.

As mentioned before the fact that the participants of the qualitative surveys also took part in the quantitative surveys led to duplication in data. 86 quality surveys have been conducted and most of these participants took part in the quantitative surveys as well. The data could only be used for this thesis due to the fact the qualitative surveys were conducted prior to the quantitative surveys. Unfortunately the data could only be used to double check a part of the research questions. It would have been good to double check the other research questions as well, to see if there would have been any significant differences in the answers. Therefore the interview guideline should have probably gotten adjusted.

The last fact which can be discussed in more detail is the fact that due to the chosen interview partners for the qualitative surveys the age, the educational attainment and the gender distribution is not representative and therefore could lead to wrong conclusions. However this can be neglected, as the main aim of the project is to collect information relating to topics, only experts know about. In most cases these experts are nowadays still highly educated elderly male persons.

6.3 Comparison with earlier studies

A study from the year 2007 about the same region, where the PhD-project is situated now, was done for the Styrian department of water management and soil water balance (Fachabteilung 19B Schutzwasserwirtschaft und Bodenwasserhaushalt). The institute of Hydrobiology and Aquatic Ecosystem Management from the University of Natural Resources and Life Sciences, Vienna got the task to create a guideline for the Enns regarding flood control, freshwater ecology, river landscape development, settlement development and recreational use. During the research process several meetings with the involved municipalities took place and the vestrymen got asked about their point of view and opinion on following points: 1.) flood control, 2.) renaturation measures, 3.) agriculture, 4.) Natura 2000 protection areas, 5.) tourism and recreation, 6.) regional and settlement planning and 7.) other projects. As one project output maps displaying different points of view, wishes and opinions of the local communities were created. (HOHENSINNER et al., 2008)

The results of these investigations can serve as basis to compare between the past, the present and the future of the perception and importance of ecosystem services of the regions inhabitants and to find out if changes and progress have been made.

Due to the fact that in the study of 2007 no ecosystem services have been directly investigated, as it was the approach for this thesis, a direct comparison is not possible and only some of the results can be used. Therefore the results of HOHENSINNER et al., 2008 for the points “settlement development/protective water management” and “area for restoration” are not taken into account.

The first point “flood protection” was answered by 30 municipalities in the guideline for the Enns. 56.7% of these had already implemented measures for flood protection and did not see a need for further measures. 20% already planned measures and 23.3% had the wish to do so in the future.

Comparing that to the present status and the results of the quantitative survey (n=165) 66.3% of the participants stated that flood control was available in the survey region and 15.1% stated that no flood control was perceived. Nearly three quarters of the interviewees stated that flood protection will be important for the region in the future, 7.2% stated that it will not be important. This means that the aim of the communities to implement flood protection measures is in accordance of what the participants of the ongoing survey perceived.

The next comparable point was the “river restoration”. 29 municipalities have given statements about the willingness to do some river restoration in the “Guideline Enns”. This point can be compared with the perception on availability and importance of “regulation and regeneration of the ecosystem”. In 2007 three quarters of the municipalities were supporting the restoration thought, 10.3% had a neutral view on it and 13.9% considered that it was no necessary to restore more. The present state was located with 70.3% for yes the service is available, 5.5% neutral and 7.8% for no not available. For the future a little bit more than three quarters of the interviewees stated that this service will be important for the future of the region, 3.6% were neutral 1.2% said no. Due to these results it can be noted that the communities were supporting the same development which the interviewees stated as getting more important for the region.

“Recreation and tourism” was answered by 29 communities in 2007 and 48.3% wanted to do more in the tourism sector whereas 51.7% considered it was not necessary. The results of the quantitative survey showed that 83% of the interviewees perceived the “tourism and recreational activities” as present and 2.4% as not available. For the future importance of the region even a decline in the importance of this service was investigated. 69.4% stated that “tourism and recreational activities” will be important and 2.4% stated that it will not be important for the region. This might show a trend towards less tourism during winter in the region, due to an already high amount of it.

“Present habitats for animal and plant species” as ecosystem services from the quantitative survey can be compared with the information to “Natura 2000” from the study 2007, but only in the point that “Natura 2000” is influencing the availability of habitats in a positive way. 22 Communities gave statements about their position to it. 27.2 % gave positive comments on “Natura 2000”, 27.2 % were set negative and nearly half of them had a neutral position about it. In the quantitative survey 81.2% of the interviewees perceived “habitats for animal and plant species” as available, 3% stated it as neutral and 3.6% did not perceive it as available. Regarding the future importance of the region 85.4% perceived it as important, 3% as neutral and no one as unimportant. This shows that since 2007 a shift towards protection and availability of habitats for animal and plant species did happen and that it will be even a little bit more important for the future of the region.

6.4 Conclusion

The results of this work are showing that stakeholders and river users do have a wide perception of what kind of ecosystems are available at the river Enns and what kind of ecosystem services are not available. The hypothesis relating to this point is showing that it is important to ask the stakeholders and especially the river users about their perception and to integrate their opinion into river management, because they are the persons who will be affected every day by the river and its landscape.

Furthermore the stakeholder and river users have a clear opinion on what kind of ecosystem services will be important for the future of the region and what kind will not be important. Also possible conflicts which can occur have been stated very clear by the interviewees. This again leads to the assumption that it might be advantageous to integrate them early not only in the river management but also inform them about the political decisions and what kind of new laws and directives will be implemented.

In addition it would be interesting to transfer this kind of study to other rivers to see whether the same results can be determined or whether new results and aspects occur.

7 Literature

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Notice: All used internet sources had an active page in July, 2013.

8 Register of illustrations

8.1 List of tables

8.2 List of figures

9 Appendix

9.1 Quantitative interview

Questionnaire

„perception of river landscape functions“

This survey deals with different functions of river landscapes. These are (more generally spoken) also referred to as “ecosystem functions”. Ecosystem functions are an essential basis and prerequisite for a functioning society and economy. Ecosystem functions include the possibility for humans to use different areas for recreation or the availability of habitats for different plant and animal species. Very often these ecosystem functions have a certain benefit for humans and contribute to their well-being, their health and their security. These relationships are apprehended in the so called “ecosystem service-concept”. Among others this includes for instance drinking water or food.

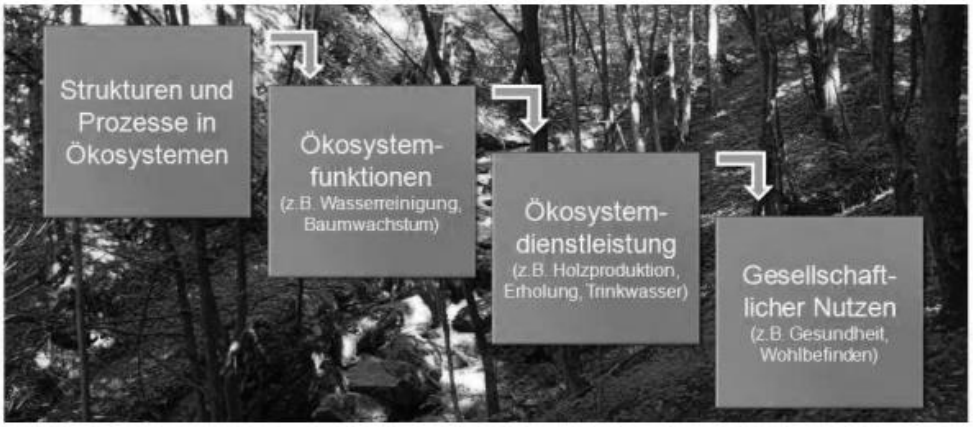


Abbildung: Zusammenhang zwischen Ökosystemen und dem gesellschaftlichen Nutzen (A. Muhar)

The following questionnaire aims on assessing, how different functions of the „ecosystem river“ are perceived and which values are assigned to them. At the same time also the human-nature-relationship shall be assessed. The results shall be considered in future planning and decision making processes.

Duration of the survey: ca. 15 min.

Do not fill out! *(has to be filled out by the interviewer)*

Interviewee: _____ Organisation/Institution: _____

(River users) activity: _____

(River users) survey location: _____

Interviewer: _____ Date: _____

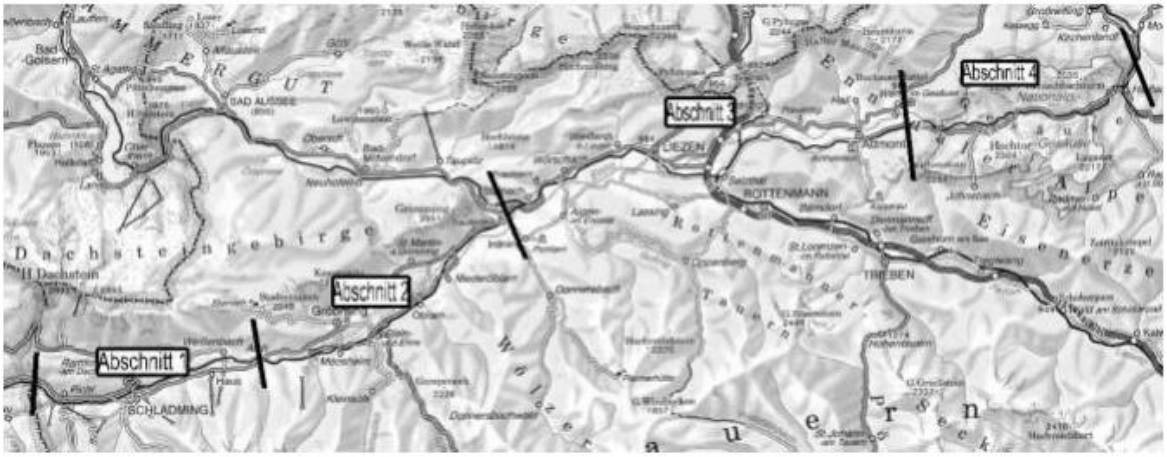
Following questionnaire refers to concrete sections of the river Enns:

section 1: Mandling (Landesgrenze) - Aich

section 2: Aich – Stainach

section 3: Stainach – Gesäuseeingang

section 4: Gesäuseeingang – Hieflau



question 1: Please indicate, which statements regarding the river sections are true for you!
(multiple answers possible- note: if none of these sections is known - breaking off)

	section 1 (Mandling – Aich)	**section 2** (Aich - Stainach)	**section 3** (Stainach – Gesäuseeingang)	**section 4** (Gesäuseeingang – Hieflau)
I live in this area (main or secondary residence)	☐	☐	☐	☐
I am spending my holidays in this area	☐	☐	☐	☐
I am spending my leisure time in this area	☐	☐	☐	☐
I use this area for water sports activities	☐	☐	☐	☐
I go fishing in this area	☐	☐	☐	☐
I manage agricultural and forestry land in this area	☐	☐	☐	☐
I deal with this river landscape due to other professional/voluntary activities	☐	☐	☐	☐
I know this section from passing it by bike	☐	☐	☐	☐
I know this section from passing it by train	☐	☐	☐	☐
I know this section from passing it by car	☐	☐	☐	☐
I do not know this section	☐	☐	☐	☐

question 2: How often do you spend your time directly at the river?

	section 1 (Mandling – Aich)	**section 2** (Aich - Stainach)	**section 3** (Stainach – Gesäuseeingang)	**section 4** (Gesäuseeingang – Hieflau)
daily to several times a week	○	○	○	○
several times a month	○	○	○	○
several times a year and lessfrequently	○	○	○	○
I have never been there	○	○	○	○

In the following I would like you to answer some questions concerning your perception of one river section. Therefore please indicate:

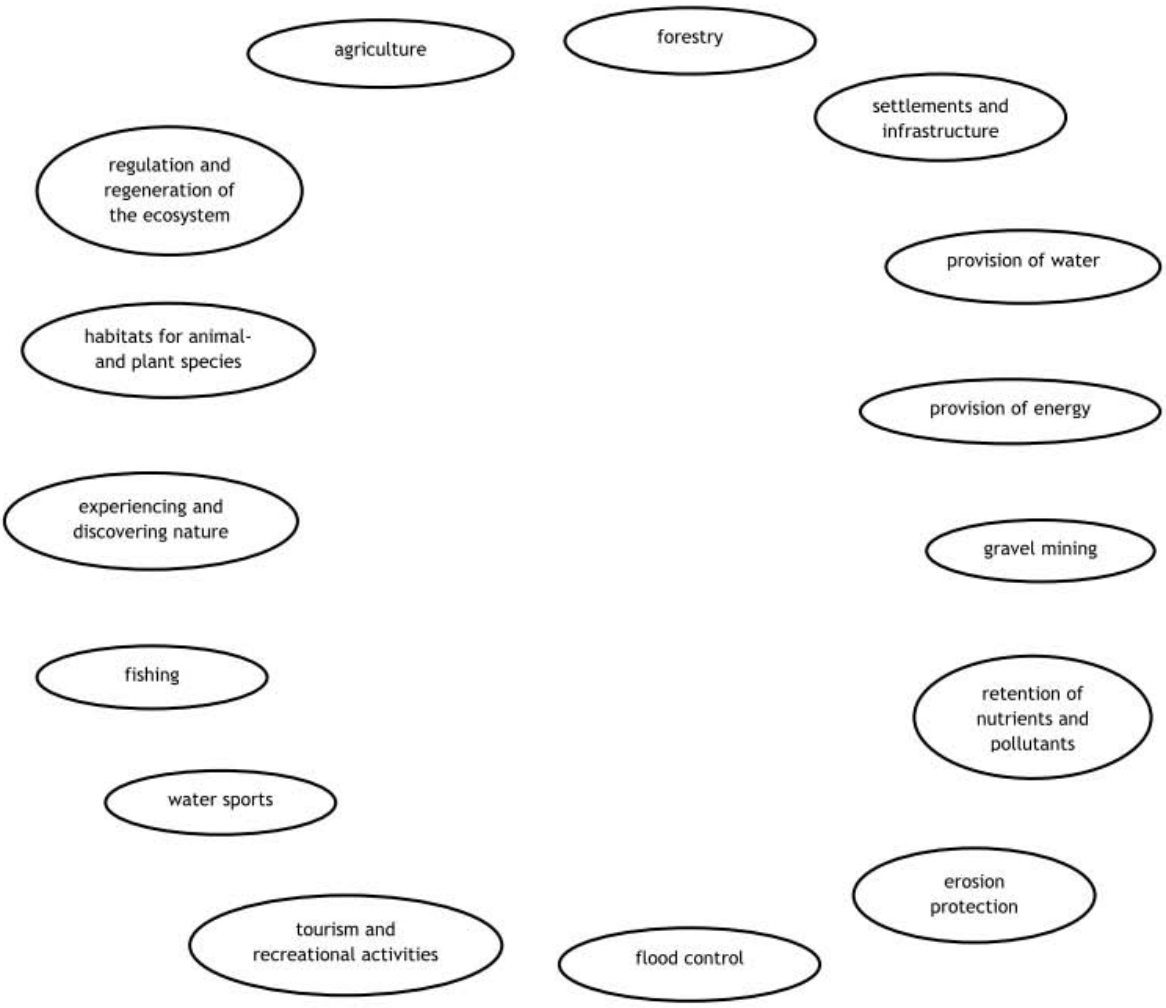
question 3: Which section do you know best in your opinion?
(comment: the following questions are not aiming on knowledge acquisition but dealing with your perceptions)

section 1 (Mandling – Aich)	**section 2** (Aich - Stainach)	**section 3** (Stainach – Gesäuseeingang)	**section 4** (Gesäuseeingang – Hieflau)
○	○	○	○

question 4.1: In the following, please indicate which functions are available at the river Enns and the adjacent area according to your perception in the river section you know best. Furthermore please indicate how important you think they are for the region's future:

	function available						For the region's future: How important is this function?					
	cannot tell	yes	rather yes	neutral	rather no	no	cannot tell	very important	important	neutral	less important	not important
opportunities for agricultural use	○	○	○	○	○	○	○	○	○	○	○	○
opportunities for forestry	○	○	○	○	○	○	○	○	○	○	○	○
opportunities for settlements and infrastructure	○	○	○	○	○	○	○	○	○	○	○	○
provision of water for irrigation and for drinking	○	○	○	○	○	○	○	○	○	○	○	○
provision of energy through water power plants	○	○	○	○	○	○	○	○	○	○	○	○
opportunities for gravel mining	○	○	○	○	○	○	○	○	○	○	○	○
retention of nutrients and pollutants (e.g. storage of CO_2)	○	○	○	○	○	○	○	○	○	○	○	○
erosion protection	○	○	○	○	○	○	○	○	○	○	○	○
flood control	○	○	○	○	○	○	○	○	○	○	○	○
opportunities for tourism and recreational activities	○	○	○	○	○	○	○	○	○	○	○	○
opportunities for water sports (e.g. rafting, canoening)	○	○	○	○	○	○	○	○	○	○	○	○
fishing opportunities	○	○	○	○	○	○	○	○	○	○	○	○
area for experiencing and discovering nature	○	○	○	○	○	○	○	○	○	○	○	○
habitats for a diversity of aquatic/terrestrial animal- and plant species	○	○	○	○	○	○	○	○	○	○	○	○
capability of the ecosystem to regulate and regenerate	○	○	○	○	○	○	○	○	○	○	○	○
other:.....	○	○	○	○	○	○	○	○	○	○	○	○

question 4. 2: Between different forms of use certain conflicts are possible. Where do you see the most important potentials for conflict in the section we just dealt with? *(please connect the respective potentials for use)*

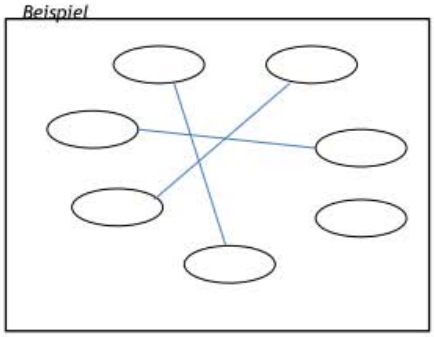


question 4.3: Is there another river section that you want to answer the same questions for?

yes	no
○	○

If yes => Please use supplementary sheets & fill out one table for each section

Beispiel



The perception of river landscape functions can also be linked to the human-nature-relationship:

question 5: If you are asked about your personal relationship with nature; would you agree or disagree with the following statements?

	strong agreement	agreement	neutral	rejection	strong rejection
I think, humans can become independent from nature by developing technology and should control and change nature. The production of necessary goods like for instance food can be improved and natural hazards like floods can be averted.	○	○	○	○	○
I do not think much of nature in my daily life.	○	○	○	○	○
I believe humans benefit from functioning ecosystems for instance from clean water, from timber or the beauty of landscapes. Hence functioning ecosystems can also create jobs and profits.	○	○	○	○	○
I see a moral obligation to conserve and protect nature, because human development and technology can be a threat to nature.	○	○	○	○	○
I consider humans and nature as equal in value and power. Nature has a value for itself, which cannot be measured only according to human utilization.	○	○	○	○	○
I feel as a part of nature. I have an emotional or spiritual bond with it. Being or living in nature is fulfilling for me. Our existence and the well-being of nature are intertwined. We cannot separate from nature.	○	○	○	○	○

question 6: Please indicate how far the following statements describe your person.

	strong agreement	agreement	neutral	rejection	strong rejection
In my childhood I have spent much time in nature.	○	○	○	○	○
I consider myself as a religious or spiritual person.	○	○	○	○	○
I spend my free time and holiday rather in nature (mountains, forests, lakes) than in cities.	○	○	○	○	○
I have a personal connection to farming and forestry (e.g. myself or close relatives run a farm)	○	○	○	○	○
To reduce my negative impact on the environment I become active, e.g. with buying bio products.	○	○	○	○	○

Finally I would like to ask you for the following information:

gender:

male	○
female	○

Main residence:

city..... PLZ.....

highest educational attainment:

compulsory school	○
apprentice training	○
VET school	○
secondary academic school	○
VET college	○
college, high-school graduate course	○
preparatory academies	○
University, University of applied sciences	○

Do you deal with rivers in your professional environment?

yes	rather yes	rather no	no
○	○	○	○

May I ask, which professional activity you pursue?

_____

Year of birth:_____

Could you name further interviewpartners that would be relevant for an interview dealing with this topic?

_____

Thank you for your contribution!

9.2 Qualitative interview

Interview guideline

„ecosystem functions of river landscapes“

Interviewee: _____ Organisation/Institution: _____

Interviewer: _____ Date: _____

Please answer following questions from your professional perspective:

1. Which river related aspects/processes are in the foreground in your working environment at the moment?
2. Which aspects/processes relevant for use are in the foreground in water management at the moment in your opinion?
3. Are there certain trends in the use of rivers in your opinion?
4. Which forms of use are considered too little in planning and decision processes?
5. Where do conflicts arise between different forms of use of ecosystems in Styria/ at the Enns river?
6. Is the ecosystem-service approach relevant in your working environment/in the management processes accompanied by you?
7. The ecosystem service concept is fostered very much at the moment (e.g. several workshops on this topic). How practicable do you see this concept considering the background of EU-WFD and the Austrian legislation.
8. For which institutions/administrative levels does the ecosystem service concept make sense in your opinion?
9. Would it be relevant to assess rivers with regard to the available ecosystem functions? Could that be a support for future planning & decision processes?
10. Many studies aim on assessing ecosystem services in a monetary way (e.g. „TEEB“-study-international study for assessing biodiversity and ecosystem services). How useful is this approach in your opinion?

9.3 Availability compared with age distribution

Einschätzung Vorhandensein Landwirtschaft			1nein	2 eher nein	3 neutral	4 eher ja	5 ja	Gesamt
Alter_klassiert	2 14-23	Anzahl	0	1	1	0	0	2
		Korrigierte Residuen	-,4	2,0	3,1	-,6	-1,9	
	3 24-33	Anzahl	4	2	1	4	13	24
		Korrigierte Residuen	1,8	-,2	-,1	,6	-1,2	
	4 34-43	Anzahl	2	3	2	3	12	22
		Korrigierte Residuen	,3	,8	1,1	,1	-1,1	
	5 44-53	Anzahl	1	5	2	3	23	34
		Korrigierte Residuen	-1,2	1,3	,4	-,9	,4	
	6 54-63	Anzahl	2	1	0	4	24	31
		Korrigierte Residuen	-,3	-1,3	-1,4	-,1	1,6	
	7 64-73	Anzahl	1	0	0	3	11	15
		Korrigierte Residuen	-,2	-1,3	-,9	,8	,7	
Gesamt		Anzahl	10	12	6	17	84	128
Einschätzung Vorhandensein Forstwirtschaft								
Alter_klassiert	2 14-23	Anzahl	0	1	0	0	1	2
		Korrigierte Residuen	-,4	,5	-,3	-,6	,3	
	3 24-33	Anzahl	2	6	1	1	14	24
		Korrigierte Residuen	,1	-,9	,1	-1,8	2,1	
	4 34-43	Anzahl	1	9	1	5	6	22
		Korrigierte Residuen	-,6	,9	,2	,9	-1,3	
	5 44-53	Anzahl	1	13	3	6	12	35
		Korrigierte Residuen	-1,2	,6	1,7	,2	-,8	
	6 54-63	Anzahl	5	9	0	6	10	30
		Korrigierte Residuen	2,1	-,4	-1,2	,7	-,8	
	7 64-73	Anzahl	1	5	0	3	7	16
		Korrigierte Residuen	-,2	-,1	-,9	,3	,4	
Gesamt		Anzahl	10	43	5	21	52	129
Einschätzung Vorhandensein Siedlungen - Infrastruktur								
Alter_klassiert	2 14-23	Anzahl	0	1	0	0	0	1
		Korrigierte Residuen	-,3	2,0	-,4	-,5	-,8	
	3 24-33	Anzahl	2	1	6	2	4	15
		Korrigierte Residuen	,4	-1,4	3,2	-,5	-1,0	
	4 34-43	Anzahl	1	5	2	5	3	16
		Korrigierte Residuen	-,6	1,2	-,2	1,6	-1,7	
	5 44-53	Anzahl	2	5	4	1	12	24
		Korrigierte Residuen	-,4	,1	,4	-2,0	1,5	
	6 54-63	Anzahl	1	4	0	2	10	17
		Korrigierte Residuen	-,7	,4	-1,9	-,7	2,0	
	7 64-73	Anzahl	3	1	0	5	2	11
		Korrigierte Residuen	1,9	-1,0	-1,4	2,6	-1,4	
Gesamt		Anzahl	9	17	12	15	32	84

Einschätzug Vorhandensein Wasserversorgung								
Alter_klassiert	2 14-23	Anzahl	0	1	0	0	1	2
		Korrigierte Residuen	-,3	1,4	-,5	-,6	-,1	
	3 24-33	Anzahl	1	2	3	4	13	23
		Korrigierte Residuen	-,3	-,9	,3	,2	,4	
	4 34-43	Anzahl	3	3	1	5	10	22
		Korrigierte Residuen	1,8	-,2	-1,1	1,0	-,8	
	5 44-53	Anzahl	0	4	7	4	20	35
		Korrigierte Residuen	-1,7	-,7	2,0	-,8	,6	
	6 54-63	Anzahl	1	5	2	4	17	29
		Korrigierte Residuen	-,6	,4	-,8	-,3	,7	
	7 64-73	Anzahl	2	4	1	3	5	15
		Korrigierte Residuen	1,4	1,4	-,6	,5	-1,6	
Gesamt		Anzahl	7	19	14	20	67	126
Einschätzung Vorhandensein Stromproduktion								
Alter_klassiert	2 14-23	Anzahl	0	0	1	0	1	2
		Korrigierte Residuen	-,9	-,5	2,0	-,4	,3	
	3 24-33	Anzahl	8	1	0	4	10	23
		Korrigierte Residuen	,6	-1,2	-1,7	1,6	,4	
	4 34-43	Anzahl	6	0	3	1	11	21
		Korrigierte Residuen	-,1	-1,8	,8	-,7	1,3	
	5 44-53	Anzahl	11	5	3	4	11	34
		Korrigierte Residuen	,4	,6	-,1	,8	-1,1	
	6 54-63	Anzahl	6	5	4	1	14	30
		Korrigierte Residuen	-1,4	,9	,8	-1,2	,8	
	7 64-73	Anzahl	7	4	1	1	3	16
		Korrigierte Residuen	1,3	1,7	-,5	-,4	-1,9	
Gesamt		Anzahl	38	15	12	11	51	126
Einschätzung Vorhandensein Schotterabbau								
Alter_klassiert	2 14-23	Anzahl	0	0	0	0	1	1
		Korrigierte Residuen	-,5	-,5	-,5	-,4	1,7	
	3 24-33	Anzahl	2	2	4	3	6	17
		Korrigierte Residuen	-,9	-1,1	,7	,4	,9	
	4 34-43	Anzahl	1	5	3	2	8	19
		Korrigierte Residuen	-1,8	,5	-,2	-,6	1,7	
	5 44-53	Anzahl	8	11	6	4	3	32
		Korrigierte Residuen	,8	2,0	,2	-,4	-2,5	
	6 54-63	Anzahl	4	6	5	7	7	29
		Korrigierte Residuen	-1,0	-,2	,0	1,6	-,3	
	7 64-73	Anzahl	8	1	2	1	4	16
		Korrigierte Residuen	3,2	-1,6	-,6	-1,0	-,1	
Gesamt		Anzahl	23	25	20	17	30	114

Einschätzung Vorhandensein Nährstoffrückhalt								
Alter_klassiert	2 14-23	Anzahl	1	0	0	0	1	2
		Korrigierte Residuen	1,9	-,4	-,7	-,7	,2	
	3 24-33	Anzahl	1	0	3	3	10	17
		Korrigierte Residuen	-,6	-1,3	,0	-,4	1,4	
	4 34-43	Anzahl	2	3	2	3	7	17
		Korrigierte Residuen	,2	1,8	-,7	-,4	-,2	
	5 44-53	Anzahl	1	1	7	7	14	30
		Korrigierte Residuen	-1,5	-1,0	1,0	,3	,4	
	6 54-63	Anzahl	4	3	5	5	10	27
		Korrigierte Residuen	,9	,8	,1	-,4	-,8	
	7 64-73	Anzahl	2	1	2	4	5	14
		Korrigierte Residuen	,5	,0	-,3	,7	-,6	
Gesamt		Anzahl	11	8	19	23	47	107
Einschätzung Vorhandensein Erosionsschutz								
Alter_klassiert	2 14-23	Anzahl	0	0	0	0	2	2
		Korrigierte Residuen	-,3	-,5	-,6	-,8	1,6	
	3 24-33	Anzahl	0	2	2	9	7	20
		Korrigierte Residuen	-,9	-,3	-,4	2,1	-1,0	
	4 34-43	Anzahl	2	3	4	6	8	23
		Korrigierte Residuen	1,6	,1	,7	,0	-1,1	
	5 44-53	Anzahl	0	4	5	11	14	34
		Korrigierte Residuen	-1,3	-,1	,3	1,0	-,6	
	6 54-63	Anzahl	2	6	3	5	13	29
		Korrigierte Residuen	1,3	1,6	-,5	-1,2	-,1	
	7 64-73	Anzahl	0	0	2	1	11	14
		Korrigierte Residuen	-,7	-1,5	,2	-1,7	2,6	
Gesamt		Anzahl	4	15	16	32	56	122
Einschätzung Vorhandensein Wasserrückhalt								
Alter_klassiert	2 14-23	Anzahl	0	0	0	0	2	2
		Korrigierte Residuen	-,3	-,6	-,3	-,8	1,3	
	3 24-33	Anzahl	2	2	2	7	10	23
		Korrigierte Residuen	,8	-,7	1,3	1,0	-1,2	
	4 34-43	Anzahl	2	3	0	6	11	22
		Korrigierte Residuen	,8	,1	-1,0	,6	-,5	
	5 44-53	Anzahl	1	6	2	6	19	34
		Korrigierte Residuen	-,8	,9	,7	-,8	,2	
	6 54-63	Anzahl	1	5	0	7	16	29
		Korrigierte Residuen	-,5	,7	-1,2	,2	,1	
	7 64-73	Anzahl	1	0	1	3	12	17
		Korrigierte Residuen	,1	-1,7	,5	-,5	1,4	
Gesamt		Anzahl	7	17	5	29	70	127

Einschätzung Vorhandensein Freizeit-Tourismus								
Alter_klassiert	2 14-23	Anzahl	0	0	0	0	2	2
		Korrigierte Residuen	-,1	-,2	-,3	-,5	,7	
	3 24-33	Anzahl	0	3	0	2	19	24
		Korrigierte Residuen	-,5	3,7	-1,0	-,5	-,5	
	4 34-43	Anzahl	0	0	0	2	21	23
		Korrigierte Residuen	-,5	-,8	-,9	-,4	1,2	
	5 44-53	Anzahl	0	0	1	7	27	35
		Korrigierte Residuen	-,6	-1,0	-,1	1,9	-1,0	
	6 54-63	Anzahl	0	0	3	3	24	30
		Korrigierte Residuen	-,5	-,9	2,5	-,3	-,4	
	7 64-73	Anzahl	1	0	0	1	15	17
		Korrigierte Residuen	2,6	-,7	-,8	-,8	,6	
Gesamt		Anzahl	1	3	4	15	110	131
Einschätzung Vorhandensein Wassersport								
Alter_klassiert	2 14-23	Anzahl	0	0	0	1	1	2
		Korrigierte Residuen	-,2	-,4	-,4	1,1	-,4	
	3 24-33	Anzahl	0	2	2	3	17	24
		Korrigierte Residuen	-,8	,3	,1	-,9	,8	
	4 34-43	Anzahl	1	1	1	6	14	23
		Korrigierte Residuen	,7	-,5	-,7	,9	-,4	
	5 44-53	Anzahl	1	3	3	3	25	35
		Korrigierte Residuen	,3	,5	,2	-1,8	1,1	
	6 54-63	Anzahl	0	1	3	8	18	30
		Korrigierte Residuen	-1,0	-,9	,6	1,2	-,5	
	7 64-73	Anzahl	1	2	1	4	8	16
		Korrigierte Residuen	1,1	1,0	-,2	,6	-1,3	
Gesamt		Anzahl	3	9	10	25	84	130
Einschätzung Vorhandensein Fischerei								
Alter_klassiert	2 14-23	Anzahl	n.a.	0	0	0	1	1
		Korrigierte Residuen	n.a.	-,2	-,2	-,5	,6	
	3 24-33	Anzahl	n.a.	2	1	4	16	23
		Korrigierte Residuen	n.a.	1,7	,7	-,4	-,6	
	4 34-43	Anzahl	n.a.	0	1	4	17	22
		Korrigierte Residuen	n.a.	-,9	,8	-,3	,4	
	5 44-53	Anzahl	n.a.	1	0	10	23	34
		Korrigierte Residuen	n.a.	-,1	-1,1	1,5	-1,0	
	6 54-63	Anzahl	n.a.	0	1	6	23	30
		Korrigierte Residuen	n.a.	-1,1	,4	,0	,4	
	7 64-73	Anzahl	n.a.	1	0	2	14	17
		Korrigierte Residuen	n.a.	,7	-,7	-,9	,8	
Gesamt		Anzahl	n.a.	4	3	26	95	127

Einschätzung Vorhandensein Naturerfahrung/erlebnis								
Alter_klassiert	2 14-23	Anzahl	0	0	0	0	2	2
		Korrigierte Residuen	-,1	-,1	-,3	-,6	,8	
	3 24-33	Anzahl	1	0	2	1	20	24
		Korrigierte Residuen	2,1	-,5	1,0	-1,7	,7	
	4 34-43	Anzahl	0	0	0	4	20	24
		Korrigierte Residuen	-,5	-,5	-1,2	,1	,7	
	5 44-53	Anzahl	0	0	1	8	26	35
		Korrigierte Residuen	-,6	-,6	-,5	1,3	-,7	
	6 54-63	Anzahl	0	0	3	5	22	30
		Korrigierte Residuen	-,5	-,5	1,6	,1	-,7	
	7 64-73	Anzahl	0	1	0	3	13	17
		Korrigierte Residuen	-,4	2,6	-1,0	,2	-,2	
Gesamt		Anzahl	1	1	6	21	104	132
Einschätzung Vorhandensein Lebensraum								
Alter_klassiert	2 14-23	Anzahl		0	0	0	2	2
		Korrigierte Residuen		-,3	-,3	-,6	,8	
	3 24-33	Anzahl		1	2	2	19	24
		Korrigierte Residuen		,1	1,3	-,9	,1	
	4 34-43	Anzahl		1	0	4	19	24
		Korrigierte Residuen		,1	-1,1	,4	,1	
	5 44-53	Anzahl		1	0	8	26	35
		Korrigierte Residuen		-,3	-1,4	1,7	-,7	
	6 54-63	Anzahl		1	1	3	25	30
		Korrigierte Residuen		-,1	-,1	-,8	,8	
	7 64-73	Anzahl		1	2	2	12	17
		Korrigierte Residuen		,5	1,9	-,3	-,8	
Gesamt		Anzahl		5	5	19	104	132
Einschätzung Vorhandensein Regulation-Regeneration								
Alter_klassiert	2 14-23	Anzahl	0	0	0	1	1	2
		Korrigierte Residuen	-,3	-,3	-,4	,8	-,3	
	3 24-33	Anzahl	0	1	2	2	17	22
		Korrigierte Residuen	-1,0	-,1	,6	-2,0	1,9	
	4 34-43	Anzahl	1	0	0	13	9	23
		Korrigierte Residuen	,1	-1,2	-1,4	3,7	-2,1	
	5 44-53	Anzahl	2	1	4	8	17	32
		Korrigierte Residuen	,8	-,5	1,7	-,2	-,7	
	6 54-63	Anzahl	1	4	2	4	18	29
		Korrigierte Residuen	-,2	2,6	,1	-1,7	,4	
	7 64-73	Anzahl	1	0	0	5	11	17
		Korrigierte Residuen	,4	-1,0	-1,2	,3	,5	
Gesamt		Anzahl	5	6	8	33	74	125

9.4 Availability compared with gender distribution

Einschätzung Vorhandensein Landwirtschaft			1nein	2 eher nein	3 neutral	4 eher ja	5 ja	Gesamt
gender Geschlecht	1weiblich	Anzahl	2	6	1	5	30	44
		Korrigierte Residuen	-1,7	1,5	-,8	-,5	,9	
	2 männlich	Anzahl	14	6	5	14	59	98
		Korrigierte Residuen	1,7	-1,5	,8	,5	-,9	
Gesamt		Anzahl	16	12	6	19	89	142
Einschätzung Vorhandensein Forstwirtschaft								
gender Geschlecht	1weiblich	Anzahl	1	11	2	6	24	44
		Korrigierte Residuen	-2,2	-1,0	,2	-,4	2,6	
	2 männlich	Anzahl	15	33	4	16	32	100
		Korrigierte Residuen	2,2	1,0	-,2	,4	-2,6	
Gesamt		Anzahl	16	44	6	22	56	144
Einschätzung Vorhandensein Siedlungen - Infrastruktur								
gender Geschlecht	1weiblich	Anzahl	2	5	6	2	9	24
		Korrigierte Residuen	-,8	,2	1,4	-1,2	,2	
	2 männlich	Anzahl	10	13	9	13	25	70
		Korrigierte Residuen	,8	-,2	-1,4	1,2	-,2	
Gesamt		Anzahl	12	18	15	15	34	94
Einschätzug Vorhandensein Wasserversorgung								
gender Geschlecht	1weiblich	Anzahl	1	3	3	6	30	43
		Korrigierte Residuen	-1,5	-1,8	-1,3	-,3	3,1	
	2 männlich	Anzahl	9	18	14	15	40	96
		Korrigierte Residuen	1,5	1,8	1,3	,3	-3,1	
Gesamt		Anzahl	10	21	17	21	70	139
Einschätzung Vorhandensein Stromproduktion								
gender Geschlecht	1weiblich	Anzahl	12	4	4	3	20	43
		Korrigierte Residuen	-,6	-,4	,2	-,5	1,0	
	2 männlich	Anzahl	32	11	8	9	36	96
		Korrigierte Residuen	,6	,4	-,2	,5	-1,0	
Gesamt		Anzahl	44	15	12	12	56	139
Einschätzung Vorhandensein Schotterabbau								
gender Geschlecht	1weiblich	Anzahl	7	4	7	4	13	35
		Korrigierte Residuen	-,4	-1,8	,8	-,6	1,9	
	2 männlich	Anzahl	21	24	13	14	19	91
		Korrigierte Residuen	,4	1,8	-,8	,6	-1,9	
Gesamt		Anzahl	28	28	20	18	32	126
Einschätzung Vorhandensein Nährstoffrückhalt								
gender Geschlecht	1weiblich	Anzahl	3	2	3	8	18	34
		Korrigierte Residuen	-,1	-,4	-1,7	,3	1,4	
	2 männlich	Anzahl	8	7	19	18	33	85
		Korrigierte Residuen	,1	,4	1,7	-,3	-1,4	
Gesamt		Anzahl	11	9	22	26	51	119

Einschätzung Vorhandensein Erosionsschutz								
gender Geschlecht	1 weiblich	Anzahl	0	3	6	9	23	41
		Korrigierte Residuen	-1,5	-1,4	,1	-,4	1,8	
	2 männlich	Anzahl	5	15	13	24	37	94
		Korrigierte Residuen	1,5	1,4	-,1	,4	-1,8	
Gesamt		Anzahl	5	18	19	33	60	135
Einschätzung Vorhandensein Wasserrückhalt								
gender Geschlecht	1 weiblich	Anzahl	1	3	2	10	28	44
		Korrigierte Residuen	-1,2	-1,3	,1	-,5	1,8	
	2 männlich	Anzahl	7	14	4	26	46	97
		Korrigierte Residuen	1,2	1,3	-,1	,5	-1,8	
Gesamt		Anzahl	8	17	6	36	74	141
Einschätzung Vorhandensein Freizeit-Tourismus								
gender Geschlecht	1 weiblich	Anzahl	0	2	2	3	39	46
		Korrigierte Residuen	-,7	1,3	,4	-1,6	,8	
	2 männlich	Anzahl	1	1	3	16	79	100
		Korrigierte Residuen	,7	-1,3	-,4	1,6	-,8	
Gesamt		Anzahl	1	3	5	19	118	146
Einschätzung Vorhandensein Wassersport								
gender Geschlecht	1 weiblich	Anzahl	0	4	2	9	30	45
		Korrigierte Residuen	-1,2	,4	-1,0	,4	,4	
	2 männlich	Anzahl	3	7	9	17	63	99
		Korrigierte Residuen	1,2	-,4	1,0	-,4	-,4	
Gesamt		Anzahl	3	11	11	26	93	144
Einschätzung Vorhandensein Fischerei								
gender Geschlecht	1 weiblich	Anzahl	n.a.	1	1	8	33	43
		Korrigierte Residuen	n.a.	-,8	-,2	-,4	,8	
	2 männlich	Anzahl	n.a.	5	3	21	69	98
		Korrigierte Residuen	n.a.	,8	,2	,4	-,8	
Gesamt		Anzahl	n.a.	6	4	29	102	141
Einschätzung Vorhandensein Naturerfahrung/erlebnis								
gender Geschlecht	1 weiblich	Anzahl	1	0	1	3	42	47
		Korrigierte Residuen	1,5	-,7	-,8	-2,3	2,3	
	2 männlich	Anzahl	0	1	5	21	72	99
		Korrigierte Residuen	-1,5	,7	,8	2,3	-2,3	
Gesamt		Anzahl	1	1	6	24	114	146
Einschätzung Vorhandensein Lebensraum								
gender Geschlecht	1 weiblich	Anzahl	n.a.	1	2	7	37	47
		Korrigierte Residuen	n.a.	-,8	,1	,1	,3	
	2 männlich	Anzahl	n.a.	5	4	14	76	99
		Korrigierte Residuen	n.a.	,8	-,1	-,1	-,3	
Gesamt		Anzahl	n.a.	6	6	21	113	146
Einschätzung Vorhandensein Regulation-Regeneration								
gender Geschlecht	1 weiblich	Anzahl	1	2	1	12	28	44
		Korrigierte Residuen	-,8	-,2	-1,4	,4	,8	
	2 männlich	Anzahl	5	5	8	23	53	94
		Korrigierte Residuen	,8	,2	1,4	-,4	-,8	
Gesamt		Anzahl	6	7	9	35	81	138

9.5 Availability compared with educational attainment

Einschätzung Vorhandensein Landwirtschaft			1nein	2 eher nein	3 neutral	4 eher ja	5 ja	Gesamt
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	7	5	1	10	38	61
		Korrigierte Residuen	,1	-,1	-1,3	,9	-,1	
	2 andere	Anzahl	9	7	5	9	51	81
		Korrigierte Residuen	-,1	,1	1,3	-,9	,1	
Gesamt		Anzahl	16	12	6	19	89	142
Einschätzung Vorhandensein Forstwirtschaft								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	8	19	3	11	22	63
		Korrigierte Residuen	,5	-,1	,3	,6	-,9	
	2 andere	Anzahl	8	25	3	11	34	81
		Korrigierte Residuen	-,5	,1	-,3	-,6	,9	
Gesamt		Anzahl	16	44	6	22	56	144
Einschätzung Vorhandensein Siedlungen - Infrastruktur								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	3	9	9	8	12	41
		Korrigierte Residuen	-1,4	,6	1,4	,8	-1,2	
	2 andere	Anzahl	9	9	6	7	22	53
		Korrigierte Residuen	1,4	-,6	-1,4	-,8	1,2	
Gesamt		Anzahl	12	18	15	15	34	94
Einschätzung Vorhandensein Wasserversorgung								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	4	12	6	14	23	59
		Korrigierte Residuen	-,2	1,5	-,6	2,4	-2,3	
	2 andere	Anzahl	6	9	11	7	47	80
		Korrigierte Residuen	,2	-1,5	,6	-2,4	2,3	
Gesamt		Anzahl	10	21	17	21	70	139
Einschätzung Vorhandensein Stromproduktion								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	24	5	3	5	25	62
		Korrigierte Residuen	1,6	-,9	-1,4	-,2	,0	
	2 andere	Anzahl	20	10	9	7	31	77
		Korrigierte Residuen	-1,6	,9	1,4	,2	,0	
Gesamt		Anzahl	44	15	12	12	56	139
Einschätzung Vorhandensein Schotterabbau								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	8	13	9	6	18	54
		Korrigierte Residuen	-1,7	,4	,2	-,9	1,8	
	2 andere	Anzahl	20	15	11	12	14	72
		Korrigierte Residuen	1,7	-,4	-,2	,9	-1,8	
Gesamt		Anzahl	28	28	20	18	32	126
Einschätzung Vorhandensein Nährstoffrückhalt								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	4	3	10	13	22	52
		Korrigierte Residuen	-,5	-,7	,2	,7	-,1	
	2 andere	Anzahl	7	6	12	13	29	67
		Korrigierte Residuen	,5	,7	-,2	-,7	,1	
Gesamt		Anzahl	11	9	22	26	51	119

Einschätzung Vorhandensein Erosionsschutz								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	3	12	10	17	19	61
		Korrigierte Residuen	,7	2,0	,7	,8	-2,8	
	2 andere	Anzahl	2	6	9	16	41	74
		Korrigierte Residuen	-,7	-2,0	-,7	-,8	2,8	
Einschätzung Vorhandensein Wasserrückhalt								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	4	8	4	16	29	61
		Korrigierte Residuen	,4	,3	1,2	,2	-1,0	
	2 andere	Anzahl	4	9	2	20	45	80
		Korrigierte Residuen	-,4	-,3	-1,2	-,2	1,0	
Gesamt		Anzahl	8	17	6	36	74	141
Einschätzung Vorhandensein Freizeit-Tourismus								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	1	2	4	11	45	63
		Korrigierte Residuen	1,2	,8	1,7	1,4	-2,5	
	2 andere	Anzahl	0	1	1	8	73	83
		Korrigierte Residuen	-1,2	-,8	-1,7	-1,4	2,5	
Gesamt		Anzahl	1	3	5	19	118	146
Einschätzung Vorhandensein Wassersport								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	1	6	6	14	36	63
		Korrigierte Residuen	-,4	,8	,8	1,1	-1,6	
	2 andere	Anzahl	2	5	5	12	57	81
		Korrigierte Residuen	,4	-,8	-,8	-1,1	1,6	
Gesamt		Anzahl	3	11	11	26	93	144
Einschätzung Vorhandensein Fischerei								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	n.a.	3	4	12	43	62
		Korrigierte Residuen	n.a.	,3	2,3	-,3	-,7	
	2 andere	Anzahl	n.a.	3	0	17	59	79
		Korrigierte Residuen	n.a.	-,3	-2,3	,3	,7	
Gesamt		Anzahl	n.a.	6	4	29	102	141
Einschätzung Vorhandensein Naturerfahrung/erlebnis								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	1	0	3	14	46	64
		Korrigierte Residuen	1,1	-,9	,3	1,6	-1,6	
	2 andere	Anzahl	0	1	3	10	68	82
		Korrigierte Residuen	-1,1	,9	-,3	-1,6	1,6	
Gesamt		Anzahl	1	1	6	24	114	146
Einschätzung Vorhandensein Lebensraum								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	n.a.	3	6	11	44	64
		Korrigierte Residuen	n.a.	,3	2,8	,9	-2,2	
	2 andere	Anzahl	n.a.	3	0	10	69	82
		Korrigierte Residuen	n.a.	-,3	-2,8	-,9	2,2	
Gesamt		Anzahl	n.a.	6	6	21	113	146
Einschätzung Vorhandensein Regulation-Regeneration								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	3	6	5	17	29	60
		Korrigierte Residuen	,3	2,3	,8	,7	-2,2	
	2 andere	Anzahl	3	1	4	18	52	78
		Korrigierte Residuen	-,3	-2,3	-,8	-,7	2,2	
Gesamt		Anzahl	6	7	9	35	81	138

9.6 Importance compared with age distribution

Einschätzung Wichtigkeit Landwirtschaft			1nicht wichtig	2 weniger wichtig	3 neutral	4 wichtig	5 sehr wichtig	Gesamt
Alter_klassiert	2 14-23	Anzahl	0	0	0	2	0	2
		Korrigierte Residuen	-,5	-,5	-,5	2,0	-1,1	
	3 24-33	Anzahl	3	2	4	6	7	22
		Korrigierte Residuen	,8	,0	1,1	-,7	-,5	
	4 34-43	Anzahl	3	3	5	7	4	22
		Korrigierte Residuen	,8	,8	1,8	-,2	-1,9	
	5 44-53	Anzahl	3	5	3	9	15	35
		Korrigierte Residuen	-,2	1,2	-,6	-1,2	1,0	
	6 54-63	Anzahl	2	2	3	10	14	31
		Korrigierte Residuen	-,6	-,6	-,4	-,2	1,2	
	7 64-73	Anzahl	1	0	0	10	6	17
		Korrigierte Residuen	-,5	-1,4	-1,6	2,3	-,1	
Gesamt		Anzahl	12	12	15	44	47	129
Einschätzung Wichtigkeit Forstwirtschaft								
Alter_klassiert	2 14-23	Anzahl	1	0	0	0	1	2
		Korrigierte Residuen	,9	-,8	-,6	-,6	,9	
	3 24-33	Anzahl	2	5	3	6	7	23
		Korrigierte Residuen	-1,7	-,2	-,2	1,4	,8	
	4 34-43	Anzahl	6	7	6	1	2	22
		Korrigierte Residuen	,6	1,1	1,8	-1,6	-1,8	
	5 44-53	Anzahl	8	8	6	4	9	35
		Korrigierte Residuen	,1	,0	,5	-,9	,3	
	6 54-63	Anzahl	8	8	3	7	5	31
		Korrigierte Residuen	,5	,4	-,9	1,1	-1,2	
	7 64-73	Anzahl	4	2	1	3	6	16
		Korrigierte Residuen	,3	-1,1	-1,0	,3	1,4	
Gesamt		Anzahl	29	30	19	21	31	130
Einschätzung Wichtigkeit Siedlungen-Infrastruktur								
Alter_klassiert	2 14-23	Anzahl	0	1	0	0	0	1
		Korrigierte Residuen	-,4	1,9	-,5	-,6	-,5	
	3 24-33	Anzahl	3	4	2	5	0	14
		Korrigierte Residuen	,9	,6	-,5	,8	-1,9	
	4 34-43	Anzahl	1	6	4	4	1	16
		Korrigierte Residuen	-1,0	1,6	,7	-,2	-1,3	
	5 44-53	Anzahl	4	2	6	4	8	24
		Korrigierte Residuen	,4	-1,9	,9	-1,4	2,4	
	6 54-63	Anzahl	2	5	1	6	3	17
		Korrigierte Residuen	-,3	,8	-1,5	,9	,0	
	7 64-73	Anzahl	2	1	3	4	2	12
		Korrigierte Residuen	,3	-1,3	,6	,5	-,1	
Gesamt		Anzahl	12	19	16	23	15	84

Einschätzung Wichtigkeit Wasserversorgung								
Alter_klassiert	2 14-23	Anzahl	0	1	1	0	0	2
		Korrigierte Residuen	-,4	1,4	1,5	-,7	-1,2	
	3 24-33	Anzahl	2	1	4	6	9	22
		Korrigierte Residuen	,1	-1,5	,6	,7	,0	
	4 34-43	Anzahl	5	4	1	8	4	22
		Korrigierte Residuen	2,6	,4	-1,4	1,9	-2,4	
	5 44-53	Anzahl	1	5	5	6	18	35
		Korrigierte Residuen	-1,4	-,2	,1	-,7	1,5	
	6 54-63	Anzahl	2	5	6	2	16	31
		Korrigierte Residuen	-,5	,1	1,0	-2,3	1,4	
	7 64-73	Anzahl	1	4	1	6	5	17
		Korrigierte Residuen	-,4	1,0	-1,0	1,5	-1,0	
Gesamt		Anzahl	11	20	18	28	53	129
Einschätzung Wichtigkeit Stromproduktion								
Alter_klassiert	2 14-23	Anzahl	0	0	1	0	1	2
		Korrigierte Residuen	-,9	-,6	,9	-,7	1,4	
	3 24-33	Anzahl	6	2	5	4	6	23
		Korrigierte Residuen	-,3	-,8	-,2	-,2	1,5	
	4 34-43	Anzahl	9	2	5	4	2	22
		Korrigierte Residuen	1,4	-,7	-,1	-,1	-,9	
	5 44-53	Anzahl	7	4	9	9	5	34
		Korrigierte Residuen	-1,2	-,4	,5	1,4	-,1	
	6 54-63	Anzahl	8	8	7	4	4	31
		Korrigierte Residuen	-,4	2,2	-,1	-,9	-,5	
	7 64-73	Anzahl	7	2	3	3	1	16
		Korrigierte Residuen	1,4	-,2	-,5	,0	-1,1	
Gesamt		Anzahl	37	18	30	24	20	128
Einschätzung Wichtigkeit Schotterabbau								
Alter_klassiert	2 14-23	Anzahl	0	0	1	0	0	1
		Korrigierte Residuen	-,7	-,7	1,8	-,4	-,2	
	3 24-33	Anzahl	3	3	6	3	1	16
		Korrigierte Residuen	-1,1	-1,1	1,3	,9	1,0	
	4 34-43	Anzahl	6	6	4	3	1	20
		Korrigierte Residuen	-,1	,0	-,5	,5	,8	
	5 44-53	Anzahl	10	14	6	3	0	33
		Korrigierte Residuen	-,1	1,8	-1,0	-,6	-1,1	
	6 54-63	Anzahl	9	8	11	3	0	31
		Korrigierte Residuen	-,3	-,6	1,7	-,4	-1,0	
	7 64-73	Anzahl	9	5	1	2	0	17
		Korrigierte Residuen	2,1	-,1	-1,9	,0	-,7	
Gesamt		Anzahl	37	36	29	14	3	118

Einschätzung Wichtigkeit Nährstoffrückhalt								
Alter_klassiert	2 14-23	Anzahl	0	0	1	0	1	2
		Korrigierte Residuen	-,5	-,4	1,2	-,9	,5	
	3 24-33	Anzahl	1	1	3	4	8	17
		Korrigierte Residuen	-,9	-,4	-,1	-,5	1,4	
	4 34-43	Anzahl	5	2	1	10	2	20
		Korrigierte Residuen	1,9	,2	-1,7	2,3	-2,3	
	5 44-53	Anzahl	2	0	7	8	13	30
		Korrigierte Residuen	-1,1	-2,0	,8	-,3	1,5	
	6 54-63	Anzahl	4	5	6	8	7	30
		Korrigierte Residuen	,2	1,8	,3	-,3	-1,2	
	7 64-73	Anzahl	2	2	3	3	5	15
		Korrigierte Residuen	,1	,7	,2	-,8	,1	
Gesamt		Anzahl	14	10	21	33	37	114
Einschätzung Wichtigkeit Erosionsschutz								
Alter_klassiert	2 14-23	Anzahl	0	0	0	1	1	2
		Korrigierte Residuen	-,4	-,5	-,5	,6	,3	
	3 24-33	Anzahl	2	1	4	6	5	18
		Korrigierte Residuen	,7	-,7	1,7	,1	-1,2	
	4 34-43	Anzahl	3	2	2	11	5	23
		Korrigierte Residuen	1,2	-,2	-,3	1,8	-2,0	
	5 44-53	Anzahl	1	2	4	13	13	33
		Korrigierte Residuen	-1,1	-,9	,3	1,1	-,1	
	6 54-63	Anzahl	3	5	2	5	15	30
		Korrigierte Residuen	,6	1,4	-,8	-2,1	1,3	
	7 64-73	Anzahl	0	2	1	3	9	15
		Korrigierte Residuen	-1,2	,5	-,5	-1,1	1,7	
Gesamt		Anzahl	9	12	13	39	49	121
Einschätzung Wichtigkeit Wasserrückhalt								
Alter_klassiert	2 14-23	Anzahl	0	0	1	0	1	2
		Korrigierte Residuen	-,3	-,3	3,1	-,8	-,4	
	3 24-33	Anzahl	2	0	1	3	15	21
		Korrigierte Residuen	1,9	-1,1	,0	-1,1	,7	
	4 34-43	Anzahl	1	2	0	8	12	23
		Korrigierte Residuen	,4	1,0	-1,2	1,4	-1,3	
	5 44-53	Anzahl	1	2	2	6	23	34
		Korrigierte Residuen	-,1	,4	,4	-,9	,5	
	6 54-63	Anzahl	0	2	1	9	19	31
		Korrigierte Residuen	-1,1	,5	-,4	,9	-,4	
	7 64-73	Anzahl	0	0	1	3	13	17
		Korrigierte Residuen	-,8	-1,0	,3	-,6	1,1	
Gesamt		Anzahl	4	6	6	30	83	128

Einschätzung Wichtigkeit Freizeit-Tourismus								
Alter_klassiert	2 14-23	Anzahl	0	0	0	1	1	2
		Korrigierte Residuen	-,1	-,2	-,3	,8	-,6	
	3 24-33	Anzahl	0	1	1	2	19	23
		Korrigierte Residuen	-,5	,7	,4	-2,0	1,6	
	4 34-43	Anzahl	1	1	1	6	14	23
		Korrigierte Residuen	2,2	,7	,4	,1	-,9	
	5 44-53	Anzahl	0	0	0	11	24	35
		Korrigierte Residuen	-,6	-1,1	-1,2	1,0	-,1	
	6 54-63	Anzahl	0	0	2	11	18	31
		Korrigierte Residuen	-,6	-1,0	1,3	1,5	-1,5	
	7 64-73	Anzahl	0	1	0	2	14	17
		Korrigierte Residuen	-,4	1,1	-,8	-1,4	1,3	
Gesamt		Anzahl	1	3	4	33	91	131
Einschätzung Wichtigkeit Wassersport								
Alter_klassiert	2 14-23	Anzahl	0	0	1	0	1	2
		Korrigierte Residuen	-,4	-,5	1,0	-1,1	,8	
	3 24-33	Anzahl	1	2	4	7	9	23
		Korrigierte Residuen	-,5	-,3	-,6	-,6	1,7	
	4 34-43	Anzahl	3	2	6	9	3	23
		Korrigierte Residuen	1,3	-,3	,5	,4	-1,5	
	5 44-53	Anzahl	5	4	4	12	10	35
		Korrigierte Residuen	2,0	,2	-1,8	-,2	,6	
	6 54-63	Anzahl	0	4	12	9	6	31
		Korrigierte Residuen	-1,7	,5	2,6	-,9	-,8	
	7 64-73	Anzahl	0	2	2	10	3	17
		Korrigierte Residuen	-1,2	,2	-1,1	2,1	-,8	
Gesamt		Anzahl	9	14	29	47	33	132
Einschätzung Wichtigkeit Fischerei								
	2 14-23	Anzahl	0	0	0	0	1	1
		Korrigierte Residuen	-,2	-,3	-,6	-,7	1,5	
	3 24-33	Anzahl	0	4	6	7	5	22
		Korrigierte Residuen	-,8	1,6	,5	-,3	-,9	
	4 34-43	Anzahl	1	3	7	8	3	22
		Korrigierte Residuen	,8	,8	1,0	,2	-1,9	
	5 44-53	Anzahl	1	3	5	13	12	34
		Korrigierte Residuen	,3	-,1	-1,4	,6	,7	
	6 54-63	Anzahl	1	2	8	11	9	31
		Korrigierte Residuen	,4	-,6	,4	,1	-,2	
	7 64-73	Anzahl	0	0	4	5	8	17
		Korrigierte Residuen	-,7	-1,4	,0	-,5	1,6	
Gesamt		Anzahl	3	12	30	44	39	127

Einschätzung Wichtigkeit Naturerfahrung/erlebnis								
	2 14-23	Anzahl	1	0	0	0	1	2
		Korrigierte Residuen	8,1	-,2	-,3	-1,0	-,3	
	3 24-33	Anzahl	0	0	1	4	18	23
		Korrigierte Residuen	-,5	-,7	,0	-1,7	1,9	
	4 34-43	Anzahl	0	2	1	9	12	24
		Korrigierte Residuen	-,5	3,0	-,1	,6	-1,2	
	5 44-53	Anzahl	0	0	1	10	24	35
		Korrigierte Residuen	-,6	-,9	-,5	-,6	1,1	
	6 54-63	Anzahl	0	0	3	14	14	31
		Korrigierte Residuen	-,6	-,8	1,6	1,7	-2,1	
	7 64-73	Anzahl	0	0	0	6	11	17
		Korrigierte Residuen	-,4	-,5	-1,0	,3	,3	
Gesamt		Anzahl	1	2	6	43	81	132
Einschätzung Wichtigkeit Lebensraum								
	2 14-23	Anzahl	n.a.	n.a.	0	0	2	2
		Korrigierte Residuen	n.a.	n.a.	-,3	-,8	,9	
	3 24-33	Anzahl	n.a.	n.a.	0	3	20	23
		Korrigierte Residuen	n.a.	n.a.	-,9	-1,4	1,7	
	4 34-43	Anzahl	n.a.	n.a.	3	10	11	24
		Korrigierte Residuen	n.a.	n.a.	3,0	2,2	-3,3	
	5 44-53	Anzahl	n.a.	n.a.	0	10	25	35
		Korrigierte Residuen	n.a.	n.a.	-1,2	,7	-,2	
	6 54-63	Anzahl	n.a.	n.a.	1	7	23	31
		Korrigierte Residuen	n.a.	n.a.	,1	-,2	,2	
	7 64-73	Anzahl	n.a.	n.a.	0	2	15	17
		Korrigierte Residuen	n.a.	n.a.	-,8	-1,3	1,5	
Gesamt		Anzahl	n.a.	n.a.	4	32	97	131
Einschätzung Wichtigkeit Regulation-Regeneration								
	2 14-23	Anzahl	0	0	0	1	1	2
		Korrigierte Residuen	-,1	-,1	-,3	,9	-,7	
	3 24-33	Anzahl	0	0	0	4	18	22
		Korrigierte Residuen	-,5	-,5	-1,1	-,6	1,2	
	4 34-43	Anzahl	1	0	4	7	12	24
		Korrigierte Residuen	2,1	-,5	3,1	,8	-2,5	
	5 44-53	Anzahl	0	0	1	9	21	31
		Korrigierte Residuen	-,6	-,6	-,5	,9	-,4	
	6 54-63	Anzahl	0	1	1	6	23	31
		Korrigierte Residuen	-,6	1,8	-,5	-,5	,5	
	7 64-73	Anzahl	0	0	0	2	14	16
		Korrigierte Residuen	-,4	-,4	-1,0	-1,1	1,6	
Gesamt		Anzahl	1	1	6	29	90	126

9.7 Importance compared with gender distribution

Einschätzung Wichtigkeit Landwirtschaft			1nicht wichtig	2 weniger wichtig	3 neutral	4 wichtig	5 sehr wichtig	Gesamt
gender Geschlecht	1weiblich	Anzahl	1	6	4	17	16	44
		Korrigierte Residuen	-2,5	1,5	-,5	1,2	,0	
	2 männlich	Anzahl	17	6	12	28	36	99
		Korrigierte Residuen	2,5	-1,5	,5	-1,2	,0	
Gesamt		Anzahl	18	12	16	45	52	143
Einschätzung Wichtigkeit Forstwirtschaft								
gender Geschlecht	1weiblich	Anzahl	6	7	9	5	18	45
		Korrigierte Residuen	-2,3	-1,3	1,6	-1,0	3,3	
	2 männlich	Anzahl	31	25	10	17	15	98
		Korrigierte Residuen	2,3	1,3	-1,6	1,0	-3,3	
Gesamt		Anzahl	37	32	19	22	33	143
Einschätzung Wichtigkeit Siedlungen-Infrastruktur								
gender Geschlecht	1weiblich	Anzahl	4	6	3	8	3	24
		Korrigierte Residuen	,1	,5	-1,0	1,0	-,8	
	2 männlich	Anzahl	11	14	15	16	14	70
		Korrigierte Residuen	-,1	-,5	1,0	-1,0	,8	
Gesamt		Anzahl	15	20	18	24	17	94
Einschätzung Wichtigkeit Wasserversorgung								
gender Geschlecht	1weiblich	Anzahl	1	5	4	11	24	45
		Korrigierte Residuen	-2,0	-,8	-1,5	,7	2,3	
	2 männlich	Anzahl	12	16	18	19	32	97
		Korrigierte Residuen	2,0	,8	1,5	-,7	-2,3	
Gesamt		Anzahl	13	21	22	30	56	142
Einschätzung Wichtigkeit Stromproduktion								
gender Geschlecht	1weiblich	Anzahl	11	4	8	12	10	45
		Korrigierte Residuen	-,8	-1,4	-,8	1,6	1,7	
	2 männlich	Anzahl	30	17	23	15	11	96
		Korrigierte Residuen	,8	1,4	,8	-1,6	-1,7	
Gesamt		Anzahl	41	21	31	27	21	141
Einschätzung Wichtigkeit Schotterabbau								
gender Geschlecht	1weiblich	Anzahl	7	7	14	8	2	38
		Korrigierte Residuen	-2,4	-1,7	2,6	2,0	1,4	
	2 männlich	Anzahl	37	31	15	8	1	92
		Korrigierte Residuen	2,4	1,7	-2,6	-2,0	-1,4	
Gesamt		Anzahl	44	38	29	16	3	130
Einschätzung Wichtigkeit Nährstoffrückhalt								
gender Geschlecht	1weiblich	Anzahl	3	0	4	18	14	39
		Korrigierte Residuen	-,8	-2,4	-1,8	2,6	1,1	
	2 männlich	Anzahl	11	12	21	20	23	87
		Korrigierte Residuen	,8	2,4	1,8	-2,6	-1,1	
Gesamt		Anzahl	14	12	25	38	37	126

Einschätzung Wichtigkeit Erosionsschutz								
gender Geschlecht	1weiblich	Anzahl	2	3	6	12	19	42
		Korrigierte Residuen	-1,0	-,5	,8	-,9	1,3	
	2 männlich	Anzahl	9	9	9	34	31	92
		Korrigierte Residuen	1,0	,5	-,8	,9	-1,3	
Gesamt		Anzahl	11	12	15	46	50	134
Einschätzung Wichtigkeit Wasserrückhalt								
gender Geschlecht	1weiblich	Anzahl	0	0	2	11	31	44
		Korrigierte Residuen	-1,5	-1,8	-,2	,0	1,4	
	2 männlich	Anzahl	5	7	5	24	56	97
		Korrigierte Residuen	1,5	1,8	,2	,0	-1,4	
Gesamt		Anzahl	5	7	7	35	87	141
Einschätzung Wichtigkeit Freizeit-Tourismus								
gender Geschlecht	1weiblich	Anzahl	0	0	2	11	33	46
		Korrigierte Residuen	-,7	-1,2	,4	-,4	,7	
	2 männlich	Anzahl	1	3	3	27	65	99
		Korrigierte Residuen	,7	1,2	-,4	,4	-,7	
Gesamt		Anzahl	1	3	5	38	98	145
Einschätzung Wichtigkeit Wassersport								
gender Geschlecht	1weiblich	Anzahl	2	4	13	16	11	46
		Korrigierte Residuen	-,6	-,4	1,1	-,3	,0	
	2 männlich	Anzahl	7	11	20	37	24	99
		Korrigierte Residuen	,6	,4	-1,1	,3	,0	
Gesamt		Anzahl	9	15	33	53	35	145
Einschätzung Wichtigkeit Fischerei								
gender Geschlecht	1weiblich	Anzahl	1	5	12	14	11	43
		Korrigierte Residuen	-,2	,7	,4	-,2	-,5	
	2 männlich	Anzahl	3	8	24	34	29	98
		Korrigierte Residuen	,2	-,7	-,4	,2	,5	
Gesamt		Anzahl	4	13	36	48	40	141
Einschätzung Wichtigkeit Naturerfahrung/erlebnis								
gender Geschlecht	1weiblich	Anzahl	1	0	2	16	28	47
		Korrigierte Residuen	1,5	-1,0	-,2	,1	,0	
	2 männlich	Anzahl	0	2	5	33	59	99
		Korrigierte Residuen	-1,5	1,0	,2	-,1	,0	
Gesamt		Anzahl	1	2	7	49	87	146
Einschätzung Wichtigkeit Lebensraum								
gender Geschlecht	1weiblich	Anzahl	n.a.	n.a.	1	9	37	47
		Korrigierte Residuen	n.a.	n.a.	-,6	-1,1	1,3	
	2 männlich	Anzahl	n.a.	n.a.	4	27	68	99
		Korrigierte Residuen	n.a.	n.a.	,6	1,1	-1,3	
Gesamt		Anzahl	n.a.	n.a.	5	36	105	146
Einschätzung Wichtigkeit Regulation-Regeneration								
gender Geschlecht	1weiblich	Anzahl	0	0	2	8	35	45
		Korrigierte Residuen	-,7	-,7	,0	-1,2	1,3	
	2 männlich	Anzahl	1	1	4	25	62	93
		Korrigierte Residuen	,7	,7	,0	1,2	-1,3	
Gesamt		Anzahl	1	1	6	33	97	138

9.8 Importance compared with educational attainment

Einschätzung Wichtigkeit Landwirtschaft			1nicht wichtig	2 weniger wichtig	3 neutral	4 wichtig	5 sehr wichtig	Gesamt
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	7	8	8	19	19	61
		Korrigierte Residuen	-,3	1,8	,6	-,1	-1,1	
	2 andere	Anzahl	11	4	8	26	33	82
		Korrigierte Residuen	,3	-1,8	-,6	,1	1,1	
Gesamt		Anzahl	18	12	16	45	52	143
Einschätzung Wichtigkeit Forstwirtschaft								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	18	15	7	12	11	63
		Korrigierte Residuen	,7	,4	-,7	1,1	-1,4	
	2 andere	Anzahl	19	17	12	10	22	80
		Korrigierte Residuen	-,7	-,4	,7	-1,1	1,4	
Gesamt		Anzahl	37	32	19	22	33	143
Einschätzung Wichtigkeit Siedlungen-Infrastruktur								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	3	12	8	10	8	41
		Korrigierte Residuen	-2,0	1,7	,1	-,2	,3	
	2 andere	Anzahl	12	8	10	14	9	53
		Korrigierte Residuen	2,0	-1,7	-,1	,2	-,3	
Gesamt		Anzahl	15	20	18	24	17	94
Einschätzung Wichtigkeit Wasserversorgung								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	7	11	10	14	18	60
		Korrigierte Residuen	,9	1,0	,3	,6	-2,0	
	2 andere	Anzahl	6	10	12	16	38	82
		Korrigierte Residuen	-,9	-1,0	-,3	-,6	2,0	
Gesamt		Anzahl	13	21	22	30	56	142
Einschätzung Wichtigkeit Stromproduktion								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	21	11	16	9	3	60
		Korrigierte Residuen	1,3	1,0	1,2	-1,1	-2,8	
	2 andere	Anzahl	20	10	15	18	18	81
		Korrigierte Residuen	-1,3	-1,0	-1,2	1,1	2,8	
Gesamt		Anzahl	41	21	31	27	21	141
Einschätzung Wichtigkeit Schotterabbau								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	19	20	13	4	1	57
		Korrigierte Residuen	-,1	1,3	,1	-1,6	-,4	
	2 andere	Anzahl	25	18	16	12	2	73
		Korrigierte Residuen	,1	-1,3	-,1	1,6	,4	
Gesamt		Anzahl	44	38	29	16	3	130
Einschätzung Wichtigkeit Nährstoffrückhalt								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	6	7	9	16	17	55
		Korrigierte Residuen	-,1	1,1	-,9	-,2	,3	
	2 andere	Anzahl	8	5	16	22	20	71
		Korrigierte Residuen	,1	-1,1	,9	,2	-,3	
Gesamt		Anzahl	14	12	25	38	37	126

Einschätzung Wichtigkeit Erosionsschutz								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	9	5	5	23	18	60
		Korrigierte Residuen	2,6	-,2	-,9	,9	-1,6	
	2 andere	Anzahl	2	7	10	23	32	74
		Korrigierte Residuen	-2,6	,2	,9	-,9	1,6	
Gesamt		Anzahl	11	12	15	46	50	134
Einschätzung Wichtigkeit Wasserrückhalt			1nicht wichtig	2 weniger wichtig	3 neutral	4 wichtig	5 sehr wichtig	
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	3	4	3	14	38	62
		Korrigierte Residuen	,7	,7	-,1	-,5	-,1	
	2 andere	Anzahl	2	3	4	21	49	79
		Korrigierte Residuen	-,7	-,7	,1	,5	,1	
Gesamt		Anzahl	5	7	7	35	87	141
Einschätzung Wichtigkeit Freizeit-Tourismus								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	1	2	1	20	39	63
		Korrigierte Residuen	1,1	,8	-1,1	1,3	-1,3	
	2 andere	Anzahl	0	1	4	18	59	82
		Korrigierte Residuen	-1,1	-,8	1,1	-1,3	1,3	
Gesamt		Anzahl	1	3	5	38	98	145
Einschätzung Wichtigkeit Wassersport								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	4	8	16	22	13	63
		Korrigierte Residuen	,1	,8	,7	-,4	-,9	
	2 andere	Anzahl	5	7	17	31	22	82
		Korrigierte Residuen	-,1	-,8	-,7	,4	,9	
Gesamt		Anzahl	9	15	33	53	35	145
Einschätzung Wichtigkeit Fischerei								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	0	9	23	16	14	62
		Korrigierte Residuen	-1,8	1,9	2,8	-1,8	-1,4	
	2 andere	Anzahl	4	4	13	32	26	79
		Korrigierte Residuen	1,8	-1,9	-2,8	1,8	1,4	
Gesamt		Anzahl	4	13	36	48	40	141
Einschätzung Wichtigkeit Naturerfahrung/erlebnis								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	0	2	3	20	39	64
		Korrigierte Residuen	-,9	1,6	-,1	-,5	,3	
	2 andere	Anzahl	1	0	4	29	48	82
		Korrigierte Residuen	,9	-1,6	,1	,5	-,3	
Gesamt		Anzahl	1	2	7	49	87	146
Einschätzung Wichtigkeit Lebensraum								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	n.a.	n.a.	3	19	42	64
		Korrigierte Residuen	n.a.	n.a.	,7	1,2	-1,5	
	2 andere	Anzahl	n.a.	n.a.	2	17	63	82
		Korrigierte Residuen	n.a.	n.a.	-,7	-1,2	1,5	
Gesamt		Anzahl	n.a.	n.a.	5	36	105	146
Einschätzung Wichtigkeit Regulation-Regeneration								
highest_education_level_2 Ausbildung: Uni/FH vs. andere	1Universität/FH	Anzahl	0	1	3	12	44	60
		Korrigierte Residuen	-,9	1,1	,3	-,9	,7	
	2 andere	Anzahl	1	0	3	21	53	78
		Korrigierte Residuen	,9	-1,1	-,3	,9	-,7	
Gesamt		Anzahl	1	1	6	33	97	138