



**ASSESSMENT OF SUSTAINABILITY INDICATORS IN THE WATER  
AND SANITATION SECTOR**

**Master thesis**

**In partial fulfilment of the requirements**

**for the degree of**

**Master of Science**

submitted by:

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## ABSTRACT

The Sustainable Development Goal 6, “Clean Water and Sanitation” (United Nation, 2017) aims at ensuring the availability of water and sustainable management thereof, as well as sanitation for all. One key criticism regarding the indicators of SDG 6 has been that the indicators do not measure the progress of the target well enough regarding certain aspects.

The thesis examines whether other indicators are better applicable to describe the achievement of SDG 6 Targets than the indicators proposed by the UN and those used in Austria.

This results in the following objectives:

- Compare the indicators for SDG 6 Targets with indicators proposed from other organizations used to evaluate the sustainability in the water and sanitation sector
- Critically discuss if these other indicators are better suitable to describe the achievement of SDG 6 Targets
- Research data availability of the indicators for assessment in/for Austria

After a thorough analysis of the possible alternative indicators, they are assigned to specific Targets of SDG 6. Furthermore, it was analysed whether the new suitable indicators are better suitable to characterize the respective target, than the UN or Austrian indicators. Data availability for the new indicators is then evaluated, in order to find out whether current data for Austria is existing and available.

The analysis shows that even though some indicators seemed promising at first, they are categorized as “less suitable” than the current set of indicators. It was found, that most alternative indicators can serve as additional or supplementary information to existing indicators and can then contribute to better describe achieving the target. Only few of the alternative indicators are better suitable to characterize the target than the UN or Austrian Indicator.

# KURZFASSUNG

Das Sustainable Development Goal 6 "Sauberes Wasser und sanitäre Einrichtungen" (United Nation, 2017) zielt darauf ab, die Verfügbarkeit von Wasser und dessen nachhaltige Bewirtschaftung sowie die sanitäre Versorgung für alle sicherzustellen. Ein zentraler Kritikpunkt an den Indikatoren des SDG 6 ist, dass die Indikatoren den Fortschritt des Ziels in bestimmten Aspekten nicht gut genug messen.

In dieser Arbeit wird untersucht, ob andere Indikatoren besser geeignet sind, die Zielerreichung von SDG 6 zu beschreiben, als die von der UN vorgeschlagenen und in Österreich verwendeten Indikatoren.

Daraus ergeben sich folgende Ziele:

- der Vergleich der Indikatoren für die SDG 6 Ziele mit den vorgeschlagenen Indikatoren zur Bewertung der Nachhaltigkeit im Wasser- und Abwassersektor von anderen Organisationen,
- die Diskussion, ob die anderen Indikatoren besser geeignet sind, die Erreichung der SDG 6 Ziele zu beschreiben,
- die Recherche der Datenverfügbarkeit der Indikatoren zur Bewertung in/für Österreich.

Nach einer ersten Analyse werden mögliche alternative Indikatoren den spezifischen Zielen von SDG6 zugeordnet. Weiters wurde analysiert, ob die neuen geeigneten Indikatoren besser geeignet sind, das jeweilige Ziel zu charakterisieren, als die UN- oder österreichischen Indikatoren. Anschließend wird untersucht, ob aktuelle Daten für Österreich vorhanden und verfügbar sind.

Die Analyse zeigt, dass einige Indikatoren - obwohl auf den ersten Blick vielversprechend - als "weniger geeignet" eingestuft werden als aktuelle Indikatoren. Es wurde deutlich, dass die meisten alternativen Indikatoren zu einer besseren Zielerreichung beitragen können, indem sie zusätzliche oder ergänzende Informationen zu den bestehenden Indikatoren liefern. Nur wenige der alternativen Indikatoren sind besser geeignet, das Ziel zu charakterisieren als der UN- bzw. Österreich-Indikator.

## ABBREVIATIONS

UniNEtZ	Universitäten und nachhaltige Entwicklungsziele (Universities and sustainable development goals)
COD	Chemical Oxygen Demand
MDG	Millennium Development Goals
SDG	Sustainable Development Goals
OWG	The UN General Assembly Open Working Group
NGO	non-governmental organization
UN	United Nation
IAEG-SDGs	Inter-Agency and Expert Group on SDG Indicators
OECD	Organization for Economic Cooperation and Development
IWRM	Integrated Water Resource Management
EU	European Union
RBMP	River Basement Management Plan
ODA	Official Development Assistance
EGSS	The Environmental Goods and Services Sector

# 1. INTRODUCTION

## 1.1 Overview

Water is an important element and crucial to the environment. According to UNESCO et al. (2015) “water is at the core of sustainable development”. In order to foster a more sustainable world, it is not surprising that the United Nations (UN) have created a separate Sustainable Development Goal (SDG) for “Water and Sanitation”. The SDG 6 aims at ensuring the availability of water and sustainable management thereof, as well as sanitation for all. However, water can be found in many different goals and plays a central role in sustainability development (UNESCO et al., 2015). In total, there are 17 different UN Sustainable Development Goals, some are more and some are less connected with SDG 6 “Clean water and sanitation” as it is shown in Figure 1.



Figure 1 The water-centric 17 Sustainable Development Goals for each sector (Makarigakis and Jimenez-Cisneros 2019)

For every goal of these 17 SDGs, there are associated targets. SDG 6 has eight targets. To measure these targets, corresponding indicators have been defined (Essex et al., 2020).

Since the SDGs are designed to work on a global level, the indicators need to be realizable by every country. But not every country is starting at the same point. Austria already scores high

at some of the indicators. Thus, some of global SDG Indicators might not help to improve Austria in completing their goals. For other countries, of the Global South for example, it would help immensely to improve towards the goals. Therefore, each country and its responsible stakeholders need to find a range of suitable indicators which suits their individual situation better and frame them for their specific conditions (Essex et al., 2020). Despite the individual adaptations, the end goal should be to contribute to achieving the SDGs (Dickens et al., 2019).

As mentioned above, Austria, as a very water-rich and prosperous country with a correspondingly well-developed infrastructure, scores well on many of the SDG 6 Targets. However, viewed as a whole, including resource conservation on a finite planet, sustainable development for all, sustainable consumption and challenges such as climate change and extinction of species, there is also a clear need for action for Austria (Germann, 2020).

### **1.2 Problem statement**

One key criticism regarding the indicators of SDG 6 – as for other SDGs – has been that in some areas the indicators do not measure the progress of the target well enough to achieve the goal in the end.

“Meaningful indicators are most needed to assess sustainable water use for humans and natural systems considering both quantitative and qualitative aspects” (Hak et al., 2015).

However, according to Bhaduri et al. (2016), many SDG 6 Indicators fail to create an understanding the progress that will be made on the SDGs. Definitions are often uncertain, leading to misinterpretation, which can cause confusion regarding whether a target has been achieved (Bhaduri et al., 2016). Another key criticism regarding SDG 6 has been that there are not really specific numerical targets or benchmarks. Many targets give a direction but no quantitative benchmark for performance at the global level (Dickens et al., 2019).

There are many suggestions for improvement for these indicators coming from different institutions, such as the OECD (Organisation for Economic Co-operation and Development, 2019), Eurostat (Eurostat, 2020) or publications like Essex et al. (2020). Also indicators from other SDGs, as reaching their targets is often overlapping with the topic of water, provide interesting information.

## 2. OBJECTIVES AND STRUCTURE OF THE THESIS

### 2.1 Objectives

This thesis has been carried out within the UniNEtZ project (Universitäten und Nachhaltige EntwicklungsZiele: Universities and sustainable development goals) (UniNEtZ 2019).

The thesis examines whether other indicators are better applicable to describe the achievement of SDG 6 Targets than the indicators proposed by the UN. The existing UN Indicators are compared to suggested indicators from other sources. It is then examined to what extent they cover different aspects for reaching the SDG 6 Targets, that are relevant in the elaboration of options for the implementation of SDGs in general and in Austria specifically. Additionally, it is evaluated whether there is data available to measure these indicators in the Austrian context.

The general objective of the thesis is to evaluate the indicators of the United Nations' SDG 6 Targets (United Nations, 2017). This results in the following specific objectives:

- Compare the indicators for SDG 6 Targets with indicators proposed from other organizations used to evaluate the sustainability in the water and sanitation sector
- Critically discuss if these other indicators are better suitable to describe the achievement of SDG 6 Targets
- Research data availability of the indicators for assessment in/for Austria

### 2.2 Structure of the thesis

The remainder of the thesis is organized as follows into different sections. The topic “Assessment of Sustainability Indicators in the Water and Sanitation sector” is presented by a brief introduction, then followed by chapter 2, where the objectives of the thesis are outlined, and the structure is explained.

Chapter 3, “The Fundamentals”, presents the basic knowledge which forms the core for understanding the objectives of this theses. This includes a brief overview of the development and goal of the SDGs, to then focus on SDG 6, “Water and Sanitation” in particular. It continues to go through each target and indicator, comparing global and Austrian specifics. Finally, a

description of new indicators used by other organizations and authors (Essex et al., OECD, Eurostat, other UN Indicators) follows.

The applied methods are then described in chapter 4, focusing on the methodology behind identifying new relevant SDG indicators in the field of water and sanitation for Austria.

Afterwards, in section 5, "Results and discussion", the results of the methods used are presented and discussed, and the opinion of the author is introduced. A suggestion for new indicators is given.

The following section, "Conclusion and Outlook, evaluates objectives and results and gives an outlook into the future.

Finally, in chapter 7 the thesis is summarised.

### **2.3 Timeframe**

The work on the thesis started in March 2020. First results were presented and discussed in September 2020, and the thesis was finalized in January 2021.

### 3. FUNDAMENTALS

#### 3.1 The development of the SDGs – from MDGs to SDGs

In September 2000, the key officials of 189 countries signed the Millennium Declaration in New York at the United Nations headquarters, in which they committed to achieving a set of eight measurable goals, The Millennium Development Goals (MDGs), by 2015. The eight goals, as can be seen in Figure 2, included (Sustainable Development Goals Fund, 2014):

1. eradicate extreme poverty and hunger,
2. achieve universal primary education,
3. promote gender equality and empower women,
4. reduce child mortality,
5. improve maternal health,
6. combating HIV/AIDs, malaria, and other diseases,
7. ensure environmental sustainability, and
8. develop a global partnership for development.



*Figure 2 The 8 Millennium Development Goals (United Nations Millennium Development Goals, 2020.)*

After the first few years, the first conclusion was drawn, and it turned out that the results for the various objectives were inconsistent. Mainly, there were some problems in the formulation of the goals. The responsibility for implementing the MDGs was formulated very vaguely. As

a result, it could quickly happen that the goals were not fully pursued (Sustainable Development Goals Fund, 2014).

In 2012 at the Rio +20 Conference a process to develop new goals was launched to continue and improve the work of the MDGs. While a small number of experts formulated the MDGs, the Member States negotiated the Sustainable Development Goals (SDGs) in a three-year, transparent and consensual process and adopted them by consensus. This was accompanied by consultation rounds, not only with the non-governmental organizations (NGOs) represented in New York but also via online platforms, global campaigns and national dialogue events (Honniball & Spijkers, 2014).

After the initial start point, it took two years of international consultation to finally, in June 2014, publish the first document with the 17 Sustainable Development Goals (SDGs). This proposed document by the UN General Assembly Open Working Group (OWG) is the foundation stone of the SDGs and their agenda of global development (Sustainable Development Goals Fund, 2014).

### **3.2 United Nations Sustainable Development Goals**

In September 2015, the United Nations General Assembly and all its 193 member states agreed to implementing the 17 SDGs at national, regional and global level by 2030, also known as the 2030 Agenda (UN Water, 2018). It is a process that requires balancing the three dimension of sustainable environment, economic and social development (Dickens et al., 2019).

The agreed goals of Agenda 2030 can be broken down into five core messages, which are preceded by action-guiding principles - the “five Ps” people, planet, prosperity, peace and partnership. The goals and objectives are thus intended to provide the impetus for measures in the areas that are of decisive importance for humanity and planet Earth by 2030 (Statistik Austria, 2020).

As Figure 3 indicates, there are 17 goals in total.



Figure 3 The 17 Sustainable Development Goals (United Nations Development Program, 2020)

### 3.3 Structure/Hierarchy of an SDG

The structure/hierarchy of the SDGs is shown in Figure 4 and can be described as follows:

1. The goal defined in each SDG, reflects the end-result that is to be achieved. In the overview of SDGs, it is shown in an abbreviated version, but the full version is a longer, goal-oriented statement. For example, for SDG 6 the short version is “Clean Water and Sanitation” and the full title is “Ensure availability and sustainable management of water and sanitation for all.” (United Nation, 2017).
2. Below the goal, targets define which measures are planned to achieve the goal. For example, SDG Target 6.3 states “By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally” (United Nation, 2017).
3. The lower step in the hierarchy are the indicators. An indicator should be an informative and easy measurable method or metric to monitor the progress towards achievement of the target and thus towards achievement of the goal, respectively (Dickens et al., 2019). For example, SDG Indicator 6.3.1 says: “Proportion of wastewater safely treated” (United Nation, 2017).

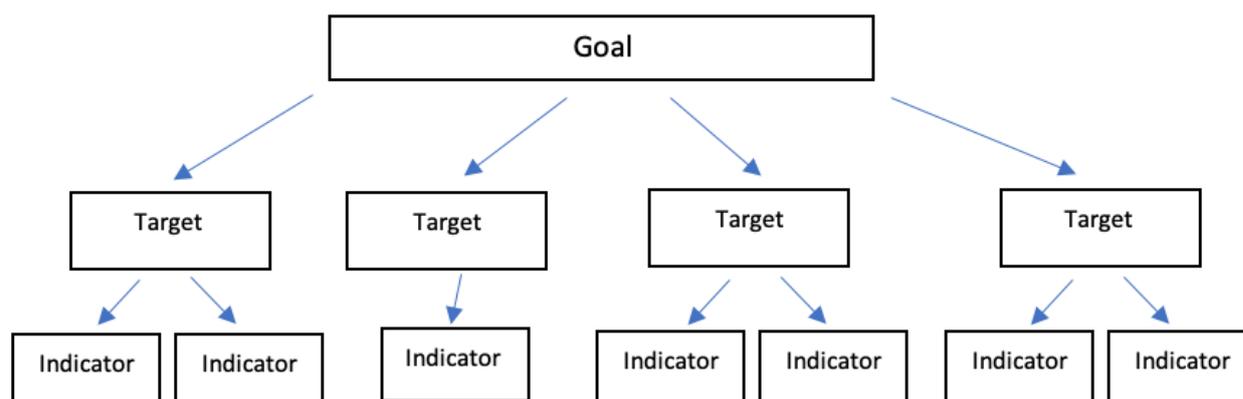


Figure 4 Structure of a Sustainable Development Goal

### 3.4 Monitoring of the SDGs

A set of 232 indicators was defined at UN level for monitoring the 169 targets. Since Agenda 2030 emphasizes that national implementation is voluntary and supported by the countries, the UN set is supplemented by additional sets of indicators at regional (appropriate for Austria: Europe) and national level. In this way, national and regional realities are to be considered, different stages of development and relevance of the individual goals are to be taken into account (Statistik Austria, 2020).

In 2015, the Statistical Commission of the United Nations decided to establish the Inter-Agency and Expert Group on SDG Indicators (IAEG SDGs). The IAEG-SDGs was entrusted with the preparation of a global set of indicators and is also responsible for the ongoing revision of the UN-Indicator Set (Statistik Austria, 2020).

In order to facilitate the implementation of the global indicator framework, all indicators have been classified by the IAEG-SDGs into three levels (Tier- classification) based on their methodological development status and global availability (Statistik Austria, 2020):

- **Tier 1:** Indicator is conceptually clear, has an internationally established methodology and standards are available, and countries regularly produce data for at least 50 per cent of countries and of the population in every region where the indicator is relevant.
- **Tier 2:** Indicator is conceptually clear, has an internationally established methodology and standards are available, but countries do not regularly produce data.

- **Tier 3:** No internationally established methodology or standards are yet available for the indicator, but methodology/standards are being (or will be) developed or tested (United Nation, 2017).

Implementation by the countries should take into account national realities, capacities and different stages of development and the associated different significance and relevance of the individual goals and sub-goals. For example, as mentioned above, Goal 14 “Life under Water - Oceans, Seas and Marine Resources” is of little importance for Austria as a landlocked country, and therefore not covered by national indicators (Statistik Austria, 2020).

On 12 January 2016, the Federal Government passed a Council of Ministers resolution instructing all federal ministries to incorporate the principles of Agenda 2030 and its SDGs into their respective strategies and programmes. In the sense of a mainstreaming approach and, if necessary, to draw up corresponding action plans and measures (Statistik Austria, 2020).

Overall, the Austrian set of indicators has been significantly expanded since 2017, and now includes around 200 indicators. Based on this data set, Statistik Austria was officially commissioned to prepare the present national SDG indicator report per the 17 SDGs of the UN Agenda 2030 in order to make it possible to measure progress in the implementation of the sustainable development goals at the national level (Statistik Austria, 2020).

### **3.5 Challenges and problem statement of SDGs**

Since the SDGs designed to work on a global level, the indicators need to be realizable by every country. Since most targets do not have a numerical goal, the agenda expects that every country develops and concretizes the goals and targets in their way by using tailored indicators to their country and problem areas (United Nation, 2017).

Nevertheless, not every country is starting at the same point. Thus, some of the SDG indicators suggested by the UN might not help to improve developed countries, such as Austria, in completing their goals. For other countries, e.g. of the Global South, the indicator would help immensely to improve towards the goals. Therefore, each country and its responsible stakeholders need to find a range of suitable indicators which suits their situation better (Essex et al., 2020).

Many of the formulated goals are, however, complex and multifaceted, which entails difficulties, especially about data collection or the further definition of precise indicators (Statistik Austria, 2020).

There are many suggestions for improvement for these indicators from different institutions, such as the OECD (Organisation for Economic Co-operation and Development) (OECD, 2019), Eurostat (Eurostat, 2020a) or publications like Essex et al. (2020).

Even though Essex et al. (2020) agree that the indicators are overall helpful tools, they also state that without having clear targets, it is challenging to implement the indicators efficiently.

An indicator shows the progress towards a target and this in further succession the goal.

As already mentioned, there are targets with no numerical values. So, if the indicator fulfils its purpose in collecting data, it would still be questionable if the goal is being achieved. The only purpose for this data would be compared with other countries (Dickens et al., 2019).

### **3.6 SDG 6 Clean water and sanitation**

This thesis examines SDG 6, Clean Water and Sanitation. The core statement is described comprehensively in synthesis report 2018 on water and sanitation of UN Water (2018):

“The establishment of SDG 6, Ensure availability and sustainable management of water and sanitation for all, reflects the increased attention on water and sanitation issues in the global political agenda. The 2030 Agenda lists rising inequalities, natural resource depletion, environmental degradation and climate change among the greatest challenges of our time. It recognizes that social development and economic prosperity depend on the sustainable management of freshwater resources and ecosystems, and it highlights the integrated nature of SDGs.”.

Therefore, the UN set 6 targets (6.1, 6.2, 6.3, 6.4, 6.5, 6.6) to measure implementation of the water and sanitation goals and two targets under the theme “means of Implementation” (6a and 6b), which focus on the progress of implementation (Guppy et al., 2019).

In connection with the targets, the UN also developed a range of 11 indicators. Both targets and indicators are in detail in Table 1.

Table 1UN Targets and Indicators of SDG6 (United Nation, 2017)

Targets	Indicators
6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all	6.1.1 Proportion of population using safely managed drinking water services
6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations	6.2.1 Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water
6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	6.3.1 Proportion of wastewater safely treated 6.3.2 Proportion of bodies of water with good ambient water quality
6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	6.4.1 Change in water-use efficiency over time 6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources
6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate	6.5.1 Degree of integrated water resources management implementation (0–100) 6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation
6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers, and lakes	6.6.1 Change in the extent of water-related ecosystems over time
6.A By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programs, including water harvesting, desalination, water efficiency, wastewater treatment, recycling, and reuse technologies	6.A.1 Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan
6.B Support and strengthen the participation of local communities in improving water and sanitation management	6.B.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management

In the next paragraphs, a description of each SDG 6 target follows. Including the global as well as Austrian indicators, which have been used in the latest report by Statistik Austria (2020). There are specific Austrian indicators, as previously mentioned - the core or primary data is generated by the countries with their indicators adapted to their needs and problems of their country (Guppy et al., 2019).

### Target 6.1 Safe and affordable drinking water



“By 2030, achieve universal and equitable access to safe and affordable drinking water for all.” (United Nation, 2017).

Target 6.1. aims at creating access to safe, non-contaminated water, not only for drinking, but also for cooking, food preparation and personal hygiene. It should be available for all, which means that it should be suitable for use by men, women, children, as well as people with disabilities. There should be no inequalities in terms of which population groups can access safe water and affordable to all of those groups (UN Water, 2017).

- Global indicator

6.1.1 “Proportion of population using safely managed drinking water services” (United Nation, 2017).

- Austrian indicator

According to Statistik Austria (2020), there is no Austrian indicator, as the target has mostly been achieved.

### **Target 6.2. End open defecation and provide access to sanitation and hygiene**



“By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations” (United Nation, 2017).

The goal of Target 6.2. is to create access to adequate and equitable sanitation and hygiene for all. Its objective is to end open defecation, creating safe sanitation chains which do not pose a threat to peoples’ health and the environment. The needs of women and girls are mentioned explicitly in this target, as in many countries, women’s roles as caretakers of household duties, as well as their menstrual hygiene management, create specific needs to accessing safe water facilities. People in vulnerable situations include groups, which are in extraordinary situations, such as war zones, refugee camps or mass gatherings (UN Water, 2017).

- Global indicator

6.2.1 “Proportion of population using safely managed sanitation services, including a handwashing facility with soap and water” (United Nation, 2017).

- Austrian indicator

“Percentage of the population without a bath, shower or toilet in the household” (Statistik Austria, 2020).

### Target 6.3. Improve water quality, wastewater treatment and safe reuse



“By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally” (United Nation, 2017).

Target 6.3. aims at improving water quality, in order to create safe use for the environmental and human health. In contrast to Target 6.1., which only focuses on water for personal use, this target also includes environmental aspects and recreational waters. The focus lies on the reduction of pollution into water bodies, including not only wastewater from household, industries and commercial establishments but also runoff from agricultural or urban areas. There is a specific emphasis on recycling (on-site reuse within the same facility) and reuse (for a further use without prior treatment) of water, complementary to the goal of better efficiency of using freshwater, as described in Target 6.4. (UN Water, 2017).

- Global indicator

6.3.1 “Proportion of wastewater safely treated” (United Nation, 2017).

- Austrian indicator

“Population connected to a municipal sewage treatment plant with at least secondary treatment. Remaining appropriate disposal by treatment in small and domestic sewage treatment plants or collection in cesspools” (Statistik Austria, 2020).

“Biochemical Oxygen Demand in rivers” (Statistik Austria, 2020).

### Target 6.4. Increase water-use efficiency and ensure freshwater supplies



“By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity” (United Nation, 2017).

Target 6.4. covers several aspects of water use and scarcity. Water scarcity describes the state in which the demand on the water by all sectors cannot be satisfied. One main goal of this target is to avoid the described water scarcity and ensure sufficient supply of fresh water, both directly, to people, but also indirectly, through water for the economy and the environment. Another key goal is to reduce water use, including by improving the efficiency of water use, creating more water output than input and decreasing water loss in the system. Even though all sectors are addressed in the target, some sectors are specifically relevant through their increased water use, such as the agricultural sector or industries such as mining (UN Water, 2017).

- Global indicators

6.4.1 “Change in water-use efficiency over time” (United Nation, 2017).

6.4.2 “Level of water stress: freshwater withdrawal as a proportion of available freshwater resources” (United Nation, 2017).

- Austrian indicators

6.4.1 “Change in water-use efficiency over time” (Statistik Austria, 2020).

6.4.2: “water stress in %.” and “water use in %.” (Statistik Austria, 2020).

### Target 6.5. Implement Integrated Water Resource Management



“By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate” (United Nation, 2017).

Most of the world’s water resources are cutting across borders. Therefore, an approach on a trans-boundary level needs to be followed closely for efficient water resource management. At the same time, a trans-sectoral approach is of high importance, as usually when dealing with water, different economic sectors and stakeholders are involved. The goal is to avoid fragmented management of water and to foster a culture of coordinated integrated water resource management (IWRM).

“The concept of IWRM seeks to promote the coordinated development and management of water and land-related resources, in order to maximize economic and social welfare equitably, without compromising the sustainability of ecosystems” (UN Water, 2017).

- Global indicators

6.5.1 “Degree of integrated water resources management implementation (0-100)” (United Nation, 2017).

6.5.2 “Proportion of transboundary basin area with an operational arrangement for water cooperation” (United Nation, 2017).

- Austrian indicators

6.5.1 “Degree of integrated water resources management implementation (0-100)” (Statistik Austria, 2020).

6.5.2: “Cooperation for cross-border basin areas” (Statistik Austria, 2020).

### **Target 6.6. Protect and restore water-related ecosystems**



“By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes” (United Nation, 2017).

Target 6.6 contributes to sustaining ecosystems and improving ecosystem health, through ensuring sufficient quantity of water as well as good water quality. Described ecosystems which are addressed in this target, are not only directly related to water, such as the mentioned wetlands, rivers, aquifers and lakes but also indirectly, such as mountains as forests. They are included in this target, as they are relevant sources for storing fresh water and for sustaining quality of water (UN Water, 2017).

- Global indicator

6.6.1 “Change in the extent of water-related ecosystems over time” (United Nation, 2017).

- Austrian indicator

“Scope of all water bodies” (Statistik Austria, 2020).

### Target 6a Expand water and sanitation support to developing countries



“By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies” (United Nation, 2017).

Target 6a encourages the implementation of the other Targets from 6.1- 6.6 and 6b by enhancing financial support. This includes increasing the external support for developing countries as well as trying to push forward the domestic funds. Another vital purpose is to intensify international cooperation, which can lead to higher grants and better loans (UN Water, 2017).

- Global indicator

6.a “Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan (United Nation, 2017).

- Austrian indicator

“Public development assistance for water and sanitation in developing countries” (Statistik Austria, 2020).

### Target 6b Support local engagement in water and sanitation management



“Support and strengthen the participation of local communities in improving water and sanitation management” (United Nation, 2017).

In order to meet everybody’s needs regarding the topic of water and sanitation planning, it is crucial achieving as much involvement of the local communities and other stakeholders as possible. Target 6b tries to tackle this obstacle (UN Water, 2017).

- Global indicator  
6.b “Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management” (United Nation, 2017).
- Austrian indicator  
According to Statistik Austria (2020), there is no Austrian indicator, as the target has largely been achieved.

### **3.7 Description of indicators proposed by other organizations and authors**

The main objective of this thesis is to compare the indicators for SDG 6 Targets with indicators proposed by other organizations and authors, then discussing the results if these better applicable and finally check if there is data of the researched indicators for Austria. To conduct this task, research about other sources has been carried out. The following is an enumeration and explanation of the other sources.

However, for this task, four primary sources have been chosen. They have been chosen for different reasons: due to the highest relevance (Essex et al., 2020), the most significant diversity or the broadest range of indicators (Eurostat, 2020c), and (OECD, 2020b) and all the indicators of the other sustainable development goals. Other sources have not taken into account, as this would have gone beyond the scope of this thesis.

The found indicators of the four different sources were assigned to the different targets in an excel sheet. After checking if the “new” indicators fulfil different requirements, they have been separated into feasible and non-feasible indicators. Further, it will be explained why some indicators fulfil or even not fulfil the requirements of a new indicator.

#### **3.7.1 Eurostat indicators**

The European Union (EU) has a statistical office, which is Eurostat. Eurostat produces European statistics in cooperation with national statistical offices and other national authorities in the EU Member States. Due to the fact of the enormous number of available indicators, they are divided into themes (Eurostat, 2020b):

- general and regional statistics
- economy and finance

- population and social conditions
  - industry, trade and services
  - agriculture, forestry and fishery
  - international trade
  - transport
  - environment and energy
  - science, technology, digital society
- (Eurostat, 2020c)

All indicators were taken into consideration. However, for this thesis, which only looks for indicators for SDG 6, mainly indicators from agriculture, forestry and fishery and environment and energy were relevant.

Thus, for this thesis the following Eurostat-indicators have been further taken into consideration:

- Population connected to public water supply
- Total population not having indoor flushing toilet for the sole use of their household
- Gross nutrient balance
- Water exploitation index
- Area under organic farming
- Eco-innovation index
- National expenditure on environmental protection by institutional sector
- Natura 2000 protected areas
- General government expenditure by function (COFOG)
- Production of environmental protection services of general government by economic characteristics

### **3.7.2 OECD indicators**

The OECD consists of 37 member states and work together to solve global key problems on a national regional and local level (OECD, 2020c).

The OECD database is accessible for all and consists of almost 300 indicators, which can be subdivided in different topics:

- agriculture
- development
- economy
- education
- energy
- environment
- finance
- government
- health
- innovation and technology
- jobs
- society

As well as at Eurostat, most of the useful indicators were found in the sectors environment, agriculture and government and for the thesis the following OECD-indicators have been further taken into consideration:

- Nutrient balance
- Infrastructure maintenance
- Population with tertiary education
- Spending on tertiary education
- Protected areas
- Central government spending environmental protection
- General government spending in environmental protection
- Net Official Development Assistance

### **3.7.3 Indicators for the National Blueprint Framework (Essex et al., 2020)**

The paper “Proposal for a National Blueprint Framework to Monitor Progress on Water-Related Sustainable Development Goals in Europe” by Essex et al. (2020) shows the challenges and the progress in SDG 6 and SDG 14 on a national level, focusing on EU countries. The paper offers a list of 24 water-related indicators, focus on the following themes:

- water stress
- water quality

- access to basic service
- infrastructure
- wastewater treatment
- solid waste treatment
- climate adaption

The selected indicators for the thesis from Essex et al. (2020) are:

- Infrastructure investment
- Drinking water quality
- Percentage of the Population connected to improved sanitation and hygiene
- Municipal Solid Waste recycled
- Surface water quality
- Groundwater quality
- Ecological water quality
- Tertiary wastewater treatment
- Nutrient Recovery
- Water Scarcity (Water Exploitation Index )
- Water leakage
- Water affordability
- Transboundary cooperation
- Notre Dame readiness index
- Flood Vulnerability
- Tertiary Education Attainment

## 4. MATERIAL AND METHODS

After a systematic literature review, this thesis used two databases (Eurostat, 2020c), and (OECD, 2020b), one paper (Essex et al., 2020) and all indicators from the other SDGs respectively targets for identifying new indicators for SDG 6.

First, all indicators from the abovementioned sources were reviewed. In total, almost 1000 indicators were monitored. Each of the indicators was checked, assessing whether they would fit as a new indicator for one of SDG 6's eight targets. If so, it was further examined, if Statistik Austria, on behalf of the State of Austria, already use this indicator. All indicators were compiled in an MSExcel®-spreadsheet. The possible ones were added to the associated targets. The indicators that were not a possible new indicator were assigned to the "could not be assigned/did not fit" list. The possible new indicators in the table were then further examined. In order to understand whether they are able to better characterize the respective targets. For this process, to assess whether the indicators are better suitable, supplementary or less suitable than the current indicators a set of different requirements by Koop and van Leeuwen (2015) was used:

- Specific
- Measurable
- Achievable
- Relevant
- Time-bound
- Easy to access
- Easy to understand
- Timely
- Reliable and consistent
- Transparent and accurate

The above-mentioned procedure can be seen in Figure 5.

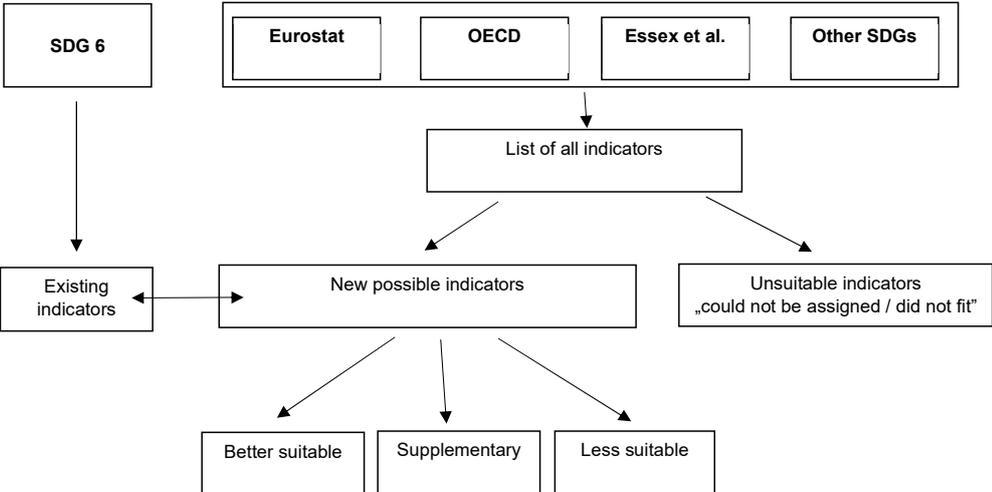


Figure 5 Methodological approach

## 5. RESULTS AND DISCUSSION

### 5.1 Potential Target 6.1 indicators

The UN Indicator is: "Proportion of population using safely managed drinking water services" (United Nation, 2017).

The analysis of the indicator of Target 6.1 shows that there are several gaps, which is why it is not suitable to characterize the respective target fully. According to Guppy et al. (2019) and Bhaduri et al. (2016), the affordability of the drinking water is not mentioned in the indicator. Both also state that it is not clear how affordability can be measured. Another aspect which the indicator misses to monitor, according to Guppy et al. (2019) and Bhaduri et al. (2016), is "universal and equitable access", for which it is also unclear how it can be measured.

The phrase of the indicator "proportion of the population" (United Nation, 2017), addresses the part "for all" in the target. However, this not fully corresponding, as Bhaduri et al. (2016) point out, if the value is below 100%, it is a violation of human rights, which means everything below 100% is not acceptable and not fulfilling the term "for all".

#### 5.1.1 Comparison of indicators from different sources

In the following section, the new indicators per target are examined, in order to find out whether they can fill the uncovered holes or which aspects of the targets they do not cover. For Target 6.1, there is only one UN Indicator and no specific Austrian indicator for comparison, as Austria claims that the goal has been reached to the most considerable extent (Statistik Austria, 2020). In this case, the new indicators are therefore analysed in reference to the global indicator.

Table 2 summarizes the results of the research on new indicators from other sources. While no indicator could be assigned from OECD (2020b) for Target 6.1, from Eurostat (2020c) suggested "Population connected to public water supply" as a new possible indicator. Essex et al. (2020) split the potential new indicators for Target 6.1 into three separate ones: "Infrastructure investment", "Drinking water quality" and "Water affordability".

Table 2 Potential indicators for SGD Target 6.1

Target	OECD	Eurostat	Essex et al.
6.1	no indicators	Population connected to public water supply	Infrastructure investment
			Drinking water quality
			Water affordability

### Infrastructure investment

In order to provide safe and affordable drinking water, the infrastructure needs to be maintained, and therefore it requires investments. The new indicator “Infrastructure investment” (Essex et al., 2020) deals with this relevant topic, providing information for this part of the target that currently remains completely untreated. Essex et al. (2020) use data from “Transport infrastructure investment and maintenance spending”. Even though the indicator approach is reasonable, the choice of data is problematic as transport infrastructure is not directly related to drinking water.

### Population connected to public water supply

“Population connected to public water supply” (Eurostat, 2020c). In an Austrian context we can assume that the available water is not only safe but also affordable when connected to the local water network. This addresses the topic of “universal access”, because it measures how many people are connected to a source of public water.

There are only two values from Austria (from 2008 and 2016), but the latest value reaches 91.8% (Eurostat, 2020c), which indicates that the large majority of the population has access to public water supply already. The remaining 8.2% largely rely on self-provision from their own wells and springs (World Bank Group, 2015).

Even though the data for this new indicator suggests that in Austria the target is already fulfilled to a high degree, this indicator serves as a good addition to the current UN Indicator. It gives more information by differentiating between who is connected to the public water supply system, and who needs to rely on self-provision.

### **Water affordability**

“Water affordability“, as suggested by Essex et al. (2020), addresses a topic, which, according to Guppy et al. (2019) and Bhaduri et al. (2016), has been left out by the global indicator. Essex et al. (2020) claim that even though water is widely affordable in Europe, some people struggle financially to afford water.

The suggested indicator measures whether everyone can afford water or its use, by taking the average water bill and the average income into consideration. If water costs more than 3% of one’s income, one is considered to be water-poor (Essex et al., 2020). According to ÖVWG (2018), based on the average consumption of an average Austrian household, the expenses for a household with a consumption of 150 m<sup>3</sup> including tax amount to 23.89 Euro per month or 0.79 Euro per day, which is 0.8% of the average household income. This means that this value is far from the 3% threshold, above which one is considered to be water-poor (Essex et al., 2020).

Overall, the new indicator “Water affordability” (Essex et al., 2020) serves as a good addition to the existing indicator for Target 6.1. It describes an aspect which has been missing in the current indicator, the topic of affordability. The indicator is particularly useful because it specifies a value that must not be exceeded for water to be considered affordable.

### **Drinking water quality**

The indicator “Drinking water quality” (Essex et al., 2020) measures the quality of the water supplied. In the EU, and consequently also in Austria, this is measured by compliance with the Drinking Water Directive (European Commission, 2016).

Data for Austria is available: according to the [European Commission \(2016\)](#) Austria reaches a mean compliance rate of 99.6% of the years 2011 to 2013. With almost 100% water quality achieved, Austria already has a very high quality of water.

This indicator provides a good complement to a specific aspect of the target, "safe water" (United Nation, 2017) as it measures a specific value for drinking water quality

### 5.1.2 Data availability

The research on the data availability of the new suggested investigators showed, that Austrian data is available for all four indicators, as can be seen from Table 3. While all are presented in percentage, the time period and interval of the data varies from yearly to only one value available.

*Table 3 Data availability in Austria for indicators describing SDG Target 6.1*

Indicator	Data available	Unit	Time period	Interval	Source
<b>Infrastructure investment</b>	yes	percentage	2000-2018	yearly	<a href="https://stats.oecd.org/Index">https://stats.oecd.org/Index</a> .
<b>Population connected to public water supply</b>	yes	percentage	2008, 2016	two values	<a href="https://appsso.eurostat.ec.europa.eu">https://appsso.eurostat.ec.europa.eu</a>
<b>Water affordability</b>	yes	percentage	2016	one value	<a href="http://cdn.thejournal.ie">http://cdn.thejournal.ie</a>
<b>Drinking water quality</b>	yes	percentage	2011-2013	mean	<a href="https://ec.europa.eu/">https://ec.europa.eu/</a>

## 5.2 Potential Target 6.2 indicators

UN Indicator: “Proportion of population using safely managed sanitation services, including a handwashing facility with soap and water” (United Nation, 2017).

According to Bhaduri et al. (2016) two indicators would be needed as the two (handwashing and sanitation) are not mutually inclusive, which can, for instance, be seen at the example of public toilets.

Besides the lack of a separate indicator for hygiene, the UN Indicator only takes handwashing as a criterion for hygiene. However, there are many other criteria like menstrual hygiene, food hygiene that could be included here (Guppy et al., 2019).

Another part of the target that is not included in the UN Indicator is “the needs of women and girls”, as well as of the “vulnerable groups”, which are not taken into consideration.

The Austrian indicator, “Percentage of the population without a bath, shower or toilet in the household” (Statistik Austria, 2020), fills part of the gap of “vulnerable groups”, which the UN Indicator misses to refer to, up to a certain degree. However, there are still several groups which are not included in this definition of people in precarious situations. The needs of women and girls are again not explicitly mentioned, nor are other vulnerable groups, such as people with disabilities, taken into consideration, even though those groups might need extra attention.

### 5.2.1 Comparison of indicators from different sources

The OECD (2020b) database revealed no new suitable indicators for Target 6.2. In contrast, from Eurostat (2020c) comes a range of possible new indicators, all dealing with the amount of the population not having access to a certain type of sanitation. The summary of the new possible indicators can be seen in Table 4.

*Table 4 Potential indicators Target 6.2*

Target	OECD	Eurostat	Essex et al.
6.2	no indicators	Total population having neither a bath, nor a shower in their dwelling	Percentage of the population connected to improved sanitation and hygiene
		Total population having neither a bath, nor a shower, nor indoor flushing toilet in their household	
		Total population not having indoor flushing toilet for the sole use of their household	

#### **Total population not having indoor flushing toilet for the sole use of their household**

Also very similar to the Austrian indicator is: “Total population not having indoor flushing toilet for the sole use of their household” (Eurostat, 2020c). However, in comparison to the other suggested indicators to this topic, this indicator only considers toilets, while the others provide a wider range of information.

### **Total population having neither a bath, nor a shower in their dwelling**

The indicator “Total population having neither a bath, nor a shower in their dwelling” (Eurostat, 2020c) is quite similar to the UN Indicator in the coverage of the target areas. The main difference is that, while both refer to peoples’ homes, Eurostat use the term “dwelling” and describes the absence of a bath or shower in it, while the UN Indicator refers to “poor housing standards” in particular.

Not having a bath or shower in one’s dwelling is considered a poor housing standard in Austrian context, therefore both indicators refer to the same situation. The Eurostat indicator is however more specific and therefore a relevant addition.

### **Total population having neither a bath, nor a shower, nor indoor flushing toilet in their household**

Another indicator suggested by (Eurostat, 2020c) is “Total population having neither a bath, nor a shower, nor indoor flushing toilet in their household”. This new indicator is very similar to the previous indicators by Eurostat (2020c) which refers to the absence of a bath or a shower. The main difference is that it describes one facet more than the UN Indicator and expands it by mentioning the flushing toilet in peoples’ household in particular.

Austrian data for “Total population having neither a bath, nor a shower, nor indoor flushing toilet in their household” (Eurostat, 2020c) is available and shows a value of 0.4% for 2010. This is an already very low value, which has further decreased to 0.1% by 2019. This means in the year 2019 only 0.1% of the Austrian population have neither a bath, nor shower, nor indoor flushing toilet in their household

This is the most precise indicator so far which refers to poor housing standards and is therefore an enrichment to describe the target.

### **Percentage of the population connected to improved sanitation and hygiene**

Another similar indicator suggested by Essex et al. (2020) is “Percentage of the population connected to improved sanitation and hygiene”. This suggested indicator seems rather vague, but there is a database which shows different categories in which the indicator is divided into: “basic” and “safely managed”. “Basic” is reached when there is “availability of a handwashing

facility on-premises with soap and water” and “safely managed” is reached when there is a “use of improved facilities which are not shared with other households and where excreta are safely disposed in situ or transported and treated off-site” (JMP, 2020).

After a value of 96.7 % (JMP, 2020) was achieved for the parameter “safely managed” and 3,23% for “basic managed” in Austria in 2017, this indicator with a total value of 99,98% provides an equally high value for Austria than the above mentioned indicators.

This indicator helps to reach the target as it gives more precise information about the part “improved sanitation and hygiene” by distinguishing between different categories.

### 5.2.2 Data availability

Table 5 shows that data is available for all of the suggested indicators. All of the data is given in percentage and measured in a yearly interval, ranging from 2000-2017 to 2000-2019.

*Table 5 Data availability overview Target 6.2*

Indicator	Data available	Unit	Time period	Interval	Source
<b>Total population not having indoor flushing toilet for the sole use of their household</b>	yes	percentage	2010-2019	yearly	<a href="https://appsso.eurostat.ec.europa.eu">https://appsso.eurostat.ec.europa.eu</a>
<b>Percentage of the population connected to improved sanitation and hygiene</b>	yes	percentage	2000-2017	yearly	<a href="https://washdata.org/data/house">https://washdata.org/data/house</a>
<b>Total population having neither a bath, nor a shower in their dwelling</b>	yes	percentage	2010-2019	yearly	<a href="https://appsso.eurostat.ec.europa.eu/">https://appsso.eurostat.ec.europa.eu/</a>
<b>Total population having neither a bath, nor a shower, nor indoor flushing toilet in their household</b>	yes	percentage	2010-2019	yearly	<a href="https://appsso.eurostat.ec.europa.eu/">https://appsso.eurostat.ec.europa.eu/</a>

### 5.3 Potential Target 6.3 indicators

The UN Indicators are 6.3.1 “Proportion of wastewater safely treated” (United Nation, 2017) and 6.3.2 “Proportion of bodies of water with good ambient water quality” (United Nation, 2017).

In both the UN Water (2017) and United Nation (2017) documents, the term “safely treated” is not further specified. Several authors criticize these indicators for Target 6.3, stating that they are too vague and incomplete. According to Bhaduri et al. (2016), the term “safely treated” in the indicator is very indistinct. It leaves too much room for interpretation for the individual countries. Therefore, this could lead to different indicators and difficulties to compare. Bhaduri et al. (2016) further criticize that “good ambient water quality” is a questionable tool to measure water quality, as it is only a single index, which is scientifically debatable, as there are many parameters to assess the water quality.

Another limitation is that the focus on “recycling and safe reuse” as emphasized in the target, is not reflected in the indicators at all.

In Austria, there are not only two but four indicators for this specific target. The indicators are

1. “Population connected to a municipal sewage treatment plant with at least secondary treatment, remaining appropriate disposal by treatment in small and domestic sewage treatment plants or collection in cesspools”. While 6.3.1 deals with the quantity of waste water, this indicator describes the connection rate of the population to the drainage water system, covering a more far-reaching aspect of the same topic. Both indicators follow the target of “halving the untreated wastewater”.
2. “Biochemical Oxygen Demand in rivers” also describes the part of the target regarding wastewater.
3. “Good water quality in all water bodies” appeals to improve the water quality.
4. “Biological status regarding material pollution in rivers in “good” or “very good” status” try to express the water quality as well.

#### 5.3.1 Comparison of indicators from different sources

The investigation of different sources revealed several new possible indicators for Target 6.3, as can be seen in Table 6.

Table 6 Potential indicators Target 6.3

Target	OECD	Eurostat	Essex et al.
6.3	Nutrient balance	Gross nutrient balance	Municipal solid waste recycled
	Wastewater treatment	Area under organic farming	Surface water quality
			Ground water quality
			Ecological water quality
			Tertiary waste water treatment
			Nutrient Recovery

### Nutrient balance and Gross nutrient balance

“Nutrient balance” (OECD, 2020b) and “Gross nutrient balance” (Eurostat, 2020c) provide information about environmental pressures. Both indicators give detailed information of usage about the nutrient phosphorus and nitrogen. A nutrient deficit (negative value) indicates declining soil fertility. A nutrient surplus (positive data) indicates a risk of polluting soil, water and air (Eurostat, 2020c).

According to Statistik Austria (2010) all in all, with the decrease in mineral fertilizer quantities and the reduced animal population in Austria, a decrease or an increase in deficits can be observed. This could be a good indicator to observe this trend in the long time. The aspect of pollution is covered by these indicators, which is missing in this way in 6.3.1 and 6.3.2.

There is sufficient data available and the new indicator covers another facet of the target, which the current indicators fails to address.

### Surface water quality, Groundwater quality, Ecological water quality

Another three indicators, all suggested by Essex et al. (2020), which describe the water quality in more detail are “Surface water quality”, “Groundwater quality” and “Ecological water quality”. In contrast, the UN Indicator 6.3.2 and the Austrian indicator “good water quality in all water bodies” only give information about the percentage of bodies in a “good” status.

By adding these three indicators, detailed information about the various water sources can be received. This provides a better insight in the status of the water bodies and allows to anticipate changes at different levels to improve the water quality in general, which the target aims at.

### **Wastewater treatment**

The indicator “Wastewater treatment” (OECD, 2020b) is already covered by Austrian indicator “Population connected to a municipal sewage treatment plant “and by Indicator 6.3.1.

### **Tertiary wastewater treatment**

The indicator which is not yet covered by the Austrian nor the UN Indicator to this extent, but also deals with the topic of wastewater treatment is “Tertiary wastewater treatment” (Essex et al., 2020). Tertiary wastewater treatment includes, besides removal of solids and organic matter (i.e. secondary treatment), the removal of nitrogen and phosphorus.

Already today, in Austria all wastewater treatment plants over 1000 p.e must remove phosphorus and all wastewater treatment plants over 5000 p.e must remove phosphorus and nitrogen. In Austria there is a total of 81% nitrogen removal and 90% phosphorus removal. Data is therefore available for Austria to measure this indicator and can be calculated for N and P separately (BMNT, 2018b).

This indicator is better suitable than the current one, because removal of N and P from wastewater is taken into consideration and can be monitored separately.

### **Municipal solid waste recycled**

The “Municipal solid waste recycled “(Essex et al., 2020) gives information whether the recycling of solid waste is increasing or not. This information is not provided by the existing Austrian indicators nor by the UN Indicators. According to Hoekstra et al. (2017), there is a connection between the amount of waste produced and the existence of garbage in water bodies, because untreated waste can cause pollution and lead to contamination in the environment. This is an aspect which is missing in the current indicators and touches upon the target’s aspect of recycling and reuse. This aspect is not covered by any indicator of this target so far.

The data for “Municipal solid waste recycled” is available from Austria from the 1990s until now. Austria had a recycling rate for municipal waste of 65% in 2016. It looks promising that Austria will reach the EU target of 70% recycling in 2030 (BMNT, 2018a).

### **Nutrient Recovery**

“Nutrient Recovery” (Essex et al., 2020) refers to nutrients recovered from sewage sludge by use as agricultural manure or via composting (Jurgilevich et al., 2016). This indicator gives information about increasing the recycling rate and water quality. The more sludge production, the more wastewater is cleaned, which means that more nutrients can be extracted from the water and the less polluted the water is.

The data for Austria is sufficiently provided by the database from Eurostat (2020c). “Nutrient Recovery” (Essex et al., 2020) refers to the aspect “recycling and safe reuse” (United Nations, 2017) of the target, and is especially relevant as this aspect is not yet covered by any of the current indicators.

### **Area under organic farming**

“Area under organic farming” (Eurostat, 2020c) serves as a potential indicator for Target 6.3, as organic farmers do not use pesticides, fertilizers, genetically modified organisms, antibiotics and growth hormones (Muscănescu, 2013). The more organic farming, the fewer infiltration of chemicals and other pesticides into the water.

Data for Austria from the year 2000 until now are available. Furthermore, according to BMLRT (2019) the trend towards organic farming continues, the proportion of organic land increased in Austria to a historic record level in 2018 with approximately 25% of the agricultural land used.

No indicator of Target 6.3 provides information on the topic of organic farming so far. This topic refers to the area of the target regarding pollution reduction, with the goal of achieving improved water quality.

### **5.3.2 Data availability**

Table 7 shows the available data for all found indicators for Target 6.3, allowing comparison between them. It clearly illustrates that data is available for all of the indicators. Most data are given in percentage or measured on a scale from – to, and one is given in tons. The time period

data is collected from varies greatly. The majority of data is collected on an annual basis, while some is only measured every 2, 5 or 6 years.

*Table 7 Data availability overview Target 6.3*

Indicator	Data available	Unit	Time period	Interval	Source
<b>Nutrient balance</b>	yes	tons	2015-2018	yearly	<a href="https://data.oecd.org/agrland/nutrient-balance.htm">https://data.oecd.org/agrland/nutrient-balance.htm</a>
<b>Gross nutrient balance</b>	yes	percentage	2010-2019	yearly	<a href="https://appsso.eurostat.ec.europa.eu/nui/">https://appsso.eurostat.ec.europa.eu/nui/</a>
<b>Surface water quality</b>	yes	scale	1st, 2nd RBMP (River Basement Management Plan)	every 6 years	<a href="https://www.eea.europa.eu/">https://www.eea.europa.eu/</a>
<b>Groundwater quality</b>	yes	scale	1st, 2nd RBMP	every 6 years	<a href="https://www.eea.europa.eu/data-">https://www.eea.europa.eu/data-</a>
<b>Ecological water quality</b>	yes	scale	1st, 2nd RBMP	every 6 years	<a href="https://www.eea.europa.eu/">https://www.eea.europa.eu/</a>
<b>Wastewater treatment</b>	yes	percentage	1970-2019	yearly	<a href="https://data.oecd.org/">https://data.oecd.org/</a>
<b>Tertiary wastewater treatment</b>	yes	percentage	1970-2015	every 5 years	<a href="https://www.eea.europa.eu/">https://www.eea.europa.eu/</a>
<b>Municipal solid waste recycled</b>	yes	percentage	1990-2018	yearly	<a href="http://data.un.org/">http://data.un.org/</a>
<b>Nutrient Recovery</b>	yes	percentage	2006-1017	every 2 years	<a href="https://ec.europa.eu/">https://ec.europa.eu/</a>
<b>Area under organic farming</b>	yes	percentage	2000-2018	yearly	<a href="https://ec.europa.eu/">https://ec.europa.eu/</a>

#### 5.4 Potential Target 6.4 indicators

The UN Indicators are 6.4.1 “Change in water-use efficiency over time” and 6.4.2 “Level of water stress: freshwater withdrawal as a proportion of available freshwater resources” (United Nation, 2017).

The existing indicators give information about the overall water use efficiency and level of water stress. Water stress includes the concept of water scarcity as well, which only refers to the availability of water, while water stress is a broader concept, also including quality and

accessibility (Schulte, 2017). Even though the indicators cover a wide range of the target, there are some aspects which are missing. One fundamental limitation mentioned by Guppy et al. (2019) is that “Water scarcity” is only mentioned in the target, and not specifically in the UN Indicator.

The Austrian indicators are “Change in water-use efficiency over time”, as well as “water stress in %” and “water use in %” (Statistik Austria, 2020). These indicators are similar to the UN Indicators, but also miss to give information about the target’s aspect of water scarcity in particular and fail to address people suffering from water scarcity. In order to reach the goal of “no water scarcity”, a separate indicator is required, not only included in the concept of water stress.

### 5.4.1 Comparison of indicators from different sources

The results of the research have revealed seven new possible indicators at Target 6.4 for Austria, as can be seen from Table 8. Several new indicators give information about fresh water, groundwater and surface water abstraction.

*Table 8 Potential indicators Target 6.4*

Target	OECD	Eurostat	Essex et al.
6.4	Infrastructure waterways maintenance	Water exploitation index, plus (WEI+)	Water leakage
	Infrastructure waterways investment	Water abstraction and use by river basin district (RBD)	Water Scarcity (Water Exploitation Index )
	Water withdrawals		

#### **Infrastructure waterways maintenance, Infrastructure waterways investment**

The two following new suggested indicators, proposed by OECD (2020b), aim to describe an essential part of the efficiency of water use. “Infrastructure waterways maintenance” (OECD, 2020b) aims to give information about the annual maintenance and the non-deterioration of the waterways. Thus, a deterioration of the water-use efficiency in this field can be avoided or detected. Furthermore, “Infrastructure waterways investment” (OECD, 2020b), touches upon another important aspect of efficiency of water use, as it covers spending on new constructions

and the improvement of the existing network. With a reduction of the funds for the maintenance, a reduction of the water use efficiency can be assumed.

Besides the actual Austrian indicator "Change in water use efficiency" (Statistik Austria, 2020), the two abovementioned indicators dealing with infrastructure can serve as good additional indicators for the target's goal of increasing water use efficiency. The reason for this is that these indicators are considered to be system-maintaining and thus fundamental indicators to address the issue of water efficiency. Therefore, it makes sense to further monitor and observe this topic. Moreover, the data for both are available from 2002 until today.

### **Water leakage**

The indicator "water leakage" (Essex et al., 2020) is another supplement to describe the water-efficiency part of the target with important information and data. This is an essential contribution to creating a more efficient water use, as water leakage can be a primary source of water loss in the system.

Since this topic has not yet been included in any indicator, it would be useful to include it as an addition to better fulfilling Target 6.4. The only problem is the missing data for Austria.

### **Water Scarcity (Water Exploitation Index)**

The indicator "Water scarcity" (Essex et al., 2020) gives information about fresh water, groundwater and surface water abstraction in a country, seen in a long term perspective. In comparison it becomes clear, that this indicator covers the critical aspect which is missing in the UN Indicator.

However, according to Eurostat (2020c), this new indicator has some limitations. The indicator does not differentiate between water, defining which is used for irrigation or which is redirected back into the water body after use. Additionally, it uses national data, which does not consider the regional and seasonal changes during the year.

### **Water exploitation index, plus (WEI+)**

"Water exploitation index, plus (WEI+)" suggested by Eurostat (2020c), is the extension or improvement of the indicator "Water scarcity". It is very similar to the Austrian indicator "water use in %", but offers different results in %.

The Water Exploitation Index plus (WEI+) is a measure of total freshwater used as a percentage of the renewable freshwater resources (groundwater and surface water) at a given time and place. It quantifies how much water is abstracted and how much water is returned after use to the environment. Like “Water Scarcity”, this indicator cannot take seasonal and regional aspects into account. The Austrian indicator gives a steady water use value of 3%, while the WEI+ results in an annual value of 1.2%-1.9% (Eurostat, 2020c). One explanation for this underestimation in the values could be that the Austrian indicator has already included regional and seasonal aspects.

The indicator "Water scarcity" (Essex et al., 2020) and the extension of the same "Water exploitation index, plus (WEI+)" (Eurostat, 2020c) does not provide new information due to its similarity to the already existing Austrian indicator. The difference in the results is worth investigation but would go beyond the scope of this master thesis.

### **Water withdrawals**

“Water withdrawals” (OECD, 2020b) monitors the amount of fresh water taken from ground and surface water. This indicator also covers the issue of water abstraction, as do the indicators "Water scarcity" (Essex et al., 2020) and "WEI+"(Eurostat, 2020c). It contains only the basic values of the abstraction and does not provide further or more detailed information. Therefore, the same applies as for the other mentioned indicators on water abstraction. The indicator does not provide any new information for fulfilling the target. Furthermore, no data is currently available for Austria.

### **Water abstraction and use by river basin district (RBD)**

The indicator “Water abstraction and use by river basin district (RBD)” by Eurostat (2020c) can be added to the indicator group regarding water abstraction. It is very similar to the indicator “Water withdrawals”, therefore similar to the indicators “Water scarcity” and “WEI+”. The difference is that it originates from a different database, Eurostat (2020c), and here the data comes from different river basin districts. This means that very accurate regional data is available, but not for the country Austria.

However, an indicator with this regional aspect could play an interesting role for Target 6.4, to obtain data from different regions, analyse it and then apply individual methods for improvement.

### 5.4.2 Data availability

As shown in Table 9, the availability of data for indicators of Target 6.4 varies greatly. Data could only be found for three out of seven indicators. All data is measured on a yearly basis, with different starting times of data collection, ranging from 1995 to 2002.

Table 9 Data availability overview Target 6.4

Indicator	Data available	Unit	Time period	Interval	Source
Infrastructure waterways maintenance	yes	Euro	1995-2018	yearly	<a href="https://data.ecd.org">https://data.ecd.org</a>
Infrastructure waterways investment	yes	Euro	2002-2018	yearly	<a href="https://data.ecd.org/">https://data.ecd.org/</a>
Water leakage	no	--	--	--	<a href="https://www.danva.dk/">https://www.danva.dk/</a>
Water Scarcity (Water Exploitation Index)	no	--	--	--	<a href="https://ec.europa.eu/">https://ec.europa.eu/</a>
Water exploitation index, plus (WEI+)	yes	percentage	2000-2017	yearly	<a href="https://ec.europa.eu/">https://ec.europa.eu/</a>
Water withdrawals	no	--	--	--	<a href="https://data.ecd.org/">https://data.ecd.org/</a>
Water abstraction and use by river basin district (RBD)	no	--	--	--	<a href="https://appso.eurostat.ec.europa.eu/">https://appso.eurostat.ec.europa.eu/</a>

## 5.5 Potential Target 6.5 indicators

Indicator 6.5.1 “Degree of integrated water resources management implementation (0-100)”

Indicator 6.5.2 “Proportion of transboundary basin area with an operational arrangement for water cooperation” (United Nation, 2017).

IWRM has many definitions and is more a process than a target itself. Therefore, Bhaduri et al. (2016) question, whether a useful indicator that describes the actual situation can be developed

at all. If the concept of IWRM is not questioned in itself, one can say that the UN Indicator covers this aspect of the target well.

They continue to criticize that “Transboundary water cooperation” is mentioned in the target but the indicator has no reference to the intensity of conflict and water scarcity and may not capture the progress toward transboundary cooperation where most needed (Bhaduri et al. 2016).

Another critical aspect which is missing is the term “at all levels”, which is stated in the target, but is missing in the indicator and not referred to in more detail (Guppy et al. 2019).

The Austrian indicator “Degree of integrated water resources management implementation (0-100)” (Statistik Austria, 2020) is the only one in the whole set of indicators which is precisely the same as the UN Indicator (6.5.1). These two indicators have the same structure. They consist of four different subcategories: enabling environment, institutions and participation, management instruments and financing: Each section is evaluated and given a score from 0-100. These are to be understood as sub-indicators. The average of these four sections results in the overall score.

The other Austrian indicator “Cooperation for cross-border basin areas” (Statistik Austria, 2020) is very similar to the UN Indicator 6.5.2. As a result, the Austrian indicators cover the target equally well than the UN Indicators.

### **5.5.1 Comparison of indicators from different sources**

In total, eight new indicators for Target 6.5 could be found by reviewing different authors’ and databases’ suggestions. They cover a wide range of topics but are all relevant for reaching the target in one way or another. Three indicators deal with the topic of education, two offer a new approach to measuring innovation and a countries’ readiness to act. Another topic is about transboundary cooperation. Other aspects covered by the new indicators are “Flood vulnerability” (Essex et al., 2020) and “Environmental tax” (OECD, 2020b). The indicators found are summarized in Table 10 below.

Table 10 Potential indicators Target 6.5

Target	OECD	Eurostat	Essex et al.
6.5	Population with tertiary education	Eco-innovation index	Notre Dame readiness index
	Spending on tertiary education		Tertiary Education Attainment
	Environmental tax		Transboundary cooperation
			Flood Vulnerability

### **Population with tertiary education, Spending on tertiary education, Tertiary Education Attainment**

The topic of tertiary education has been found in several databases: “Population with tertiary education” (OECD, 2020b), “Spending on tertiary education” (OECD, 2020b) and “Tertiary Education Attainment” (Essex et al., 2020). “It gives information on highly educated professionals that are necessary in the creation or adoption of new technologies, fundamental for growth” (Brunello et al., 2007). Even though not directly related to the topic of water in particular, it is a crucial indicator which points into the future, looks beyond the horizon and the ability to deal with future challenges. “Without educated capital, the country would lack the skills required to cope with future challenges” (Essex et al. 2020).

Therefore, all these three indicators would be a benefit. It should also be mentioned that data is available for all three.

### **Environmental tax**

The indicator “Environmental tax” (OECD, 2020b) could be added to the existing subcategories (enabling environment, institutions and participation, management instruments and financing) since this aspect is not clearly present in the subcategories and sufficient data is available. It can therefore be used for evaluating indicator 6.5.1 and the respective Austrian indicator. Alternatively, the available data could help evaluate one of these sections for a more accurate result.

This indicator can help to make the actual UN or Austrian indicator itself more precise, allowing the target to be evaluated more accurately.

### **Flood Vulnerability**

The indicator “Flood vulnerability” suggested by Essex et al. (2020) is, like the previous indicator, one that could more or less serve as an addition or an extension to the sub-indicators. There is an increase in the change of precipitation therefore intensity of extreme rainfall increases, which goes hand in hand with a rise of flood vulnerability (Allen and Ingram, 2002). Since this aspect is missing in the current set of indicators, it would be a good indicator to add. The approach is valuable for better reaching Target 6.5, but the data for this indicator which Essex et al. (2020) used, is not accessible online anymore. It therefore needs to be further evaluated, whether data from other databases provides similar information.

### **Eco-innovation index**

“Eco-innovation index” (Eurostat, 2020c) represents a new indicator with a different view or approach to this target. It is an indicator with many sub-indicators from the areas eco-innovation inputs, eco-innovation activities, eco-innovation outputs, resource efficiency outcomes and socio-economic outcomes. By rating these categories, a value is generated, which rates innovativeness of EU countries and allows for them to be compared. Data for Austria from the year 2010 until now are available in annual intervals.

This indicator can contribute to better reaching the target in the future, by helping to make future decisions concerning IWRM and transboundary cooperation more innovative. This indicator could be an opportunity to view the target or the problems to be solved with a different approach, because it promotes a holistic view on environmental, economic and social performance.

### **Notre Dame readiness index**

Another indicator with a view from another angle regarding this target is the “Notre Dame readiness index” (Essex et al., 2020). It measures overall readiness by considering three components – economic readiness, governance readiness and social readiness. “Readiness measures a country’s ability to leverage investments and convert them to adaptation actions” (Chen et al., 2015).

The same applies to this indicator as to the one above; it can outline a different approach which may reveal new solutions. For this indicator the data is available from the beginning of 1995 until now.

### **Transboundary cooperation**

The indicator “Transboundary cooperation” (Essex et al., 2020) monitors the presence of legal frameworks for transboundary basins, which are important for successful management of water supply. This indicator measures not only whether there is any, but also the quality of the cooperation.

The current indicator has no relation to conflict intensity and cannot capture progress towards cross-border cooperation where it is most needed (Bhaduri et al. 2016). The new indicator covers this missing aspect and can therefore serve as a potentially new indicator. It should be noted, however, that the data about legal framework which is Essex et al. (2020) using is not available anymore.

### **5.5.2 Data availability**

The available data for all new indicators is shown in Table 11. Most indicators are either measured in percentage, percentage of GDP or with a certain value. The timeframe of data collection varies greatly. While some data collection has started in 1994 already (e.g. “Environmental tax”), other data sets are more recent, such as “Eco-innovation index” (Eurostat, 2020c). All data is gathered on a yearly basis, creating a solid base of data for monitoring and comparison.

Table 11 Data availability overview Target 6.5

Indicator	Data available	Unit	Time period	Interval	Source
Population with tertiary education	yes	percentage	2004-2019	yearly	<a href="https://data.oecd.org/">https://data.oecd.org/</a>
Spending on tertiary education	yes	percentage of GDP	2012-2015	yearly	<a href="https://data.oecd.org/">https://data.oecd.org/</a>
Tertiary Education Attainment	yes	percentage	2010-2019	yearly	<a href="http://appsso.eurostat.ec.europa.eu/">http://appsso.eurostat.ec.europa.eu/</a>
Environmental tax	yes	percentage of GDP	1994-2016	yearly	<a href="https://data.oecd.org/">https://data.oecd.org/</a>
Flood vulnerability	no	--	--	--	<a href="https://www.wri.org/">https://www.wri.org/</a>
Eco-innovation index	yes	value	2010-2018	yearly	<a href="https://ec.europa.eu">https://ec.europa.eu</a>
Notre Dame readiness index	yes	value	1995-2018	yearly	<a href="https://gain-new.crc.nd.edu">https://gain-new.crc.nd.edu</a>
Transboundary cooperation	no	--	--	--	-

## 5.6 Potential Target 6.6 indicators

The UN Indicator is “Change in the extent of water-related ecosystems over time” (United Nation, 2017).

This indicator 6.6.1 considers only vegetated wetlands, open water and groundwater aquifers (Guppy et al., 2019), which leaves some other water-related ecosystems out of consideration, for example, the mountains. Another aspect which is missing according to Guppy et al. (2019) is that this indicator does not monitor the protection or to what degree the ecosystem is protected.

The Austrian indicator “Scope of all water bodies” (Statistik Austria, 2020) provides less information than the UN Indicator and does not contribute regarding the fulfilment of the target.

### 5.6.1 Comparison of indicators from different sources

While Essex et al. (2020) do not suggest any new indicators suitable for Target 6.6, the propositions by OECD (2020b) and Eurostat (2020c) offer new additions to the range of possible indicators. In total, a range of eight new suitable indicators could be found which are summarized in Table 12.

*Table 12 Potential indicators Target 6.6*

Target	OECD	Eurostat	Essex et al.
6.6	Land cover change	National expenditure on environmental protection by institutional sector	no indicators
	Protected areas	Natura 2000 protected areas	
	Central government spending environmental protection	General government expenditure by function (COFOG)	
	General government spending in environmental protection	Production of environmental protection services of general government by economic characteristics	

#### Land cover change

The indicator “Land cover change” (OECD, 2020b) gives information about the loss of natural and semi-natural vegetated land. This is a part of water-related ecosystems and could therefore provide useful data for achieving the target. What needs to be mentioned is that the amount of data is limited to only one value from the year 2015.

#### Protected areas, Natura 2000 protected areas

“Protected areas” (OECD, 2020b) and “Natura 2000 protected areas” (Eurostat, 2020c), even though from different databases, both monitor protected area coverage.

In Austria there are different categories and classes of protected areas. About 16 % of the federal territory is strictly protected as Natura 2000 area, national park or nature reserve. In addition, there are less strictly protected areas, such as landscape conservation areas and Protected landscape areas (ÖROK, 2014). It makes sense to give special treatment to Natura 2000 areas

as part of the indicators for Target 6.6, as they are areas of outstanding importance for the conservation of biological diversity in Europe (Sundseth & Creed, 2008).

In combination with the abovementioned indicator on “Land cover change” (OECD, 2020b), “Protected areas” (OECD, 2020b) and “Natura 2000 protected areas” (OECD, 2020b) can serve as a useful addition to the current Austrian indicator “Scope of all water bodies” (Statistik Austria, 2020), focusing on land cover change and protected areas in particular. They contribute to the goal of Target 6.6 “protecting and restoring water-related ecosystems” (United Nation, 2017), by focusing on areas which require most protection.

### **Central government spending environmental protection, General government spending in environmental protection, National expenditure on environmental protection by institutional sector, General government expenditure by function (COFOG) and Production of environmental protection services of general government by economic characteristics**

Several authors suggest a new indicator, which describes state governmental expenses on environmental protection. The suggestions of new indicators include: “Central government spending environmental protection” (OECD, 2020b), “General government spending in environmental protection” (OECD, 2020b), “National expenditure on environmental protection by institutional sector” (Eurostat, 2020c), “General government expenditure by function (COFOG)” (Eurostat, 2020c) and “Production of environmental protection services of general government by economic characteristics” (Eurostat, 2020c).

All these suggestions, added as indicators, could be useful, as they cover missing aspects of the main indicator and can therefore be beneficial in reaching Target 6.6. Data for Austria are available for all of them.

#### **5.6.2 Data availability**

Table 13 shows data availability for the proposed indicators, revealing that all of them have associated data. With the exception of the "Land Cover charge"(OECD, 2020b), which was only collected once in 2015, all indicators are measured annually and thus represent a data basis which shows the change over a longer period of time. The data is measured in different units: percentage, percentage of GDP or in Euro.

Table 13 Data availability overview Target 6.6

Indicator	Data available	Unit	Time period	Interval	Source
Land cover change	yes	percentage	2015	one value	<a href="https://data.oecd.org/">https://data.oecd.org/</a>
Protected areas	yes	percentage	1970-2020	yearly	<a href="https://data.oecd.org/">https://data.oecd.org/</a>
Natura 2000 protected areas	yes	percentage	2011-2019	yearly	<a href="https://appsso.eurostat.ec.europa.eu/">https://appsso.eurostat.ec.europa.eu/</a>
Central government spending environmental protection	yes	percentage	2007-2018	yearly	<a href="https://data.oecd.org/">https://data.oecd.org/</a>
General government spending in environmental protection	yes	percentage of GDP	1995-2018	yearly	<a href="https://data.oecd.org/">https://data.oecd.org/</a>
National expenditure on environmental protection by institutional sector	yes	euro	2014-2017	yearly	<a href="https://appsso.eurostat.ec.europa.eu/">https://appsso.eurostat.ec.europa.eu/</a>
General government expenditure by function (COFOG)	yes	euro	2014-2017	yearly	<a href="https://appsso.eurostat.ec.europa.eu/">https://appsso.eurostat.ec.europa.eu/</a>
Production of environmental protection services of general government by economic characteristics	yes	euro	2010-2017	yearly	<a href="https://ec.europa.eu/">https://ec.europa.eu/</a>

## 5.7 Potential Target 6.a indicators

The UN Indicator is “Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan” (United Nation, 2017). Official development assistance (ODA) denotes government aid, bilateral or multilateral, in order to promote economic development of developing countries (OECD, 2020b). The UN Indicator monitors ODA flows to a country related to how much of it is incorporated the government coordinated spending plan. This is relevant in order to comprehend the country's dependence on external support and the extent to which this support is coordinated by the government. The higher the value, the more are donors consistent with the national government water and sanitation policies and plans (UN Water, 2017).

The analysis of the indicator of Target 6.a shows that there are monitoring gaps. According to [Bhaduri et al. \(2016\)](#) the actual indicator monitor the aspects of water supply and sanitation but misses the topics recycling and reuse technologies.

The Austrian indicator “Public development assistance for water and sanitation in developing countries” (Statistik Austria, 2020) strikes the same notch as the UN Indicator. However, it defines aid from a different perspective. The UN Indicator refers to assess ODA flows to a country in relation to how much of it is included in the government coordinated spending plan.

In contrast, the Austrian indicator measures the amount of aid funds for water and sanitation that go to developing countries.

### 5.7.1 Comparison of indicators from different sources

The research of different sources revealed only a few possible new indicators for Target 6.a, all of which are from (OECD, 2020b), as shown in Table 14 below.

*Table 14 Potential indicators Target 6.a*

Target	OECD	Eurostat	Essex et al.
6a	Country Programmable Aid (CPA)	no indicators	no indicators
	Grants by private agencies and NGOs		
	Net Official Development assistance (ODA)		

#### Country Programmable Aid (CPA)

“The Country Programmable Aid (CPA)” (OECD, 2020b) measures the share of ODA over which recipient countries have or could potentially have a significant say. “As such, CPA is closer to capturing actual aid flows to countries than the concept of official development assistance, and has been proven a good proxy for aid recorded at the country level.” (OECD, 2020b).

If data can be gathered specifically for the water sector, this indicator could provide valuable information that helps to achieve the Target 6.a.

### Grants by private agencies and NGOs

“Grants by private agencies and NGOs” (OECD, 2020b) covers non-public bodies (private voluntary agencies, private foundations and NGOs) with its data, which was not the case with the UN respectively the Austrian indicator. The new indicator refers to transfers made by those private bodies in cash, goods or services (OECD, 2020b).

Similarly to CPA, no data for the water sector alone is available. If this specific data can be provided, this indicator can be a good addition to the current UN or Austrian indicators.

### Net Official development assistance (ODA)

The indicator “Net official development assistance” (OECD, 2020b) is already covered by the UN Indicator.

Data is available, but not for the water and sanitation sector alone.

#### 5.7.2 Data availability

Data is available for all of the suggested indicators, as Table 15 shows. All of the indicators refer to a value measured in US dollars and are gathered on an annual basis, with “Grants by private agencies and NGOs” having the most extensive data available, reaching back to 1970.

*Table 15 Data availability overview Target 6.a*

Indicator	Data available	Unit	Time period	Interval	Source
Country Programmable Aid (CPA)	yes	dollar	2000-2018	yearly	<a href="https://data.oecd.org/">https://data.oecd.org/</a>
Grants by private agencies and NGOs	yes	dollar	1970-2017	yearly	<a href="https://data.oecd.org/">https://data.oecd.org/</a>
Net Official development assistance (ODA)	yes	dollar	2015-2019	yearly	<a href="https://data.oecd.org/">https://data.oecd.org/</a>

### **5.8 Potential Target 6.b indicators**

While there is a global indicator for this target, “Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management” (United Nation, 2017). There is no Austrian indicator according to Statistik Austria (2020), as the target has largely been achieved.

The data research revealed that none of the considered authors criticized Indicator 6.b in particular. Furthermore, none of the reviewed sources have revealed new indicators for Target 6.b.

### **5.9 Possible related Indicators from other SDGs**

In addition to the sources mentioned above, all other SDG Targets were also searched for possible alternative indicators. Only those indicators were included that would contribute to a better description of the achievement of the SDG 6 Targets. Thus, the result is limited to the following 3 indicators:

#### **Total environmental taxes**

Environmental taxation is an important instrument for guiding sustainable development, to encourage producers and consumers to limit or reduce environmental pollution and to use natural resources responsibly (Statistik Austria, 2020).

The indicator “Total environmental taxes” (Statistik Austria, 2020) originates from SDG 12, can therefore be relevant for Target 6.5, as it can contribute evaluating the Indicator 6.5.1 and the respective Austrian indicator “Degree of integrated water resources management implementation” (United Nation, 2017). This indicator can however not replace the current indicator, but serve as an addition to the list of sub-indicators.

#### **Total environmental turnover from EGSS (The Environmental Goods and Services Sector)**

The “Environmental Goods and Services Sector (EGSS)” (Statistik Austria, 2020) serves as a tool to present the environmental economy in a comprehensive and comparable form, enabling

analyses of turnover growth, value added, exports and employment development in the environmental sector.

On the one hand, EGSS covers all activities aimed at measuring, preventing, reducing, limiting or remedying environmental damage. On the other hand, it focuses on the careful use of natural resources. Energy dominates the environmental economy; classical environmental protection activities such as water protection and waste management also generated significant shares of turnover, gross value added, exports and employment (Statistik Austria, 2020).

The indicator “Total environmental turnover from EGSS” (Statistik Austria, 2020), which also originate from SDG 12. It can be relevant for Target 6.5. It contributes, like the indicator before, to evaluate the Indicator 6.5.1 and the respective Austrian indicator. Both can however not replace the current indicator, but serve as an addition to the list of sub-indicators.

### **Official development assistance and public expenditure for the protection and sustainable use of biodiversity and ecosystems**

The Indicator “Official development assistance and public expenditure for the protection and sustainable use of biodiversity and ecosystems” stems from SDG 15, but is also relevant for SDG 6, in particular for Target 6.6 regarding biodiversity and ecosystems and/or Target 6.a regarding ODA.

## 6. CONCLUSION AND OUTLOOK

### 6.1 Target 6.1

“By 2030, achieve universal and equitable access to safe and affordable drinking water for all.” (United Nation, 2017).

- Global indicator

6.1.1 “Proportion of population using safely managed drinking water services” (United Nation, 2017).

- Austrian indicator

According to Statistik Austria (2020), there is no Austrian indicator, as the target has mostly been achieved.

None of the new indicators is suitable to characterize the target better than the UN Indicator, but the new indicators cover gaps which the UN Indicator does not cover (Table 16).

*Table 16 Indicator classification Target 6.1*

Target	Better suitable	Supplement	Less suitable
6.1	no indicators	Population connected to public water supply	Infrastructure investment
		Water affordability	
		Drinking water quality	

- “Population connected to public water supply” (Eurostat, 2020c) gives more detailed information about who is connected to the public water supply system and therefore refers to the part “achieve universal and equitable access” in the target.
- “Water affordability” (Essex et al., 2020) gives information about the topic of affordability, which is important as the target aims for “affordable drinking water”.
- “Drinking water quality” (Essex et al., 2020) refers to the aspect of safe drinking water, which the target tries to reach.

- “Infrastructure investment” (Essex et al., 2020), the approach is reasonable as maintenance infrastructure is related to the quality of drinking water. However, the data used is not related to drinking water.

### **Outlook**

The so far omitted topic of “affordability” is addressed by the new indicator “Water affordability” (Essex et al., 2020), offering an interesting and valuable approach to tackling this issue. While “safe drinking water” is already somewhat mentioned in the current target, and addressed by several new suggestions, other parts of the target are still not sufficiently covered by either the current or new indicators. Even with the newly found indicators, the target’s goal of providing “universal and equitable access” to drinking water, is not covered sufficiently. Furthermore, the goal to provide it “for all” remains unsolved by the authors’ suggestions of new indicators. These are the aspects which need further attention in order to better reach Target 6.1.

Most importantly, the decision not to design or use an indicator specific for Austria for this target sends a questionable statement. Because as stated before, if less than 100% of the population have access to drinking water, is a violation of fundamental human rights Bhaduri et al. (2016).

### **6.2 Target 6.2**

“By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations” (United Nation, 2017).

- Global indicator  
6.2.1 “Proportion of population using safely managed sanitation services, including a handwashing facility with soap and water” (United Nation, 2017).
- Austrian indicator  
“Percentage of the population without a bath, shower or toilet in the household” (Statistik Austria, 2020).

## CONCLUSION AND OUTLOOK

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As shown in Table 17, one indicator would be better suitable than the UN Indicator, two deliver more and deeper information about an already covered topic and one indicator monitors information about the same topic as the others but not in the same amount, and is therefore less suitable.

*Table 17 Indicator classification Target 6.2*

Target	Better suitable	Supplement	Less suitable
6.2	Total population having neither a bath, nor a shower, nor indoor flushing toilet in their household	Total population having neither a bath, nor a shower in their dwelling	Total population not having indoor flushing toilet for the sole use of their household
		Percentage of the population connected to improved sanitation and hygiene	

- “Total population not having indoor flushing toilet for the sole use of their household” (Eurostat, 2020c) is similar to the UN Indicator and delivers less information than the other similar indicators.
- “Total population having neither a bath, nor a shower in their dwelling” (Eurostat, 2020c) is a good addition to the actual indicators because it gives more detailed information.
- “Total population having neither a bath, nor a shower, nor indoor flushing toilet in their household” (Eurostat, 2020c) is the most precise indicator of these three’s. It monitors all the information the UN Indicator does and describes one facet more, the flushing toilet in peoples’ household in particular.
- By distinguishing between different categories of sanitation and hygiene the indicator “Percentage of the population connected to improved sanitation and hygiene” (Essex et al., 2020) helps to reach the target better.

### Outlook

The current UN Indicator “Percentage of the population without a bath, shower or toilet in the household” (United Nations, 2017) covers the target rather well. Poor housing standards often

go hand in hand with insufficient sanitation, and this way, the indicator captures this aspect. The only indicator which could be better suitable is “Total population having neither a bath, nor a shower, nor indoor flushing toilet in their household” (Eurostat, 2020c) as it is slightly more specific than the UN Indicator.

However, other forms of hygiene and sanitation like menstrual hygiene, food hygiene, etc. which have been identified as missing aspects to the current indicators by Guppy et al. (2019) have not been specified by any of the new indicators. It should be considered whether it makes sense to find new indicators to better cover this aspect of Target 6.2 in the future.

### **6.3 Target 6.3**

“By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally” (United Nation, 2017).

- Global indicator

6.3.1 “Proportion of wastewater safely treated” (United Nation, 2017).

- Austrian indicator

“Population connected to a municipal sewage treatment plant with at least secondary treatment. Remaining appropriate disposal by treatment in small and domestic sewage treatment plants or collection in cesspools” (Statistik Austria, 2020).  
“Biochemical Oxygen Demand in rivers” (Statistik Austria, 2020).

For Target 6.3, one indicator is better suitable than the actual ones. There are four indicators which deliver information about aspects, which haven’t been covered yet. Three indicators provide more detailed information of a topic, which is covered by the Austrian indicator. One indicator does not monitor new information at all and is therefore less suitable. Table 18 summarizes these findings below.

## CONCLUSION AND OUTLOOK

Table 18 Indicator classification Target 6.3

Target	Better suitable	Supplement	Less suitable
6.3	Tertiary wastewater treatment	Nutrient balance	Wastewater treatment
		Gross nutrient balance	
		Surface water quality	
		Groundwater quality	
		Ecological water quality	
		Nutrient recovery	
		Area under organic farming	
		Municipal solid waste recycled	

- “Tertiary wastewater treatment” (Essex et al., 2020) is better suitable than the already existing indicators because it delivers the same information as the current ones and also provides data regarding the degree of nutrient removal.
- “Nutrient balance” (OECD, 2020b) and “Gross nutrient balance” (Eurostat, 2020c) both indicators covers a facet, which is not covered yet by the UN or Austrian indicator.
- “Surface water quality”, “Groundwater quality”, “Ecological water quality” all coming from Essex et al. (2020), are a supplement to the actual list of indicators for Target 6.3, because they monitor more detailed information about the water sources than the actual ones.
- “Wastewater treatment” (OECD, 2020b) is not really suitable because the Austrian indicator covers all its aspects.
- “Municipal solid waste recycled” (Essex et al., 2020) is an aspect which is missing in the current indicators and touches upon the target’s aspect of recycling and reuse. This aspect is not covered by any indicator of this target so far.

- “Nutrient Recovery” (Essex et al., 2020) is a supplement for Target 6.3 as it delivers information for the topic of recycling, which is not covered by the UN Indicator nor the Austrian indicators,
- “Area under organic farming” (Eurostat, 2020c), would help to achieve the target in a better way because it provides information about pollution reduction and no indicator provides information about it.

### **Outlook**

The UN Indicator “Good ambient water quality” (United Nation, 2017) is a questionable tool to measure water quality, as it is only a single index, which is scientifically debatable, as there are many parameters to assess the water quality. “Good water quality in all water bodies” (Statistik Austria, 2020) is also rather vague. Some of the new suggested indicators manage to specify water quality in more detail. This is a good approach to better reaching the goal of “improving water quality”. However, only certain aspects of water quality are covered this way, and a more holistic, yet specific indicator is needed to better reach this goal.

Only one indicator, “Nutrient Recovery” (Essex et al., 2020) delivers information for the topic of recycling. Even with this new suggested indicator, “increasing recycling and safe reuse globally” still remains a topic that needs further attention in the list of indicators for Target 6.3.

### **6.4 Target 6.4**

“By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity” (United Nation, 2017).

- Global indicators
  - 6.4.1 “Change in water-use efficiency over time” (United Nation, 2017).
  - 6.4.2 “Level of water stress: freshwater withdrawal as a proportion of available freshwater resources” (United Nation, 2017).
- Austrian indicators
  - 6.4.1 “Change in water-use efficiency over time” (Statistik Austria, 2020).
  - 6.4.2: “water stress in %.” and “water use in %.” (Statistik Austria, 2020).

As Table 19 shows, no indicators have been found which are better suitable than the current UN and Austrian indicators. Only one of the supplementary indicators covers an aspect which the current indicators do not cover yet. All of the other supplementary indicators provide further information to a current problem, which the current UN and Austrian indicators already cover. Three indicators turned out to be less suitable than the current UN and Austrian indicators.

Table 19 Indicator classification Target 6.4

Target	Better suitable	Supplement	Less suitable
6.4		Infrastructure waterways maintenance	Water scarcity (Water exploitation index)
		Infrastructure waterways investment	Water exploitation index, plus (WEI+)
		Water leakage	Water withdrawals
		Water abstraction and use by river basin district (RBD)	

- “Infrastructure waterways maintenance” (OECD, 2020b) and “Infrastructure waterways investment” (OECD, 2020b) both deal with infrastructure and can be fundamental indicators to address the issue of increasing “water use efficiency” (United Nations, 2017).
- Similarly, “Water leakage” (Essex et al., 2020) covers the target’s aspect of “water-use efficiency”, because water loss can be a major problem in the system. This indicator is especially interesting, because this topic hasn’t been mentioned yet by any of the other indicators.
- “Water scarcity” (Essex et al., 2020), “Water exploitation index, plus (WEI+)” (Eurostat, 2020c), as well as “Water withdrawals” (OECD, 2020b) are all similar to the Austrian indicator, and therefore do not provide relevant new information for fulfilling the target.
- “Water abstraction and use by river basin district (RBD)” (Eurostat, 2020c) is similar to the Austrian indicator but it stands out as it is the only indicator which uses regional data. As it is more specific, it should be considered a supplementary indicator.

### Outlook

The current indicators cover the target rather well, but the new indicators provide supplementary aspects which can be beneficiary for reaching the target. One key aspect which is not covered by any of the found indicators is the number of “people suffering from water scarcity”. An indicator focusing on these people in particular might be beneficial for better reaching the target and needs further investigation in the future.

### 6.5 Target 6.5

“By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate” (United Nation, 2017).

- Global indicators

- 6.5.1 “Degree of integrated water resources management implementation (0-100)” (United Nation, 2017).

- 6.5.2 “Proportion of transboundary basin area with an operational arrangement for water cooperation” (United Nation, 2017).

- Austrian indicators

- 6.5.1 “Degree of integrated water resources management implementation (0-100)” (Statistik Austria, 2020).

- 6.5.2: “Cooperation for cross-border basin areas” (Statistik Austria, 2020).

Except for one indicator, which is better suitable to describe “transboundary cooperation”, all of the other potential new indicators for Target 6.5 are supplementary to the existing indicators. Five of the additions expand the indicator to include themes that have not yet been considered, but which fit in well thematically. Another two provide a completely new approach to measuring the target (Table 20).

Table 20 Indicator classification Target 6.5

Target	Better suitable	Supplement	Less suitable
6.5	Transboundary cooperation	Population with tertiary education	
		Spending on tertiary education	
		Tertiary education attainment	
		Environmental tax	
		Flood vulnerability	
		Eco-innovation index	
		Notre Dame readiness index	
		Total environmental taxes	
		Total environmental turnover from EGSS	

- “Transboundary cooperation” (Essex et al., 2020) covers the current UN and Austrian indicator, and furthermore delivers information on measuring the quality of transboundary cooperation. It is therefore better suitable to measuring “transboundary cooperation” (United Nation, 2017).
- “Population with tertiary education” (OECD, 2020b), “Spending on tertiary education” (OECD, 2020b), “Tertiary education attainment” (Essex et al., 2020)  
Tertiary education is not directly related to water in particular, because with educated capital countries can better cope with future challenges.
- “Environmental tax” (OECD, 2020b) could be added as a sub-indicator, improving the evaluation of the UN and Austrian indicator of Target 6.5.
- Like the previous indicator “Flood vulnerability” (Essex et al., 2020) can serve as an extension to the list of sub-indicators.
- “Eco-innovation index” (Eurostat, 2020c) could address the problems standing in the way to measuring the target process to reaching the goal with a new approach. It can therefore contribute to better reaching the target, by helping to make future decisions regarding IWRM and transboundary cooperation more innovative.

- Also “Notre Dame readiness index” (Essex et al., 2020) through its different approach may help to better solve the target, both regarding IWRM and transboundary cooperation.
- The indicator “Total environmental taxes” (Statistik Austria, 2020) originates from SDG 12. It can contribute evaluating the Indicator 6.5.1 This indicator can however not replace the current indicator, but serve as an addition to the list of sub-indicators.
- “Total environmental turnover from EGSS” (Statistik Austria, 2020), which also originate from SDG 12 contributes, like the indicator before, evaluating the Indicator 6.5.1 and the respective Austrian indicator. Also it can not replace the current indicators, but serve as an addition to the list of sub-indicators.

### **Outlook**

Both current UN and Austrian indicators are already very good as they give a numerical value to measure progress. Except one of the newly found indicators are not better suitable and should therefore be seen more as a complement than a substitute. “At all levels” has not been specified in any of the new indicators, still leaving much room for interpretation. This is an aspect, which could be specified in the future.

### **6.6 Target 6.6**

“By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes” (United Nation, 2017).

- Global indicator  
6.6.1 “Change in the extent of water-related ecosystems over time” (United Nation, 2017).
- Austrian indicator  
“Scope of all water bodies” (Statistik Austria, 2020).

Table 21 shows the overview of all possible indicators which have been found for Target 6.6. None of them are better suitable than the current indicators, but they provide useful complementary aspects for better reaching the target.

## CONCLUSION AND OUTLOOK

Table 21 Indicator classification Target 6.6

Target	Better suitable	Supplement	Less suitable
6.6		Land cover change	
		Protected areas	
		Natura 2000 protected areas	
		Central government spending environmental protection	
		General government spending in environmental protection	
		General government expenditure by function (COFOG)	
		Production of environmental protection services of general government by economic characteristics	
		National expenditure on environmental protection by institutional sector	

- “Land cover change” (OECD, 2020b) could serve as a supplementary indicator, as it provides useful data for reaching the target.
- “Protected areas” (OECD, 2020b), “Natura 2000 protected areas” (Eurostat, 2020c) could serve as potential supplementary indicators to the current set of indicators, by focusing on ecosystems which are protected.
- “Central government spending environmental protection” (OECD, 2020b), “General government spending in environmental protection” (OECD, 2020b), “National expenditure on environmental protection by institutional sector” (Eurostat, 2020c), “General government expenditure by function” (COFOG) (Eurostat, 2020c), and

“Production of environmental protection services of general government by economic characteristics” (Eurostat, 2020c) are all considered complementary and cover an area not covered by the current indicators.

### **Outlook**

Even though providing useful new suggestions to reach target 6.6, both current and potential new indicators only cover some aspects of the target and leave several mentioned limitations untouched. For instance, none of the new suggested indicators solve the problem of specifying the scope of water bodies better than the UN Indicator does. To which degree the ecosystem is protected is still an open point which has not been addressed by any of the new indicators.

### **6.7 Target 6.a**

“By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies” (United Nation, 2017).

- Global indicator

6.a “Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan (United Nation, 2017).

- Austrian indicator

“Public development assistance for water and sanitation in developing countries” (Statistik Austria, 2020).

The Table 22 shows that for Target 6.a, no better suitable indicators could be found. Two can serve as a supplement, while one turned out to be less suitable than the current set of indicators.

Table 22 Indicator classification Target 6.a

Target	Better suitable	Supplement	Less suitable
6.a		Country Programmable Aid (CPA)	Net official development assistance (ODA)
		Grants by private agencies and NGOs	

- “Country programmable aid (CPA)” (OECD, 2020b) specifies an aspect of the UN Indicator, but due to the fact that it leaves other aspects untouched and no separate data for the water and sanitation sector is available, it can only be a useful additional indicator for this target, or can be used to refine current indicators.
- “Grants by private agencies and NGOs” (OECD, 2020b) focuses on the private sector, which is an aspect that hasn’t been covered yet. If specific data for water and sanitation is retrievable, this indicator can be interesting as a supplement.
- Net official development assistance (ODA)” (OECD, 2020b) is similar to the UN Indicator, but at the same time less specific. Therefore, of less relevance for reaching the target.

**Outlook**

Both “Country programmable aid (CPA)” (OECD, 2020b) and “Grants by private agencies and NGOs” (OECD, 2020b) deliver interesting aspects for Target 6.a, as they further specify developmental aid. The key limitation is that for both no separate data for the water sector alone is available, which is something that needs to be further investigated in the future. The target is quite specific by mentioning water- and sanitation related programmes (“water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies”), but no new indicators could be found which focus on those activities in more detail. This is an aspect which might need further research, should this part of the target be described in more depth.

**6.8 Target 6.b**

“Support and strengthen the participation of local communities in improving water and sanitation management” (United Nation, 2017).

- Global indicator

6.b “Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management” (United Nation, 2017).

- Austrian indicator

According to Statistik Austria (2020), there is no Austrian indicator, as the target has largely been achieved.

None of the reviewed sources have revealed new indicators for Target 6.b.

### **Outlook**

While there is a global indicator for this target, there is no Austrian indicator, as the target has largely been achieved, according to Statistik Austria (2020). Also, in none of the reviewed literature new suggestions for this indicator were found. In this thesis, it was assumed that the lack of attention to this topic is justified as the goal has been met in the Austrian context. However, in further research it might make sense to verify this in depth by always taking the local circumstances into consideration.

The data research revealed that none of the considered authors criticized Indicator 6.b in particular. Furthermore, none of the reviewed sources have revealed new indicators for Target 6.b.

## 7. SUMMARY

This thesis was conducted in order to find out whether indicators from other sources are better suitable to describe the achievement of SDG 6 (Clean Water and Sanitation). The aim was to discuss if these alternative indicators are better suitable and whether data is available for Austria.

The following databases or papers were used to find new possible indicators:

- OECD (2020b)
- Essex et al. (2020)
- Eurostat (2020c)

As well as

- Indicators from all other SDGs (United Nations, 2017)

They were analysed and the possible new alternative indicators were then assigned to specific Targets of SDG 6. The majority of the indicators was found to not be suitable to describe SDG6 targets and was put into “could not be assigned/did not fit” list. Further, it was analysed whether the new suitable indicators are better suitable to characterize the respective target, than the UN or Austrian indicators. It was examined, whether they can fill uncovered holes or which aspects of the targets they do not cover. Data availability for the new indicators was then evaluated, in order to find out whether current data for Austria is existing and available.

The analysis showed:

- Only few of the alternative indicators are better suitable to characterize the target than the UN or Austrian Indicator.
- It was found, that most alternative indicators can serve as additional / supplementary information to existing indicators and can then contribute to better describe achieving the target.
- Even though some indicators seemed promising at first, they were classified as “less suitable” than the current set of indicators.

## 8. LIST OF REFERENCES

- Allen, M. R., & Ingram, W. J. (2002). Constraints on future changes in climate and the hydrologic cycle. *Nature*, 419(6903), 228–232. <https://doi.org/10.1038/nature01092>
- Bhaduri, A., Bogardi, J., Siddiqi, A., Voigt, H., Vörösmarty, C., Pahl-Wostl, C., Bunn, S. E., Shrivastava, P., Lawford, R., Foster, S., Kremer, H., Renaud, F. G., Bruns, A., & Osuna, V. R. (2016). Achieving Sustainable Development Goals from a Water Perspective. *Frontiers in Environmental Science*, 4. <https://doi.org/10.3389/fenvs.2016.00064>
- BMASGK. (2019). *Eingliederungsindikatoren 2018- Kennzahlen für soziale Inklusion in Österreich*.
- BMLRT. (2019). *Köstinger: Österreich ist Bio-Weltmeister*. <https://www.bmlrt.gv.at/service/presse/land/2019/K-stinger---sterreich-ist-Bio-Weltmeister-.html>
- BMNT. (2018a). *Die Bestandsaufnahme der Abfallwirtschaft in Österreich- Statusbericht 2018*. [https://www.arge.at/Downloads/2\\_BAWPL\\_Statusbericht%202018.pdf](https://www.arge.at/Downloads/2_BAWPL_Statusbericht%202018.pdf)
- BMNT. (2018b). *Kommunales Abwasser-Österreichischer Bericht 2018*. [https://www.bmlrt.gv.at/dam/jcr:82567bed-9f5f-4c0d-b874-6ff783529a3c/Komm%20Abwasser%20-%20Lagebericht\\_2018\\_20180706\\_gsb.pdf](https://www.bmlrt.gv.at/dam/jcr:82567bed-9f5f-4c0d-b874-6ff783529a3c/Komm%20Abwasser%20-%20Lagebericht_2018_20180706_gsb.pdf)
- Brunello, G., Garibaldi, P., & Wasmer, E. (Eds.). (2007). *Education and Training in Europe*. Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780199210978.001.0001>
- Chen, C.-H., Noble, I., Hellman, J., Coffee, J., Murillo, M., & Chaffla, N. (2015). *University of Notre Dame Global Adaptation Index- Country Index Technical Report*.
- Dickens, C., Smakhtin, V., McCartney, M., O'Brien, G., & Dahir, L. (2019). Defining and Quantifying National-Level Targets, Indicators and Benchmarks for Management of Natural Resources to Achieve the Sustainable Development Goals. *Sustainability*, 11(2), 462. <https://doi.org/10.3390/su11020462>
- Essex, B., Koop, S. H. A., & Van Leeuwen, C. J. (2020). Proposal for a National Blueprint Framework to Monitor Progress on Water-Related Sustainable Development Goals in Europe. *Environmental Management*, 65(1), 1–18. <https://doi.org/10.1007/s00267-019-01231-1>
- European Commission. (2016). *Synthesis Report on the Quality of Drinking water in the Union examining Member States' reports for the 2011-2013 period, foreseen under Article 13(5) of Directive 98/83/EC*.
- Eurostat (2020a). *EU SDG Indicator set 2020- Result of the review in preparation of the 2020 edition of the EU SDG monitoring report*. [https://ec.europa.eu/eurostat/documents/276524/10369740/SDG\\_indicator\\_2020.pdf](https://ec.europa.eu/eurostat/documents/276524/10369740/SDG_indicator_2020.pdf)
- Eurostat (2020b). *Wer wir sind*. Wer Wir Sind - Eurostat. Retrieved 31 August 2020, from <https://ec.europa.eu/eurostat/de/about/overview>
- Eurostat (2020c). *Datenbank*. Retrieved 31 August 2020, from <https://ec.europa.eu/eurostat/de/data/database>

- Guppy, L., Mehta, P., & Qadir, M. (2019). Sustainable development goal 6: Two gaps in the race for indicators. *Sustainability Science*, 14(2), 501–513. <https://doi.org/10.1007/s11625-018-0649-z>
- Germann, V. (2020). Zusammenfassung des Perspektivenberichts der SDG 6 Gruppe . *UniNEtZ-Newsfeed: SDG 6* (16.03.2020). [https://www.uninetz.at/reflexionen/reflexionen\\_2020/sdg6\\_zusammenfassung\\_psb/](https://www.uninetz.at/reflexionen/reflexionen_2020/sdg6_zusammenfassung_psb/)
- Hak, T., Janoušková, S., & Moldan, B. (2015). Sustainable Development Goals: A need for relevant indicators. *Ecological Indicators*, 60, 565–573. <https://doi.org/10.1016/j.ecolind.2015.08.003>
- Hoekstra, A. Y., Mekonnen, M. M., Chapagain, A. K., Mathews, R. E., & Richter, B. D. (2012). Global Monthly Water Scarcity: Blue Water Footprints versus Blue Water Availability. *PLOS ONE*, 7(2), e32688. <https://doi.org/10.1371/journal.pone.0032688>
- Honniball, A., & Spijkers, O. (2014). MDGs und SDGs: Lehren aus der öffentlichen Beteiligung an der Ausarbeitung der UNEntwicklungsziele. *Vereinte Nationen*, 62(6), 251–256.
- JMP. (2020). *Joint Monitoring Programme for Water Supply, Sanitation and Hygiene*. <https://washdata.org/data/household#!/>
- Jurgilevich, A., Birge, T., Kentala-Lehtonen, J., Korhonen-Kurki, K., Pietikäinen, J., Saikku, L., & Schösler, H. (2016). Transition towards Circular Economy in the Food System. *Sustainability*, 8(1), 69. <https://doi.org/10.3390/su8010069>
- Koop, S. H. A., & van Leeuwen, C. J. (2015). Assessment of the Sustainability of Water Resources Management: A Critical Review of the City Blueprint Approach. *Water Resources Management*, 29(15), 5649–5670. <https://doi.org/10.1007/s11269-015-1139-z>
- Lazarova, V., Levine, B., Sack, J., Cirelli, G., Jeffrey, P., Muntau, H., Salgot, M., & Brissaud, F. (2001). Role of water reuse for enhancing integrated water management in Europe and Mediterranean countries. *Water Science and Technology*, 43(10), 25–33. <https://doi.org/10.2166/wst.2001.0571>
- Muscănescu, A. (2013). *Organic versus conventional: Advantages and disadvantages of organic farming*. 13(1), 4.
- OECD. (2019). *Measuring Distance to the SDG Targets 2019: An Assessment of Where OECD Countries Stand*. OECD. <https://doi.org/10.1787/a8caf3fa-en>
- OECD (2020b). *Database*. Retrieved 31 August 2020, from <https://data.oecd.org/searchresults/?hf=20&b=0&l=en&s=score>
- OECD (2020a). *Our global reach*. Retrieved 31 August 2020, from <http://www.oecd.org/about/members-and-partners/>
- ÖROK. (2014). *Schutzgebiete in Österreich*. <https://www.oerok-atlas.at/oerok/files/summaries/64.pdf>
- ÖVWG. (2018). *Die österreichische Trinkwasserwirtschaft- Branchendaten und Fakten*. [http://www.trinkwassertag.at/wp-content/uploads/2018/04/%C3%96VGW\\_Branchenbild\\_Trinkwasserwirtschaft\\_2018.pdf](http://www.trinkwassertag.at/wp-content/uploads/2018/04/%C3%96VGW_Branchenbild_Trinkwasserwirtschaft_2018.pdf)
- Schulte, P. (2017, 17 January). What Do “Water Scarcity”, “Water Stress”, and “Water Risk” Actually Mean? *CEO Water Mandate*. <https://ceowatermandate.org/posts/water-scarcity-water-stress-water-risk-actually-mean/>

## LIST OF REFERENCES

---

- Statistik Austria. (2020). *Indikatorenset zur Agenda 2030*.
- Statistik Austria. (2010). *Regionale Nährstoffbilanzen in Österreich für NUTS 3-Gebiete*. [http://ww3.umweltbundesamt.at/fileadmin/site/umweltthemen/landwirtschaft/2015/NUTS3\\_N\\_P\\_Balance\\_AT.pdf](http://ww3.umweltbundesamt.at/fileadmin/site/umweltthemen/landwirtschaft/2015/NUTS3_N_P_Balance_AT.pdf)
- Sundseth, K., & Creed, P. (2008). *Natura 2000: Protecting Europe's biodiversity*. European Commission, Directorate General for the Environment.
- Sustainable Development Goals Fund. (2014, 17 December). *From MDGs to SDGs*. Sustainable Development Goals Fund. <https://www.sdgfund.org/mdgs-sdgs>
- UN Water. (2017). Integrated Monitoring Guide for Sustainable Development Goal 6 on Water and Sanitation – Targets and global indicators. *UN-Water*. <https://www.unwater.org/publications/sdg-6-targets-indicators/>
- UN Water. (2018). *Sustainable Development Goal 6: Synthesis report 2018 on water and sanitation*. United Nations.
- UNESCO, World Water Assessment Programme (United Nations), & UN-Water. (2015). *Water for a sustainable world*.
- UniNetZ. (2019). Erstellung eines Optionenpapiers für die Regierung zur Umsetzung der Nachhaltigkeitsziele von Paris 2015. Retrieved 29 March 2020, from <https://www.uninetz.at/>
- United Nation (Ed.). (2017). *Transforming Our World: The 2030 Agenda for Sustainable Development*. In *A New Era in Global Health*. Springer Publishing Company. <https://doi.org/10.1891/9780826190123.ap02>
- United Nation Development Program. (2020). *Sustainable Development Goals*. UNDP. <https://www.undp.org/content/undp/en/home/sustainable-development-goals.html>
- United Nations, D. of E. and S. A. (2017). *IAEG-SDGs tier classification for global SDG indicators*. <https://unstats.un.org/sdgs/iaeg-sdgs/tier-classification/>
- World Bank Group. (2015). *Water and Wastewater Services in the Danube Region*. [https://sos2018.danubis.org/files/File/SoS\\_Report-2018.pdf](https://sos2018.danubis.org/files/File/SoS_Report-2018.pdf)

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## 11. APPENDIX

		OECD	Eurostat	Essex et al.
6.1	Drinking water	-	Population connected to public water supply	Infrastructure investment Drinking water quality
6.2	Sanitation/ Hygiene	-	Total population having neither a bath, nor a shower in their dwelling Total population having neither a bath, nor a shower, nor indoor flushing toilet in their household - EU-SILC survey Total population not having indoor flushing toilet for the sole use of their household - EU-SILC survey	Percentage of the population connected to improved sanitation and hygiene
6.3	Water quality	Nutrient balance	Gross nutrient balance	Municipal Solid Waste recycled Surface water quality Ground water quality
		Wastewater treatment	Area under organic farming	Ecological water quality Tertiary waste water treatment Nutrient Recovery
6.4	Water use efficiency	Water withdrawals	Water abstraction and use by river basin district (RBD)	Water Scarcity (Water Exploitation Index )
		Infrastructure waterways maintenance	Water exploitation index, plus (WEI+)	Water leakage
		Infrastructure waterways investment		Water affordability
6.5	IWRM	Population with tertiary education	Eco-innovation index	Transboundary cooperation
		Spending on tertiary education		Notre Dame readiness index
		Environmental tax		Flood Vulnerability
				Tertiary Education Attainment
6.6	Water related ecosystems	Land cover change	National expenditure on environmental protection by institutional sector	-
		Protected areas	General government expenditure by function (COFOG)	
		Threatened species	Production of environmental protection services of general government by economic characteristics	
		Central government spending environmental protection	Natura 2000 protected areas	
		General government spending in environmental protection		
6.a	International cooperation	Country Programmable Aid (CPA) Grants by private agencies and NGOs Net Official development assistance (ODA)	-	-
6.b	Participation	-	-	-

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Indicators that could not be assigned/did not fit		
OECD	Eurostat	Essex et al.
<b>Agriculture Topic</b>	<b>General and regional statistics</b>	
Crop production	Animal populations by NUTS 2 regions (tgs00045)	Drinking water connection
Meat consumption	Production of cow's milk on farms by NUTS 2 regions (tgs00046)	Secondary WWT (%)
Agriculture support	Population on 1 January (tgs00001)	Waste Water to Energy
Producer protection	Population change by NUTS 2 region - Crude rates of total change, natural change and net migration plus adjustment (tgs00099)	Solid waste generated
Fish landings	Population density by NUTS 2 region (tgs00024)	Solid Waste to Energy (%)
Aquaculture production	Total and land area by NUTS 2 region (tgs00002)	Renewable energy % total
Agriculture land	Population on 1 January by NUTS 2 region (tgs00096)	Integrated Water Resources Management
	Live births by NUTS 2 region (tgs00097)	
<b>Development topic</b>	Deaths by NUTS 2 region (tgs00098)	
Private flows	Total fertility rate by NUTS 2 region (tgs00100)	
Other official flows	Life expectancy at birth by sex and NUTS 2 region (tgs00101)	
Total official and private flows	Regional gross domestic product by NUTS 2 regions - million EUR (tgs00003)	
Other official flows	Regional gross domestic product (million PPS) by NUTS 2 regions (tgs00004)	
Grants by private agencies and NGO's	Regional gross domestic product (PPS per inhabitant) by NUTS 2 regions (tgs00005)	
Distribution of net ODA	Regional gross domestic product (PPS per inhabitant in % of the EU27 (from 2020) average) by NUTS 2 regions (tgs00006)	
Food aid	Real growth rate of regional gross value added (GVA) at basic prices by NUTS 2 regions (tgs00037)	
	Disposable income of private households by NUTS 2 regions (tgs00026)	
<b>Economy topic</b>	Primary income of private households by NUTS 2 regions (tgs00036)	
Financial corporations dept to equity ratio	Early leavers from education and training by sex and NUTS 1 regions (tgs00106)	
Non- financial corporations dept to surplus ratio	Human resources in science and technology (HRST) by NUTS 2 regions (tgs00038)	
Value-added in financial corporations	Employment in high-tech sectors by NUTS 2 regions (tgs00039)	
Value-added in non-financial corporations	Patent applications to the European patent office (EPO) by priority year by NUTS 2 regions (tgs00040)	
Banking sector leverage	High-tech patent applications to the European patent office (EPO) by priority year by NUTS 2 regions (tgs00041)	
Foreign direct investment income receipts by industry	Intramural R&D expenditure (GERD) by NUTS 2 regions (tgs00042)	
Outward Foreign direct investment stocks by partner country	Researchers, all sectors by NUTS 2 regions (tgs00043)	
Foreign direct investment stocks	All causes of death by NUTS 2 regions (tgs00057)	
Inward Foreign direct investment flows by industry	Death due to cancer by NUTS 2 regions (tgs00058)	
Outward Foreign direct investment flows by industry	Death due to ischaemic heart diseases by NUTS 2 regions (tgs00059)	
Foreign direct investment income payments by partner country	Death due to accidents by NUTS 2 regions (tgs00060)	
Foreign direct investment income payments by industry	Death due to transport accidents by NUTS 2 regions (tgs00061)	
Foreign direct investment flows	Physicians or doctors by NUTS 2 regions (tgs00062)	
Foreign direct investment restrictiveness	Dentists by NUTS 2 regions (tgs00063)	
Inward Foreign direct investment flows by partner country	Available beds in hospitals by NUTS 2 regions (tgs00064)	
Gross domestic production	All causes of death by NUTS 2 regions (tgs00057)	
Domestic demand forecast	Death due to cancer by NUTS 2 regions (tgs00058)	
Quarterly GDP	Death due to ischaemic heart diseases by NUTS 2 regions (tgs00059)	
Real GDP forecast	Death due to accidents by NUTS 2 regions (tgs00060)	
Nominal GDP forecast	Death due to transport accidents by NUTS 2 regions (tgs00061)	
Real GDP long-term forecast	Physicians or doctors by NUTS 2 regions (tgs00062)	
Investment (Gross fixed capital formation)	Dentists by NUTS 2 regions (tgs00063)	
Investment forecast	Available beds in hospitals by NUTS 2 regions (tgs00064)	
Investment by sector	Nights spent at tourist accommodation establishments by NUTS 2 regions (tgs00111)	
Investment by asset	Number of establishments and bed-places by NUTS 2 regions (tgs00112)	
Household financial assets	Maritime transport of passengers by NUTS 2 regions (tgs00075)	
Household disposable income	Maritime transport of freight by NUTS 2 regions (tgs00076)	
Household spending	Air transport of passengers by NUTS 2 regions (tgs00077)	
Household savings	Air transport of freight by NUTS 2 regions (tgs00078)	
Household dept	Rail network by NUTS 2 regions (tgs00113)	
Household financial transactions	Motorways network by NUTS 2 regions (tgs00114)	
Household net worth	Employment rate of the age group 15-64 by NUTS 2 regions (tgs00007)	
Household saving forecast	Employment rate of the age group 55-64 by NUTS 2 regions (tgs00054)	
Trade in goods and services	Employment rate of the age group 20-64 by NUTS 2 regions (tgs00102)	
Domestic value added in gross exports	Unemployment rate by NUTS 2 regions (tgs00010)	
Import content of exports	Long-term unemployment rate (12 months and more) by NUTS 2 regions (tgs00053)	
Trade in goods and services forecast	Households that have internet access at home by NUTS 2 regions (tgs00047)	
Trade in goods	Households that have broadband access by NUTS 2 regions (tgs00048)	
Trade in services	Percentage of households with broadband access in relation to households with internet access, by NUTS 2 regions (tgs00049)	
Current account balance	Individuals regularly using the internet by NUTS 2 regions (tgs00050)	
Current account balance forecast	Individuals who have never used a computer by NUTS 2 regions (tgs00051)	
Exports by business size	Individuals who ordered goods or services over the internet for private use in the last year by NUTS 2 regions (tgs00052)	
Imports by business size	At-risk-of-poverty rate by NUTS 2 regions (tgs00103)	
Terms of trade	Severe material deprivation rate by NUTS 2 regions (tgs00104)	
Composite leading indicators	People at risk of poverty or social exclusion by NUTS 2 regions (tgs00107)	
Business confidence index	People living in households with very low work intensity by NUTS 2 regions (population aged 0 to 59 years) (tgs00108)	
Consumer confidence index	Total population, Candidate countries and potential candidates (tgs00027)	
Value added by activity	Gross domestic product, Candidate countries and potential candidates (tgs00028)	
Gross national income	Productivity of artificial land (t2020_rd100)	
Net national income	Built-up areas (t2020_rd110)	
Net lending/ borrowing by sector		
Saving rate	<b>Economy and finance</b>	
Inflation	Gross domestic product at market prices (tec00001)	

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Inflation forecast	Compensation of employees (tec00013)	
Producer price indices	Taxes on production and imports less subsidies (tec00016)	
Price level indices	Final consumption expenditure of households and non-profit institutions serving households (tec00009)	
Housing prices	Final consumption expenditure of general government (tec00010)	
Share prices	Gross fixed capital formation (investments) (tec00011)	
GDP per hour worked	Goods and services, imports and exports (tec00110)	
Labor productivity and utilization	GDP per capita in PPS (tec00114)	
Labor compensation per hour worked	Real GDP growth rate - volume (tec00115)	
Multifactor productivity	Exports of goods and services in % of GDP (tet00003)	
Unit labor costs	Imports of goods and services in % of GDP (tet00004)	
Labor productivity forecast	Real GDP per capita (sdg_08_10)	
<b>Education topic</b>	Nominal labour productivity per person employed (ESA 2010) (tec00116)	
Adult education level	Nominal unit labour cost growth - (ESA 2010) (tec00130)	
Spending on tertiary education	Employment, domestic concept - Total (tec00112)	
Public spending on education	Final consumption expenditure of households, by consumption purpose (tec00134)	
Private spending on education	Regional gross domestic product by NUTS 2 regions - million EUR (tgs00003)	
Reading performance (PISA)	Regional gross domestic product (million PPS) by NUTS 2 regions (tgs00004)	
Mathematics performance (PISA)	Regional gross domestic product (PPS per inhabitant) by NUTS 2 regions (tgs00005)	
Science performance (PISA)	Regional gross domestic product (PPS per inhabitant in % of the EU27 (from 2020) average) by NUTS 2 regions (tgs00006)	
Secondary graduation rate	Real growth rate of regional gross value added (GVA) at basic prices by NUTS 2 regions (tgs00037)	
Tertiary graduation rate	Disposable income of private households by NUTS 2 regions (tgs00026)	
Tertiary graduates by field	Primary income of private households by NUTS 2 regions (tgs00036)	
Enrolment rate in secondary and tertiary education	Adjusted gross disposable income of households per capita in PPS (tec00113)	
Enrolment rate in early childhood education	Household saving rate (tec00131)	
Number of students	Household investment rate (tec00098)	
International student mobility	Gross debt-to-income ratio of households (tec00104)	
Teachers salary	Investment rate of non-financial corporations (tec00099)	
Students per teaching staff	Profit share of non-financial corporations (tec00100)	
Woman teachers	Gross return on capital employed, before taxes, of non-financial corporations (tec00101)	
Teachers by age	Net debt-to-income ratio, after taxes, of non-financial corporations (tec00102)	
Teaching hours	Net return on equity, after taxes, of non-financial corporations (tec00103)	
Teaching staff	Investment by institutional sectors (tec00132)	
School principals	Gross operating surplus and mixed income (tec00015)	
Youth not in employment education or training	Net national income (tec00133)	
<b>Energy topic</b>	Gross national income (teina080)	
Primary energy supply	Gross disposable income (teina090)	
Crude oil production	Gross saving (teina100)	
Electricity generation	Total general government revenue (tec00021)	
Renewable energy	Total general government expenditure (tec00023)	
Nuclear power plants	Taxes on production and imports (tec00020)	
Crude oil import prices	Current taxes on income, wealth, etc. (tec00018)	
Road accidents	Net Social contributions (tec00019)	
Infrastructure investment	Social benefits (other than social transfers in kind) paid by general government (tec00026)	
Passenger transport	General government gross fixed capital formation (tec00022)	
Freight transport	General government output (tec00017)	
Container transport	General government deficit/surplus (tec00127)	
Passenger car registration	General government gross debt (sdg_17_40)	
<b>Environment topic</b>	General government gross fixed capital formation - annual data (teina210)	
Air and GHG emissions	General government deficit (-) and surplus (+) - quarterly data (teina205)	
Air pollution exposure	General government gross debt - quarterly data (teina230)	
Air pollution effects	ECU/EUR exchange rates versus national currencies (tec00033)	
Build-up area	Euro/national currency exchange rates (teimf200)	
Patents on environment technologies	Real effective exchange rate - 42 trading partners (teimf250)	
Forest resources	Euro yield curve by maturity (1, 5 and 10 years) (teimf060)	
Material consumption	EMU convergence criterion series - annual data (tec00097)	
Material productivity	Long term government bond yields (teimf050)	
Municipal waste	Day-to-day money market interest rates (teimf100)	
<b>Finance topic</b>	3-month-interest rate (teimf040)	
Purchasing power parities	Short-term interest rates: Day-to-day money rates (tec00034)	
Exchange rates	Short-term interest rates: three-month interbank rates (tec00035)	
Insurance spending	HICP - all items - annual average indices (tec00027)	
Gross insurance premiums	HICP - inflation rate (tec00118)	
Gross direct insurance premiums	HICP - all items (teicp000)	
National Insurance market share	HICP - food (teicp010)	
Long-term interest rates	HICP - alcohol and tobacco (teicp020)	
Long-term interest rates forecast	HICP - clothing (teicp030)	
Short-term interest rates	HICP - housing (teicp040)	
Short-term interest rates forecast	HICP - household equipment (teicp050)	
Narrow money	HICP - health (teicp060)	
Broad money	HICP - transport (teicp070)	
Gross pension replacement rates	HICP - communications (teicp080)	
Net pension replacement rates	HICP - recreation and culture (teicp090)	
Gross pension wealth	HICP - education (teicp100)	
Net pension wealth	HICP - hotels and restaurants (teicp110)	
Pension funds assets	HICP - services (teicp280)	
Private pension assets	HICP - miscellaneous goods and services (teicp120)	
	HICP - all items excluding energy, food, alcohol and tobacco (teicp200)	
	HICP - all items excluding energy (teicp210)	
	HICP - all items excluding energy and unprocessed food (teicp220)	
	HICP - all items excluding energy and seasonal food (teicp230)	
	HICP - non-energy industrial goods (teicp290)	

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<b>Government topics</b>	HICP - all items excluding tobacco (teicp240)	
General government deficit	HICP - energy (teicp250)	
Trust in government	HICP - food, alcohol and tobacco (teicp260)	
General government revenue	Comparative price levels (tec00120)	
General government spending by destination	Price and volume convergence between EU Member States (tec00121)	
General government debt	GDP per capita in PPS (tec00114)	
General government financial wealth	House price index (2015 = 100) - quarterly data (teicp270)	
Government production costs	Balance of payments, current account, monthly data (teibp010)	
Government reserves	Balance of payments, capital account, monthly data (teibp020)	
Tax revenue	Balance of payments, current and capital account, monthly data (teibp030)	
Tax on personal income	Balance of payments, financial account, monthly data (teibp040)	
Tax on corporate profits	Balance of payments, financial account, net, quarterly data (teibp110)	
Social Security contributions	Balance of payments, current account, quarterly data (teibp050)	
Tax on payroll	Balance of payments, capital account, quarterly data (teibp060)	
Tax on property	Balance of payments, current and capital account, quarterly data (teibp070)	
Tax on goods and services	Current account transactions - credits, debits and balance (tec00038)	
Tax wedge	Current account transactions - goods: credits, debits and balance (tec00039)	
	Current account transactions - services: credits, debits and balance (tec00040)	
<b>Health topic</b>	Current account transactions - primary income: credits, debits and balance (tec00041)	
Doctors consultations	Current account transactions - secondary income: credits, debits and balance (tec00042)	
Computed tomography (CT) exams		
Magnetic resonance imaging exams	<b>Population and social conditions</b>	
Caesarean sections	Population on 1 January (tps00001)	
Child vaccination rates	Population as a percentage of EU27 (from 2020) population (tps00005)	
Length of hospital stay	Population change - crude rates of total change, natural change and net migration plus adjustment (tps00019)	
Hospital discharge rates	Population by age group (tps00010)	
Hospital beds	Proportion of population aged 65 and over (tps00028)	
Computed tomography scanners	Old-age-dependency ratio (tps00198)	
Magnetic resonance imaging units	Population without the citizenship of the reporting country (tps00157)	
Mammography machines	Foreign-born population (tps00178)	
Radiotherapy equipment	Women per 100 men (tps00011)	
Health spending	Population density (tps00003)	
Pharmaceutical spending	Population on 1 January by NUTS 2 region (tgs00096)	
Doctors	Population change by NUTS 2 region - Crude rates of total change, natural change and net migration plus adjustment (tgs00099)	
Nurses	Population density by NUTS 2 region (tgs00024)	
Medical graduates	Total and land area by NUTS 2 region (tgs00002)	
Nursing graduates	Total fertility rate (tps00199)	
Daily smokers	Mean age of women at childbirth and at birth of first child (tps00017)	
Alcohol consumption	Live births and crude birth rate (tps00204)	
Overweight or obese population	Share of live births outside marriage (tps00018)	
Life expectancy at birth	Total fertility rate by NUTS 2 region (tgs00100)	
Life expectancy at 65	Live births by NUTS 2 region (tgs00097)	
Infant mortality rates	Life expectancy at birth by sex (tps00205)	
Potentially years of life lost	Life expectancy at age 65, by sex (tps00026)	
Suicide rates	Infant mortality rate (tps00027)	
	Deaths and crude death rate (tps00029)	
<b>Innovation and technology topic</b>	Life expectancy at birth by sex and NUTS 2 region (tgs00101)	
Mobile broadband subscriptions	Deaths by NUTS 2 region (tgs00098)	
Fixed broadband subscriptions	Immigration (tps00176)	
Business use of broadband	Emigration (tps00177)	
Households with broadband access	Acquisition of citizenship (tps00024)	
Employees by business size	Crude marriage rate and crude divorce rate (tps00206)	
Young self-employment	Mean age at first marriage by sex (tps00014)	
Enterprise is by business size	Asylum and first time asylum applicants - monthly data (rounded) (tps00189)	
Self-employment with employees	Persons subject of asylum applications pending at the end of the month - monthly data (tps00190)	
Self-employment without employees	Asylum and first time asylum applicants - annual aggregated data (rounded) (tps00191)	
Self-employment with tertiary education	First instance decisions on asylum applications by type of decision - annual aggregated data (tps00192)	
Self-employment by activity	Final decisions on asylum applications - annual data (tps00193)	
Starting a business	Asylum applicants considered to be unaccompanied minors - annual data (tps00194)	
Running a business	Resettled persons - annual data (tps00195)	
Inventors	Population projections (tps00002)	
Industrial production	Projected old-age dependency ratio (tps00200)	
Tourism GDP	Healthy life years at birth by sex (tps00150)	
Tourism receipts and spending	Life expectancy at birth by sex (tps00208)	
Information and communication technology value edit	Healthy life years at age 65 by sex (tepsr_sp320)	
Information and communication technology employment	Life expectancy at age 65 by sex (tepsr_sp330)	
Information and communication technology investment	Share of people with good or very good perceived health by sex (sdg_03_20)	
Information and communication technology goods exports	Total health care expenditure (tps00207)	
Access to computer from home	Long-term care (health) expenditure (tps00214)	
Internet access	Practising physicians (tps00044)	
Gross domestic spending on research and development	Licensed physicians (tps00167)	
Researches	Practising dentists (tps00045)	
Government researchers	Physicians or doctors by NUTS 2 regions (tgs00062)	
Triadic patent families	Dentists by NUTS 2 regions (tgs00063)	
	Hospital beds (tps00046)	
<b>Jobs topic</b>	Curative care beds in hospitals (tps00168)	
Benefits in unemployment, share of previous income	Psychiatric care beds in hospitals (tps00047)	
Adequacy of minimum income benefits	Available beds in hospitals by NUTS 2 regions (tgs00064)	

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Financial disincentive to return to work	Discharges from hospitals (tps00048)
Working hours needed to exit poverty	Self-reported unmet need for medical examination and care by sex (sdg_03_60)
Financial disincentive to increase working hours	Causes of death, by sex (tps00152)
Net childcare costs	Death due to cancer, by sex (tps00116)
Financial disincentive to enter employment with childcare costs	Death due to other ischaemic heart diseases, by sex (tps00119)
Average wages	Death due to suicide, by sex (tps00122)
Employee compensation by activity	Death due to accidents, by sex (tps00125)
Gender wage gap	Death due to transport accidents, by sex (tps00165)
Wage levels	Death due to pneumonia, by sex (tps00128)
Employment rate	Standardised death rate due to tuberculosis, HIV and hepatitis by type of disease (sdg_03_41)
Labor force participation rate	Standardised preventable and treatable mortality (sdg_03_42)
Hours worked	Death due to chronic liver disease, by sex (tps00131)
Employment rate by age group	Death due to diseases of the nervous system, by sex (tps00134)
Employment by education level	Death due to diabetes mellitus, by sex (tps00137)
Employment by activity	Death due to alcoholic abuse, by sex (tps00140)
Part time employment rate	Death due to AIDS (HIV-disease), by sex (tps00143)
Self-employment rate	Death due to homicide, assault, by sex (tps00146)
Temporary employment	Death due to drugs dependence, by sex (tps00149)
Labor force	Suicide death rate by age group (tps00202)
Labor force forecasts	All causes of death by NUTS 2 regions (tgs00057)
Unemployment rate	Death due to cancer by NUTS 2 regions (tgs00058)
Unemployment rate by age group	Death due to ischaemic heart diseases by NUTS 2 regions (tgs00059)
Unemployment rate forecast	Death due to accidents by NUTS 2 regions (tgs00060)
Unemployment rates by education level	Death due to transport accidents by NUTS 2 regions (tgs00061)
Long term unemployment rate	Participation in early childhood education by sex (sdg_04_30)
Youth unemployment rate	Adult participation in learning by sex (sdg_04_60)
	At most lower secondary educational attainment by age (tps00197)
<b>Society topic</b>	At least upper secondary educational attainment, age group 25-64 by sex (tps00065)
Population	At least upper secondary educational attainment, age group 20-24 by sex (tps00186)
Working age population	Tertiary educational attainment by sex (sdg_04_20)
Young population	Tertiary educational attainment, age group 30-34 by sex and NUTS 1 regions (tgs00105)
Elderly population	Tertiary educational attainment, age group 25-64 by sex and NUTS 2 regions (tgs00109)
Fertility rates	Early leavers from education and training by sex (sdg_04_10)
Income inequality	Early leavers from education and training by sex and NUTS 1 regions (tgs00106)
Poverty rate	Young people neither in employment nor in education and training (15-24 years) - % of the total population in the same age group (tpsIm90)
Poverty gap	Employment rates of recent graduates (tps00053)
Discriminatory family code	Underachievement in reading, maths or science (source: OECD) (sdg_04_40)
Violence against woman	Participation in early childhood education by sex (sdg_04_30)
Women in politics	Adult participation in learning by sex (sdg_04_60)
Social institutions and gender	At most lower secondary educational attainment by age (tps00197)
Housing overcrowding	At least upper secondary educational attainment, age group 25-64 by sex (tps00065)
Permanent immigrant inflows	At least upper secondary educational attainment, age group 20-24 by sex (tps00186)
Stocks of foreign-born population in OECD countries	Tertiary educational attainment by sex (sdg_04_20)
Foreign born population	Tertiary educational attainment, age group 30-34 by sex and NUTS 1 regions (tgs00105)
Foreign population	Tertiary educational attainment, age group 25-64 by sex and NUTS 2 regions (tgs00109)
Native born employment	Early leavers from education and training by sex (sdg_04_10)
Foreign born employment	Early leavers from education and training by sex and NUTS 1 regions (tgs00106)
Native born unemployment	Young people neither in employment nor in education and training (15-24 years) - % of the total population in the same age group (tpsIm90)
Foreign born unemployment	Employment rates of recent graduates (tps00053)
Native born participation rates	Underachievement in reading, maths or science (source: OECD) (sdg_04_40)
Foreign born participation rates	Jobless households - children (tps00181)
National population distribution	Jobless households by sex (tps00182)
Urban population by city size	Employment rate by sex, age group 20-64 (t2020_10)
National area distribution	Persons employed part-time - Total (tps00159)
Social spending	Employees with a contract of limited duration (annual average) (tps00073)
Pension spending	Total unemployment rate (tps00203)
Public unemployment spending	Long-term unemployment rate by sex (sdg_08_40)
Family benefits public spending	Harmonised unemployment by sex (teilm010)
Social benefits to households	Harmonised unemployment by sex - age group 15-24 (teilm011)
Public spending on incapacity	Harmonised unemployment by sex - age group 25-74 (teilm012)
Public spending on labor markets	Harmonised unemployment rate by sex (teilm020)
	Harmonised unemployment rate by sex - age group 15-24 (teilm021)
	Harmonised unemployment rate by sex - age group 25-74 (teilm022)
	Employment rate by educational attainment level (tepsr_wc120)
	Employed persons with a second job (tps00074)
	Hours worked per week of full-time employment (tps00071)
	Hours worked per week of part-time employment (tps00070)
	Unemployment rates of the population aged 25-64 by educational attainment level (tps00066)
	Employment rate of the age group 15-64 by NUTS 2 regions (tgs00007)
	Employment rate of the age group 20-64 by NUTS 2 regions (tgs00102)
	Employment rate of the age group 55-64 by NUTS 2 regions (tgs00054)
	Unemployment rate by NUTS 2 regions (tgs00010)
	Long-term unemployment rate (12 months and more) by NUTS 2 regions (tgs00053)

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	Job vacancies in number and % - NACE Rev. 2, B-S, quarterly data (tps00172)	
	Average gross annual earnings in industry and services, by sex (tps00175)	
	Gender pay gap in unadjusted form (sdg_05_20)	
	Minimum wages (tps00155)	
	Labour cost index by NACE Rev. 2 (teilm100)	
	Labour cost index by NACE Rev. 2 - percentage change Q/Q-1 (teilm120)	
	Labour cost index by NACE Rev. 2 - percentage change Q/Q-4 (teilm130)	
	Labour cost index by NACE Rev. 2 - Index (2016=100) (teilm140)	
	Total wages and salaries (tps00113)	
	Social security and other labour costs paid by employer (tps00114)	
	Labour costs annual data - NACE Rev. 2 (tps00173)	
	People at risk of poverty or social exclusion (t2020_50)	
	People at risk of poverty or social exclusion by NUTS 2 regions (tgs00107)	
	At-risk-of-poverty threshold - EU-SILC survey (tessi014)	
	Dispersion around the at-risk-of-poverty threshold - EU-SILC survey (tessi126)	
	At-risk-of-poverty rate by sex (tessi010)	
	At-risk-of-poverty rate by detailed age group - EU-SILC survey (tessi120)	
	At-risk-of-poverty rate by household type - EU-SILC survey (tessi121)	
	At-risk-of-poverty rate by most frequent activity status - EU-SILC survey (tessi124)	
	At-risk-of-poverty rate after social transfers by sex (tps00184)	
	People at risk of poverty after social transfers (t2020_52)	
	At-risk-of-poverty rate of households without dependent children by work intensity - EU-SILC survey (tessi122)	
	At-risk-of-poverty rate of households with at least one dependent child by work intensity - EU-SILC survey (tessi123)	
	At-risk-of-poverty-rate, by highest level of education attained (tps00151)	
	At-risk-of-poverty rate by tenure status - EU-SILC survey (tessi125)	
	At-risk-of-poverty rate before social transfers by sex - EU-SILC survey (tesov250)	
	At-risk-of-poverty rate before social transfers by age group - EU-SILC survey (tesov252)	
	Persistent at-risk-of-poverty rate by sex - EU-SILC survey (tessi020)	
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## 12. CURRICULUM VITAE

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### Ausbildung

#### **EnvEuro Master - Environmental Science in Europe**

University of Copenhagen, Kopenhagen, Dänemark | BOKU, Wien, Österreich | 08/2018 – 02/2021

#### **Bachelor of Science in Umwelt- und Bio-Ressourcenmanagement**

BOKU (Universität für Bodenkultur) | Wien, Österreich | 10/2013 - 06/2018

#### **Matura**

St. Ursula AHS | Wien, Österreich | 09/2002 – 07/2010

### Berufliche Erfahrung

#### **Praktikum EVN Naturkraft**

EVN | Maria Enzersdorf, Österreich | 09/2019

#### **Praktikum in der Abteilung für Marketing und Vertrieb**

World Climate Ltd. | Kopenhagen, Dänemark | 02/2018 - 05/2018

#### **Praktikum bei Stadtplanungsbüro**

Pumpnig und Partner ZT | Graz, Österreich | 07/2016 - 09/2016

#### **Praktikant und Mitarbeiter der Seminar-Abteilung**

Österreichischer Wasser- und Abwasserwirtschaftsverband (ÖWAV) | Wien, Österreich  
02/2015 - 01/2018

#### **Marketing Praktikant**

C5 | London, Großbritannien | 04/2013 - 08/2013

**Grundwehrdienst**

Österreichisches Bundesheer | Mistelbach, Österreich | 1/2011 - 7/2011

**ORF Praktikum**

Österreichischer Rundfunk (ORF) | Wien, Österreich | 11/2010 - 12/2010

**Praktikum in der Baubranche**

Architekten u. Stadtbaumeister Ing. Wozak & Ing. Werl | Schwechat, Österreich | 08/2008

**IT-Kenntnisse**

Microsoft Office

Adobe InDesign

SAP

ArcGis

**Sprachkenntnisse**

Deutsch: Muttersprache

Englisch: Fließend in Sprache und Schrift

### **13. AFFIRMATION**

I certify, that the master thesis was written by me, not using sources and tools other than quoted and without use of any other illegitimate support.

Furthermore, I confirm that I have not submitted this master thesis either nationally or internationally in any form.

Perchtoldsdorf, 29.01.2021,

Lorenz Schober

A handwritten signature in black ink, appearing to read 'Schober', written in a cursive style.