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Oikeustieteellinen tiedekunta

The Impact of the Precautionary Principle on the Circular Economy Objectives of End-of-Waste in the EU

Ympäristöoikeus murroksessa
Thesis

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20.3.2023

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Tiivistelmäsivu

Tutkielma

Oppiaine: Oikeustiede
Tekijä: Kamilla Sjöblom
Otsikko: Ennalta varautumisen periaatteen vaikutus End of Waste -menettelyn kiertotaloustavoitteisiin EU:ssa/ The Impact of the Precautionary Principle on the Circular Economy Objectives of End-of-Waste in the EU
Ohjaaja: Anne Kumpula
Sivumäärä: 64 sivua
Päivämäärä: 20.3.2023

Ennalta varautumisen periaate on yksi keskeisistä Euroopan unionin toiminnasta tehdyssä sopimuksessa mainituista ympäristöoikeutta ohjaavista periaatteista. Ennalta varautumisen periaate tulee ottaa huomioon myös jätteeksi luokittelun päättymismenettelyssä (EoW). EoW-menettelyä voidaan hyödyntää kiertotalouteen siirtymisessä, joka on yksi keskeisistä EU:n ympäristötavoitteista. Jätemateriaalin käytyä läpi EoW-menettelyn, sen jätestatus lakkaa ja jätteestä tulee lain silmissä taas tuote. Jätteeksi luokittelun päättymisen edellytykset on määritelty uudistetun jätepuitedirektiivin artiklassa 6. Tutkimuksessa tarkastellaan erityisesti kyseisten edellytysten neljättä kriteeriä, jonka mukaisesti EoW-menettelyn läpikäyneen aineen tai esineen käytöstä ei saa aiheutua haitallisia kokonaisvaikutuksia ympäristölle eikä ihmisten terveydelle. Ennalta varautumisen periaate nivoutuukin EoW-menettelyyn nimenomaan artiklan 6 neljännen kriteerin kautta. Keskeiseksi tarkastelun kohteeksi nousee myös riskianalyysi, jossa arvioidaan haitallisten kokonaisvaikutusten olemassaoloa.

Tutkimus pyrkii selvittämään, miten ennalta varautumisen periaatteen soveltaminen vaikuttaa niihin kiertotaloustavoitteisiin, joita jätteeksi luokittelun päättymisellä pyritään edistämään. Tutkimuksessani käytän monimetodillista lähestymistapaa. Keskeisiä lähteitä ovat EUTI:n ratkaisut ja komission kommunikaatiot, sekä oikeustieteellinen ja laajemmin riskeihin ja tieteelliseen varmuuteen liittyvä kirjallisuus.

Tutkimuksessa jätteeksi luokittelun päättymistä hyödynnetään esimerkkinä ennalta varautumisen periaatteen vaikutuksesta laajemmin EU:n kiertotaloustavoitteiden toteutumiseen. Aihe on tärkeä ensisijaisesti EU:n ympäristöllisten toimenpidetavoitteiden toteutumisen arvioinnin kannalta. Tutkimuksen johtopäätöksenä nousee esiin ennalta varautumisen periaatteen keskeisyys yhtäältä kiertotalouden tavoitteiden toteutumisen varmistamisen kannalta, että sen mahdollinen jarruttava vaikutus, mikäli sitä sovelletaan liian laajasti ja matalalla kynnyksellä. Keskeistä olisikin suorittaa kattava riskianalyysi, jossa otetaan huomioon sekä jätestatuksen loppumisesta, että sen jatkumisesta aiheutuvat ympäristölliset haitat. Kattava riskien punninta, joka tehdään toiminnan ja toimimatta jättämisen välillä, on keskeinen osa haitallisten ympäristöllisten kokonaisvaikutusten arvioinnissa, ja vain sellaisen arvioinnin pohjalta ennalta varautumisen periaatetta on mahdollista hyödyntää parhaalla mahdollisella tavalla ympäristöriskien hallinnassa.

Avainsanat: jätteeksi luokittelun päättyminen, ennalta varautumisen periaate, kiertotalous

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Abstract

Thesis

Subject: Law
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Supervisor: Anne Kumpula
Number of pages: 64 pages
Date: 20.3.2023

The precautionary principle is one of the key principles guiding the EU environmental policy mentioned in the TFEU. The precautionary principle must be taken into consideration in End-of-Waste (EoW) practice as well. One of the main environmental objectives of the EU is the shift to circular economy (CE), and utilization of EoW is one of the policy options for supporting that shift. After waste material has completed the EoW procedure, its status as waste ceases and the material is legally seen as a product again. The conditions for material to complete the EoW procedure have been laid out in Article 6 of the amended Waste Framework Directive. This study will focus on the fourth criterion, according to which the use of the substance or object that has completed the EoW procedure must not lead to overall adverse environmental or human health impacts. The precautionary principle becomes part of the EoW assessment due to the fourth criterion. In addition, risk analysis becomes a central topic of discussion, as the presence of adverse impacts is determined in the analysis.

The study aims to examine how the precautionary principle affects the CE objectives which the use of EoW targets to promote. The study is executed by using an approach of combining multiple methods. Important sources are CJEU rulings, Commission Communications, legal literature and literature on risks and the concept of scientific certainty.

In the study, EoW is used as example of the wider scale impacts that the precautionary principle may have on the CE objectives of EU. The subject is relevant especially from the point of view of evaluating whether the EU environmental policy objectives are achieved. A central conclusion of the study is that the precautionary principle has a two-fold role – it is both a prerequisite for achieving of the CE goals, and a potential barrier for the promotion of CE, if its scope of application is too wide and threshold for its application too low. It is important to execute a comprehensive risk analysis, where both the environmental disadvantages of both cessation and continuation of waste status are compared. Extensive evaluation of risk trade-offs, executed between action and inaction, is a key element of the assessment of adverse environmental impacts, and it is only after such analysis when the precautionary principle can be utilized in the best possible way in environmental risk management.

Keywords: end-of-waste, precautionary principle, circular economy

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Abbreviations

CEAP	Circular Economy Action Plan
CJEU	Court of Justice of the European Union
BP	By-product
EoW	End-of-Waste
EU	European Union
JRC	The Joint Research Centre
MS	Member States
REACH	The European Union Regulation 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals
TFEU	Treaty of the Functioning of the European Union
WFD	Waste Framework Directive 2008/98/EC as amended by Directive (EU) 2018/851

1 Introduction

1.1 Background

If we continue to consume resources at the same volume we currently do, the biocapacity of the Earth is at its limit. We have already exceeded the sustainable levels of raw material and energy consumption years ago, therefore not only do we have to stop the increase of consumption, but also drastically decrease current volume of it. For example, in Europe the estimated required decrease in raw material consumption varies between 60 % and 90 % of the current consumption.[1] At the same time, there is a growing expectancy of higher standard of living, especially in the countries of emerging economies.

As we face the urgent need to optimize our consumption of raw materials, circular economy has become a widely discussed and accepted alternative for the current system. Circular economy is an intuitively appealing concept and a promising option, as it is attractive from the business perspective as well. The concept is most often discussed and popularized by its practitioners, e.g the business community and policy-makers[2], and consequently there is a multitude of definitions for circular economy, which are often lacking from the academic perspective.[3] The issue of the current material economy system is the linear consumption model, where material flows 'downwards' the system, and is eventually discarded, which results in waste and emissions.[4] In perfect circular economy, nothing goes to waste as all used material is reused in similar fashion to its original use. As Stahel puts it, the ultimate goal is to recycle atoms.[5] However, limited by the physical laws of entropy, the goal is achievable only

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[1] Backes 2017, p. 11.

[2] Korhonen – Honkasalo – Seppälä 2018, p. 37

[3] As there are many different definitions for the concept of CE, Prieto-Sandoval *et. al*. (2018, p. 610) conducted extensive academic literary review and based on that, proposed the following definition, with the definition aiming for cohesion and inclusion: The circular economy is an economic system that represents a change of paradigm in the way that human society is interrelated with nature and aims to prevent the depletion of resources, close energy and materials loops, and facilitate sustainable development through its implementation at the micro (enterprises and consumers), meso (economic agents integrated in symbiosis) and macro (city, regions and governments) levels. Attaining this circular model requires cyclical and regenerative environmental innovations in the way society legislates, produces and consumes.

[4] Korhonen – Honkasalo – Seppälä 2018, p. 38.

[5] Stahel 2016, p. 437.

in theory.[6] The key to understanding circular economy is to realize that not all reuse is equal in ecological value. 'Down-cycling'[7] needs to be avoided, as it is not true circularity, in which theoretically, material can be used infinitely for the same purpose.

The origins of the current emerging environmental catastrophe must be remembered as well – it is not only the lack of circularity but the volume of consumption that is the root of our problem. Without changing the current culture of consumption, circular economy will not solve the underlaying problem and instead shall remain a minor technical tool with minimal impact in the overall picture.[8]

Circular economy is one of the particles to the new economic and ecological order, that enables us to start living in harmony with our planet once again. The issue of excessive waste generation is a central one to be solved in the pursuit of circularity. In the EU level, the key legal structure regulating waste is the Waste Framework Directive[9] (WFD).[10] The objectives of the WFD are to reduce generation of waste and its negative impacts, and to reduce overall impacts of resource use and to increase resource efficiency. All these objectives are deemed necessary for the successful transition to a circular economy in the EU.[11]

Under the WFD, one of the key legal concepts promoting the system of circularity is the re-classification of waste, or the End-of-Waste (EoW) and By-Product (BP) procedures. In the EU, EoW simply means that waste will cease to be waste after undergoing a recovery operation, given that it complies with the regulative criteria.[12] Afterwards material is considered non-waste and can be utilized similarly to any virgin raw material or product. A material can be considered

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[6] Georgescu-Roegen suggested in 1971 that due to the law of entropy, material circularity would not be possible even in theory, as recycling and reprocessing always require energy. However, their theory has since been rejected (see e.g Ayres, 1999), as the Earth's ecosystems receives infinite solar power from the Sun which could be harnessed to processing of all waste into raw material again. Nevertheless, in practice, the goal of perfect circularity remains unreachable.

[7] E.g usage of discarded clothing as insulation material is considered 'down-cycling'. Recycling the material discarded clothes so that new clothes can be made from the resulting textile, is considered 'up-cycling'.

[8] Korhonen – Honkasalo – Seppälä 2018, p. 43.

[9] Waste Framework Directive 2008/98/EC.

[10] Scotford 2007, p. 372.

[11] Article 1 of the Waste Framework Directive 2008/98/EC, as amended by Directive (EU) 2018/851 (WFD).

[12] Article 6 of the WFD.

a by-product, if it results from a production process whose primary aim is not to produce that material, and if it complies with the criteria of the WFD.[13] In this paper I will focus on EoW, but the legal concept of BP can be often assimilated theoretically with EoW and in my opinion, does not need separate dissertation in the point of view I have taken in this paper.

In the current environmental legislative framework of the EU, the EoW and BP procedures are subjected to the precautionary principle, one of the over-arching principles of environmental law in the EU. Regardless, there is still no generally agreed definition for the principle.[14] However, the most commonly referenced and used definition[15] could be that of the Rio Declaration:

> In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost effective measures to prevent environmental degradation.[16]

The precautionary principle was first introduced in EU level legislation in the Maastricht Treaty in 1992. The promulgation of the Maastricht Treaty and the Rio Declaration took place during the same time period, and it is often thought that the introduction of the principle and its definition in the Rio Declaration was in the minds of the EU legislators. However, it has also been suggested, that the introduction of the precautionary principle to EU law was originally prompted by an older tradition of the principle in German environmental law, as well in which the principle had ambiguous meanings and interpretations.[17]

In the EU, the principle's legal basis is laid in the TFEU Article 191, where the principles, that should be taken into consideration when regulating and interpreting EU environmental law, are listed. The role of the precautionary principle, among the other principles, is stated in the Article as follows:

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[13] Article 5 of the WFD.

[14] E.g de Sadeleer 2020, p. 136 and Aven 2011, p. 1515, Rayfuse 2016, p. 30.

[15] See e.g. Fisher 2007, p. 40, Lofstedt 2014, p. 139.

[16] Principle 15 of the 1992 Rio Declaration on Environment and Development.

[17] Jans – Vedder 2008, p. 37.

> Union policy on the environment shall aim at a high level of protection taking into account the diversity of situations in the various regions of the Union. It shall be based on the precautionary principle and on the principles that preventive action should be taken, that environmental damage should as a priority be rectified at source and that the polluter should pay.[18]

Although the precautionary principle is embedded into the environmental legislation of the EU, it is not defined in the EU law. The deliberately simplistic wording of the Article intends to leave the principle as a policy guideline, whose exact meaning shall take shape by political discretion of the EU institutions, interpretation of the EU Courts, especially CJEU and its application in practice. An influential document has been the Communication on the Precautionary Principle[19], released in 2000 by the Commission to clarify the application of the principle by the Commission.

It is likely, that the precautionary principle is given different meanings depending on context and that its definition in the EU has become a sui generis version.[20] However, although taking a closer look to the meaning and purpose given to the principle is necessary to understand its role in waste regulation in the EU context, the exact definition of the precautionary principle even if just in the context of WFD, is not the focus point of this paper. Instead, after examining the meaning of the principle, I will concentrate on the principle's impact on achieving the objectives of circular economy in waste regulation, especially EoW, in the EU. In the course of this study, I will further examine the conflict between ensuring environmental safety and the urgent need to promote the circular economy and the manifestation of that dilemma in the EoW procedure.

1.2 Research questions, methodology and aims of the study

The scope of my study will be defined by the research questions. The intent of my research is to seek answers to the following question:

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[18] TFEU Art 191(2).

[19] COM(2000)1 Final.

[20] Cheyne 2007, p. 469.

- What is the impact of the precautionary principle on the interpretation of the condition that EoW 'substances or objects will not lead to overall adverse environmental or human health impacts' in the Article 6 of the WFD, in the context of the objectives of circular economy in the EU waste regulation?

I have chosen to address this question is in particular due to the scarcity of legal study regarding this specific subject that I have observed. I believe that this subject has been left without much attention due to the 'niche' nature of EoW. However, I believe that how the precautionary principle affects EoW, acts as an example of larger scope of environmental value-laden decision-making regarding the invocation of precaution. How the EU legislator and the Courts deal with risk is a central part of examining the approach to precaution against the background of increasing pressure to shift to circular economy.

Thus, my aim is to find answers to my main research question by focusing on the following sub-questions:

- What are the demands that the objective of circular economy sets for waste regulation, and specifically, for EoW?

- What is the role of the precautionary principle in the EoW regulation and practice in the EU and what kind of demands the principle sets for them?

- When the precautionary principle is applied, on what basis and how it relates to risk analysis?

All these questions aid in answering to the main research question. Firstly, the objectives of circularity in waste regulation must be identified, to assess how application of the precautionary principle affects them. Secondly, the role of the precautionary principle needs to be examined specifically in regards of EoW regulation, to gain understanding of how the principle affects the EoW procedure. Finally, I believe risk analysis is a central point of discussion as the presence of 'overall adverse environmental or human health impacts' is determined in that process.

I will conduct my research by combining different methodologies. I will carry out a literary review on the recent research conducted on the precautionary principle in the EU and its role in risk analysis. I will go further into the subject by analyzing EU case law regarding the application of the principle. In the process of my study, I will take a closer look to subjects of

risk, scientific knowledge and uncertainty in law, but also philosophical ways of understanding them. I believe that legal and philosophical understandings of these subjects are intertwined and should not be separated in my study, which does not merely explore these concepts inside the scope of law and their textual meanings, but instead from the point of view of how their understandings affect the goals of regulation. Ultimately, I will conduct a review on the impacts of current legislation and its approach to the precautionary principle on the circular economy goals of EoW.

I must emphasize that my aim is not to provide a comprehensive overview on the role of the precautionary principle in the EU, a subject already much studied, but rather focus on the principle's role specifically in the limited context of EoW, while keeping in mind the objectives of the circular economy in the EU. Thus, the focus of my study is three-fold, as I examine the distinct but interconnecting aspects of the objectives of circular economy, the precautionary principle and EoW procedure all in EU context.

1.3 Structure of the study

The structure of my study is determined by the research questions. In chapter 2, I will begin by taking a look into the circular economy as a general concept and the regulative and policy framework which supports the achieving of it in the EU. I will then elaborate on what kind of role waste regulation has been given in that framework. I believe that by clarifying how the political goal of a shift to circular economy is translated to EU legislation and what kind of demands the goals sets for waste regulation, I will offer the reader a basic understanding of the central concepts of my study. The subject may seem disconnected from the main question of focusing on the role of the precautionary principle, but I am convinced that in order to examine my core research question thoroughly and for the reader to understand my argumentation later in the study, setting the context where the EU waste regulation today operates, is a necessary step. I will clarify the structure of regulative and policy instruments that promote circularity in the EU, introduce the concept of EoW in the EU and simultaneously examine how waste regulation, and specifically EoW, is mentioned in those regulative documents that aim at promoting circularity. I aim to draft a concise overview of what kind of a role the EU seems to have given to EoW in its pursuit of shift to circular economy in the upcoming years.

Next, in chapter 3, I will introduce the precautionary principle, whose influence in the EoW context my study is focused on. After a brief overview of the historical roots and purpose of the principle, I will move on to present its current position in the EU waste legislation. I will briefly discuss the role of the REACH regulation in EoW context, where its function is twofold, as it may act both as a precautionary instrument, but also may support the objectives of achieving circular economy. I will then introduce some of the most relevant and recent EU case law regarding the application of the principle in EU environmental context. Most importantly, I will keep the perspective of the objectives of circular economy at the center of the discussion and mirror how the precautionary principle's influence in waste regulation impacts those objectives. I will then move on to briefly explore the different interpretations of the precautionary principle given in international law and EU law. I will conclude the chapter with and overview of the impact of precautionary principle on waste regulation, especially discussing it in the context of the goal of better utilization of waste and EoW, as representants of the objective of circular economy.

In chapter 4, I will focus on the concepts of risk and scientific uncertainty, on how they tangent the earlier discussion of chapter 3 regarding the precautionary principle and how the relationship of risk and uncertainty and the precautionary principle relate to EoW on conceptual and practical level. To set up the context of discussion, I will first provide a brief introduction to the process of risk analysis as it is understood in the EU environmental context. I will then proceed to examine how the precautionary principle relates to the risk analysis and ultimately, where the limits of the approach emphasizing the importance of risk analysis lay. After discussing the relationship of risk and precaution in general terms, I will bring the context back to EoW and look into the risks of EoW in circular economy. Lastly, I will elaborate on how and to which degree these risks, and also potential benefits, of EoW are controlled and restricted by the precautionary principle. After considering all these factors, I will conclude the chapter by analyzing the scope and rationale of the role of precautionary principle in the EoW context in the EU, whilst remembering to acknowledge the background EU objective of shifting to circular economy. Lastly, in chapter 5, I will present the conclusions of my study.

2 Waste Regulation and the Objective of Circular Economy

2.1 Circular Economy – the Emerging New Order of the Material Economy

As established above, it is commonly agreed that there is an urgent need to reduce the consumption of raw materials. According to some estimates, by 2050 we will need three Earths instead of one, if we keep living the way we currently do.[21] Optimizing our material use, and promoting new innovations to aid in the process, is of key importance in reducing our impact on the environment: extradition of natural resources causes approximately 50 % of all greenhouse gas emissions and over 90 % of global biodiversity loss and water stress.[22] It is undisputedly clear that we cannot keep up the same pace as we have the past decades and centuries. A radical, immediate revolution seems necessary in order to preserve even some of the natural environment for the next generations to come.

In addition to the need to urgently cut the consumption of (virgin) raw materials, we have a global waste problem that keeps growing in volume and severity. To absorb the current amount of waste generated we would need 1.81 planets; almost double the Earth we have.[23]

Waste material is conventionally considered to be of low economic and industrial value. What is more, the cumulation of waste is inevitably causing environmental deterioration in geosphere and biosphere, which then contributes to a wide range of social and economic problems. Waste accumulation is also fundamentally linked with equality deficit, inflicting most burden to the societies in critical developmental phases with less resources to overcome the problem as industrial manufacturers commonly export waste to countries with less stringent environmental regulation. To resolve the issue of continuing accumulation of waste, we need a change in how waste is perceived. If waste could be converted to valuable goods instead of useless discard, the problem of uncontrolled disposal and pollution exports would eventually cease to exist. Ideally, protecting the environment would simultaneously provide economic returns and have a positive effect on social wellbeing.[24] That is possible in circular economy model, where the material

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[21] https://www.un.org/sustainabledevelopment/sustainable-consumption-production/, last seen on 13.1.2022.

[22] United Nations 2020, p. 68.

[23] The World Counts 2022. https://www.theworldcounts.com/economies/global/effects-of-consumerism, last seen on 14.7.2022.

[24] Scheel 2016, p. 377.

loop is closed and waste is used as raw material for new products, causing the need for virgin raw material extraction to considerably decrease.

Circular economy can be one particle of the new economic order, that enables us to start living in harmony with our planet once again. It must be pointed out, that the circular economy is but one option or part of the change – in order to solve the multifaceted environmental issues we face, we need a multifaceted approach. But in the current crisis of increasing raw material consumption and waste generation, the pursuit of circularity is generally agreed to be an important part of the transformation to sustainable economy.[25]

Key phase in closing the material loop is the recovery of the materials that would, without undergoing recovery operation, be considered waste and treated as such. Developing new technologies to fully utilize, to 'up-cycle' materials on molecular level is of paramount importance in promoting circular material flow and material efficiency.[26] Additionally, a market needs to exist for the materials recovered for the recovery operations to be both financially and environmentally feasible. For a market to exits, recovered materials need to be utilized in the design and production phases of goods. That is, in order to close the loop, innovations are needed in different phases of products' life cycles. Circularity requires a holistic approach to consumption and production of products and materials they are made of.

2.2 The Objectives of Circular Economy in the EU and how they are supported by the EU Waste Regulation

Traditionally environmental law has been able to manage environmental hazards created by point sources of production rather effectively. However, there has been less success in containing the negative environmental impacts from sources associated with products' entire life cycle.[27] Products' life cycle includes different phases which each consume energy and may

[25] Prieto-Sandoval – Jaca – Ormazabal 2018, p. 610.

[26] Stahel 2016, p. 437.

[27] Dalhammar 2015, p. 99.

have other negative environmental impacts, e.g., their production, transportation, and end-of-life management.

The EU has recognized the issue of lifecycle impacts and has included the objective of circular economy in its environmental strategy. The objective manifests in Circular Economy Action Plan (CEAP), whose first edition was launched in 2016, and the second edition in 2020. CEAP is one of the cornerstones of the European Green Deal.[28] The overarching goal of the Green Deal is to have 'climate neutral' EU by 2050. In the communication on the new CEAP the Commission states, that in order to achieve the goals of the European Green deal, "the EU needs to accelerate the transition towards a regenerative growth model that gives back to the planet more than it takes, advance towards keeping its resource consumption within planetary boundaries, and therefore strive to reduce its consumption footprint and double its circular material use rate in the coming decade". The CEAP exists to support achieving the goals of the European Green Deal. The CEAP has several main objectives, which are all intertwined and interrelated and aim at promoting material circularity. One of the main objectives of CEAP contributing to the European Green Deal is to establish a product policy framework, that will "make sustainable products, services and business models a norm". Additionally, there are objectives to minimize waste generation and make "circularity work for people, regions and cities". Measures contributing to the establishing of 'the product policy framework' for circularity include focusing policies on key sectors[29] which the EU considers resource intensive, and which therefore would have the most potential for circularity.[30]

To achieve the main objectives of CEAP, that is, a functioning circular economy, a sustainable product framework and reduced amount of waste, there are detailed and practical policy actions are listed in the CEAP. In order to support circularity and the decrease in waste generation, hazardous substances in materials are to be replaced with 'safe-by-design chemicals'. These non-hazardous chemicals are expected to increase opportunities for circularity by 'increasing the confidence in using secondary raw materials'. Other complementing measures listed in the

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[28] The European Green Deal is the EU's concerted strategy for a climate-neutral, resource-efficient and competitive economy. It was first presented on 11th of December in 2019. See more: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en

[29] These key product value chains include electronics and ICT, batteries and vehicles, packaging, plastics, textiles, construction and buildings and food, water and nutrients.

[30] COM(2020) 98 final, p. 6.

CEAP include developing advanced sorting systems to separate contaminants from waste, developing methodologies to minimize the presence of substances harmful to health or the environment in recycled materials and improving the classification and management of hazardous wastes to ensure clean streams of recycled materials.[31]

In addition, under the goal of ensuring less waste, there is the goal of establishing a solid EU-level market for secondary materials. As the Commission points out, the demand and supply of secondary raw materials have been disproportionate and there has been problems associated with the quality, availability, and costs of secondary raw materials, preventing the expansion of their commercial use.[32] To support the functioning of the EU-wide market for secondary raw materials, one notable policy measure is the goal of increasing recycled content in products' raw materials.[33] That goal has been enacted in the 2022 Proposal of the Commission, where legally binding requirements of minimal recycled content in plastic packaging are suggested.[34] In addition, it is mentioned in the CEAP that the Commission aims to 'assess the scope to develop further EU-wide end-of-waste criteria for certain waste streams based on monitoring Member States' application of the revised rules on end-of-waste status and by-products, and support cross-border initiatives for cooperation to harmonize national end-of-waste and by-product criteria'.[35] After drafting EU-wide criteria for certain materials in the beginning of the 2010s[36], but then stalling with developing harmonized criteria, it seems that the Commission intends to re-explore the potential which setting EU-level EoW criteria could offer for promoting circularity and waste prevention.

As seen from above, there is an extensive policy and legislative framework in place that aims at promoting circular economy in the EU. However, Backes pointed out in 2017 that even if the objective of circular economy is much present in the current discourse of the EU and the

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[31] *ibid.*, 13–14.

[32] *ibid.*, p. 14.

[33] *ibid.*, p. 4.

[34] COM(2022) 677 final, p. 58.

[35] COM(2020) 98 final, p. 14.

[36] The EoW criteria are set for iron, steel and aluminium scrap in Council Regulation (EU) No 333/2011, for copper scrap in European Commission Regulation (EU) No 715/201, for glass cullet in European Commission Regulation (EU) No 1179/2012.

Member states, it remains vague and lacks concrete targets.[37] There is the overarching goal of a climate-neutral EU in 2050 in the European Green Deal, to which decreasing raw material consumption and reducing of waste will eventually contribute. However, it seems that the EU has this time focused on setting practical, concrete goals on legislative level and even has mentioned the potential use of enforcement measures if the MS do not meet the objectives in set time limits. In accordance with the objectives of the CEAP, the Waste Directives of the EU were revised in 2018.[38] The revised directives target especially the environmental impacts of product's end-of-life phase. The package of revised directives sets concrete, numeral goals for material efficiency in waste management, focusing on higher recycling rates and lower rates for landfilling and energy recovery. The amended WFD aims at protection of the environment and human health and the shift to a circular economy by preventing waste generation and adverse impacts of waste and resource use, and by promoting resource efficiency.[39]

Even if the purpose of the CEAP and the legislative amendments driven by it is to "aim at accelerating the transformational change required by the European Green Deal"[40], it has been argued that the new amended directives lack ambition and effective measures. Although the concrete recycling targets binding the MS were included, otherwise no new binding measures were introduced and the approach to the concept of waste remains conservative. As Malinauskaite *et al.* put it, it seems that advancing circular economy is mostly mentioned in the declared goals of the directive, but those goals do not translate into the binding provisions of the regulation.[41] They criticize the new WFD for its treatment of end-of-life phase of products as well, as they argue that the WFD does not adequately address the potential of new technological advancements in turning waste into a valuable resource.[42] There are innovative

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[37] Backes 2017, p. 13.

[38] Total of six waste directives were revised in 2018, with the following four directives: Directive (EU) 2018/849 amending Directives 2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and 2012/19/EU on waste electrical and electronic equipment, Directive (EU) 2018/850 amending Directive 1999/31/EC on the landfill of waste, Directive (EU) 2018/851 amending Directive 2008/98/EC on waste, Directive (EU) 2018/852 amending Directive 94/62/EC on packaging and packaging waste.

[39] Directive (EU) 2018/851 amending Directive 2008/98/EC on waste, Article 1.

[40] COM(2020) 98 final, p. 2–3.

[41] Malinauskaite – Jouhara – Spencer 2017, p. 69.

[42] *ibid.*, p. 68.

technologies which would allow treating waste without causing any risks to the environment, but such technologies have not been recognized in the regulation. I will discuss the potential of innovations as drivers of the shift into circularity more in the next chapter.

2.3 Circular Economy and Innovations

As stated above, in order to close the material loop, we need innovative solutions. When promoting circular economy, these kind innovations are needed multiple levels. That includes the products and materials' production phase, their consumption phase and the legislation regulating these phases. 'Eco-innovations' in all these three levels are required to accelerate the shift to circular economy.[43] The demand for innovations in different areas means holistic approach is needed. However, until this point, it has been apparent that the siloed fields of academic research, companies and administrations seem to not cooperate efficiently in producing those innovations.[44] In addition, a similarly holistic approach is needed within the administrative framework. Environmental matters are not managed merely through explicitly environmental policy instruments, but by multiple interdependent administrative frameworks[45], in this case the framework policing production and consumption phases of products.

When considering innovations regarding waste, especially on the legislative level, it must be recognized, that the concept of waste is relative to place, time and circumstances.[46] No material is physically, indefinitely waste, but the status of waste fluctuates depending on the material's use and the law that applies to it. Indeed, the idea of circular economy relies on that recognition of relativity, and so should the law establishing that circularity.

Support of scientific research is a necessity when establishing circular economy in general, but especially when considering EoW and its subjection to precautionary principle. In order to rationally and efficiently utilize EoW, solid scientific background knowledge is required. Ideally, the instances of invocation of the principle should be as few as possible, as most

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[43] Prieto-Sandoval – Jaca – Ormazabal 2018, p. 606.

[44] Stahel 2016, p. 436.

[45] Scotford 2017, p. 155.

[46] de Sadeleer 2012, p. 142-143.

situations could be covered by and settled according to relevant scientific knowledge. Precautionary principle only needs to be taken into account, when our current scientific knowledge does not provide us with answers. I will discuss these scientific uncertainties and their relation to rational decision-making more in detail in chapter 4.

As an example of eco-innovations, Scheel introduces the SWIT model for industrial ecology clusters. SWIT is a "system-centered framework capable of constructing the proper conditions for creating and sharing value through circular products and residue chains, creating self-organized sustainable communities".[47] What is remarkable, that the SWIT is not just a new technological or business solution, but a concept that seeks to transform the whole idea traditional model of industrial production. I use it here as an example of the 'level' of innovation that we currently need, in order to radically transform the functioning of our current economy. We already know that traditional business models and public policies limited in scope and time do not provide with solutions to the shift to sustainable growth.[48] However, the problem with the innovative, developed systems like SWIT is often the reality of regulative barriers. When formulating for instance synergized industrial production systems with zero waste approach, it is necessary to simultaneously create legal design to support the new system. When considering eco-innovations, legal innovations unlock the possibilities for eco-innovations on other levels.

The need for innovation is frequently mentioned in the 2018 CEAP. CEAP aims to ensure that shifting to circular economy harnesses the potential of research and innovation.[49] There is a major focus in developing the production phase of products into a sustainable one. Additionally, there are efforts mentioned in restricting single-use of products and promoting 'product-as-a-service' models.[50] Even if the emphasis seems to be in innovations relating to materials and technologies, innovations in administrative and regulative fields are mentioned as well, such as

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[47] Scheel 2016, p. 378.

[48] Scheel – Vasquez 2013, p. 88.

[49] COM(2020) 98 final, p. 3.

[50] *ibid.*, p. 4.

developing a new tracking mechanism for substances of very high concern[51] and revising regulatory framework on end-of-life vehicles promoting circular business models.[52]

EoW practice could, if utilized more efficiently, be one of the key eco-innovations on the legislative level. Needless to say, the practical utilization of EoW (and BP) requires innovations in production and possibly, consumption phase as well. Legislation can be seen as a corner stone and/or driver for innovations on those more practical levels.

2.4 EoW in Waste Hierarchy in the EU

The cornerstone of waste regulation in the EU is the concept of waste hierarchy as it is described in the Article 4 of the WFD. Waste hierarchy provides us with priority order in waste prevention and management. The prioritized option is the prevention of generation of waste. Then, prioritized in the order as mentioned, are reuse, recycling, other recovery (such as energy recovery) only lastly, disposal. Therefore, waste hierarchy in itself does not include concrete or numeral goals for the functioning of material economy but is more of an over-arching principle guiding waste regulation and policies in the EU. Consequently, its interpretation and adaptation has been less than consistent by the MS. The lax interpretative space has made avoiding of fulfilling the objectives of waste hierarchy easier for the MS in the past.[53] However, as the revised WFD sets numeral, waste stream-specific and legally binding targets for recycling, the enforcement of the waste hierarchy should be more efficient in the future.

Material classified as EoW[54] is included in the calculations towards the recycling targets set in the revised directives.[55] However, the concept of EoW operates with different logic to recycling targets. In practice, the impact of EoW is often similar to that of recycling, and as mentioned, the material completing EoW procedure counts towards the recycling targets. Yet, there are no concrete goals for the amount of material completing the procedure. Instead, EoW is a 'shortcut'

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[51] *ibid.*, p. 13.

[52] *ibid.*, p. 8.

[53] See e.g. COM(2018) 656 final.

[54] However, this does not apply to BP, as it cannot be used towards the calculation of the recycling targets.

[55] Article 6(3) of the WFD.

for the utilization of waste-based material and a relief of administrative burdens for the entity operating the utilization process. Essentially, turning waste into product has been and is mainly driven by business interests[56], environmental benefits being merely the desirable side effects to those in possession of the waste material. Nevertheless, in the long run, the purpose of EoW procedure is to decrease the demand of virgin raw materials by closing the material loop by removing regulatory barriers of utilization of waste-based material as raw material.

That is to say, the concept of EoW one of the many practices of implementing waste hierarchy. In essence, EoW procedure is about defining waste and the scope of that definition. The scope of assigning material the status of waste then premeditates how easily material can be sent back to circulation. As Turunen articulates it, adopting the over-inclusive definition of waste might undermine the process of achieving circular economy.[57] However, even if it is agreed that the broad definition of waste does not encourage utilizing waste material in full potential, it is not certain that objectives of preventing waste generation or minimizing waste associated risks, will lead to this kind of 'over-inclusive' definition.[58]

As stated before, Article 6 of the WFD sets the requirements of when waste can cease to be waste under EU legislation. The most interesting and relevant criterion from the point of view of my research topic is the fourth and last criterion, which is: "(d) the use of the substance or object will not lead to overall adverse environmental or human health impacts."[59]

I have chosen to focus on the fourth criterion as application of the precautionary principle becomes relevant when assessing environmental and health impacts. For material to complete the EoW procedure, the impacts of the change in its status are evaluated, and these impacts must not lead to overall adverse environmental or human health impacts. Ideally, the evaluation process is conducted based on scientific data while taking into account all potential direct and indirect impacts of the material entering back into the economy.[60]

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[56] Desrochers 2002, p. 62.

[57] Turunen 2018, p. 23.

[58] Scotford 2017, p. 149.

[59] Article 6(1)(d) of the WFD.

[60] Turunen 2018, p. 98-99.

As the JRC recognized in its 2009 report, it is important when evaluating the adverse impacts, that also positive impacts should be taken into account.[61] The assessment should be carried out by comparing the end results of the two scenarios – the scenarios of whether material is considered waste or non-waste. Allowing the material to receive non-waste status typically results in higher utilization rate and decreased costs relating to waste management and raw material acquisition.

Similarly, the definition for when material may be considered BP, is provided in Article 5. As regulated in the Article, receiving by-product status requires impact assessment equivalent to the one obligatory in EoW procedure. I will be discussing impact assessment obligations from the point of view of EoW, but as the requirements for the assessment for both EoW and BP are the same, the following discussion is mostly applicable to BPs as well.

The current definitions of Articles 5 and 6 have embedded in them the extensive relevant CJEU case law, where the concept of waste and non-waste has been thoroughly examined.[62] However, the interpretation of the Articles should be made not only with textual approach, instead also taking into account systematic and teleological approaches due to the ambiguity left in the wording of the two Articles.[63] As Scotford articulates it, the aims of the waste regulation and the guiding environmental principles of TFEU should be taken into consideration, when the scope of concept of waste is defined.[64]

It could be interpreted that the fourth criterion is the strictest of all of the criteria, as it offers a clear threshold for when completing the EoW procedure is possible – that is, only in the case that there would be no adverse environmental or human health impacts if the material in question receives non-waste status. Such approach is merely dogmatic, and the criteria is not, and could not be, fulfilled to the extent it has been worded in the text of the Article in practice. However, there are instances where risks exist, but they can be managed adequately e.g with other regulative framework and exercising strict monitoring. Thus, Dalhammar suggests, that the evaluation of environmental impacts should be conducted in holistic manner taking into

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[61] JRC 2009, p. 9.

[62] Scotford 2007, p. 367.

[63] Turunen 2018, p. 81.

[64] Scotford 2007, p. 387.

account the whole lifecycle of a product or material, especially considering the underlying objective of the waste regulation of minimizing the amount of waste generated and lengthening the lifecycles of materials and products.[65]

However, as I mentioned, in practice the objective of Articles 5 and 6, the scientifically based impact assessment with unambiguous results, is difficult to achieve. In reality, this is not a realistic goal, but merely the ideal. Naturally, in practice there are situations where the legislator or an enforcer of legislation is faced with the issue of uncertainties regarding the composition or behavior of a material for which it needs to define material specific criteria or when it is applying such criteria. I will discuss this issue of inherent uncertainty more in chapter 4.

2.5 Conclusions – Legislative Demands of the Shift to Circularity

For legislation to aid with the goal of achieving circular economy, there is a need for continuous regulative innovation and adjusting of the current framework.[66] A prerequisite for legislation to support the shift to circularity, is to identify appropriate systemic, technical, scientific and economic means, or eco-innovations, that enable the shift.[67]

The interconnection of high level, innovative industrial technology, environmental and toxicological research, and the demand of legislation to keep up with those, including profound revolutions in the conceptual level, is a difficult multidiscipline and multilevel structure to administer and control. Objectives should be common and coordinated, to efficiently achieve them. However, it is no easy task for a single responsible entity to promote scientific, legal, business, and academic efforts in a coherent manner. To add, the success of the shift to circularity depends on chemical and metallurgical innovations[68] and innovative business model creation to economically utilize the new technologies on practical level. This all needs to be in accordance with waste legislation, which in theory should be able regulate something the researchers and innovators haven't even discovered yet. The legislator faces an urgent, yet

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[65] Dalhammar 2015, p. 115-116.

[66] E.g. Scheel 2016 p. 377, Turunen 2018, p. 204, Prieto-Sandoval – Jaca – Ormazabal 2018, p. 613.

[67] Hofstra – Huisingh 2014, p. 459.

68 Stahel 2016, p. 436.

abstract challenge of regulating unknow technologies and processes to make sure they in no way harm the environment or the health of humans, but at the same time to ensure that as much as possible of the generated waste material enters circulation. The "wicked problem" of climate change prevention is particularly present in the EoW procedure.

Circular economy can be examined and defined from three different perspectives: economic, social and scientific. The first two have been discussed often and some the discourse is very business-oriented and/or popularized.[69] The scientific part, as Korhonen *et al.* point out, has been left without enough attention.[70] Academic theorizing of economic and social perspectives is possible with little connection to practicality. All three aspects are needed to first study and then apply in practice for circular economy to became reality instead of it remaining a conceptual utopia. Analogically, the same applies to EoW. EoW has been studied in the economic and social/legal perspectives.[71] There has been separate scientific studies, but a holistic study approach seems to be little executed in practice, even though EoW could offer a practical tool and legislative key to better environmental policies and practice. In this paper I aim to discuss the regulative side without forgetting its fundamentally intertwined relationship with scientific studies and level of available technologies.

When assessing the invocation of the precautionary principle regarding exceptions from waste status, the situation is unique compared to many others the precautionary principle applies to. Typically, the assessment is conducted between new industrial innovations and protection of human health and the environment. While there is a considerable risk to human health and the environment associated with allowing waste material EoW status, there lies a risk in not allowing the use the exceptions from waste status as well. In chapter 4. I will further explore why risk analysis in its current form might not be completely fit for situations such as EoW, which include environmental risk trade-offs.

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69 Academic research on economic and social aspects of circularity and waste, see e.g. Prieto-Sandoval – Jaca – Ormazabal 2018; Scheel 2016.

70 Korhonen – Honkasalo – Seppälä 2018, p. 38.

71 See e.g. Turunen 2018.

In the next chapter I will examine in more detail, what kind of impact the precautionary principle has in the EU, and what are the options and values we need to weigh, when precautionary approach is considered in the context of waste regulation, and EoW specifically.

3 The Precautionary Principle and Waste Regulation in the EU

3.1 The Background and Purpose of the Precautionary Principle

The precautionary principle is included in EU legislation in the TFEU Article 191. The principle is not textually defined in any EU legislation, but the Rio definition cited in chapter 1 is considered one of the commonly accepted definitions.[72] The precautionary principle is one of the newest principles of international environmental law. It appeared for the first time in a treaty text in the 1985 Vienna Convention, although ideas reflecting a precautionary approach had been present since the 1960s. Instances of environmental and health catastrophes, such as the ozone layer depletion in the 1980s, which I will discuss more into detail later in this chapter, increased the support for the principle worldwide. In the 1990 Bergen Ministerial Declaration the precautionary principle was first recognized as a principle of general application.[73]

In the EU, the precautionary principle was adopted into the Union's legislation in the 1990s after series of environmental and health disasters that followed the regulatory failures of the European countries.[74] The role of the principle was further crystallized in a 1998 ruling by CJEU, in which the court stated: 'where there is uncertainty as to the existence or extent of risks to human health, the institutions may take protective measures without having to wait until the reality and seriousness of those risks become fully apparent.'[75]

The position of the principle was strengthened by the European Commission's Communication on the Precautionary Principle in 2000.[76] The Communication sought to clarify the meaning and the grounds of application of the principle. In the Communication, it is stated that '[a]pplying the precautionary principle is a key tenet of [the Commission's] policy, and the choices it makes to this end will continue to affect the views it defends internationally, on how this principle should be applied'.[77] However, as the document did not explicitly give

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[72] Principle 15 of the 1992 Rio Declaration on Environment and Development.

[73] Sands – Peel – Fabra – MacKenzie 2012, p. 219.

[74] de Sadeleer 2020, p. 140.

[75] CJEU C-157/96 *National Farmers Union,* ECLI:EU:C:1998:191. Paragraph 63.

[76] EAA 2001, "Late lessons from early warnings", p. 13.

[77] COM(2000)1 Final, summary paragraph 3.

instructions to any other entity than the Commission, its role and scope of application within the EU has been since questioned. Lofstedt has argued that the application of the principle is not compatible with the Communication, and therefore the European courts seem to be 'misinterpreting' it.[78] On quite the opposite, Fisher, and later on Scotford, have argued that the understanding of the purpose and scope of application of the principle of the MS and EU institutions has been derived from the 2000 document, despite originally created to merely communicate the role of the principle under the Commissions competence.[79]

In similar fashion to the precautionary principle, risk regulation became an issue of interest in the EU level legislation in the 1990s, after a series of high profile issues involving risks to health and the environment, such as the BSE[80] epidemic in the UK.[81] Indeed, the evolution of EU risk regulation took place simultaneously with the inclusion of the precautionary principle in EU regulation.[82] The way which the principle and approach towards risk have been adapted in the EU reflects the political atmosphere at the end of the millennium. It can be argued that the historical situation of the 1980-90s affects the applying of the principle even today. De Sadeleer calls the phenomenon "risk adverse political culture", which served a fertile ground for the influence of the precautionary principle to grow. In addition to the environmental field, the scope of precautionary principle has grown, as it has since permeated the fields of food safety and public health policy as well.[83]

During the period of the principle's acceptance, different kind of environmental hazards were at the center of public and regulative interest, opposed to those that the EU aims to tackle today. If the view of the formation of the principle reflecting the historical political atmosphere is taken even further, we can point out that time and thus, risks, have changed, and the rationale under which the principle was adapted has since changed. The current overarching goal is to support the shift into circular economy due to the current material economy putting unbearable

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[78] Lofstedt 2014, p. 137.

[79] Fisher 2007, p. 229, Scotford 2017, p. 90.

[80] Bovine spongiform encephalopathy, also known as the "mad cow disease".

[81] Joerges 2001, p.

[82] Fisher 2007, p. 209.

[83] de Sadeleer 2020, p. 140-141.

pressure to the planet and its resources. Such goal did not exist in the EU until in the 21st century.[84] Thus, if protecting human health was the main objective of the regulation in the 1990s, the perspective has radically changed in the past decades. Undoubtedly, the end goal is still a healthy living environment for humans, but the hazards we face have transformed from relatively manageable public health hazards to the risk of extinction of the whole ecosystem upholding our existence.

Indeed, the discussion involving the role and scope of the precautionary principle in has not reached an unambiguous conclusion and continues to evolve and reach different forms.[85] From the perspective of international environmental law, controversiality exists regarding its usefulness and suitability in managing the issues environmental regulation currently aims to tackle. Some consider it to merely emphasize the requirement for careful consideration of possible harmful consequences and for the application of the principle to secure an early action approach to environmental hazards. Even if these goals are most likely universally accepted, some argue that the principle does not serve as merely a tool for minimizing adverse environmental impacts, but on the contrary, the invocation of the principle leads to excessive restrictions to environmentally harmless or even beneficial activities. In extreme cases, the principle could serve as legal grounds for prohibiting activities of which no evidence of them having harmful impacts exist and result in for the entity who performs these actions to be responsible for proving no harm could possibly be inflicted by said actions.[86]

As all principles, the precautionary principle may be defined only in relation to the specific context it operates in. Nevertheless, even compared to other legal principles, the precautionary principle has been subject to vast controversy.[87] On one hand, according to de Sadeleer, there are two main arguments against its acceptance. Firstly, it is undoubtedly a principle of varying definitions, based on which some argue that its nature is too disputed and vague for it to be a guiding principle. Secondly, there are arguments that the applying of the principle has been

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[84] The goal of circular economy was first introduced in policy level in the beginning of the 2010s in the EU, see e.g. the 7th Environmental Action Programme for 2013-2020, Decision No 1386/2013/EU on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet'.

[85] Scotford 2017, p. 155-156.

[86] Rayfuse 2016, p. 30.

[87] Fisher 2007, p. 40-41.

inconsistent, most likely due to its ambiguous nature.[88] On the other hand, Fisher argues that questioning of the principle in fact targets the model 'administrative constitutionalism', the principle is perceived to uphold.[89] However, these arguments mostly target the essence of the principle and have an inter-jurisdictional view. Thus, when focusing only to the European context, the criticism is not applicable as such.

On one hand, de Sadeleer has described the impact of the precautionary principle to be interconnecting different legal systems and like other such 'directing principles', building a bridge between modern and post-modern law. Endemic to post-modernity is the demand for the legislator to answer to complex, unpredictable and volatile situations, to which traditional, static legal norms do not provide answers to.[90] Thus, principles could be seen as creating coherence and predictability to multilevel legal environments, such as the structure that the EU and the MS form together, required to regulate complex issues. On the other hand, Fisher offers an opposing view to that of de Sadeleer, arguing that not a single principle exists, but instead multiple separate meanings of it depending on which context they operate in.[91] As I will further discuss later in subchapter 3.3., it seems plausible, that the precautionary principle does not constitute a single, defined norm stemming from a certain legislation, that could be universally used to assess the legality of all EU and MS actions. And as Scotford has argued, there is a difference between the principle of proportionality and the precautionary principle, due to the former being a principle of general application and the latter of diverse definitions and context reliant scopes of application.[92]

Thus, both Fisher and Scotford have argued that the ambiguous and context-dependent nature of the principle enables it to address appropriately a multitude of situations, as opposed to more 'stable' principles, such as the principle of proportionality. However, as Zander points out, the multiple and varying purposes and ways of application of the principle may lead to

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[88] de Sadeleer 2020, p. 153.

[89] Fisher 2007, p. 42.

[90] de Sadeleer 2018, p. 371-372.

[91] Fisher 2007, p. 211.

[92] Scotford 2017, p. 184.

unforeseeable conditions and a confusing legal environment involving the application of the principle.[93]

3.2 Precaution in the EU Waste Regulation and how it affects the EU Objectives of Circular Economy

3.2.1 Regulative Demands of the Increase in Waste Material Utilization

Utilization of waste as raw material is not a newly introduced concept. There are a lot of examples of capitalizing waste and by-product in the early centuries of industrialization. Before industrialization, it was standard practice in many cultures to use all available material so that only as minimal amount of disposal would be generated as possible.[94] Even if circular production was a popular business model already centuries ago, it existed solely due to economic and resource related incentives.[95] The economic benefits of circular economy are still there today, even if we now face more complex, urgent issues that should be the driving force behind the shift to circularity.

As utilizing waste in production used to be standard practice centuries ago, it is only logical to conclude, that the need for EoW procedure has only surfaced due to the modern, extensive environmental regulation. EoW does not equal utilization of waste in commercial manner, as material classified as waste may be utilized as waste (recycling) if certain requirements are fulfilled. Instead, EoW comprises of a legal level metamorphosis of material from one conceptual status to another. EoW procedure can been used as a regulative means to enhance the efficiency of waste utilization and to create true circularity on legal and practical level. The point of discussion is not whether waste material should be reused and recycled, but what are the benefits EoW procedure specifically offers and how those benefits are being limited by the precautionary principle.

Precautionary principle is embedded in the fourth criterion of Article 6 of the WFD, which prescribes that waste completing the EoW procedure and consequent cessation of its status as

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[93] Zander 2010, p. 327.

[94] Desrochers 2002, p. 56.

[95] *ibid.*, p. 62.

waste must not have overall adverse environmental or health impacts. The preventative approach[96] of the criterion has been set to ensure the high level of protection of the environment and human health. However, if we take the perspective of maximum increase of circular consumption, it can be argued that the precautionary, or even preventative, dimension of the WFD complicates and moreover, disincentives waste material utilization. In practice, the risks associated with uncontrolled and unmonitored resource use obviously restrict the utilization of secondary materials.

Nevertheless, it must be pointed out, that even if waste completes the EoW procedure, it does not completely fall outside the scope of environmental control mechanisms. Potential hazards of virgin materials and products are regulated with other legislation, in the EU often by REACH regulation.

The REACH regulation applies to chemical substances both on their own and as components of articles and mixtures. REACH regulates market access of substances and the requirements of information of the risks of hazardous impacts that a substance may have to human health or the environment. The requirements apply to both virgin and secondary raw materials, as they are not explicitly differentiated in the regulation. REACH has a considerable impact in achieving the objectives of circular economy in the EU and the assimilation of virgin and secondary materials in the regulation seems to not support the substituting of virgin materials with those recycled. Due to the technical requirements of REACH, there are situations where processing virgin materials, instead of recycled ones, is administratively the easier and more cost efficient, sometimes even the only practically possible option. For example, if there are extensive requirements of information of the contents of a substance, secondary materials are in less advantageous position to compete against virgin materials, whose consistency can be identified without expensive and time-consuming testing of the material.[97]

The function of the REACH regulation is to increase the amount of information and its availability of substances, and to decrease the amount of certain substances of concern in the material economy and the replacement of them with safe substances. The goal of replacing substances of concern reflects the precautionary principle. However, there is no goal, at least an explicit one, of enhancing recycling or the circular economy in REACH. It seems apparent,

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[96] Turunen 2018, p. 103.

[97] Römph – Van Calster 2018, p. 267-272.

that REACH has been created to operate in linear material economy, not in a circular one, which then is reflected in its contents and ultimately may impede the utilization of recycled materials.[98] However, in the end, the elimination of high-risk substances from circulation will be favorable to promoting circular economy. In practical level, it would simplify the risk analysis process regarding EoW materials, as there can be a presumption that no high-risk substances should be present, even if the complete contents of a substance or material cannot be identified.

In addition, as Turunen has noted, REACH enables the possibility of even hazardous waste to undergo EoW procedure.[99] Including hazardous waste in the pool of potential materials that could be classified as non-waste, enhances the operating of circular economy. Due to the hazardous nature of the material, the recovery process is more complicated compared to that of non-hazardous waste and the role of it more critical in preventing adverse environmental or health impacts. However, hazardous waste may have characteristics that lead to easier material recovery. As WFD Article 18 prohibits the mixing of different types of hazardous wastes or mixing of hazardous and non-hazardous wastes, the quality of hazardous waste is often homogenous, unlike e.g., household generated waste. In addition, compared to non-hazardous waste streams, the composition of hazardous waste is usually well known. Even if hazardous wastes' properties contain more risks than those of non-hazardous waste, the potential adverse environmental and health impacts of hazardous waste can be regulated with other legislation.

REACH could be an important component of the legal framework supporting the general goal of shifting to circular economy.[100] REACH is especially relevant in the EoW procedure, where the main barrier of its utilization are the potential hazardous qualities of the materials undergoing the EoW procedure. The lists of substances profiled high-risk in REACH could be exploited more efficiently when establishing EoW criteria, to ensure coherent functioning of product and waste legislation and to increase the mobility of materials between the two

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[98] *ibid.*, p. 268-270.

[99] Turunen 2018, p. 118.

[100] However, interestingly, REACH has not been given much emphasis the CEAP, where the Commission seems to stress the importance of other regulation. REACH is mentioned there only regarding the goal of minimizing waste from electronics and ICT, where the aim is to review the EU rules on restrictions of hazardous substances in electrical and electronic equipment and provide guidance to improve coherence with relevant legislation, including REACH and Ecodesign. COM(2020) 98 final, p. 7.

regulative frameworks.[101] REACH can be seen as primarily a tool to manage environmental and health risks of chemicals. It contains extensive requirements of scientific testing of substances and proof of adequate risk mitigation of substances of very high concern, in order to authorize their use. The precautionary approach of REACH mirrors the complexity of the substances' behavior and interactions in the natural environment.[102] To conclude, REACH seems to have both potential to act as a driver, and as a barrier for utilization of secondary materials, whether it be as waste or non-waste.

3.2.2 The Precautionary Principle in the Recent CJEU Case Law

The kind of role the EU environmental law principles are given in each context, is determined by the specific legal framework that principle exists. Their often vague meanings in legal text are then clarified by the reasoning of the EU courts, mainly the CJEU.[103] During the past few decades a substantial amount of case law where the precautionary principle has been the subject of the Courts' rulings has emerged, due to its ambiguous nature, and its central position in policy areas involving scientific uncertainties.[104] Interestingly, in 2007 Fisher observed the relevant case law to be much less rich and unnuanced in argumentation than the other legal principles in the EU.[105] On quite the contrary, ten years later Scotford argued that the case law involving the examining and defining the precautionary principle is perhaps the most developed, yet also most complex, among the case law on the legal principles in the EU.[106]

In the 2000s the CJEU opted for a definition of the precautionary principle, which enables the functioning of the waste regulative framework with the widest possible scope but does not require it.[107] In other words, the CJEU has understood the principle to allow taking

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[101] Römph – Van Calster 2018, p. 271.

[102] *ibid.*, p. 275.

[103] Scotford 2017, p. 116.

[104] Fisher 2007, p. 218.

[105] *ibid.* p. 240.

[106] Scotford 2017, p. 171.

[107] Cheyne 2007, p. 475.

precautionary measures in a situations of uncertainty, instead of requiring its application.[108] The precautionary principle has been given the role of a final safety net in preventing adverse impacts to human health or the environment. The current approach enables the wide interpretation of the concept of waste, and thus extends the potential scope of application of waste regulation. The wide interpretation of the concept of waste translates to the stricter approach to materials undergoing EoW procedure.

There are a few examples of such strict application of the precautionary principle in questions regarding waste law from recent years.[109] In the *Verlezza* case[110], the key question was to which degree there must be knowledge about the harmful properties of the waste, while recognizing, that it is impossible to achieve absolute certainty that there are none. The Court examined the question in the light of the aim of the EU waste regulation, which it concluded to be that of balancing the precautionary principle and the technical and economic viability, protection of resources and the overall impacts on the environment, human health, society, and the economy. After acknowledging the aims of the waste legislation, the CJEU ruled that the WFD does not require that a certainty about waste does not containing hazardous substances ought to be provided, but that the waste holder should assess the content of substances that can reasonably be assessed.[111] However, the Court ruled that where a risk assessment 'as complete as possible' is conducted and when it is practically impossible for the waste holder to assess the presence of hazardous substances or the hazardous qualities of the waste, a protection measure must take place, where the waste may be classified as hazardous waste.[112]

Essentially, even if there are no scientific reasons to believe that the waste could be hazardous or contain hazardous substances, the ruling enables its classification as hazardous waste, if the holder of the waste is unable to prove the non-hazardous quality of or the absence of hazardous substances in that waste. *Prima facie* the ruling seems to allow quite a low threshold of the invocation of precautionary measures, to which the Court refers here as 'protective measures'. However, interestingly the CJEU concluded earlier in the *Verlezza* ruling, that waste should be

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[108] Sobotta 2021, p. 723.

[109] *ibid.,* p. 227.

[110] CJEU C-487/17 *Verlezza and Others*, EU:C:2019:270.

[111] *ibid.,* paragraph 59.

[112] *ibid.,* paragraph 60.

classified as hazardous only when 'objective evidence' exists, that the classification of the waste as hazardous 'is required'.[113] The statement remains confusing, as the Court refers to its earlier *Fidenato*[114] ruling, where instead of confirming the approach of *Verlezza*, the Court seems to clarify the exact opposite interpretation. The ruling of *Fidenato* can be understood so that protective measures are not required, possibly not even allowed, when facing mere uncertainty, without suspicion of adverse impacts.[115]

Another recent CJEU ruling regarding waste law is that of *Prato Nevoso Termo Energy*.[116] In that case the subject matter considered EoW, specifically whether the continuation of waste status of vegetable oil that was used as a fuel was lawful considering the WFD. The Court acknowledged that the MS, in absence of EU wide EoW criteria, have wide scope of judgement of whether a material is fit to undergo the EoW procedure, as they are required to perform extensive scientific and technical assessment of the risk potential of the material.[117] However, the right to discretion retained by the MS is restricted by the precautionary principle. Application of the precautionary principle prevents the MS of laying down EoW criteria for a substance, if after examining best available scientific information, there remains uncertainty as to whether the use, in specific circumstances, of that substance is devoid of any possible adverse impacts to the environment and human health.[118] Even if the first part of the Court statement would, in theory, allow wide discretion for the MS, in practice, the second part of the statement leaves the MS with very limited scope of discretion, due to the requirement of absence of 'any possible adverse impacts', which essentially is a requirement of certainty. Thus, the ruling requires the MS to apply the precautionary principle even when there is only a minor suspicion of potentially harmful effects or doubt of harmlessness.[119]

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[113] *ibid.,* paragraph 48.

[114] Case C-111/16 *Fidenato and Others*, EU:C:2017:676.

[115] Sobotta 2021, p. 729.

[116] CJEU C-212/18 *Prato Nevoso Termo Energy,* ECLI:EU:C:2019:898.

[117] *ibid.*, paragraph 36.

[118] *ibid.*, paragraph 58.

[119] Sobotta 2021, p. 730.

Considering the rulings of *Verlezza* and *Prato Nevoso Termo Energy*, it seems that the Court has recently taken an approach that allows for lower threshold for the invocation of the precautionary principle. In an earlier ruling of *Lapin luonnonsuojelupiiri* from 2013, the Court demonstrated a more liberal approach, rendering that hazardous waste can be treated as non-waste if the criteria for EoW of Article 6 is otherwise fulfilled, including the requirement of no overall adverse environmental or health benefits.[120] The ruling emphasized the case-specific circumstances that must be taken into account, when assessing the risk of the mentioned impacts.

The Court's 2021 ruling of *Bayer CropScience* seems to continue its latest approach of allowing low threshold for the invocation of the precautionary principle.[121] In the ruling, the Court established once again, that no conclusive scientific evidence of harmful effects on health or the environment needs to be presented to take preventative action on regulative level. The context of the ruling was that there were chemicals used in plant protection and there were some scientific studies conducted that showed that the chemicals in question could have hazardous effects in honeybee population. The Plant Protection Regulation[122] requires the assessment of approval criteria for pesticides in accordance with the current state of scientific and technical knowledge. Argumentation of the case ultimately regarded how strong an evidence can be used as proof for restriction of pesticide use, and the Court confirmed that it was sufficient for the invocation of the precautionary approach that 'unacceptable risks resulting from acute and chronic effects - - could not be ruled out'.[123]

What is interesting in the *Bayer CropScience* ruling is that the Court referred to the new information as relevant 'in so far as it is scientific or technical'. Previously, the Court has used phrasings such as the 'best scientific information available' or the 'most reliable scientific data available'. The choice of wording of the Court could be interpreted to have widened the scope of relevant new information that could result in reassessment of risks of adverse impacts to

120 CJEU C-358/11 Lapinluonnonsuojelupiiri ECLI:EU:C:2013:142.

121 CJEU C-499/18 P Bayer CropScience AG and Others v European Commission, ECLI:EU:C:2021:367.

122 Regulation 1107/2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC

123 ibid., paragraph 167.

human health or the environment, as required by the precautionary principle.[124] By widening the scope of possible proof for the demand for precautionary measures, the Court actually seems to clarify the concept of scientific uncertainty, as basis for such uncertainty must not anymore, according to the ruling, be based on scientific information that is evaluated 'best' or 'most reliable'. It could be interpreted that the ruling eases the burden of one step of subjective, judicial evaluation of the quality of the information compared to other scientific/technical information, as any new scientific or technical knowledge could be sufficient without such evaluation.

At the same time, however, the decision could be seen as widening the scope of application of the precautionary principle, as the requirements for the type and quality of scientific information activating its invocation are less rigorous. This can be seen as a negative development, conflicting with the principle of proportionality, as even slight doubt could be interpreted as uncertainty and thus lead to restrictions with extensive impacts. On the other hand, as Jennings points out, margin science and the studies of emerging risks, which would fall into the scope of 'any new scientific or technical knowledge', but most like not that of 'best scientific information available', may act as an 'early warning system' for risks for human health and the environment.[125] Even if the ruling regarded specifically the Plant Protection Regulation, the decision of the Court demonstrates a strict approach to the precautionary principle, which could translate to application of the principle in rulings considering other fields of environmental law.

Nevertheless, in addition to the legislation applied, the circumstances of the *Bayer CropScience* case were very different to those regarding waste legislation and especially the EoW procedure. In the *Bayer CropScience* case, potential losses due to the precautionary approach would be suffered by the profits of the agriculture industry. However, there would be a risk of serious, far-reaching, and possibly irreversible environmental harm, should a significant decline in honeybee population, or in worst case scenario, their extinction, follow the continuation of the use of these plant protectants. What is more, as highlighted by Scotford, in the EU the precautionary principle has multiple niche definitions, depending on the specific regulative context.[126] Thus, the ruling cannot be directly translated to the context of precaution and EoW,

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[124] Jennings 2022, p. 195.

[125] Jennings 2022, p. 196.

[126] Scotford 2017, p. 157.

but it seems to be a continuation of the stricter approach that of the cases *Verlezza* and *Prato Nevoso Termo Energy*, which did consider waste legislation.

However, as many have agreed, too broad of an application of waste regulation only imposes unnecessary regulatory and administrative stress to potentially reusable material and disincentives closing the material loop.[127] As Cheyne argues, finding the appropriate scope of application for the precautionary principle in practice is necessary for its justified use as underlying principle of EU environmental legislation and policies. The principle must not gain disproportionate influence in waste legislation.[128] Invocation of the principle must be based on calculated risk, not irrational or exaggerated risk adversity[129], because otherwise it may be self-defeating and detrimental to the circular economy objectives of the EU. The CEJU's recent application of the principle seems to demonstrate an approach where even slight possibility, or the inability to rule it out, for adverse impacts on human health or the environment are prioritized against industrial profit. When the circumstances regard waste regulation and the promotion of circular economy, the Court's approach seems to favor precaution over innovation as well but is more ambiguous in its opinion. Overall, the scope of discretion for EoW criteria is currently considerably limited due to the approach of the Court, namely the ruling of *Prato Nevoso Termo Energy*, requiring the absence of any scientific uncertainty, which, in practice, will most of the time be present.[130] At the same time, the restrictive interpretation of the principle undoubtedly strengthens the level of environmental protection in the EU.[131]

3.3 Alternative Perspectives to the Application the Precautionary Principle

As mentioned before, the CJEU is the legal body whose interpretation of the role and scope of the principle is the most relevant point of refence, when applying the principle in the EU. As the CJEU has opted for an inclusive interpretation of the principle, the scope of the principle

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[127] E.g Cheyne 2007 p. 482, Scotford 2017, p. 149, Korhonen – Honkasalo – Seppälä 2018, p. 45.

[128] Cheyne 2007, p. 483.

[129] E.g in case of establishing GMO legislation in the EU, the precautionary principle was used as a theoretical footing for non-scientific fears and as a means to promote political agendas. See more: Cheyne 2007.

[130] Sobotta 2021, p. 732.

[131] Jennings 2022, p. 199, Sobotta 2021, p. 735.

can be far-reaching in the EU, which is nothing but justifiable, when there are serious environmental and health hazards weighed against the economic profit of the few. However, as I have sought to emphasize before, in the context of EoW (and BP) the realities are different, as both lax and strict approaches to precaution aim to support the well-being of the environment. In addition, the application of the principle is tightly attached to the current legal framework, but also the current scope and level scientific studies and administrative and political realities.

Another point of view to the role of the principle is to recognize its impact in challenging the institutionally embedded commercial interests or the non-transparent decisions influenced by them.[132] Incorporating the principle into EU legislation was a clear distinction from the commercially oriented legislative goals the Union had at the time, in favor for environmental stability. Nevertheless, as concluded above, the principle is essential safeguard for ensuring environmental and human health protection, but can have the opposite effect, if applied in unreasonably broad and strict manner.

Examples of 'false positive' invocations of the principle are scarce.[133] Intuitively it seems logical, that keeping track of 'lost potential benefits' is difficult, if not practically impossible. In addition, even if examples of 'false positives' could be demonstrated, they most likely would not offer relevant material in the context of EoW. The circumstances of EoW procedure are unique, as the concept is relatively new and a different logic applies to it, compared to the multitude of cases where a clear opposition between industrial gain and environmental protection can be found. First and foremost, the dilemma of precaution and EoW lies in the 'risk trade-off' of harmful environmental impacts of both overregulation and not regulating enough, of precautionary and permissive approaches.

It seems that a value judgement must be made, as no objective correct answer can be found, as long as uncertainties exist. And those uncertainties, as established before, regrettably seem to be that of permanent nature, when acknowledging the limits of scientific research performed by humans, as we know it today.

However, the future might hold answers to risk-related decision making more factually informed and thus, more objectively certain – as new complexities emerge, so do new

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[132] Cheyne 2007, p. 471.

[133] EAA 2001, p. 12.

technologies. If in the past risk scenarios with ever growing complexities have been impossible to conclusively assess, emerging technologies, such as sophisticated modelling and systems utilizing artificial intelligence, bring us closer to unveiling the complex and intertwined causal relations of substances and adverse environmental impacts, not only in theory but also in the natural environment. However, establishing these models, as the process is supposedly executed by humans, will also require value judgements, which will influence the results, and the error margins of them. Thus, the objectivity of even the most sophisticated and intellectual modelling systems is often questioned.[134] What is more, when these models are utilized in legislation and court decisions, there is a risk that normative decisions appear based in scientific certainties, even if fundamentally they are induced from subjective value judgements.[135]

Additionally, alternative (or additive) risk management option can be found in diversification of technologies.[136] In the context of material circularity, this could mean diverse use of different substances and recovery operations. Another way of mitigating risks associated in the EoW practice could be extended producer responsibility (EPR). As the problem of EoW is often that the material may contain unknown risks, one way to alleviate that problem could be the wide application of EPR framework. In EPR schemes the content of the waste material is better controlled, as the entities producing that material are responsible for its end-of-life management. In practice, the global nature of our economy prevents us from knowing the contents of the waste material completely, as some products always flow in from outside of the scope of the EPR scheme. Nonetheless, the contents of the bulk of waste material could be better identified if information would be available directly from the producer. In addition, in EPR schemes producers are incentivized to use materials and chemicals, which are less harmful and therefore easier to recycle at the end of their lifecycle[137], which would increase opportunities for EoW and bring us closer to closing the loop in both practical and conceptual level.

However, I will not speculate further about the options to manage the risks in practice, as they are not the focus of my study. My focus is the impact of the precautionary principle in the

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[134] E.g. Fisher 2007, p. 7, Douglas 2009, p. 142, Steel 2015, p. 7, and Winsberg 2018 p. 138.

[135] Paloniitty – Kotamäki 2021, p. 285.

[136] EAA 2001, p. 187.

[137] Gertsakis – Morelli – Ryan 2002, p. 521.

process, and in the next chapter, I will summarize what I have discussed about its impact in the EU waste law.

3.4 Conclusions – Impact of the Precautionary Principle in the EU Waste Regulation

As I have discussed above, multiple meanings of legal principles exist simultaneously inside the EU law, in different legal acts or frameworks. The precautionary principle is not explicitly mentioned in the WFD, and thus, a meaning relevant in the context of waste cannot be derived from the Directive directly. Thus, a central interpretative aid has been provided by the case law regarding the role of the precautionary principle in waste law. The scope of the case law is extensive and complex, and from that material a specific role of the principle in context of EoW can be derived.[138]

However, despite the contextual nature that the principle has been given in the EU, the core meaning of it is universal. The purpose of the precautionary principle is to not act before it is too late, due to the harmful environmental consequences being to far-reaching and irreversible.[139] In the context of EoW, that means to prevent wastes with harmful properties of getting rid of waste status and entering back into circulation as products.

It is important to acknowledge, that the precautionary principle does not present an individual 'test', with which EoW, or any environmental decisions in the EU must comply with. Rather, it determines the area of competence within which the EU institutions may act.[140] Therefore, it needs to clarified, that when referring to not abiding by the principle, the actual 'infringement' is the failure to abide by the requirements of administrative decision-making the interpretation of the principle has set to EU institutions.[141] In other words, as the CJEU assess whether decisions have been made 'in accordance' with the precautionary principle, what is in fact assessed is the adequacy of administrative process, instead of whether a substantive norm is

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[138] Scotford 2017, p. 160.

[139] Jans – Vedder 2008, p. 37.

[140] Scotford, p. 172.

[141] *ibid.*, p. 182.

breached. What is more, as Zander suggests, the role given to the principle in the EU seems to act as an enabler of precautionary measures, but however, does not require them in situations of scientific uncertainty.[142]

In the next chapter I will further discuss factors of risk and uncertainties, the scope and role of risk analysis, and the limits to answers scientific research can provide us with. By focusing on these underlaying 'demand factors' of the precautionary principle, I believe its function and impact in the context of EoW can then be further understood.

[142] Zander 2010, p. 333.

4 Risks of End-of-Waste in Circular Economy

4.1 Calculating risk – Practical Basis for the Invocation of the Precautionary Principle

4.1.1 Risk analysis

In the 1970s a growing number of chemical substances were produced and used, while simultaneously knowledge about their potential harmful impacts to health and the environment increased. As a result of these developments, a regulatory shift took place. If previously public policies and legislation had held the ideal of absolute safety under scientific certainty, the focus now shifted from aims for absolution to acceptance of uncertainties. The new approach could be described as risk-based.[143] It was recognized that aiming for absolute safety was no longer an option even in theory. On the contrary, risk-based approach was practically achievable, and it offered theoretical and ethical basis for better functioning public policies. In addition to being practically unreachable, the goal of absolute safety would be paralysis inducing, as it would have prevented the utilization of most technological and chemical innovations at the time. Thus, instead of aiming for absolute safety, it was accepted that there are risks of harmful effects for the environment and human health and the goal of public policies should be to minimize those risks.

A key part of risk-based approach is the inclusion of risk analysis procedure. Risk analysis framework is applied to, besides EoW, to all risk potential practices concerning human health and the environment. Risk analysis in the EU is considered to consist of three stages: risk assessment, risk management and risk communication.[144] Risk assessment entails the scientific analysis of acceptable level of risk, for example, considering hazardous substances in recovered waste material, the acceptable level of concentration of certain substance in that material. Risk assessment can be divided into two phases, as first the level of unacceptable risk needs to be identified, and afterwards the scientific evaluation of the risks at hand is performed.[145] It needs to be pointed out, that the threshold for unacceptability is subjective and dependent on the

143 Douglas 2009, p. 139.

144 COM(2000)1 Final, p. 2.

145 Scotford 2017, p. 173. See also CFI T-13/99 Pfizer ECLI:EU:T:2002:209, paragraph 162.

cultural context.[146] Legal thresholds for 'safe' levels of e.g. concentration of hazardous substance in a material or emissions of such substance to the environment may not be corresponding to the real life environmental thresholds of safety.[147]

Despite the Commission placing heavy emphasis on risk assessment phase and its attempts to define it in the 2000 Communication on the precautionary principle, the Communication remained vague on how the assessment should be conducted when facing scientific uncertainties.[148] In addition to that, risk assessment essentially relies on the theoretical assumption that the degree of the risk is in fact mathematically calculable. In practice, the most accurate possible estimate is the goal of the process. Risk assessment also has direct impacts on the circular economy objective, as a coherent and generally applicable risk-assessment process is necessary for the well-functioning single EU material market.[149]

The second step, risk management, is completed on the grounds of the first step. Risk management comprises of a political decision guided by the results of calculations of risk assessment. If a negative consequence is identified in the risk assessment process, it is then when the precautionary principle should be taken into consideration, when deciding what action should be taken.[150] Risk management translates to deciding, what is an acceptable level of risk to the society.[151] The third step, risk communication, is a purely political one, where the goal is to communicate the decision concerning the risk to the public, 'so that the tension between public perceptions and expert judgement could be reduced'.[152]

From the point of view of my research questions, the most interesting steps are the first and the second ones. Risk assessment is a complex procedure that eventually has a great impact in determining the outcome of the risk analysis. In the first phase, the prerequisites for making the political decision are established. However, translating scientific knowledge into environmental

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[146] Fisher 2007, p. 8-9.

[147] Polansky – Carpenter – Folke – Keeler 2011, p 401.

[148] Fisher 2007, p. 226.

[149] van Dijk – Gustavsson – Dekker – van Wezel, p. 7.

[150] COM(2000)1 final, p. 14.

[151] Jans – Vedder 2008, p. 38.

[152] de Sadeleer 2020, p. 195.

policy is not an automatically straightforward procedure, as it is inevitable that value judgements must be made in the process. Accordingly, in the Communication the principle is identified as 'particularly relevant' to risk management.[153] Thus, even if it would seem that most heavily and visibly values impact decisions in risk management, where political and societal goals are weighted against the results of risk assessment, some have argued, that value judgements must also be made in the seemingly objective scientific process of risk assessment.[154] Therefore, it could be argued that the precautionary principle in deed is, or should be, equally emphasized in the risk assessment phase as well.[155]

In similar fashion, Fisher criticizes the conceptual separating of risk analysis as consisting of three distinct procedural phases, calling it 'problematic and simplistic'. In her in-depth analysis of the principle and its relation to public administration she argues that the separation between scientific, expert-lead and value-based, democratic approaches to risk decision-making might overly simplify the discussion relating to opinions about risk, or even miss the point of it. She continues to argue that it is not a choice between science and democracy how risks should be evaluated, but instead the context of risk evaluation is public administration.[156] Of course, the role of public administration is established and limited by law, and law is the primary channel to challenge the decisions of public administration and thus the inner logic of law will affect the legal contemplation of the role public administration, and according to that logic, that of the precautionary principle as well.[157] If we take Fisher's argument even further, the essence of the principle is defined in the process of defining the role of public administration – how the understanding of administrative constitutionalism influences the scope of application of the precautionary principle. Essentially, the "type" of administration, manifesting in certain institutional context, e.g. risk analysis, would define how the principle is then applied.

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[153] COM(2000)1 final, p. 2.

[154] Douglas calls this the "endemic need for judgement", ever present in risk assessment, and in scientific research itself. Rejecting or accepting a hypothesis may need judgement, but the need for judgement is embedded deeper, into the practical process itself, of choosing and evaluating evidence, testing methods, etc. Douglas 2009, p. 147, also Winsberg 2018 p. 138.

[155] Hansen – Carlsen – Tickner 2007, p. 398, de Sadeleer 2020, p. 196.

[156] Fisher 2007., p. 18.

[157] *ibid.*, p. 22.

According to the Communication, it requires decision-makers to obtain a scientific evaluation as complete as possible through a structured approach in order to take precautionary measures[158], or in other words, precautionary measures could be taken when supported by 'maximum scientific objectivity'. However, at the same time, the Commission acknowledges that it is sufficient to have 'reasonable grounds for concern' that the potentially harmful impacts may be 'inconsistent with the high level of protection chosen for'[159] the EU, to take action on the basis of the precautionary principle. The wording seems contradictory, as it appears to dismiss the importance of scientific evaluation, and emphasize its deficiencies, despite the requirement for the evaluation to be conducted as 'complete as possible'. In her analysis, Scotford interprets this to translate to the EU institutions possessing individual discretion in their environmental risk taking.[160] As van Dijk *et al.* observe, the requirements for risk assessment and environmental safety greatly vary between different EU regulative contexts, even while universally guided by the precautionary principle.[161]

It must be acknowledged, that in most situations involving scientific uncertainty, even if more scientific research is conducted, our understanding of risk remains limited.[162] Therefore no complete and absolute knowledge of a product's or substance's harmful effects on health or the environment can be produced in the risk assessment. This gap between certainty and mere estimates is where the precautionary principle guides the process of risk analysis. According to the logic of the precautionary approach, preventative action can be taken even if there are uncertainties about the possible hazardous consequences in a certain scenario.

Whether these preventative measures should be taken, is a political decision to be made in the risk management process. The CJEU has previously stated in its rulings that 'where it proves to be impossible to determine with certainty the existence or extent of the alleged risk because of the insufficiency, inconclusiveness or imprecision of the results of studies conducted, but the likelihood of real harm to public health persists should the risk materialize, the precautionary

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[158] COM(2000)1 Final, p. 15.

[159] *ibid.*, p. 1.

[160] Scotford 2017, p, 90.

[161] van Dijk – Gustavsson – Dekker – van Wezel, p. 1-2.

[162] Fisher 2007, p. 7.

principle justifies the adoption of restrictive measures'.[163] However, as de Sadeleer points out, it remains unclear what the court meant when referring to 'insufficiency, inconclusiveness or imprecision'[164] which implies the broad spectrum of situations where the precautionary principle may be applied. I will discuss the dilemma of sufficient certainty further in the next subsection.

4.1.2 Legal Threshold for the Invocation of the Precautionary Principle

As concluded earlier in subchapter 3.2.2., it has been established in the EU case law that a mere hypothetical assumption of adverse impacts cannot trigger the appliance of the precautionary principle.[165] This restricts the excessive use of the principle and serves as a minimum standard when applying it. Obviously, the precautionary principle must be applied rationally and as science based as possible, as it theoretically could be applied to most scenarios when we recognize the level of uncertainty associated with all scientific observations. This idea is sculpted into the principle of proportionality, to which the principle of precautionary must be submitted to.

The principle of proportionality is settled in the EU case law to be one of the over-arching, guiding principles of environmental law in the EU. It requires that the actions of public bodies in the EU must not exceed what is appropriate and necessary for achieving a legitimate objective of the rules regulating certain situations. Where there is a choice to be made between multiple appropriate means of action, the least restrictive one should be chosen, and the potential negative consequences must be in proportion to the objectives pursued.[166] Similarly, it is explicitly mentioned in the 2001 Communication that measures taken on basis of the precautionary principle must be 'proportional, non-discriminatory, consistent' and follow a cost-benefit-analysis of action and inaction and an 'examination of scientific developments'.[167]

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[163] CJEU C- 192/ 01 *Commission v Denmark* paragraph 52, CJEU C- 343/ 09 *Afton* paragraph 61.

[164] de Sadeleer 2020, p. 199.

[165] CFI T-13-/99 *Pfizer* paragraph 143 and CJEU T-521/14 *Sweden v Commission*, paragraph 161.

[166] CJEU C-343/09 *Afton Chemical,* paragraph 45.

[167] COM(2000)1 Final, p. 17.

However, the Communication leaves us with no clear instructions, how these requirements should be taken into account in the risk analysis process.[168]

The threshold for the invocation of the precautionary principle is commonly considered exceeded, when there is a scientific uncertainty of possible consequences that could be serious.[169] The problem lies within the ambiguity of the concept of 'scientific uncertainty', to which there is no common, undisputable definition. It is an obvious impossibility that precaution should be applied to every instance where there is a possibility of harm. The threshold must be placed where there is at least some scientific evidence of a potential risk.[170] We must operate within a range that the current scientific knowledge understands as otherwise we are left paralyzed. This forces us to make assumptions, that eventually may be harmful to the environment or human health. And as I have earlier concluded, there is always a level uncertainty present when dealing with real-life risks, non-removable by scientific research.

When operating with that assumption, we then must determine the acceptable level of uncertainty within our operating range. Aven distinguishes two possible scenarios where there are scientific uncertainties relevant to the application of the precautionary principle:

> 1. It is difficult to specify a set of possible consequences (state space), or
>
> 2. There is a lack of understanding of how the consequences (outcomes) are influenced by underlying factors. It is difficult to establish an accurate prediction model (a cause-effect relationship).[171]

Using this interpretation, when considering the application of the precautionary principle in relation to EoW and BP practices, we can conclude that both 1. and 2. scenarios are present. There might be surprises regarding the consequences of the use of a certain material as its exact consistency and ways of utilization are often unknown. In addition, it is difficult to analyze with certainty how the substances that the material consists of or how its use will affect the environment. It is difficult to establish a reliable prediction model of possible outcomes, when

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[168] Fisher 2007, p. 228.

[169] Aven 2011, p. 1515.

[170] de Sadeleer 2020, p. 202.

[171] Aven 2011, p. 1520.

there may not be a complete understanding of what the material is, how it is used or how it may affect the environment.

From this point of view, it seems justified and reasonable to apply the precautionary principle when making decisions regarding the use of EoW and BP materials. That is, in situations involving scientific uncertainties it *can* be applied, however, it must not be applied in all situations involving such uncertainties. The CJEU has concluded that the threshold for the invocation of the principle should not be interpreted too broadly as discussed above, but it remains indefinite when it assesses the actual threshold of the application. However, the EU Courts have ruled that when determining the severity of the potential risk, its reversibility, accumulation, and possible delayed effects must be taken into account, as well as possible cumulation of the hazard from outside sources.[172] The risk of irreversibility is constantly present, when the subject is as critical and vulnerable as the environment or human health. Similarly, one of the characteristic risks associated with harmful substances in waste material that enters in circulation is their accumulative nature and the gap in time between the exposure and the occurrence of the harmful impacts on health and the environment.

Thus, it has been acknowledged that when assessing the risk, the underlying, complex interdependencies and causal connections associated with the hazard should be taken carefully into account.[173] These factors are relevant in the context of EoW as well and must be taken into consideration, when setting and interpreting EoW criteria. This approach emphasizes the importance of scientific study and the co-operation of scientist and regulators, with the goal that regulative and judicial decisions are as science-based as possible.

Nevertheless, a clearer definition of 'scientific uncertainties' is needed specifically in the context of EU legislation. Additionally, it seems that the relationship of the precautionary principle and the principle of proportionality remains unfixed. In general, the substance of environmental principles of the EU and their interrelations is ever evolving, and even new principles may emerge.[174] When weighing the principles of precaution and proportionality, the 'enabling', or less strict, interpretation of the precautionary principle in can be seen as an

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[172] T-13/99 Pfizer, paragraph 153 and C-192/01 Commission v Denmark, paragraph 50. These cases involved risks associated with hazardous substances.

[173] Fisher 2007, p. 8.

[174] Scotford 2017, p. 95.

emphasis on proportionality, and the strict interpretation could be in contradiction with the principle of proportionality.[175]

However, it seems that a balancing principle is missing in the specific context of EoW. The principle of proportionality does limit the uncontrollable expansion of the influence of the precautionary principle, but mostly concerns economic efforts, not environmental ones. Since new principles are developed in the EU context, hypothetically, if a 'principle of circularity' would develop, it would act as a balancing factor in risk analysis and decision-making processes, when those concern risk trade-off situations, where taking action or omitting from it both may contain environmental risks.

4.1.3 Consequences of Material Completing the EoW Procedure

As concluded above, risk analysis is a necessary tool when scientifically assessing the potential harmful effects of certain action. In the context of Eow and BP regulation, we must assess the potential harmful effects of the use of certain materials to the environment or human health. As the material is exempted of the waste status, the requirements and restrictions of waste regulation are not applied to it anymore. When material loses its waste status, it simultaneously loses its trackability, and may be placed on the market and purchased as any other virgin material.

When setting the criteria for the exemption of waste status of certain material or when making a case-by-case decision, it is important that a sufficient analysis of risks is made. If material is classified as non-waste and is systematically used as raw material for a long period of time, and the material is only later on found out to have harmful properties, it may be impossible to reverse the harm that has been already caused. The high risk-potential must weight heavy on the scale when accepting new EoW and BP materials. Hence one of the main objectives of EoW and BP provisions is to determine whether the material should stay within the waste regulation framework, or would it be safe to let it be regulated by other legislation.[176] In the EU waste legislation, the high level of environmental and health protection is ensured with the fourth

[175] Sobotta 2021, p. 732.

[176] Turunen 2018, p. 73.

criterion of the Article 6 of the WFD in a situation where the possible harmful properties of waste material are unknown. Exemption from the waste status is naturally not an exemption from all regulation concerning safe se of a material. For example, most ex-waste falls into the regulatory scope of REACH regulation as discussed in chapter 2. However, these alternative safety frameworks have their deficiencies as well. For example, when considering solid whole products, comprehensive testing is rarely conducted, and no coherent and readily available information might exist regarding the chemical contents of those products.[177] Nevertheless, it can be concluded that overall, when regulated by waste legislation, material is subjected to more administrative obligations ensuring safety and control of the use of the material.

However, while the purpose of waste regulatory framework has been ensuring the high protection of the environment and human health from harmful substances and materials, in the process it does impose restrictions on the use of all waste materials. Most regulatory restrictions are subjected to completely harmless materials because the harmful material cannot be separated from the mass of harmless waste material.[178] While fulfilling the objective of preventing adverse impacts on the environment and human health, the objective of establishing circular material flow is consequently harder for us to achieve.

Another crucial aspect in evaluating the material's suitability for EoW procedure is long-term vision. If we are picturing a future for our society and for the way of life an average citizen currently in developed countries has, as stated before, we need radical changes to the functioning of our material economy. From a static point of view, the results of a risk analysis may seem completely different, compared to analysis conducted for long-term point of view. If we accept the gruesome fact that in case material circularity is not radically increased, the environmental impacts we will face will be undisputedly detrimental for humanity, if not catastrophic or even fatal. However, there are factors regarding (perceived) safety, economic feasibility and practicality of utilization of secondary materials, as well as administrative and regulative barriers, which currently make increasing material circularity difficult. In the next chapter, I will proceed to take a closer look into those restricting factors and ways to mitigate them.

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[177] Bolinius – Sobek – Löf – Undeman 2018, p. 1428.

[178] Turunen 2018, p. 74.

4.2 Barriers for the Utilization of EoW

As I have discussed before, one of the major issues concerning the safety of EoW materials is that environmental impacts of (virgin) materials and chemicals currently in use might not be exhaustively known yet.[179] But not only does the risk lay in the potential harmful impacts of substances found in materials that have completed EoW procedure - there is also another, administrative 'layer' to that risk, which increases the irreversibility of potential harmful impacts. EoW procedure accommodates the material of slipping back into the economy again with no practical means of retracting it. Waste material is documented and tracked more meticulously than non-waste materials. Additionally, as the material's lifetime, or the number of cycles it makes, increases, so does the risk of environmental hazards in long term. Pushing for circularity of waste materials, and especially for getting rid of waste status, might equal pushing for high-risk, unsecure, and unpredictable material economy.

Utilizing EoW materials to their full potential requires the acceptance of consumers of products containing waste-based materials, which has been a challenge in the past.[180] One point of view is that the precautionary approach of the WFD contributes to increased acceptance of utilization of waste-based materials by consumers. It might be better to adhere to stricter, even unnecessarily stringent rules, if it increases the business opportunities to utilize waste-based material due to the increased perceived safety by the consumers and thus allowing more material to flow back into circulation.

There are risks caused by the regulative and administrative structures as well. In 2018 the Commission recognized four issues in the transition process from waste to product and vice versa.[181] Firstly, the communication of information of substances in the material to those who are responsible for its recovery is often lacking, which results in break in information flow from product phase (under REACH regulation) to end-of-life phase.[182] Secondly, some waste-based material may contain substances, that are not allowed in similar new materials anymore. This

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[179] Korhonen – Honkasalo – Seppälä 2018, p. 43.

[180] Directorate-General for Environment, European Commission 2020, p. 35.

[181] COM(2018) 32 final.

[182] *ibid.*, p. 2-3.

is called the issue of 'legacy substances'.[183] Thirdly, the unharmonized state of EoW regulation in the EU results in unlevel playing field and complicates the classifying process of material, as no certainty of when waste ceases to be waste exist on EU level.[184] Fourthly, the regulation on hazardous substances in not consistent between waste regulation and product regulation (mainly, REACH). Material may be considered containing hazardous chemicals under product regulation, but after it is discarded and it falls under the scope of waste regulation, the information of its chemical composition is often lost, and it may be considered non-hazardous waste.[185]

In the 2017 Roadmap leading to the Communication, the Commission listed issues slightly different from the final Communication. Back then the Commission listed four key issues with regulating waste and chemicals in coherent, effective manner. The key issues recognized then were 1) the insufficient information about existence of hazardous substance in products and waste, 2) no existing evaluating framework to determine the economic and environmental consequences of use of recycled materials that contain such substances, 3) legal uncertainties about when material can cease to be waste and last lastly, 4) the administrative incoherence regarding waste methodologies, e.g., the application and issuing of waste permits.[186]

Of the issues listed above, the most interesting one from the point of view of my topic is the insufficient framework for determining the impact of recycling materials, which may have substances with hazardous properties. Especially, as the Commission observes, there is no functional methodology to assess the overall impacts, neither positive or negative, of utilizing waste containing potentially hazardous properties compared to disposing of it or submitting it to energy recovery. However, the issue was not discussed or further elaborated in the final Communication.

The key barriers the Commission has identified in its 2018 Communication are practical level issues with theoretically straightforward regulative solutions. To solve these issues, the legislator needs to assess the prioritization of material efficiency and safety control, which is

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[183] *ibid.*, p. 4.

[184] *ibid.*, p. 5.

[185] *ibid.*, p. 6.

[186] European Commission 2017, p. 1–2.

completed by determining the acceptable level of uncertainties in the substance composition or behavior of substances in said material.

Considering the ambitious recycling targets set in the WFD for the MS, the motives for them to classify waste material as non-waste could become corrupt. EoW and BP procedures should not be treated as loopholes to assist in meeting the recycling targets by classifying material on false grounds as non-waste. This should be prevented with the criteria regulating the future use of material and the criteria prohibiting the adverse environmental or health impacts. The newly set recycling targets are one reason to uphold stringent invocation of precautionary principle, as some actors might try to pass material unapplicable to the process as non-waste due to the WFD requirements.

All these barriers I mentioned here have a connection to the precautionary principle, and as I have observed, the precautionary principle seems to offer at least a partial solution or mitigation to the barriers mentioned here. Precautionary principle does have positive effects in addition to the direct effect of preventing uncontrollable use of materials and substances less studied or new to science overall.

4.3 Limits to Risk Analysis

It was only in 1974 when a hypothesis of ozone layer depletion caused by CFCs was first introduced. Prior to that, it had not been seriously considered, that such hole in the ozone layer could be likely, or even possible. It turned out that chemicals that were studied under typical atmospheric conditions and found harmless, had for years inflicted serious harm in the Earth's stratosphere. The risk analysis performed for CFCs had not been able to forecast such a possibility, as it was only then revealed that CFCs had previously unknown characteristics when exposed to an environment other than that of the Earth's surface.[187]

The example from the 1970s demonstrates how limited the scope of risk analysis may in certain situations be. Even if risk analysis, including risk assessment, is conducted in legislative process to lay scientific foundation to regulation, as de Sadeleer points out, the data of such analyses is

[187] EAA 2001, p. 170.

often lacking and the results can be ambiguous.[188] Essentially, due to methodological restrictions, regulative decisions based on risk analysis are founded upon approximates and educated guesses, instead of certainties. In these situations of uncertainty, the precautionary principle has naturally increased its importance in the decision-making process relating to environmental regulation.[189]

Furthermore, risk assessment may effectively calculate the probability of risks we are aware of prior to the assessment, but it does not enlighten us on the risks or their probability, that lay outside of our current scientific knowledge. As Fisher points out, in situations of high scientific uncertainty, the views on the nature and seriousness of a risk are not commonly agreed, which leads to the processes of assessing the existence and the acceptability of the risk to 'collapse into each other'.[190] Traditional risk management theories do not offer answers, as there is no scientific method of assigning probabilities to events whose mere existence is uncertain.[191] Due to the incremental technological and industrial advancements of today, the increasing complexities, feedback loops and interdependencies between material economy and the environment produce uncertainties bring risk assessment to its limit. When there is not only uncertainty regarding the likelihood of certain outcomes, but also uncertainty of the outcomes themselves, the situation could be better described as that of ignorance, instead of uncertainty.[192] That underlying state of ignorance may often be concealed by expert opinions and tentative assumptions[193], but is still a defining aspect of environmental regulation, and should not be left unnoted.

If it is acknowledged that mere risk does not conclusively characterize the circumstances as there is uncertainties and ignorance as well, one can ask, what value does risk analysis then have. Risk analysis is, in its core, unable to map scenarios that are not known, only the probabilities of known scenarios. And as history reminds us, environmental harm has often

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[188] de Sadeleer 2020, p. 190.

[189] *ibid.*, p. 191.

[190] Fisher 2007, p. 10.

[191] Polansky – Carpenter – Folke – Keeler 2011, p. 389.

[192] EAA 2001, p. 170.

[193] Van der Sluijs 2005 p. 87

happened specifically due to unknown outcomes, not incorrectly assessed risks. Inevitably, this reasoning leads to questioning legitimacy and adequacy of the institutions performing risk analysis.[194]

As I stated before, the risks of today are more serious and more difficult to assess than the ones policy makers had to deal with before. Additionally, our understanding of not only environmental intricacies and feedback loops but also theoretical studies of complexity and chaos are advancing.[195] We are faced with the inevitable limits to our concept of 'scientific certainty'. There will always be some level of ignorance and uncertainty in our level of knowledge.[196] Undesirable surprises will happen in the future too, as circumstances will arise where we have been unable to predict possible outcomes accurately. The physical world contains such complex, interrelated, intercausal and cumulative factors[197], which our scope of knowledge does not currently provide accurate ways of predicting in absolute certainty.

Whether natural sciences even have the theoretical potential to accurately predict the realities of physical world, and if they do, to which degree, is an old and ongoing discussion which I will not elaborate on here. Nevertheless, as put by Douglas, there is an 'endemic uncertainty' in science.[198] The small but inescapable chance of uncertainty, or falsity, should not be considered a flaw, but a quality of science. In fact, an essential quality of scientific knowledge is that it is dynamic. Self-correction is in its nature, and decisions should be made according to the best and latest knowledge available to us. After all, scientific knowledge is the most reliable knowledge we have.[199]

Nonetheless, uncertainty is something both scientific and legal spheres have to operate with, and both have means of reducing it. In scientific context, uncertainty can be reduced by conducting studies in iterative fashion, by repeating results and correcting them in time. On legislative level, there can be different mechanisms for the process of reducing of uncertainty,

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[194] Fisher 2007, p. 11.

[195] *ibid.*, p. 15.

[196] Wahlberg 2010, p. 111.

[197] Fisher 2007, p. 8.

[198] Douglas 2009, p. 3.

[199] Ahteensuu 2020, p. 36–37.

for example requirements of periodical renewal of short-term permits[200] or policy reassessments when new scientific or technical knowledge emerges[201].

Environmental law overlaps with natural sciences more than most other fields of law. For environmental regulation to work as we want it to in the physical environment, that regulation needs to be based in science. In addition to the uncertainty endemic to science, the fields of environmental and climate regulation often relate to fields of study, which face extra uncertainties due to the complexities of the subjects of study, such as the climate or behavior of chemical substances in the natural environment.[202]

The fact that science is uncertain and may be corrected in the future, does not equal it should not be used in policy making, as I concluded above. Despite the deficiencies it has in producing certainties, scientific knowledge is still the best available option we have. Science is the most important and reliable 'epistemic authority' of our society.[203] However, the emphasis, or the degree to which scientific hypothesis should be considered should be adjusted according to the possible uncertainty and error margins, and the seriousness of the consequences should that scientific hypothesis later be corrected.

In 1972 philosopher Alvin Weinberg suggested the term 'trans-science' to describe the space between definite, answered scientific questions and what is unknown and unanswerable by science.[204] The questions that lay in between these extremities seemingly could be answered by scientific means, but we do not yet possess those means. In theory, a comprehensive and exhaustive risk assessment could be conducted. But in practice, the subject seems too complex to realistically manage. There are thousands of substances, and the practical risks, which are different for each one, depend on the manner and conditions of use and the base material, and longevity and reactiveness of the substance, and the environmental it is subjected to, etc. The list is long and complex, which is exactly why the precautionary principle plays a key role in

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[200] Paloniitty – Kotamäki 2021, p. 284.

[201] CJEU C-499/18 P *Bayer CropScience AG and Others v European Commission*, ECLI:EU:C:2021:367., as discussed earlier in chapter 3.2.

[202] Douglas 2009, p. 9.

[203] *ibid.*, p. 135.

[204] Weinberg 1972, p. 209.

EoW practice today. In the next section I will discuss the impact the precautionary principle in waste regulation, and specifically in EoW, more in detail.

4.4 Picking priorities – Requirements of Certainty in the Decision-making Process

As Fisher has articulated, the significance of risk analysis cannot be reduced to merely practical level technical or ethical disputes, but instead has a more far-reaching consequences, as risk disputes show us how risks are identified, understood and reacted to by the responsible institutions.[205] Depending on how the precautionary principle is interpreted and applied, both scenarios discussed above, that of reasonable level of environmental protection and that of paralyzing over-caution, are possible when applying the principle. This is the problematic that reveals the contradiction in the current scope of application of the precautionary principle. The objective of the principle has originally been to prevent harm to the environment and human health with choosing the cautionary approach when uncertainties exist. However, in context of circular economy, in addition to protecting us from environmental hazards, opting for the precautionary approach in fact seems to impede the adaption of the new material economy and innovations that promote it. Nevertheless, as I have discussed above, in reality, aiming for circular economy is nothing but a simple process, and instead requires holistic improvements and innovations in all fields. Even if it is true that precautionary approach makes the process of utilizing waste material more complicated, as it prevents some material of underdoing EoW procedure, at the same time, precautionary principle may act as a driver for material utilization, as I have concluded in subchapter 4.2. Removing the option for precautionary measures is obviously not an answer that would be sustainable considering the requirements of protection of environment and human health. Therefore, the relevant point for discussion, or the key problem, seems to be the balancing the precautionary and innovative approaches.

One of the earliest recorded examples of the precautionary approach was the removing of a water pump in 1854 England, which was inconclusively connected to the raging cholera epidemic in London at the time.[206] In this particular case, as in most other cases of early

[205] Fisher 2007, p. 11.

[206] EAA 2001, p. 14.

invocations of the precautionary principle, the costs of being overly cautious were low: minor financial losses, and perhaps mildly upset citizens. However, being right could save lives. Similarly, in the end of the millennium, the environmental and health hazards back then had serious impacts if not managed appropriately but acting too early or strongly did not have major disadvantages.

This asymmetry of negative and positive impacts has previously been a key condition for most situations where precautionary approach has been chosen. Precautionary principle in the context of environmental legislation is often associated with the contrasting interests of commercial activity and environmental protection.[207] The common assumption is that stringent application of the principle equals higher levels of environmental protection and more lax approach entails higher economic profits at the expense of the environment. In this paper my intention has been to consider the effects of the principle in the context of waste regulation in broader view, where it is accepted that precaution in accordance with the principle may result in less straightforward, less predictable, less desirable outcomes. That is, taking into consideration the possible deterring effects on circular flow of waste material of stringent application of the principle; that too much emphasis on the principle has negative *environmental* impacts.

Turunen considers that protecting environment and human health should be always prioritized over advancing circular economy, when those two are contradicting.[208] In situations where the contradiction is blatant, few would disagree with that. But when operating in the grey area of having a substance with unknown or possible detrimental effects, where relieving the material of its waste status and closing its loop would in turn offer great environmental benefits, choosing the correct approach is much less obvious.

The discussion tangents the discussion to define ‘uncertainties’ and especially, what should be considered an acceptable level of uncertainty. Ahteensuu argues that as natural sciences and political decision making have different goals, they should consequently have different criteria for error as well. He elaborates that due to this difference, scientific certainty should not be the

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[207] Cheyne 2007, p. 470.

[208] Turunen 2018, p. 208.

prerequisite for climate (or any environmental) action.[209] Scientific research must have tight criteria for potential errors. If such stringent level of certainty would be required in environmental political decision-making, the number of executable actions would diminish. Ahteensuu also points out, that according to some theorists, decision-making may be rational even if it does not rely on scientific certainty or consensus.[210]

In essence, laws are (or should be) based on values of the society promulgating them. However, how much of an influence should scientific hypotheses have in law, and how should the degree of that influence be decided? The question is too broad to be discussed here. But when scientific hypotheses have a direct impact in legislation, as they often do in environmental law, there must be a value-based assessment of how much they should affect the legal framework. Science and law are two separate 'entities' functioning on very different logic. Embedding requirements of scientific certainties into political and administrative level decision-making results in including the unfit error criteria of science into public policies. As established before, error margins in scientific research are too stringent to use in practical, societal setting. The *theory of varying objectives* suggests that risk criteria should be adjustable according to the purpose of which it is used for.[211] More lax criteria should be used in order to not take risks due to not taking action promptly enough.

Another interesting theory is *the argument from inductive risk*. The result is the same as with theory of varying objectives, but the reasoning differs. The argument from inductive risk is most notably enunciated by Daniel Steel, as follows:

> Decisions on whether hypothesis will be accepted or rejected, may have logical effects on practical action, and when that is true, acceptance should co-depend on non-epistemic value judgements of what are the costs of accepting a hypothesis when it is false and when it is true. Thus, it is justified that non-epistemic values may affect scientific reasoning.[212]

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[209] Ahteensuu 2020, p. 28–29 and p. 40.

[210] *ibid.*, p. 43.

[211] *ibid.*, p. 40.

[212] Steel 2010, p. 17.

Although the argument from inductive risk originally applies to accepting scientific hypothesis, there has been suggestions that it could be applied to the early stages of risk assessment[213], including that in the process of political decision-making. That would mean, that the thresholds of risk assessment could be adjusted according to the 'non-epistemic value judgements', that is, of what we think is valuable and important. If we take the reasoning a bit further, it would justify the 'tuning' of the risk criteria in accordance of whether absolute safety or opportunities for innovations are prioritized.

There have been examples of overestimating uncertainties concerning potential environmentally harmful impacts of industrial activities, in order to avoid restrictive measures. The strategy has been utilized by parties incentivized to promote these activities, despite the possible adverse effects to the environment.[214] Quite possibly, the same 'strategy' to exaggerate uncertainties has been used by those valuing the environment over economic matters. How one perceives uncertainties and reacts to them, is most often determined by the values and interests guiding their perspective.

In the specific context of EoW, as I have mentioned, there are environmental values at risk in both ends of the spectrum of prioritization. In other words, the goals and reasoning might be the same, even if the outcome is the complete opposite. The promotion of EoW can been perceived as environmental and climate action, thus, the same action, that the precautionary principle enables taking even in a situation of doubt. Therefore, EoW could be considered as environmental or climate action. And as Ahteensuu argues, climate inaction has no rational grounds, as the argumentation presented for it are left logically indefensible.[215]

Nevertheless, I must clarify that I am not aiming at setting up a straw man here – obviously, precautionary actions aiming to ensure the high level of protection are defined in different context e.g. in the EU case law concerning the principle. Thus, I am not suggesting that the approach to EoW is unlawful or contradictive in the context of EU waste regulation. I am merely pointing out the paradox clearly shown in the EoW procedure, where essentially, environmental

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[213] Winsberg 2018, p. 138.

[214] van der Sluijs 2005, p. 91.

[215] Ahteensuu, p. 44.

protection, via risk analysis, hinders the promotion circular economy objectives set in the EU level.

As arguing whether promoting EoW would protect or risk the wellbeing of the environment seems futile, as it does in fact have potential for both, as I have earlier established. Therefore, taking a new point of view might be more fruitful. Zander, and later Lofstedt, have presented interesting critique towards the functioning of the principle in the EU. They have pointed out the omission of systematic risk trade-off assessment or cost-benefit analysis in the process of evaluation whether the threshold for applying the precautionary principle has been exceeded. Without such an assessment, protective measures may end up targeted incorrectly, unfairly, and inefficiently. This kind of assessment was called upon in the 2000 Communication, but since then, has not been adhered to by the EU Courts.[216] Others have also pointed out, that for EU to achieve the goals of the Green Deal, similar the approach could be adapted even in the risk assessment phase, where a more comprehensive, comparative assessment of alternative options could be conducted.[217] Additionally, precautionary measures may be impossible to challenge in a system where the results of precautionary action are not compared to the results of non-action, which may lead to deficient opportunities to seek redress.[218] Zander emphasizes the importance of holistic approach to risks, which translates to overall assessment of risks as whole, not just one risk assessed in theoretical isolation from the others. The only way to effectively take precautionary action, in his point of view, would be to decrease the overall risk level the society and/or the environment.[219] I agree with this opinion, as the underlaying problem with the precautionary approach seems to be that the overall picture is not assessed systematically and comprehensively, but that focus remains in the immediate proximity in time and seriousness of consequences.

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[216] Zander 2010, p. 150–151, Lofstedt 2014 p. 153–154.

[217] Jacobs – Malloy – Tickner – Edwards 2016, p. 265, van Dijk – Gustavsson – Dekker – van Wezel 2021, p. 7.

[218] Zander 2010, p. 331.

[219] *ibid.*, p. 347–348.

4.5 Conclusions – Justification of Precaution in the EoW Context

Desrochers points out that in historical perspective, many material streams used to be valuable resources during the early years of industrialization[220], before the development of environmental and risk regulation as we know them today. Korhonen speculates how stringent environmental legislation framework actually hinders the utilization of some material flows with material of economic value, thus in fact only undermining the progress towards circularity.[221] After studying the precautionary principle and its role in the EU waste legislation, Cheyne concludes that in order for the EU to achieve the objectives set in its waste legislation, the precautionary principle must be applied lightly and only if appropriate scientific grounds exist.[222]

Due to the TFEU requirement for EU environmental regulation to aim at high level of protection of human health and the environment, we can assume, that in situations where potential economic profit and human health and/or environmental safety are to be weighed, environmental and health protection should be prioritized and the precautionary approach should be chosen, although the approach being limited by the principle of proportionality. However, the argumentation becomes more complex, when the assessment needs to be conducted between potential adverse impacts for human health and/or the environment and the advancement of circular economy and innovations promoting it.

As concluded earlier, prolonging taking action by exploiting the perceived scientific uncertainties, when considering restriction of possibly harmful practices, is not justifiable. However, the same logic could be applied when considering whether to allow more waste material into circulation under the EoW procedure or not. One could reason, that if we acknowledge the fact that we cannot keep exhausting our resources as we currently do, do we have any other rational choice but to allow the increased material flow into circularity, if that material has no proven harmful impacts? If later it is scientifically proven that a certain material let into circulation indeed has adverse environmental effects, remedial action should be taken.

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[220] Desrochers 2002, p. 55–56.

[221] Korhonen – Honkasalo – Seppälä 2018, p. 45.

[222] Cheyne 2007, p. 483.

Nevertheless, there is always a possibility, that the harm inflicted is too serious and permanent in nature, that the damage caused cannot be corrected.

Another interesting point of view is, that instead of merely ensuring environmental safety, the extensive environmental regulation of the EU has been created for supporting the functioning of the internal single market.[223] Therefore, as the environmental regulation of the EU has been originally designed for the purpose of enabling effective functioning of the European single market, the underlaying design still mainly supports that function. One can argue that the wide understanding of the concept of waste and the strict criteria for undergoing EoW procedure are partially remnants of the previous political aspirations focusing on the economic success and public acceptance of the Union in its early years.

Nevertheless, the economic and political aspects of upholding a functioning internal market and increase in raw material recycling cannot be completely separated. A level playing field for secondary and virgin raw materials is necessary to increase the utilization rate of discarded material. Additionally, it is important to ensure, that waste status should always be a burden to the one in possession of the discarded material. Waste status should never make utilizing or disposing of the material administratively more convenient or economically more profitable.

As I have previously discussed, when the subject of contemplation is whether to promote waste utilization or ensure the maximum safety of secondary materials, both environmental risks and 'benefits' are high. The outcome of decisions the considers the surviving of the living environment of all species on the Earth. How should scientific uncertainties adjust the risks we take, if there are potential monumental 'environmental losses' in both options; the risk of substances detrimental to human health and the environment being allowed to material circulation, or the risk of uncontrollably accumulating amounts of waste and shrinking reserves of natural resources. It seems that, there other option than to make a value-based judgement of whether to prioritize the precautionary approach, or the approach prioritizing innovation and promotion of circularity before it is too late. These kinds of decisions are not made in the risk assessment process, and although the best and most recent scientific and technical knowledge should be taken into account when considering different options, these are ultimately political decisions, made outside of the scope of environmental law.

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[223] Malinauskaite – Jouhara – Spencer 2017, p. 68, de Sadeleer 2012, p. 138–139, Scotford 2017, p. 86.

Even after taking a critical look to the justification of the principle, I must conclude, that in order to ensure the high level of protection of human health and the environment, I have not been able to identify rational grounds for decreasing of the influence of the precautionary principle. In other words, no better option seems to be found that that of the precautionary approach. This kind of conclusion is possible even after taking into consideration the hindering effects of precaution on circular economy. Eventually, these hindering factors may be the price we have to pay from the certainty of safety. Nonetheless, these negative impacts should not be left ignored. However, the acceptance of negative effects does not prevent us increasing the emphasis on risk trade-offs and the comprehensive, systematic cost-benefits analysis (in addition to the 'standard' risk analysis) of different identified outcomes.

Even if there has been some comprehensive and relevant critique towards the principle and the circular economy that I have appreciated in my study, I call for more research on the impact of the precautionary principle on the practical level of the EoW procedure. The scope and aim of my study did not allow for the examining of the impact of principle in more practical context, for example in the development and inclusion of EoW criteria for new waste types. I found there to be a vacuum in scientific research, legal literature, and official publications regarding the interaction of EoW, risks and the precautionary principle.

In the next chapter, I will conclude the findings of my study on role of the precautionary principle on the promotion of circular economy as demonstrated in the EoW context. I aim to clarify whether the discussion really may be encapsulated to political value judgements outside the scope of law, or if there are answers to be found inside the legal framework.

5 Conclusions

Being wrong costs, especially when the at stake are the future of human beings and our planet. As highlighted by Polansky *et al*., decision-makers today are faced with the increasing need to make decisions determining the future of our environment and society, with information available saturated with uncertainty.[224] Such high stakes require careful decisions, as potential losses are tremendous. However, precaution, or 'overcaution', can sometimes slip into anti-scientific and irrational intuitive fear. We have seen this most clearly in the debate over GMOs.[225]

However, neither is there nothing scientific in the belief of absolute scientific certainty, if it is acknowledged, that no such certainty can be reached. To pretend to know also equals not knowing.[226] As I have discussed in my study, we can simultaneously acknowledge the impossibility of obtaining absolute certainty, and still aim for the best possible alternative - conducting the best possible research, to which rational decisions can be founded upon. If we have high standards for the amount and quality of scientific knowledge, we can rely less on precaution, and more on science. However, as Paloniitty and Kotamäki put it, aims of scientific reduction of uncertainty in environmental matters, and their assessment in legal context, 'could ebb and flow between the factual and normative worlds, making the most of both their common ground, the precautionary principle'.[227] One way to perceive the precautionary principle is to view it as a bridge between the scientific and the normative, even if the two cannot be in the real world completely separated. How I understand this, is that the precautionary principle creates an element of normative guidance where there is an absence of factual knowledge, to which one could argumentatively lean on when making decisions.

Dalhammar highlights the importance of context when developing environmental policies. He uses an example concerning deviations from the waste hierarchy – there are cases where deviation from the hierarchy results in more environmentally beneficial outcome than abiding by it. That is, sometimes the option that initially seems less beneficial for the environment

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[224] Polansky – Carpenter – Folke – Keeler 2011, p. 389.

[225] Lofstedt 2014, p. 151–152.

[226] EAA 2001, p. 185.

[227] Paloniitty – Kotamäki 2021, p. 308.

might, after closer inspection, be more favorable for it.[228] Similarly, context is highly important when considering best policies for the end-of-life phase of a product or material. Some material may be best suitable for energy recovery, for example if its calory concentration is high but its reuse and/or recycling potential is low.[229] Some materials may have characteristics which make them more valuable when recovered to reuse than some other materials with different characteristics. Some materials undergoing EoW procedure may have more positive environmental or societal impacts than others, for example rare earth metals/minerals, whose extraction and enrichment processes are highly energy intensive. The positive environmental impacts thus may vary considerably depending on the material. One could conclude that materials with properties that increase their suitability for reuse or material recovery, and materials with high positive environmental impacts when reused, should have lower threshold to be accepted to undergo EoW procedure, as their potential positive impact is greater. Essentially, those materials' potential harmful impacts should have less relative weight when evaluating their suitability for EoW procedure.

In the end, technical innovations and scientific studies define how EoW materials can be utilized in practice. The criterion prohibiting adverse environmental and health impacts requires us to have scientific information on the qualities of the material for it to cease to be waste. The better our understanding of material qualities is, the less material does not pass the EoW evaluation merely due to lack information of the material. If we expand our knowledge of materials and substances by means of scientific research, less material would be subjected to the precautionary function of Articles 5 and 6, and consequently, more material could flow back into circulation.

It is important to realize that what is considered as "adverse impacts" always contains an evaluative component. No scientific finding is in itself "adverse", as "adversity" only arises from the human evaluation process.[230] Thus, political decision making, even if based on scientific research, always contains some component of axiological evaluation, when scientific knowledge is transformed to policies and laws.

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[228] Dalhammar 2015, p. 116.

[229] *ibid.*, p. 117.

[230] Ahteensuu 2020, p. 34.

Unfortunately, this realization is abused by those trying to create rationale for not taking action to protect the environment and stop climate change. My purpose is not to introduce reasons for not taking action, but to bring forward that the pursuit of having political decision-making made purely on the basis of scientific certainties is futile. There are always values, interest and goals that need to be weighted which affect the outcome of decision-making process. In the context of EoW, this weighing process is particularly interesting, as the circumstances involve a risk trade-off, where potential adverse impacts may be the result of both action and inaction. If less known substances and materials are allowed to enter circulation as products, we are closer to circular economy than we have ever been, but eventually some of those substances may turn out to be harmful and in the worst-case scenario, that they have inflicted serious, irreversible harm that we have not noticed until it is too late. On the contrary, we already are in the middle of an ecological crisis, and we desperately need new policies and innovations to save our environment and our way of life. It seems that in a theoretical level a value judgement needs to be made between the 'safe' option, where less-known substances are allowed into circulation and the riskier, but potentially more environmentally beneficial option.

However, as I have highlighted earlier, the two-fold approach to risk analysis does not provide us with a complete picture of it. Commonly, some have emphasized the supremacy of objective and scientific knowledge in risk analysis, and on the opposite, some have stressed the uncertainty of the results of even the most sophisticated risk analysis, and thus deemed, that the only option is to rely on value judgements. Fisher makes a statement on how this kind of dichotomy thinking is limited, and instead the core of risk decision-making is neither, as its institutional context is in fact public administration. Fisher describes this context as 'polycentric, malleable and openended', as opposed to those of scientific or legal contexts.[231]

EoW does not fall always and completely to the administrative realm, because the criteria can be set in legislative level, where the legislator is the risk assessor. However, in case-by-case decisions, there are no set criteria, and relevant authorities will make the decision, as said, by case specific consideration.

The decision-maker is left with a complex web of different legal frameworks, competing principles, conflicting case law rulings. The context specific meaning of the principle needs to

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[231] Fisher 2007, p. 22.

be found in the midst of the non-uniform legal material.[232] Accordingly, as Scotford argues, the definitions the precautionary principle have been given in the EU case law depend on the legal context, or specific legal framework, the principle is examined in.[233] Therefore, in the context of EoW, or in the wider context of all waste material, as the application of the principle is specific to that framework, a "more lax" way of application could exist, without risking the overall level of protection in other areas of environmental law.

As Scotford concludes, the precautionary principle should not be falsely understood to amount to standalone legal grounds for supporting environmental objectives, including objectives of circular economy. Instead, it may be used in creating legal tests to evaluate the actions taken in the environmental sector by EU or MS institutions, and their impacts on the environmental objectives of the EU. The principle offers guidance on the scope of discretion for the institutions to operate within.[234]

Law is not empty of content, not a mere venue or vessel, but in itself constructs the decisions we make in the society.[235] That essentially why I decided to study this topic – how a legal construct, inside the legal framework, interacts with another legal construct, and produces an outcome significant outside the legal framework, in the sense of our physical reality, or in this case, the environment. To conclude, the precautionary principle may impede the circular economy objectives of the EU, which better utilization of EoW would assists in meeting. At the same time, the precautionary principle can be seen as a means of promoting circularity, as its application increases material safety and trust to secondary materials and helps to prevent irreversible negative environmental impacts. Risk analysis is the key procedure where the possibility of waste material utilization is decided, and in that process, it is important to make comprehensive analysis on both negative and positive potential impacts, or the risk trade-offs that EoW contains, in the wide context of the objectives of circular economy.

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[232] *ibid.*, p. 18.

[233] Scotford 2017, p. 156.

[234] *ibid.*, p. 192.

[235] Fisher 2007 p. 23, Lee – Natarajan – Lock – Rydin 2018, p. 432.