D1.1 Territories' CE activities and state-of-the-art of CE

WP no and title	**WP 1 CE framework analysis and actions to enhance CE**
Lead Beneficiary	**SINTEF**
Responsible Author(s)	**Henrik Brynthe Lund, Mari Wardeberg, Jens Hanson, Sarianna Palola, Anna Tenhunen-Lunkka, Riina Karki, Linda Rekosuo, Pirjo Kaivos, Jelizaveta Krenjova-Cepilova, Trond Åge Langvik, Gunn Birgitte Skoge Nygaard, Einari Kisel**
Contributor(s)	**VTT, TLN, FVH, EKOF, CLIC, Frstad, MTK, Viken, TalTech, TARTU**

This document contains the report *D1.1 Territories' CE activities and state-of-the-art* for the TREAoURcE project (Grant Agreement No. 101059491).

Funded by the European Union

Project Details			
Project acronym	TREASoURcE	Start / Duration	June 2022 / 48 months
Topic	HORIZON-CL6-2021-CIRCBIO-01-01 – Circular Cities and Regions Initiative (CCRI)'s circular systemic solutions	Grant Agreement No	101059491
Type of Action	Innovation Action (IA)	Coordinator	VTT Technical Research Centre of Finland Ltd
Contact person	Anna Tenhunen-Lunkka, anna.tenhunen-lunkka@vtt.fi		
Website	https://treasource.eu/		

Deliverable Details			
Deliverable No	D1.1		
Deliverable Name	Territories' CE activities and state-of-the-art		
Work Package	WP1		
Dissemination level	SEN/PU	Type	Report
Due Date (M)	31 March 2023	Submission date	
Lead Beneficiary	SINTEF	Responsible Author	Henrik Brynthe Lund

Deliverable Contributors				
	Name	Organisation	Role / Title	E-mail
Deliverable leader	Henrik Brynthe Lund	SINTEF	Co-lead of WP1, T1.1 lead/Research scientist	henrik.brynthe.lund@sintef.no
Contributing Author(s)	Mari Wardeberg	SINTEF	Research scientist	mari.wardeberg@sintef.no
	Jens Hanson	SINTEF	Research scientist	jens.hanson@sintef.no
	Sarianna Palola	VTT	Research scientist	Sarianna.palola@vtt.fi
	Pirjo Kaivos	CLIC Innovation	Head of Circular Economy	pirjo.kaivos@clicinnovation.fi
	Riina Kärki	MTK	Project team member/ WP5 leader/ Project	riina.karki@mtk.fi

Funded by the European Union

			Manager at MTK	
	Linda Rekosuo	EcoFellows	Project Manager at Ecofellows	linda.rekosuo@tampere.fi
	Trond Åge Langvik	Fredrikstad municipality	Advisor	trolan@fredrikstad.kommune.no
	Jelizaveta Krenjova-Cepilova	Tallin University of Technology	Research fellow/project manager	jelizaveta.krenjovacepilova@taltech.ee
	Einari Kisel	Tallin University of Technology	Head of partnership and strategy	einari.kisel@taltech.ee
	Anna Tenhunen-Lunkka	VTT	Project Coordinator / Seniors Scientist, Project Manager	anna.tenhunen-lunkka@vtt.fi
	Gunn Birgitte Skoge Nygaard	Viken county	Senior advisor	gunnny@viken.no
Reviewer(s)	Anne-Christine Ritschkoff	VTT	Senior Advisor	anne-christine.ritschkoff@vtt.fi
	Sigrid Damman	SINTEF	Senior research scientist	sigrid.damman@sintef.no
Final review and quality approval	Anna Tenhunen-Lunkaa	VTT	Project Coordinator / Seniors Scientist, Project Manager	anna.tenhunen-lunkka@vtt.fi

Funded by the European Union

Document History			
Date	Version	Name	Changes [modify as needed]
17.11.2022	V1.0	Henrik Brynthe Lund	Initial draft
22.03.2023	V2.0	Henrik Brynthe Lund	Full first draft for QA
27.03.2023	V3.0	Henrik Brynthe Lund	Third draft improved based on consortium feedback
31.03.2023	V4.0	Henrik Brynthe Lund	Reviewed and final version

Funded by the European Union

TABLE OF CONTENTS

Funded by the European Union

List of Figures

List of Tables

Funded by the European Union

Acronyms and abbreviations

Acronym	Full name
BT	Business Tampere
CCRI	Circular Cities and Regions Initiative
CDP	Communication and Dissemination Plan
CE	Circular Economy
CEAP	Circular Economy Action Plan
CLIC	CLIC Innovation Ltd
D	Deliverable report
DMP	Data Management Plan
ECO	ECO STOR AS
EKOF	Ekokumppanit Oy (EcoFellows)
EU	European Union
FAIR	Findable, Accessible, Interoperable and Reusable
Frstad	Fredrikstad kommune
FVH	Forum Virium Helsinki Oy
GA	Grant Agreement
GD	GreenDelta GMBH
GDPR	General Data Protection Regulation
ICT	Information and Communication Technology
KVC	Key value chain
KVC-DEMO	Key value chain demonstration
MTK	The Central Union of Agricultural Producers and Forest Owners
PF	Polyfuels Group AB (Previously known as Green Ideas Group GIG)
RDI	Research, development and innovation
SDG	Sustainability Development Goals
SDU	Syddansk Universitet
SE	Stakeholder engagement
SECAP	Tallin Sustainable Energy and Climate Action Plan
SE-DEMO	Stakeholder engagement demonstration
SINTEF	SINTEF AS / SINTEF Energy
SUPD	Single Use Plastic Directive
TalTech	Tallinna Tehnikaülikool
TARTU	Tartu Linn (Tartu City)
TLN	Tallinna Linn (City of Tallinn)
TOPSOE	Topsoe AS
VIKEN	Viken Fylkeskommune
VTT	VTT Technical Research Centre of Finland Ltd

Funded by the European Union

Executive Summary

The objective of the report is to provide a comprehensive overview of the current status of circular economy (CE) in the target countries of the TREASoURcE project; Finland, Norway, Sweden, Denmark, and Estonia. This is achieved by examining and analysing existing strategies, roadmaps and action plans for CE and for the key value chains (KVCs) targeted in the project; plastics, EV batteries and bio-based waste and side streams. The report provides an assessment of existing documents within the different territories, which can serve as a foundation for the work undertaken by the TREASoURcE project. The study also focuses on specific regions and municipalities in Finland, Norway and Estonia, where the studied regions are Usimaa and Pirknamaa in Finland and Viken in Norway. On the municipal level, we analyse Helsinki and Tampere in Finland, Fredrikstad in Norway, and Tartu and Tallinn in Estonia.

The report develops a framework for analysis of the targeted documents, aiming to provide a better understanding of how the documents can provide a way forward in the transition towards a CE. The framework draws on the literature on sustainability transitions to dig into a total of 56 different documents, covering both the national, regional, and local levels in the five countries. Thematically, the analytical framework covers topics such as 1) scope, purpose, and objective, 2) portrayal of the future and change, and 3) innovation and wider societal change. The findings from the document analysis are synthesized into five analyses covering the target countries and selected regions. Thereafter we draw up some comparative remarks to provide some further insights on the similarities and differences between the countries.

We find that the studied territories have progressed differently in terms of developing strategies, road maps and action plans to promote CE. Whereas the Nordic countries all have national CE strategies, the Estonian strategy is currently under development. Furthermore, we see a clear distinction between the national and regional and local levels in terms of availability of CE strategies, where documents on the national level are more clear-cut strategies, either general CE strategies or strategies for individual KVCs. Whereas regional and local levels are characterized by a lack of strategies targeting CE in particular, making it more challenging to piece together a holistic understanding of the current status of CE in the studied regions and municipalities. Aims and visions for CE are found in the more general county and municipal plans for climate and other similar documents.

We have identified three takeaways that can inform practitioners, policy-makers and researchers based on reflection and insights developed during an interactive and interdisciplinary workshop with representative from SINTEF, VTT, Fredrikstad Municipality, Tampere and TalTech. We argue that 1) there is a need for cross-regional collaboration to enhance CE for certain materials, 2) there is a need to move from static documents to action, thus moving towards increased implementation of CE strategies is warranted to promote a transition towards CE, and 3) a need for cross-country learning, where late comers can draw upon experiences and best practices from countries that have progressed further in terms of CE.

Funded by the European Union

1. INTRODUCTION

Circular economy (CE) is an important means to tackle the emerging challenges related to increased greenhouse gas (GHG) emissions, resource depletion and climate change. The TREASoURcE project (2022-2026) aims to facilitate and commerce systemic change through the development of systemic CE solutions in cities and regions for currently underutilized or unused plastic waste, electric vehicle batteries (EV-batteries) and bio-based waste and side streams. The project is expected to significantly increase production and material circulation in the Nordic and Baltic Sea Regions. To achieve the objectives of TREASoURcE, the following report aims to consolidate and advance knowledge on the current status of CE through an assessment of CE strategies, action plans and roadmaps in the Nordic countries and Estonia, as well as CE strategies, action plans and roadmaps for the key value chains (KVCs) of plastics, EV-batteries and bio-based waste and side streams. Moreover, the Finnish regions of Pirkanmaa and Uusimaa and the respective municipalities of Tampere and Helsinki, the Norwegian county of Viken together with Fredrikstad municipality and the Estonian cities of Tartu and Tallinn will also be analysed. These countries, regions and municipalities are analysed based on the affiliation of stakeholders and location of the demonstration cases in the TREASoURcE project. As such, the analysis covers all the territories of the involved stakeholders and the areas where the technological demonstrations are developed and implemented.

Figure 1: The case countries, regions and municipalities

This report understands CE as a sustainable economic model, which aims to minimize waste and optimize the use of resources. It is based on the idea of reducing the consumption of natural resources by narrowing, slowing down, or closing resource loops, where products, materials and resources are kept in use for as long as possible. To drive the transition towards a CE, several circular strategies can be implemented. Potting et al. (2017) introduced a 9R framework (**Error! Reference source not found.**) including 9 circular strategies, which depict different levels of high circularity (low R-number) to low circularity (high R-number). (Potting;Hekkert;Worrell;& Hanemaaijer, 2017).

Funded by the European Union

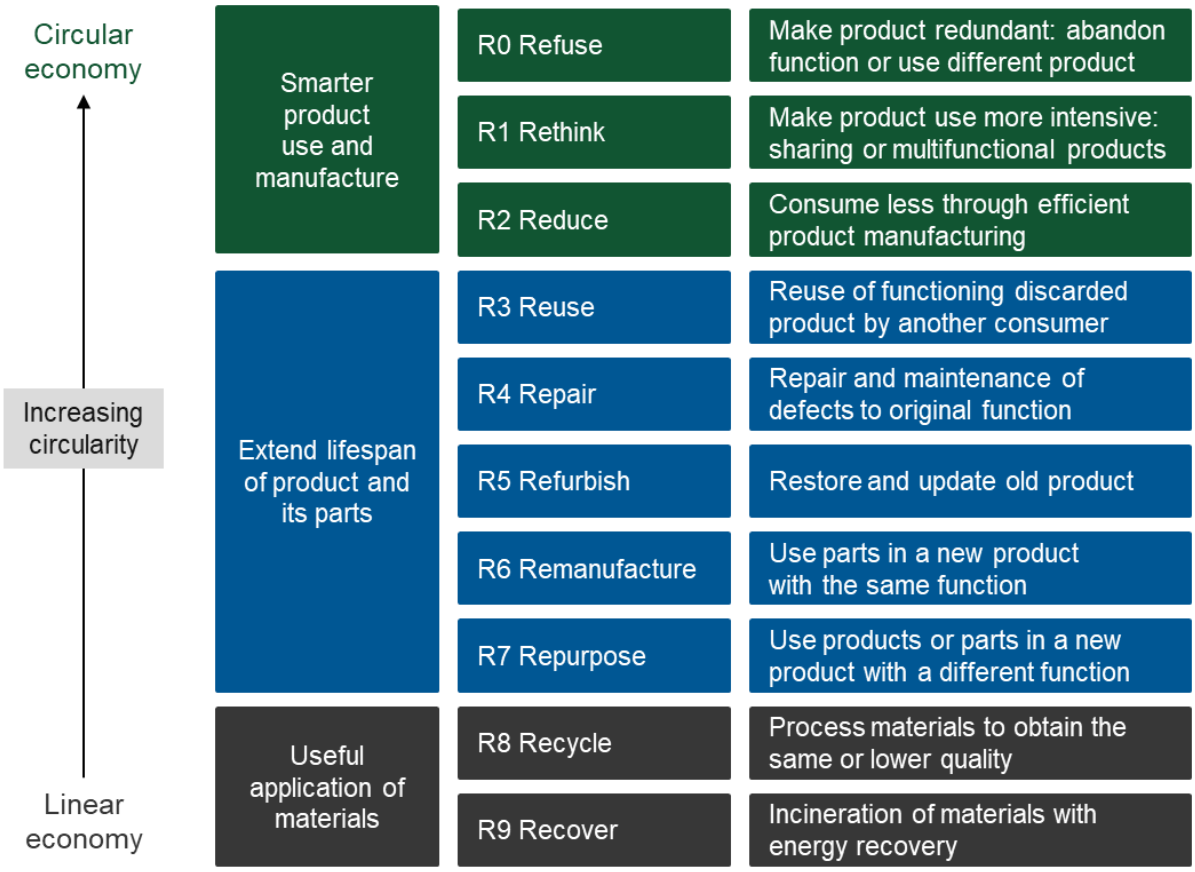

Figure 2: 9R circular strategies prioritised by level of circularity (Potting et al 2017

The European Union (EU) has taken a leadership role in advancing policies for the CE and has recognized the importance of moving away from the traditional linear economic model. The efforts of the European Union to promote the CE are part of a broader plan to reduce greenhouse gas (GHG) emissions by at least 55% by 2030, compared to 1990 levels, and make Europe climate-neutral by 2050, known as the New Green Deal (European Commission, 2019). The EU has made the transition towards a CE a key priority, as it aims to reduce waste, increase resource efficiency, and promote a more sustainable economy. The New Green Deal includes measures to support the CE, such as promoting sustainable product design, improving the durability and reparability of products, and supporting the development of circular business models. Overall, the EU's approach to the CE is a comprehensive and ambitious one, which aims for wide societal change by transforming the way we produce, consume, and use resources, to build a more sustainable future. By promoting the CE, the EU is not only reducing waste and conserving resources but also creating new economic opportunities and driving innovation in the transition towards a more sustainable future.

In 2020, the EU also adopted a New Circular Economy Action Plan (CEAP), which sets out a comprehensive strategy to promote a more sustainable and resource-efficient economy (European Commission, 2020). The CEAP aims to create sustainable growth and jobs and bring about positive environmental impacts like mitigating climate change, reducing the pressure on natural resources and halting biodiversity loss (European Commission, 2020; European Commission, 2019). The CEAP considers the entire lifecycle of products and presents initiatives targeting sustainable and circular

Funded by the European Union

design, CE processes, sustainable consumption, preventing waste, and ensuring maximum circulation of the resources within the EU economy. The key sectors in its focus are where most resources are used and circularity potential is high: electronics and ICT, batteries and vehicles, packaging, plastics, textiles, construction and buildings, food, water and nutrients. The initiatives in the CEAP are both legislative and non-legislative, altogether there are 35 actions listed in the action plan.

The main results from this report were found through a structured document analysis of a total of 52 policy documents from the five case countries, regions, and municipalities. The analysis provides an overview of the current status of CE in the analysed territories. The results will be used as a baseline for the work in the TREASoURcE project, as it provides an overview of the status of CE (read through existing strategies, roadmaps, and action plans) in the territories covered by the project.

Following this introduction, this report first presents the analytical approach, elaborating on how the transitions to CE can be understood, defining what this report means by strategies, action plans and roadmap and provides a framework for analysis. Second, the methodology used for this analysis will be presented, followed by an analysis of the five territories. Lastly, a comparative analysis will be presented, followed by reflections and key takeaways for both practitioners and researchers working with issues related to CE.

Funded by the European Union

2. Analytical approach

2.1. The transition to a circular economy

CE has been put forward as a key strategy to mitigate climate change and contribute to sustainable production and consumption (Chizaryfard, Trucco, & Nuur, 2021; Kirchherr, J; Reike, D; Hekkert, M, 2017). Such radical societal transitions involve the transformation of a multitude of technologies, sectors, and value chains (Chizaryfard, Trucco, & Nuur, 2021). Territories and regions have different opportunities and barriers in transitions into CE, such as industrial clusters, differences in population density, and/or natural resources (The European Economic and Social Committee, 2019). Therefore, it is useful and necessary to understand the local and national conditions and strategies for moving towards a CE.

The transition to a CE is a complex process, involving drastic changes in the production-consumption patterns that affect the environment (European Environment Agency, 2016). As an example of the complexity of transitioning to circular plastics, Johansen et al (2022), highlight that CE cannot be achieved only by addressing the issues in the waste management system but a combination of changes is needed across the whole value chain including e.g. also design and use phase. The existing knowledge base tends to focus more on end-of-life-phase rather than the whole value chain and different phases. They emphasize the importance of a holistic approach, where the transition to CE should be done carefully mapping implications, stakeholders and their involvement as well as collaboration. (Johansen;Christensen;Ramos;& Syberg, 2022).

The complexity of CE transition processes is also exacerbated by several barriers, such as regulatory, cultural, market and technological (Kirchherr, et al., 2018). Interactions between these interrelated barriers can contribute to an unchanged system with a resulting lock-in to the current linear economy, which thus provides insights into the main reasons for ineffective transitions into a CE (Kirchherr, et al., 2018). However, managing the transition requires an understanding of the broad societal trends and the drivers enabling a CE (European Environment Agency, 2016).

As with other transitions towards more sustainable production and consumption patterns, policy may play a critical role in overcoming barriers and fostering development towards a CE transition. However, there is a growing recognition, both among scholars and policymakers, of the lacking capacity of traditional policy approaches to foster innovation and transformation at a sufficient scope and pace to address societal challenges, such as CE transitions (Schot & Steinmueller, 2018). Both in academic literature and policy making, novel policy paradigms, such as "transformative innovation policy" and "mission-oriented policies" have emerged (Mazzucato, 2016). These go beyond traditional policy goals of fostering innovation for economic growth, but focus on addressing societal challenges, such as waste, resource depletion and the transition to CE. Policy thus has the potential of stimulating not only the rate of, but also the direction of innovation and transitions (Weber & Rohracher, 2012). Strategies and roadmaps constitute one way in which policymakers can provide directionality and seek to attempt to influence societal change in certain directions. Indeed, roadmaps and strategies have been shown

Funded by the European Union

to be used in a variety of ways to portray future development pathways and can in themselves become policy instruments to support transitions and societal missions (Miedzinski, Mazzucato, & Ekins, 2019).

2.2 Defining roadmaps, strategies and action plans

This report differentiates between strategies, action plans and roadmaps. Drawing on the definition of CE strategies and roadmaps set by the European Economic and Social Committee (The European Economic and Social Committee, 2019), these documents aim to further the transition towards a CE, by presenting clearly defined objectives or desired outcomes which include key steps or milestones towards the envisaged future within a certain timeframe. Usually, these CE strategies and roadmaps provide an overarching framework of ongoing initiatives "in different sectors, by different players, and at different stages of the value chain or different states of development" (The European Economic and Social Committee, 2019, s. 7), and describe instruments encouraging the transition and act as inspiration for stakeholders and actors to be involved.

Roadmaps provide a time-based framework which enables the development, illustration, and communication of strategic plans while taking into consideration the independent advancement of technology, products and markets (Miedzinski, McDowall, Fahnestock, Rataj, & Papachristos, 2022). Roadmaps share a number of design features (Phaal et al., 2004; Phaal & Muller, 2009 in (Miedzinski, McDowall, Fahnestock, Rataj, & Papachristos, 2022)):

1) They include a reflection on the current state of development or a baseline i.e., '*where are we now?*'.
2) They have an explicit purpose usually expressed as a vision and strategic priorities and targets i.e., '*where do we want to go?*'.
3) They include an explicit perspective of time horizon and short-, medium- and long-term timelines that illustrate the process of getting to the vision i.e., '*how to get there?*'.
4) Many roadmaps may present a path towards the vision by depicting various interrelated layers e.g., technology, product, sector, policy.
5) The development of roadmaps requires active stakeholder involvement from across disciplines, economic sectors, business, and public organisations.
6) Irrespective of whether the process of road mapping is intra- or inter-organisational, stakeholder discussions should be seen as a learning process and knowledge sharing exercise.

2.3 Framework for analysis of CE strategies, road maps and action plans

While there exists literature on roadmaps and strategies on the one hand and the conceptualization societal transitions, missions, and transformative innovation policy on the other, few approaches provide specific analytical approaches to study roadmaps in such contexts. Miedzinski et al. (2022) provides one of few specific analytical perspectives on roadmaps analysis. This perspective considers dimensions that are relevant for evaluating how roadmaps connect with processes linked to societal transitions and system innovation, including considering how change is expected to occur, and which

Funded by the European Union

types of innovation that are expected to drive such change. We build and adjust this perspective to suit the analysis of strategies, action plans and roadmaps of CE, by focusing on the categories and sub-questions presented in Table 1.

Funded by the European Union

Theme	Overall questions	Concrete questions	Justification/ Explanation
Scope, purpose and objective(s) of document	What is the main rationale, purpose and scope of the strategy/roadmap?	1. What is the defined specific purpose (ambition) and scope (narrow/broad, multiple sectors/value chains)?	
	What is the wider context in which the strategy/roadmap are developed?	2. To what extent does the document take into account the wider context (how does it relate to the broader debate on CE)?	Wider context refer to if/how the document relates to the broader debate on CE. Local/regional level, how does they relate to national strategies/roadmaps?
Portrayal of the future and description of how change occurs	How does the strategy/roadmap introduce visions and pathways (e.g., narrative scenarios, targets, milestones action plans)?	3. Does the document specify a target/goal? 4. Does the document provide a timeline (e.g.,2030/2050)? 5. Does the document present specific reduction targets? 6. Are specific goals linked to larger (EU/national) goals?	Reduction in tonnes? CO2 emissions? Are the regions/municipalities more ambitious?
	How do they discuss assumptions about probable futures and include narratives explaining how future change is expected to occur?	7. How does the document envisage the future of the value chain in focus? 8. Does the documents specify steps to achieve the envisaged future? 9. Is there an action plan to follow up the strategy?	
Role of innovation: The level of ambition and aspiration of innovation activities, including experimentation and system innovation. The extent in which the document encourage innovation specialization in areas relevant to sustainability transitions.	What type of innovation activity does the document promote to enable sustainability transition?	10. What kind of innovation does the document present (take particular note of whether or not the document goes beyond technological innovation)? a) Technological innovation? b) Social innovation (change among users/consumers? c) Business model innovation? d) System innovation (wide reaching change across actor groups)?	

Funded by the European Union

		11. Where in the value chain does innovation take place? Does the document focus on particular segments, of focus on more overarching change across multiple sectors and value chains? 12. Does the innovation(s) link to a particular R-strategy (if so, which one(s))? 13. How does the document discuss the need for (innovation) policies to achieve the vision? 14. Does the document discuss solutions for experimentation/demonstration?	
	What is the level of ambition of innovation?	15. How does the document discuss wide reaching systemic change or incremental improvements?	
	Is the document based on a strategic prioritisation process that includes existing and emerging areas of specialisation?	16. Does the document specify prioritized areas for innovation and technology development (are there particular technologies/sectors/VC segments that are prioritized)?	
		17. What are the main drivers and barriers for CE?	
Use of evidence: The use of evidence and scientific knowledge to underpin the analysis, vision, pathways and action plans of roadmaps.	What type of evidence are used to inform the strategy/roadmap process?	18. Describe the academic basis for the document. Is the document based on particular reports or white papers?	
Alignment and credibility: The extent to which roadmaps align actor strategy with the shared vision and engage actors in transformative innovation.	How are stakeholders selected, consulted and engages at different phases of the strategy/roadmap process?	19. What kind of stakeholders have been involved in developing the strategy/roadmap? 20. Does the strategy present who contributed in developing the strategy/roadmap? 21. How inclusive is the process?	On local and regional level: autonomy in the process, or driven by national level actor(s)?

Funded by the European Union

Table 1 - The analytical framework developed for analysis of CE strategies, roadmaps and action plan

3. Methodology

The following section describes the research process in more detail to provide a better understanding of the choices that were made in the process, and how we have handled issues along the way. The work was conducted in the period September 2022 – March 2023. In general, the work can be divided into four interconnected steps where the research team:

1) developed an analytical framework based on relevant literature (described in section 2),
2) identified relevant documents on national, regional, and local levels in the five countries,
3) analysed the identified documents guided by the developed analytical framework, and
4) synthesized data from the analysis and wrote out both national and comparative analyses of the data gathered from the documents.

Step 1 has been accounted for in section 2. This section will therefore pay attention to the remaining three steps.

According to Bowen (2009), conducting a document analysis entails a process of finding and selecting relevant documents (CE strategies, action plans and roadmaps), making sense of these documents, and synthesizing data contained in the documents (Bowen, 2009). The identification of relevant documents for this report was done using two different strategies. First, covering documents that pertains to the national level in the five countries, we conducted web searches (using search words such as “CE strategy”, “plastics strategy” followed by the different countries) based on the teams existing knowledge about CE strategies, roadmaps, and action plans from previous research projects. This resulted in a list of opensource documents that were mainly derived from the respective government’s web sited. On a regional and local level in Finland, Norway, and Estonia, the TREASoURcE project’s local and regional partners have been involved in gathering and analysing the relevant documents. In sum, we have reviewed 18 documents for Finland, 18 documents for Norway, 3 documents for Sweden, 8 documents for Denmark, and 9 documents for Estonia. A total of 56 documents (see Appendix A).

Concerning the types of documents that could be found, it became clear, quite early on, that the types of documents that we found on the regional and local levels were different compared to the national documents. While national level CE documents were more clear-cut strategies, roadmaps, and action plans, the regions and municipalities covered here did not necessarily have any of these. Whereas some, such as Helsinki and Tampere, had CE strategies, the municipalities of Fredrikstad (NOR), Tartuu and Tallinn (EST) did not. To provide a holistic understanding of the current state of CE within these territories, we, therefore, had to make use of documents such as regional climate and environment plans, municipal sector plans for climate, and local waste management plans, that in some way covered the topic of CE (both in general and related to the three key value chains). As such, the result of the identification process was a plethora of different types of documents, that in sum could provide an overview of the current status

Funded by the European Union

of CE in the different territories covered. We recognize that there is a potential difference between national strategies, which can be seen as promoting industrial development and increased value capture, whereas regional and local plans are more geared towards the interests of the county and municipality, in terms of job creation, welfare etc.

The analysis of the documents was undertaken by all the project partners, both academic and non-academic, from the different territories, where partners from the different countries were responsible for the analysis of their own country. The national analyses of Sweden and Denmark were conducted by researchers from SINTEF, as there were no local partners engaged in the task from these countries. The analysis was guided by the framework developed early in the research process (see Section 2) using a shared Excel file to gather the data from all the documents. Throughout the process the research team had recurring meetings (every other week) to discuss potential issues with the framework, particular challenges in the different national analyses, and other issues that came up.

The final step of the document analysis was synthesizing the information gathered in the Excel framework from the document analysis into coherent text, making up the final national analyses. To ensure coherence across the different national analyses in terms of both structure and scope, a structure was developed for both the national, regional, and local levels, where information was synthesized into separate paragraphs. Based on the national analyses, the team went on to write out the comparative part of the analysis section. This work was done through a physical workshop in Oslo, where the partners discussed and agreed on how to structure the comparative analysis, which was completed by the individual participants after the workshop.

Funded by the European Union

4. Results of the analysis

The following section presents a brief analysis of overarching CE documents, as well as an analysis of the CE-related documents in the KVCs of the TREASoURcE project: **plastic**, **EV-batteries** and **bio waste and side streams** based on the documents presented in Appendix A**Error! Reference source not found.**, divided into the five case countries represented in this report. Denmark and Sweden pertain to the national documents concerning CE, whereas Finland, Norway and Estonia also cover the regional and local levels. In Finland, we provide an analysis of the Pirkanmaa and Uusimaa regions and the respective municipalities of Tampere and Helsinki. In Norway, we provide an analysis of Viken county and the municipality of Fredrikstad. Finally, in Estonia, we analyse existing strategies for CE in the municipalities of Tartu and Tallinn.

4.1 Finland

4.1.1 National documents

In Finland, the transition towards CE is seen as an important opportunity to both reduce environmental impacts and GHG emissions but also strengthen the export economy and employment. Finland has ambitious to be a carbon-neutral and fossil-free welfare society and strongly supports the implementation of CE solutions together with the central government, municipalities, enterprises, and citizens. The amendment to the Climate Act as of March 1, 2023, defines that municipalities must implement climate plans, which can increase the amount of CE strategies being developed in Finland in the coming years. The law requires that the plan includes e.g., the goal of reducing greenhouse gas emissions and the actions to achieve the goal (Ulvi, ym., 2022; Ministry of the Environment, 2023).

Finland is strongly committed to a systematic strategy in the transition to a CE and was among the first countries to produce a CE roadmap in 2016. The Finnish roadmap to the CE was updated in 2019, *The Critical Move – Finland's roadmap to the circular economy 2.0,* and it sums up a vision for 2025, where there are different visions for the government, towns and cities, businesses, and citizens (Sitra, 2019).

To guide this transition, Finland has its own strategic program for the CE, which was accepted in 2021. The CE Programme envisions that through the actions and measures planned, Finland will reduce the consumption of unrenewable natural resources and reach a carbon-neutral CE society by 2035 (Ministry of the Environment Resolution, 2021). The key measures identified are (Ministry of the Environment (a), 2021).:

Funded by the European Union

- CE incentives such as taxation promoting a CE and limit the use of virgin resources and reduce CO2 emissions.
- Information compiling on CE services for citizens, such as sharing and repairing.
- Transforming Finland into a leading country in a digital CE by harnessing open and connected data on material and data flows.
- Support sustainable CE market development via legislation and economic instruments.
- Low-carbon circular solutions for the public sector in construction, mobility and energy.
- Incorporate CE into the education and work-life skills.

The Annual Climate Report 2022 revealed that there were no major changes in Finland's total emissions in 2021, furthermore, land use and the forestry sector became a new source of emission for the first time. This is explained by e.g., increased harvesting and slower forest growth. Material circularity plays a share in the overall GHG emissions, but the share of recycled material out of all material use in Finland was just around 7 % (2018), which is lower than the EU average. However, the national CE activity level is high, with multiple projects and programs on the way. Energy production and transport systems are one of the main key policy target areas. (Siljander;Cederlöf;& Skoglund, 2022)

In Finland, a National Waste Plan to 2027 was published in 2022 and it presents a plan for waste management to reduce the volume and harmfulness of waste. It also includes measures and has annual monitoring to assess the change. The National Waste Plan is seen as one of the main circularity drivers for Finland, and it presents recycling rate targets that should reach at least the levels presented by the EU. The most important impacts foreseen are more sustainable and safe use of resources, and improved protection of the environment via decreasing waste volumes and increasing recycling (Ympäristöministeriö , 2022).

Finland has several roadmaps, strategies and action plans that support the implementation and transition towards CE. The European Green Deal is considered as a reference basis in most. Regarding the key values chains in focus, there are three main CE related strategies or roadmaps: *National battery strategy 2025* (Ministry of Economic Affairs and Employment of Finland, 2021), *National bioeconomy strategy* (Finnish Government, 2022) and *National Plastics Roadmap 2.0* (Ministry of Environment of Finland, 2022). The documents are interconnected with EU-wide regulations, directives, and guidelines regarding CE. Throughout these three documents, there are several common trends. For example, innovation and investing in research and development are seen as important tools on the path towards sustainability and CE. Also, each document clearly states measures to be taken to reach the desired goals and steps on how to verify the scale and direction of progress.

National battery strategy 2025 (Ministry of Economic Affairs and Employment of Finland, 2021) aims to improve the battery sector in Finland. Even though the strategy is not limited to CE it is strongly present in the document. From the technology perspective, the strategy focuses especially on materials and battery systems as well as on the electrification of traffic and heavy machinery. Based on the strategy,

Funded by the European Union

the battery value chain and electrification play central roles in reaching the climate and other environmental targets. From a CE point of view, increasing battery lifetime and material efficiency are the key targets. The goal is that batteries manufactured in Finland will be reliable, their repairability will be developed as well as their life cycle increased by enabling reuse or remanufacturing. According to the strategy, especially reuse will need new business models and digital solutions. As an example, a battery passport is suggested, which would present the product and usage history of any equipment, and in doing so would aid the reusability of the said battery. From the recycling point of view, the current challenge is to get high enough volumes of recycled materials to Finland. In addition, the strategy highlights that CE should be brought into play already in the product development phase and that there is a clear need for increased circular design competence.

Overall, the strategic objectives of the National Battery strategy can be summarized as increasing competitiveness, skills, and responsibility. CE is present in all the objectives, for example, the strategy suggests that investments in CE should be enabled by proper infrastructure, regulation, and logistics. Also, it is seen that sustainability should be used to guide operations, and when combined with traceability solutions, create new business opportunities can be created. Additionally, the need for cooperation between different actors and cross-disciplinary research is highlighted as it can accelerate innovations by combining, for instance, battery, energy, and ICT sectors.

The first *national bioeconomy strategy* of Finland was published in 2014 and due to the updates in the EU's Bioeconomy strategy in 2018, the Ministry of Economic Affairs and Employment set to update the national bioeconomy strategy as well. The new national bioeconomy strategy (Finnish Government, 2022) covers the biowaste and side streams key value chain, but are, however, mainly on forest based bioeconomy. The aim of the strategy is to double the value added of the bioeconomy in an ecologically, socially, and economically sustainable way by 2035. High emphasis is put on research, development, and innovation (RDI) investments and on supporting the commercialization of new innovations in the bioeconomy. The strategy is divided into four specific focus areas (Finnish Government, 2022):

1. Higher added value from the bioeconomy
2. Strong knowledge and technology base
3. Competitive operating environment
4. Usability and sustainability of bioresources and other ecosystem services

The strategy states specific measures, responsible bodies, and key actors for each of the focus areas to guide and ensure their efficient implementation. For example, as measures to increase information and competitive status of the side and waste streams, the strategy lists utilization and development of digital marketplaces as well as regional cooperation to develop a business ecosystem. For these measures, the Ministry of Agriculture and Forestry is nominated as one of the responsible bodies and Natural Resources Institute Finland is one of the key actors, among others. Biowaste and side streams are seen as key components on the path towards sustainable production of high-added value chemicals and products. Added value is sought by developing new raw materials, manufacturing methods, products and services,

Funded by the European Union

increasing processing value and resource efficiency, and utilizing side streams and CE operating models. According to the strategy, reducing the overconsumption of natural resources requires ensuring the sustainability of the raw material base of the bioeconomy and strengthening the utilization of side and waste streams as well as extending the life cycle of products. Digitalization and education are considered to be key factors throughout the document. The impact of the stated measures is to be monitored through statistics and sustainability indicators, such as value-added and investments in the bioeconomy.

The national *Plastics Roadmap 2.0* (Ministry of Environment of Finland, 2022), which is an update on the first national Plastics Roadmap (2018) of Finland. It is coordinated by the Ministry of the Environment and implemented by a cooperation network. The most recent roadmap puts more emphasis on promoting reuse, replacing virgin plastic with recycled plastic, and improving the recyclability of plastic products. It also sets quantitative targets that should be reached and state specific measures for how to reach them. The overall main goal is to ensure the breakthrough of a circular plastics economy in Finland by 2030 by tackling the whole life span of different plastic products. To ensure this, the road map addresses not only plastics recycling-related aspects but also CE as a whole. This is to be done by implementing several specific measures. These are reducing littering and other environmental damage caused by plastics, avoiding unnecessary consumption, and promoting reuse, enhancing plastics recycling, and improving the recyclability of plastic products and replacing fossil-based virgin plastics either with recycled plastic or with renewable materials. Each of these measures encompasses several sub-measures that describe the process in more detail.

To fulfil and follow through with these measures, the roadmap also states a number of specific goals that are to be achieved by 2030 (Ministry of Environment of Finland, 2022):

- Substantial reduction of plastic litter, especially in marine environment.
- Reduce the amount of consumption by 30% and increase reuse.
- Recycling rate of 60% with plastic packaging and start recycling of other plastic products.
- Plastic packaging to be made fully recyclable or reusable and improve recyclability and reusability of other plastic products.
- 30% of recycled plastic content in new plastic products in several product groups.
- Lead the way in recyclable products made of renewable materials and in plastic-free materials for specific purposes.

The progress towards the stated goals is to be measured quantitatively. For example, the amount of single-use plastics is to be lower by 2026 as compared to 2022. Overall, the Ministry of the Environment acts as the main monitoring body for the implementation of the roadmap. The program also includes several goals derived from EU-wide and national commitments that support the transition towards a sustainable circular plastics economy. For example, EU waste directives, the directive on single-use plastics (SUPD), CE programs, the plastics strategy, the marine strategy, the chemicals strategy and regulations, legislation on food contact materials and the regulation on the use of recycled plastic in food packaging. On the national level, the Waste Act and waste decrees, Green Deal commitments, the program of measures of Finland’s marine strategy and the national waste management plan, are used as references. The external goals include several cross-cutting measures that are also listed in the

Funded by the European Union

roadmap. To ensure the progress and general direction of the implementation of the Plastics Roadmap 2.0, a program assessment will be conducted at the end of 2025.

Overall, on national level the CE goals and targets in Finland seem to be even more ambitious than what is set on EU level. This is clearly illustrated by the fact that Finland has set to be fully carbon neutral by 2035.

4.1.2 Pirkanmaa

The Pirkanmaa region is located in the South-Western part of Finland. It holds a population of approx. 533 000, of which the majority is located close to the largest city in the region, Tampere (population of approx. 244 000) (Statistics Finland, 2023). On the regional level biogas has its own roadmap called *Pirkanmaa Biogas Roadmap 2030* (Pirkanmaa Centre for Economic Development, Transport and the Environment, 2021). In addition, there is a short general CE strategy called *CE smart Pirkanmaa* (Pirkanmaa Centre for Economic Development, Transport and the Environment, 2023). Overall, from 23 Tampere region municipalities only Tampere city has its own CE plan, 19 Pirkanmaa municipalities are part of the national carbon neutrality network (HINKU) (CANEMURE, 2023) and 13 municipalities have climate or carbon neutrality roadmaps. There are also 7 municipalities that mention CE in their strategy. Pirkanmaa has been selected as one of the Circular Cities and Regions Initiative (CCRI) Pilot Regions, which is founded by the EU as a part of CEAP, focusing on implementation of CE across European regions and cities.

The Biogas Roadmap 2030 (Pirkanmaa Centre for Economic Development, Transport and the Environment, 2021) is for the promotion of Pirkanmaa's biogas production and use until 2030 was prepared in 2020-2021 and the latest update is from spring 2021. The roadmap is supposed to be updated about once a year, but at least in 2022, the update has not been done. The first version of the roadmap was developed by Pirkanmaa Centre for Economic Development, Transport and the Environment (ELY) in cooperation with the stakeholders. The parts of the roadmap briefly describe the current situation in Pirkanmaa in terms of biogas production (years 2019-2020), goals until 2030, and measures to reach the goals. The measures are mainly measures for the next few years (approx. 1-5 years), the implementation of which can be monitored.

Also *CE Smart Pirkanmaa strategy* (Pirkanmaa Centre for Economic Development, Transport and the Environment, 2023) has been developed by Pirkanmaa Centre for Economic Development, Transport and the Environment (ELY). The document is short and describes the CE at a general level. The document's driver is carbon neutrality, but it does not mention any linkages to higher-level national or EU strategies. Any specific targets are not mentioned. Overall, the strategy aims to improve the nutrient cycle, circular industry flows, usage of renewable energy and recycling. The strategy lists some actions such as

Funded by the European Union

the biogas network Pirkabio and a strong focus on recycling of batteries as well as municipal and packaging waste.

4.1.2.1 Tampere

Tampere city published their CE plan in 2022. The main themes for the plan are land use and land transfer, material cycles and waste management, as well as a sustainable food system. The horizontal themes that are linked to all main themes are procurement, sharing services, education, and digitalization. The most visible value chains are bio and plastic waste. The plan emphasizes reduction of the amount of waste and one of its targets is to develop waste management. The development includes improvement of sorting and recycling as well as reduction of the amount of biowaste in mixed waste. The importance of nutrient cycling and reducing food waste are highlighted (Tampere city, AFRY Finland, 2022).

4.2.1 Uusimaa

The Uusimaa region is located on the South coast of Finland and holds a population of approx. 1 737 000. The majority of the population lives in the urban area surrounding the capital Helsinki, which has a population of approx. 665 000 (Statistics Finland, 2023). The CE is a vital part of the region's carbon neutrality goals and measures in Uusimaa. CE is supported by regional programs and actions, the most important of which is the Helsinki-Uusimaa Circular Valley (Helsinki-Uusimaa Circular Valley, 2022). Uusimaa has three main strategic documents for the CE: *Well Ahead – Helsinki-Uusimaa Regional Programme 2022-2025* (Helsinki-Uusimaa Regional Programme, 2021), *Helsinki-Uusimaa Regional Climate Roadmap* (Helsinki-Uusimaa Regional Council, 2022) (Helsinki-Uusimaa Regional Council, 2022) *and Smart specialisation strategy for Helsinki-Uusimaa Region "Resource-wise Helsinki-Uusimaa"* (Helsinki-Uusimaa Regional Council, 2020).

Helsinki-Uusimaa is aiming at climate neutrality by the year 2030, in line with the forerunner municipalities of the region. The Helsinki-Uusimaa Regional Climate Roadmap (Helsinki-Uusimaa Regional Council, 2022) is the guideline for climate work supporting the municipalities and other actors in the implementation of their mitigation goals. A climate neutral CE is one of the 6 climate spearheads of the Helsinki-Uusimaa regional climate roadmap. The goal is to support the region's transition from a linear operating model to a circular model to improve sustainability. CE related to the resource wisdom is the cutting theme in the roadmap work.

The large cities in the Helsinki-Uusimaa region, as well as many smaller municipalities, already have climate and CE action programmes of their own. The regional level paves the way for the municipalities. Currently, 2 of the region's 26 municipalities, Helsinki and Porvoo, have a CE roadmap (City of Helsinki, 2020) (City of Porvoo, 2019). 10 municipalities have a climate, carbon neutrality or resource-wise roadmap e.g., Järvenpää, Kerava, Kirkkonummi. The CE is almost always part of these roadmaps. In addition, 10 municipalities belong to the national carbon neutrality network (HINKU) (HINKU, 2022).

Funded by the European Union

The cities Helsinki, Espoo and Vantaa are also committed to the CE green deal (Ministry of the Environment, Finland, 2022). Green Deal is a voluntary fixed-term agreement by which solutions are sought to climate challenges, loss of biodiversity, overconsumption of natural resources and promotion of a CE. With the help of the green deal, the participating actors identify the most effective CE actions in terms of their operations. The information generated during the preparation is used by them in the development of work and decision-making. Helsinki-Uusimaa has been also selected as one of the CCRI Pilot Regions.

In general, the key value chains of the TREASoURcE project have been discussed very little in the strategies, roadmaps, and action plans of the Helsinki-Uusimaa region and its municipalities. The measurable goals are usually set for carbon neutrality. The exception is plastic, which has been selected as one of the Circular Valley key areas (Helsinki-Uusimaa Circular Valley, 2022). The plastic theme has also been discussed in some municipal programs.

4.2.1.1 Helsinki

City of Helsinki has a *Roadmap for Circular and Sharing Economy* (City of Helsinki, 2020) but overall the CE actions are spread to many divisions, for example, *Carbon neutral Helsinki emission reduction program* (Helsinki, 2022) collects a wide range of different action plans that are under different agencies and actors. Helsinki has committed to the regional climate change plans and strategies and in Helsinki, the climate work is conducted by Helsinki Region Environmental Services HSY, for example, *Sustainable city life program* (HSY, 2020).

4.2 Denmark

Denmark has a long track record of environmental protection and for working with green solutions and technologies (The Ellen MacArthur Foundation, 2015; Magazzino, Mele, Schneider, & Sarkodie, 2021). It has been a frontrunner in the OECD on the reduction of waste landfilled, and using incineration with energy recovery, thus viewing waste as an important resource (OECD, 2019). The following section will present a synthesis of 8 analysed documents (presented in Appendix A), where four is linked to CE in general and the last four are specifically aimed at the value chain of plastics and bioeconomy. Therefor will this section first focus on strategies, action plans and roadmaps for CE in Denmark, then draw attention to the three key value chain of TREASoURcE.

4.2.1 National documents

Nationally, the Danish government presents several documents on CE, such as the *Action Plan for Circular Economy* (Ministry of Environment of Denmark, 2021), the *Strategy for Circular Economy* (Ministry of Environment and Food of Denmark; Ministry of Industry, Business and Financial Affairs,

2018), the *Climate Plan for a Green Waste Sector and Circular Economy* (Ministry of Environment of Denmark , 2020)*, Plastic without waste – The Government's plastic action plan* (Ministry of Environment and Food of Denmark, 2018) and the *Action plan for new and sustainable proteins* (Ministry of Environment and Food of Denmark, 2018). At the basis of these documents lies the national *Roadmap for a green Denmark* (The Prime Minister's Office, 2021), which constitutes the government's cross-sectoral roadmap to ensure that Denmark reaches their goal of reducing GHG emissions by 70% in 2030, compared to 1990, which is also reflected in the *Action Plan for CE* and *the Climate Plan for a Green Waste Sector*. (Ministry of Environment of Denmark, 2021; Ministry of Environment of Denmark , 2020)Moreover, strategies, action plans and roadmaps published outside governmental documents have also been included in this analysis, providing a more nuanced picture of the status regarding CE and the key value chains. These documents are *Responsible plastic production – Strategy for the Plastic Industry 2020-2023* (The Danish Plastic Federation, 2020), published by the Danish Plastic Federation, and *Circular economy with a focus on plastics and textiles: A 2030 and 2050 roadmap* (Innovation Fund Denmark, 2021)*,* published by a research and innovation partnership between Danish universities.

Three of the most central documents on CE in Denmark is the *Action Plan for CE,* the *Strategy for CE* and the Danish *Climate Plan for a Green Waste Sector and CE.* These are rather broad in their scopes, covering multiple value chains. Denmark's *Strategy for CE* emphasizes the government's objectives to promote a CE, including better (re)use of resources and waste prevention. It highlights three sections with high potential for CE; the food-, industry-, and construction sector, and presents 15 initiatives within six thematic themes:

- Strengthening companies as the driving force for the CE.
- Supporting CE through data and digitalization.
- Promoting CE.
- Changing consumption patterns.
- Creating well-functioning markets for waste and secondary raw materials and deriving more value from buildings and biomass).

To follow up this strategy, the Danish *Action Plan for CE*, describes Denmark's policy and specific efforts are centred around three focus areas: the environmental and climate burden; biomass and construction; and plastics. It serves as a unifying framework, by presenting 129 initiatives, for the prevention and handling of waste. Moreover, it also contains the government's three visions for CE:

1. Bending the waste curve, meaning, less waste, more resource efficiency, and more reuse.
2. A climate-neutral waste sector by 2030.
3. Reduce the amount of incinerated plastic waste by 80% by 2030, compared to 2020.

These visions are also represented in other policy documents, such as the *Climate Plan,* which constitutes an agreement between eight governmental parties, and set in place to ensure a green and climate-neutral Danish waste sector by 2030, presented through 27 initiatives. It contains eight visions

Funded by the European Union

for CE, centred around a green and climate-neutral waste sector, increased and streamlined waste sorting, more recycling of plastics and a strong recycling sector, less incineration and less import of waste.

Across the national documents EU targets regarding CE act as indicators and are an essential guideline for the Danish government's objectives. Through EU membership, Denmark is obliged to meet EU requirements, for example in recycling and waste reductions, and Denmark's mandatory and indicative targets for waste and resource management are mainly derived from EU directives. EUs ambitions to become climate-neutral by 2050 are highly represented within the analysed documents. Increased Danish participation in European work on circular standards, harmonized framework conditions across EU countries, and international cooperation are important elements in reaching EU targets, thus providing Denmark with the means to realize their goals and ambitions for a CE. The *Climate Plan* (Ministry of Environment of Denmark , 2020) also emphasizes the importance of change in the perception of waste across the EU, accordingly, viewing waste as a more valuable resource. Furthermore, it also presents the need to ensure that EU waste is handled within the EU, and not exported to regions with lower waste handling quality, highlighting Denmark's global responsibility to reduce the strain on natural resources and the CO2 emissions that consumptions entail globally (Ministry of Environment of Denmark , 2020). Moreover, the EU's Strategy on CE and legislative package on CE are lifted in the *Strategy for CE* as important to promote CE in competitiveness, resource productivity and sustainable use of resources. . While placing the EU high on the agenda, the documents also emphasize the importance of UNs Sustainability Goals (SDGs), and point to the S*trategy for CE* as an important contributor in realizing the SDGs, as well as the EUs strategy and action plan for CE.

The *Action Plan for CE*, the *Strategy for CE* and the *Climate Plan for a Green Waste Sector and CE* portray an optimistic future where CE shall become a sustainable growth engine for the "next green business adventure" (Ministry of Environment of Denmark, 2021; Ministry of Environment of Denmark , 2020), and where competitiveness and jobs go hand-in-hand with considerations to nature and environment. Furthermore, the *Strategy for CE* and the *Action Plan for CE* also highlights that Denmark wants to ensure more value from raw material and boost CE development. Innovation is described as vital in transitions towards a CE. Incremental innovations and improvements are needed (for example in design and technical components), but there is also a need for deep transformations. Across the analysed documents, there is a focus on overarching system chance (paradigm shift) across value chains and nationally, there is a need for new (green) business models. However, the *Strategy for CE* and the *Action Plan for CE* illustrate the need for innovation policies to a limited extent, arguing that there is a need for more targeted regulations and highlighting the importance of EU policies in achieving a CE.

4.2.2 Key value chains

The key value chains (plastics, biowaste and side streams and EV batteries) are emphasized differently across Danish strategies, action plans and roadmaps. While plastics are included both in more generic documents, such as the *Action Plan for CE*, the *Strategy for CE* and the *Climate Plan for a Green Waste*

Funded by the European Union

Sector, and in specific documents, such as the *Government's Plastic Action Plan* and the *Strategy for the Plastic Industry*, the value chains of biowaste and EV-batteries are less represented. EV batteries do not yet have a dedicated strategy, action plan or roadmap, but are somewhat included in the national documents on CE. and through EU membership, Denmark is obliged to follow EU regulations on these value chains. The case is almost the same for biowaste, but here the *Action plan for new and sustainable proteins* (Ministry of Environment and Food of Denmark, 2018) give a direction for a sustainable bioeconomy.

Regarding EV batteries, Denmark has, since the mid-00s, extended producer responsibility (EPR) for electronics and batteries, giving the producers and importers the responsibility for handling their products when they become waste (Ministry of Environment of Denmark, 2021). One of the initiatives in the A*ction Plan for CE* is to review the EPR for batteries to better promote environmentally current design and reduce administrative costs. It also highlights a great need for the upcoming EU battery regulation (European Commission, 2022) to support a European circular value chain, making batteries more sustainable throughout their entire life cycle and considering the increased number of electric cars. Denmark will promote that the regulation supports a higher degree of recycling of batteries, increased use of recycled materials and lower the CO2 footprint.

Biowaste is presented as one of six areas of future efforts within the *Action Plan for CE*, suggesting that the government aims to get more value from biomass. There is a focus within the *Action Plan for CE* and the *Strategy for CE* on better recycling of biowaste, including food and garden waste, addressing the potential to recover resources and convert residues from, for example, agriculture, fisheries and food processing, into bio-based materials which can be used and recycled for various purposes, for example, sugar, lignin, methane fat and proteins produced through biorefining to be used in the production of medicine, food and feed, materials and energy. The government also presents in the *Strategy for CE* the desire, in cooperation with businesses, to contribute to creating new market-based value chains focusing on increasing the quality and value of sustainable biomass production. Through the *Action plan for new and sustainable proteins* (Ministry of Environment and Food of Denmark, 2018), the National Bioeconomy panel recommends that a bioeconomy strategy is developed, with clear political targets with the aim to make Denmark a pioneering country within sustainable bioeconomy and optimization of production and use of biological resources in Denmark.

Plastics are lifted as an important area of future efforts by the Danish governments within the *Action Plan for CE*, the *Climate Plan for a Green Waste Sector* and the *Plastic Action Plan*, and through the EU, Denmark is obliged to recycle 50% and 55% of all plastic packaging in 2025 and 2030 (Ministry of Environment and Food of Denmark, 2018). The national *Plastic Action Plan* sets a high focus on less plastic in nature, smarter production and consumption, more cooperation within the value chain, better waste management and more recycling. Moreover, through the plastic strategy published by the Danish Plastic Federation (The Danish Plastic Federation, 2020) and the roadmap on CE with a focus on plastic and textiles, published by Danish Universities (Innovation Fund Denmark, 2021), there is also a goal for

Funded by the European Union

the plastic industry to reuse and recycle all plastics, recovering plastics at the highest possible level and decouple the resource consumption. The government also envisage in the *Plastic Action Plan*, more circular consumption of plastics, meaning that plastic products are designed for reuse and recycling, plastic waste is collected and repeatedly recycles into new products and where plastics only should be used where it is necessary.

Innovation is highlighted in the *Plastic Action Plan* as essential for CE in plastics. Solutions must be found in all parts of the value chain, from plastic manufacturers, product developers, designers, retail, consumers, municipal waste companies, private waste collectors, waste processors and the buyers of recycled plastics for new products. To achieve this, both more circular product design and technical innovations is portrayed as needed, both in terms of incremental improvements and a structural systemic change across the value chain and the Danish economy. The Danish *Action Plan for CE* argue that efforts and activities must be targeted to the value chain segments with the greatest effect and most potential for technology development within Danish companies and export of solutions. However, there are some important barriers to overcome to achieve CE within the plastic value chain in Denmark, such as technological, organizational and regulatory barriers. For example, the *Plastic Action Plan* and the *Climate Plan for a Green Waste Sector* argue that today's economic regulations of the waste sector entail incentives for incineration rather than recycling, which act as an important barrier for increased recycling, reductions of GHG emissions and the transitions to a more efficient CE. On the other side, several drivers are also pushing for a higher degree of CE within plastics, such as the public sector and its role in terms of consumption and as the biggest employer in Denmark, and cooperation within and between value chains .

4.3 Sweden

Swedish documents that outline CE strategies and action plans highlight Sweden`s favourable conditions, particularly in terms of innovation capabilities, to succeed with a CE transition on a national level, as well as having international influence, particularly on the EU level. This section analyses the national strategies and action plans for CE. The national documents include: (1) Circular Economy – Strategy for the transition in Sweden (Government Offices of Sweden, 2020), (2) Circular Economy – Action plan for the transition in Sweden (Government Offices of Sweden, 2021) and (3) Sweden`s action plan for plastics – A part of the circular economy (Government Offices of Sweden, 2022).

4.3.1 National documents

The main goal and ambition of Sweden`s CE strategy is argued to be the articulation of a vision and overarching target which influences direction and guidance for a wide set of actors, including the public sector, industry, research and education as well as civil society and individuals. The CE strategy

Funded by the European Union

document thus has an economy-wide scope, with a main aim to articulate a strategy with the vision to go towards a society with more efficient resource use in non-toxic and circular value streams that replace virgin materials. Several value chains are mentioned in the strategy document, including, but also beyond, plastics, bio and batteries. However, no specific actions, goals or timelines are articulated towards these in the strategy document (Government Offices of Sweden, 2020). Rather the main focus of the strategy is to articulate four focus areas that are seen to enable the fulfilment of the overall CE vision, hence:

1. CE through sustainable production and product design.
2. CE through sustainable consumption and use of materials, products, and services.
3. CE through non-toxic and circular cycles.
4. CE as a driver for business and other actors through actions that foster innovation and circular business models.

While the strategy document does not specify targets and timelines, the CE transition is seen as a tool to reach national and international environmental and climate targets, and the global Agenda 2030 targets. As such, the ambition of the strategy can be interpreted as ambitious, also given that the transition is seen to occur on all levels of society to address the generational target of a society where all major environmental problems are solved (Government Offices of Sweden, 2020).

While the strategy document (Government Offices of Sweden, 2020) outlines a broad vision, the action plan for the CE transition (Government Offices of Sweden, 2021), which builds on the strategy by again focusing on the 4 focus areas, has the aim to provide more specific policies and actions. A key focus of the action plan is to provide the Swedish government's plans for how the work on these 4 areas should proceed. The action plan also specifies more specific targets, which are seen as intermediate targets (ettappemål). On an overall level, the CE action plan is linked to intermediate targets of Sweden's targets for GHG emissions, which should be lowered by 63% (compared to 1990) by 2030, 70% by 2040, net-zero by 2045 and reach negative emissions after 2045. The targets in the action plan also include more specific targets linked to particular areas and value chains. These for instance include; the reduction of food waste (matsvinn) with 20% per capita between 2020 and 2025, as well as targets for plastic packing discussed below. In terms of actions, a diverse set of actions are presented in connection to the four overall focus areas articulated both in the strategy and action plan. These actions range from being oriented towards activities such as the provision of information (demands for producers and informing consumers), bans of certain materials and products (e.g. straws), as well as strengthening wider policy initiatives that also are seen as relevant and enabling to a CE transition (such as "industriklivet" and "klimatklivet") (Government Offices of Sweden, 2021).

The strategy and action plan is focused on the national level, but does relate to EU common rules, and also discusses areas in which Sweden is seen to play an important role on the EU level, such as developing eco-design in a circular direction, the EU textile strategy and contribute overall to development of circular policy frameworks on the EU level (Government Offices of Sweden, 2020; Government Offices of Sweden, 2021). The action plan however also acknowledges that the CE transition is only at its

Funded by the European Union

beginning and that the action plan should be seen as a step along the way, but not the final step – and as such the actions could be seen as mouldable and in need of further development. Indeed, the action plan articulates the need for further policy development and regulatory change, particularly related to modernizing waste regulations, to make the CE transition happen (Government Offices of Sweden, 2021).

Innovation is seen as a central driver and has a central role in all documents, which portrays Sweden as a country with strong innovation capabilities that should be harnessed to enable the CE transition. The strategy and action plan documents highlight the need for innovation across value chains and actors, but in many instances quite focused on technical innovation. In some instances, the documents refer to incremental change, such as changes in product design, but in general, the documents reflect more system-wide change across value chains and sectors. While innovation is seen as necessary across society, the strategy and action plan does emphasise innovation in business and industry (Government Offices of Sweden, 2020; Government Offices of Sweden, 2021). Innovation is thus discussed as an overarching approach to the CE transition, but specific actions to strengthen innovation are also mentioned. Examples of the latter include using Vinnova (national innovation agency) to strengthen capabilities and competencies in advanced digital technologies and business models. Even specific actions such as using RISE (research institute) to gather competencies and resources for dissemination and enabling adaptation of advanced digital solutions, which overall are seen as key enabling technologies in the CE transition are discussed in the CE action plan (Government Offices of Sweden, 2021). Thus, while the document discusses the need for innovation across value chains and actors generically, it does also highlight areas such as digitalization as one type of interlinked path for innovation, amongst others by replacing products with services, making it easier to share and reuse products/services and enable tracking and sharing necessary for a CE transition. Overall, innovation is promoted as central to the CE transition.

4.3.2 Key value chains

While Sweden`s national CE strategy does not present specific actions towards specific value chains, it does highlight waste streams that should be prioritized. These include plastic, textiles, renewable and biobased raw materials, food, construction and buildings, as well as critical metals and materials (Government Offices of Sweden, 2020). The action plan in turn follows up on the strategy document and presents targets related to these prioritized areas, such as those linked to plastic packaging, food waste, construction materials and municipal waste. The overall action plan acknowledges the need to further develop specific actions towards particular waste streams and links this to action plans for specific waste and value streams (Government Offices of Sweden, 2021). Sweden has so far developed an action plan for plastics (Government Offices of Sweden, 2022), with an upcoming bio-economy strategy in progress. Our focus waste streams (plastic, bio and batteries) are emphasised differently in the strategy and action plan. While plastics and bio are mentioned as prioritized waste streams, batteries are discussed in relation

Funded by the European Union

to the wider topic of critical materials and minerals (Government Offices of Sweden, 2020; Government Offices of Sweden, 2021).

Plastics is one of the prioritized waste streams in the national strategy document, which mainly highlights the challenges associated with plastic circularity and waste, but also highlights challenges linked to both reducing use as well as increasing recycling and improving waste sorting (Government Offices of Sweden, 2020). The CE action plan lines out reduction targets for plastics in the area of packaging, where a goal is set to increase the share of recyclable packaging increase by 20% from 2022 to 2026 and 30% from 2022 to 2030. With regard to plastics, the action plan further suggests a set of actions. These include information requirements for producers of certain types of plastics (packaging and disposable products) to guide consumers in how to handle the waste. Furthermore, the CE action plan suggests a plan to ban straws, cups and lunch boxes made of frugolite, as well as products decided to be banned at the EU level. Also, a requirement for use of 30% recycled PET in drinking packages is included in the action plan. The action plan also includes ambitions to work for a global agreement on plastics (Government Offices of Sweden, 2021). Sweden`s action plan for plastics and CE (Government Offices of Sweden, 2022) provides an additional set of targets, which are set with specific reduction targets, percentages of recycled materials used in products and bans of certain plastic products, in addition to a specification of years by which targets should be reached. The plastic action plan also specifies a set of actions, which again are organized in accordance with the 4 main areas developed in the CE strategy. The CE action plan for plastics thus covers production, product design as well as consumption. Overall, the plastic action plan sees sustainable plastic use as a tool to reach SDGs, in part by reducing the need for the production of novel plastic products. Increased lifetime, longer use of individual products, rental systems, systems for recycling as well as design for increased durability are mentioned as key actions, where innovation and novel business models along entire circular flows are seen as important underlying dynamics (Government Offices of Sweden, 2022).

Biowaste is also a prioritized waste stream in Sweden`s CE strategy. With regards to biowaste streams, the strategy document notes the advantage of Sweden`s competencies and infrastructure for a bioeconomy, noting the opportunity to replace fossil products. The strategy document notes the need for recycling but also acknowledges the limitations for instance in terms of fibre wear and tear. The CE strategy document notes the need to develop a national bioeconomy strategy (Government Offices of Sweden, 2020). The CE action plan identifies some specific targets, which include an intermediate target of reducing food waste by 20 percentage points per capita between 2020 and 2025, and 75% of waste from restaurants, retail and households should be sorted and biologically treated by 2023. Additionally, the action plan notes the need for research and innovation that include value creation related to by-products from green and blue bio-economy waste streams, as well as support for infrastructure for the production of biofuels and biogas (Government Offices of Sweden, 2021). A bioeconomy strategy has been commissioned by the Swedish government, with October 2023 as a due date.

Funded by the European Union

While the strategy document does not discuss batteries as a prioritized waste stream, it does prioritize critical materials and minerals, which also are seen as important to batteries, amongst others. The document notes the need for increased circularity but also acknowledges the challenges associated with increased demand in global value chains. The strategy document notes the need for relating CE for batteries to the EU battery directive (Government Offices of Sweden, 2020).

4.4 Norway

In their report on *Closing the Circularity Gap in Norway* (Circle Economy, 2020), the organization Circle Economy concluded that the circularity of Norway as a country was 2.4%, meaning that more than 97% of all resources utilised is not circulated back into the economy. Although criticized for its methodology from Norwegian industries, the report provides a baseline for the CE in Norway. Furthermore, it provides emphasis on the importance of the development of strategies, roadmaps and action plans that can set the course for the transition towards a CE. This section includes the analysis of strategies, road maps and action plans for CE (which can be found in Appendix A) on national, regional and local levels.

4.4.1 National documents

The national documents concerning CE in Norway covered in the analysis are *Norway's strategy for a green, circular economy* (Ministry of Climate and Environment, 2021), the *Norwegian Plastics Strategy* (Ministry of Climate and Environment, 2021), and *Norway's battery strategy* (Ministry of Trade, Industry and Fisheries, 2022). The Norwegian CE strategy (Ministry of Climate and Environment, 2021) lays down the foundation for the Norwegian Governments work for the development of CE in Norway, particularly emphasizing the potential for value creation in Norwegian industries. The strategy thus pays particular attention to value chains where Norway has a competitive advantage and has the largest potential for CE. These are the bioeconomy, process industry, construction, and commodity trade and services. To achieve a transition to a CE the strategy also identifies digitalization across all sectors and collaboration among private and public actors to create data bases as an important aspect of acheiveing CE. Data can contribute to improving CE e.g. through tracing of materials within different industries, but also improve sustainability reporting within sectors. Extended producer responsibility (EPR), making producer accountable for their products at end-of-life, i.e. when they become waste, is also a tool that is identified as an important driver for CE in the Norwegian strategy for CE (Ministry of Climate and Environment, 2021). The vision of *The Norwegian Plastics Strategy* (Ministry of Climate and Environment, 2021) on the other hand is to contribute to a more sustainable value chain for plastics globally, nationally, and regionally. Furthermore, the plastics strategy focuses on the development of circularity across different value chains and industries, e.g. packaging, construction and textiles. *Norway's battery strategy* (Ministry of Trade, Industry and Fisheries, 2022) on the other hand does not provide any direction in terms of setting out broader goals for circularity. Rather, it is aimed towards promoting the advantages for

Funded by the European Union

Norwegian and international commercial actors to invest and set up industrial battery activities in Norway (Ministry of Trade, Industry and Fisheries, 2022, s. 3). The Norwegian government's bioeconomy strategy (The Norwegian Government, 2022) provides three overarching goals to strengthen the country's efforts within the bioeconomy; 1) increase value creation and employment, 2) reduction of GHG, and 3) more efficient and sustainable use of natural resources. In particular, the strategy highlights the role of bioresources as renewable input factors that can replace non-renewable (fossil) input factors in existing industrie, e.g. in the production of bioplastics and batteries. Furthermore, the Norwegian bioeconomy strategy emphasises the importance of minimising and utilising residual raw material and how building cross-sectoral value chains can promote increased circularity through better utilisation of bioresources and new circular solutions.

All three strategies (Ministry of Climate and Environment, 2021; Ministry of Climate and Environment, 2021; Ministry of Trade, Industry and Fisheries, 2022) are oriented towards, and situated within, the EU discourse on CE. According to *Norway's strategy for developing a green, circular economy* (Ministry of Climate and Environment, 2021) the Norwegian government has not set up national goals for reduction of climate gasses or reduction of specific resource usage. However, the Norwegian climate change act has put into law the ambitions of a 50-55% reduction of GHG emissions by 2030, and a 90-95% reduction by 2050 (The Norwegian Ministry of Climate and Environment, 2023). Although not a member country, Norway is committed to the EU vision of a net-zero society by 2050 (European Commission, 2018), and the intermittent milestones on the way there in 2030. Likewise, the Norwegian strategy for a CE is interconnected with the European Green Deal (European Commission, 2019) and EUs action plan for CE (European Commission, 2020). Given the interconnections between battery and automotive manufacturing, the Norwegian battery strategy (Ministry of Trade, Industry and Fisheries, 2022) also highlights the importance of the new EU Battery Regulation (European Commission, Green Deal: Sustainable batteries for a circular and climate neutral economy, 2022), and also the *Fit for 55* package aiming to phase out combustion engines by 2035 (European Commission, 2021). The Norwegian Plastics Strategy (Ministry of Climate and Environment, 2021) on the other hand draws on the EU CE action plan and upcoming regulations on packaging and packaging waste (ref EU doc.) As mentioned above, the Norwegian CE strategy (Ministry of Climate and Environment, 2021) and the Norwegian Plastics Strategy (Ministry of Climate and Environment, 2021) draw on the goals set out on the EU level. Additionally, targets for plastics recycling from household waste and industrial waste is set to 65% by 2030, with both strategies (Ministry of Climate and Environment, 2021; Ministry of Climate and Environment, 2021) conveying targets for recycling of 50% of plastic packaging by 2025 and 55% by 2030. Neither of the two strategies (Ministry of Climate and Environment, 2021; Ministry of Climate and Environment, 2021) are followed up by an action plan that describes and operationalises how to achieve these goals in Norway. The Norwegian Battery Strategy provides 10 actions for the successful development of the Norwegian battery industry, but CE is not a key feature in these action points.

Innovation is thought to be essential to succeed in the transition towards a CE. The plastics strategy (Ministry of Climate and Environment, 2021) and the national strategy for CE (Ministry of Climate and

Funded by the European Union

Environment, 2021) both highlight the need for innovation in the design phase, as 80% of the total emissions of products are decided in the design phase (Ministry of Climate and Environment, 2021). As such, ecodesign, which aims to utilize as little materials as possible and enables recycling when the products are discarded, is identified as important (Ministry of Climate and Environment, 2021), and the EU Ecodesign direct is identified as important in this regard. Business model innovation is also identified as a key contributor to CE, and especially the development of repair functions, which extend products' lifetime, that are more available and affordable is particularly mentioned (Ministry of Climate and Environment, 2021).

4.4.2 Viken county

Viken, was officially formed as a new county on 1 January 2020, merging the previous counties of Akershus, Buskerud and Østfold. Viken consists of 51 municipalities where a population of approx. 1 269 000 is unevenly distributed across highly urbanised and largely rural areas (Statistics Norway, 2023). The county government has endorsed the Sustainable Development Goals (SDGs) as a holistic framework for implementing the Regional Planning Strategy for a Sustainable Viken 2020-2024. Regional planning strategies provide the framework around which policy, strategies and thematic plans should be made. Until either decided repealed, or replaced with new thematic plans and strategies, the inherited plan, and strategies from Akershus, Østfold and Buskerud are still in place.

Viken does not have any dedicated strategies, action plans or road maps for CE, neither in general nor for the key value chains on plastics, EV batteries and biobased waste and side streams. The analysis has therefore focused on documents such as the regional planning strategy for Viken (Viken county, 2020), the regional climate and energy plan (Østfold county, 2019), and the agriculture strategy (Viken county, 2021). Furthermore, we have relied on web pages and additional information on different CE initiatives within the county to provide a just picture of CE within the county.

Overall, the county plans relate to the broader debate on sustainability and sustainable development, identifying SDGs that development within the county should abide by (Viken county, 2020). Additionally, several of the strategies argue that Viken needs to become a net-zero county by 2050 if it is to fulfil the aims of the Paris Agreement and that the road to 2050 includes an 80% reduction of CO2 emissions (compared to 2016 levels) by 2030 for that to be realistic (Østfold county, 2019). As the documents stem from different county constellations, they also build on each other and argue that Viken should be a pioneer county for a CE, working towards increased reuse, recycling and environmentally friendly resource utilization (Viken county, 2020).

Viken county is engaged in Biogass Oslofjord where the aim is to collect and utilize food waste in biogas production (Biogass Oslofjord, u.d.). Biogas is highlighted as a key energy source in the future, with the aim to double the production of biogas and reduce the flaring of biogas by 90% by 2030. The aim is to

Funded by the European Union

have 90% of all energy needs covered by fossil-free or waste-based energy production by 2040 (Østfold county, 2019).

Concerning plastics waste streams the strategies do not provide specific targets or aims for CE for plastics, but the *Regional climate and energy plan for Østfold* (Østfold county, 2019) sets out an aim for a 70% increase in recycling of waste by 2030. We can only make assumptions that this also includes plastics and recycling of plastics.

4.4.3 Fredrikstad municipality

Fredrikstad municipality is located in the South-Eastern part of Norway and has a population of approx. 84 000 (Statistics Norway, 2023). The municipality is currently in the process of developing its own CE strategy, meaning that at the moment there are no CE strategies, road maps or action plans available for analysis. Therefore, we draw information from documents such as the municipal sector plan for climate (Fredrikstad municipality, 2019) and the municipal industry plan (Fredrikstad municipality, 2021) (see Appendix A) and strategy documents for the municipal waste company (FREVAR KF, 2022) to say something about the current status on CE within Fredrikstad municipality.

Fredrikstad municipality has set out goals concerning the recycling of household waste and similar industrial waste, aiming for 60% material recycle from these sources (Fredrikstad municipality, 2019) as a response to EU targets for material recycling. Additionally, the municipality aims to reduce 60% of its climate gas emissions by 2030. Overall, the municipality relates to the international climate agenda, aiming to contribute to Europe becoming a net zero society by 2050. The municipality will contribute to these goals by reducing the consumption of resources, by increasing the public's knowledge and facilitating more reuse, a sharing economy and circular consumption. However, these actions are not further specified. Fredrikstad municipality argues that it has contributed to the CE for years, through energy recovery at a district heating plant operated by FREVAR. One could, however, argue that this is the lowest of possible contributions to a CE, yet a contribution nonetheless if the waste that is being incinerated is not suitable for material recycling.

Regarding innovation, the municipality encourages local businesses involved in developing business initiatives around the CE to avoid being stuck in storage and processing of waste. Fredrikstad encourages businesses to climb in the value chain to secure greater value capture and develop products that are based on high levels of knowledge and competence (Fredrikstad municipality, 2021). The municipality has immediate access to key competence concerning CE and utilization of resources. The industrial area Øra is a national frontrunner concerning CE and industrial symbiosis and hosts the Norwegian Centre for Circular Economy (NCCE – a cluster initiative within the Innovation Norway cluster programme) (NCCE, u.d.).

Concerning the key value chains in the TREASoURcE project, the company HydroVolt (a collaboration between the Norwegian company Hydro (aluminium producers) and Swedish Northvolt (battery

manufacturer)) is located in the Øra industrial park and is the first EV battery recycling company in Norway. Furthermore, the municipal waste company FREVAR handles biowaste from wastewater treatment plants (sludge) and food waste from the local food industry to produce biogas for municipal trucks and buses. FREVAR aims to produce 2.7 million m3 of biogas in the period 2022-2025 (FREVAR KF, 2022).

Concerning plastic, Fredrikstad has an action plan for plastics (Fredrikstad municipality, 2018), where the CE is highlighted as something that local industry should pursue, and take advantage of the Norwegian Centre for Circular Economy (NCCE, u.d.). The action plan identifies some follow-up points for different plastic waste streams, such as plastic waste from agriculture. However, the action plan does not provide any targets concerning e.g. the recycling of plastic waste.

4.5 Estonia

Two main documents at the national level fall under the current analysis of national strategies and roadmaps on the topic of CE - *the White Paper on Circular Economy* (The Estonian Ministry of Environment, 2022) *the National Waste Management Plan 2014–2020* (The Estonian Ministry of Environment, 2014). The analysis also briefly addresses *The Estonian Environmental Strategy 2030* (The Estonian Ministry of Environment, 2007) and *Estonia's 2030 National Energy and Climate Plan (NCEP)* (The Estonian Ministry of Economic Affairs and Communications, 2019) paying attention to the focus areas of the TREASoURcE project.

At the local level, five documents were analysed in the two largest municipalities in Estonia – the city of Tallinn (approx. 454 000 inhabitants) and the city of Tartu (approx. 91 000 inhabitants) (Statistics Estonia, 2023). The local level documents are the following: *Tallinn Waste Management Plan 2022-2026* (Tallinn City Government, 2022), *Tallinn Sustainable Energy and Climate Action Plan 2030* (Tallinn City Government, 2021), *Tartu Waste Management Plan 2020-2024* (Tartu City Government, 2020), *Guidelines for Organising Environmentally Friendly Events* (Tartu City Government, 2022) and *Tartu City Energy and Climate Action Plan* (Tartu City Government, 2021).

4.5.1 National documents

The White Paper (the *White Paper* henceforth) provides the general vision of CE in Estonia, the basic principles as well as the development directions/goals in this realm. Being rather broad in scope, it covers multiple sectors and is not focused on any specific value chain. The White Paper is planned to constitute a basis for the elaboration of further activities in the realm of CE. *The National Waste Management Plan 2014–2020 (the Waste Management Plan* henceforth) describes the most important principles of development in the waste management field and provides indicators together with the expected activities

Funded by the European Union

for the next seven years. The document is still in force in 2023 until the new Waste Management Plan is ready (expected in April 2023). Its main objective is sustainable waste management which considers the hierarchy of waste. Both documents are followed up by Action Plans**.** CE Action Plan is formulated based on development priorities described in *the White Paper* (The Estonian Ministry of Environment, 2023). 10 actions are listed, and the period of implementation and the connection to development priority is defined. The Waste Management Action Plan outlines the necessary activities, the budget items, the responsible entities, and the estimated cost (The Estonian Ministry of Environment, 2014).

The White Paper provides a compressed summary of the global trends that lead to the necessity of CE. It briefly presents the economic and technological changes stimulated by the CE approach (e.g., materials with better properties, electric vehicles, and efficient plus-energy buildings). However, *the White Paper* does not provide a specific national deadline in terms of CE development in Estonia, nor any specific reduction targets. It rather explains the overall strategic framework in Estonia for the development of CE and is hence linked to both national and EU goals. For instance, the development strategy "Estonia 2035" aims for Estonia to be a competitive, knowledge-based society and economy and climate-neutral country by 2050. To achieve this among other things, it is intended to encourage the adoption of environmentally sustainable production and consumption models to increase the recycling of materials and the use of secondary raw materials. *The White Paper* also emphasizes the importance of Green Public Procurement for Estonia. It is stressed that in 2020 procurements constituted almost 1/3 of state budget and hence it is even more important for public authorities to procure public good with minimal negative environmental impact. Both documents are linked to EU strategies and deals that concern CE and national environmental strategies and policies[1]. In addition, *The Waste Management Plan* is based on the analysis of achieved results during 2008-2013 (The Estonian Ministry of Environment, 2014) and the overview of waste management area as of 2014 (The Estonian Ministry of Environment, 2014).

The White Paper elaborates the vision of CE in Estonia, which is the following: “Estonia has a functioning circular system of production and consumption, and we are a smart country leading the transition to circular economy.” (p.18). To achieve this vision, the strategy outlines six development priorities, which are underpinned by strategic actions and the roles of different stakeholders (state, municipality, entrepreneur, individual). The development priorities are the following:

1. Resources are used responsibly and based on demand; resource use is well-considered and waste production is minimized.
2. The business models of Estonian companies are forward-looking and circular.

[1]*The White Paper* is linked to European Green Deal, Circular Economy Action Plan, a European Strategy for Plastics, New Consumer Agenda, EU Chemicals Strategy and others. Except for a few sources, the White Paper is mostly based on EU strategic documents and national development strategies/plans. There are references to Ellen Macarthur Foundation reports and OECD reports, one academic article, CESME White Book on Circular Economy and national websites on environmental information. *The Waste Management Plan* considers different environtmental and national strategies such as „Sustainable Estonia 2021“, „Estonian Environmental Strategy 2030“, and others.

Funded by the European Union

3. The necessary know-how and expertise for implementing CE is ensured and the cooperation between stakeholders and sectors is well-functioning.
4. Functional digital solutions have been created to support the CE and high-quality data for monitoring the situation has been ensured.
5. The CE is well coordinated and there is a supportive legal and economic environment.
6. Environmentally conscious thinking and environmentally friendly behaviour are mainstreamed in the society.

Also, the document outlines the necessity for the creation of a favourable environment to develop CE. The necessary conditions are environmental awareness, cooperation and involvement, smart solutions, systemic and coordinated approach, and up-to-date legal environment. It is stressed that all stakeholders must apply the following principles: needs-based production and consumption; applying the principles of circular design; employing the best possible approach; following the principles of materials' hierarchy; promoting sustainable choices.

The Waste Management Plan foresees three strategic objectives:

1. prevent and reduce the generation of waste, including reducing hazardous waste;
2. recycle or otherwise reuse waste to the maximum extent possible;
3. and reduce the environmental risk arising from waste by, among other things, improving efficiency monitoring and supervision.

Each objective is followed by a list of metrics, base level in 2011 and target level in 2020. Also, lists of measures(actions) are provided to achieve every objective. Whereas the 1st strategic objective is focused on the overall reduction of waste, the 2nd objective talks among others about the share of biodegradable waste in the municipal waste (target level for 2020 – 20%, base level in 2010 – 56%), as well as the share of recycled biodegradable waste in the municipal waste (base level 5% - target level 13%). The measures/actions specific to biodegradable waste include the creation of the collection and handling network for nation-wide biodegradable waste management. Furthermore, plastic packaging constitutes 32% of all packaging waste. The 1st objective connects the increase in the generation of packaging waste with the growth of GDP (should be below 2/3 of GDP growth rate). Also, the 2nd objective states the share of recycled packaging waste in the overall mass of packaging waste (base level 56%, target level 60%). The EV-batteries fall under the general category of batteries and accumulators (more specifically, industrial batteries and accumulators). The 2nd objective of *the Waste Management Plan* also states the share of batteries and accumulators waste in the total mass of waste - base level 33% and target level 45% (as of 2016). No further targets have been established regarding EV-batteries. It can be noted that Estonia has incorporated the EU directive 2006/66/EC (Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC, 2006) into national legislation: the Estonian Governmental Decree (part of the Waste Law) sets the requirements for collecting, returning to the manufacturer, and reusing or disposing waste form batteries (Estonian Government, 2013).

Funded by the European Union

The measures do not address specifically packaging waste or batteries waste but are general in scope: optimization of the collection and handling network of separately collected waste; supporting business that deal with recycling of waste; consistent awareness raising on the topic of waste recycling and reuse; development and maintenance of waste reporting information system.

The Estonian Environmental Strategy 2030 sets the following target regarding waste management: by 2030 waste disposed to landfills shall be decreased by 30% and the harmfulness of waste generated shall be reduced significantly. It also addresses the strategic choice between recovery and disposal of waste, i.e., between the development of reduction and recovery of waste and the disposal of waste. The reduction of waste generation in production activities must be preferred. When the smallest possible waste generation has been achieved, the recovery of the waste must be preferred, as disposal of waste strains the environment. The document also promotes the use of environmentally sustainable biofuels. The same topic is significantly addressed by the *Estonia's 2030 National Energy and Climate Plan (NCEP 2030).* One of the key objectives of NCEP 2030 is ensuring energy security by keeping the rate dependency on imported energy as low as possible. This implies the usage of local fuels as high as possible as well as developing biomethane production. The target for 2030 is renewable energies share of total energy consumption at 42%. This implies also increased use of biofuels in transport. The share of renewable transport fuels is aimed at 14%, which is primarily met by domestic biomethane (production of up to 340GWh of biomethane).

The Estonian Food Waste Prevention Plan (The Estonian Ministry of Environment, 2021) is aiming at reducing food waste and food loss in the entire food supply chain (primary production, food processing and preparation, food retail) both in catering and households. The Plan is the result of incorporation of the EU Waste directive 2008/98/EU (The European Parliament and the Council, 2008) into national legislation and is directly connected to the current Waste Management plan 2014-2020 (extended until 2022) and will be part of the new waste management plan. The Plan outlines six activity areas under which concrete actions are addressed emphasizing the content of the actions, responsible entity, relevant stakeholders and the period of implementation. While the scope of this analysis does not allow to go deep into the descriptions of these actions, the activity areas are worth mentioning. These are:

1. Data collection and mapping of food waste generation amounts.
2. Legislative framework and agreement on regulatory goals.
3. Implementation of effective cooperation.
4. Innovation and scientific and development activities.
5. Promoting the redistribution of food.
6. Continuous awareness raising, informing and training for the realization of goals.

The White Paper as well as *the Waste Management Plan* foresee technological innovation. *The Waste Management Plan* speaks about the introduction of new technologies that contribute to the reduction of waste by allowing certain materials to be treated as by-products instead of waste. It also briefly addresses the need for development of new technologies in the oil shale industry (The Estonian Ministry of

Funded by the European Union

Environment, 2016). *The White Paper* also foresees technological innovation as an integral part of development priorities. For instance, development priority no. 4 speaks about technological innovation, i.e., the functional digital solutions to support the CE and high-quality data for monitoring the situation. The strategic actions in this development area include: 1) creating sharing and collaboration platforms, 2) ensuring interoperability between databases and collaboration platforms, 3) implementation of innovative digital solutions, including those using artificial intelligence. Furthermore, development priority nr 6 foresees social innovation, i.e., the change of individual patterns of behaviour, change of attitudes and values. Change in business models is also mentioned (development priority no. 2): the business models of Estonian companies are forward-looking and circular. Also, development priority no. 3 involves system innovation to some degree: the necessary know-how and expertise for implementing CE is ensured and the cooperation between stakeholders and sectors is well-functioning. As mentioned earlier, the *Estonian Food Waste Prevention Plan* addresses innovation as one of its activity areas. The Plan talks about technological innovation – developing an IT platform aiming at the prevention of food waste and donation of food; system innovation – mapping of new required skills, jobs or services that are needed in connection with the transition to a CE (consideration should be given to the possibility of creating voluntary food waste audits for companies); innovation in research and financial instruments to support innovation and its implementation in the food supply chain.

CE Conferences constitute one method of stakeholder involvement in the development of CE in Estonia. They take place once a year. The conferences provide the opportunity for stakeholders to share best practices and knowledge and discuss the future of CE in Estonia. In total four conferences took place; the last one having been conducted in autumn 2022. From 2020 onwards, different interest groups gather to try to find solutions to problems, find cooperation partners and raise important bottlenecks through joint discussion. The detailed information about the working groups is available on the website of Estonian Ministry of Environment (The Estonian Ministry of Environment, 2023).

4.5.2 Tallinn municipality

Tallinn Waste Management Plan 2022-2026 seeks to set an example in Estonia by moving towards a holistic CE and testing new approaches. The document aims to expand the separate collection of biowaste, promote the collection and handling of textile waste, turn waste centers into CE centers and encourage reuse and repair. The separate collection of biowaste will become compulsory for all properties starting from 1st of June 2023 (Tallinn City Council, 2023). *Tallinn Sustainable Energy and Climate Action Plan 2030 (SECAP)* is a cross-sectoral development document that specifies the strategic goal of the development strategy *Tallinn 2035* (Tallinn City Government, 2020) to achieve climate neutrality by 2050. The document is a comprehensive system of political, economic, technological, educational, and administrative activities in order to reduce GHG emissions by 40% by 2030. One of the main actions is energy production from biowaste and wastewater.

Funded by the European Union

Tallinn Waste Management Plan sets two main targets towards 2026: prevention and reduction of household waste and promoting and increasing separate waste collection and recycling. There are specific reduction targets set for 2026 in comparison to base target level from 2019. The ambition is to increase the share of separate collection and recycling of bio-waste to at least 20% of the total mass of municipal waste to help achieve 55% recycling of municipal waste set by 2025.

Both documents address innovation from different perspectives. The main focus areas in *Tallinn Waste Management Plan* are the advancement of a reuse system for used clothing and textiles, the development of collection and handling of clothing and textile waste and boosting green procurement. *Tallinn Sustainable Energy and Climate Action Plan 2030,* on the other hand, focuses on innovation in the transport/energy sector. Several types of innovation are presented: cost-effective biodiversity monitoring solutions, diversification of waste-sorting options, use of innovative solutions and technological opportunities in buildings, promotion of green offices in municipal buildings, and innovative renovation and construction of buildings.

Tallinn Waste Management Plan includes references to different studies and analysis by Stockholm Environmental Institute, LCA Consulting, TemaNord, Turu-uuringute AS, World Bank and other. The goals of and courses of actions under *Tallinn Sustainable Energy and Climate Action Plan* are based mostly on the basic documents of the Covenant of Mayors and the SECAP guidelines.

Both documents were formulated based on stakeholder involvement. During the preparation of *Tallinn's Waste Management Plan* 43 relevant stakeholders received the draft plan for review, a public hearing was held, and more than 80 points of feedback were given. Also, *Tallinn Sustainable Energy and Climate Action Plan* was consulted with stakeholders from the public sector (both state and municipal level), the private sector and academia between 2017-2021.

4.5.3 Tartu municipality

Tartu Waste Management Plan 2020-2024 (*Tartu Waste Management Plan* henceforth) describes general and technical requirements of waste management in the city of Tartu, aspects related to organized waste transport, collection and handling conditions for waste, which is not included in organized waste transport (including hazardous waste, waste from healthcare and veterinary service providers). The document is based on EU and national regulations and its main focus is on the implementation of measures related to household and packaging waste. *Tartu City Energy and Climate Action Plan* describes the goals and activities of various fields, with which to reduce the negative impact on the environment and climate and to reach climate neutrality by 2050 as a result of joint efforts. It focuses on sustainable modes of travel, emission-free transport fuels (including biofuels), production of renewable energy, as well as reaching a community agreement, where all sectors of society play an important role. Both documents are based on the waste policy principles of the EU.

Funded by the European Union

The following strategic goals are outlined in *Tartu City Energy and Climate Action Plan*: 1) decreasing carbon emissions by 40% (216,320 tonnes per year) by 2030 compared to 2010; 2) stopping the use of non-renewable energy sources in the municipal sector (buildings owned by the city, street lighting, public transport, means of transportation); 3) reaching a new level of production and consumption of renewable energy; 4) adapting to climate change; 5) strengthening cooperation with other European cities in achieving climate neutrality and participating in different European initiatives. *Tartu City Energy and Climate Action Plan* has a small section on waste management. It sets the strategic goals and the main tasks for reducing emissions. The strategic goals regarding waste management are the following:

1. To avoid and reduce waste generation.
2. To recycle waste or reuse it in another way to the maximum extent.
3. To decrease the environmental risk caused by waste, among other things by making monitoring and supervision more efficient.

One of the most important objectives is to decrease the share of mixed municipal waste in the total volume of municipal waste.

The following specific objectives are envisioned by *Tartu Waste Management Plan*: 1) to prevent and reduce waste generation; 2) to recycle waste or otherwise reuse it at the maximum level; 3) to reduce the environmental risk arising from waste, by enhancing, among other things, monitoring, and supervision. The document sets recycling and recovery targets for 2025 and 2030 and Tartu city's waste collection goals for the year 2024. The following goal for 2024 is set by *Tartu Waste Management Plan* regarding the prevention and reduction of waste generation: the amount of collected household waste per person should not exceed 419 kg/year. The share of separately collected household waste in the total mass of household waste is aimed to be 60% by 2024, compared to 53% in 2017. The share of packaging waste in mixed household waste is set at 24% by 2024, compared to 33% in 2017. The share of biodegradable waste in mixed municipal waste is aimed at 20% by 2024 compared to 32% in 2017.

According to *Tartu Waste Management Plan*, it is possible in principle to use the collected biodegradable waste to produce biogas. Currently, composting of the collected biodegradable waste (both garden and kitchen waste) is mainly done at the transfer station. However, the produced compost is not certified, i.e. it is not recycled in the sense of the National Waste Act (The Estonian Parliament, 2004). It also means that compost cannot be sold as a product and can only be passed on to companies that have a waste permit or registration certificate. Today, the material is used, for example, in filling the ground.

Tartu Waste Management Plan addresses 2 types of innovation. Innovation in public procurement implies that the conditions of procurement carried out by the local government should consider the recycling and reuse of waste as an integral part of the process. When conducting environmentally friendly public procurements, it is necessary to keep in mind the prevention of waste generation and the procuring of products and services that promote recycling and reuse. Furthermore, social innovation is addressed as well through the development of recycling centres, on-site composting, raising the awareness of residents

Funded by the European Union

and increased waste sorting, development of waste management centres, and promotion of a circular and repairs-based economy.

Two vision workshops were organized in Tartu to prepare *Tartu City Energy and Climate Action Plan*. Both workshops assembled representatives from more than 60 different fields. The workshops analysed four different future scenarios using the foresight methodology and formulated the vision for Tartu in 2030. The document was also on public display, where everyone could submit proposals.

The Guidelines for Organising Environmentally Friendly Events set out the minimum requirements and recommendations for the conduct of public events. The guidelines rely on the Environmental Strategic Framework for Environmental Activities of Tartu (Tartu 24, Acento). By 2025, a cultural management inventory pool has been created in the municipalities of the Tartu 2024 region, which can be rented and shared with others (decorations, frames for trash cans, dishes and so forth) and enables the organisation of public and cultural events without using single-use solutions. By 2025, environmentally friendly food (organic and local) will be offered and redistributing leftover food from the events has become a norm. By 2025, separate waste collection should be a norm at events (this means that 90% of events have been organized in a way that waste is collected separately). By 2025, more environmentally friendly energy and transportation solutions will be used at events compared to 2022.

On a national level Estonia has *the White Paper on CE*, which provides a rather general vision on how Estonia could develop circular economy. There are six development priorities outlined. *The Action Plan of the White Paper* has a rather brief table (1 page), which connects development priorities to actions and period of implementation. There are no strategies/roadmaps separately for plastics, EV-batteries and biowaste. These types of waste are handled in *the Waste Management Plan* (plastics as part of packaging waste; EV batteries as part of batteries and accumulators waste; and biowaste is addressed as biodegradable waste); however, most on the details and concrete regulations are still on the legislative level (National Waste Act). *The Estonian Environmental Strategy* addresses waste as well and promotes the use of environmentally sustainable biofuels. The usage of local fuels is significantly addressed by the *Estonia's 2030 National Energy and Climate Plan*. Biowaste is hence an important area for Estonia to focus on. This is also the focus area for Tallinn - the separate collection of biowaste will become compulsory for all properties starting from 1st of June 2023. Tartu is currently in progress of development of circular economy strategy.

5. Comparative aspects

The objective of this report is to provide an overview of existing strategies, road maps and action plans for CE in the five countries involved in the TREASoURcE project. As such, the scope of the report is not to compare the different territories, which also would be challenging given the difference in size,

Funded by the European Union

population etc., particularly on the regional and local levels. However, based on the national analyses, we provide some comparative notions to provide some insights into similarities and differences (on a national level) between the five countries.

5.1 Presence of CE policies across the countries

All the Nordic countries have a general national CE strategy, but the countries vary in terms of having action plans that operationalize the aims and visions set out in the strategies, as seen in Table 2. Estonia does not have a dedicated CE strategy but is guided by its White Paper on CE and a very concise CE action plan and there is pending ongoing work to develop a national CE strategy. Norway is the only Nordic country that does not have an action plan for CE, whereas Sweden, Denmark and Finland do. However, the Finnish national CE action plan does not provide a clear-cut list of actions, whereas the Swedish and Danish CE action plans and the Estonian White Paper do provide a more stepwise way forward to achieve CE.

	Finland	Sweden	Norway	Denmark	Estonia
CE strategy	No	Yes	Yes	Yes	No
CE action plan	Yes	Yes	No	Yes	Yes
CE roadmap	Yes	No	No	No	No
Plastic strategy	No	No	Yes	No	No
Plastic action plan	No	Yes	Yes	Yes	No
Plastic roadmap	Yes	No	Yes	No	No
Bio-based waste and side stream/bioeconomy strategy	Yes	No	Yes	No	No
Bio-based waste and side stream/bioeconomy action plan	No	No	No	Yes	No
Battery strategy	Yes	No	Yes	No	No
Battery action plan	No	No	No	No	No

Table 2: Simplified overview of the five countries and their CE strategies, action plans and roadmaps

Regarding the KVCs, plastics is most emphasized in terms of national strategies. As seen in Table 2, Denmark, Finland, Norway, and Sweden all have a national strategy for plastics, whereas only Finland and Norway have a strategy for batteries. For Finland, this battery strategy is tightly connected to CE topics, whereas the Norwegian battery strategy does not have CE as a key feature. Concerning bio waste and side streams, both Finland and Denmark have documents related to this, where Finland provides a

Funded by the European Union

national bioeconomy strategy and Denmark a bioeconomy action plan. Sweden has commissioned a bioeconomy strategy due in 2023. While Estonia does not have specific documents on the KVCs, relevant topics are included in the national waste management plan, which aims to reduce waste and improve recycling and reuse. Concerning action plans to follow up national CE strategies for the KVCs, there is a great variety between the countries. For example, Norway does not have an action plan to follow up the national strategy for plastics, whereas Finland's Plastic roadmap, Denmark's Plastic Action plan and Sweden`s Action Plan for plastic provide concrete steps and measures to work towards increased plastic circularity. We also find that although for example, Finland does not have a corresponding action plan for the national Bioeconomy strategy, the strategy itself provides measures and steps that should be worked with to increase circularity for bioresources.

5.2 Connection to EU

Generally, the national documents on CE in Finland, Norway, Estonia, Denmark and Sweden are tightly connected to the EUs goals and ambitions on CE, where EU targets act as indicators and a baseline for national targets, as well as driving the strategic planning in the five countries. The climate neutrality targets in Denmark and Norway follow the EU targets to reach climate neutrality by 2050, although Norway specifies a bit less ambitious aim, becoming a *low emission society* with a 90-95% reduction in GHG emissions by 2050. However, the goals set by the Finnish and Swedish governments are more ambitious and aim for climate neutrality by 2035 in Finland and negative carbon emissions after 2045 in Sweden. Regarding the KVCs, most countries have used the EU-level targets and goals directly, if such specific goals are stated for each KVC, but some variation can be observed. For example, Denmark has stated that it aspires to a climate-neutral waste sector by 2030, and Finland aims to recycle 60% of its plastics by 2030. Moreover, the UN's SDGs are also driving the transition towards CE in the case countries and are commonly adopted into the national ambitions. For example, in Denmark and Sweden, the national documents put the SDGs high on the agenda, arguing that strategies and action plans act as important tools in achieving the SDGs. Related to the KVCs, the connection to the EU and the SDGs seems to be looser. Regionally and locally, the documents vary in terms of how they refer to national or EU documents. Viken country shares the EU vision of climate neutrality by 2050 and emphasizes the Paris Agreement and SDGs. In Fredrikstad municipality, their municipal industry plan refers to financial instruments on both national and EU targets as important tools for achieving CE. In Estonia, the waste management plans of Tallinn and Tartu refer to national and EU level regulations and strategies and in Finland, Pirkanmaa use the strategies on national and EU level as a background for their own strategies.

Funded by the European Union

5.3 The role of innovation and change in the CE strategies

The emphasis on innovation activities materializes somewhat differently across the countries. Norway, for example, present an indistinct approach to innovation and where in the value chain innovation is to take place, while also highlighting the importance of innovation in CE transitions. The Finish documents are highly innovation-based, with a high priority given to technological and digital innovations. In both Sweden and Denmark, innovation is highlighted as an essential driver for the transition towards CE, highlighting the need for innovation across and within value chains and actors. On a broad level, three aspects of innovation emerge; social, technological and system innovation. Technological innovation, such as new digital and material solutions, are emphasized throughout the countries, however, with different focal points. Finland put a high emphasis on funding allocated to RDI, while Denmark points out circular product design and Norway focuses on technological innovation in general. Moreover, digitalization is lifted as an important means to achieve CE in Finland, Sweden, Norway, and Denmark. In Finland for example, combining data and CE is highlighted as needed for circular solutions, while the Swedish documents underline both the importance of strengthening digital capabilities in business and industry as well as enabling consumers in terms of making it more accessible to share and reuse products/services, and replacing products with services. Moreover, digitalized-enabled tracking is lifted as necessary for CE transitions. Social innovation, such as changes in behaviour patterns, is less emphasized within the countries but is still an important element for CE innovation, emphasized in Denmark, Estonia and Sweden. The Danish documents emphasize that there is a need for substantial changes in consumption patterns to achieve CE. Moreover, system innovation, or deep transformative change, is highlighted within all countries as being important in CE transitions. Here, new business models are needed, and there is a need for legislative change. To achieve this, there is also a need for cooperation and transfer of expertise between sectors and actors, as highlighted in Finland, Denmark and Sweden.

In addition to different types of innovation, transitioning to a CE also warrants more wide-reaching societal change. Yet, this is not as prevalent as innovation in the national strategies. In Finland, societal change is not very much at the centre of strategies and roadmaps. The reason is probably that citizens have not been involved in the processes, especially in the battery and bio side strategies. On the other hand, regarding plastics and the CE in general, citizens are taken into account at some level and the education and need for knowledge is mentioned in all strategies and roadmaps. The needs of the future from the citizens' point of view concern the security of supply and securing a welfare society, taking sustainability aspects into account. In Estonia, societal change is discussed in the White Paper on VCs, which argues that to enable a CE transition it is needed to concentrate on behavioural patterns, changes in attitudes and changes in values. Sweden´s strategies refer in general to system-wide change across VCs and sectors, and do include points related to consumer information, for instance, but remains focused on businesses and industry. Denmark is moving forward with wide change. The need for a broad perspective and dialogue with VC actors is identified, as is the need for systemic innovation and a paradigm shift. New business models, changes in consumption habits, more ecological design, increased use of recycled products and materials, more information and cooperation, as well as technological innovations are

Funded by the European Union

needed to enable the CE transition in Denmark. The Norwegian national CE strategy highlights the needs for change in consumption, and that consumers of all types of goods need to demand more sustainable products and services and change their consumption patterns. For this to happen, the Norwegian CE strategy argues that the industries need to provide sustainable goods and information about the sustainability of these goods, and the consumers need to be motivated to make sustainable choices. Consumers are identified as drivers for the transition towards a more CE, but there is a further need for change. Similar patterns of expectations for wide-reaching change are also found in the Swedish documents, where the four identified key areas ((1) CE through sustainable production and product design, (2) CE through sustainable consumption and use of materials, products and services, (3) CE through non-toxic and circular cycles and (4) CE as a driver for business and other actors through actions that foster innovation and circular business models) crosses different actor groups and sectors.

In relation to innovation and societal change, it is also relevant to lift the R-strategies (see **Error! Reference source not found.**)
presented in the documents, which speaks upon the level of ambition. Throughout the case countries documents, there is a high emphasis on "recycling", which is low on the r-strategy hierarchy. According to (Potting, Hekkert, Worrell, & Hanemaaijer, 2017) higher level or circularity implies fewer resources and less environmental pressure, and it is important to remember that CE goes beyond just recycling. Within the documents, higher-up r-strategies, such as "reduce", "reuse", and "repair" is also given attention, however, it seems these are less highlighted than "recycling".

6. Reflections and takeaways

In this final section we make use of the opportunity to draw out some of the reflections that have come about while working on the analysis of CE documents from the target countries. As such, we do not provide a conclusion in this final section. Rather, we draw up four takeaways that we believe are useful, not only for the continued work within the TREASoURcE project, but also for other research communities, policymakers, and other stakeholders (both private and public) that are working on issues related to realizing the transition towards a CE.

The first takeaway is related to regional cross-border collaborations in the Nordics. We see that in the attempt to achieve a circular plastic, EV battery, and bio-economy in Nordic countries, geography can be a limiting factor. In this report, we have dived into national, regional (sub-national) and local documents promoting or tackling CE. We have not seen considerations for cross-border regional collaboration in the documents analysed for the purpose of this report. Given the challenges that e.g. transportation of waste across long distances within countries and the need for large quantities and continuous inflow of waste materials pose for actors that aim to create value from waste, we believe that cross-border collaboration (e.g. in the Northern parts of Norway, Sweden and Finland) could promote increased circularity.

Funded by the European Union

The second takeaway concerns the implementation of CE strategies, and how to move from static documents to action. Although it is outside the scope of this report to cover the implementation of the analysed strategies, roadmaps, and action plans, we believe that it is relevant to reflect briefly on how the documents provide a way forward in terms of setting out actions that can contribute to the implementation of the visions and aims set out in the documents. Overall, the promotion of actions for implementation seems to intensify as we move from high-level national strategies towards more fixed value chain strategies (e.g. on plastics) or local-level plans. When comparing the studied countries, the higher-level CE strategies are more ambiguous than the value chain-specific strategies or regional and local plans. It seems that there can be a gap in how to operationalise the visions and strategies set out in the national documents, thus making implementation more challenging. The planned CE actions get more tangible, and implementation is more deep-rooted when the action is described in detail and has a measurable target, a responsible entity/body is named, and a timeline is indicated.

The third takeaway is on the promotion of cross-country learning, i.e. how practices among “frontrunners” in CE can provide guidance for countries that are in the early stages of trying to catch up. There are several issues of CE management where current arrangements need improvements (for example how the CE national plans are transferred into actions at the municipal or citizen level, how the models of citizen and stakeholder engagement are implemented, how biogas feedstock deliveries are organised, etc.). In such cases, cross-country and cross-municipality learning of “best practices” may provide valuable insights. Nordic countries have a strong tradition of cross-country collaboration on “best practices” that has delivered excellent results in many fields. Baltic states have often followed the suit from Nordic practices, but in recent years they have also been included in such collaboration platforms as partners. Such a Nordic-Baltic collaboration on policy implementation and regulatory affairs can provide the next level also in the implementation and delivery of CE policies.

7. REFERENCES

Biogass Oslofjord. (n.d.). *About Us*. Retrieved February 17, 2023, from https://biogassoslofjord.no/english/

Bowen, G. A. (2009). Document Analysis as a Qualitative Research Method. *Qualitative research journal*(2), pp. 27-40.

CANEMURE. (2023, 1 31). *Hiilineutraalisuomi*. Retrieved from Hinku-kunnat: https://www.hiilineutraalisuomi.fi/fi-fi/hinku/hinkukunnat

Chizaryfard, A., Trucco, ,. P., & Nuur, C. (2021). The transformation to a circular economy: framing an evolutionary view. *Journal of Evolutionary Economics, 31*(2), 475-504. doi:https://doi.org/10.1007/s00191-020-00709-0

Circle Economy. (2020). *The Circularity Gap Report - Norway. Closing the Circularity Gap in Norway.* Amsterdam: Circle Economy.

City of Helsinki. (2020). *The City of Helsinki's Roadmap for Circular and Sharing Economy.* Helsinki: City of Helsinki/ Urban Environment Division / Environmental Services.

City of Porvoo. (2019). The City of Porvoo Circular economy roadmap. Porvoo: Yolanda Potrykus, Posintra Oy.

Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC. (2006). Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32006L0066

Estonian Government. (2013). Requirements and procedures for collecting, returning to the manufacturer, and reusing or disposing of waste from batteries and accumulators, as well as target numbers and deadlines. Retrieved from https://www.riigiteataja.ee/akt/115102013005?leiaKehtiv

European Commission. (2018). *A Clean Planet for All—A European Strategic Long-Term Vision for A Prosperous, Modern, Competitive and Climate Neutral Economy (COM (2018) 773 Final).* Brussels, Belgium: European Commission.

European Commission. (2019). *Communication from the commission: The European Green Deal* (Vol. COM(2019) 640 final). European Union: European Commission. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1576150542719&uri=COM%3A2019%3A640%3AFIN

European Commission. (2020). *A new Circular Economy Action Plan. For a cleaner and more competitive Europe. COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS.* Brussels: European Commission. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN

European Commission. (2021). *'Fit for 55': delivering the EU's 2030 Climate Target on the way to climate neutrality.* European Commission.

European Commission. (2022). *Green Deal: Sustainable batteries for a circular and climate neutral economy*. Retrieved from https://ec.europa.eu/commission/presscorner/detail/en/ip_20_2312

European Environment Agency. (2016). *Circular economy in Europe. Developing the knowledge base.* Luxembourg: European Environment Agency. doi:10.2800/51444

Finnish Government. (2022). *The Finnish Bioeconomy Strategy - Suomen biotaloustrategia.* Helsinki: Finnish Government.

Fredrikstad municipality. (2018). *Action plan for plastics 2018-2022 (Handlingsplan Plast 2018-2022).* Fredrikstad municipality.

Fredrikstad municipality. (2019). *Municipal sector plan for climate 2019-2030 (Kommunedelplan for klima 2019-2030).* Fredrikstad municipality.

Fredrikstad municipality. (2021). *Industry plan for the municipality of Fredrikstad 2021-2025 (Næringsplan for Fredrikstad kommune 2021-2025).* Fredrikstad municipality.

FREVAR KF. (2022). *Action plan for FREVAR KF 2022-2025 (Handlingsplan FREVAR KF 2022-2025).*

Funded by the European Union

Government Offices of Sweden. (2020). *Circular Economy – Strategy for the transition in Sweden.* Stockholm: Government Offices of Sweden.

Government Offices of Sweden. (2021). *Circular Economy – Action plan for the transition in Sweden.* Stockholm: Government Offices of Sweden.

Government Offices of Sweden. (2022). *Sweden`s action plan for plastics – A part of the circular economy.* Stockholm: Government Offices of Sweden.

Helsinki. (2022). *Hiilineutraali Helsinki -päästövähennysohjelma.* Helsinki: Helsinki.

Helsinki-Uusimaa Circular Valley. (2022). *Helsinki-Uusimaa Circular Valley really kicking off*. Retrieved 12 2022, from https://uudenmaanliitto.fi/en/helsinki-uusimaa-circular-valley-really-kicking-off/

Helsinki-Uusimaa Regional Council. (2020). *Smart specialisation strategy highlights resource wisdom*. Retrieved 12 2022, from https://uudenmaanliitto.fi/en/development-and-planning/smart-specialisation-strategy-for-the-helsinki-uusimaa-region/

Helsinki-Uusimaa Regional Council. (2022). *Helsinki-Uusimaa an EU pioneer region in climate change adaptation*. Retrieved 12 2022, from https://uudenmaanliitto.fi/en/helsinki-uusimaa-an-eu-pioneer-region-in-climate-change-adaptation/

Helsinki-Uusimaa Regional Council. (2022). *Regional Climate Roadmap is guiding climate actions*. Retrieved 12 2022, from https://uudenmaanliitto.fi/en/development-and-planning/helsinki-uusimaa-regional-climate-roadmap/

Helsinki-Uusimaa Regional Programme. (2021). *Well Ahead set out as vision of Regional Programme*. Retrieved 12 2022, from https://uudenmaanliitto.fi/en/development-and-planning/helsinki-uusimaa-regional-programme/

HINKU. (2022). *Hinku network - Towards Carbon Neutral Municipalities*. Retrieved 12 2022, from https://www.hiilineutraalisuomi.fi/en-US/Hinku

HSY. (2020). *Kestävän kaupunkielämän ohjelma.* Helsinki: Helsingin seudun ympäristöpalvelut - kuntayhtymä.

Innovation Fund Denmark. (2021). *Circular economy with a focus on plastics and textiles: A 2030 and 2050 Roadmap.* Innovation Fund Denmark. Retrieved from https://innovationsfonden.dk/sites/default/files/2021-08/Appendix%206%20_%201112-00007A%20-%20Circular%20economy%20with%20a%20focus%20on%20plastics%20and%20textiles%20A%202030%20%26%202050%20Roadmap.pdf

Johansen, M. R., Christensen, T. B., Ramos, T. M., & Syberg, K. (2022). A review of the plastic value chain from a circular economy perspective. *Journal of Environmental Management, 302, Part A*. doi:ttps://doi.org/10.1016/j.jenvman.2021.113975

Kirchherr, J., Piscicelli, L., Bour, R., Kostense-Smit, E., Muller, J., Huibrechtse-Truijens, A., & Hekkert, M. (2018). Barriers to the Circular Economy: Evidence From the European Union (EU). *Ecological Economics, 150*, 265-272. doi:https://doi.org/10.1016/j.ecolecon.2018.04.028

Kirchherr, J; Reike, D; Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation & Recycling, 127*, 221-232. doi:10.2139/ssrn.3037579

Magazzino, C., Mele, M., Schneider, N., & Sarkodie, S. A. (2021). Waste generation, wealth and GHG emissions from the waste sector: Is Denmark on the path towards circular economy? *Science of The Total Environment, 775*(1), 142510. doi:https://doi.org/10.1016/j.scitotenv.2020.142510

Funded by the European Union

Mazzucato, M. (2016). From Market Fixing to Market-Creating: A New Framework for Innovation Policy. *Industry and Innovation*.

Miedzinski, M., Mazzucato, M., & Ekins, P. (2019). *A framework for mission-oriented innovation policy roadmapping for the SDGs: The case of plastic-free oceans.* Working Paper Series (IIPP WP 2019-03), UCL Institute for Innovation and Public Purpose. Retrieved from https://www.ucl.ac.uk/bartlett/public-purpose/publications/2019/jun/framework-mission-oriented-innovation-policy-roadmapping-sdgs

Miedzinski, M., McDowall, W., Fahnestock, J., Rataj, O., & Papachristos, G. (2022). Paving the pathways towards sustainable future? A critical assessment of STI policy roadmaps as policy instruments for sustainability transitions. *Futures, 142*, 103015. doi:https://doi.org/10.1016/j.futures.2022.103015

Ministry of Climate and Environment. (2021). *Norway's strategy for developing a green, circular economy (Nasjonal strategi for ein grøn, sirkulærøkonomi).* Oslo: Ministry of Climate and Environment.

Ministry of Climate and Environment. (2021). *Norway's Plastic Strategy (Noregs Plaststrategi).* Oslo: Ministry of Climate and Environment.

Ministry of Economic Affairs and Employment of Finland. (2021). *National Battery Strategy 2025 - Kansallinen akkustrategia 2025.* Helsinki: Ministry of Economic Affairs and Employment of Finland.

Ministry of Environment and Food of Denmark. (2018). *Action plan for new and sustainable proteins – follow up on recommendations from the National Bioeconomy Panel (Handlingsplan for nye bæredygtige proteiner – opfølgning på anbefalinger fra Det Nationale Bioøkonomipanel).* Copenhagen: Ministry of Environment and Food of Denmark. Retrieved from https://mim.dk/media/216689/18_handlingsplanforproteiner__.pdf

Ministry of Environment and Food of Denmark. (2018). *Plastic without waste – The Government's plastic action plan (Plastik uden spild – Regjeringens plastikhandlingsplan).* Copenhagen: Ministry of Environment and Food of Denmark. Retrieved from https://mim.dk/media/216691/18_ny_regeringens_plastikhandlingsplan_full_version_final_0123-2019.pdf

Ministry of Environment and Food of Denmark; Ministry of Industry, Business and Financial Affairs. (2018). *Strategy for a circular economy (Strategi for cirkulær økonomi).* Copenhagen: Ministry of Environment and Food of Denmark. Retrieved from https://mim.dk/media/216694/strategi_for_cirkulaer_oekonomi.pdf

Ministry of Environment of Denmark . (2020). *Climate Plan for a Green Waste Sector and Circular Economy (Klimaplan for en grøn affaldssektor og cirkulær økonomi).* Copenhagen: Ministry of Environment of Denmark. Retrieved from https://www.regeringen.dk/media/9591/aftaletekst.pdf

Ministry of Environment of Denmark. (2021). *Action Plan for Circular Economy (Handlingsplan for cirkulær økonomi. National plan for forebyggelse og håndtering av affald 2020-2032).* Copenhagen: Ministry of Environment of Denmark. Retrieved from https://mim.dk/media/222902/handlingsplan-for-cirkulaer-oekonomi_0607211338.pdf

Ministry of Environment of Finland. (2022). *Plastic Roadmap 2.0 - Muovitiekartta 2.0.* Helsinki: Ministry of Environment of Finland.

Ministry of the Environment (a). (2021). *Strategic programme to promote a circular economy.* Ministry of the Environment. Retrieved from https://ym.fi/en/strategic-programme-to-promote-a-circular-economy

Ministry of the Environment. (2023, 03 01). *Ilmastolain uudistus*. Retrieved from https://ym.fi/ilmastolain-uudistus

Ministry of the Environment Resolution. (2021). *Government resolution on the strategic programme for circular economy.* Ministry of employment and economy.

Ministry of the Environment, Finland. (2022). *Circular Economy Green Deal - Kiertotalouden Green Deal*. Retrieved 12 2022, from https://ym.fi/kiertotalouden-green-deal

Ministry of Trade, Industry and Fisheries. (2022). *Norway's battery strategy (Norges batteristrategi).* Oslo: Ministry of Trade Industry and Fisheries.

NCCE. (n.d.). *About NCCE (Norwegian Centre of Circular Economy)*. Retrieved February 17, 2023, from https://ncce.no/en/hva-er-ncce/

OECD. (2019). *OECD Environmental Performance Reviews: Denmark 2019.* OECD Environmental Performance Reviews. Paris: OECD Publishing. doi:https://doi.org/10.1787/1eeec492-en

Pirkanmaa Centre for Economic Development, Transport and the Environment. (2021). *Pirkanmaa biogas roadmap 2030 - Pirkanmaan biokaasutiekartta vuoteen 2030.* Tampere: Pirkanmaa Centre for Economic Development, Transport and the Environment (ELY).

Pirkanmaa Centre for Economic Development, Transport and the Environment. (2023, 1 15). *CE Smart Pirkanmaa - Kiertoviisas Pirkanmaa*. Retrieved from Ympäristöviisas Pirkanmaa: https://ymparistoviisas.fi/kiertoviisas/

Potting, J., Hekkert, M., Worrell, E., & Hanemaaijer, A. (2017). *Circular economy: measuring innovation in the product chain.* The Hague: Agency PNA.

Schot, J., & Steinmueller, W. E. (2018). Three frames for innovation policy: R&D, systems of innovation and transformative change. *Research Policy , 47*(9), 1554-1567. doi:https://doi.org/10.1016/j.respol.2018.08.011

Siljander, R., Cederlöf, M., & Skoglund, K. (2022). *Ilmastovuosikertomus 2022.* Ministry of the Environment. Retrieved from http://urn.fi/URN:ISBN:978-952-361-068-2

Sitra. (2019). *Finnish road map to a circular economy 2016-2025.* Sitra. Retrieved from https://www.sitra.fi/en/projects/leading-the-cycle-finnish-road-map-to-a-circular-economy-2016-2025/

Statistics Estonia. (2023, March 23). *POPULATION BY SEX, AGE AND PLACE OF RESIDENCE AFTER THE 2017 ADMINISTRATIVE REFORM, 1 JANUARY* . Retrieved from https://andmed.stat.ee/en/stat/rahvastik__rahvastikunaitajad-ja-koosseis__rahvaarv-ja-rahvastiku-koosseis/RV0240

Statistics Finland. (2023, March 23). *Preliminary population structure by Month, Area and Information*. Retrieved from https://pxweb2.stat.fi/PxWeb/pxweb/en/StatFin/StatFin__vamuu/statfin_vamuu_pxt_11lj.px/table/tableViewLayout1/

Statistics Norway. (2023, March 23). *Areal og befolkning, etter region, statistikkvariabel og år*. Retrieved from https://www.ssb.no/statbank/table/11342/tableViewLayout1/

Statistics Norway. (2023, March 23). *Fredrikstad (Viken)*. Retrieved from https://www.ssb.no/kommunefakta/fredrikstad

Funded by the European Union

Tallinn City Council. (2023). Tallinn's Waste Management Rule. Retrieved from https://www.riigiteataja.ee/akt/410062014054?leiaKehtiv

Tallinn City Government. (2020). Tallinn 2023. Development Strategy. Retrieved from https://strateegia.tallinn.ee/en

Tallinn City Government. (2021). Climate-neutral Tallinn. Tallinn Sustainable Energy and Climate Action Plan 2030. Retrieved from https://www.tallinn.ee/et/media/309750

Tallinn City Government. (2022). Tallinn Waste Management Plan 2022-2026. Retrieved from https://www.riigiteataja.ee/aktilisa/4170/5202/2007/Tallinna%20jaatmekava%202022-2026.pdf

Tampere city, AFRY Finland. (2022). *Tampere city's circular economy pöan - Tampereen kaupungin kiertotaloussuunnitelma.* Tampere: Tampere city.

Tartu 24, Acento. (n.d.). Strategic Framework for Environmental Activities of Tartu. Retrieved from https://media.voog.com/0000/0041/9889/files/Tartu%202024%20Keskkonnategevuste%20strateegia.pdf (In Estonian)

Tartu City Government. (2020). Tartu Waste Management Plan 2020-2024. Retrieved from https://www.riigiteataja.ee/akt/429012020045

Tartu City Government. (2021). Tartu City Energy and Climate Action Plan. Retrieved from https://tartu.ee/sites/default/files/uploads/Linnavarad/SECAP/TartuEnergy2030.pdf

Tartu City Government. (2022). Guidelines for Organising Environmentally Friendly Event. Retrieved from https://media.voog.com/0000/0041/9889/files/Tartu%202024_Guidelines_13.05.2022_eng.pdf

The Danish Plastic Federation. (2020). *Responsible plastic production – Strategy for the Plastic Industry 2020-2023 (Plastproduktion med ansvar – Strategi for Plastindustrien 2020-2023).* Copenhagen: The Danish Plastic Federation. Retrieved from https://plast.dk/wp-content/uploads/2020/08/Plastindustrien_Strategirapport_2020_opslag_f%C3%A6rdig.pdf

The Ellen MacArthur Foundation. (2015). *Potential for Denmark as a circular economy. A case study from: DELIVERING THE CIRCULAR ECONOMY – A TOOLKIT FOR POLICYMAKERS.* Retrieved from https://mst.dk/media/135137/15-11-25-cirkulaer-oekonomi.pdf

The Estonian Ministry of Economic Affairs and Communications. (2019). Estonia's 2030 National Energy and Climate Plan. Retrieved from https://www.mkm.ee/media/7028/download

The Estonian Ministry of Environment. (2007). The Estonian Environmental Strategy 2030. Retrieved from https://envir.ee/en/media/2042/download

The Estonian Ministry of Environment. (2014). The Action Plan 2014-2017 for the National Waste Management Plan 2014-2020. Retrieved from https://envir.ee/media/807/download

The Estonian Ministry of Environment. (2014). The Description of Waste Handling. Retrieved from https://envir.ee/media/811/download

The Estonian Ministry of Environment. (2014). The Fulfilment of Objectives Stated in the National Waste Management Plan 2008-2013. Retrieved from https://envir.ee/media/805/download (In Estonian)

The Estonian Ministry of Environment. (2014). The National Waste Management Plan 2014-2020. Retrieved from https://envir.ee/media/808/download (in Estonian)

Funded by the European Union

The Estonian Ministry of Environment. (2016). National Development Plan for the Use of Oil Shale 2016-2030. Retrieved from https://www.envir.ee/media/4271/download

The Estonian Ministry of Environment. (2021). The Food Waste Prevention Plan.

The Estonian Ministry of Environment. (2022). The White Paper on Circular Economy. Retrieved from https://ringmajandus.envir.ee/sites/default/files/2022-10/Ringmajandus%20valge%20raamat%20%282%29.pdf (in Estonian)

The Estonian Ministry of Environment. (2023). Estonian Circular Economy Action Plan. Retrieved from https://ringmajandus.envir.ee/sites/default/files/2022-12/Eesti%20ringmajanduse%20tegevuskava%202023.pdf

The Estonian Ministry of Environment. (2023). Working groups: meeting and results. Retrieved from https://ringmajandus.envir.ee/et/tooruhmad-kohtumised-ja-tulemused

The Estonian Parliament. (2004). Waste Act. Retrieved from https://www.riigiteataja.ee/en/eli/ee/520012015021/consolide/current

The European Economic and Social Committee. (2019). *Circular economy strategies and roadmaps in Europe: Identifying synergies and the potential for cooperation and alliance building.* Brussel: The European Economic and Social Committee (EESC) . doi:doi:10.2864/554946

The European Parliament and the Council. (2008). Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives.

The Prime Minister's Office. (2021). *Roadmap for a green Denmark (Køreplan for et grønt Danmark).* Copenhagen: The Prime Minister's Office. Retrieved from https://www.regeringen.dk/media/10651/pjece-koereplan-for-et-groent-danmark.pdf

Ulvi, T., Helonheimo, T., Hildén, M., Linjama, J., Pihlainen, S., Riekkinen, V., . . . Seppälä, J. (2022). *Kunnan ilmastosuunnitelman toteuttamisvaihtoehdot ilmastolaissa.* Helsinki: Ympäristöministeriö.

Viken county. (2020). *The road to a sustainable Viken - regional planning strategy 2020-2025 (Veien til et bærekraftig Viken - regional planstrategi 2020-2024).* Viken county.

Viken county. (2021). *Agriculture strategy 2021-2030 for Viken county (Lanbruksstrategi 2021-2030 for Viken fylkeskommune).* Viken county.

Weber, M., & Rohracher, H. (2012). Legitimizing research, technology and innovation policies for transformative change: Combining insights from innovation systems and multi-level perspective in a comprehensive ‘failures’ framework. *Research Policy*.

Ympäristöministeriö . (2022). *Kierrätyksestä kiertotalouteen : Valtakunnallinen jätesuunnitelma vuoteen 2027.* Ympäristöministeriö (Ministry of Environment, Finland). Retrieved from http://urn.fi/URN:ISBN:978-952-361-266-2

Østfold county. (2019). *Regional climate and energy plan 2019-2030 (Regional plan klima og energi 2019-2030).* Østfold county.

Funded by the European Union

8. Appendix A

List of analysed documents

Country	English translation	Strategy name	Territorial focus	Territory addressed	Value chain
Norway	Norway's strategy for developing a green, circular economy	Nasjonal strategi for ein grøn, sirkulær økonomi	National	Norway	All
Norway	Norway's Plastic Strategy	Noregs plaststrategi	National	Norway	Plastic
Norway	Norway's Battery Strategy	Norges batteristrategi	National	Norway	Batteries
Norway	Road map for circular plastic packaging in Norway	Veikart for sirkulær plast emballasje i Norge	National	Norway	Plastics
Norway	Known resources – unknow pssibilities. The Governments bioeconomy strategy	Kjente ressurser – uante muligheter. Regjeringens bioøkonomistrategi	National	Norway	Bioeconomy
Norway	The Road to a sustainable Viken – regional planning strategy 2020-2024	Veien til et bærekraftig Viken – regional planstrategu 2020-2024	Regional	Viken	All
Norway	Countyplan for Østfold – Østfold towards 2050	Fylkesplan for Østfold – Østfold mot 2050	Regional	Viken	All
Norway	Regional climate and	Regional plan for klima og energi 2019-2030	Regional	Viken	All

	energy plan 2019-2030				
Norway	Procurement strategy for Viken county	Anskaffelsesstrategi for Viken fylkeskommune	Regional	Viken	All
Norway	Agriculture strategy 2021-2030 for Viken county	Landbruksstrategi 2021-2030 for Viken fylkeskommune	Regional	Viken	Bio
Norway	Energy Strategy for Viken County's buildings	Energistrategi for Viken fylkeskommune sine bygninger	Regional	Viken	Battery/ Bio
Norway	Municipal sector plan for climate 2019-2030	Kommunedelplan for klima 2019-2030	Local	Fredrikstad	All
Norway	Industry plan for the municipality of Fredrikstad 2021-2025	Næringsplan for Fredrikstad commune 2021-2025	Local	Fredrikstad	All
Norway	Innovation strategy for the municipality of Fredrikstad	Innovasjonsstrategi for Fredrikstad commune	Local	Fredrikstad	All
Norway	Smart Fredrikstad Strategy	Strategi for Smart Fredrikstad	Local	Fredrikstad	All
Norway	Action plan for plastics 2018-2022	Handlingsplan Plast 2018-2022	Local	Fredrikstad	Plastic
Norway	Goal and Strategy plan for FREVAR KF 2018-2022	Mål og strategiplan for FREVAR KF 2018-2022	Local	Fredrikstad	Bio/ Plastic
Norway	Action Plan FREVAR KF 2022-2025	Handlingsplan FREVAR KF 2022-2025	Local	Fredrikstad	Bio/ Plastics
Denmark	Action plan for circular economy	Handlingsplan for cirkulær økonomi	National	Denmark	All

Denmark	Strategy for circular economy	Strategi for cirkulær økonomi	National	Denmark	All
Denmark	Climate plan for a green waste sector and circular economy	Klimaplan for en grøn affaldsektor og cirkulær økonomi	National	Denmark	All
Denmark	Roadmap for a green Denmark	Køreplan for et grønt Danmark	National	Denmark	All
Denmark	Plastic without waste – The Government's plastic action plan	Plastik uden spild – Regjeringens plastikhandlingsplan	National	Denmark	Plastic
Denmark	Responsible plastic production – Strategy for the Plastic Industry 2020-2021	Plastproduktion med ansvar – Strategi for Plastindustrien 2020-2023	National	Denmark	Plastic
Denmark	Circular economy with a focus on plastics and textiles: A 2030 and 2050 roadmap		National	Denmark	Plastic
Denmark	Action plan for new and sustainable proteins – follow up on recommendations from the National Bioeconomy Panel	Handlingsplan for nye bæredygtige proteiner – opfølgning på anbefalinger fra Det Nationale Bioøkonomipanel	National	Denmark	Bio
Finland	Strategic programme to promote a circular economy	Kiertotalouden strateginen ohjelma	National	Finland	All
Finland	National Waste Plan	Valtakunnallinen jätesuunnitelma	National	Finland	All

Finland	Finnish road map to a circular economy 2016-2025	Kiertotalouden tiekartta Suomelle 2016-2025	National	Finland	All
Finland	Critical Move – Finland's roadmap to the circular economy 2.0	Kriittinen Siirto – Suomen Kiertotalouden Tiekartta 2.0	National	Finland	All
Finland	Plastics Roadmap 2.0	Muovitiekartta 2.0	National	Finland	Plastic
Finland	National Battery Strategy 2025	Kansallinen akkustrategia 2025	National	Finland	Battery
Finland	The Finnish Bioeconomy strategy	Suomen biotalous strategia	National	Finland	Bio
Finland	CE Smart Pirkanmaa	Kiertoviisas Pirkanmaa	Regional	Pirkanmaa	All
Finland	Pirkanmaa Biogas Roadmap	Pirkanmaan biokaasutiekartta vuoteen 2030	Regional	Pirkanmaa	All
Finland	Tampere city's circular economy plan	Tampereen kaupungin kiertotaloussuunnitelma	Local	Tampere	All
Finland	Well Ahead set out as vision of Regional Programme	Reilusti edellä – Uusimaa ohjelma 2022-2025	Regional	Uusimaa	All
Finland	Smart specialisation strategy highlights resource wisdom	Uudenmaan älykkään erikoistumisen strategia	Regional	Uusimaa	All
Finland	Helsinki-Uusimaa Regional Climate Roadmap	Hiilineutraali Uusimaa 2030 -tiekartta	Regional	Uusimaa	All

Finland	The City of Helsinki's Roadmap for Circular and Sharing Economy	Helsingin kierto- ja jakamistalouden tiekartta	Local	Helsinki	All
Finland	The City of Porvoo Circular economy roadmap	Porvoon kiertotalouden tiekartta	Local	Porvoo	All
Finland	Carbon neutral Helsinki action program	Hiilineutraali Helsinki -toimenpideohjelma	Local	Helsinki	All
Finland	Sustainable urban life program	Kestävän kaupunkielämän ohjelma	Local	Helsinki	All
Sweden	Circular Economy – Strategy for the transition in Sweden	Cirkulär ekonomi – strategi för omställningen i Sverige	National	Sweden	All
Sweden	Circular Economy – Action plan for the transition in Sweden and	Cirkulär ekonomi – Handlingsplan för omställning av Sverige	National	Sweden	All
Sweden	Sweden`s action plan for plastics – A part of the circular economy	Sveriges handlingsplan för plast - En del av den cirkulära ekonomin	National	Sweden	Plastic
Estonia	White Paper on Circular Economy	Ringmajanduse valge raamat	National	Estonia	All
Estonia	The National Waste Management Plan 2014–2020 (still in force as of March 2023)	Riigi jäätmekava 2014-2020	National	Estonia	All

Estonia	The Estonian Environmental Strategy 2030	Eesti Keskkonnastrateegia aastani 2030	National	Estonia	All
Estonia	The Estonia's 2030 National Energy and Climate Plan (NCEP)	Eesti riiklik energia- ja kliimakava aastani 2030 (REKK 2030)	National	Estonia	All
Estonia	The Estonian Food Waste Prevention Plan	Toidujäätmete tekke vältimise kava	National	Estonia	Bio
Estonia	Tallinn Waste Management Plan 2022-2026	Tallinna jäätmekava 2022–2026	Local	Tallinn	Plastics/bio
Estonia	Tartu Waste Management Plan 2020-2024	Tartu linna jäätmekava 2020-2024	Local	Tartu	Plastics/bio
Estonia	Guidelines for Organising Environmentally Friendly Events	Keskkonnahoidlie sündmuste korraldamise juhend	Local	Tartu	All
Estonia	Climate-neutral Tallinn. Tallinn Sustainable Energy and Climate Action Plan 2030	Kliimaneutraalne Tallinn. Tallinna säästva energiamajanduse ja kliimamuutustega kohanemise kava 2030	Local	Tallinn	Plastics/bio
Estonia	Tartu Energy 20230	Tartu Energia 2030	Local	Tartu	Plastics/bio