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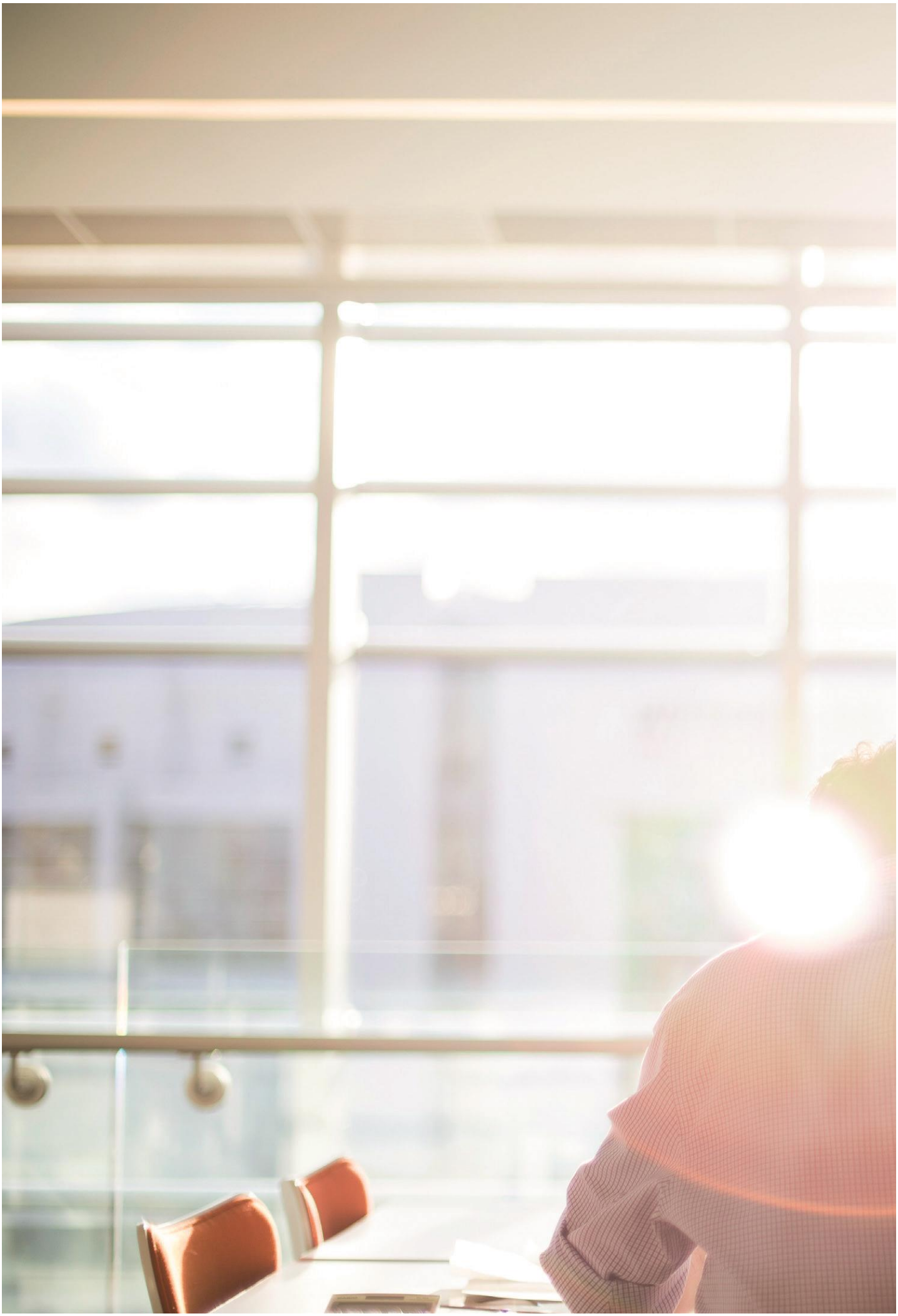
CIRIEC No. 2025/02



Double materiality analysis as a central filter for ESG reporting in Austrian and German municipal utilities

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CIRIEC activities, publications and researches are realised with the support of the Walloon-Brussels Federation, the Walloon Region, the Belgian National Lottery and Belspo.

Les activités, publications et recherches du CIRIEC bénéficient du soutien de la Fédération Wallonie-Bruxelles, de la Région wallonne, de la Loterie nationale belge ainsi que de Belspo.

Abstract

The 2022 Corporate Sustainability Reporting Directive significantly expands the number of companies required to disclose non-financial information, now including many large municipal utilities (MUs) for the first time. The study focuses on 14 Austrian and German MUs and examines the current state, challenges, and opportunities of a double materiality analysis in line with the European Sustainability Reporting Standards (ESRS). Methodologically, the study is based on a qualitative content analysis of 28 sustainability reports. In addition, five expert interviews were conducted with representatives of large Austrian MUs in February 2025. The findings show that only a few pioneering MUs have embedded their highly material topics in their corporate strategy. In other MUs, structured double materiality analyses have been carried out and can be allotted to the Environmental, Social and Governance (ESG) dimensions required by the CSRD. The identification of narrative and quantitative data points and the embeddedness in the strategy process is not yet completed.

The 14 highly prioritized topics of MUs can be divided into three dimensions. The environmental dimension (E) focuses on five key aspects: (1) energy efficiency; (2) (greenhouse gas) emissions; (3) climate protection measures; (4) energy, heating and mobility transition and (5) reliable and high-quality waste disposal. The social dimension (S) also comprises five key topics: (1) health protection; (2) attractiveness as an employer; (3) security of service provision/security of supply; (4) sustainable cities and (5) product responsibility. In the governance dimension (G), four key aspects are very important: (1) compliance and anti-corruption; (2) security and data protection;

(3) industry, innovation and sustainable infrastructure; and (4) efficient operations. There is a clear trend that "ESRS E1: Climate Change", "ESRS S1: Own Workforce" and "ESRS G1: Business Conduct" are of utmost importance for all studied MUs. The range of qualitative and quantitative data points is broad in the analysed MUs. This ranges from estimates of around 200 data points based on the European Financial Reporting Advisory Group (EFRAG) guidelines to MUs that have already defined up to 650 qualitative and quantitative data points for their ESG reporting.

Key challenges include the complexity of Scope 3 emissions accounting, a meaningful stakeholder engagement, and high consultancy costs. Despite regulatory uncertainty and differing levels of ESG maturity, the double materiality process offers strategic potential like corporate resilience or stakeholder trust improvement. Pioneering MUs can serve as benchmarks, while others should leverage best practices. However, policymakers need to address quite soon the uncertainties of an ESG reporting landscape that has been further fragmented by the EU Omnibus I proposal in February 2026 and should provide regulatory clarity.

Keywords: municipal utilities, Austria, Germany, double materiality analysis, ESG reporting
JEL Codes: Q56, H83, M41

Executive Summary

Motivation: With the adoption of the CSRD (Corporate Sustainability Reporting Directive (Directive 2022/2464/EU)), the scope of companies that must report on their sustainability matters has expanded considerably. Regarding state-owned enterprises, on the local government level the CSRD affects large municipal utilities (MUs) to a much greater extent. Many large MUs are first time implementers to disclose non-financial information. Prior to the European Commission's Omnibus I proposal in February 2025, all limited liability corporations meeting two of the three following criteria were subject to the reporting requirements by the 2025 financial year at the latest: at least 250 employees; a balance sheet total exceeding EUR 25 million and revenue surpassing EUR 50 million. The Omnibus I proposal plans to raise the employee threshold to 1,000 employees and postpone the reporting deadline for those companies set to report for the first time in the 2025 financial year.

A key element of the CSRD is the double materiality. The double materiality analysis serves to identify the key topics that are subject to the reporting requirements. The adoption of the European Sustainability Reporting Standards (ESRS) (following the CSRD) has significantly expanded the scope of reportable narrative and quantitative data points. Additionally, there has been a re-organisation along the ESG (environmental, social and governance) dimensions. However, the associated reporting costs have been heavily criticised as a highly bureaucratic endeavour.

Methodological approach and key findings: Within the state-owned enterprises, the study focuses on large MUs as providers of services of general interest. The paper analysis the current status of the double materiality analysis as well as the challenges and opportunities associated with the process of preparing a double materiality analysis in selected Austrian and German MUs. All 14 MUs included in the study have already carried out and published a materiality analysis along the triple bottom-line, i.e., financial, social and environmental sustainability. Methodologically, the study is based on a qualitative content analysis of 28 sustainability reports. The two most recent reports were included for each MU. In addition, five expert interviews were conducted with representatives of large Austrian MUs in February 2025. While a few MUs have already completed their double materiality analysis according to the three ESG dimensions and embedded material topics in their corporate strategy, in most MUs the restructuring of their sustainability reporting process is still in full swing. This leads to a two-speed development. Only the pioneers are proactively integrating ESG matters.

The 14 most important and highly prioritised topics of the MUs can be divided into three dimensions. The environmental dimension (E) focuses on five key aspects: (1) energy efficiency; (2) (greenhouse gas) emissions; (3) climate protection measures; (4) energy, heating and mobility transition; and (5) reliable and high-quality waste disposal. The social dimension (S) also comprises five key topics: (1) health protection; (2) attractiveness as an employer; (3) security of service provision/security of supply; (4) sustainable cities and (5) product responsibility. In the governance dimension (G), four key aspects are important: (1) compliance and anti-corruption; (2) security and data protection; (3) industry, innovation and sustainable infrastructure; and (4) efficient operations. All MUs show a clear trend that "ESRS E1: Climate Change", "ESRS S1: Own Workforce" and "ESRS G1: Business Conduct" are the most highly prioritised ESG reporting categories. The range of qualitative and quantitative data points in the included MUs is broad. This ranges from a rough estimate of around 200 data points in the three thematic fields based on the European Financial Reporting Advisory Group (EFRAG) guidelines to MUs that have already defined up to 650 qualitative and quantitative data points for their ESG reporting.

Challenges and opportunities: A key challenge for all MUs is the complexity of CO_2 accounting, particularly Scope 3 accounting, which is methodologically very demanding. The implementation of ESG reporting incurs considerable consultancy costs in all MUs and the process is very time-consuming. The dialogue with key stakeholder groups required to identify material topics, the so-called "stakeholder engagement process", is by no means trivial. That is also true for carrying out climate risk assessments. Additionally, the Omnibus I proposal (European Commission, 2025) has heightened regulatory uncertainty. This is exacerbated by the fact that the number of data points subject to ESG reporting will probably be reduced. The processes of national implementation of the CSRD have not been completed in Germany or Austria (as of May 2025).

Despite these challenges, significant opportunities exist for all MUs. The double materiality analysis is essential to reduce ESG reporting to the most relevant topics. Furthermore, embedding sustainability within the corporate strategy strengthens reputation management, employer branding and resilience to future regulatory and

market-related changes. To mitigate the risk of greenwashing and to highlight the unique contribution of MUs as providers of services of general interest and thus critical infrastructure, ESG reporting should be seen as an opportunity to make the specific contributions of MUs as highly reliable providers of services of general interest more visible to a broader circle of key stakeholder groups. ESG reporting is systematically linked to the strategy and organisational development processes of those MUs that view ESG requirements as an opportunity. The pioneers among the MUs can serve as benchmarks, while those that are still developing their ESG approach can leverage best practices and external expertise to accelerate their progress.

Practical implications: Most MUs adopt a "keep it simple" approach to ESG reporting to fulfil the requirements with minimal complexity. This reduces the effort involved but harbours the risk of overlooking opportunities. A minimalist approach serves only as a temporary solution. The Omnibus I proposal will reinforce this pragmatic-minimalist approach of most MUs for the time being. Nevertheless, the authors believe that it is essential to embed high-priority topics in the corporate strategy to strengthen corporate resilience and demonstrate the value contribution of the MU as a company providing services of general interest. Proactive MUs have advantages in the transformation of their business model and can use ESG data for strategic repositioning. This is the only way to successfully transform their business model. Policymakers need to address the regulatory uncertainties of an ESG reporting landscape further fragmented by the Omnibus I proposal and should quickly provide regulatory clarity and ensure a level playing field.

List of abbreviations

CO_2	Carbon dioxide
CSRD	Corporate Sustainability Reporting Directive
E	Environmental
EFRAG	European Financial Reporting Advisory Group
ESG	Environmental, Social, Governance
ESRS	European Sustainability Reporting Standards
EU	European Union
RQ	Research question(s)
G	Governance
GRI	Global Reporting Initiative
MU	Municipal Utility
MUs	Municipal Utilities
NGO	Non-Governmental Organisation
S	Social

1. Motivation

In recent years, issues such as social sustainability and climate protection have become increasingly important for for-profit, nonprofits and state-owned companies. Within the latter, the paper focuses on the municipal enterprises. The expectations of key internal and external stakeholders of large municipal companies to disclose their contributions on sustainability matters have increased significantly. Regarding large municipal corporations, this affects numerous large municipal utilities (MUs), which are the focus of this study. As part of the critical infrastructure, they are not only ensuring the provision of public services in a very high reliability but are also important players regarding climate resilience. In order to achieve the European Union's (EU's) ambitious sustainable development targets, MUs face massive challenges in adapting their business model to achieve CO_2 neutrality.

Historically, German and Austrian MUs have a long tradition of being key actors in providing public services. Today, MUs operate in highly regulated markets and have to assert themselves as market participants in competition and fulfil their public mandate, which leads to complex trade-off decisions. In the past, MU's energy division served as a 'cash cow', and was essential for the internal cross-subsidisation of MU's other loss-making/less profitable divisions (e.g. swimming pools, public transport) and at the same time fulfils the city's dividend expectations. Today, however, the energy division faces major, capital-intensive transformation challenges in order to meet the climate neutrality targets.

Compared to private for-profit companies of a similar size, the accountability requirements for state-owned enterprises are significantly more complex, as they have to fulfil a wide range of accountability requirements in addition to corporate financial reporting and, in the case of regulated industries, the sector-specific requirements of the regulatory authorities (Greiling & Schaefer, 2020; Greiling, 2021). Not least due to the membership of politicians from the host municipality on the supervisory boards of the MUs, they are also subject to particular media attention. The topic of integrated sustainability reporting by MUs on financial, environmental and social issues received increased attention at the beginning of the 2010s, before it became clear that the switch from voluntary to mandatory reporting promoted by the European Commission only applied to capital market-oriented companies and financial intermediaries with more than 500 employees. As the studies by Greiling and Grüb (2014) as well as Papenfuß, Grüb and Friedländer (2015) showed, only very few MUs voluntarily prepared a sustainability report at this time.

At the EU level, climate protection was one of the EU Commission's key topics during the first four years of Ursula von der Leyen's presidency.

The 2022 Corporate Sustainability Reporting Directive (CSRD) (Directive 2022/2464/EU) represents a milestone in the disclosure of non-financial information by large companies. Compared to the 2014 Non-Financial Reporting Directive (Directive 2014/95/EU), it requires much more comprehensive reporting on sustainability issues. The CSRD covers all limited liability corporations that fulfil two of the following three criteria: an annual average of more than 250 full-time equivalent employees, a balance sheet total of more than EUR 25 million or revenue of more than EUR 50 million. While 11,600 companies in the EU were subject to reporting requirements under the 2014 Non-Financial Reporting Directive (Directive 2014/95/EU) and its national transpositions, the CSRD has increased the number of companies subject to reporting requirements to 49,000 by lowering the employee threshold to 250 employees and removing the capital market orientation. This covers more than 75% of the turnover of all companies operating in the EU (KPMG, 2022). In 2022, Schuster (2022) estimated that the number of public companies subject to reporting requirements would increase from 3,000 to 18,500 companies, and for the first time also include many MUs.

The CSRD made the principle of double materiality mandatory. Reporting was further developed into ESG (Environmental, Social, Governance) reporting. Material topics must be identified together with important internal and external stakeholder groups and the results documented in a verbal or visualised materiality matrix. The concept of double materiality in connection with ESG reporting plays a key role in the CSRD. The concept of "double materiality" was first formally proposed by the European Commission (European Commission, 2017; 2019) in the guidelines on non-financial reporting. The principle of double materiality requires companies to assess materiality from two perspectives (European Commission, 2017; 2019):

> (1) "to the extent necessary for an understanding of the company's business performance, results and position" and "in the broader sense of the impact on the company's value";
>
> (2) "the environmental and social impact of the company's activities on a broad range of stakeholders".

Double materiality also requires companies to assess the interconnectivity of the two perspectives and requires them to not only assess the environmental and social impact of their business activities on their financial performance (outside-in perspective), but also to consider the impact of their business activities on the environment and society (inside-out perspective). Double materiality also requires companies to identify and transparently disclose risks and opportunities

in connection with sustainable development (Baumüller & Mayr, 2023; KPMG, 2022).

The European Sustainability Reporting Standards (ESRS), which were developed by the European Financial Reporting Advisory Group (EFRAG), specify which specific narrative and quantitative data points are to be reported for the material topics. The European Commission adopted the ESRS on 31 July 2023 and the delegated act on Set 1 of the ESRS was published in the Official Journal of the EU on 22 December 2023. The ESRS contain a large number of data points that are not to be implemented in full. The term data point is misleading, as it is not only about quantitative information but also about verbal descriptions and therefore narrative elements.

Which companies must comply with the CSRD, when, and to what extent has become more ambiguous following 26 February, 2025. On this day, the European Commission presented the Omnibus I proposal, which outlines extensive changes in the areas of the CSRD, supply chain law and EU taxonomy. Key changes regarding the CSRD concern the reduction of the scope of application by increasing the number of employees to 1000 (in full-time equivalents), the postponement of the start of reporting for companies that would have been required to report from 2025 onward or for the first time (so-called wave 2 and wave 3 companies), the reduction of mandatory reporting content and the announcement of the removal of reasonable assurance (European Commission, 2025).

In order to reduce the number of ESG report contents to a manageable level, this study focusses on German and Austrian MUs and examines how they can use the double materiality analysis as a filter to identify the topics that are material to them. In this context, this study addresses the following research questions (RQ):

RQ1: What are the material topics in relation to ESG criteria in Austrian and German municipal utilities?

RQ2: Which stakeholders were involved in identifying the material topics?

RQ3: What are the main challenges and opportunities regarding the double materiality analysis process?

This study is organised as follows: Chapter 2, *ESG reporting and double materiality*, provides an overview of ESG reporting and the concept of double materiality. Chapter 3, *Prior Literature,* presents the previous literature and highlights the need for further research, especially for MUs. Chapter 4 describes the methodology and selection of MUs. Chapter 5 presents the findings of

the documentary analysis and the expert interviews. In Chapter 6, *Conclusions and implications*, the research questions are answered before practical implications and (methodological) limitations are presented.

From an academic perspective, the study makes several contributions to the discourse on the state of ESG reporting in state-owned enterprises. With a focus on German and Austrian MUs, companies that are providing services of general interest, take centre stage. This is the first study to deal with the implementation of double materiality in MUs to determine the material topics for ESG reporting for MUs. Thus, this study assesses how well MUs are prepared to meet the ESRS requirements and highlights which opportunities and challenges are associated with the double materiality analysis for MUs.

2. ESG reporting and double materiality

The CSRD significantly expands the scope of mandatory reporting on sustainability matters. The CSRD aims to establish more extensive reporting requirements than the 2014 Non-Financial Reporting Directive (Directive 2014/95/EU), partly due to the transition from single to double materiality. According to the Global Reporting Initiative (GRI), the definition of material topics is as follows "*Material topics are topics that represent an organisation's most significant impacts on the economy, environment, and people, including impacts on their human rights.*" (GRI, 2021, P. 4).

EFRAG defines double materiality from the perspective of "financial materiality" and "impact materiality". The materiality of impacts includes: "*A sustainability matter is material from an **impact** perspective when it pertains to the undertaking's material actual or potential positive or negative impacts on people or the environment over the short-, medium- or long-term. Impacts include those connected with the undertaking's own operations and upstream and downstream **value chain** including through its products and services as well as through its business relationships. **Business relationships** include those in the undertaking's upstream and downstream **value chain** and are not limited to direct contractual relationships;* (EFRAG, 2024b, ESRS 1 paragraph 43).

For actual negative impacts materiality is based on the severity of the impact while for potential negative impacts it is based on the severity and likelihood of the impact. Severity is based on the following factors: (a) the scale; (b) scope; and (c) the irremediable character of the impact (EFRAG, 2024b, ESRS 1 paragraph 45).

For positive impacts, materiality is based on (EFRAG, 2024b, ESRS 1 paragraph 46):

(a) *the scale and scope of the impact for actual impacts; and*

(b) *the scale, scope and likelihood for potential impacts.* (EFRAG, 2024b, ESRS 1 paragraph 46)

The concept of materiality encompasses both the material impacts of an organisation and its ability to influence sustainability outcomes. The GRI emphasises the importance of issues related to the economy, the environment and human rights, while EFRAG's double materiality approach distinguishes between financial materiality and impact materiality and considers both negative and positive impacts on people and the environment.

The ESRS (Directive 2022/2464/EU), published at the end of 2022, set out what information companies must disclose about their material impacts, risks and opportunities in relation to ESG issues. The ESRS framework provides companies with a structured approach to reporting on their ESG performance, as the following quote shows: "*In particular, the ESRS specify what information a company must disclose about its material impacts, risks and opportunities relating to environmental, social and governance sustainability issues.*" (European Commission, 2023, p. 5). The ESRS consist of 2 general standards and 10 thematic standards. The latter are divided into the categories environmental, social and governance. The requirements are applicable if a sustainability issue is identified as material for the company. The assessment of double materiality increases the complexity of reporting, as it analyses not only the company's impact on society and the environment, but also assesses how social and environmental issues affect the company (KPMG, 2022; EFRAG, 2024a).

Table 1 below provides an overview of the thematic ESRS standards (European Commission, 2023):

Table 1: Thematic ESRS (European Commission, 2023)

Environment	
ESRS E1	**Climate change:** adaptation to climate change, climate change mitigation, energy
ESRS E2	**Pollution:** air pollution, water pollution, soil pollution, pollution of living organisms and food, substances of concern, substances of very high concern, microplastics
ESRS E3	**Water and marine resources:** Water, marine resources
ESRS E4	**Biodiversity and ecosystems:** direct impacts on biodiversity loss, impacts on the status of species, impacts on the extent and status of ecosystems, impacts on and dependencies on ecosystem services
ESRS E5	**Circular economy:** resource inflows, including resource utilisation, resource outflows related to products and services, waste

Social	
ESRS S1	**Own workforce:** working conditions, equal treatment and opportunities for all, other labour-related rights
ESRS S2	**Workers in the value chain:** working conditions, equal treatment and equal opportunities for all, other labour-related rights
ESRS S3	**Affected communities:** economic, social and cultural rights of communities, civil and political rights of communities, rights of indigenous peoples
ESRS S4	**Consumers and end-users:** information-related impacts for consumers and/or end-users, personal safety of consumers and/or end-users, social inclusion of consumers and/or end-users
Governance	
ESRS G1	**Business conduct:** Corporate culture, whistle blower protection, animal welfare, political engagement, supplier relationship management including payment practices, corruption and bribery

The ESRS are divided into a two general and 12 thematic disclosure requirements and more than 1200 narrative and quantitative data points. In the environmental dimension (E), ESRS E1 comprises 12 disclosure requirements with a total of 212 data points, consisting of 98 narrative and 114 quantitative data points. ESRS E2 includes 7 disclosure requirements with 66 data points, consisting of 39 narrative and 27 quantitative points. ESRS E3 comprises 6 disclosure requirements with 48 data points, of which 37 are narrative and 11 are quantitative. ESRS E4 has 8 disclosure requirements and 123 data points, which are highly narrative in nature with 112 narrative and 11 quantitative points. In ESRS E5, there are 7 disclosure requirements with 84 data points, consisting of 55 narrative and 29 quantitative data points (European Commission, 2023; EFRAG, 2024a).

In the social dimension (S), ESRS S1 consists of 19 disclosure requirements with 191 data points, which are divided into 127 narrative and 64 quantitative points. ESRS S2, S3 and S4 each comprise 7 disclosure requirements with 73, 71 and 70 data points respectively. All of them are narrative. Finally, ESRS G1, which deals with corporate governance issues, comprises 8 disclosure requirements with 51 data points, made up of 38 narrative and 13 quantitative points (European Commission, 2023; EFRAG, 2024a).

3. Prior Literature

Although the topic of double materiality is becoming increasingly important in the context of the CSRD, empirical research on the implementation of double materiality is still in a very early stage (e.g., Peteri, 2024; Dragomir et al., 2024; Bossut et al., 2021). In addition, very few studies have analysed the relationship between ESG and materiality in non-financial reporting (e.g. Albuquerque et al., 2024; Rodrigues, 2023; Nielsen, 2023). The majority of studies on ESG performance focus on large, listed companies.

With regard to the state of the empirical literature on sustainability reporting by state-owned enterprises, a systematic literature review by Greiling and Bauer (2023) has shown that most studies assess the quantitative scope of reporting using the Global Reporting Initiative (GRI) guidelines and that sustainability reporting only achieves an overall degree of achievement of less than 50%. The second area of interest is the development of sustainability reporting over time, which shows that the progress made in the disclosure of environmental and social issues lags behind that of the economic dimension (Greiling, 2023; Greiling & Bauer, 2023). In third place are studies that look at the factors that influence the quantitative scope of sustainability reporting and the underlying motives. Factors such as size, stock market listing, age of the company, sector, voluntary external audits, proportion of foreign shareholdings, quality of company management as well as top management and committers as power promoters have a positive effect, as expected (Greiling, 2023).

In the context of double materiality, there have been four studies to date that deal exclusively with state-owned enterprises (Bauer & Greiling, 2022; Ruiz Lozano et al., 2022; Torelli et al., 2020; Farneti et al., 2019). One of the most recent studies examining the topic of materiality in connection with sustainability reporting was conducted by Bauer & Greiling (2022). The authors analysed 63 sustainability reports of German municipal utilities or municipal water companies with regard to material topics on the basis of a GRI evaluation model. The analysis based on the GRI reporting standard showed that sustainability reporting in all three dimensions (environmental, social and economic) still has a lot of room for improvement in terms of the content that the companies have labelled as material in their reports. Reporting on the ecological dimension and the associated material topics is weakest. Municipal water utilities should make more use of reporting as part of active stakeholder and legitimacy management to communicate their environmental, social and financial contributions more proactively. Balanced ESG reporting requires that all three dimensions are given equal weight.

Ruiz-Lozano et al. (2022) evaluate the disclosure of the materiality process in sustainability reports of 166 Spanish state-owned enterprises. The results suggest that the limited disclosure of information about the materiality process is due to the desire of state-owned enterprises to create symbolic legitimacy. Although sustainability reporting has been mandatory for a long time in Spain, few state-owned enterprises carry out a materiality analysis to define the key topics of their sustainability reports. Furthermore, institutional isomorphisms, especially legislative constraints, exert only limited influence on the materiality process (Ruiz-Lozano et al., 2022).

Torelli et al. (2020) analyse the relationship between the application of the materiality principle in non-financial reporting and the stakeholder engagement processes. Methodologically, the study is based on a document analysis involving 152 Italian public sector entities. The analysis emphasises the importance of sector specific factors, the application of the GRI sustainability reporting requirements and the inclusion of key stakeholders in the materiality analysis to increase the quality of sustainability reporting that is aligned with the key information needs of the main stakeholder groups.

Farneti et al. (2019) investigate how disclosure on social issues is influenced by integrated reporting. They focus on a single case study on the state-owned New Zealand Post (Post New Zealand). Methodologically, a content analysis of annual and integrated reports from 2009 to 2017 was conducted on the social dimension, supplemented by two in-depth, semi-structured interviews to investigate changes in disclosure. The results show that integrated reporting promotes a better focus on key stakeholder concerns. While the overall disclosure on the social dimension of sustainability has been reduced, the quality of the information provided has improved due to an improved focus on stakeholder-material topics.

Current research on double materiality and non-financial reporting reveals several research gaps. Although (double) materiality has been included in the GRI Standards and the Integrated Reporting Guidelines since the mid-2010s, albeit on voluntary basis, research on this topic among state-owned enterprises remains limited. No studies focused exclusively on MUs in German-speaking countries. The first studies addressing the implementation of triple bottom line reporting along the economic, environmental and social dimensions of sustainability, exclusively on German and Austrian MUs, were published by Greiling and Grüb (2014) and Papenfuß et al. (2015). Research into the ESG readiness of state-owned enterprises is still in its infancy. To date, only one study has examined materiality in connection with sustainability reporting in MUs (Bauer & Greiling, 2022), despite MU's longstanding importance

as companies providing services of general interest and being a part of the critical infrastructure.

4. Sample selection and research methodology

4.1 Selection of MUs

The selection of relevant MUs was based on city size and sustainability reporting practices. To identify the relevant MUs, the sample was narrowed down to Austrian cities with more than 100,000 inhabitants and German cities with more than 200,000 inhabitants, because these were expected to fall within the scope of the CSRD. MUs in these cities that have published a non-financial report either in the form of a sustainability report or an integrated report were included. Finally, the two most recent non-financial reports per MU were examined for the existence of a narrative or visualised materiality matrix. Selecting the last two non-financial reports was based on two considerations: (1) some MUs only started voluntarily to publish sustainability reports in 2022, and (2) some of the MUs only published their materiality matrix in two reports in total. MUs that published two non-financial report but did not include a materiality analysis in their reports were excluded from the sample. Table 2 provides an overview of the 14 MUs included, nine are from Germany and five from Austria.

Table 2: Overview of the municipal utilities included

No.	Municipal Utility	Region	Number of employees (2023)	Revenue 2023 (€ million)	Total assets (€ million)	Reporting obligation in accordance with CSRD	Analysed reporting years
1	Stadtwerke München[1]	Germany	11.000	9.700	12.837,4	X	2023, 2022
2	Enercity AG Hannover[1]	Germany	3373	9.152	4.580,6	X	2023, 2022
3	Stadtwerke Leipzig GmbH	Germany	747	104	1.328,6	X[2]	2023, 2022
4	ENTEGA AG (Darmstadt)	Germany	800	4.085	1.416,9	X[2]	2023, 2022
5	Stadtwerke Duisburg AG	Germany	1.200	6.600	1.070,64	X	2023, 2022
6	Badenova AG & Co. KG (Freiburg)	Germany	1.451	1.696	2.375,28	X	2023, 2022
7	Dortmunder Energie- und Wasserversorgung GmbH	Germany	1.100	43,37	1.53	X	2023, 2022

No.	Municipal Utility	Region	Number of employees (2023)	Revenue 2023 (€ million)	Total assets (€ million)	Reporting obligation in accordance with CSRD	Analysed reporting years
8	MVV AG[1]	Germany	6.390	7.531	6.028	X	2023, 2022
9	Mainova AG	Germany	3.000	148	2.913,5	X	2023, 2022
10	Linz AG	Austria	3.313	1.399	2.395,07	X	2019, 2021
11	Wiener Stadtwerke	Austria	16.793	6.200	17.710	X	2023, 2022
12	Graz Holding	Austria	3.200	708	1.651,19	X	2023, 2022
13	Innsbrucker Kommunalbetriebe AG	Austria	1.730	372	908,83	X	2023, 2022
14	Stadtwerke Klagenfurt	Austria	1.000	415	308,81	X	2022, 2021

1 Implementer of the non-financial reporting directive from 2014
2 Omnibus threshold of 1000 employees is not reached

4.2 Empirical research methodology

This study employs a two-stage methodological approach. The first step consists of a content analysis according to Mayring (2022). To this end, 28 non-financial reports were analysed in order to answer RQ1 and RQ2. All reports were available in German and English. In a second step, five expert interviews were conducted with representatives of Austrian MUs in February/March 2025 in order to gain an up-to-date insight into how far MUs are in identifying the material ESG topics, what the key data points are and opportunities and challenges associated with the implementation of the double materiality analysis (RQ3).

4.2.1 Documentary analysis

The content analysis focused exclusively on the materiality matrices of 28 non-financial reports. First, reports were searched for relevant content using the keyword "materiality" or "materiality matrix". Second, all material topics identified by the MUs were systematically recorded (for each MU) in an Excel spreadsheet. Finally, these topics were assigned to the corresponding ESG dimensions (environmental, social and governance) and their subcategories in another Excel spreadsheet. This categorisation was used to determine which of the three pillars (E, S or G) were considered most important by

the stakeholder groups involved in the identification of the material topics and how the assessment within the subcategories (E 1 to E 5, S 1 to S 4 and G 1).

Firstly, within the environmental dimension, the topics were categorised according to the ESRS sub-categories: climate change (E 1), pollution (E 2), water and marine resources (E 3), biodiversity and ecosystems (E 4) and circular economy (E 5). Within the social dimensions the same procedure was applied: own workforce (S 1), employees in the value chain (S 2), affected communities (S 3) and consumers and end-users (S 4). Governance topics were analysed based on their focus along the ESRS G1 (Business Conduct). This includes information on key areas such as compliance, innovation and market positioning as well as partnerships and supplier relationships and were inductively assessed and mapped to the different governance categories to ensure a comprehensive understanding. This structured approach enabled a comprehensive analysis of how MUs consider the three ESG pillars in their materiality assessments.

Secondly, as part of the analysis, the ***10 material topics*** that were mentioned most frequently by all MUs were identified. *Thirdly*, the material topics with the highest priority were analysed and also categorised according to ESG. High-priority topics are those considered particularly important by the MUs management board and the involved internal and external stakeholder groups included in the materiality analysis. These topics are explicitly mentioned in the 28 non-financial reports and are often also visually highlighted, e.g., in the top right-hand corner of the materiality matrices, where they reflect high importance for both stakeholder interests and the organisational impact. These assessments and results are presented in Tables 3-6 and Figure 1 (see Chapter 5).

To answer the second research question, the non-financial reports were searched using the keywords "stakeholders" and "stakeholder groups" to identify the most important stakeholder groups. The data for each MU was then analysed in an Excel spreadsheet. In a further step, Figure 2 was created to show the stakeholder groups that were mentioned most frequently by the MUs.

The "four-eyes principle" was applied in the analysis, requiring two study authors to independently code the data before comparing any discrepancies in order to increase the validity and reliability of the findings.

4.2.2 Interviews

In addition, five expert interviews were conducted with ten interviewees from five Austrian MUs in February 2025 (see Table 1). The expert interviews serve to deepen the findings of RQ1 and RQ2 and to answer RQ3. For reasons of anonymity and data protection, the MUs with which the interviews

were conducted are not named. Therefore, these MUs are listed as MU1-MU5 (Table 3).

Table 3: Interview partners

MU	Number of interviewees	Position of the interviewees	Duration of the interview in min.
MU1	2	Managing Director; Sustainability Management	73
MU2	5	Head of Sustainability and Services of General Interest; Sustainability Management; Accounting and Controlling	56
MU3	1	Sustainability management	58
MU4	1	Sustainability management	46
MU5	1	Sustainability management	52

The interview guide contained open questions, focusing on the following topics:

- Current materiality analysis according to ESG criteria
- Data points in the three pillars (ESG: environment, social, governance)
- Challenges and opportunities in the ESG context

The interviews lasted approximately 46 to 73 minutes and were conducted in German, partly in person and partly online via Zoom, and then transcribed.

A qualitative content analysis approach was chosen to analyse the data (based on Mayring, 2022 and Miles et al., 2020). The "four-eyes principle" was also applied. The coding process was carried out using MAXQDA 2022 software and was based on the interview questions. Therefore, the coding is only seductive.

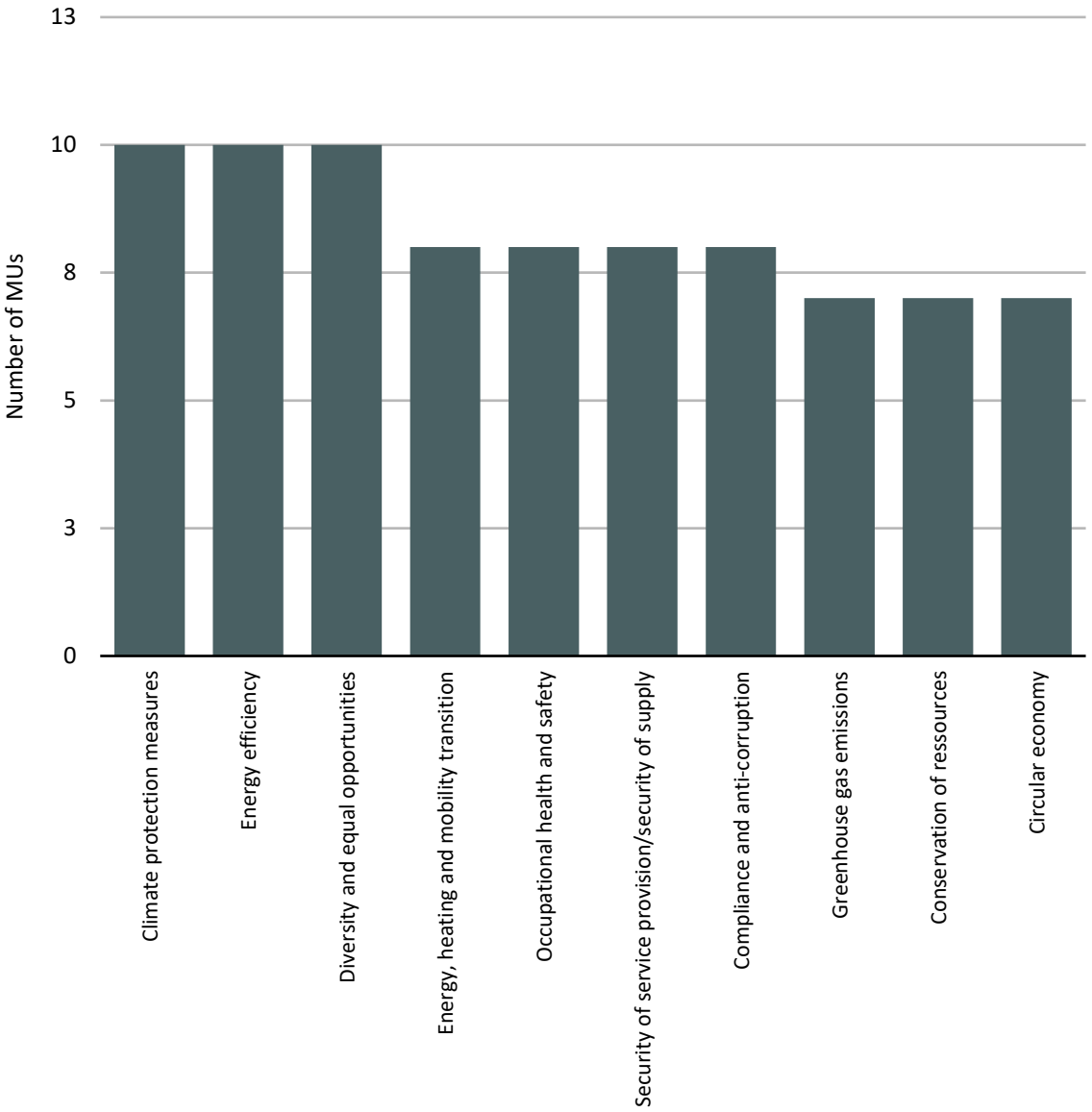
5. Findings

5.1 Material Topics of the Municipal Utilities

The documentary analysis revealed that the MUs categorised several topics as material in their non-financial reporting (Figure 1). Climate action was categorised as material by 10 of the 14 MUs, as were energy efficiency, diversity and equal opportunities. Energy, heat and mobility transition, occupational health and safety, security of service delivery/security of supply, referred to in

the ESRS as safeguarding the service, and compliance with anti-corruption measures were categorised as material by 8 MUs. Greenhouse gas emissions, resource conservation and circular economy are mentioned (as material) by 7 MUs each.

Figure 1: Material topics



5.2 Interview Findings on the Double Materiality Analysis Process

All MUs take ESG criteria into account in their double materiality analysis, although they differ in their approaches. As shown in Table 4, MU1 follows a data-based, analytical approach, while MU4 and MU5 rely heavily on workshops. MU3 uses an external assessment model provided by auditors. In all MUs, the implementation of ESG reporting is a time-consuming and expensive process, particularly with regard to the involvement of technical specialists (e.g., for CO_2 accounting) and consulting firms in the development process. As is usual with quality management approaches, continuous improvement takes place. The early involvement of auditors was also repeatedly emphasised. MU1 is the most advanced in terms of performance indicators. Linking the findings of double materiality with the strategy was described in some cases as a key challenge and in others as essential. Overall, two different speeds are evident in the progress already made.

Table 4: Insights into the development process of the materiality matrix

Municipal Utility	Approach	Methodology
MU1	Very detailed, data-driven approach with 650 data points (500 quantitative and 150 narrative); continuous refinement of the process	Threshold introduced to prioritise key topics; consultation-intensive process
MU2	Clear approach: E1, S1, G1 are most important; performance indicators in progress	Constant internal coordination and involvement of consulting companies
MU3	Strong support from the auditor; use of a rating scale from 1 to 5 in an Excel analysis	Assessment via an Excel tool provided by the auditor
MU4	Workshop with an additional survey as the main analysis tool	Workshop and online survey
MU5	Implementation of impact workshops at Group level and in the subsidiaries; implementation of a financial materiality analysis; differentiation between the hierarchy levels	Workshops at various hierarchical levels (Group and subsidiaries)

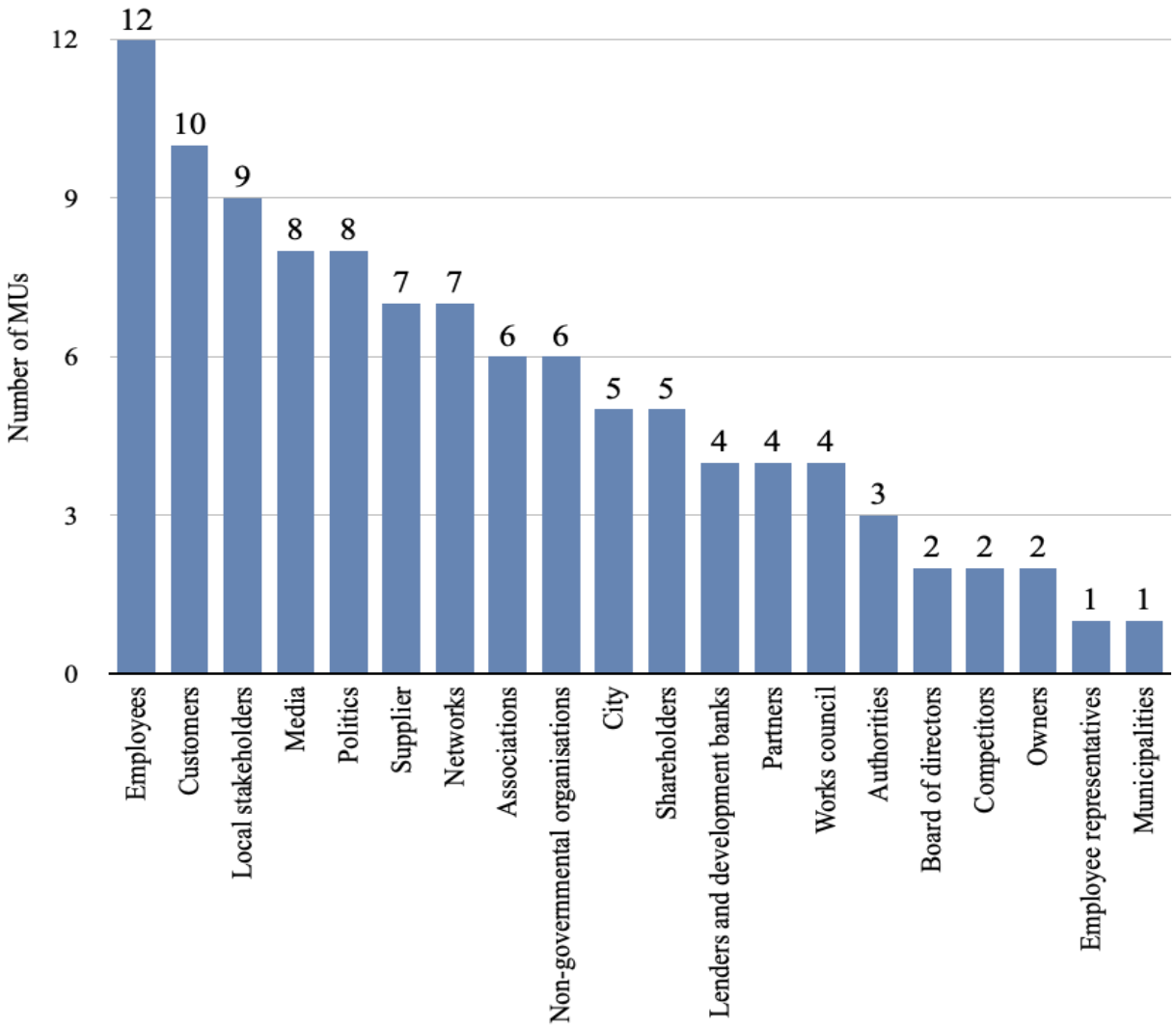
5.3 Key Stakeholder Groups

MUs have already included what they consider to be the key stakeholder groups in their double materiality analysis process or plan to do so for the update of their materiality analysis according to ESG criteria. MU1 is currently preparing a comprehensive stakeholder survey and intends to survey relevant topics in

a more targeted manner than in its first materiality analysis in order to avoid that the stakeholders are asked regarding materially topics where they are not experts in (MU1). MU4 has conducted both internal workshops and an online survey for external stakeholder groups (e.g., customers). The intensity with which banks request ESG information has increased significantly.

As can be seen in Figure 2, employees are the most important stakeholder group in Austrian and German MUs, closely followed by consumers and local stakeholders. The figure also shows that MUs are embedded in a very complex structure of diverse stakeholder groups that have different information needs.

Figure 2: Main stakeholder groups



5.4 Overview of the Material Topics according to ESG Dimensions

5.4.1 Environmental dimension

Documentary analysis

ESRS E1 is the most strongly targeted sub-category in the environmental dimension (see Table 5). E1 includes energy efficiency, reduction of greenhouse gas emissions and climate protection measures, energy transition, heating and mobility as well as the transition to green electricity and climate-neutral services. The focus on climate change reflects its importance in the green transformation. ESRS E5 is the second most important sub-criterion. Here, the MUs focus on resource conservation, circular economy, sustainable production and waste management. ESRS E2 primarily addresses issues such as microplastics, shaping of transport transition and electromobility air and water pollution, with a focus on reducing harmful environmental impacts. ESRS E3 emphasises access to clean water and innovative approaches such as "sponge cities" for flood resilience. ESRS E4 has few, but very effective, targets relating to biodiversity conservation (Table 5).

Within the environmental dimension, energy was presented as an essential topic by 11 MUs, followed by climate protection measures, which were identified as essential by 10 MUs. (Greenhouse gas)-emissions, clean water and wastewater services as well as resource conservation and circular economy, are considered an essential topic by 7 MUs.

Table 5: Findings of the content analysis on the environmental dimension

ESRS E1: Climate change	ESRS E2: Pollution	ESRS E3: Water and marine resources	ESRS E4: Biodiversity and Ecosystems	ESRS E5: Circular economy
-Energy -(Greenhouse gas) emissions -Climate protection measures -Energy transition, heating and mobility -Expansion of in-house production of green electricity -Climate-neutral services	-Microplastics -Micropollutants in wastewater -Air pollution -Shaping the transport transition and electromobility	-Clean water and sanitary facilities -Drainage safety -Flood protection -Sponge city	-Biological diversity	-Reliable and high-quality waste disposal -Resource utilisation and circular economy -Sustainable consumption and production -Materials and raw materials

Interviews

The five analysed MUs cover a large number of environmental data points, with some overlap but also company specific data points. Climate protection (E1) is a central aspect for all five MUs. All five analysed MUs consider climate protection and CO_2 emissions (E1) to be essential and the accounting of greenhouse gas emissions according to Scope 1 and 2 is largely established. Scope 3, on the other hand, is handled differently: while MU1 is already in the process of expanding this area, MU2 does not consider comprehensive recording of Scope 3 to be feasible. MU3 has taken steps to record its ecological footprint, while MU5 does not consider it to be essential. In addition, energy consumption (E2) is recorded by all five MUs, as it is directly related to climate protection and the sustainability strategy. Water (E3) is another key performance indicator for all five MUs. They explicitly name water consumption as one of the key environmental indicators and consider water quality and pollution to be relevant issues due to their proximity to rivers in the city. The topics of resource utilisation and waste and recycling management (E5) are central issues for three MUs with MU4 and MU5 particularly focussing on this area, while MU1 deals with it under the general topic of environmental pollution. Furthermore, MU2 and MU3 carry out a climate risk analysis in order to better assess potential risks such as flooding with MU3 seeing this as particularly essential due to its proximity to the city river.

The surveyed MUs differ in their data collection for the key topics of the environmental dimension. MU4 sees supplier management as an important aspect of climate protection and thus differs from the other four MUs. Whereas, for MU3, recording the pollutants in the construction process to monitor air, soil and water pollution is another key issue. This differs from the other companies, which do not explicitly mention this point.

MU1 struggles with the challenges of recording transport emissions, as there is no standardised calculation system. The product-related carbon footprint is also challenging. MU2 considers the impact of the vehicle fleet (e.g., tyre wear) to be insignificant, while MU5 focuses specifically on the transition to electromobility.

With regard to the scope of consolidation, only MU2 includes investments in its environmental reporting, while the other four MUs have not made any statements on this matter.

Synthesis

Table 6: Key findings in the environmental dimension

Environmental Dimension	Key Findings[1]
ESRS E1 - Climate change	-Most important environmental area in all analysed Mus. -Strong focus on energy efficiency, reducing greenhouse gas emissions, climate protection measures and switching to green electricity. -CO_2-emissions (Scope 1 and 2) are well established, but Scope 3 remains a challenge. -Some MUs carry out climate risk analyses. -Supplier management and the impact on the vehicle fleet are further aspects.
ESRS E5 - Circular economy	-The second most important area focussing on sustainable production, waste management and recycling. -Resource inflows and outflows are central topics. -Waste and the circular economy as well as resource utilisation are dealt with sporadically.
ESRS E2 - Pollution	-Focus on air pollution, water pollution and microplastics. -The aim is to reduce harmful environmental impacts. -Emphasise reporting on pollutants in construction to monitor air, soil and water pollution. -Involve supplier management in efforts to reduce pollution.
ESRS E3 - Water and marine resources	-Focus on sustainable water use and access to clean water. -Innovations such as "sponge cities" for flood resilience are emerging. -Water consumption as a key indicator. -Issues such as water quality and pollution are essential.
ESRS E4 - Biodiversity and Ecosystems	-Few but very effective targets related to nature conservation efforts. -Recognised as crucial for climate adaptation and urban resilience. -Not yet comprehensive data collection in all MUs, but awareness of importance exists.

[1] ranked from the most addressed E dimension to the least addressed E dimension

Overall, it can be stated that all MUs analysed environmental aspects, albeit with different emphases. E1 is the dominant ESRS environmental category for all the analysed MUs, followed by ESRS E5 and ESRS E2. ESRS E3 and E4 are not as dominant as the other categories (Table 6). While climate protection, energy, water and waste management are considered general core areas, there are differences in the level of detail, particularly in the accounting of Scope 3 emissions, the integration of climate risks and specific factors in the area of construction or supply chain management.

5.4.2 Social dimension

Documentary analysis

ESRS S1 is the best-covered subcategory in the social dimension, covering health protection and occupational safety, equal opportunities and employee well-being as well as employee awareness, training opportunities, diversity, fair pay, safe working conditions, inclusion and socially responsible offers and respect

for human rights within the organisation. ESRS S3 is another focus area for MUs, emphasising social responsibility, the security of supply and infrastructure development. In particular, ensuring the security of supply is a central topic within S3. However, this extends beyond this category, also affecting areas of dimensions E and G. This topic has historically been central to MUs, as the first MUs emerged in the 19th century because private companies were unable to guarantee the security of supply during the period of industrialisation. ESRS S4 covers consumer rights and safety and also focuses on product responsibility, accessibility and customer satisfaction. Emphasising personal security and privacy is essential for customer trust and transparency in business operations. ESRS S2 focuses on ensuring social standards throughout the supply chain and reflects the need for MUs to extend their social responsibility beyond the own workforce (Table 7).

Within the social dimension, diversity and equal opportunities were identified as an essential topic by 10 MUs. Health and safety in the workplace and security of supply were also prioritised by 10 MUs, followed by social responsibility, which was classified as essential by 7 MUs.

Table 7: Findings of the content analysis of the social dimension

ESRS S1: Own workforce	ESRS S2: Employees in the value chain	ESRS S3: Affected communities	ESRS S4: Consumers and end-users
-Health protection and occupational safety -Attractive employer -Training and further education -Health promotion in the workplace -Diversity and equal opportunities -Secure and appropriately paid jobs in the long term -Working conditions -Inclusion/accessibility and socially acceptable offers -Respect for human rights within the company -Employee satisfaction -Environmental education and waste avoidance among employees	-Social standards in the supply chain	-Security of supply -Sustainable cities and communities -Impact on the communities concerned -Social responsibility -Committed urban society -Corporate and social responsibility -Supra-regional commitment -Contribution to the common good -Economic, social and cultural rights -Clean and well-kept cityscape -Reliable transport infrastructure -Sustainable development of infrastructure -Avoidance of negative effects on the population -Sustainable development of urban neighbourhoods -Stakeholder group management	-Responsibility for the product -Customer satisfaction -Accessibility and socially acceptable offers -Personal safety of consumers and customers -Customer proximity -Needs-based offers for customers -Consumer communication, fair advertising and data protection

Interviews

The surveyed MUs recorded various social data points, although there are many similarities and also individual emphases. The primary emphasis is on the company's own workforce (S1), working conditions and customer safety (S4). While some MUs already collect detailed data and performance indicators, others are still in the early stages of expanding their data collection beyond the routine data already available.

All five MUs attach great importance to the working conditions of their own employees (S1) and actively collect data on S1. MU2 emphasises that it already has an excellent database, which has been built up over the years. MU3 has a clear focus in this area, conducting regular employee satisfaction surveys, to assess the working conditions.

In addition, three MUs consider economic, social and cultural rights to be essential (S3). MU1 cites security of supply and mobility as key issues under S3. MU4 and MU5 also deal with the social and economic impact on the population. MU4 in particular emphasises the importance of civil and political rights. All MUs have repeatedly emphasised that the security of supply is a key cross-sectional issue.

MU3, 4 and 5 categorise S4 as essential. In MU4, the focus is primarily on the personal safety of customers. Special attention is also paid to the involvement of end consumers. Whereas, MU5 covers all aspects of S4.

The analysed MUs differ in their data collection practices on the key topics of the social dimension. While MU1 explicitly covers S2 (labour in the value chain), MU2 and MU3 largely exclude this area. MU3 states that, to date, no analysis of the supply chain has been carried out, which means that possible violations in the value chain cannot be ruled out. In addition, MU2 has established a code of conduct on child labour in the artistic areas, as children are involved as performers.

MU1 emphasises that services of general interest and the security of service provision/security of supply are company-specific topics within the scope of S3.

Synthesis

Although all MUs cover numerous aspects within the social dimension, the level of detail varies greatly. The focus is on the company's workforce (S1), affected communities (S3) and consumers and end-users (S4) (Table 5). S2, on the other hand, is challenging. Specific topics such as child labour (MU2), services

of general interest (MU1) or promoting diversity (MU5) show that each MU also sets individual priorities in addition to the core areas. Ensuring security of supply, or to use the terminology of the ESRS, the security of services is an essential cross-cutting issue for all MUs.

Table 8: Key findings in the social dimension

Social Dimension	Key Findings[2]
ESRS S1 - Own workforce	-Most comprehensive area focussing on health protection and occupational safety, equal opportunities, training, diversity, fair pay and employee wellbeing. -Recognised as essential by all MUs.
ESRS S3 - Affected communities	-Security of service provision/security of supply as a cross-cutting issue. -Focus on infrastructure development and social responsibility. -Strong focus on sustainable cities and communities. -Social and economic impact on the community.
ESRS S4 - Consumers and end-users	-Concentration on consumer confidence. -Transparency, accessibility and ethical business practices. -Product safety, customer satisfaction and data protection.
ESRS S2 - Employees in the value chain	-Ensuring social standards throughout the supply chain. -S2 partially covered by the MUs.

[2] ranked from the most addressed S dimension to the least addressed S dimension

5.4.3 Governance-dimension

Documentary analysis

Table 9 contains the governance criteria, with a strong focus on compliance and anti-corruption, data security, digitalisation, competition and sustainable business practices. Approaches to process, product and system innovations can be found in both the ecological and social dimensions.

Table 9: Findings of the document analysis on the governance dimension

ESRS G1: Business Conduct		
Compliance with legal requirements	**Market position and innovation**	**Partnerships and suppliers**
-Anti-corruption measures -Data security and data protection -Fair competition and fair supplier relationships -Protection and whistle-blowers -Transparency for lobbying activities	**Innovative solutions for long-term success (operational processes)** -Future-oriented investments in green technology, intelligent solutions for smart cities and in regional infrastructure -Digitisation -Efficient operating processes -Research and development **Market position** -Competitiveness -Securing the continued financial existence of the company	**Partnerships** -Political participation -Establishment of (educational) networks) -Local and supra-regional transfer of expertise and knowledge **Suppliers** -Supplier management -Responsible for procurement

Interviews

In the area of governance, the five MUs show different starting positions and levels of maturity in collecting relevant data points. While some MUs have already firmly established structures for corporate governance, compliance, and data protection, others are still in the early stages of developing and implementing governance standards.

All MUs categorise governance (G1) as a central component of their ESG reporting, with compliance with legal requirements and anti-corruption measures playing a central role here. MU 1, 2, 4 and 5 have already established respective processes. Whereas MU3 emphasised the importance of protecting whistle-blowers. Data protection is an important part of the governance strategy for most of the studied MUs. Furthermore, MU 2, 4 and 5 consider anti-corruption to be an important part of governance reporting. MU4 goes one step further by integrating the protection of whistle-blowers as an additional mechanism to combat corruption. The classification of innovations was often questioned. It would be short-sighted to assign innovation activities exclusively to the area of governance. Instead, similar to the security of service provisions/security of supply, innovation is a cross-cutting issue that extends beyond governance.

The five MUs prioritise the key governance issues differently. MU3 is in a special situation as it does not yet have a centralised corporate strategy, code of conduct, or overarching governance structure. The current challenge is to newly define these. Existing structures are likely to be adapted for this purpose in the future. While MU4 explicitly classifies supplier management as part of governance, other MUs do not consider it within this category.

Synthesis

To summarise, it can be said that the collection of governance data points in all MUs focuses on the areas of corporate governance, compliance with legal requirements, data protection and anti-corruption (Table 10). There are differences in the degree of maturity of the governance structures: while some MUs already have detailed processes in place, others are not yet as advanced.

Table 10: Key findings in the governance dimension

Governance Dimension	**Key Findings[3]**
Compliance with legal requirements	-G1 has the highest priority in all MUs. -Compliance and combating corruption are essential. -All MUs have introduced compliance and anti-corruption processes. -Protection of whistle-blowers in governance reporting. -Data protection and cyber security are crucial aspects of corporate governance.
Innovation and market position	-Innovation and market position are the dominant governance issues. -Innovation as a cross-cutting issue. -Forward-looking investments in green technologies, smart city solutions and regional infrastructure are key aspects.
Partnerships and suppliers	-The focus is on supplier management. -Collaboration with networks.

[3] ranked from the most addressed G dimension to the least addressed G dimension

5.5 High-priority topics

14 high-priority topics with were identified as part of the document analysis and assigned to the ESG criteria in the next step (Table 11):

Table 11: High priority topics, organised by ESG criteria

E	S	G
-Energy efficiency -(Greenhouse gas) emissions -Climate protection measures -Energy, heating and mobility transition -Reliable and high-quality waste disposal	-Health protection and occupational safety -Attractive employer -Security of service provision -Sustainable cities -Product responsibility	-Compliance and anti-corruption -Security and data protection -Industry, innovation and sustainable infrastructure -Efficient operating process

In the environmental (E) dimension, energy efficiency, the reduction of greenhouse gas emissions and climate protection measures are cited as particularly important topics. The focus on energy, heating, and mobility transition is crucial to achieve the transition to sustainable energy sources and environmentally friendly modes of transport. In addition, reliable and high-quality waste disposal is essential to minimise the carbon footprint.

The social dimension (S) includes topics such as health protection and occupational safety, which ensure that employees work in a safe and healthy environment. An attractive employer image is also important for staff retention and to attract new employees. In addition, the safety of service delivery is essential to support communities. Initiatives to promote sustainable cities and communities aim to improve the quality of life and environmental awareness in urban areas. Product responsibility is also a highly prioritised topic in the social sector, as it concerns a company's impact on consumers and society. Product responsibility includes issues such as product safety and consumer protection as well as the environmental and social impact of products throughout their life cycle.

Compliance and anti-corruption are central to the governance dimension (G). MUs must comply with legal requirements and actively avoid corruption to gain and maintain the trust and legitimacy of key stakeholders. In an increasingly digital world ensuring data security and privacy remains crucial. In addition, responsible innovation policies promote sustainable infrastructure development. Building resilient infrastructure, promoting broad-based and

sustainable industrialisation, and supporting innovation are highly relevant topics in governance. Efficient processes contribute to increased productivity and reduced resource consumption.

5.6 Challenges and opportunities

Table 12 shows the key challenges and opportunities in connection with the double materiality analysis and ESG reporting that were discussed in the interviews.

Table 12: Challenges and Opportunities

Challenges	Opportunities
-Lack of definitions and standards for double materiality -Meaningful integration of stakeholder groups -CO_2 accounting, in particular Scope 3 recording -Time and communication costs (internal awareness-raising) -Lack of expertise and cost-intensive external support -Difficulties in analysing climate risks and integrating them into existing information systems -Link to the corporate strategy	-Embedding in the corporate strategy -Holistic/group-wide consideration of the activities of the MUs for sustainable activities -Raising internal awareness of sustainability -Employer branding and employee retention -Reputation management -Transformation of the business model

Only a few challenges arise in the context of creating the materiality matrix. This concerns semantic and threshold-related ambiguities regarding the concept of materiality. No clear benchmarks exist, and auditors can only help to a limited extent. As a result, MUs must create their own definitions, which makes cross-company comparisons difficult. Additionally, it was repeatedly mentioned as a challenge how a meaningful stakeholder dialogue can be achieved when creating the materiality matrix.

The other challenges primarily relate to ESG reporting. The biggest challenge for MUs is the complexity of CO_2 accounting (especially Scope 3 emissions). MU1, for example, considers the calculation of waste emissions to be unfeasible and explains this with the following example: "*It would have to be determined how many waste bins there are, what the collection intervals are and what emissions result from this*" (MU1). MU4 emphasises that the greenhouse gas balance depends heavily on the quality of the data, with difficulties in the data collection process and also concerning their reliability.

A great deal of persuasion is required within the organisation and missing expertise has to be purchased at great expense. In addition, a considerable amount of communication is required between the business units, especially when financial effects have to be assessed, which the interviewees from one MU described as "*dangerous madness*".

Obtaining data is challenging, as routine data only cover a limited amount. New processes need to be established, and responsibilities assigned for the collection of numerous data points. While MU1 is already very advanced, MU3 does not yet have a standardised methodology for data collection nor a corporate strategy, "*everything has to be developed from scratch.*" (MU3). MU5 criticises the lack of routine, as "*everything has to be clearly explained and at the same time the time resources are lacking*" (MU5).

In addition, there are consolidation problems, as MUs are corporate groups and the readiness and data quality can vary greatly in the individual business fields. Sustainability reporting is seen as particularly time-consuming and resource-intensive. One MU described the fact that ESG responsibilities still too heavily rely on individual actors, despite the need for organisational structures. Another problem is strategic integration, as ESG issues must not only be documented but also implemented in corporate management.

The lack of internal ESG experts and the difficulty of finding suitable external partners with sufficient expertise poses another challenge for the MUs. There is often a lack of specific technical expertise, for example in the area of carbon accounting. Without external support, the implementation of ESG reporting would hardly be possible. The identification of physical and transitory risks is also complex and almost impossible to manage without external help. Integrating these risks into existing systems (e.g., risk management) represents a major challenge. MU2 sees the taxonomy as particularly "*problematic*" (MU2), as there are no clear definitions and comparisons are difficult.

Embedding the findings of the double materiality analysis in the corporate strategy also presents a challenge. On the one hand the board needs to be convinced, while at the same time climate planning, budgeting and taxonomy need to be coordinated. In this context, MU4 mentioned the problem of assigning organisational coordination responsibilities (*"defining the lead" MU4*). That can lead internally to acceptance problems.

MUs not only identify challenges but also see considerable opportunities in the materiality analysis. These opportunities include a better strategic orientation, increased awareness of sustainability and competitive advantages. Particular emphasis is placed on a holistic view of MUs' activities regarding

sustainability issues at the group level, which opens up new perspectives and strengthens long-term corporate decisions.

The double materiality analysis offers a great opportunity for the strategy process. The consideration of ESG criteria supports the top-down approach, as top management makes strategic decisions not only based on corporate goals but can also incorporate well-founded sustainability analyses into their decision-making. The data derived from ESG reporting can be used to determine the state of the respective MU. This knowledge enables a targeted strategic reorientation in which climate risks can be identified at an early stage and competitive advantages can be created. However, the double materiality analysis is also a tool for realigning business areas. Dealing with the analysis helps to understand one's current status and how you can achieve long-term sustainability goals. A climate risk analysis is considered essential for redefining opportunities more clearly.

MU2 emphasises that the double materiality analysis helps to obtain an overall view regarding sustainability activities of the corporate group. A comprehensive picture is formed through standardised recording and targeted data queries. MU5 sees cross-divisional work as an opportunity to gain new perspectives on key issues. The exchange between different areas fosters mutual learning and helps identify fields of action for the future. MU2 regards this "*crisis*" as an opportunity and sees the potential of proactively creating a shared awareness of ESG issues. By adopting a structured approach, the company can utilise its resources in a more targeted manner and develop new sustainable measures.

The materiality analysis helps emphasise sustainability and raise awareness within the company. Taking sustainability into account is an important tool for employer branding. A company that enables meaningful work becomes more attractive to employees. Sustainability initiatives, such as a job ticket program, shows how ESG criteria can be integrated into incentive systems. The double materiality analysis offers the opportunity to develop sustainable products and business models that can strengthen a company's market position. Additionally, the analysis can be used as a marketing tool to position a company as sustainable and differentiate it from its competitors. In summary, materiality analysis is seen as a driver of change and sustainable corporate management.

6. Conclusions and implications

With regard to the first research question: "*What are the material topics in relation to ESG criteria in Austrian and German municipal utilities?*", the findings show that MUs in Austria and Germany have made great progress in conducting a double materiality analysis, although the speed of ESG orientation differs. None of the included MUs have published their ESG materiality analysis yet.

The 14 most important and highly prioritised material topics across all three dimensions are as follows. Within the environmental dimension, these are: (1) energy efficiency; (2) (greenhouse gas) emissions; (3) climate protection measures; (4) energy, heating and mobility transition; and (5) reliable and high-quality waste disposal. In the social dimension, these are: (1) health protection; (2) attractiveness as an employer; (3) security of service provision/security of supply; (4) sustainable cities and (5) product responsibility. Within the governance dimension, this includes: (1) compliance and anti-corruption; (2) security and data protection; (3) industry, innovation and sustainable infrastructure; and (4) efficient operations.

The content analysis and the interview findings show that the highly prioritised material topics align with the ESRS categories E1 (Climate Change), S1 (Own Workforce) and G1 (Business Conduct). According to *ESRS E1: Climate Change*, MUs must, among other things, balance their greenhouse gas emissions, disclose strategies and measures for climate protection and, if applicable, provide information on how they deal with internal carbon pricing, quantify the financial impact of climate risks and climate opportunities, and disclose measures for the transition to a net-zero economy. All energy consumption must be recorded and measures to promote sustainable mobility must be implemented. The high relevance of *ESRS E1* is not surprising given the MU's areas of activity such as energy production, waste disposal, water supply and local public transport. The EU member states have committed themselves to climate neutrality by 2050, with corresponding commitments from national governments, that currently still have ambitious time frames. The green transformation requires MUs to phase out fossil fuels for energy generation and to achieve a green mobility transition in order to meet the net-zero target by 2050. This is associated with a very high investment requirement for MUs. In addition, the infrastructure of the MUs is very susceptible to extreme weather events. Within the environmental dimension, *ESRS E5: Circular Economy* ranks second, followed by *ESRS: E2: Pollution*. *ERSR E3: Water and marine resources* and *E4: Biodiversity and Ecosystems* follow at a considerable distance.

The very high relevance of *ESRS S1: Own Workforce* is understandable both from MUs tradition as a being enterprise, where employee development and inclusion

have always been a high priority, and from the current labour shortage. This requires the company to position itself as a good employer with a wide range of social benefits. The fact that employees are the most important stakeholder group also fits into this picture. *ESRS 3: Affected Communities*, in which the MUs also categorise the very central issue of security of supply, ranks second, although the security of service provision/security of supply is a cross-cutting issue. *ESRS S4: Consumers and end-users* follow in third place. There is a wide range of opinions regarding the relevance of *ESRS E2: Employees in the value chain*. While some MUs see this as a very central priority, other MUs assign it lower importance, particularly in comparison to ESRS S1.

Governance (*ESRS G1*) forms a backbone of MU's ESG reporting. Compliance with legal requirements, the commitment to anti-corruption measures and the protection of whistle-blowers are key topics. The topics addressed as part of the governance dimension also extend to market positioning and innovation, with the establishment of innovative solutions being a cross-cutting issue. System, product and process innovations are essential in order to ensure long-term success and thus the continued existence of the MU. Another aspect cited by the MUs was the partnership with external stakeholders. Suppliers play a particularly important role in the governance dimension.

With regard to the second research question: "*Which stakeholders were involved in identifying the material topics?*" -it is clear that the most important stakeholder group for MUs are employees. This is also reflected in the materiality aspects assigned to the ESRS S1. Customers take second place, followed by local stakeholder groups and the media. The latter stakeholder group is too unspecific to identify the material topics, but is central to MUs public relations work. That politics only ranks fifth is highly surprising because political representatives are members of the supervisory board and some cities see as instruments for implementing city policies regarding sustainable matters.

With regard to the third research question: "*What are the main challenges and opportunities regarding the double materiality analysis process?*", different stages of development are evident among the MUs, which leads to different challenges and opportunities. A few MUs have already completed their double materiality analysis according to ESG criteria and successfully linked the highly prioritised material topics to their strategic processes. This gives them a clear advantage when it comes to aligning sustainability with corporate goals, strengthening their reputation, and proactively responding to regulatory requirements. However, even these pioneers face challenges in refining Scope 3 carbon accounting and fully integrating sustainability into all areas of business operations. Additionally meaningful stakeholder engagement and

managing the complexity of climate risk assessment remain significant challenges.

In contrast, the majority of MUs are still in the early stages regarding the materiality analysis process. The Omnibus I proposal gives them additional time, which should be used to refine their material topics and make progress in identifying narrative and quantitative data points. In some cases, they have not yet conducted a double materiality analysis along the ESG dimensions and are only beginning to analyse how ESG issues fit into their strategic framework. The lack of standardised definitions and sector-specific guidelines further complicates the process and makes it difficult to identify relevant data points.

There is a wide range of data points. Some MUs are still at a relatively early stage. This does not mean that they do not have any ESG data points. Rather, that there are large gaps in terms of the final narrative and quantitative data points to be included in ESG reporting, as well as in the responsibilities and information basis required in advance for new data points. The rough estimates range from approximately 200 data points based on the EFRAG guidelines, which can be found in the *appendix*, to one MU that has already identified 650 data points for its ESG reporting. The collection of ESG data, the implementation and the involvement of stakeholders is time-consuming and expensive. To avoid becoming a data graveyard, the data points must be updated regularly. In addition, embedding sustainability in the corporate strategy requires considerable internal communication efforts, is training-intensive and involves all the challenges associated with a complex organisational development process, as the business model of MUs undergoes massive change.

The tenor of the vast majority of MUs was a "keep it simple" approach, i.e., they limit themselves to what is absolutely necessary for ESG reporting and try to meet the ESG requirements with minimal complexity. This principle ensures that ESG reporting remains manageable but also harbours the risk of missing opportunities. Despite the need for healthy pragmatism, a minimalist approach is only a temporary solution for the upcoming green transformation requirements, which extend far beyond changes in ESG reporting. In spite of the differences in speed and methodological approaches, all MUs can benefit from a structured double materiality analysis, as this serves as a filter to identify the most important ESG topics. From the authors' perspective, reporting on the most material topics also provides an opportunity to recognise and communicate the value-added contribution of the MUs as a sustainable companies and reliable providers of services of general interest. The pressure from banks will significantly increase. It is essential to embed the highly prioritised material topics into the corporate strategy, which can positively

influence reputation management, employer branding and resilience to future regulatory and market-related changes, provided that not only a green façade is constructed. In the authors' view, those MUs that have proactively addressed the issue have an advantage in the necessary transformation of their business model to prepare their company for the future. They can leverage data points from ESG reporting to monitor their progress in strategic repositioning. Despite all the differences in the business sectors and the specific priorities set by the policymakers in the respective cities, the more advanced MUs can serve as a benchmark, particularly in those areas that focus on the generic aspects of the MUs. Differences arise in the specific modifications of the MU's fields of activity and in the city-specific topics that are highly prioritised by city policy. In the shared topics, it is essential that the MUs network to exchange best practices.

Policy-makers have a crucial role to play in clarifying ESG reporting requirements to reduce minimise uncertainty and ensure a level playing field for MUs. The planned increase of the CSRD thresholds through the Omnibus I package reduces the regulatory burden for MUs with up to 1000 employees. To avoid a two-speed transition to sustainable development, policymakers should provide regulatory clarity. Political decision-makers in the cities, who sit on the supervisory boards of the MUs, also have to make difficult trade-off decisions between the desirable requirements in the cities' sustainability strategies and their role as representatives of the owners, who are interested in a stable return. The investments required for the green transformation are very high.

This study focuses on Austrian and German MUs, which limits the generalisability of the findings within the (broader) EU context. Both the sample for the documentary analysis and the number of interviews are small. This means that only trend statements are possible, especially as all MUs have developed a materiality matrix, but no MU has published the double materiality analyses based on the thematic ESG dimensions yet. The expert interviews were conducted with five Austrian MUs. The interviews should be extended to German MUs. Furthermore, the method of analysis is based on a qualitative assessment, which is systematic but contains subjective interpretations. Future studies should expand the sample size and include additional countries in which MUs play an important role as municipal actors. With regard to the double materiality analysis process, as a first step it is important to clarify which stakeholder groups are being addressed. In the authors' view, auditors should also be involved at an early stage.

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Appendix: Guidance for data points
(based on European Commission, 2023; KPMG, 2024; EFRAG, 2022)

Table 13: High-priority topics and the associated data points in the Environmental dimension

Environmental Dimension (E)	
E 1	
Energy	- Total energy consumption - Energy consumption by activity - Energy intensity - Share of renewable energies - Energy consumption in the value chain - Energy efficiency measures - Targets for energy consumption
Greenhouse gas emissions	- Scope 1 emissions - Scope 2 emissions - Scope 3 emissions - Total emissions - Greenhouse gas intensity - GHG reduction targets - Strategies and measures to reduce emissions - - Application of emissions trading schemes
Climate protection measures	- Description of the organisation's internal strategies for mitigating climate change and adapting to its impacts. - Indicate whether and how the following areas are considered in the strategies: Climate protection, adaptation to climate change, energy efficiency, use of renewable energies, other relevant areas. - List of the most important climate protection measures taken in the reporting year and planned for the future, broken down by decarbonisation levers, including nature-based solutions. - Description of the reductions in greenhouse gas emissions achieved and expected as a result of these measures. - Disclosure of the significant financial resources (CapEx and OpEx) required to implement the measures and their allocation to: Relevant items or notes in the financial statements, Key performance indicators in accordance with Commission Regulation (EU) 2021/2178, Where applicable, the CapEx plan in accordance with the said Regulation. - Definition and disclosure of targets for reducing greenhouse gas emissions and adapting to climate change. - Indication of whether the targets are scientifically sound and consistent with limiting global warming to 1.5°C. - Description of the guidelines and frameworks used to set these targets, including the underlying climate scenarios. - Companies must state whether they use internal carbon pricing mechanisms. If so, the following information must be disclosed: The level of CO_2 price applied, how this price is factored into business decisions, the financial impact of internal CO_2 pricing on the company. - Disclosure of greenhouse gas removal projects that the company either carries out itself or finances. - Disclosure of the amount of emissions removed or offset in tonnes of CO_2 equivalent. - Description of the quality and origin of the carbon credits used, including the underlying standards and certifications. - Quantification of the potential financial impact of material physical risks (e.g. from extreme weather events) and transition risks (e.g. from regulatory changes) on the organisation. - Assessment of the potential financial benefits from climate-related opportunities, such as the development of new climate-friendly products or services.

E 2	
Energy, heating and mobility transition	- Recording of the company's total energy consumption, broken down by: Non-renewable energy sources: e.g. fossil fuels such as coal, oil and gas, renewable energy sources: e.g. solar, wind, hydro and biomass energy. - Calculation of energy consumption in relation to a financial indicator. - Specific information on energy consumption for heating and cooling purposes, broken down by energy source. - Description of measures to increase the efficiency of heating and cooling systems, including investments in modern technologies or building refurbishments. - Record the greenhouse gas emissions of the company's own vehicle fleet, broken down by vehicle type and fuel type. - Report emissions from business travel, broken down by mode of transport (e.g. air, rail, car). - Description of initiatives such as the use of electric vehicles, promotion of carpooling or use of public transport. - Presentation of company-wide strategies for reducing emissions in the areas of energy, heating and mobility. - Definition of short and long-term targets for reducing energy consumption and the associated emissions. - Regularly reviewing and reporting on the progress made in implementing these strategies and achieving the targets set.
E 5	
Reliable and high-quality waste disposal	- Description of the company's internal strategies for promoting the circular economy, including the integration of principles of waste prevention, reuse and recycling in business models and processes. - Indication of specific targets and measures to reduce resource consumption and minimise waste. - Detailed description of measures implemented to improve waste management, such as investments in recycling technologies, training programmes for employees or partnerships with waste management service providers. - Indication of the financial and human resources allocated to these measures. - Definition and disclosure of short, medium and long-term targets for reducing resource consumption and waste volumes. - Description of the methods used to measure progress towards these targets. - Disclosure of the amount and type of resources used during the reporting period, including raw materials, packaging and other materials. - Breakdown of the proportion of recycled or renewable materials compared to virgin raw materials. - Recording and disclosure of the total amount of waste generated during the reporting period, broken down by type of waste (e.g. hazardous and non-hazardous waste). - Description of the waste treatment methods used, including recycling, reuse, energy recovery or landfill. - Indication of the proportion of waste treated in accordance with the principles of the circular economy. - Analyse the significant positive and negative impacts of resource use and waste management on the environment and society. - Assessment of the associated risks and opportunities for the organisation, including regulatory changes, market trends or technological developments.

Table 14: Key high-priority topics and the corresponding data points in the Social dimension (based on European Commission, 2023; KPMG, 2024; EFRAG, 2022)

Social Dimension (S)	
S 1	
Health protection	**Health and safety management system:** - Percentage of own workforce covered by the organisation's health and safety management system. - Explanation of whether the management system is based on legal requirements and/or recognised standards or guidelines. - Certifications **Work-related injuries:** - Number of reportable work-related injuries - Rate of reportable work-related injuries - Number of fatalities due to work-related injuries - Number of days lost due to work-related injuries - Number of near misses **Work-related illnesses:** - Number of reportable work-related illnesses: Total number of such illnesses reported in the reporting period. - Rate of notifiable work-related illnesses: Calculation of the rate per 200,000 hours worked. - Number of deaths due to work-related illnesses: Specific indication of deaths caused by work-related illnesses. **Risks assessments and preventive measures:** - Risks assessments carried out - Preventive and protective measures implemented - Health and safety training - Number of training hours - Participation rate - Employee participation and communication - Employment involvement - Indication of methods and channels through which health and safety information is communicated to the workforce. - Percentage of employees regularly working more than 48 hours per week. - Percentage of employees eligible for family-related leave and the percentage who take it, by gender. - Whether employees are paid an appropriate wage and, if not, the percentage of employees affected. - Information on the coverage of employees by social security systems in the event of illness, unemployment, accidents at work, parental leave and retirement. - Gender distribution in top management. - Age distribution of employees in defined age groups. - Percentage of employees with disabilities.

Attractive employer	**Concepts related to the company's labour force:** - Description of the policies and procedures implemented by the organisation to promote a positive work environment. - Measures to promote diversity, equal opportunities and inclusion. **Procedures for involving workers and their representatives:** - Description of the methods the company uses to obtain and consider the opinions and concerns of employees. - Description of the dialogue with employee representatives and trade unions. **Procedures to address negative impacts and grievance mechanisms:** - Information on existing complaint channels for employees. - Measures to resolve problems reported by employees. **Measures taken and management approaches:** - Details of programmes and initiatives to improve working conditions. - Strategies to promote employee well-being and satisfaction. **Objectives related to managing significant negative impacts and promoting positive impacts:** - Setting and pursuing targets to improve employee satisfaction and loyalty. - Measures to promote professional development and further training. **Characteristics of the company's employees:** - Workforce statistics, including gender distribution, age structure and employment types. Staff turnover rate and average length of service. **Collective agreement coverage and social dialogue:** - Percentage of employees covered by collective labour agreements. - Information on participation in social dialogue and the existence of works councils. **Diversity and inclusion indicators:** - Percentage of women and men in the total workforce. - Gender distribution in management positions, including senior management and board level. - Distribution of employees by age group, e.g. under 30 years, 30-50 years and over 50 years. - Average age of the workforce and specifically in management positions. - Proportion of employees with a migration background or different ethnic origins, where permitted under data protection law. - Percentage of employees with disabilities. - Measures to promote inclusion and accessibility in the workplace. - Description of the company's diversity and inclusion strategies. - Measures implemented to promote diversity, such as training, mentoring programs or networks. - Targets and progress in increasing diversity in various areas of the organisation. **Appropriate remuneration:** - Information on the salary structure and the relationship between basic salary and variable remuneration. - Measures to ensure fair and equitable remuneration. **Social security:** - Information on company social benefits such as pension schemes, health insurance and other benefits. **Key figures for further training and skills development:** - Average number of training hours per employee. - Percentage of employees participating in training programs. **Key figures for health and safety:** - Accident statistics and accident prevention measures. - Programmes to promote the physical and mental health of employees. **Key figures for work-life balance:** - Offers such as flexible working hours, home office options and support programs for balancing work and family life. - Utilisation of these offers by employees.

	Key remuneration figures: - Ratio of the average remuneration of women to men. - Information on the total remuneration of managers compared to the median of the workforce. **Incidents, complaints and serious impacts related to human rights:** - Number and type of reported incidents of human rights violations. - Measures taken to address and prevent such incidents.
S 3	
Security of service provision	- Information on measures and key figures relating to the safety of employees, which can indirectly influence the quality of service provision. - Information on ensuring standards at third-party providers involved in the provision of services. - Disclosure of processes for identifying and managing risks that could affect the continuity and safety of services. - Information on how climate-related risks could affect the infrastructure and therefore the provision of services.
Sustainable Cities	- Greenhouse gas emissions. - Energy consumption. - Climate protection strategies. - Information on the release of pollutants into the air, water and soil. - Measures to prevent environmental pollution. - Water consumption. - Measures for the efficient use and protection of water resources. - Impacts on biodiversity. - Initiatives to protect and promote biodiversity. - Material consumption. - Data on the amount of waste generated and its disposal or recycling. - Description of the impact of operations on local communities, including urban areas. - Initiatives to support local communities and promote sustainable urban development.
S 4	
Product responsibility	- Information on the use of raw materials and materials in products. - Information on the service life of products and strategies for extending it. - Data on the recyclability of products and materials used. - Information on measures to ensure the safety of products for users. - Data on customer satisfaction with the products and how complaints are handled. - Data on the provision of product information, including the origin of materials and production conditions. - Information on quality control processes and standards. - Data on compliance with legal and regulatory requirements relating to products. - Data on research and development activities to improve product stewardship.

Table 15: High-priority topics and the corresponding data points in the Governance dimension
(based on European Commission, 2023; KPMG, 2024; EFRAG, 2022)

Governance Dimension (G)	
Business Conduct	
Compliance and anti-corruption	**Corporate culture and business practices:** - Description of internal policies and procedures to promote a culture of integrity and transparency. - Information on training programs for employees on ethical behaviour and compliance. **Management of relationships with suppliers:** - Information on due diligence processes to assess supplier integrity. - Measures to ensure that suppliers comply with the company's ethical standards. **Prevention and detection of corruption and bribery:** - Details of implemented risk assessments and internal control mechanisms to prevent corruption. - Details of internal control procedures designed to mitigate the risk of corruption and bribery. **Confirmed cases of corruption or bribery:** - Reporting on the number of incidents of corruption or bribery confirmed during the reporting period or description of actions taken to address these incidents and prevent future incidents. **Political influence and lobbying activities:** - Disclosure of policies and guidelines relating to political influence and lobbying activities. - Information on memberships in relevant associations and organizations and related contributions. **Payment practices:** - Information on payment terms to suppliers and average payment terms. - Measures to ensure fair and transparent payment practices along the supply chain.
Data security and data protection	- Description of the processes for identifying and managing risks, including those related to data security and data protection. - Information on compliance with legal and regulatory requirements relating to data protection, such as the General Data Protection Regulation (GDPR). - Information on how the company protects the personal data of employees and what measures are taken to ensure their privacy. - Details of policies and practices to protect customer data, including information on data encryption, access controls and data breach procedures.
Market position and innovation	
Industry, innovation and infrastructure	- Information on measures to improve energy efficiency in production processes and infrastructure. - Data on the share of renewable energies in the company's total energy consumption. - Information on the implementation of new technologies to reduce resource consumption. - Information on investments in facilities and systems that support recycling and reuse. - Reporting on projects that contribute to the development of local infrastructure. - Initiatives to support research and development in collaboration with local communities or institutions. - Information on investments in research and development and their results. - Description of the company's strategic approaches to promoting innovation.

Efficient operating processes	- Information on the company's total energy consumption, broken down by energy source, as well as information on measures to improve energy efficiency. - Reporting on direct and indirect emissions (Scope 1, 2 and 3) and strategies for reducing them. - Information on the use of raw materials and measures to reduce material consumption. - Data on waste volumes generated, recycling rates and waste prevention strategies. - Key figures on workforce productivity and initiatives to increase efficiency through training and development programs. - Description of processes to identify and manage risks that could affect the efficiency of operating processes. - Information on research and development activities to optimize processes and introduce more efficient technologies.

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This working paper is indexed and available in RePEc
Ce working paper est indexé et disponible dans RePEc

ISSN 2070-8289
ISBN 978-2-931051-87-0 - EAN 9782931051870
https://doi.org/10.25518/ciriec.wp202502

Bauer, P. & Greiling, D. (2025). *Double materiality analysis as a central filter for ESG reporting in Austrian and German municipal utilities*. CIRIEC Working Paper 25/02. Liège: CIRIEC International. https://doi.org/10.25518/ciriec.wp202502

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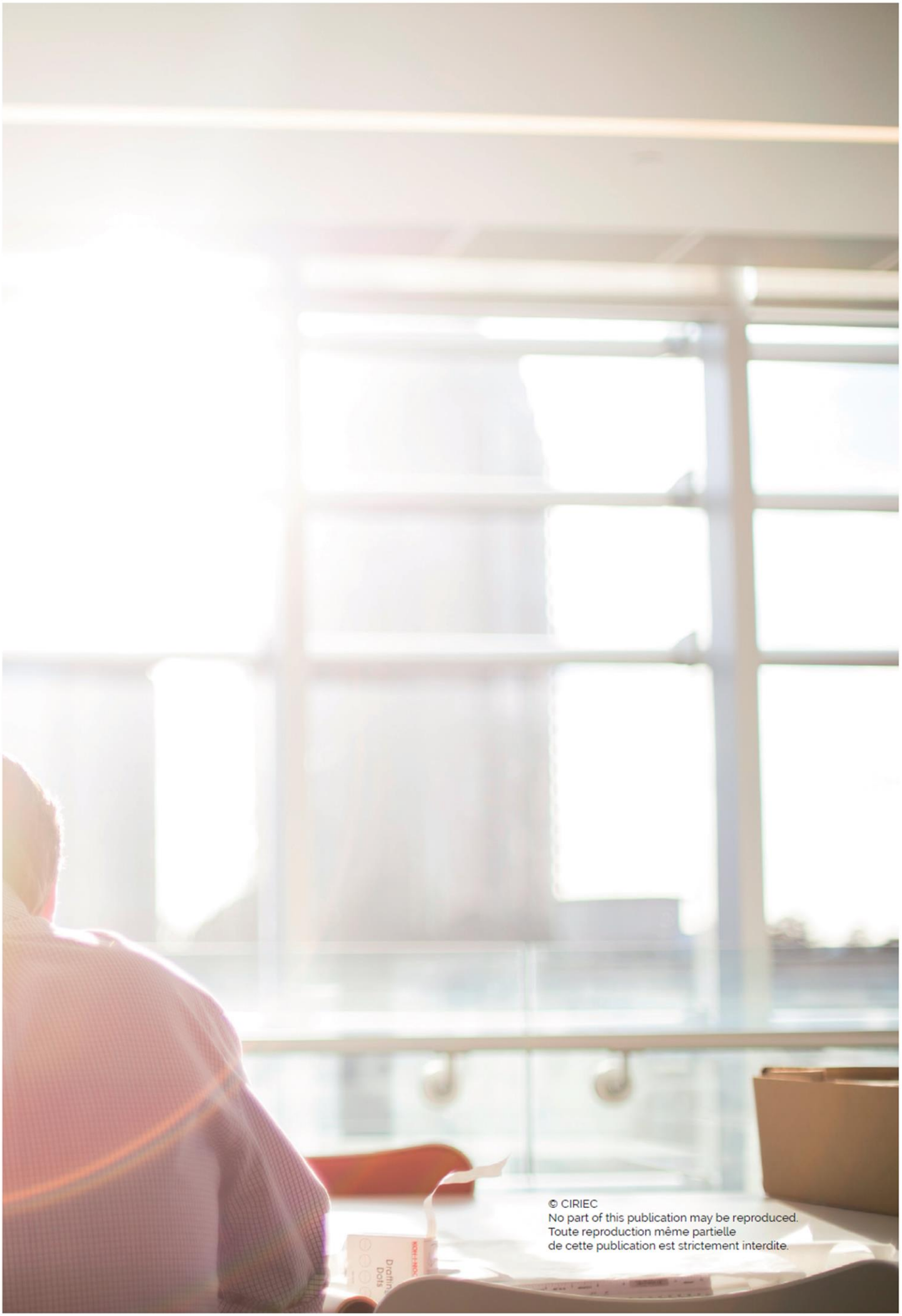

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