

## Article

# Overcoming Current Challenges for Circular Economy Assessment Implementation in Public Sector Organisations

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**Abstract:** Circular Economy (CE) is seen as a key strategy in achieving sustainable development and the United Nations Sustainable Development Goals (SDGs). To seize the potential of CE, public and private organisations need to evaluate and communicate their progress moving away from the non-sustainable paradigm of “take–make–dispose” towards circularity. The literature and practitioners demonstrate a growing interest in CE assessment as a driver for this transition. Nevertheless, the majority of CE assessments are implemented in private companies and implementation in public sector organisations is low. This article presents the challenges that currently prevent public sector organisations from implementing CE assessment and derives strategies to overcome them. A total of 21 CE and assessment experts from the Portuguese public sector were interviewed, and the results were triangulated with an extensive policy document review. The findings show that cultural barriers, particularly a lack of public and political pressure as well as a resistance towards change, are considered the main challenges for CE assessment implementation. Cultural challenges drive structural ones such as a lack of leadership commitment, the voluntary nature, and a missing clear governance for CE assessment. Technical and financial challenges, contrary to previous findings of the literature, are not prioritised and are seen as a result of the cultural and structural challenges. Overall, the research suggests that CE assessment is often a discussion among academics and highly specialised practitioners. In order to drive its implementation, the debate has to involve stakeholders beyond expert circles to trigger awareness for its necessity and to facilitate usage for a broader audience.

**Keywords:** circular economy; sustainable development; public management; assessment; indicators; barriers; drivers; stakeholders



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## 1. Introduction

Circular economy (CE) assessment is gaining increasing attention as a method to drive the transition from the non-sustainable paradigm of “take–make–dispose” towards the cyclical use of resources and growth of in-use stocks, possibly contributing to sustainable development [1]. It is seen as one key strategy to a more sustainable paradigm and in achieving the United Nations Sustainable Development Goals (SDGs) [2]. According to the United Nations, CE particularly influences several SDGs, namely 6 on energy, 8 on economic growth, 11 on sustainable cities, 12 on sustainable consumption and production, 13 on climate change, 14 on oceans, and 15 on life on land [3]. In the desired shift towards the CE, evaluating the circularity of materials, products, services, and strategies or their contribution to the CE is crucial for designing and prioritizing circular solutions based on evidence [4]. Therefore, a wide range of CE assessment approaches has been developed in recent years.

Among other authors, Roos Lindgreen et al. [5], Corona et al. [4], and Figge et al. [6] developed, inventoried, and evaluated many different CE assessment approaches. Due to the absence of a generally accepted definition of the CE concept, existing CE assessment approaches evaluate circularity in different ways [7,8]. The literature found that most of the existing CE assessment approaches focus on measuring resource efficiency as well as material stocks and flows [9,10]. Some approaches also assess the impacts of CE practices and strategies on sustainable development [11,12]. Assessing the impacts of CE activity on sustainable development can be of paramount importance, as CE practices do not automatically lead to an overall increase in sustainable development [13]. The CE assessment approaches target three levels: the micro level of organisations, products, and materials; the meso-level of industrial networks; and the macro level of policies and regulations [14–16].

The public and private sectors are highlighted as key actors in the CE transition [17]. The state of research and implementation of CE assessment shows a clear focus on private companies [18]. However, the public sector differs from the private sector in that it has different missions and tasks. In addition, public sector organisations are structured by bureaucratic principles [19,20]. Bureaucracies are characterized by non-competitive (impersonal) hierarchies, rule-based management, functional speciality, division of labour, and focused missions [21]. These principles influence the implementation and sustainment of assessment approaches [22]. To date, the public sector's contribution to the CE is often analysed and assessed at the macro level. In 2008, China was one of the first countries to release a specific framework of indicators to track progress pursued under the “Circular Economy Promotion Law” [23,24]. This development was the start to a series of efforts in developing appropriate indicators to assess CE policies, e.g., the European Union (EU) Circular Economy Indicators [25].

However, the public sector is also a significant actor driving sustainable development at the micro level [26]. Public sector organisations are major economic players, with public procurement accounting for 14% of the GDP in the EU and a role model to other public sector organisation, NGOs, the private sector, as well as citizens [27,28]. Public sector organisations have already implemented sustainability and CE practices and strategies in their operations, including procurement activities [29,30]. In addition, especially since the 80s and 90s, public sector organisations have increasingly included performance assessment in their managerial practices and operations [31,32]. This paradigm shifted from the traditional bureaucratic organisation to including more managerialism, called New Public Management (NPM). In the context of NPM, assessment is highlighted as the key topic for public managers [33]. The idea of “more with less” has become a slogan, as public managers seek to maintain or improve the quality of their service delivery [34]. Nevertheless, the connection between CE activities and assessment has often not been made yet. Although many public sector organisations have proclaimed their support for explicitly assessing their CE performance, its implementation still appears to be in the early stages of development [35]. To capture more CE potential, they also need to implement a CE assessment in their operations, processes, and strategies [36]. Therefore, it is the aim of this research to analyse existing challenges preventing the implementation of CE assessments in public sector organisations and to derive strategies to overcome these challenges.

## 2. Theoretical Framing of Factors Influencing CE Assessment Implementation

Successfully implementing CE assessment in a public sector organisation requires the availability of an adequate CE assessment approach [16]. It further needs the setup of a formal and comprehensive assessment process that is compatible with existing assessment approaches within the organisation [37]. Furthermore, resources, such as a budget and human resources, should be provided to ensure the planning, development, implementation, and execution of the CE assessment [38]. In addition, an organisational governance structure that fosters the implementation of a CE assessment is needed, e.g., leadership committed to the implementation of CE assessment [34]. Lastly, a cultural acceptance is

required, e.g., the individuals at all levels of the organisations must understand the value of a CE assessment [39].

The CE assessment literature has not explicitly explored the challenges and drivers of CE assessment implementation yet. Existing contributions mainly detail technical implementation challenges and drivers related to the assessment approach. The debate can be summarized in two main technical sub-challenges. First, it is difficult for organisations to select an adequate CE assessment approach [10]. Due to the lack of a commonly accepted CE definition, there is no agreement about what aspects of the CE transition process and effects need to be measured [16]. The large number of existing CE assessment approaches are often criticised for ignoring context- and sector-specific factors of the CE, e.g., the impact of a given CE practice potentially leads to different results in different contexts [15]. Second, several authors highlight that using existing assessment approaches often involves complex processing of data and unclear decision management. Extensive data requirements and the resulting need for expertise are major challenges for implementation [15]. In fact, information exchange is also cited as a constraint to successful CE assessment implementation [40]. Some authors also mention the competition and rivalry among professionals with regard to their knowledge input and the employed data, indicators, models, and software which can be CE assessment implementation challenges [41].

Research on the implementation of CE strategies and practices in organisations explored further barriers. Two contributions were from de Jesus and Mendonça [42] and Kirchherr et al. [17], who aggregated previous findings and develop frameworks to conceptualise them. De Jesus and Mendonça [42] argued that four factors influence the implementation of CE: technical, economic, institutional, and cultural factors. Kirchherr et al. [17] collected empirical data from CE experts all over the EU and concretised subfactors. For example, Kirchherr et al. [17], and Plá-Julan and Guevara [43] detailed factors by highlighting, e.g., high upfront investment costs, the time-consuming efforts of performing these activities, and the need for specialised human resources as some of the most important challenges for the implementation of CE practices.

Within the literature on assessment in public sector organisations, a number of authors have discussed the obstacles to assessment [44–46], the experiences with assessment [47–52], or methods for promoting continuous organisational improvement through assessment [38,53–55]. This research is particularly embedded in the significant body of literature on sustainability assessment in public sector organisations [56–60]. Contributions by Lancer Julnes and Holzer [38] and by Holzer et al. [39] detailed the importance of the distinct bureaucratic organisational structure influencing assessment implementation. For example, the absence of mandatory requirements for assessment is identified as a key challenge for implementation [56]. The lack of dedicated financial resources, for example, to hire dedicated and knowledgeable staff and to set up user-friendly Information Technology (IT) support systems is highlighted as an implementation challenge [39]. Kroll [61] demonstrated that the lack of leadership is often associated with the use of performance information. Furthermore, missing stakeholder engagement was mentioned in contributions on sustainability assessment in public sector organisations [27,62].

Besides the distinct organisational structure, public sector organisations act in a political context and are thus influenced by a political culture. Kirchherr et al. [17] identified cultural factors as the key influencers of CE implementation, including assessment practices. The particular organisational culture of public sector organisations can lead to a particular mindset of the stakeholders, e.g., an aversion to change, the emphasis of elections influencing decision making, less tolerance for well-conceived failure, little value of exploring new opportunities, and a lack of rewards for innovation [63]. Furthermore, the literature identified the absence of awareness for the necessity of assessment as a key influence factor for implementation [27].

In summary, two important remarks are presented. First, typically, there are multiple possible interaction and determination effects between the challenges as pointed out by authors such as Kirchherr et al. [17], or de Jesus and Mendonça [42]. For example,

the selection of a complex CE assessment method often leads to a data-intensive and difficult CE assessment execution [16]. Another example would be that the lack of CE awareness may lead to a low interest of leadership and stakeholders for CE assessment implementation. Second, it was observed that the presented challenges can have two directions. The literature shows that the outlined challenges can prevent assessment implementation but can also drive it depending on the context. For example, leadership is presented as an implementation driver if it supports assessment [27,49] or as a challenge if leadership advocates against it [64]. The interactions among the four challenges/drivers can, thus, result in a chain reaction towards CE assessment implementation failure or success. Therefore, this article initially conducts a detailed analysis of the current challenges for assessment implementation and their most important causes. Once these challenges are identified, it is possible to derive strategies aimed at creating a cascading reaction geared towards successful CE assessment implementation.

### 3. Methodological Approach

#### 3.1. Case Selection

Similar to the concept of CE, there is no commonly accepted definition of public sector organisations or public administration [65]. In this research organisations, ministries and agencies at the national level that clearly belong to the core government are included [66]. Our aim for this study is to gain in-depth knowledge of CE assessment implementation via the single case of Portuguese central public sector organisations. The authors suggest that single case studies can produce valid research outcomes when the case in question is illustrative for the research purpose [67]. Therefore, Portuguese public sector organisations were selected based on a combination of purposeful and convenience sampling [68]. The mix ensured the selection of an illustrative case based on purposefully selected criteria as well as context knowledge and access to the CE policy-making elite in Portugal, which was the target group for the interviews [69]. Potential impacts of the convenience sampling on generalizability of the data are acknowledged and mitigated with the purposefully selected criteria [70].

Portuguese public sector organisations were selected based on three criteria:

- Portuguese public sector organisations are committed to the CE and are a frontrunner in the EU with their action plan for CE in Portugal 2017–2020 as an all-encompassing CE strategy;
- They have assessment expertise. On the micro level, they assess a variety of objects, including some of their efforts in the field of sustainability [71]. On the macro level, they assess the outputs and outcomes of the CE action plan with a clear set of assessment targets [72];
- Portuguese public sector organisations do not assess their CE progress at the organisational level yet. Therefore, they can provide first-hand insights to existing implementation challenges.

In addition, Portuguese public sector organisations were chosen out of convenience as some authors of this paper were familiar with the Portuguese public administration and the existing CE and sustainability assessments as they have been working together in other research projects.

#### 3.2. Methods

To analyse why CE assessment is not yet implemented in public sector organisations, a data triangulation approach was conducted including primary and secondary data [73–75]. It entailed three components: desk research, semi-structured interviews, and a policy document analysis [76]. Based on desk research, an initial coding framework regarding factors influencing CE assessment implementation in public sector organisations was developed (see Table 1). The findings from semi-structured interviews were triangulated with findings from a policy document review and coded using the framework.

The desk research was conducted via Elsevier's Scopus and Thompson Reuters' Web of Science [76]. The search focused on journal articles and book chapters with no limit regarding the time of publication. Two searches were executed including the "title", "abstract", and "keywords": the first search aimed at identifying articles on CE strategy, practice, and assessment implementation in organisations (descriptors: circular economy, organisation (and synonyms, e.g., "micro"), assessment (and synonyms, e.g., "measurement" and "evaluation"), challenges (and synonyms, e.g., "barrier" or "obstacle"), and drivers (and synonyms, e.g., "facilitator"); the second search targeted assessment implementation in public sector organisations (descriptors: public sector (and synonyms, e.g., "public administration" or "public organisation"), assessment (and synonyms, e.g., "measurement" and "evaluation"), challenge (and synonyms, e.g., "barrier" or "obstacle"), and drivers (and synonyms, e.g., "facilitator"). The titles and abstracts of the identified articles were screened, and the ones that seemed most relevant to this research were included. Included articles were:

- contributions on challenges and drivers of CE assessment implementation in organisations;
- contributions on challenges and drivers of CE strategy and practice implementation in organisations, and
- contributions on challenges and drivers of assessment implementation in public sector organisations.

Key contributions were, for example, de Jesus and Mendonça [42] exploring and categorising CE implementation barriers and drivers, Kristensen et al. [16] reviewing CE assessment approaches at the micro level, Domingues et al. [27] analysing sustainability reporting in public sector organisations, and Holzer et al. [39] analysing barriers for assessment in public sector organisations. We also examined bibliographies of the identified studies to identify further relevant literature. Overall, 158 contributions were selected. Based on the selected articles, recurring and prominent challenges were identified and selected [77]. The main findings are summarised in Table 1.

**Table 1.** Initial coding framework: challenges for Circular Economy (CE) assessment implementation in public sector organisations.

Factors Influencing Implementation	Challenges	Exemplary Arguments
Technical	<ul style="list-style-type: none"> <li>• No adequate CE assessment approach</li> <li>• Complex CE assessment process</li> </ul>	<p>"CE tools are not applied in a systematic way ( . . . ) due to their complexity, the time required to implement them" [15] (p. 554); "CE strategies demand socio-institutional changes ( . . . ), increasing the complexity of the evaluation" [9] (p. 460)</p>
Financial	<ul style="list-style-type: none"> <li>• Costs for introducing and executing CE assessment</li> </ul>	<p>"New systems require significant managerial investments in measurement design and staff training for information collection" [78] (p. 92); "High upfront investment costs" [79] (p. 29)</p>
Structural	<ul style="list-style-type: none"> <li>• Voluntary nature of CE assessment</li> <li>• Missing stakeholder engagement for CE assessment</li> <li>• Missing leadership commitment to CE assessment</li> </ul>	<p>"Absence of mandatory requirements" [56] (p. 91); "Leadership traits contributed substantially in implementing successfully" [80] (p. 1); "Need for stakeholders' engagement" [15] (p. 554)</p>
Cultural	<ul style="list-style-type: none"> <li>• Bureaucratic/political mindset</li> <li>• Lack of CE awareness</li> </ul>	<p>"Public organization ( . . . ) aversion to change in general" [39] (p. 24); "Subject to political wills and power struggles" [39] (p. 6); "Influenced more by the political climate" [64] (p. 536); "CE is associated with poverty" [43] (p. 73); "lack of awareness" [15] (p. 554)</p>



To collect primary data, the main method was semi-structured interviews. All interviews were carried out in English between 2019 and 2020. They were conducted in person and lasted between 45 and 90 min. An exemplary script can be found in Table A1. A total of 21 interviewees were selected in a two-stage sampling process (see Table 2). First, the Ministry of the Environment and Climate Action initially nominated participants based on CE expertise and knowledge in the field of assessment in public sector organisations. Second, snowball sampling was utilized [81]. This involved asking each interviewee to suggest further participants with the mentioned selection criteria. All interviews were recorded and subsequently transcribed [82]. The research suggests that it is possible to reach thematic saturation after 12–16 interviews [83,84].

**Table 2.** Overview of the interviewees and their roles.

#	Role of the Interviewees
1	Expert on the Green Public Procurement (GPP) strategies
2	Specialist on resource regulation
3	Member of an environmental lab engaged with the implementation of environmental standards (e.g., ISO) and regulations (e.g., EMAS)
4	Member of an environmental lab engaged with the implementation of environmental standards (e.g., ISO) and regulations (e.g., EMAS)
5	Expert on materials and waste streams
6	Expert on CE and eco-innovation
7	Expert for GPP strategies
8	Expert on strategic planning in the field of agriculture, forestry, and rural development
9	Expert on CE and food waste
10	Expert on the environment and defence
11	Expert on CE policies
12	Expert for environmental statistics and planning
13	Expert on environmental planning and strategies
14	Expert on CE and health
15	Expert on CE and macroeconomic implications
16	Expert on CE and macroeconomic implications
17	Expert on economic strategies
18	Expert on environmental management of the sea and ports
19	Expert on CE statistics
20	Expert on CE statistics
21	Expert on CE statistics

The roles of the interviewees have been separated from their organisational belonging to ensure anonymity (see Table 3). We argue that this approach helped us gain more trust and to obtain additional insights [69]. The selected details regarding interviewees are provided whenever possible.

**Table 3.** Overview of the organisations represented by the interviewees.

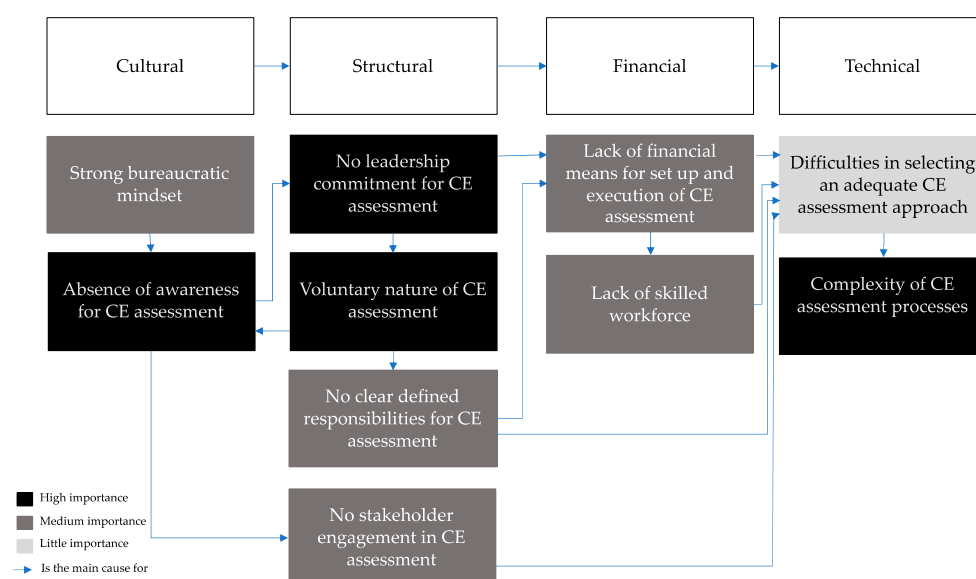
Organisations Involved in the Interviews
Entity for Public Procurement and Shared Services (eSPap)
Portuguese Environmental Agency of the Ministry of Environment and Climate Action
Portuguese Ministry of Agriculture, Directorate General of Programming and Policy Services
Portuguese Ministry of Environment and Climate Action, Directorate General for Environment and Climate Action
Portuguese Ministry of Health, Central Administration of the Health System
Portuguese Ministry of National Defence, Directorate General for National Defence Resources
Portuguese Ministry of the Economy and Digital Transition, Directorate General of Economic Activity
Portuguese Ministry of the Sea, Directorate General for Marine Resources
Statistics Portugal

To triangulate the empirical data from the interviews with another source existing governmental CE and sustainability assessment initiatives, reports and legislative documents in Portugal were included in the analysis. An online search as well as asking the interviewees yielded 36 relevant results, e.g., the Portuguese “Paper and Plastics Resolution” [85], introducing the mandatory assessment of resources such as paper in Portuguese public sector organisations. An overview of all selected documents, a short description and the access link (if publicly accessible) can be found in Table A2. Including this complementary source of information provided valuable insights and examples of problematic and successful implementations of CE and assessment initiatives that happened in the past. The number of included data was determined based on thematic saturation. Data collection terminated when the data produced no novel information on key research themes [86].

The empirical data was analysed in a qualitative content analysis supported by the qualitative data analysis software tool NVivo [87,88]. Following a similar approach to the study conducted by Micheli and Pavlov [89], the data were analysed through a structured coding procedure (see Table 1). The results obtained were then reviewed and critically explored. It was possible to identify, code, and categorize consistent patterns in the data. Conclusions were drawn based on the literature and the empirical data. The challenges were ranked according to their importance (high, medium, and little) [90]. Challenges with high importance were those most frequently mentioned and emphasized by many interviewees (e.g., “This is one of the most important points.”; “This is very important.”) as well as confirmed by the policy document analysis. Challenges with medium or little importance were less frequently mentioned and/or less emphasized (e.g., “This does not have so much power.”; “It is not that.”). In line with this, out of the many complex interactions between the challenges, the most important causes have been identified based on frequent highlighting by the interviewees. Departing from this, it is possible to derive strategies aimed at triggering a chain reaction for a successful CE assessment implementation. The chain reactions were identified based on existing examples and repeated emphasis in the interviews and from the policy documents.

#### 4. Results and Discussion

The findings of the CE assessment implementation challenges and their most emphasized interactions are presented in sequence of their relevance, as identified in the interviews and policy documents. Figure 1 shows that important challenges for CE assessment implementation are spread across all four factors. Cultural challenges as well as challenges resulting from the bureaucratic structure cause financial and technical challenges and, therefore, have led to a missing implementation of CE assessment in public sector organisations.



**Figure 1.** Key CE assessment challenges and their interactions.

#### 4.1. Current Challenges to CE Assessment Implementation in Public Sector Organisations

##### 4.1.1. Cultural Challenges

The empirical data confirms that there is a lack of awareness for the necessity of CE assessment in Portuguese public sector organisations, which is considered a root cause for the absence of its implementation. The policy documents showed that current assessments that could be associated with CE, such as the measurement of paper and plastics consumption, are not explicitly mentioning CE [85]. According to the data, two reasons mainly lead to this absence. First, there is no public and political pressure pushing the topic of organisational CE assessment onto the agenda of decision makers (interviewees # 6, 8–10, 12, 13, 15, 16, and 19–21). One interviewee highlighted: “I think the main problem is that CE assessment is not a priority at the moment. [ . . . ] still the political level and the public opinion is not aware” (interviewee # 8). Second, there is a lack of role models and peers who already included CE assessment in their internal operations and strategies (interviewees # 1, 7, 12, and 18–21). For example, the EU included CE assessment of public organisations neither in their Circular Economy Action Plan of 2015 nor in the New Circular Economy Action Plan for a Cleaner and More Competitive Europe as part of the Green Deal from 2020 [91,92]. An interviewee mentioned: “we take part in several groups at the European Union, World Bank, OECD and when we share our experience, we always try to share what we have been doing, share the challenges we are facing and trying to see how other countries are working”. He added that they are usually following international instructions, but in the case of CE, they do not exist (interviewee # 19).

In addition, the bureaucratic mindset within the organisation and the resulting resistance towards change led to a perception that CE assessment creates more work than benefits. Especially in the context of some existing sustainability assessment efforts, the interviewees argued that CE is often perceived as another new fashion trend around sustainable development which will soon be replaced by a new concept (interviewees # 7, 8, and 15–20). Regarding efforts towards sustainable development in Portugal, such a shift of concepts has occurred before. The policy document analysis showed that, in 2014, a former government developed and adopted a Green Growth Strategy in Portugal [93]. When the new government came into power, they shifted their focus on CE and launched the Action Plan for the Circular Economy in Portugal: 2017–2020 (CE action plan), replacing the former strategy [72].

Some interviewees mentioned that the organisations often perceive themselves as a service provider or legislator rather than a role model to reduce their own socioeconomic and environmental impacts (interviewees # 8, 9, and 15). An interviewee emphasized:



“we are specialists in making others more sustainable but not ourselves” (interviewee # 8). The Portuguese Environmental Agency, for example, certifies organisations with the EMAS regulation. However, the policy documents show that they are themselves not a certified organisation [94]. Furthermore, it should be remembered that assessment in public sector organisations is not apolitical [78]. Some interviewees mentioned a fear of failure culture (interviewees # 12 and 13). Interviewees described widespread CE assessment and reporting as potentially making the weaknesses of public sector organisations transparent, including problems collecting the necessary data or negative CE performance results. They argued that, in some areas such as energy and paper consumption, data is collected and evaluated but the results are only communicated to a very small audience (interviewees # 11, 20, and 21).

#### 4.1.2. Structural Challenges

Driven by culture, the rigid and formal structure of public sector organisations support more implementation challenges. As highlighted, public sector organisations are hierarchical. Thus, successful decision making requires leadership commitment, e.g., by the ministers or secretaries of state [95]. In the Portuguese public sector organisations, there is a lack of top-level commitment promoting CE assessment (interviewees # 10–13 and 21). An interviewee highlighted: “If it was a priority, we would do it. It is a top-down process and not bottom up ( . . . ) A mandate from the Ministry of Finance for example. If the Ministry of Finance said that everyone has to implement CE assessment, everyone would do it or the Prime Minister. If the Prime Minister said it needs to be done . . . I think it would only need that” (interviewee # 11). Hereby, the Ministry of Finance, the Council of Ministers, as well as the Prime Minister himself were highlighted as potential driving forces.

In line with the literature, almost all interviewees emphasised the voluntary nature of CE assessment (interviewees # 5, 8, 9, 12, 13, 18, and 19). Bureaucracies often work based on strict chains of command [21]. Thus, the identified absence of obligation for CE assessment is a key challenge. Furthermore, it leads to a lack of clear objectives and targets. The policy document analysis highlighted that neither the European Union nor the Portuguese Council of Ministers passed a resolution that mandates Portuguese public sector organisations to implement CE assessment. It was argued that: “it is not a law, not obliged, not a priority for the government; so we do not do it.” (interviewee # 12). The missing obligation also leads to a lack of a clear and mutually agreed plan for CE assessment.

In addition, the responsibility for CE assessment as a cross-cutting topic is not clearly defined, which challenges successful CE assessment implementation. Due to their bureaucratic structure, Portuguese public sector organisations have varying but clearly defined responsibilities, tasks, and interests. For example, the Ministry of Defence mainly protects the country sovereignty or defends its interests abroad and the Ministry of Environment works on topics such as preventing climate change or ensuring biodiversity [96]. The different tasks and responsibilities lead to several barriers for CE assessment implementation, and the commitment level varies among organisations. In the Ministry of the Environment or the Ministry of the Economy, the topic of CE and the importance of CE assessment are more widely acknowledged than in the Ministry of National Defence. An interviewee argued “it is just not seen as a priority in the military because it is not the core business of the organisation” (interviewee # 10). In addition, public sector organisations regularly change their organisational layout, which leads to a shift in tasks and responsibilities. For example, the Portuguese Environmental Agency (APA) includes multiple organisations that were recently merged, or the Ministry of Environment and Climate Action used to be the Ministry of Environment and Energy Transition until 2020 and before the Ministry for Environment and Spatial Planning until 2011. The lack of clear responsibility for a cross-cutting topic such as CE is considered a main implementation challenge.

The empirical data shows that the organisational culture, including the absence of CE awareness, as well as the structure, with a lack of CE leadership commitment and its voluntary nature, were considered major challenges to CE assessment implementation. The resulting aversion against CE assessment within the public sector organisations caused some of the following factors.

#### 4.1.3. Financial Challenges

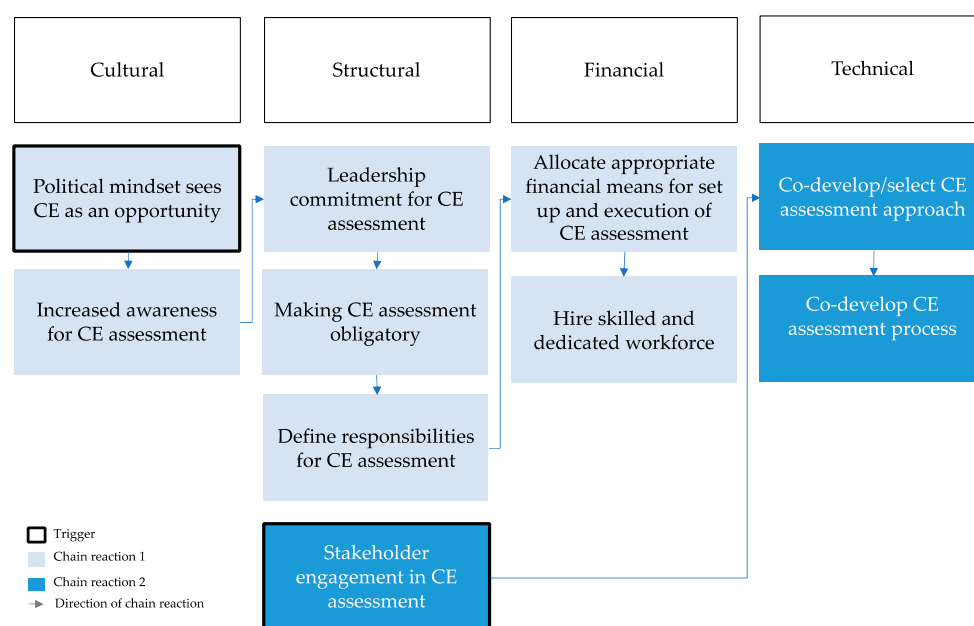
The lack of financial resources further challenges CE assessment implementation. Similar to many governments, in the Portuguese public sector organisations, budgets are allocated by the Ministry of Finance [97]. If there is no priority for CE assessment, a budget is not allocated. The financials of Portuguese public sector organisations mirror the lack of awareness and the missing organisational commitment towards CE assessment. The lack of finances leads to problems in setting up and executing a CE assessment across all Portuguese public sector organisations, e.g., eventual IT software licenses, standards, and data collection. One of the interviewees mentioned: “we cannot do nothing if we don’t have tools” (interviewee # 19). Second, there is not enough dedicated and knowledgeable members of staff (interviewees # 1, 10, 15, and 17). One of the experts argued: “I think one important thing is the capacitation and involvement of human resources. Currently there is a lack of human resources that are aware of these topics and that have education in environment, energy . . . they don’t need to be all environmental engineers, but they have to be aware and enjoy and like these topics” (interviewee # 10). During the interviews with the Ministry of the Environment or the Ministry of the Economy, a lack of experts was not mentioned. This might be due to the closeness of the organisational function to the topic, as public sector organisations usually hire subject matter experts [98].

#### 4.1.4. Technical Challenges

A few interviewees emphasised the absence of an appropriate CE assessment approach as a CE implementation challenge (interviewees # 1, 12, 15, 16, and 19). In line with the reasoning of the financial challenges, interviewees argued that the lacking political will and organisational commitment are responsible for Portuguese public sector organisations not selecting and/or developing an appropriate assessment approach. Moreover, in line with the literature on CE assessment, some interviewees mentioned the complexity and overwhelming data requirements as challenges for CE assessment implementation (interviewees # 1, 2, 6, 7, 12, 15, 16, and 21). There is a large interest from academic researchers in assessing CE in organisations with fewer contributions from practice, which indicates the complexity of CE implementation [16]. The literature provides a large number of CE indicators which cover multiple CE principles and are complex to understand and to apply. An interviewee highlighted, “We need to be more aware of this and we need more statistics and data support from the national office, like Statistics Portugal” (interviewee # 7). Furthermore, existing assessment efforts show that public sector organisations do not have a working infrastructure for a CE assessment across the different public sector organisations [99,100]. For example, in the context of the questionnaire related to the paper and plastic resolution [99], the interviewees highlighted the absence of a government-wide IT infrastructure and the use of the different systems and tools as key implementation challenges. The existing IT is often not ideal to share data across organisations, and updating it would require financial resources (interviewees # 2–5, 12, 13, and 20) [99].

### 4.2. Strategies to Overcome Challenges in CE Assessment Implementation in Public Sector Organisations

As pictured in Figure 2, two triggers for two possible strategies driving CE assessment implementation were identified. The empirical data gave further insights and examples of how the two chain reactions might evolve in the given context.



**Figure 2.** Strategies to overcome the challenges for CE assessment implementation.

In the first strategy, the political mindset of decision makers triggers a chain reaction towards an increased awareness for CE assessment that leads to leadership commitment, an obligation for CE assessment, and an allocation of responsibilities and financial resources. The interviews as well as the policy document analysis show that the topic of CE will gain increased attention in Portugal in the near future, e.g., because Portugal will take over the presidency of the Council of the European Union January–June 2021, where CE will play a central role as a part of the European Green Deal [83]. In line with the literature, the interviewees suggested that this event could prompt Portuguese policy makers to take interest in gaining a CE reputation. Beyond the Portuguese context, the literature argues that having a political purpose for collecting CE assessment data may overcome the resistance to CE assessment resulting from the bureaucratic mindset within the organisation [38] (interviewees # 6, 19, and 21).

The increased awareness for CE improves leadership commitment and can lead to a legal mandate for CE assessment. In a public sector organisation, leaders clarify organisational goals and fundamentally shape the organisational culture [101]. Therefore, the buy-in for CE assessment from senior managers is essential for its implementation. Moreover, the interviewees argued, in line with Holzer et al. [39], that an obligatory character of CE assessment would be a crucial driver for successful implementation: “When we are obliged, we do it. ‘Simplex’, for example, it was binding a national policy we had to comply to. We just executed it and implemented” (interviewee # 11) [102]. They explained that a resolution from the Council of Ministers, a body that includes all senior ministers in Portugal, would be most effective (interviewees # 2 and 5). The policy document analysis confirmed this, showing that government-wide approaches were triggered by mandatory resolutions from the top level, such as Simplex, SNIERPA, and SPeM [102–104]. The case of Simplex further highlighted that a legal mandate can also trigger the necessary allocation of a budget for dedicated skilled staff as well as for initiating and executing CE assessment [102].

A second chain reaction is triggered by increased stakeholder engagement to select and codevelop a CE assessment approach and process (interviewees # 1, 8, and 9). Research on sustainability assessment already noticed that stakeholder engagement plays a crucial role [59]. Individuals at all levels of the organisation need to understand the value of the assessment before they can fully embrace the changes [39]. It is suggested by the literature and interviewees to include all relevant stakeholders for identifying the assessment approach and execution process [7]. The interviewees argued, “If you don’t

transmit, if important stakeholders are not involved, you may have the best plan for your organisation, but it will not work.” (interviewee # 1). An identified best practice from the interviews was the start of assessment ideas often by developing a methodological approach proposed by sectoral experts and then by circulating it throughout the entire organisation to receive contributions. The members of staff have 10 days to contribute to the development of the assessment approach, e.g., to highlight data issues, to suggest different methods, or to add organisation-specific input (interviewees # 19 and 20).

Stakeholder engagement further allows for learning from best practices of the implementation of previous assessment approaches. Many interviewees suggested the integration of a CE assessment in existing assessment schemes or toolkits for public organisations. The policy document analysis shows that sustainability assessment has already been implemented to some extent in Portugal. For example, the *Administração dos Portos de Sines e do Algarve* (Port Administration of Sines and the Algarve) regularly assesses and reports their sustainability efforts using the Global Reporting Initiative (GRI) guidelines [105,106]. Furthermore, the Portuguese Environmental Agency (APA) assesses and reports on Portugal’s efforts towards environmental sustainability every year through the State of the Environment Report, which could be extended to also assess organisational CE efforts [107]. In line with contributions by the British Standards Institution [108] or Kristensen and Mosgaard [16], CE assessment could be included in the existing standards, guidelines, toolkits, certification schemes, or eco labels.

According to Saidani et al. [15], about 45% of existing CE indicators are linked to computational tools, making their application and implementation more convenient for practitioners. The interviewees advocated for supporting IT tools that need to be compatible to be used in all public sector organisations. Also, here co-development was highlighted since relying on out-of-the-box software systems that come with predesigned measures can miss the nuances of a context-specific CE assessment. Furthermore, many interviewees highlighted the importance of clear governance, including responsibilities and a chain of command similar to governance of the assessment of CE best practices resulting from the Portuguese CE action plan in 2019 [72] (interviewees # 1, 11–13, and 19). The interviewees proposed the installation of a focal point in each organisation that consolidates and reports the assessment data (interviewees # 5 and 19–21). They further argued, in line with Holzer et al. [39] that regular discussion of performance information will help engrain these practices into the culture of the organisation. This process could be supported by regular meetings and clear communication channels (interviewees # 3–5 and 19–21). Finally, the use of assessment information within the decision-making process is a critical element in producing desired outcomes. According to the literature, this component characterizes the very first step towards the institutionalization of assessments [39].

## 5. Conclusions

The previous sections presented the case study of CE assessment implementation in Portuguese public sector organisations. The analysis highlights that there are still multiple challenges for CE assessment implementation across the four factors (cultural, structural, financial, and technical) that require action. We observed a lack of CE assessment awareness, missing leadership for CE assessment implementation, its voluntary nature, and the complexity of CE assessment approaches as the most pressing challenges preventing CE assessment implementation. Departing from this, two strategies were derived leading to a commitment for CE assessment as well as a codeveloped CE assessment approach and execution process. In combination, both strategies can break the barriers and can drive the CE assessment implementation in Portuguese public sector organisations. Beyond this case study, this research draws broader theoretical and practical lessons.

First, CE assessment of organisations is difficult to implement in the public sector. All interviewees involved in this research were able to mention multiple implementation challenges. As outlined in Section 2, the current research on CE assessment argues that technical challenges cause the failure of CE assessment implementation. Nevertheless,

the data show that cultural and structural challenges for CE assessment outweigh the technical challenges and partly cause them. Especially the lack of awareness for the importance of CE assessment emerges as a key barrier. This shows that challenging prevailing assumptions of the literature and practice led to the discovery of a broader spectrum of CE assessment implementation challenges. Thus, it is important to look beyond the technical barriers of CE assessment and to focus on cultural and structural challenges.

Second, the results show that existing frameworks on barriers for CE strategy and practice implementation, such as the ones developed by de Jesus and Mendonça [42] or by Kirchher et al. [17], can serve as a basis for detailed analysis of single practices such as CE assessment. These frameworks were consolidated, and insights from the CE assessment literature and public sector-specific contributions were added. The newly developed, more detailed, coding framework guided this analysis (see Table 1). The findings from the data analysis show that no major amendments were made to the coding framework and that the empirical data was in line with the findings from the literature. The main contribution is, therefore, the merger of different fields of research and exploration of empirical data developing more detailed context-specific frameworks (see Figures 1 and 2). We argue that our approach might be transferable for analysing the implementation of other CE practices, e.g., business model implementation.

Third, we found that explicitly exploring the strategies and chain reactions for successful CE assessment implementation offered insights and concrete steps for action. It was argued in Section 2 that the identification of CE implementation challenges and their causes allow for the derivation of strategies for successful CE implementation. Most existing analyses focus on identifying the barriers and draw less attention to the strategies to overcome them, implying the clarity of the next steps. We found that the explicit analysis of strategies added value to the analysis. During the interviews, we asked directly how to overcome the implementation challenges. In addition, we analysed how existing assessment initiatives had been implemented in the past. Including this perspective led to the identification of sector-specific best practices of existing assessments or insights into successful governance of CE assessment, as requested by the CE assessment literature.

Lastly, it is important to highlight the limitations of this research. For example, selecting one case study has the advantage of describing this case in depth. In that sense, the derived framework is generalisable whereas particular findings may not be. Furthermore, the derived strategies to overcome CE assessment challenges have been developed in line with the empirical data but were not yet tested in Portuguese public sector organisations. Methodologically, interviews entail potential validity issues. This limitation was mitigated by triangulating the interview data with the findings from the policy document review. Future empirical research is needed.

We need to acknowledge that there is not one magical approach for CE assessment implementation in all public sector organisations around the world. Therefore, future research should explore further single case studies in the public sector to gain more in-depth knowledge on CE assessment implementation challenges and strategies to overcome them. In addition, large-n studies can explore patterns across different institutional, cultural, and geographic contexts. Further exploring CE assessment implementation in the private sector can also give a more comprehensive view. In addition, many interviewees did not understand how CE assessment compliments already existing sustainability assessment approaches. The literature so far does not provide a comprehensive answer to this question. This research needs to be seen as a starting point for future research that is urgently needed to close the highlighted CE assessment implementation gap.

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## Appendix A

**Table A1.** Interview guideline (exemplary for an organisation that does not perform explicit CE assessment yet).

Interview Section	Exemplary Questions
General Introduction (approx. 5 min)	<ul style="list-style-type: none"> <li>• Introduction of the research team</li> <li>• Explanation of the aim of the interview</li> <li>• Explanation of data treatment and confidentiality</li> </ul>
Introduction of the interviewee (approx. 5 min)	<ul style="list-style-type: none"> <li>• What is your educational/professional background?</li> <li>• Which organisation do you work for?</li> <li>• What is your role in the organisation?</li> <li>• How long have you worked for this organisation?</li> <li>• Since when are you working in the field of CE?</li> </ul>
Status of assessment (approx. 20 min)	<ul style="list-style-type: none"> <li>• Is there any kind of assessment in your organisation?</li> <li>• Are there any existing efforts of sustainability/environmental/CE assessments in your organisation?</li> <li>• Is there the intention to implement CE assessment in your organisation?</li> </ul>
Deep dive CE assessment (approx. 30 min)	<ul style="list-style-type: none"> <li>• Why do you not have any/sustainability/CE assessment in your organisation?</li> <li>• What are the current challenges for implementing CE assessment in your organisation?</li> <li>• What could drive the implementation of CE assessment in your organisation?</li> <li>• Who would need to drive CE assessment in your organisation?</li> <li>• Who should be involved in CE assessment? Why?</li> <li>• What would be the key areas of CE assessment in your organisation?</li> <li>• How would you assess CE?</li> </ul>

## Appendix B

Table A2. Overview of the selected policy documents.

Policy Document	Description	Access
Database of good CE and sustainable practices	Summary of the results of a government-wide survey within the Portuguese public administration; outline of 75 good practices to implement CE activity in public sector organisations.	Interview data
Decree law 56/2012 on the Portuguese Environment Agency (APA I.P)	The Portuguese Environment Agency (APA I.P) was established through the Decree-Law 56/2012, replacing the earlier Climate Change Commission (1998). Operating within the Ministry of Environment, Spatial Planning and Energy (MAOTE), it became responsible for monitoring and development of climate policy at the national level.	<a href="https://dre.pt/web/guest/pesquisa/-/search/191865/details/normal?q=56%2F2012+">https://dre.pt/web/guest/pesquisa/-/search/191865/details/normal?q=56%2F2012+</a>
Decree law No. 82 D/2014 establishing a set of green fiscal rules	Includes, for example, tax breaks for low-emission vehicles, energy-efficient buildings, and sustainable forest management that also affect public sector organisations. It including assessment as a threshold for law application.	<a href="https://dre.pt/home/-/dre/66022084/details/maximized?p_auth=Hg07h3xg">https://dre.pt/home/-/dre/66022084/details/maximized?p_auth=Hg07h3xg</a>
Decree-Law 71/2006 on the Portuguese Carbon Fund	Establishes the Portuguese Carbon Fund (FPC), a state financial instrument for acting on the carbon market to ensure compliance with national targets on climate change issues, making use of the flexibility mechanisms of the Kyoto Protocol and supporting national projects to reduce emissions.	<a href="https://dre.pt/pesquisa/-/search/671386/details/maximized">https://dre.pt/pesquisa/-/search/671386/details/maximized</a>
Decree-Law No. 69/2000 establishing the legal regime on environmental impact assessment of significant effects of public and private projects.	Establishes the legal regime on environmental impact assessment of significant effects of certain public and private projects on the environment by transposing to our internal system Council Directive No. EC/85/337 of 27 June 1985 with the amendments introduced by Council Directive EC/95/11 of 3 March 1997.	<a href="https://dre.pt/pesquisa/-/search/281589/details/maximized">https://dre.pt/pesquisa/-/search/281589/details/maximized</a>
Eco.nomia webportal	This portal is one of the components of the PAEC, assuming itself as a space for sharing CE knowledge.	<a href="https://eco.nomia.pt">https://eco.nomia.pt</a>
Environment Basic Law No. 19/2014	Sets out the basis of environmental policy in compliance with the provisions of Articles 9 and 66 of the National Constitution. The Environmental policy aims to enforce environmental rights through the promotion of the sustainable development, supported by an adequate management of the environment.	<a href="https://www.ecolex.org/details/legislation/framework-act-on-the-environment-act-no-\$-1187-lex-faoc005753/?">https://www.ecolex.org/details/legislation/framework-act-on-the-environment-act-no-\$-1187-lex-faoc005753/?</a>
Green Growth Commitment/Green Growth Coalition (GGC)	Predecessor of the CE action plan. One of the three key ideas of the GGC is that “promoting the efficient use of resources implies optimised resource management aimed at increasing productivity and maximising the use of resources (e.g., material efficiency, energy efficiency, water efficiency, ecodesign, urban renewal)”. It is implemented across sectors. It adopted EU climate goals and targets and further developed them.	<a href="https://www.crescimentoverde.gov.pt/wp-content/uploads/2014/10/Proposta_Comp_Crescimento_Verde.pdf">https://www.crescimentoverde.gov.pt/wp-content/uploads/2014/10/Proposta_Comp_Crescimento_Verde.pdf</a>
GRI reports of Portuguese public sector organisations	The GRI has published a pilot version of a public sector supplement specifically to address the reporting needs of these organisations (GRI 2005). There is an overview of Portuguese public sector organisations using the GRI.	<a href="https://database.globalreporting.org">https://database.globalreporting.org</a>

Table A2. Cont.

Policy Document	Description	Access
ISO standards, e.g., ISO 14001:2015	Few public sector organisations are certified by ISO standards such as the 14001 on Environmental Management Systems.	Interview data
JUNTAr	A fund for local solutions for CE, also targeting public sector organisations. The fund is over one million euros for projects; each project is supported up to 25,000 euros. In 2018 55 projects were supported last year, in 2019 44 projects.	<a href="https://www.fundoambiental.pt/avisos/\$2019/economia-circular/economia-circular-em-freguesias-juntar.aspx">https://www.fundoambiental.pt/avisos/\$2019/economia-circular/economia-circular-em-freguesias-juntar.aspx</a>
LIFE programme	It is a financial instrument that was created with the specific objective of contributing to the implementation, updating, and development of European Policies and Strategies in the area of Environment through co-financing of projects with European-added value.	<a href="https://www.apambiente.pt/_zdata/Instrumentos/Instrumentos%20Financeiros/ProgramaLiFE20142020/InfoLiFE.pdf">https://www.apambiente.pt/_zdata/Instrumentos/Instrumentos%20Financeiros/ProgramaLiFE20142020/InfoLiFE.pdf</a>
National Strategy for Climate Change Adaptation (ENAAAC 2020)	The ENAAAC 2020 corresponds to an outline of the objectives, planned activities, and organisation and functioning model for the 2020 period, with a view to promoting the integration of adaptation to climate change in the various public policies and operationalization instruments, specifically of a territorial nature, as well as in society in general.	<a href="https://sniambgeoviewer.apambiente.pt/GeoDocs/geoportaldocs/Consulta_Publica/DOCS_QEPIC/150515_ENAAAC_Avaliacao_AAE.pdf">https://sniambgeoviewer.apambiente.pt/GeoDocs/geoportaldocs/Consulta_Publica/DOCS_QEPIC/150515_ENAAAC_Avaliacao_AAE.pdf</a>
National System for Energy and Indoor Air Quality Certification of Buildings (SCE)	Energy certification the buildings, in accordance with the Portuguese National System for Energy and Indoor Air Quality Certification of Buildings (SCE).	<a href="https://www.buildup.eu/en/explore/links/sce-portuguese-national-system-energy-and-indoor-air-quality-certification-buildings">https://www.buildup.eu/en/explore/links/sce-portuguese-national-system-energy-and-indoor-air-quality-certification-buildings</a>
Operational Programme Sustainability and Efficiency in Resource Use–PO SEUR 2020	The EU-funded PO SEUR intends to contribute to implementation of the Europe 2020 strategy across all sectors, particularly in relation to the green growth, climate change adaptation, risk prevention and management, and resource use efficiency.	<a href="https://poseur.portugal2020.pt/">https://poseur.portugal2020.pt/</a>
Overview of EMAS organisations in Portugal	EU Eco-Management and Audit Scheme (EMAS) is a premium management instrument developed by the European Commission for companies and other organisations to evaluate, report, and improve their environmental performance.	<a href="https://emas.apambiente.pt/organizacoes-emas?language=pt-pt">https://emas.apambiente.pt/organizacoes-emas?language=pt-pt</a>
Overview of EMAS organisations in Portugal	EU Eco-Management and Audit Scheme (EMAS) is a premium management instrument developed by the European Commission for companies and other organisations to evaluate, report, and improve their environmental performance.	<a href="https://emas.apambiente.pt/organizacoes-emas?language=pt-pt">https://emas.apambiente.pt/organizacoes-emas?language=pt-pt</a>
Plano Estratégico para os Resíduos Urbanos 2014–2020 (PERSU 2020)	The PERSU embodies waste management as a way to continue the material life cycle. Waste is managed as an endogenous resource, minimising its environmental impact and taking advantage of its socioeconomic value. This plan promotes the efficient use and management of primary and secondary resources, decoupling economic growth from material consumption and waste production. The Portuguese Environment Agency (APA) prepares annual reports for monitoring this strategic plan.	<a href="https://apambiente.pt/_zdata/Políticas/Resíduos/Planeamento/PERSU_II/Portaria_187_2007_PERSU_II.pdf">https://apambiente.pt/_zdata/Políticas/Resíduos/Planeamento/PERSU_II/Portaria_187_2007_PERSU_II.pdf</a>

Table A2. Cont.

Policy Document	Description	Access
Portuguese Public Administration Energy Efficiency Programme (ECO.AP) (Government of Portugal, 2013)	It is a program to increase energy efficiency in Portuguese public sector organisations.	<a href="https://ecoap.pnaee.pt/">https://ecoap.pnaee.pt/</a>
Project tracking app “Factive” from the National Statistics Institute	Mentioned during the interviews as a best practice for an assessment tool mentioned by multiple interviewees the National Statistics Institute.	Interview data
Project tracking app “Factive” from the National Statistics Institute	Mentioned during the interviews as a best practice for an assessment tool by multiple interviewees of the National Statistics Institute.	Interview data
Quadros de Responsabilidade e Avaliação QUAR	Annual reporting of public sector organisations. Quantitative and qualitative targets that are set for each ministry at the beginning of the year and evaluated at the end of the year.	Interview data
Questionnaire related to paper and plastic resolution	A large questionnaire developed and disseminated by the Portuguese Environmental Agency and the Office of the Presidency of the Council of Ministers.	Interview data
Resolution (141/2018) and decree law (37/2018)	The paper and plastics resolution commits Portuguese public sector organisations to reduce their paper and plastic consumption.	<a href="https://dre.pt/home/-/dre/115440317/details/maximizedhttps://dre.pt/home/-/dre/116794199/details/maximized">https://dre.pt/home/-/dre/115440317/details/maximizedhttps://dre.pt/home/-/dre/116794199/details/maximized</a>
Resolution 152/2016 Estratégia Nacional de Compras Públicas Ecológicas para 2020 (ENCPE 2020)	Green Public Procurement strategy in Portugal	<a href="http://www.impic.pt/impic/pt-pt/noticias/estrategia-nacional-para-as-compras-publicas-ecologicas-2020-encpe-2020http://www.impic.pt/impic/assets/misc/pdf/RCM_38_2016_ENCP.pdf">http://www.impic.pt/impic/pt-pt/noticias/estrategia-nacional-para-as-compras-publicas-ecologicas-2020-encpe-2020http://www.impic.pt/impic/assets/misc/pdf/RCM_38_2016_ENCP.pdf</a>
Resolution 190-A/2017 establishes the Action plan for CE in Portugal: 2017–2020	In 2017, the Portuguese Council of Ministers approved the Action Plan for the Circular Economy (PAEC). It consists of the following elements: a carbon neutral economy; knowledge as impulse; inclusive and resilient economic prosperity; and a flourishing, responsible, dynamic, and inclusive society.	<a href="https://eco.nomia.pt/pt/recursos/noticias/paec">https://eco.nomia.pt/pt/recursos/noticias/paec</a>
Resolution 45/2016 Sistema Nacional para Políticas e Medidas (SPeM)	The SPeM is a mandatory implementation system, essential for assessing progress made in terms of climate policy and reporting, through which compliance with obligations under the United Nations Framework Convention is demonstrated for Climate Change (UNFCCC) and community.	<a href="https://apambiente.pt/_zdata/DMMC/RCM%2045_2016.pdf">https://apambiente.pt/_zdata/DMMC/RCM%2045_2016.pdf</a>
Resolution 93/2010 mandating the development of a new regulatory framework for post-2010 climate policy in Portugal	This resolution establishes that the government will draft different documents to address the challenges of climate change arising from commitments for the post-2012 period: a National Low Carbon Roadmap, with horizons of 2020, 2030, and 2050.	<a href="https://www.apambiente.pt/_zdata/Alteracoes_Climaticas_Relatorios/Art4MMR/2014_MMR_art4_PTsubmission.pdf">https://www.apambiente.pt/_zdata/Alteracoes_Climaticas_Relatorios/Art4MMR/2014_MMR_art4_PTsubmission.pdf</a>
Resolution of Council of Ministers 20/2013 establishing the National Action Plan for Energy Efficiency (PNAEE 2016) and the National Action Plan for Renewable Energy (PNAER 2020)	This PNAEE and the PNAER 2020 repeal the PNAEE 2015, approved by the Resolution of Council of Ministers 80/2008, of 16 May 2008. Part of this is a program to increase energy efficiency in Portuguese public sector organisations (Portuguese Public Administration Energy Efficiency Programme (ECO.AP)).	<a href="https://ecoap.pnaee.pt/">https://ecoap.pnaee.pt/</a>

Table A2. Cont.

Policy Document	Description	Access
Resolution of Council of Ministers 68/2005, establishes the National System for the Estimation of Emissions by Sources and Removals by Sinks and Air Pollutants (SNIERPA)	SNIERPA contains a set of legal, institutional, and procedural arrangements that aim to ensure the accurate estimation of emissions by sources and removals by sinks of GHG and other air pollutants including public sector organisations.	<a href="https://apambiente.pt/_zdata/DMMC/RCM%2020_2015.pdf">https://apambiente.pt/_zdata/DMMC/RCM%2020_2015.pdf</a>
Resolution of the Council of Ministers no 56/2015 Strategic Framework for Climate Policy (QE-PiC)	QE-PiC in Annex I, the National Program for Climate Change 2020/2030 (PNAC 2020/2030) in Annex II, and the National Strategy for Adaptation to Climate Change in Annex III. The Strategic Framework for Climate Policy sets out the vision and objectives of national climate policy to 2030. The PNAC is one of the elements that constitute the QE-PiC.	<a href="https://apambiente.pt/_zdata/DMMC/RCM%2056_2015.pdf">https://apambiente.pt/_zdata/DMMC/RCM%2056_2015.pdf</a>
Resolutions 104/2006 and 1/2008, establishes and amends the National Climate Change Programme (PNAC)	The PNAC 2006 contains a set of measures defined for the sectors of the economy with an impact on GHG emissions: energy (demand and supply, including the subsectors transport, residential and services, and industry), agriculture and livestock, forestry, and waste and thereby developed a framework of policies and measures.	<a href="https://dre.pt/web/guest/pesquisa/-/search/191865/details/normal?q=56%2F2012+">https://dre.pt/web/guest/pesquisa/-/search/191865/details/normal?q=56%2F2012+</a>
Simplex	The first Simplex Programme was launched in 2006. The aim is to improve public service delivery by reducing red tape, reducing compliance costs and using ICT. The success of the programme is continuously assessed.	<a href="http://historico.simplex.gov.pt/downloads/whatissimplex.pdf">http://historico.simplex.gov.pt/downloads/whatissimplex.pdf</a>
Strategic Plan for Hospital Waste (PERH)	The PERH aims to strengthen measures for the prevention of medical waste, going beyond mere waste management to introducing the material life-cycle approach, with a focus on reducing the environmental impact resulting from production and waste management and on strengthening the concept of the economic value of waste. Moreover, it encourages the recovery of waste and the use of materials resulting from recovery, considering elimination as the very last option.	<a href="https://apambiente.pt/_zdata/Políticas/Resíduos/Planeamento/PERH/PERH_2011_2016.pdf">https://apambiente.pt/_zdata/Políticas/Resíduos/Planeamento/PERH/PERH_2011_2016.pdf</a>
The Global Reporting Initiative (GRI) Reports in Portuguese public sector organisations	GRI is a sustainability reporting guideline. The guidelines represent the reporting content that has been identified as most broadly relevant to both reporting organisations and report users.	<a href="https://www.intechopen.com/books/digital-communication-management/analysis-of-gri-sustainability-reports-issued-by-portuguese-public-sector-entities">https://www.intechopen.com/books/digital-communication-management/analysis-of-gri-sustainability-reports-issued-by-portuguese-public-sector-entities</a>
The Report on the State of the Environment (OER)	The OER allows us to draw a global picture of Portugal's current panorama on the environment in the context of its economic and social evolution.	<a href="https://rea.apambiente.pt/">https://rea.apambiente.pt/</a>
Web form to identify sustainability practices	It is a questionnaire including more than 200 questions developed by the Portuguese Environmental Agency that aims to identify good sustainability practices of the Portuguese central public sector organisations.	Interview data

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