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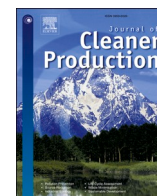
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Effective governance of circular economies: An international comparison

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ABSTRACT

This paper focuses on a comparative study of the governance of Circular Economy (CE) in sixteen different countries. The analysis rests on a theoretical framework of insights gained in transition management literature and public administration, particularly network governance. It is assumed that two forms of governance are needed to cope with the complex circular economy transition process: public and network governance. The hypothesis was that in order to implement CE effectively, strong leadership of government, active involvement of stakeholders and receptivity to network governance are crucial. Based on the analysis described in this paper, two models have been designed that refine the original hypothesis: a model on the effectiveness of CE governance and a model that presents four main avenues for developing CE in different socio-cultural and political contexts. It is recommended to continue exploring this area of research, which is underexamined in the literature.

1. Introduction

Scarcity and overconsumption of resources lead to alarming problems. The supply of sufficient resources is at stake, as we annually consume more than the Earth can provide. In 1970, it required the equivalent of one Earth to sustain our current population; nowadays, it takes about 1.75 Earths, and if we maintain our present consumption patterns, we will need three Earths by the year 2050 (Kaza et al., 2018). The growing awareness of the depletion of the Earth has put the idea of a circular economy (CE) high on national agendas (De Jesus and Mendonça, 2018). Despite the wide range of different definitions for the term ‘circular economy’ (Kirchherr et al., 2017), there is a common denominator: the concept of a cyclical, closed-loop, regenerative system in which resource input and waste, emissions and energy leakage are minimised, and redesign and reuse of products are prioritised (Murray et al., 2017). CE is seen as a way to overcome the linear take-make-dispose pattern of production and consumption and replace it with a circular system, in which the value of products, materials and resources is maintained in the economy for as long as possible (Merli et al., 2018). According to Ghisellini et al. (2016) CE provides a reliable framework for radically improving the present business model towards preventive and regenerative eco-industrial development as well as increased wellbeing based on recovered environmental integrity.

Among the first governments that have taken serious action towards transitioning to a CE, are China, Japan and the European Union (Geng et al., 2009; Kalmykova et al., 2017; Lieder and Rashid, 2016; Reike

et al., 2018; Su et al., 2013). Other actors have also started to implement CE initiatives. For instance, new and existing businesses have introduced circular products and services, often accompanied by alternative business models (Michellini et al., 2017; Murray et al., 2017; Winans et al., 2017). Additionally, civil society and NGOs have kickstarted campaigns to get public attention for CE and critically observe governmental policies regarding CE (Kalmykova et al., 2017; Wachholz, 2020).

The promise of CE has also elicited the interest of the scientific community, leading to a growing number of articles in this field since the last decade (Ghisellini et al., 2016; Khitous et al., 2020; Merli et al., 2018; Winans et al., 2017). The literature mainly focuses on terminologies and definitions of CE and on issues such as ecoparks, industrial symbiosis, supply chains, material closed loops and business models (Homrich et al., 2018). A particular topic critically reflected upon is the risk of greenwashing by governments and industry who reduce the concept of CE merely to efficiency optimisations instead of a more radical transformation towards new systems thinking (Birkeland, 2020; Giampietro and Mayumi, 2018; Kopnina, 2019). However, the issue of how to govern the transformational change from the present, mainly linear economy to a CE remains largely underexplored (Khitous et al., 2020; Patterson et al., 2017).

De Jesus and Mendonça (2018) states that moving away from the linear model will not be an easy task as entrenched technical systems are made stiffer by risk avoidance and special interests with much to lose in the short run. Because it implies a fundamental change, the transition to CE is of a disruptive nature (Ritzén and Sandström, 2017). Business as

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key actor will have to overcome numerous barriers (Kirchherr et al., 2018; Russell et al., 2019), viz. financial, structural, operational, attitudinal and technological (Ritzén and Sandström, 2017). Based on an analysis of a broader set of barriers, Allwood et al. (2011) suggest three main mechanisms to promote CE: business opportunities, governmental interventions and consumer drivers. This means that not only technical, but also social and institutional changes are needed to transform the upstream process of production and consumption (Merli et al., 2018), including more sustainable choices and the adoption of CE principles (Ranta et al., 2018). Successful CE initiatives typically involve a broad variety of economic and societal stakeholders that need to work together to enable the circular flow of materials and related efficiency benefits (Ranta et al., 2018). Governments can enhance CE initiatives through the implementation of various policy instruments such as regulatory, financial-economic and social instruments. However, without bottom-up support from industry and the community, CE initiatives are not sustained (Lieder and Rashid, 2016; Winans et al., 2017). The involvement of all actors and their capacity to link and create suitable collaboration and exchange patterns, is indispensable (Ghisellini et al., 2016). Ddiba et al. (2020) emphasise the importance of leadership from the public sector in co-developing visionary strategies for circularity and using their convening power to facilitate cross-sectoral collaboration.

To cope with this complex transition process, Cramer (2020a) calls for two forms of governance: public governance, which represents the conventional role of government as the guardian of the common good (here: to safeguard the environment) and network governance, which is about collaboration among actors: people who are willing to contribute to transformational change and who need each other to realise this (Cramer, 2020a). Network governance does not replace conventional public governance but complements it. It helps realise CE goals and increases societal support for more stringent measures (Cramer, 2020a). If and how the concurrent application of both types of governance can lead to effective implementation of CE is a question that has hardly been addressed in the literature (Ddiba et al., 2020; Franco, 2017; Ghisellini et al., 2016; Kalmykova et al., 2017; Lieder and Rashid, 2016). This paper aims to fill this knowledge gap by comparing the governance of implementing CE in sixteen different countries worldwide.

The structure of this paper is as follows. First, the methodology will be explained, followed by the technological background, which builds on insights gained in transition management literature and public administration, particularly network governance. Next, the 16 countries studied will be compared on their current public governance, the involvement of relevant actors and the receptivity to network governance in view of their socio-cultural and political context. The analysis leads to a discussion on how to effectively govern societal change towards CE, considering a country's socio-cultural and political context.

2. Material and methods

To understand the governance of moving to CE in different socio-cultural and political contexts, a qualitative, exploratory, cross-country comparison is made based on a selection of sixteen countries. The Netherlands is used as the reference case, as this country is one of the frontrunners in implementing circular economy policies and has also put into practice network governance. These experiences have been extensively documented in various publications (Cramer, 2020a, 2020b, 2020c and 2020d), which is not the case for other countries. The Dutch case reveals that conventional public governance is needed to formulate a policy plan and implement relevant instruments to steer towards CE. However, this traditional form of governance is insufficiently connected to the people who are expected to help realise the CE policy objectives. To complement conventional public governance, a form of network governance has been implemented. Network governance supports the positive forces in society, thereby making a crucial contribution to the circular policy objectives of countries and regions. It can align the growing number of inspiring standalone initiatives, thereby establishing

a stronger CE movement (Cramer, 2020a).

The leading question of this paper is whether other countries also consider network governance, complementary to public governance, crucial for governing CE, and if so, how the concurrent application of both public and network governance can lead to an effective implementation of CE in those countries. To support an international comparison, interviews were held with representatives of sixteen countries, including the Netherlands, between January and May 2021. These representatives had been selected because they are actively involved in a worldwide network of 'circular hotspots or comparable CE platforms' that promote CE in their country. As the Holland Circular Hotspot, a public-private organisation, cooperates closely with most of them and is actively involved in establishing new circular hotspots, the author was able to identify the one or two most suitable persons to be interviewed in each country. As director and/or senior manager of a circular hotspot or CE platform these persons are crucial actors in their countries in promoting CE as an independent, intermediary party. Twenty people were interviewed in total. Prior to the interview, the interviewees received the publication summarising the Dutch experiences (Cramer, 2020a) and a checklist of 45 interview questions.

The interviews were held via a video call, lasted an average of 1.5–2 h and consisted of three parts. Part 1 discusses current CE policies and practices. As it was difficult to acquire comparable data on circular material use rates outside Europe, the assessment is based on available statistical data from Eurostat and the OECD about waste management (percentages of landfill, incineration, and recycling) and assessments of the interviewees on the existence of a national CE policy plan (with clear targets and actions, decided upon by the government), a CE product policy, and the extent of the second-hand and repair markets. The latter aspects represent product-reuse measures that are higher on the 10R ladder of circularity (Cramer, 2020a). According to this ladder highest priority should be given to Refusal of use, and then to Reduction, which means decreasing material use per unit of product. Afterwards, priority should be given to Rethinking the product in view of circularity; next to product options such as Reuse, Repair, Refurbishment, Remanufacturing and Repurposing; and then to material and resource Recycling. Finally, any remaining residue which cannot be recycled should be incinerated with energy Recovery, although this particular practice is not part of a circular economy (Cramer, 2017).

Table 1 was designed to assess the phase of development of CE in each country. The two main criteria were whether national CE policies were in place and how far the country had proceeded in implementing recycling and higher steps on the R ladder of circularity. The cut-off criteria applied were based on expert judgement of the author. In this and the following tables I also call Flanders and Scotland a country, while they are formally part of a federal government, respectively Belgium and Great Britain. However, because they both have their own government and CE policies, we consider them a country.

The interviewees were also asked to assess the degree of

Table 1
Characteristics of CE transition phases.

Predevelopment	Startup	Acceleration	Stabilization
No national policies on circular economy	National policies on circular economy in development	National policies on circular economy in place	National policies on circular economy are 'the new normal'
Percentage of recycling of household waste below 40% and no attention for redesign/reuse of products	Percentage of recycling of household waste between 40% and 56% and low levels of attention for redesign/reuse of products	Percentage of recycling of household waste above 56% and medium levels of attention for redesign/reuse of products	

governmental leadership on CE in their respective country and the involvement of different actors in the implementation (viz. industry, startups/scale-ups, local government, NGOs, and civil society). The resulting data were used to analyse whether these aspects correlate with a more advanced development phase of CE.

Part 2 first addresses the view of the interviewee(s) on the importance of network governance for implementing CE in their country and the applicability of the experiences gained in the Netherlands as described in Cramer (2020a).

Next, the receptivity to network governance is discussed in view of the socio-cultural and political context of the country. To reveal these data, insights from the literature on cultural differences in management and political culture were used. Inspired by the work of Hofstede (2011) the following three dimensions are used: large versus small power distance (specified into pluralist versus autocratic government), short-term versus long-term orientation, and individual versus collective interests prevail. According to Hofstede (2011), pluralist governments are based on majority vote and change peacefully. Autocratic governments are based on co-optation and change by revolution. Short-term versus long-term orientation is conceptualised broadly by Hofstede (2011) but focuses here on the orientation of policymakers. Individual interests prevail in cultures in which the ties between individuals are loose – everyone is expected to look after themselves and their immediate family – while collective interests prevail in cultures in which people are integrated into strong, cohesive in-groups from birth onwards (Hofstede, 2011). To complement the data gathering, four additional, potentially relevant dimensions related to socio-political culture were derived from Schneider and Barsoux (2003): antagonistic society versus consensus-oriented society; media controlled by state versus freedom of speech, centralised versus decentralised government and dominant role of state in economy versus limited role. The interviewees were asked to assess their country regarding the seven dimensions listed in Table 2.

The dimension ‘antagonistic society versus consensus-oriented society’ is assumed to be crucial in building networks consisting of different stakeholders. Therefore, this dimension is specified by also assessing the attitude of different actors vis-à-vis each other on the dimension ‘antagonistic versus cooperative attitude’ and asking the interviewees whether this facilitates or complicates network governance. When raising this issue, the fact remains that adversarial engagement with issues such as CE can be fruitful if done in a dialectic fashion (DiSalvo, C., 2015; Frauenberger, C. et al., 2018).

The final part of the interview, part 3, aimed to reflect upon the most important drivers for network governance and public governance. Through an open question, the interviewees were asked their view on this issue.

In parts 1, 2 and 3 of the interviews, 21, 19 and 5 questions were posed respectively with a response rate of 100%. Literal transcriptions were made of each interview, which allowed for an accurate analysis of the data and citation of interviewees. Additionally, policy documents and other relevant material provided by the interviewees were included in the analysis. A draft report was then produced, containing the cross-comparison of the sixteen cases. To validate the data, the draft results were sent to the interviewees for comments, and these were included in a final draft of this paper.

Table 2
Receptivity to network governance, specified by seven cultural dimensions.

Antagonistic society	Consensus-oriented society
Autocratic government	Pluralistic government
Short-term oriented	Long-term oriented
Media controlled by state	Freedom of speech
Centralised government	Decentralised government
Dominant role of state in economy	Limited role of state
Individual interests prevail	Collective interests prevail

3. Theory

The paper builds on transition management literature, which deals with the question of how to transform from a current system towards another, more desirable system, for instance from a linear to a circular economy (De Jesus et al., 2016; Homrich et al., 2018; Loorbach, 2010; Rotmans et al., 2001; Smith et al., 2005). The dynamics of this transition can be viewed as iterative processes of build-up of emerging alternatives and breakdown of established regimes over a period of decades. (Loorbach et al., 2017). Roggema et al. (2012) prefer to call this change towards a future that is fundamentally different from the existing, transformation instead of transition as they consider the latter as an improved version of the existing. To address more radical transitions, Irwin (2015) proposes a new area of design practice and research, so-called ‘transition design’, that advocates design-led societal transition toward more sustainable futures.

Since the turn of the century, transition management research has gained growing attention, particularly among researchers in the field of sustainability (Markard et al., 2012). Scholars analyse how societies can break free from existing practices and technologies by engaging in co-evolutionary governance using visions, transition experiments and cycles of learning and adaptation (Kemp et al., 2007). ‘Governance’ here refers to the structures, processes, rules, and traditions that determine how members of societies make decisions and share power, exercise responsibility, and ensure accountability (Patterson et al., 2017).

The core ideas within transition research have been adopted in various disciplines, domains, and research fields. This has resulted in different approaches in transition research, viz. the socio-technical, the socio-institutional, and the socio-ecological approach (Loorbach et al., 2017). The socio-institutional approach in particular relates to the core problem raised in this paper. This perspective focuses on the role of power, politics and agency in sustainability transitions and takes into account social learning, culture and daily practices as factors that strongly influence the direction and dynamics of transitions (Loorbach et al., 2017). According to Loorbach et al. (2017), the governance model associated with this perspective differs from the dominant governance logic of state and market. Most societal problems, including sustainability, are too complex to fit into the formal problem-solving structures of government (Carlsson and Sandström, 2008). While administrative boundaries, both between different levels of policymaking and between different policy sectors, are delineated, societal problems, particularly within the area of natural resource management, are characterised by their cross-scale nature (Carlsson and Sandström, 2008 REMOVE ; in Sandström). The new governance model associated with the socio-institutional approach provides more room for multi-actor networks that can empower context-specific transformative solutions. It includes multiple possible modes of policy and decision-making (e.g., hierarchical, market, network), and multiple possible actors (e.g., government, industry, research, civil society) (Patterson et al., 2017).

Therefore, top-down steering by governments and intergovernmental organisations alone cannot address the global environmental problems (Hajer et al., 2015). Both top-down steering and bottom-up self-organisation are likely to be needed, as transformations will emerge from co-evolutionary interactions across multiple sectors of human society and scales over time (Caldwell et al., 2021; Patterson et al., 2017). It is vital to consider how both top-down steering (e.g., the role of a ‘strong state’) and bottom-up self-organisation can contribute to transformations (Patterson et al., 2017; Smith et al., 2005). Top-down planning and market dynamics only account for part of the societal transformation. Agency and interaction in networks shape society as well (Loorbach, 2010). Therefore, the governance of sustainability transitions has a dual character: it requires an interactive dynamic between public governance and network governance (Cramer, 2020a).

Scholars in transition management have principally studied network governance by focusing on the role of actors and agency in sustainability transitions (Fischer and Newig, 2016) and the aspect of power in

multi-actor networks (Farla et al., 2012; Jakob et al., 2020). Despite the progress made by researchers studying sustainability transitions, the knowledge about the overall governance and its effectiveness is still scarce (Jones, 2020; Wishart and Bebbington, 2020). Scholars in public administration also analyse the relevance of networks. According to Provan and Kenis (2008), these scholars usually assume that networks are collaborative arrangements and that therefore governance, which implies hierarchy and control, is inappropriate. However, Provan and Kenis (2008) argue that although network governance may not be a legal issue, as with organisational governance, it is critical for effectiveness. Especially in the public and nonprofit sectors, where collective action is often required for problem solving, goal-directed networks are extremely important as formal mechanisms for achieving multi-organisational outcomes (Provan and Kenis, 2008). They state that some form of governance is necessary to ensure that participants engage in collective and mutually supportive action, that conflict is addressed, and that network resources are acquired and utilised efficiently and effectively.

To orchestrate such networks, scholars studying the governance of CE emphasise the importance of a neutral intermediary, who can align all relevant actors and accelerate the transition process in a goal-oriented direction (Cramer, 2020d; Gliedt et al., 2018; Kanda et al., 2019, 2020; Kivimaa et al., 2019; Rohe and Chlebna, 2021). The intermediary – here called ‘transition broker (Cramer, 2020d) – can be a person or a team. They need to be trustworthy and have adequate competencies (Cramer, 2020d). For instance, they need to be entrepreneurial, excite and inspire others to cooperate, think and act from a systems perspective, act in the collective interest, have a broad knowledge base, and be able to open doors at all policy levels. The transition broker is the orchestrator of the transition process and acts as a servant leader with clear societal objectives in mind. This perspective of goal-oriented network governance mediated by a transition broker has been adopted in the study on the Dutch CE experiences (Cramer, 2020a).

In this study it has been analysed how network governance can be operationalised in product chains and at the local level. Although every case is tailor-made, several characteristics were common to all (Cramer, 2020a). Each circular initiative showcased how the partners jointly developed a circular initiative, often mediated through a transition broker. Each successful circular initiative is a building block for the circular economy. When such an initiative is scaled up and ultimately becomes mainstream, the linear economic system is successively broken down and the circular system built up. This process of creating building blocks should be repeated several times in a significant number of product chains to become fully circular. To reiterate, the transition to a circular economy is not linear, but iterative and spanning at least two decades. It is a continuous transformational change, in which all product chains play an important role (Cramer, 2020a). From the Dutch study ten guiding principles for building CE through network governance are derived, which are presented in Table 3.

The Dutch experiences on how network governance can power CE serve as the starting point for the comparative analysis presented in this paper. The main aim of the analysis is to understand how the concurrent application of both public and network governance plays out in the sixteen countries selected. The hypothesis is that in order to implement CE effectively, strong leadership of government, active involvement of different actors, and receptivity to network governance are conditional. To test this hypothesis, a comparative analysis will be made taking into account these three factors. Although the study is exploratory, it aims to provide first insights into the similarities and differences among countries in the governance of CE and its effectiveness. This fills a knowledge gap that presently exists.

Table 3

Ten guiding principles for building a circular economy through network governance.

Sparkling the transition to a circular economy
Guiding principle 1: The circular initiative starts with a shared sense of urgency
Guiding principle 2: The implementation of circular initiatives occurs in four sequential yet cyclic phases (preparing the initiative, building a joint business-case, scaling up successful initiatives and mainstreaming these initiatives)
Guiding principle 3: Tasks to be performed for each circular initiative are roughly the same, but the focus is case-specific
Guiding principle 4: Building a circular economy is a journey with a clear destination, but no predetermined path.
Context is key
Guiding principle 5: Focus on the most promising innovations
Guiding principle 6: Map the key drivers and preconditions for successful implementation
Guiding principle 7: Identify the relevant actors and assess their willingness to join forces
Successful implementation
Guiding principle 8: New circular business models should benefit all network partners
Guiding principle 9: Intermediaries (‘transition brokers’) can accelerate circular initiatives
Guiding principle 10: A transparent division of labour among the relevant actors is indispensable

4. Results

4.1. Policies and practices

Table 4 compares the government policies and practices regarding CE in the sixteen countries studied. The data on waste management (percentages of landfill, incineration, and recycling) are clustered into (very) low, medium and high. The cut-off criteria based on expert judgement of the author, were:

- Landfill: low (<8%), medium (8–38%), high (>38%)
- Incineration (conventional and energy recovery from waste): low (<11%), medium (11–41%), high (>41%)
- Recycling municipal waste: very low (<30%), low (30–40%), medium (40–56%), high (>56%); It should be noted that only data about municipal waste was available, while this usually represents only about 25% of the total amount of waste. Data about industrial waste is generally not publicly reported and could therefore not be included in the overview.

The other aspects were assessed by the interviewees, namely the existence of a national CE policy plan (with clear targets and actions, decided upon by the government), a CE product policy, and the extent of the second-hand and repair markets.

Table 4 highlights that only six countries (the Netherlands, Flanders, Finland, Norway, Scotland and Taiwan) have a policy plan on CE; these countries also have a high or medium percentage of household waste being recycled and a low percentage of waste going to landfill, except for Scotland. Eight of the remaining countries still have high percentages of landfill waste, and Italy and Slovenia have medium percentages.

Only four countries (the Netherlands, Flanders, Italy and Finland) have a product policy on CE in place. Table 4 shows that the current CE policies and practices are still at early stages in many countries. With respect to the second-hand and repair markets, the picture is slightly different. Although the second-hand market is at low and sometimes medium levels in the countries studied, it is clearly growing, particularly due to the interest of the younger generation to buy second-hand items. The same holds for the repair market.

Table 5 summarises the sixteen countries’ development phase regarding CE. The assessment for each country was based on the following procedure; first the interviewee provided the data on the policies and practices (included in Table 4) and then the development phase was discussed during the interview, taking Table 1 as a reference

Table 4
Current CE policies and practices.

	National policy plan ^b	Landfill, percent ^a	Incineration, percent ^a	Recycling percent ^a	CE product policy ^b	Second hand ^b	Repair ^b
1. Netherlands	Yes	Low	High	High	Yes	Medium	Medium
2. Flanders	Yes	Low	Medium	High	Yes	Medium	Medium
3. Italy	No	Medium	Medium	Medium	Yes	Medium	Low
4. Finland	Yes	Low	High	Medium	Yes	Low	Low
5. Norway	Yes	Low	High	Medium	No	Medium	Low
6. Scotland	Yes	Medium	Medium	Medium	No	Low	Low
7. Hungary	No	High	Medium	Low	No	Medium	Low
8. Slovenia	No	Medium	Medium	High	No	Low, but growing	Low, but growing
9. Slovakia	No	High	Low	Low	No	Low, but growing	Low, but growing
10. Czech Republic	No	High	Medium	Low	No	Low, but growing	Medium, but growing
11. Poland	No	High	Medium	Low	No	Low, but growing	Low
12. Taiwan	Yes	Low	Medium	High	No	High	High
13. Turkey	No	High	Low	Very low	No	Low, but growing	Medium
14. Australia	No	High	Low	Medium	No	Low, but growing	Low
15. Brazil	No	High	Low	Low	No	Low, but growing	Low, but growing
16. Canada	No	High	Low	Very low	No	Low	Low

^a OECD statistics 2021 Municipal Waste Generation and Treatment and Eurostat, Circular Economy Overview 021 Waste Statistics.

^b Based on assessment of interviewees.

Table 5
Development phase, leadership and involvement of different actors in the 16 countries.

	Development phase	Strong leadership CE	Involvement of industry	Involvement of startups/scale-ups	Involvement of local government	Involvement of NGOs/civil society
1. Netherlands	Just before acceleration	Yes	Medium/high	High	High	Medium/low-medium
2. Flanders	Just before acceleration	Yes	Medium/high	High	High, in bigger cities	Medium/low-medium
3. Italy	Startup	Yes	Medium/high	Medium	Regions medium, cities low	Low
4. Finland	Just before acceleration	Yes	Medium/high	Medium	Medium/high	Low
5. Norway	Predevelopment	No	Low, except for frontrunners	Low/medium	Low	Low
6. Scotland	Just before acceleration	Yes	Low/medium	High	Low/medium	High/low-medium
7. Hungary	Predevelopment	No	Low, except some international companies	Low/medium	Low, with some exceptions	Medium/low
8. Slovenia	Startup	No	Medium/high for international and export-oriented companies	Medium	High	Low-medium/low
9. Slovakia	Predevelopment	No	Low	Low	Low	Medium/low
10. Czech Republic	Predevelopment	No	Low, but medium to high for some international companies	Low/medium	Low	Medium/medium
11. Poland	Predevelopment	No	Low, but medium for some international and large domestic companies	Medium	Medium	Medium/low
12. Taiwan	Just before acceleration	Yes	Medium/high for internationally oriented companies	High	Low	High/Low-medium
13. Turkey	Predevelopment	No	Medium	Medium	Low, with some exceptions	Low/some high/medium-high
14. Australia	Predevelopment	No	Low/medium	Low	Low, with some exceptions	Low-medium/low
15. Brazil	Predevelopment	No	Low, except for some international companies and companies that export to the EU	Low	Low	Low
16. Canada	Predevelopment	No	Low	Low	Low, with some exceptions	Low

for this assessment. In addition, Table 5 includes the assessment of the interviewees on the strength of governmental leadership on CE and on the degree of involvement of the different actors in CE. Table 5 shows that the sixteen countries' development phases vary. Nine are in the predevelopment phase, two are in the startup phase and five are just before the acceleration phase. The countries that are more ahead have a stronger governmental leadership in CE than those that are still in the

predevelopment phase. Slovenia appears to be an exception. This stems from the fact that the country's previous government had taken a clear leadership role in promoting CE and had implemented numerous measures.

Table 5 also shows that industry is generally more involved when government takes a stronger leadership role in CE. In countries with low industry involvement, international and/or export-oriented companies

are often more involved. For instance, the interviewee from Brazil states: “If we want to distribute our products worldwide, then we need to follow developments elsewhere. That is why industry is looking at Europe and other places where they see what’s happening on, for instance, circular economy.”

A similar correlation with a stronger leadership role in CE holds for the involvement of local government, with a few exceptions. For example, the involvement of local governments in Poland is at a medium level even without strong leadership from the national government. “Local government is responsible for waste management. Various cities take this role seriously,” says the interviewee. In Taiwan, on the other hand, local governments are hardly involved at all despite strong government leadership because of “the short-term orientation of local politicians.” In Italy the involvement of local governments is low, but of regions medium as “they have more competencies to adopt the integrated CE approach”, the interviewee explains.

The involvement of startups/scale-ups varies widely and seems to depend more on the general innovation culture in their country than on governmental leadership in CE. Remarkably, the interviewees often consider the involvement of NGOs and civil society in implementing CE as being at low or medium levels. Most NGOs focus on specific environmental issues: they relate to circular ideas, but often don’t frame them as such. Few NGOs are actively involved in promoting the circular economy; they often depend on government subsidies to carry out their work. Exceptions are Taiwan and Scotland, where NGOs are actively engaged. Consultancy firms focusing on the circular economy usually play a more prominent role than NGOs. They are often financed by governments and industry to help implement circular initiatives. With respect to the involvement of civil society, various interviewees emphasise the low interest of the public in general but notice the growing attention for CE, particularly within the younger generation. In conclusion, there is a clear relation between the leadership role of the national government regarding CE and the involvement of existing industry and local government. The involvement of startups/scale-ups, NGOs and civil society seems to depend mainly on other factors.

4.2. Receptivity to network governance

The interviewees were asked to respond to the Netherlands’ experiences, particularly concerning network governance and the structured, goal-oriented approach summarised in ten guiding principles (Cramer, 2020a). All interviewees emphasise the importance of network governance and recognise the ten guiding principles. The role of an independent intermediary (called transition broker) is also highly valued, exemplified by the following quote: “A neutral intermediary is very important, because entrepreneurs, government and society have different perspectives.” How to implement network governance is a challenge for all interviewees.

To analyse the receptivity of countries to network governance, use is made of the assessments of the interviewees on seven socio-cultural and political dimensions (see Table 6).

From Table 6, it can be derived that three cultural dimensions do not seem to be distinctive in the receptivity to network governance. The choices for ‘dominant versus limited role of the state in the economy’, ‘centralised versus decentralised government’ and ‘individual versus collective interests prevail’ are randomly distributed and are not considered critical for network governance by the interviewees. The prior expectation had been that network governance may be easier when the role of the state is less dominant and the government decentralised. The data did not present evidence of that assumption. It was also assumed that when collective interests prevail, the embedded sense of community would be stronger and the involvement of different actors higher. Although a direct correlation with network governance could not be found for this case either, this dimension is expected to be a driver for network governance. The interviewees’ responses reveal that a high sense of community may increase the positive attitude of civil society

Table 6
Receptivity to network governance, specified by 7 cultural dimensions.

	Antagonistic vs. Consensus-oriented society	Autocratic vs. pluralistic government	Short-term vs. long-term-oriented government	Media controlled by state vs. freedom of speech	Centralised vs. decentralised government	Dominant role vs. limited role of state in economy	Individual vs. collective interests prevail
1. Netherlands	Consensus-oriented	Pluralistic	Short-term	Freedom of speech	Decentralised	In-between	Collective
2. Flanders	Consensus-oriented	Pluralistic	Short-term	Freedom of speech	Decentralised	Dominant	Collective
3. Italy	Consensus-oriented	Pluralistic	Short-term	Freedom of speech	In-between	In-between	Collective
4. Finland	Consensus-oriented	Pluralistic	Short-term	Freedom of speech	In-between	In-between	Collective
5. Norway	Consensus-oriented	Pluralistic	Short-term	Freedom of speech	Decentralised	Dominant	Collective
6. Scotland	Consensus-oriented	Pluralistic	Short-term	Freedom of speech	Centralised	Dominant	Collective
7. Hungary	Antagonistic	Autocratic	Short-term	Media controlled by state	Centralised	Dominant	In-between
8. Slovenia	Antagonistic	Autocratic	Short-term	Media controlled by state	In-between	Dominant	Individual
9. Slovakia	Antagonistic	Autocratic	Short-term	In-between	In-between	Dominant	Individual
10. Czech Republic	Antagonistic	Autocratic	Short-term	In-between	Decentralised	In-between	Individual
11. Poland	Antagonistic	Autocratic	Short-term	Media controlled by state	Centralised	Dominant	Individual
12. Taiwan	Consensus-oriented	Pluralistic	Short-term	Freedom of speech	In-between	In-between	Collective
13. Turkey	In-between	In-between	Short-term	In-between	Centralised	Dominant	Collective
14. Australia	In-between	In-between	Short-term	Freedom of speech	Limited	Limited	In-between
15. Brazil	Consensus-oriented	Pluralistic	Short-term	Media controlled by state	In-between	Dominant	In-between
16. Canada	Antagonistic	In-between	Short-term	Freedom of speech	In-between	Dominant	In-between

towards CE as they care not only for their own interests but also for the common good. Concerning the dimension ‘short-term versus long-term oriented government’, all interviewees say their country’s situation represents a short-term approach. Many interviewees state that the four-year term of their national government generally leads to short-term orientation, which hampers CE policies directed at long-term transformational change. Some interviewees, particularly those from countries with a CE policy plan, are positive about the longer-term orientation of their government on this issue. This means that overcoming the short-term orientation of government is a major challenge. Finally, the dimension ‘media controlled by the state versus freedom of speech’ is of importance as freedom of speech allows for openness of debate and the varied and sometimes conflicting input of many stakeholders. However, looking at the data, freedom of speech is a supportive, not a dominant, factor in network governance.

Two cultural dimensions stand out as directly related to the receptivity to network governance: autocratic versus pluralistic government and antagonistic versus consensus-oriented society. In order to substantiate this conclusion, the additional, separate assessment on the attitude of different actors vis-à-vis each other and the difficulty to implement network governance, need to be analysed first (see Table 7).

Table 7 clearly shows that a cooperative attitude of different actors towards each other facilitates network governance. Even when the assessment of the levels of cooperation is as ‘in-between’ (viz. for Turkey and Taiwan), network governance can work. When the assessment is ‘antagonistic’, particularly in the relationship between government and industry, network governance is considered more difficult (medium/high). While the attitude of government versus industry seems to be crucial in how difficult network governance is perceived, the attitude of NGOs towards both government and industry is less decisive. The interviewees often answer that it depends on the NGO whether cooperation is possible. That is why their assessments in this category tend to be nuanced. Fig. 1 combines the above data on the difficulty of implementing network governance with the data on the ‘autocratic versus pluralistic government’ and ‘antagonistic versus consensus-oriented society’ dimensions (derived from Table 6) on a vertical axis and the phase of CE development on the horizontal axis.

Based on the insights derived from Fig. 1, one may tentatively conclude that countries with an antagonistic society and often an autocratic government experience difficulty in implementing network governance; they also have a relatively slow introduction of CE. The ones who have medium or low levels of difficulty usually have a

cooperative society and pluralistic government and have proceeded further in CE. The following discussion explains why these preliminary conclusions need to be interpreted with nuance.

4.3. Drivers for effective governance

4.3.1. Drivers for network governance

Based on the interviews it can be concluded that a structured, goal-oriented approach is the main driver to implement network governance effectively. The ten guiding principles based on the Dutch experiences, are seen by the interviewees as a good example of such a structured approach and as a helpful standard to build a CE. Based on their own experiences, the interviewees also shared a few noteworthy additional drivers.

1. Market pressure through supranational policies

According to the interviewees, the EU’s circular economy policies do not just impact EU member states’ policies and practices but also governments and companies that have a trade relationship with the EU. For instance, the interviewee from Brazil states: “If we want to distribute our products worldwide, then we need to follow developments elsewhere. That is why industry is looking at Europe and other places where they see what’s happening on, for instance, circular economy.” Besides EU CE policies China’s import ban on waste (e.g. plastics) has also triggered CE initiatives, among others in Australia and Europe, according to various interviewees.

2. International companies committed to promote CE worldwide

Various interviewees emphasise the impact of international companies that have the ambition to implement CE worldwide. The Slovenian interviewee illustrates this point. “Our industry is quite involved in CE, particularly the international companies, because their competitive advantage is very much related to whether they have embedded the principles of CE and sustainability in their core businesses”. And the Australian interviewee responds similarly: “The main driving actor is the business community. Particularly multinationals that have already made a commitment worldwide”.

3. Positive attitude of civil society towards CE

Table 7
Actors’ attitude towards each other.

	Government <-> Industry	Government <-> NGOs	NGOs <-> Industry	Difficulty to implement network governance
1. Netherlands	Cooperative	Cooperative/sometimes antagonistic	Cooperative/sometimes antagonistic	Low
2. Flanders	Cooperative	Cooperative	Cooperative/sometimes antagonistic	Medium
3. Italy	In-between	In-between	Cooperative	Medium
4. Finland	Cooperative	Cooperative/sometimes antagonistic	Cooperative/sometimes antagonistic	Low
5. Norway	Cooperative	Cooperative/sometimes antagonistic	Cooperative/sometimes antagonistic	Low
6. Scotland	Cooperative	Cooperative	In-between, depending on NGO	Low
7. Hungary	Antagonistic	Depending on the NGO	Depending on NGO	Medium/high
8. Slovenia	In-between	Antagonistic	Antagonistic	Medium/high
9. Slovakia	Antagonistic	Cooperative	Cooperative	Medium/high
10. Czech Republic	In-between	Antagonistic or in between	Antagonistic or in between	Medium/high
11. Poland	Antagonistic	Cooperative (NGO dependent on money)	Cooperative, depending on NGO	Medium/high
12. Taiwan	In-between	In-between	In-between	Low
13. Turkey	In-between	Depending on NGO	Depending on NGO	Low
14. Australia	In-between	Cooperative/sometimes antagonistic	Cooperative/sometimes antagonistic	Medium/high
15. Brazil	In-between	Depending on NGO	Depending on NGO	Medium
16. Canada	Antagonistic	Cooperative, depending on NGO	Antagonistic with some exceptions	High, fear for co-optation

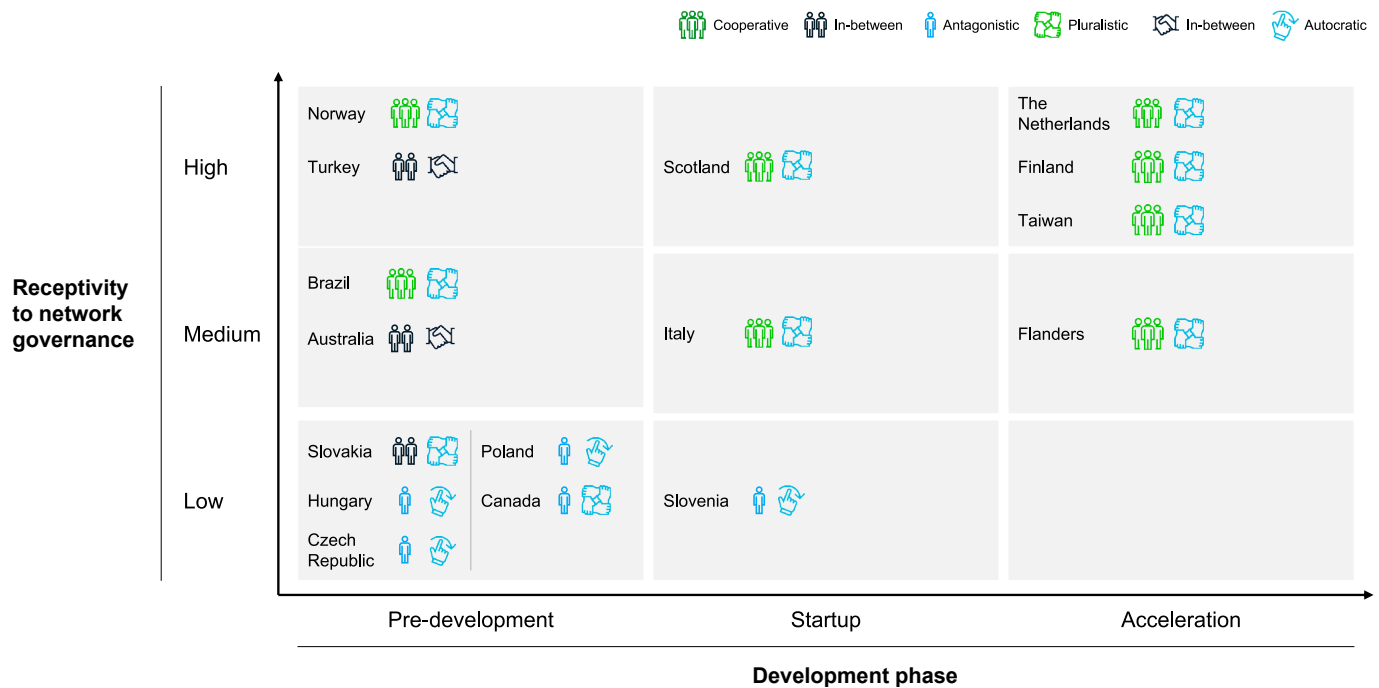


Fig. 1. Relation between receptivity to network governance and development phase.

Interviewees stress that civil society, including NGOs, can play a positive role in the implementation of CE. When a particular country's society and culture is more predisposed to caring for the environment, this will also enhance its interest in prudently dealing with resources and products (Allwood et al., 2011). However, to mobilise this societal support, other actors (national/local governments, industry sectors) need to join forces.

4. Financial support for strengthening CE skills, knowledge, platform facilities and business development

What CE means, how to implement this transformational change, and how to visualise the potential of CE is a big challenge for many countries. Various interviewees mention financial support for the development of CE skills and knowledge as a driver. Various interviewees also advocate the importance of raising general awareness and education and the need for creating a CE platform and appointing transition brokers. Finally, interviewees stress the need to better align CE start-ups and SMEs with CE tools and subsidies and to prepare the financial sector for CE business models.

4.3.2. Drivers for public governance

To build a CE, adequate policies and economic, legal and other government instruments should be in place. Given the state of the art of the policies and practices in the sixteen countries studied, substantial efforts still have to be made. According to the interviewees, the main driver for public governance is to create effective government policies and practices for a circular economy. They mention the following additional drivers for public governance:

1. Breaking through the silo mentality in government

CE can have a positive impact on the environment, the economy and social well-being, and therefore covers various policy areas. CE governance needs to move beyond the confines of traditional environmental policy and focus on integral policy mechanisms such as a national strategy and legislation, with a clear delineation of mandates and responsibilities of public bodies and other actors involved during different

stages of a material's life cycle (Ölund Wingqvist and Slunge, 2013). Working across ministries and different levels of government is perceived as causing a significant bottleneck.

2. Long-term orientation of government

Long-term-oriented CE policies are mentioned by many interviewees as a driver for the CE transition. At present, government is too short-term-oriented to take the lead in the long-term objective of CE, they stress.

3. Inclusion of external costs in the price of products

A fundamental problem is that the environmental and social costs of products during their lifecycle are not internalised in their price. Through implementing policy instruments such as extended producer responsibility, taxes, and charges, the costs of for example product disposal or pollution from industrial production can be reflected in the product price (Ölund Wingqvist and Slunge, 2013). As the Dutch interviewee states: "Inclusion of external costs in the price of products and new business models are needed to stimulate CE."

4. Willingness to build public-private partnerships

No company or government can realise CE alone. It requires partnerships among companies within and across production chains and between government and industry. Limited cooperation between these parties is also mentioned as an important obstacle to implementing CE. Government can play an important role to overcome these bottlenecks, but also neutral intermediaries ('transition brokers') that orchestrate networks, various interviewees state.

5. Discussion

The hypothesis of this paper was that strong public governance, the active involvement of relevant actors, and receptivity to network governance are conditional to implement CE effectively. To test this hypothesis, an international comparative analysis was carried out. The

exploratory research reveals that the hypothesis can generally be confirmed but needs to become more nuanced. The prospects are more favourable when the context is in line with the hypothesis, but even then, bottlenecks in implementation need to be overcome. Below, a more refined governance model will be formulated, representing various avenues for developing CE in different contexts. The following results are the constituents of this model.

With respect to public governance on CE, the comparative analysis clearly shows the differences in the phase of development that countries are in. Nine are in the first predevelopment phase, two in the startup phase, and five just before the acceleration phase. The countries that are more ahead have a stronger government leadership in CE issues than those that are still in the predevelopment phase. The analysis also shows that a strong leadership role of the national government usually corresponds with a greater involvement of industry and local government in CE. The involvement of startups/scale-ups, NGOs and civil society seems to be less dependent on a strong government leadership and is also triggered by other factors, such as an innovative culture and a high environmental consciousness of civil society.

The study also shows that to complement public governance, network governance is considered crucial by all interviewees. However, they admit that implementing network governance is complicated. To understand under which conditions network governance can thrive, seven socio-cultural and political dimensions were analysed. Two dimensions showed the most prominently as being relevant: 'autocratic versus pluralistic government' and 'antagonistic versus consensus-oriented society'. The latter dimension was further specified by analysing how (antagonistic or cooperative) the different actors behave vis-à-vis each other and whether this influences the receptivity to network governance. The analysis reveals, that countries with a consensus-oriented society and pluralistic government experience fewer difficulties in implementing network governance than those with an antagonistic society and autocratic government. Especially a cooperative relationship between government and industry seems to positively influence the possibilities for network governance, while the attitude of NGOs versus both government and industry is more nuanced. According to the interviewees, it depends on the NGO whether cooperation is possible. When these results were combined with the development phase of the sixteen countries, those having fewer or no difficulties to implement network governance seem to have made more progress in CE. The remaining five dimensions do not seem to be decisive factors for the receptivity to network governance.

The interviews also provide insight into the drivers for network and public governance to implement CE effectively. The main driver for network governance is a structured, goal-oriented approach, comparable to the approach developed on the basis of the Dutch experiences. The main driver for public governance is to have adequate CE policies and practices in place. The interviewees also mentioned a number of additional drivers. Its purpose is to provide examples of potential drivers one can mobilise in governing CE and not an exhaustive list. It is up to the people orchestrating the transition to CE to decide which of these or other additional drivers are helpful to start and build a CE. In the literature more drivers for effective governance are mentioned than those mentioned above. Concerning network governance, some emphasise the importance of taking network governance seriously and being aware of the risk of putting it in place just for show (Kamols and Guaralda, 2021). Others offer design models to engage citizens and communities thoughtfully in participatory networks (Caldwell et al., 2021; Huybrechts et al., 2017). And others again point out the problem that a human-centred approach to network governance, aimed primarily at improving humans' quality of life, may come at the expense of the natural environment and planetary well-being (Loh, S. et al., 2020; Yigitcanlar et al., 2019). Also with respect to public governance, several authors have analysed drivers and barriers some of which were not mentioned by the interviewees (e.g. Allwood et al., 2011; De Jesus and Mendonça, 2018).

The above results can be summarised in a first model assessing the effectiveness of CE governance (see Fig. 2). The model is based on the data about the strength of government leadership on CE, the involvement of relevant actors (particularly industry), the receptivity to network governance, and the drivers for governing CE.

Fig. 2 can serve as a guidance of how to build a CE. The transition can be catalysed by using the strong aspects of a country's governance and involving the most relevant actors. Experiences have shown that the targeted involvement of actors - particularly pro-active companies - willing to join forces provides better opportunities to boost circular initiatives (Cramer, 2020a). The strategic selection of actors leads to a more focused course of action. After setting up the first successful circular initiatives, the challenge is to scale up and increase actors' participation. Being able to scale up ambitiously requires a firm sense of goal-orientation in the broad network. At this stage, government leadership becomes indispensable, too. How a country implements public and network governance, involves an increasing number of actors and how it mobilises the drivers, differs per country. The effectiveness of governance increases when the CE strategy is aligned with the right timing - a country's 'windows of opportunity'.

Based on the comparative study of sixteen countries a second model can be formulated, describing four main avenues for developing CE in different socio-cultural and political contexts. The first is when both strong government leadership, medium/high involvement of actors (particularly industry) and receptivity to network governance are present in a country. This case, which reflects the original hypothesis, offers favourable conditions for effectively implementing network governance. However, obstacles still have to be removed. For instance, it might be that a silo mentality in government or a risk-averse attitude in business prevails, or that negotiation processes are slow or counter-productive. It can also be—as in Taiwan—that a weak connection between the manufacturing and consumer markets hampers collaborative efforts along the entire value chain. To overcome such obstacles, it is extremely important that additional drivers are mobilised and network governance be orchestrated in a goal-oriented manner—in close interaction with (inter)national and local governments, which also need to act accordingly. Various Northern European countries, Scotland, Italy and Taiwan are cases in point.

The second avenue is when strong government leadership is lacking but medium/high involvement of actors (particularly industry) and network governance are present. Then considerable progress can be made in the predevelopment and startup phases with the companies willing to work together. In the case of Brazil and Turkey, those companies are mostly international ones with a clear global CE mission, companies exporting to the EU and proactive solution providers (mostly SMEs). In this avenue, setting up joint initiatives through network governance can trigger the involvement of other actors. That creates a bottom-up movement which demonstrates the importance and benefits of moving to a circular economy. To strengthen this movement, network partners can also mobilise additional drivers, particularly those that speed up network governance. This may urge governments to take on a leadership role as well, thereby facilitating the acceleration phase and ultimately the mainstreaming phase.

The third avenue is when strong government leadership exists, but involvement of actors (particularly industry) and receptivity to network governance are limited. Slovenia used to be an inspiring case. The country's previous government took a leading role in promoting CE policies and mobilised additional drivers to strengthen public governance. It got industry support for implementing top-down measures and also involved NGOs, which generally have an antagonistic attitude towards government and industry in the country. This example shows that clear government leadership can create network governance, including in cases involving an antagonistic society. The previous Slovenian government was not autocratic, meaning the collaboration between public and network governance worked much better than it does with today's autocratic government. China—one of the frontrunners in the circular

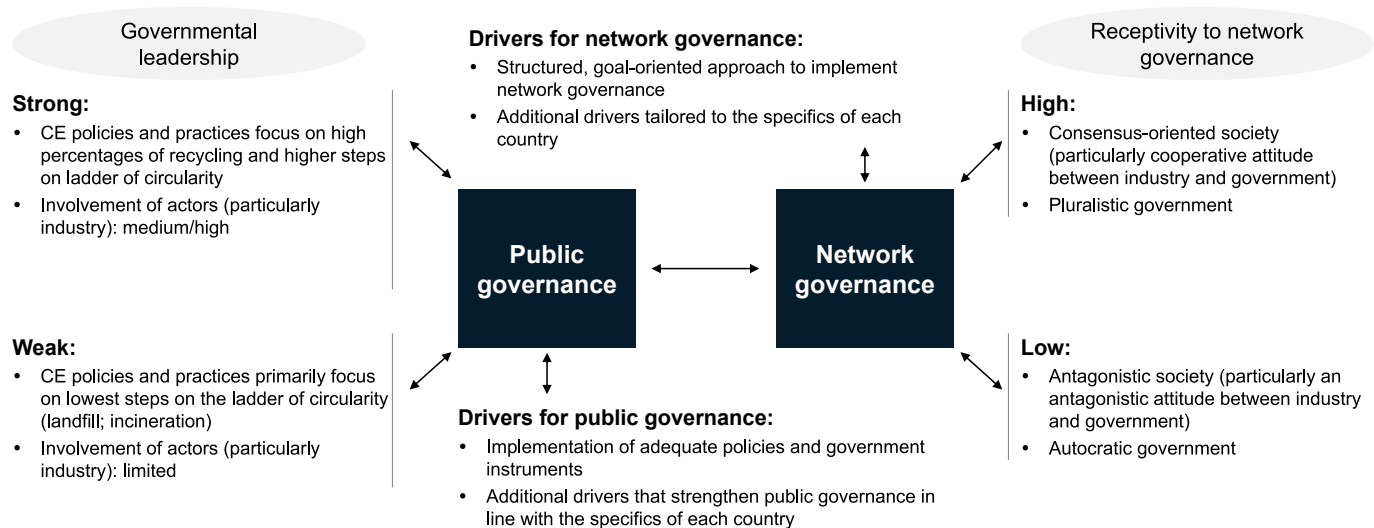


Fig. 2. Effectiveness of the governance of circular economy.

economy—is not part of this study but can also serve as a good example of this third starting point. The transition to a circular economy is seen there as a gradual process, directed, controlled and monitored from above. Policies particularly focus on the meso- and macro-levels. The challenge is to reach the micro-levels of implementation with active support from the bottom-up (Naustdalslid, 2014).

The last starting point is when countries lack both strong government leadership, have low-medium involvement of actors (particularly industry) and low receptivity to network governance. Generally, these countries are in a less favourable position to implement CE. However, here, too, cores of change can be created, particularly by proactive companies. They can join forces, setting up first circular initiatives and mobilising additional drivers to enhance network governance. Their successful examples can show the merits of a circular economy, which triggers the interest of more actors. For instance, in some Eastern European countries, a coalition of companies kick-started the circular economy. And in Australia, specific companies, cities and states are the engines of change. When these bottom-up initiatives lead to promising economic, social and ecological results, the pressure on national governments and others to actively engage may also increase.

Table 8 summarises the four avenues for developing CE in different contexts. It is up to those persons orchestrating the transition process to strategically select the most appropriate strategy tailored to the specifics of their own country. The effectiveness of the governance can be increased by carefully selecting strategies that are attuned to the strong aspects of public and/or network governance, interested actors (particularly proactive companies) and positive drivers for network and public governance in each country, and by continuously reflecting upon the progress made. After carrying out the most promising initiatives successfully, these initiatives can be scaled up and others started. This can create a movement of CE initiatives, which may involve all relevant actors and strengthen both public and network governance.

The analysis has shed light on two knowledge gaps that are underexplored in the literature. First, it is underexplored if and how the concurrent application of both network and public governance can lead to effective implementation of CE. Several authors have studied public governance, particularly in terms of the effectiveness of different policy instruments (Milios, 2018; Ranta et al., 2018), but without taking complementary network governance into account. Others have addressed the general bottlenecks and drivers for CE governance (e.g. Allwood et al., 2011; Kirchherr et al., 2018; Ölund Wingqvist; Slunge, 2013; Russell et al., 2019), but did not study how to overcome these constraints in practice through governance. Again others studied network governance, particularly from the perspective of how to include

Table 8

Avenues for developing circular economy (CE) in different contexts.

Starting point	Prospects for developing CE	Lead actors	Example countries
Government CE leadership: strong . Involvement industry: medium/high . Network governance: medium/high	Conditions for starting and accelerating CE are favourable , but several obstacles should be removed to get all actors on board.	Government, industry and other relevant actors jointly take the lead to reach ambitious CE objectives.	Various Northern European countries, Scotland, Italy and Taiwan
Government CE leadership: limited . Involvement industry: medium/high . Network governance: medium/high	Starting CE is relatively easy . Pro-active companies can start CE, but acceleration requires mobilisation of additional drivers and actors, including government.	Coalition of the willing of pro-active companies can kickstart circular initiatives, hoping that other actors and government will follow.	Brazil and Turkey
Government CE leadership: strong . Involvement industry: low . Network governance: low	Starting CE is relatively easy . Government can implement policies but needs support from relevant actors for implementing top-down measures.	Government is lead actor but should make sure that industry and other actors implement the actions needed to reach the CE objectives.	Slovenia
Government CE leadership: limited . Involvement industry: low . Network governance: low	Starting CE is complicated . Kick-off possible via first movers in industry (and others), but mobilisation of additional drivers and actors, including government, is crucial.	Pro-active companies can start (with other relevant actors) circular initiatives and jointly increase pressure on government and others to follow.	Various Eastern European countries, Canada and Australia

all relevant actors and avoid a human-centred approach. As scholars in public administration usually assume networks to be informal, collaborative arrangements, they consider governance, which implies hierarchy and control, inappropriate. One of the exceptions are Provan and

Kenis (2008), but they did not develop a practice-based model of network governance, comparable to the ten guiding principles for building a circular economy of Cramer (2020a).

Secondly, knowledge is lacking about the country specific circumstances of governing the implementation of CE (Ölund Wingqvist and Slunge, 2013). This study shows that there is no one-size-fits-all approach that can be adopted, regardless of the socio-cultural and political context and the people involved. For some countries, the dual application of both public and network governance fits their culture, while for others it is less obvious. In all cases, it is a continuous search for how to mobilise the positive forces in society to move to a circular economy. Every country has different cores of change that can empower a growing number of people to join. The big challenge is to orchestrate the transformation and overcome all barriers. This study provides first insights in the specific socio-cultural and political context of the 16 countries studied.

The results of the qualitative study presented here are preliminary but show the relevance of this area of research. When the public and network governance of implementing CE is considered carefully, well-meant CE initiatives will fall on fertile ground. More insight should be gained into the particularities of the governance of other countries than the ones studied here and into the successes and failures in all these countries. Most countries in this study are high- and middle-income countries. It would be interesting to learn about CE from low-income countries and indigenous cultures, where much knowledge and wisdom can be found on how to deal prudently with the environment (Kimmerer, 2013). Based on these insights, the model of the effectiveness of the governance of CE presented in this paper may need to be refined. This also holds for the avenues of developing CE. The outcome of this study is based on interviews with one or two key persons, which are neutral, well-informed intermediaries ('transition brokers') in each country. Their assessments are inherently subjective and could be generalised further by holding interviews with additional actors. Despite these reservations, the study provides first insights into the topic of governance that is much underexposed in the literature on CE.

CRedit authorship contribution statement

Jacqueline Cramer: I declare the following: the corresponding author is responsible for ensuring that the descriptions are accurate.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

- Allwood, J.M., Ashby, M.F., Gutowski, T.G., Worrell, E., 2011. Material efficiency: a white paper. *Resour. Conserv. Recycl.* 55 (3), 362–381. <https://doi.org/10.1016/j.resconrec.2010.11.002>.
- Birkeland, J., 2020. Net-positive Design and Sustainable Urban Development. Routledge. <https://www.taylorfrancis.com/books/9780429290213>.
- Caldwell, G.A., Fredericks, J., Hespanhol, L., Chamorro-Koc, M., Sánchez, M.J., Barajas, V., Castelazo André, M.J., 2021. Putting the people back into the "smart": developing a middle-out framework for engaging citizens. In: Aurigi, A., Odendaal, N. (Eds.), *Shaping Smart for Better Cities*. Academic Press, pp. 239–266. <https://doi.org/10.1016/B978-0-12-818636-7.00008-1>.
- Carlsson, L., Sandström, A.C., 2008. Network governance of the commons. *Int. J. Commons* 2 (1), 33–54. <https://doi.org/10.18352/ijc.20>.
- Cramer, J., 2017. The raw materials transition in the Amsterdam Metropolitan Area: added value for the economy, well-being and the environment. *Environment* 59 (3), 14–21. <https://doi.org/10.1080/00139157.2017.1301167>.
- Cramer, J., 2020a. How Network Governance Powers the circular economy; Ten Guiding Principles for Building a circular economy, Based on Dutch Experiences. Amsterdam Economic Board, Amsterdam, ISBN 978-90-90-33928-3.
- Cramer, J., 2020b. Practice-based model for implementing circular economy; the case of the Amsterdam Metropolitan Area. *J. Clean. Prod.* 255 (6), 120255 <https://doi.org/10.1016/j.jclepro.2020.120255>.
- Cramer, J., 2020c. Implementing the circular economy in the Amsterdam Metropolitan Area: the interplay between market actors mediated by transition brokers. *Bus. Strat. Environ.* 29 (6), 2857–2870. <https://doi.org/10.1002/bse.2548>.
- Cramer, J., 2020d. The function of transition brokers in the regional governance of implementing circular economy – a comparative case study of six Dutch regions. *Sustainability* 12, 21, 12, 5015. <https://doi.org/10.3390/su12125015>.
- De Jesus, A., Antunes, P., Mendonça, S., 2016. Eco-innovation in the transition to a circular economy: an analytical literature review. *J. Clean. Prod.* 172, 2999–3018. <https://doi.org/10.1016/j.jclepro.2017.11.111>.
- De Jesus, A., Mendonça, S., 2018. Lost in transition? Drivers and barriers in the eco-innovation road to the circular economy. *Ecol. Econ.* 145, 75–89.
- Ddiba, D., Andersson, K., Koop, S.H.A., Ekener, E., Finnveden, G., Dickinson, S., 2020. Governing the circular economy: assessing the capacity to implement resource-oriented sanitation and waste management systems in low- and middle-income countries. *Earth Syst. Govern.* 4, 100063 <https://doi.org/10.1016/j.esg.2020.100063>.
- DiSalvo, C., 2015. *Adversarial Design*. MIT Press. <https://doi.org/10.7551/mitpress/8732.001.0001>.
- Farla, J., Markard, J., Raven, R.P.J.M., Coenen, L., 2012. Sustainability transitions in the making: a closer look at actors, strategies and resources. *Technol. Forecast. Soc. Change* 79, 991–998. <https://doi.org/10.1016/j.techfore.2012.02.001>.
- Fischer, L., Newig, J., 2016. Importance of actors and agency in sustainability transitions: a systematic exploration of the literature. *Sustainability* 8 (5), 476. <https://doi.org/10.3390/su8050476>.
- Franco, M., 2017. CE at the micro level: a dynamic view of incumbents; struggles and challenges in the textile Industry. *J. Clean. Prod.* 168 (5), 833–845. <https://doi.org/10.1016/j.jclepro.2017.09.056>.
- Frauenberger, C., Foth, M., Fitzpatrick, G., 2018. On scale, dialectics, and affect: pathways for proliferating participatory design. In: Lee, Y., Teli, M., Light, A., Garde, J., Vines, J., Brandt, E. (Eds.), *Proceedings of the 15th Participatory Design Conference. Association for Computing Machinery, United States of America*, pp. 1–13. <https://doi.org/10.1145/3210586.3210591>. Full Papers, 1.
- Geng, Y., Zhu, Q., Doberstein, B., Fujita, T., 2009. Implementing China's circular economy concept at the regional level: a review of progress in Dalian, China. *Waste Manag.* 29 (2), 996–1002. <https://doi.org/10.1016/j.wasman.2008.06.036>.
- Ghisellini, P., Cialani, C., Ulgiati, S., 2016. A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. *J. Clean. Prod.* 114, 11–32. <https://doi.org/10.1016/j.jclepro.2015.09.007>.
- Giampietro, M., Mayumi, K., 2018. Unraveling the complexity of the Jevons Paradox: the link between innovation, efficiency, and sustainability. *Front. Energy Res.* 6, 26. <https://doi.org/10.3389/fenrg.2018.00026>.
- Gliedt, T., Hoicka, C., Jackson, N., 2018. Innovation intermediaries accelerating environmental sustainability transitions. *J. Clean. Prod.* 174, 1247–1261. <https://doi.org/10.1016/j.jclepro.2015.09.007>.
- Hajer, M., Nilsson, M., Raworth, K., Bakker, P., Berkhout, F., de Boer, Y., Rockström, J., Ludwig, K., Kok, M., 2015. Beyond cockpit-ism: four insights to enhance the transformative potential of the sustainable development goals. *Sustainability* 7 (2), 1651–1660. <https://doi.org/10.3390/su7021651>.
- Hofstede, G., 2011. Dimensionalising cultures: the Hofstede model in context. *Online Read. Psychol. Cult.* 26. <https://doi.org/10.9707/2307-0919.1014>. Unit 2, subunit 1.
- Homrich, A.S., Galva, G., Gamboa Abadia, L., Carvalho, M.M., 2018. The circular economy umbrella: trends and gaps on integrating pathways. *J. Clean. Prod.* 175, 525–543. <https://doi.org/10.1016/j.jclepro.2017.11.064>.
- Huybrechts, L., Benesch, H., Geib, J., 2017. Institutioning: participatory design, co-design and the public realm. *CoDesign* 13 (3), 148–159. <https://doi.org/10.1080/15710882.2017.1355006>.
- Irwin, T., 2015. Transition Design: a proposal for a new area of design practice, study, and research. *Des. Cult.* 7 (2), 229–246. <https://doi.org/10.1080/17547075.2015.1051829>.
- Jakob, M., Flachsland, C., Steckel, J.C., Urpelainen, J., 2020. Actors, objectives, context: a framework of the political economy of energy and climate policy applied to India, Indonesia, and Vietnam. *Energy Res. Social Sci.* 70, 101775 <https://doi.org/10.1016/j.erss.2020.101775>.
- Jones, S., 2020. Waste management in Australia is an environmental crisis: what needs to change so adaptive governance can help? *Sustainability* 12 (21), 9212. <https://doi.org/10.3390/su12219212>.
- Kalmykova, Y., Sadagopan, M., Rosado, L., 2017. Circular economy – from review of theories and practices to development of implementation tools. *Resour. Conserv. Recycl.* 135, 190–201. <https://doi.org/10.1016/j.resconrec.2017.10.034>.
- Kamols, N., Foth, M., Guaralda, M., 2021. Beyond Engagement Theatre: Challenging Institutional Constraints of Participatory Planning Practice. *Australian Planner*, pp. 1–13. <https://doi.org/10.1080/07293682.2021.1920993>.
- Kanda, W., del Rio, P., Hjelm, O., Bienkowska, D., 2019. Technological innovation systems approach to analyse the roles of intermediaries in eco-innovation. *J. Clean. Prod.* 227, 1136–1148. <https://doi.org/10.1016/j.jclepro.2019.04.213>.
- Kanda, W., Kuusma, M., Kivimaa, P., Hjelm, O., 2020. Conceptualising the systemic activities of intermediaries in sustainability transitions. *Environ. Innov. Soc. Transit.* 36, 449–465. <https://doi.org/10.1016/j.eist.2020.01.002>.
- Kaza, S., Yao, L.C., Bhada-Tata, P., Van Woerden, F., 2018. *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050*. Urban Development, World Bank, Washington, DC. <https://openknowledge.worldbank.org/handle/10986/30317>. License: CC BY 3.0 IGO.
- Kemp, R., Loorbach, D., Rotmans, J., 2007. Transition management as a model for managing processes of co-evolution towards sustainable development. *Int. J. Sustain. Dev. World Ecol.* 14 (1), 78–91. <https://doi.org/10.1080/13504500709469709>.

- Khitous, F., Strozzi, F., Urbinati, A., Alberti, F., 2020. A systematic literature network analysis of existing themes and emerging research trends in circular economy. *Sustainability* 12 (1633), 24. <https://doi.org/10.3390/su12041633>.
- Kimmerer, R.W., 2013. *Braiding Sweetgrass; Indigenous Wisdom, Scientific Knowledge, and the Teachings of Plants*. Milkweed, Minneapolis, Minnesota.
- Kirchherr, J., Reike, D., Hekkert, M., 2017. Conceptualizing the circular economy: an analysis of 114 definitions. *Resour. Conserv. Recycl.* 127, 221–232. <https://doi.org/10.1016/j.resconrec.2017.09.005>.
- Kirchherr, et al., 2018. Barriers to the circular economy: evidence from the European Union (EU). *Ecol. Econ.* 150, 264e272 <https://doi.org/10.1016/j.ecolecon.2018.04.028>.
- Kivimaa, P., Boon, W., Hyysalo, S., Klerkx, L., 2019. Towards a typology of intermediaries in sustainability transitions: a systematic review and a research agenda. *Res. Pol.* 48 (4), 1062–1075. <https://doi.org/10.1016/j.respol.2018.10.006>.
- Kopnina, H., 2019. Green-washing or best case practices? Using circular economy and Cradle to Cradle case studies in business education. *J. Clean. Prod.* 219, 613–621. <https://doi.org/10.1016/j.jclepro.2019.02.005>.
- Lieder, M., Rashid, A., 2016. Towards circular economy implementation: a comprehensive review in context of manufacturing industry. *J. Clean. Prod.* 115, 36–51. <https://doi.org/10.1016/j.jclepro.2015.12.042>.
- Loorbach, D., 2010. Transition management for sustainable development: a prescriptive, complexity-based governance framework. *Governance: Int. J. Pol., Adm. Inst.* 23 (1), 161. <https://doi.org/10.1111/j.1468-0491.2009.01471>.
- Loorbach, D., Frantzeskaki, N., Avelino, F., 2017. Sustainability transitions research: transforming science and practice for societal change. *Annu. Rev. Environ. Resour.* 42, 599–626. <https://doi.org/10.1146/annurev-environ-102014-021340>.
- Loh, S., Foth, M., Caldwell, G.A., Garcia-Hansen, V., Thomson, M., 2020. A more-than-human perspective on understanding the performance of the built environment. *Architect. Sci. Rev.* 63 (3–4), 372–383. <https://doi.org/10.1080/00038628.2019.1708258>.
- Markard, J., Raven, R., Truffer, B., 2012. Sustainability transitions: an emerging field of research and its prospect. *Res. Pol.* 41, 955–967. <https://doi.org/10.1016/j.respol.2012.02.013>.
- Merli, R., Preziosi, M., Acampora, A., 2018. How do scholars approach the circular economy? A systematic literature review. *J. Clean. Prod.* 178, 703–722. <https://doi.org/10.1016/j.jclepro.2017.12.112>.
- Micheline, G., Moraes, R.N., Renata, N., Cunha, R.N., Costa, J.M.H., Ometto, A.R., 2017. From linear to circular economy: PSS conducting the transition. In: *The 9th CIRP IPSS Conference*, vol. 64. Circular Perspectives on Product/Service-Systems Procedia CIRP, pp. 2–6. <http://creativecommons.org/licenses/by-nc-nd/4.0/>.
- Milios, L., 2018. Advancing to a circular economy: three essential ingredients for a comprehensive policy mix. *Sustain. Sci.* 13 (3), 861–878. <https://doi.org/10.1007/s11625-017-0502-9>.
- Murray, A., Skene, K., Haynes, K., 2017. The circular economy: an interdisciplinary exploration of the concept and application in a global context. *J. Bus. Ethics* 140, 369–380. <https://doi.org/10.1007/s10551-015-2693-2>.
- Naustdalslid, J., 2014. Circular economy in China – the environmental dimension of the harmonious society. *Int. J. Sustain. Dev. World Ecol.* 21 (4), 303–313. <https://doi.org/10.1080/13504509.2014.914599>.
- Ölund Wingqvist, G., Slunge, D., 2013. Discussion Paper; Governance Bottlenecks and Policy Options for Sustainable Materials Management. Swedish Environmental Agency/UNDP, Bromma, Sweden.
- Patterson, J., Schulz, K., Vervoort, J., van der Hel, S.C., Widerberg, O.E., Adler, C., Hurlbert, M., Anderton, K., Sethi, M., Barau, A., 2017. Exploring the governance and politics of transformations towards sustainability. *Environ. Innov. Soc. Transit.* 24, 1–16. <https://doi.org/10.1016/j.eist.2016.09.001>.
- Provan, K.G., Kenis, P., 2008. Modes of network governance: structure, management, and effectiveness. *J. Publ. Adm. Res. Theor.* 18 (2), 229–252. <https://doi.org/10.1093/jopart/mum015>.
- Ranta, V., Aarikka-Stenroos, L., Ritala, P., Saku, J., Mäkinen, S.J., 2018. Exploring institutional drivers and barriers of the circular economy: a cross-regional comparison of China, the US, and Europe. *Resour. Conserv. Recycl.* 135, 70–82. <https://doi.org/10.1016/j.resconrec.2017.08.017>.
- Reike, D., Vermeulen, J.V., Witjes, S., 2018. The circular economy: new or refurbished as CE 3.0? – Exploring controversies in the conceptualization of the circular economy through a focus on history and resource value retention options. *Resour. Conserv. Recycl.* 135, 246–264. <https://doi.org/10.1016/j.resconrec.2017.08.027>.
- Ritzén, S., Sandström, G.O., 2017. Barriers to the circular economy—integration of perspectives and domains. *Procedia CIRP* 64, 7–12. <https://doi.org/10.1016/j.procir.2017.03.005>.
- Roggema, R., Vermeend, T., Van den Dobbelsteen, A., 2012. Incremental change, transition or transformation? Optimising change pathways for climate adaptation in spatial planning. *Sustainability* 4 (10), 2525–2549. <https://doi.org/10.3390/su4102525>.
- Rohe, S., Chlebná, C., 2021. The evolving role of networking organizations in advanced sustainability transitions. *Geography of Innovation and Sustainability Transitions*. No. 04, GEIST Working Paper series. 10.13140/RG.2.2.35742.25927.
- Rotmans, J., et al., 2001. More evolution than revolution: transition management in public policy. *Foresight* 3 (1), 15–31. <https://doi.org/10.1108/14636680110803003>.
- Russell, M., Gianoli, A., Grafakos, S., 2019. Getting the ball rolling: an exploration of the drivers and barriers towards the implementation of bottom-up circular economy initiatives in Amsterdam and Rotterdam. *J. Environ. Plann. Manag.* 63 (11), 1903–1926. <https://doi.org/10.1080/09640568.2019.1690435>.
- Schneider, S.C., Barsoux, J.L., 2003. *Managing across Cultures*, second ed. Prentice Hall, New Jersey.
- Smith, A., Stirling, A., Berkhout, F., 2005. The governance of sustainable socio-technical transitions. *Res. Pol.* 34 (10), 1491–1510. <https://doi.org/10.1016/j.respol.2005.07.005>.
- Su, B., Heshmati, A., Geng, Y., Yu, X., 2013. A review of the circular economy in China: moving from rhetoric to implementation. *J. Clean. Prod.* 42, 215–227. <https://doi.org/10.1016/j.jclepro.2012.11.020>.
- Wachholz, C., 2020. Will EU circular economy policies lead us to sustainable development? A viewpoint from an environmental NGO perspective. In: Eisenriegler, S. (Ed.), *The Circular Economy in the European Union*. Springer, Cham, pp. 57–66. https://doi-org.proxy.library.uu.nl/10.1007/978-3-030-50239-3_7.
- Winans, K., Kendall, A., Den, H., 2017. The history and current applications of the circular economy concept. *Renew. Sustain. Energy Rev.* 68 (1), 825–833. <https://EconPapers.repec.org/RePEc:eee:rensus:v:68:y:2017:i:p1:p:825-833>.
- Wishart, L.J., Bebbington, J., 2020. Zero waste governance: a Scottish case study. *Int. J. Sustain. Dev.* 23, 128–147, 1/2. <https://doi.org/10.1504/IJSD.2020.112180>.
- Yigitcanlar, T., Foth, M., Kamruzzaman, Md, 2019. Towards post-anthropocentric cities: reconceptualizing smart cities to evade urban ecocide. *J. Urban Technol.* 26 (2), 147–152. <https://doi.org/10.1080/10630732.2018.1524249>.