Pluralizing urban futures: A multicriteria mapping analysis of online taxis in Indonesia

Suci Lestari Yuana [a,b,*], Wouter Boon [a], Rob Raven [a,c], Maarten A. Hajer [a,d], Frans Sengers [a], Bipashyee Ghosh [e]

[a] Copernicus Institute of Sustainable Development, Utrecht University, the Netherlands
[b] Faculty of Social and Political Sciences, Universitas Gadjah Mada, Indonesia
[c] Monash Sustainable Development Institute, Monash University, Australia
[d] Urban Futures Studio, Utrecht University, the Netherlands
[e] Sciences Policy Research Unit, University of Sussex, United Kingdom

ABSTRACT

The exploration of urban future storylines of transformative change is subject to socio-political processes rather than a mere, objective envisioning of the desirable city. Approaches in urban imagination and planning processes should thus consider plural perspectives across a range of actors and stakeholders beyond the usual suspects of experts and professionals. This paper mobilizes the case of the emergence of online taxis in Indonesia to embrace a more inclusive approach to the assessment of urban mobility futures by employing multi-criteria mapping (MCM) analysis and combining it with an open dialog on future storylines. We answer the question of what insights can be derived from diversifying future storylines in the online taxi industry in Indonesia? From applying a more inclusive approach in constructing future imaginaries we derive four insights: 1) criteria to appraise the future are never purely technological; 2) there is a difference in perceptions of time horizons among actors when imagining futures; 3) perceptions of time horizons are shaped by actor backgrounds and social interactions; and 4) the MCM method contributed to helping individuals to focus and explore their future storylines.

1. Introduction

Urban mobility is central to the social, environmental, and economic development of cities. This is explicitly recognized in target 11.2 of the UN Sustainable Development Goals: "By 2030, provide access to safe, affordable, accessible, and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons" (UN General Assembly, 2015, p. 26). However, the formulation of the goal raises the question of how to incorporate the various views and interests of all actors, especially of the most vulnerable ones, into envisioning the future of urban mobility systems. Despite long-standing scholarship on 'futuring', existing approaches in urban imagination and planning processes still remain somewhat limited in the ways in which plural perspectives across a range of actors and stakeholders — beyond the usual suspects of experts and professionals — might be better considered. In this paper, we extend this scholarship and propose a more inclusive approach of exploring and negotiating the future based on multi-criteria

---

mapping (MCM) and apply this to a case study of urban mobility in Indonesia.

Various approaches and concepts exist that take a performative approach to what we will refer to as 'future storylines', such as 'socio-technical imaginaries', 'articulating expectations', 'techniques of futuring' or 'envisioning'. For instance, Jasanoff (2015) uses the notion of 'socio-technical imaginaries' and focuses on linking the past with the future, enabling or restricting action in spaces, and normalizing ways of thinking about many possible future worlds. Imaginaries are most powerful when they become part of a "collective repertoire" of ideas and statements shared by large stakeholder groups (Voβ and Kemp, 2006; Voβ et al., 2009; Jasanoff and Kim, 2009; Konrad & Böhle, 2019). Imaginaries are never neutral constructs but are framed in a particular way. This leads to dynamics of inclusion and exclusion of certain actors and aspects, as they become perceived as more or as less important or meaningful parts of the future.

Particularly, this paper builds on the insights gained from the *Futures* special issue on "Socio-technical futures and the governance of innovation processes" (Konrad & Böhle, 2019), which foregrounds a participatory and inclusive approach to 'future storylines' to make innovation processes more transparent, pluralistic, and democratic. The papers in that issue deal with various participatory practices and procedures, from forecasting, scenario-modeling to foresight and technology assessment (Hisschemöller and Hoppe, 2001; Fortun and Fortun, 2005; Van de Kerkhof, 2006; Grin, 2006; Cockerill et al., 2009 ; Cuppen, 2012,; Hess, 2015; Kim, 2015; Konrad & Böhle, 2019). Taking such assessment further, our paper has two objectives. First, to explore the benefits of using multi-criteria mapping as a more inclusive mechanism for pluralizing future storylines. Second, to present a fieldwork-based attempt to broaden multi-stakeholders' dialogues in the storylines of the future of online taxis in Indonesia.

In doing so, empirically this paper explores future storylines of digital technology in urban mobility in Indonesia. The paper hones in on digital ridesharing enabled by smartphone apps, which in Indonesia are commonly known as "online taxis". Ever since their aggressive introduction several years ago, digital ridesharing services (e.g., Uber) have grown in popularity, yet have also led to controversy and disruption in many cities around the world (Pelzer et al., 2019). Since then, a diverse set of tensions among various car-based and motorcycle-based transport systems and actors in the mobility systems of Jakarta and other cities has become apparent. Related to the disruption of the urban mobility system is the reshaping of the nature of employment, which may lead to workers or drivers being unfairly treated (Nastiti, 2017). The Indonesian government has attempted to regulate online taxis many times, and online taxi businesses and drivers have both tried to protect their interests through various discursive tactics (Yuana, 2020). Recently, policymakers were criticized for not being proactive in dealing with these anxieties, and for preferring short-term solutions rather than systematically anticipating the future position of online taxis in the context of urban mobility (Yuana, 2020).

The question we ask here is "What insights can be derived from diversifying future storylines in the online taxi industry in Indonesia?" To address this question, we used multi-criteria mapping (MCM) developed by Stirling and colleagues (2019). MCM is a multi-stakeholder engagement tool that helps to broaden and open up societal debates about political choices through: (1) a systematic storyline of all relevant perspectives, for instance on new technologies; (2) illuminating the range of uncertainties within and ambiguities between each of these perspectives; and (3) documenting qualitative arguments and reflections concerning the rationales and underlying beliefs associated with these perspectives and uncertainties. The advantage of MCM is that it allows quantitative representations of how different actors and stakeholders assess performance ('appraisals'), which is integrated with qualitative information on the reasons for those appraisals. We complemented MCM with action research to foster an open dialog among a diverse group of stakeholders about Indonesian urban mobility and to consider a wider-than-usual range of future storylines in public decision-making.

The paper is structured as follows: Section 2 discusses relevant scholarship on future storylines and Section 3 describes the MCM approach in constructing open dialog on imaginaries for future mobility. Section 4 presents the results. Section 5 reflects on and discusses implications of our approach for scholarship on future storylines. Section 6 concludes.

2. Pluralizing future storylines

Future storylines can be a powerful trigger for actions that shape the socio-technical fabric of society (Beckett 2013; van Lente 2012). Although visions evoke a particular future, they are important in the present by enabling transformative action through imagination. For instance, the storylines of possible futures have been demonstrated to play an important role in sustainability transitions through the concept of "expectations" (Schot & Geels, 2008; Sovacool et al., 2019; van Lente, 2012). The storylines of expectations guide actors involved in innovations by shaping a collective future orientation, fostering resources and constructive protective spaces to shield, nurture, and empower certain technologies instead of others (Konrad, 2006; Meadowcroft, 2009; Smith & Raven 2012; Van Lente & Bakker, 2010).

In general, future storylines have the potential to guide and coordinate actions across techno-epistemic networks, establish key political decisions, justify new investment in science and technology, promote certain development pathways, and justify the inclusion or exclusion of certain actors in the decision-making process (Delina, 2018). Therefore, future storylines are most powerful when they become part of a collective repertoire of ideas and statements shared by diverse stakeholder groups; in such contexts, future storylines cannot be ignored anymore, even by those that do not necessarily share them, because by then the future storylines have become part of social reality (Van Rijnsoever et al., 2014). Thus, future storylines are never neutral constructs, but are framed in a particular way where some aspects, actors and perspectives are included and privileged, whereas others are excluded.

Here we highlight two observations that are particularly relevant to our aim to pluralize future storylines, and to which we return in the discussion section. First, Masini's argument on the plurality of perceptions of time horizons in future studies (Masini, 1993, p.32). The perception of time horizon generally differs between applied and academic futurists (Marien, 2002; Brier, 2005). In the scholarly work on future storylines, time horizons are often categorized from short term (present to 5 years); to the medium term (5–10 years); and the long term (from 20 to 50 years) (Bauer, 2018). Perceptions of time horizons and how they relate to socio-institutional processes

have received limited attention (Sovacool & Geels, 2016) and our research aims to unpack this relation.

Second, we are interested in the social interaction in future storylines because they shape the possibility space of pluralizing future storylines. The social contexts in articulating future storylines shape which storyline becomes the dominant articulation of the future. Which means the existence of future storylines are contested based on the social interaction. We follow the notion of "bounded imaginaries" developed by Smith et al. (2016), who argued that not all imaginaries become influential and gain national or international traction. Rather this depends on the degree at which those articulating imaginaries are able to delegitimize and erase alternative futures and lived experiences. Through this we highlight the social and power dynamics of articulating the future which we want to aim for in our research by using the multi-criteria mapping (MCM) method.

3. Research design

3.1. Context of Indonesian urban mobility

The development of transport services in Jakarta does not conform to the "modern infrastructure ideal" referring to systems of service provision catered for in an equal and universal way by responsible public authorities (Coutard 2008; Graham & Marvin 2001; Van Welie et al., 2018). Jakarta has experienced rapid growth over the last few decades, drawing immigrants from across the region to the city's fast-growing economy and modern life. Like many cities, both in the Global North and Global South, Jakarta's transport policy prioritized cars over other mobility modes. At the same time, many cities in the Global South struggle with a generally insufficient provision of public transport (Dimitriou, 2013). More affluent urbanites are laying claims on an increasing part of scarce road space (Sengers, 2016), while markets — particularly in the informal sector — are expected to organize the provision of services through what is characterized as "Laissez-Faire Transit" (Cervero, 2001). The informal public transportation steps in to offer a viable alternative to the negative stresses of growth on urban transportation systems dominated by cars and inefficient public transport.

One popular mode of transport in Jakarta is offered by motorbike taxi providers or *'ojeks'*. These motorbike taxis offer urban mobility services to the lower-middle class and working-class households. The emergence of digital applications for ojeks and other taxi services has led to a critical convergence of formal and informal transport. These online taxis have improved the accessibility and connectivity of formal and informal worlds. Since 2014, online taxis companies such as Easy Taxi, Uber, Gojek, Grab and other emerging start-up companies (Wahyuningtyas, 2016) had fiercely competed for market share. In the end two giant companies, Gojek and Grab, remained (Nurhasana et al., 2021). These companies employed multiple strategies to maintain their motorbike taxis services during the Covid-19 pandemic. They responded to multiple restrictions by providing face masks, hand sanitizers and plastic shields to protect drivers and customers (Jakarta Post, 2020). Despite all the changes and flexibility being employed, the future of online taxis existence is still a battleground between policymakers, business player and local communities (Yuana, 2020).

Governmental organizations find it difficult to respond to and accommodate online taxis (Leung, 2016). The current urban mobility system in Indonesia is favoring formal public transport over informal, "splintered" transport. The legal complexity involved in regulating 'ojeks' is the main reason why authorities avoid including 'ojeks' in Indonesia's traffic control system. Notably, Indonesia's traffic laws and highway traffic laws are structured to apply primarily to vehicles with four or more wheels (Medeiros et al., 2018). Consequently, there is a regulatory void for public transportation options that involve two-wheeled vehicles such as 'ojeks'. Moreover, informal transport is not represented in policy discussions, e.g. on a ministerial level. This leads to further inequalities of support and protection for workers in the informal transport and subsequently hinders the implementation of radical changes in the overall transport system.

While the current situation in Jakarta points to some futures being more likely to materialize than others, our position is that the future is always open and that alternative storylines are always conceivable or may progress in parallel (Moon, 2015). Claims about the likelihood or indeed the inevitability of a particular mobility future are articulated to anticipate events and to make taking action incontrovertible ("if we do not act, traffic will be gridlocked ten years from now" or "and that is why we now seriously need to consider public transport infrastructure"). In this context, a "bounded imaginary" of the future of urban mobility is imminent and is shaping the everyday practice of urban mobility. However, there should be space for alternative imaginaries; the future of Jakarta mobility is still open, which invites a thorough and inclusive approach to pluralising future storylines.

3.2. Multi-criteria mapping methods

The key method used in this research to construct imaginaries from multiple perspectives is multi-criteria mapping (MCM) (Smith and Stirling, 2007; Stirling, 2011; Smith and Stirling, 2018). This approach helps to open up the debates about the future of urban mobility inclusively. MCM is a type of multicriteria analysis tool that is distinctive in its aim to appraise multiple options simultaneously and to offer a clear understanding of uncertainties associated with each of the options. In this way, MCM allows a more nuanced understanding of complexity of choices in relation to diverse perspectives and does not force narrowing down to a single, "collectively-agreed-on", best course of action. The approach aims to identify the different underlying reasons, or criteria, that influence people's perceptions of different options (Stirling & Mayer, 2001).

The MCM method consists of five stages: (1) constructing an open-ended set of **options** to appraise; (2) identifying a range of **criteria** to assess these options; (3) **scoring** the performance of each option against these criteria; (4) **weighting** each criterion to determine its relative importance; (5) allowing for overall **reflection** and adjustments to the final visual outcome and overall process. The step-by-step guide to applying the MCM method is explained in more detail in Stirling and Mayer (2001) and in Raven and Al (2017).

To build an inclusive imaginary we combined MCM methods with mapping multiple future storylines. MCM has frequently been used to appraise technological options in the current state. An earlier study by Royuela et al. (2016) modified the MCM approach to develop participative foresight scenario mapping in which they used MCM methods to build future scenarios. Inspired by their research, we created similar future scenarios, using a novel approach. As illustrated in Fig. 1, our methodology was divided into three main phases: constructing future storylines, appraising future storyline through one-on-one MCM interviews, and a future storylines dialog.We formulated future storylines by incorporating insights from a more diverse range of stakeholders, which allowed us to incorporate everyday understandings of and experiences with motorcycle taxis. Our storylines consist of future narratives and imagined positions of actors in those narratives. To share the results of MCM analysis and initiate dialog with the stakeholders, we held a workshop with diverse stakeholders. The workshop allowed a deeper and critical engagement with the uncertainties around the future storylines and the diversity of perspectives. The workshop also complemented the MCM interviews by validating the plausibility and desirability of the future.

All three phases were designed to facilitate an inclusive dialog about future storylines. The first step was to build initial storylines for later use as core options in the MCM interviews. We found this step was necessary to give our interviewees an entry point for engaging with the potential uncertainties and ambiguities of the future of urban mobility. The second step was the one-on-one MCM interview in which interviewees reflected upon and appraised the core options. Interviewees were also invited to revise or suggest additional options if they deemed them suitable. This is in the true spirit of MCM: to offer diverse stakeholders the choice and capacity to express perspectives about alternative future storylines beyond the ones suggested by the interviewer. The results of the appraisal of the core options were presented in the stakeholder's workshop in the third and final step of this research, to initiate dialog between diverse stakeholders and for validating and negotiating the different future.

3.2.1. Future storylines building

To construct an initial, preliminary set of future storylines of online taxis in Indonesia, we analyzed websites. First, we gathered data from the official web pages of online taxi companies and the Ministry of Transportation, and national digital newspapers such as Kompas and Detik.com. We selected data from 2015 to 2019 in order to capture data on online taxis since their inception in 2015. The second step was to identify future storylines from multiple stakeholders in the online taxi industry. To build the storylines, we codified the data into three categories: (a) technological innovation to be expected in the future, e.g. the rising presence of online taxis as part of a super-app company in 2030; (b) government policies to be expected for online taxis, e.g. policy on a tariff mechanism for online taxis; and (c) problems to be expected to emerge in the future, e.g. the exploitation of gig workers. Based on the three categories, the third step concerned formulating three initial future storylines. We are aware this method could not identify which storyline is more marginal, however, we use these storylines only as entry points to open up a dialogue during the MCM interview session.

3.2.2. Future storylines appraisal

Our study attempts to bring more, a greater number and more diverse perspectives in deliberating the future storylines. To do so, we carefully selected our interviewees which we believe could bring more diversity of perspectives and experiences in the context of online taxis. We included 9 respondents covering a variety of perspectives as being shown in Table 1. The diversity of perspectives that we brought into the appraisal is reflected in:

1. The policy makers category: next to the Ministry of Transportation within which the online taxi regulation is centralized, we added perspectives from the Ministry of Communication and Information regarding the impact of digital platforms on urban mobility, and from KPPU (the Supervisory Commission of Business Competition) on business ecosystems.
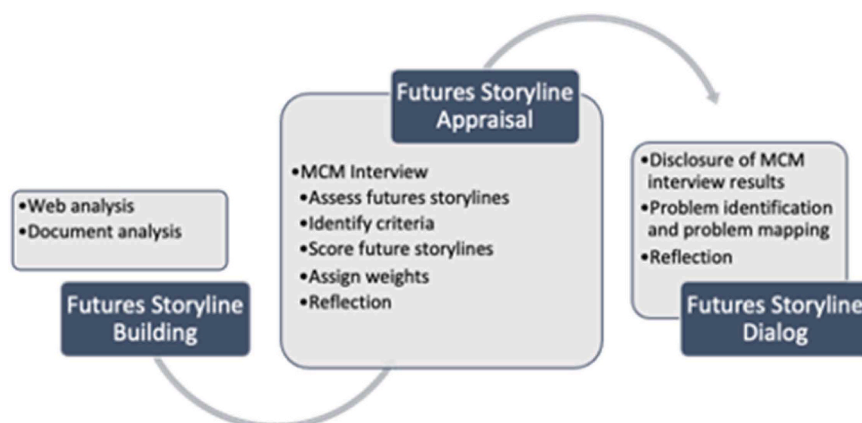

Fig. 1. Three phases of constructing future storylines (inspired by the work of Royuela et al. (2016).

Table 1
List of interviewees.

Category	Function or representative of
Policymakers	Head of Urban Transport, Ministry of Transportation
	Ministry of Communication and Information
	KPPU, Supervisory Commission of Business Competition
Drivers' Community	ADO, Alliance of Online Car-Taxi Drivers Indonesia
	KOPDAR, Organization of online motorbike taxis
Users' Community	MTI, Indonesian Transport Society
(Online taxi customers)	Queenrides, female drivers, and female users' community
Professional Consultant	Transport Expert
	Digital Economy Expert

2. The drivers' community: they have hardly been invited in planning or brainstorming meetings on urban mobility policy and are usually only involved in the socialization of the online taxi regulations. We invited two leading drivers' community organizations: ADO that represents local branches and KOPDAR that represents motorbike taxi drivers.

3. The users' community category: deliberation of online taxis regulation has so far never involved user communities. Most data about customers had been delivered by the platform company. We included MTI as a non-profit community that focuses on transport issues and advances users' perspectives, and Queen Rides representing non-profit female drivers and users to add gender perspectives in transportation issues.

4. Professional consultancy on digital innovation: usually in ministerial meetings only experts with a transportation background are invited to give advice. However, in this research, we added an expert on the digital economy to knowledge on the influence of digital innovation on urban mobility.

We conducted 3–4 h MCM interviews with each interviewee from February to June 2020. We followed the five stages of MCM interviews. The first stage was verifying if the interviewee was comfortable with the set of future storylines to appraise, or whether the interviewee wanted to make any changes. This step gives freedom to interviewees to reject our initial future storyline or add their own future storyline in the interview set. At the start of the interview, we offered interviewees our three future storylines for their appraisal. They were invited to suggest additional storylines and/or elaborate the three initial storylines. The second stage was identifying a range of criteria to assess the future storylines. Each interviewee was invited to develop their own set of criteria with which they would like to appraise the options. The third stage entailed the interviewee scoring the future storylines against each of the criteria and providing qualitative reasoning for each score. The fourth stage entailed the interviewee assigning a weight to each criterion. In the final (fifth) stage, we reviewed and reflected on the final outcomes of the appraisal and overall process and made necessary adjustments to scores, weights, or even qualitative explanations. All interviews were recorded with consent.

The data was collected during the Covid-19 pandemic; we therefore conducted our interviews and workshop online. We experienced some problems with poor internet connections during the data collection, which may have adversely impacted the quality of interaction. The online formats were anticipated to somewhat limit optimization of the interviews and workshop, e.g., due to internet connection issues, lack of personal connection, time-zone difference. However, we took measures to reorient the format and styles of engagement to mitigate these limitations. Hence, they are not expected to have influenced the results.

3.2.3. Future storylines dialog

This was the final step after conducting the MCM interviews with experts and stakeholders of online taxis in Indonesia. The dialog workshop was held on September 15, 2020, in collaboration with the Ministry of Transportation (MoT). The purpose of organizing this workshop was to facilitate the Ministry to encounter more diverse perspectives than the usual future storylines of online taxis. We compared our list of interviewees with the usual attendants of the Ministry meetings on online taxis. Based on diversity of perspectives and experiences we decided to invite 5 discussants from the usual invitees of the Ministry meetings and 5 discussants from our interviewee list (all 9 interviewees were invited as discussant in this workshop, 1 was not able to join due to schedule conflicts, 3 were part of usual invitees of the Ministry meetings).

The 10 workshop discussants formed a diverse group. The usual invitees on the Ministry meeting were: (1) the director-general of land transportation, (2) the director of urban transportation, (3) the public policy manager of Gojek (an online taxi company), (4) the transport expert, and (5) ADO, (drivers' community representatives). The additional 5 discussants which could bring wider perspective were: (1) the secretary-general of the MTI (Indonesian Transport Society/ user's organization), (2) the special advisor to the Minister of Communication and Information, (3) the representative of the KPPU (the Indonesian Supervisory Commission for Business Competition), (4) the digital economy experts, and (5) the representatives of KOPDAR (a motorbike taxi rider organization).

The Ministry of Transportation acted as a moderator and intermediary between the research team and the stakeholder groups in the online meeting. Besides inviting the workshop discussants, the Ministry proposed to invite 20 of their internal staff as audience of this workshop. They were not invited to give an opinion on our research findings, but they were allowed to raise questions during a Q & A session.

At the beginning of the workshop, the researcher (the lead author) presented the appraisal of all options (future storylines) from the MCM interviews for 20 min followed by 10 min of comments and reflections from the discussants. After each comment from the discussants, the moderator opened up the Q&A session and directed the discussion to focus on identifying problems in order to achieve

the future storylines of the online taxis. Before closing the workshop, the researcher invited participants to reflect on the workshop via a one-on-one talk or by filling out the online survey. 10 audiences filled in the online survey and expressed their reflections and 3 audiences gave their reflections verbally.

4. Results: diversity of future storylines of Indonesian online taxis

This section presents the diversity of future storylines of online taxis in Indonesia. Based on the three phases of our research framework, we have divided the results into three subsections: (4.1) diversity of future storylines; (4.2) diversity in appraisal of future storylines; and (4.3) actor backgrounds and social relations shaping the articulation of future storylines.

4.1. Diversity of future storylines

The three future core storylines of online taxis are "Transformation", "Optimization", and "Decentralization". Table 2 illustrates the core storylines covering their general narratives, and related positions of the government and online taxi companies. These storylines describe not only the image of the future of online taxis but also the pathways for achieving each imagined future. Even though the core storylines were prepared by the researcher prior to the MCM interview, all the interviewees accepted these storylines to be appraised and some even added further details to the narrative of the storylines, thereby confirming that the results of our desk research were relevant for the stakeholders' imaginations of online taxis.

Besides the three core storylines, our interviewees came up with four additional storylines. These additional storylines were not systematically appraised by all nine interviewees due to an inability of the MCM software to allow them to appear in other interviews. However, these storylines give some valuable insights into the alternative future of online taxis and we took the opportunity in the workshop to introduce these additional storylines. These storylines represent the diversity of future storylines as played out by multiple stakeholders. We have retained the original titles of storylines proposed by their creator, as they illustrate the interviewees' nuanced perspectives on the future. The four additional storylines are:

1. Storyline "5 G Technology Leapfrogging" imagines the emergence of autonomous vehicles in urban mobility which will gradually replace human drivers, meaning there will be fewer online taxi drivers in the future. In this storyline, the government is imagined as the initiator, deciding on when and where autonomous vehicles are to be implemented. Policymakers from the Ministry of Information and Technology proposed the storyline. The participant who created the storyline displayed a high level of confidence by stating: *"I am optimistic that the introduction of autonomous vehicles will happen in less than 5 years in Indonesian urban mobility. For example, it is designed to be implemented in the new capital city of Indonesia in Kalimantan Island which is now under construction and monitored by our Ministry"* – interview March 10, 2020.
2. Storyline "Autonomous Vehicles" resembles the previous storyline and imagines the prominence of driverless cars. This storyline was initiated by the representative of the user community who also owns a digital business. In this storyline, platform companies act as dominant actors in steering the development of autonomous vehicles. The participant showed some pessimism about the role of government in this storyline by saying: *"We are a capitalist country. As long as the government does not stand by the citizens, [companies] will always remain dominant. It is hard to imagine the government will develop tools that benefit the people because they do not have money. Without money and authority, people will lose with capitalists"* – interview April 30, 2020.
3. Storyline "Jakarta Pilot" imagines that future mobility development will start from Jakarta, the capital city, and would then be replicated in other regions. This storyline was proposed by a transportation expert who is frequently asked to attend and advise the Ministry of Transportation as a consultant. This storyline recognizes the current centralized and unequal development between the capital city and other local areas which will continue in the future. The participant expressed this inequality by saying: *"Talking about Indonesia is different compared to developed countries. Our analysis must recognize the inequality between the capital and other cities,*

Table 2
The three core future storylines of online taxis.

Storyline	"Transformation"	"Optimization"	"Decentralization"
Images of the future	In 2030, online taxis will be embedded very well in people's daily activities. Online taxis are a convenient and easy option for urban families that offer door-to-door mobility services.	In 2030, due to a limitation of services in some remote areas in the city, online taxis function as feeders for the first- and last-mile commutes.	In 2030, the emergence of digital apps that are developed by individual online taxi drivers or local driver communities is growing. These newcomers collaborate with local governments to provide transport services in the neighborhood.
Imagined position of government	The government functions as an enabler of online taxis.	The government acts as a manager of innovation, integrating all modes of transport services and regulating business players.	Local governments play more active roles in supporting the local business players.
Imagined position of the online taxi company	Online taxi companies own a meta-platform or "super-app" that integrates multi-modal transport and multi-sector services such as transportation, logistics, digital finance, digital entertainment.	Online taxi companies collaborate with the government to organize integrated urban mobility.	Online taxi companies will focus on the capital city and other big cities.

which is very high. Therefore, Jakarta must be a separate future storyline and should be imagined differently from other cities" – interview March 2, 2020.

4. Storyline "Substitusi" ["substitution" in English] imagines that online taxis will completely replace conventional taxis. The storyline was proposed by a policymaker from the Ministry of Transportation. Even though this storyline seemed to him to be possible, he was rather pessimistic about it because he said that conventional taxis have been popular for 20–40 years. He predicted that the market will be shared between online taxis for customers who want cheaper fares, and conventional taxis for customers who prefer quality of service. However, according to him, it was necessary to propose this storyline as an alternative future that speculates on the trends of the conventional taxis.

From these four additional storylines, we observe that the diversity of future storylines could go beyond the technology and deployment of online taxis. The first and second additional storylines discuss artificial intelligence as a point of departure for imagining the development of online taxis. The third storyline starts from spatial inequality, which is one of the main characteristics of the densely populated capital cities of Global South countries. The fourth storyline uses the reaction of online taxis' competitors as a consideration in imagining the future.

4.2. Diversity in the assessment of future storylines

After being given the opportunity to identify additional possible future storylines, each interviewee was asked to appraise the three original storylines plus their own additional storyline if they had suggested one. Here, we treat the diversity in the appraisal of future storylines. We discuss two types of diversity: (a) performance diversity, which illustrates the respondent's level of optimism and pessimism towards the core storylines, and (b) appraisal diversity, which unpacks various criteria used to assess the storylines.

4.2.1. Performance diversity

Fig. 2 shows the diversity in terms of performance, measured as the degree of optimism or pessimism interviewees displayed for each core and additional storyline. A high degree of optimism means interviewees perceive that the future storylines are feasible and meet their desired criteria. The four additional storylines were introduced by individual respondents, so the orange bars only represent the mean of the pessimistic and optimistic score assigned by the interviewee who proposed the storyline.

Generally, the overlaps between the ranges for different future storylines show the combined effect of a high degree of uncertainty and variability in their performance. It can be observed that on average, the "Optimization" storyline received higher optimistic scores than the other storylines. Interestingly, although interviewees were most optimistic about the "Optimization" storyline, they were also more uncertain about it. According to the qualitative statements associated with the scores, such a high degree of uncertainty stems from the respondents' difficulty in articulating the future of the mobility system on a national level, because they are far better acquainted with the situation in Jakarta. There are vast differences in transport infrastructure between Jakarta and other locations in Indonesia. *"Talking about Indonesia is different in comparison to developed countries. Jakarta must be distinguished from other cities and regions. One should consider the many varieties of contexts and developments in areas other than Jakarta"* - interview with Transport Expert 5 April 2020. From this statement we could interpret how Jakarta has become the focal point for business and administration of Indonesia, being more developed yet also different from any other city in Indonesia. So, stakeholders found it easier to imagine the future of Jakarta than to imagine national-level urban mobility.
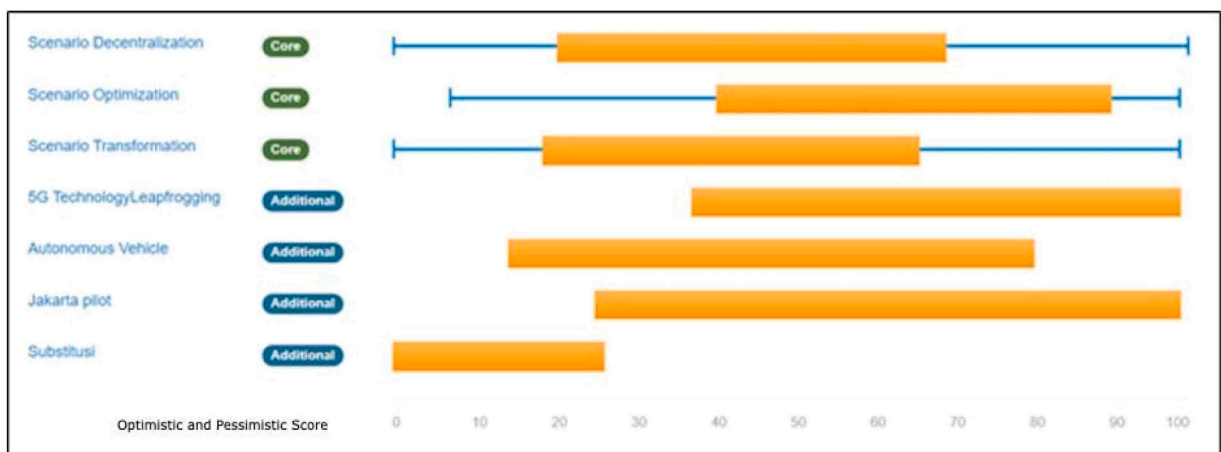

Fig. 2. Performance diversity for future storylines of online taxis. Thin blue lines represent the range between the lowest (most pessimistic) and highest (most optimistic) rating. Thicker orange bars represent the range between the mean pessimistic and the mean optimistic rating for a storyline. In general, the further the bars and lines extend to the right, the more desirable are the future storylines. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Another issue contributing to the uncertainty around the "Optimization" storyline is the differences in opinion about the desirable criteria. Even though that storyline imagines the government having a strong role in realizing the future, many interviewees are pessimistic about the consequences of such a strong role. In this sense, the pessimistic appraisal of this future storyline reflects the uncertainty about the central role of the government in governing online taxis. One policymaker expressed this pessimism as follows during the interview:

> *"In this storyline, regulation is stricter, and businesses will be less innovative. Moreover, ideally, tariffs and quotas should be led by supply and demand and not regulated by the government. Tariffs are determined by online apps and the number of players is growing, which will guarantee tariffs are competitive. However, if we look at village areas, numbers of digital app users are still small, so it is questionable if village areas could follow the competition."* – interview May 7, 2020.

This quote expresses policymakers' divergent perspective on the role of government in managing online taxis. While most policymakers agree the government role should be central in managing online taxis, this respondent hopes for less control from the government and is more supportive of free-market competition. However, the last sentences also indicate uncertainty about the future of business competition of online taxis in urban and rural areas.

4.2.2. Appraisal diversity

Appraisal diversity is defined as contrasts in perceptions and values between the different stakeholders participating in the appraisal process. These divergent perspectives on desirable futures were reflected in the respondents' selection of criteria. This appraisal diversity can be captured by comparing the responses of the stakeholders either at the level of individuals or at a semi-aggregated level where the variously definable groupings of stakeholder perspectives can be compared with each other. Table 3 illustrates 19 criteria proposed during all nine MCM interviews. They have been categorized into four sectors: economy, government regulation, social criteria, and technology. Table 3 also presents the number of times the criteria were used in MCM interviews, indicating the importance of indicators for appraising the future of online taxi storylines.

In the "economy" category, the criteria of business competition, added value to consumers, and partnership (between company and drivers) were discussed the most. That business competition was a criterion frequently discussed in the interviews reflects that the current market environment of competition between two giant online taxi companies has influenced stakeholders' imagination about the future of online taxis. In addition, this finding highlights the importance of relationships between stakeholders for imagining the future of online taxis, e.g. in the form of competition between online taxi companies, interactions between company and customers, and 'partnerships' of companies and drivers.

In the "government regulation" category, consumer protection was discussed most during the interviews. The reason could lie in the vulnerable position of consumers and the absence of strong consumer protection. The vulnerability of consumers was expressed by a digital economy expert interviewee: *"Consumer protection must be one crucial criterion because there are still biases, even though the government said they would listen to the public. It is because business players can use think-tank organizations and media to steer public opinion. The media creates public opinion"* - digital economy expert interview 5 March 2020. In this sense, the company has influence over the framing of online taxis in the public media, which means the prevailing public opinion may not truly represent or protect the interests of users or consumers.

Table 3

List of criteria for the future of online taxis mentioned in the nine MCM interviews (numbers in parentheses in the first column refer to the frequency the criteria were used by different interviewees).

Economy	
Business competition (3)	standard for business practices that include pricing mechanism, anti-monopoly, non-discrimination
Business ecosystem (1)	the ecosystem that enables the growth of digital start-ups
Added value to consumers (3)	the gain for consumers for using online taxi services
Tariff (1)	the minimum and maximum rates for one trip of an online taxi
Partnership (3)	the dynamic relationship between company and drivers
Government Regulation	
Consumer protection (4)	the regulation that protects consumers' safety
Human resources (3)	the capacity of policymakers to create regulations for online taxis
Regulation for start-up (1)	the government position toward the emergence of start-ups
Strategic planning (3)	the trajectory of government policy toward urban mobility
Legal protection (3)	the law that protects the legality of online taxi services
Social	
Labor exploitation (1)	the exploitation effect of online taxis on drivers
Health and pension insurance (1)	the guarantee of health and pension funds for drivers
Driver organization (1)	the growth and activity of a union for online taxi drivers
Customer organization (1)	the growth and activity of the customers' community
Gender empowerment (1)	the effect of online taxis on gender inequality
Technology	
Digital infrastructure (2)	the supporting facilities that enable the online taxi service
Digital talent (1)	the number of IT professionals to support the ecosystem
Public transportation (1)	the quality of mass public transportation
Quotas (1)	the minimum and maximum numbers of online taxi vehicles in a city

Interestingly, none of the five criteria in the "government regulation" category articulate driver protection or drivers' regulation. Some specific criteria proposed discuss the government's position, regulation of start-ups or other business players, and regulation of consumer protection. The reason for the absence of criteria on drivers could be the ambiguous nature of the work of drivers: they are not easily categorized as employees or entrepreneurs. Even the driver representative did not mention or discuss this possible criterion and when asked why, answered: *"Maybe it is because I was having lots of interaction with policymakers and business players. I feel less and less confident in my own imagination of the future and I feel very much influenced by the idea of the future from policymakers"*- interview with the representatives of ADO in 4 April 2020 This answer could indicate the realization of "bounded imaginaries", which means a person's capability to have future imaginations related to others during social interaction. This shows that the multiple stakeholders that were individually interviewed do not possess individual visions after all. Their visions are connected and shaped by one another.

In contrast, the drivers' perspective does feature largely in the "social" category. Here, four of the five criteria are about drivers: labor exploitation, health and pension for drivers, driver organization, and gender empowerment for female drivers. This suggests that drivers' conditions and struggles are merely seen as social consequences of the disruptive innovation of online taxis, rather than as a crucial development that needs separate legal protection and regulation. Even the drivers preferred to discuss the legal issues of online taxis and the business model of online taxis, but not specifically regulating protection for drivers. Finally, the "technology" category contains criteria that address digital technology (digital infrastructure and digital talent) and transportation (public transportation and transportation quotas). From all interviews, these technical aspects were only discussed by policymakers and experts. This means the actors were divided on which criteria they found important. Technical criteria were more interesting for policymakers and experts, while socio-economic criteria were more important for users' and drivers' communities.

4.3. Actor backgrounds and social relations shaping the articulation of future storylines

The interviewee and workshop participants represented a variety of backgrounds. We observed some interesting differences in the way actors perceived futures and articulated future storylines, which was partially influenced by their social relations.

First, the diversity of perspectives could be divided into two categories: market-oriented perspectives and government-led perspectives. Our analysis of categorizing the perspectives is largely based on what the interviewees said during the discussion of regulation criteria in relation to who is the leader or what should be the leading mechanism of the online taxi future. Interviewee answers that proposed a more liberal and market-based mechanism were categorized as being part of the market-oriented perspective, while answers that proposed a more centralized function of the government in regulating innovation were categorized as government-led perspectives.

Second, there was a division of perspectives among policymakers. The representative of KPPU (Supervisory commission of business competition) argued that the future market of online taxis will be competitive and is therefore best governed by a market-based mechanism. On the other hand, the Ministry of Transportation representative argued that tariff regulation led by the government is important to protect drivers from predatory pricing by companies. This argument is also shared by the Ministry of Communication and Information representative: this ministry favors the government's ability to facilitate marginal actors. The diversity among policymakers implies that their perspectives are not personal but are those of their employer.

Third, even though they shared similar expertise in social criteria, as mentioned in the subsection on appraisal diversity, the drivers' and users' communities have contrasting perspectives related to which mechanism should regulate online taxis. Drivers are more supportive of a government-led perspective, which is in line with the discussion of drivers' bounded imaginaries. Their bounded imaginaries could be the result of the drivers' perspective being formed through frequent interactions with actors who have more authority in imagining the future. As illustrated in the statement during the MCM interview: *"Maybe it is because I was having lots of interaction with policymakers and business players. I feel less and less confident in my own imagination of the future and I feel very much influenced by the idea of the future from policymakers"* - interview April 4, 2020. Similar arguments could explain why the user community is more supportive of a market-based mechanism: *"The news mostly shows the success of business players having minimum correlation with government intervention. Look at the unicorn companies* [Gojek and Grab]*, they grow without government support"* - interview with Queenrides (users community) representatives, May 20, 2020. Users are mostly informed through media and have less direct interaction with the government. As discussed in the subsection on appraisal diversity in the government category, media coverage has generally been sponsored by business players to influence public opinion.

Fourth, we observe the politics of social relations shaping the individual time horizon of future storylines. What we mean by politics of social relations is who talks to whom, when and how? We argue these relations bound the imaginaries of individuals to articulate the future. One example we found was the statement from the drivers' community who felt their imagination was limited only to a short time horizon (1 year or less) due to frequent encounters with people from the government. Another example concerns the policy maker from the Ministry of Information and Telecommunication who proposed the "5 G Technology Leapfrogging" storyline. His frequent interactions with other coordinating ministers and his active involvement in the national planning of digital infrastructure shaped his optimism and ability to imagine a long-time horizon (20 years and more). *"I have met a lot with influential young people in Indonesian ministries. Young people tend to work with a long vision orientation and use a concrete approach in solving problems"* - interview with a policy maker from the Ministry of Information and Telecommunication, March 10, 2020. Thus, we analyzed how social interaction forms an important factor in shaping the length of the individual time horizon.

Fifth, although the MCM interviews and the workshop varied in the length of the time horizon and problems of online taxis captured, they might still have longer-term influence by creating a space for future discussions and collaborations between diverse stakeholders. One of the respondents from the user organization mentioned: *"I appreciate the opportunity to be able to listen directly to the drivers' perspectives"*. Such appreciation suggests that any opportunities for multi-actor exchange and coordination in shaping mobility

are rare. However, the limitation of this research was the minimum intervention from the researchers in supporting actors who have a short time horizon to gain bigger confidence in articulating their future. As one of the drivers' representatives stated in the workshop *"I feel the research about future storylines is too far away from my reality, which cannot provide immediate solutions to my daily problems"*.

5. Discussion

Following the presentation of results in the previous section, we now offer the following four insights. First, future imaginaries are never purely about a particular technology but more about values and expectations about the technology to fulfill them. Our case study shows two storylines which were additionally proposed by actors who were inspired by emerging technologies (the 5 G leapfrogging storyline and the autonomous vehicle storyline). These additional storylines illustrate the diversity of future storylines in our case. However, when we look at the criteria to appraise these storylines, the non-technological aspects such as regulation, social impact, and economic issues are more prominent than technical aspects in the articulated future. This can be seen from the list of criteria for characterizing the future of online taxis (Table 3). Of the 19 criteria articulated by the nine participants in the study to appraise online taxis, only four relate to technological aspects of mobility. Most of the criteria refer to how online taxis should be positioned in current and future social, economic, and legal conditions, such as how online taxis should protect consumers, or how online taxi drivers should obtain fairer working conditions. This echoes a long tradition in the social study of technology in general, and socio-technical future and socio-technical imaginaries research specifically (Konrad & Böhle, 2019), and there is arguably a need to advance approaches to decenter the role of technology in future-oriented technology assessments (Truffer et al., 2017).

Second, we observe a difference in the time horizon of those participating in this research. Some of them think in longer timescales, whereas others mostly have an immediate or medium-term future. Based on the results, actors can be divided by their temporal capacity to imagine the future. For the four policymakers, it was more common to imagine and plan the future of mobility in the next 5–10 or 10–20 years. The three participants from the drivers' community articulated that they found 5–10 years future imagination as too distant and even at times frustrating, because this would not address their immediate daily problems. We note that preferences regarding the time horizon covered by future storylines do not say anything about the cognitive ability to take a short or long-term view. Rather, we argue, it is more important to consider that for some, what happens (and changes) tomorrow is more important than for others. To a driver who is dependent (and worried) about his/her income today or tomorrow, talking about long-term developments may only look like a distraction. Considering the time window of future storylines can help in understanding some of the fundamental challenges of pluralizing future storylines beyond the involvement of experts and professionals. Pluralizing future storylines with involvement beyond the usual suspects not only widens the range of interests to be considered in a future storyline, but also broadens the range of time horizons to be considered. Research on pluralizing the time horizons of future storylines specifically, and the practice of future exploration and anticipation, is still embryonic.

Third, future storylines are shaped in interactions between actors. For example, again on the time horizons our results show how a group with a short-term horizon, such as the drivers' community, becomes more pessimistic when discussing the uncertainty of the future because they encounter a group with a longer time horizon, such as policymakers who have more established plans about the future (and often have the capability to execute them). As a result, these interactions affected the perspective of drivers who are more in line with the government-led perspectives rather than with driver-driven perspectives. In that sense, it could be that in imagining and creating, the future actors do not a priori possess ready-made imaginaries, but that these imaginaries emerge in social networks through dialog, interaction, and after considering the context and situation of different actor groups.

Furthermore, the 'bounded imaginaries' concept introduced by Smith et al. (2016) resonates with our study's dynamics. It presents a vantage point to explore how social dynamics and power relations intersect with temporal perspectives, shaping the prominence of particular future narratives. In essence, the articulation of future storylines is not solely a product of individual imaginings, but a complex result of dialogues, interactions, and contextual considerations. The convergence of temporal perspectives and 'bounded imaginaries' becomes evident when we analyze how certain groups, based on their temporal capacities to envision the future, interact and shape their narratives. For instance, the drivers' community, with its shorter-term horizon, may encounter skepticism when faced with policymakers' more extended visions. This interaction, informed by 'bounded imaginaries,' highlights how the power dynamics inherent in articulating the future can influence the convergence and divergence of perspectives.

Lastly, using the MCM method contributed to helping individuals to focus and explore their future storylines. Especially the one-on-one MCM interviews, each lasting around 3–4 h, were designed to enable individuals to reflect on their own ideas about the future and appraisal of future storylines. While this extended engagement enables comprehensive insights, it raises the question of participant burden and potential exclusion of certain voices because (specific groups of) potential respondents are under time constraints. To address this limitation, future research could explore adapted formats like shorter interactions or multiple sessions with breaks. However, in such cases of shorter interactions, there is a risk that the results may not be as reflexive as it is in this paper. In addition, gathering multiple actors into one dialog session as part of the MCM method is challenging, in terms of facilitating the less powerful actors to articulate their knowledge and experiences.One should recognize that there is an imbalance in how different participants experience structural power relationships in imagining the future. In the case of the futures of online taxis workshop, when drivers were asked to meet in the offices of decision-makers, they might have been confident about their visions of the future, at the same time feeling intimidated because of the setting and social relationships involved, and what would happen when they shared their views. Therefore, the limitation of this research is in supporting individuals to build more confidence in engaging in dialogue with higher authority individuals. In further research using MCM, this challenge should be better recognized and better navigated.

6. Conclusion

Building on research conducted in Indonesia, this paper has addressed the question "What insights can be derived from diversifying future storylines in the online taxi industry in Indonesia?" It has explored the diversity of future storylines of urban mobility, and specifically online taxis, by embracing a more inclusive approach in the form of multi-criteria mapping (MCM). Using MCM analysis, this research initiated a dialog that opened up multiple ways of imagining the future and allowed participants to reflect on their own view about the future. This dialog enabled us to uncover four insights of an inclusive technique in constructing future imaginaries: 1) future storylines appraisal are never purely technological; 2) there is a difference in perceptions of time horizons among actors when imagining future; 3) perceptions of time horizons are shaped by actor backgrounds and social interactions; and 4) the MCM method contributed to helping individuals to focus and explore their future storylines. However, the MCM method still has shortcomings as a bottom-up approach. It needs to open up more by engaging with social or cultural practices as alternatives to quantitative measurements in appraising options. Further research could have a more critical reflection on power structure and inequalities in the research design. This paper contributes to futuring research by adopting MCM analysis as a tool for constructing future storylines with multiple actors.

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.

Data availability

Data will be made available on request.

Acknowledgements

References

Bauer, A. (2018). When is the future? Temporal ordering in anticipatory policy advice. *Futures, 101*, 36–45.

Beckett, J. (2013). Imagined future: Fictional expectation in the economy. *Theory and Society, 42*(3), 219–240.

Brier, D. J. (2005). Marking the future: A review of time horizons. *Futures, 37*(8), 833–848.

Cervero, R. (2001). Efficient urbanisation: economic performance and the shape of the metropolis. *Urban Studies, 38*(10), 1651–1671.

Cockerill, K., Daniel, L., Malcynski, L., & Tidwell, V. (2009). A fresh look at a policy sciences methodology: Collaborative modelling for more effective policy. *Policy Sciences, 42*, 225.

Coutard, O. (2008). Placing splintering urbanism: Introduction. *Geoforum, 39*(6), 1815–1820.

Cuppen, E. (2012). Diversity and constructive conflict in stakeholder dialogue: Considerations for design and methods. *Policy Sciences, 45*, 23–46.

Dimitriou, H. T. (2013). Towards a developmental approach to urban transport. *Transport planning for third world cities* (p. 379). Routledge Revivals.

Fortun, K., & Fortun, M. (2005). Scientific imaginaries and ethical plateaus in contemporary US toxicology. *American Anthropologist* (Vol 107,(*1*), 43–54.

Graham, S., & Marvin, S. (2001). *Splintering urbanism: networked infrastructures, technological mobilities and the urban condition. Psychology Press*.

Grin, J. (2006). Reflexive modernization as a governance isuue, or: Designing and shaping re-structuration. In J.-P. Voβ, D. Bauknecht, & R. Kemp (Eds.), *Reflexive governance for sustainable development* (pp. 57–81). Cheltenham: Edward Elgar.

Hess, D. (2015). Public as threats? Integrating science and technology studies and social movements studies. *Science as Culture, 24*(1), 69–82.

Hisschemöller, M., & Hoppe, R. (2001). Coping with intractable controversies: The case for problem structuring in policy design and analysis. In M. Hisschemöller, R. Hoppe, W. N. Dunn, & J. R. Ravetz (Eds.), *Knowledge, power and participation in environmental policy analysis* (pp. 47–72). New Brunswick and London: Transaction Publishers.

Jakarta Post. (2020). Gojek makes concerted effort to protect drivers, customers during COVID-19. *Jakarta post*. Retrieved from https://www.thejakartapost.com/ms/gojek-2019/2020/04/22/gojek-makes-concerted-effort-to-protect-drivers-customers-during-covid-19.html.

Jasanoff, S. (2015). Future Imperfect: Science, technology and the imaginations of modernity. In S. Jasanoff, & S. H. Kim (Eds.), *Dreamscapes of modernity: Sociotechnical imaginaries and the fabrication of power* (pp. 1–33). Chicago, IL: University of Chicago Press.

Jasanoff, S., & Kim, S. H. (2009). Containing the atom: Sociotechnical imaginaries and nuclear power in the United South and South Korea. *Minerva, 47*(2), 119–146.

Kim, S. H. (2015). Social movements and contested sociotechnical imaginaries in South Korea. In S. Jasanoff, & S. H. Kim (Eds.), *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power* (pp. 152–173). Chicago, IL: University of Chicago Press.

Konrad, K. (2006). The social dynamic of expectations: The interaction of collective and actor-specific expectation on electronic commerce and interactive television. *Technology Analysis and Strategic Management* (Vol. 18,, 429–444.

Konrad, K., & Böhle, K. (2019). Socio-technical futures and the governance of innovation processes - An introduction to the special issue. *Futures, 109*, 101–107.

Leung, K.H. (2016). *Indonesia's summary transport assessment*.

Marien, M. (2002). Futures studies in the 21st century: a reality-based view. *Futures, 34*(3–4), 261–281.

Masini, E. (1993). *Why futures studies?* London: Grey Seal Books.

Meadowcroft, J. (2009). What about the politics? Sustainable development, transition management, and long-term energy transitions. *Policy Sciences, 42*(4), 323–340.

Medeiros, R. M., Duarte, F., Achmad, F., & Jalali, A. (2018). Merging ICT and informal transport in Jakarta's ojek system. *Transportation Planning and Technology, 41*(3), 336–352.

Moon, S. (2015). Building from the outside in: Sociotechnical imaginaries and civil society in new order Indonesia. In S. Jasanoff, & S. H. Kim (Eds.), *Dreamscapes of modernity: Sociotechnical imaginaries and the fabrication of power* (pp. 174–198). Chicago, IL: University of Chicago Press.

Nastiti, A. (2017). Drivers' stories reveal how exploitation occurs in Gojek, Grab and Uber. *The conversation*. Retrieved from ⟨https://theconversation.com/drivers-stories-reveal-how-exploitation-occurs-in-gojek-grab-and-uber-82689⟩.

Nurhasana, R., Matsuyuki, M., Hasan, C., Shellasih, N. M., Ningtyas, F. R., Fitrinitia, I., & Kuwayama, S. (2021). The socioeconomic conditions of online taxi driver families during the COVID-19 pandemic in Jakarta greater area. *Jurnal Ilmu Keluarga & Konsumen, 14*(3), 216–226.

Pelzer, P., Frenken, K., & Boon, W. (2019). Institutional entrepreneurship in the platform economy: How Uber tried (and failed) to change the Dutch taxi law. *Environmental Innovation and Societal Transition, 33*, 1–12.

Raven, R., et al.Al. (2017). Unpacking sustainabilities in diverse transition contexts: Solar photovoltaic and urban mobility experiments in India and Thailand. *Sustainability Science, 12*, 579–596.

Royuela, J. B., Eames, M., & Buckingham, S. (2016). 'Participative foresight scenario mapping': Adapting an MCM method to appraise foresight scenario for the long term sustainable development of a small island. *International Journal of Multicriteria Decision Making, 6*(2), 118–137.

Schot, J., & Geels, F. W. (2008). Strategic niche management and sustainable innovation journeys: Theory, findings, research agenda, and policy. *Technology Analysis and Strategic Management, 20*(5), 37–554.

Sengers, F. (2016). Cycling the city, re-imagining the city: Envisioning urban sustainability transitions in Thailand. *Urban Studies, 54*(*12*), *2763–2779*. https://doi.org/10.1177/0042098016652565

Smith, A., & Raven, R. (2012). What is protective space? Reconsidering niches in transitions to sustainability. *Research policy, 41*(6), 1025–1036.

Smith, A., & Stirling, A. (2007). Moving outside or inside? Objectification and reflexivity in the governance of socio-technical system. *Journal of Environmental Policy and Planning, 9*(3/4), 351–373.

Smith, A., & Stirling, A. (2018). Innovation, sustainability and democracy: An analysis of grassroots contributions. *Journal of Self-Governance and Management Economics, 6*(1), 64–97.

Smith, J. M., & Tidwell, A. S. D. (2016). The everyday lives of energy transitions: Contested sociotechnical imaginaries in the American West. *Social Studies of Science, 46*(3), 327–350.

Sovacool, B. K., & Geels, F. W. (2016). Further reflections on the temporality of energy transitions: A response to critics. *Energy Research & Social Science, 22*, 232–237.

Sovacool, B. K., Kester, J., Noel, L., & de Rubens, G. Z. (2019). Contested visions and sociotechnical expectations of electric mobility and vehicle-to-grid innovation in five Nordic countries. *Environmental Innovation and Societal Transitions, 31*, 170–183.

Stirling, A. (2011). Pluralising progress: From integrative transitions to transformative diversity. *Environmental Innovation and Societal Transitions, 1*(1), 82–88.

Stirling, A., & Mayer, S. (2001). A novel approach to the appraisal of technological risk: A multicriteria mapping study of a genetically modified crop. *Environment and Planning C Government and Policy, 19*(4), 529–555.

Truffer, B., Schippl, J., & Fleischer, T. (2017). Decentering technology in technology assessment: Prospects for socio-technical transitions in electric mobility in Germany. *Technological Forecasting & Social Change, 122*, 34–48.

UN General Assembly (2015). Transforming our world: the 2030 agenda for sustainable development. United Nations. A/RES/70/1. Retrieved from https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf. (Accessed 19 July 2021).

Van de Kerkhof, M. (2006). Making a difference: On the constraints of consensus building and the relevance of deliberation in stakeholder dialogues. *Policy Sciences, 39*, 279–299.

Van Lente, H. (2012). Navigating foresight in a sea of expectations: lessons from the sociology of expectations. *Technology analysis & strategic management, 24*(8), 769–782.

Van Lente, H., & Bakker, S. (2010). Competing expectations: The case of hydrogen storage technologies. *Technology Analysis & Strategic Management, 22*, 693–709.

Van Rijnsoever, F. J., Welle, L., & Bakker, S. (2014). Credibility and legitimacy in policy driven innovation networks: Resource dependencies and expectations in Ducth electric vehicle subsidies. *Journal of Technology Transfer, 39*, 635–661.

Van Welie, Cherunya, P. C., Cherunya, P. C., Truffer, B., & Murphy, J. T. (2018). Analysing transition pathways in developing cities: The case of Nairobi's splintered sanitation regime. *Technological Forecasting and Social Change, 137*, 259–271.

Voβ, J.-P., & Kemp, R. (2006). Sustainability and reflexive governance: Introduction. In J.-P. Voβ, D. Bauknecht, & R. Kemp (Eds.), *Reflexive governance for sustainable development* (pp. 3–28). Cheltenham: Edward Elgar.

Voβ, J.-P., Smith, A., & Grin, J. (2009). Designing long-term policy: rethinking transition management. *Policy Sciences, 42*, 275–302.

Wahyuningtyas, S. Y. (2016). The online transportation network in Indonesia: A pendulum between the sharing economy and ex ante regulation. *Competition and Regulation in Network Industries, 17*(3–4), 260–280.

Yuana, et al. (2020). A dramaturgy of critical moments in transition: Understanding the dynamics of conflict in socio-political change. *Environmental Innovation and Societal Transition* (Vol. 37,, 156–170.