Fostering Sustainable Urban Futures Through Twitter Public Space

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Abstract The smart city is based on digital data that can contribute to a better understanding and efficient management of urban processes. These data, which are produced by devices and citizens through online and social media activities, are usually managed and exploited by big tech companies. We claim that digital sustainability is tightly connected to environmental sustainability. Citizens have lost control over data-driven processes that are happening on a global arena. However, communities, through their online communication, can contribute to an alternative narrative and the creation of public spaces that constitute the premise to build more sustainable cities. In this paper, a social media analysis of the Twitter communication of two grassroots communities (i.e., creative skilled migrants living in Amsterdam and Dutch elderly) is carried out. It is based on a language analysis of geo-tagged data, combined with a social network analysis that show the contribution of these two groups to the smart city debate. Their different voices can give rise to more sustainable cities in which social equity and environmental protection become priority themes. These two communities exploit the available Twitter space, as a contact zone. Even though there might not be a clear political purpose in their narrative, the interaction between the local and global level of communication (mediated by social networks) gives rise to a space that stimulates participation, and has the potential to contribute to a more sustainable urban future.

1 Introduction

The smart city, as eco-efficient city structure [1, 32], is based on digital data that contribute to a better understanding and efficient management of urban processes [16]. These data are produced not only by devices but also by citizens through online and social media activities.

Data collection and monitoring by global technology companies, governments, and knowledge institutions can contribute to more sustainable urban spaces [14, 29,

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30, 52]. However, it remains an open question whether sustainability, understood as environmental protection and social equity, can be really achieved through digitization since economic growth seems the main concern of urban development [36].

Citizens are often not involved or not interested in taking part in the monitoring and exploitation of their digital data. They underestimate the impact of their digital data on environmental and social sustainability, but these data could contribute to make urban processes more efficient and improve social conditions, if properly employed.

In this paper, we claim that digital and environmental, as well as social sustainability are strictly connected. The lack of sustainability in the way we relate to the environment and to digital networks are two aspects of the same problem. They are two symptoms of the same illness: communities have lost control over social and economic data-driven processes that are happening at large scale on a global arena. At all levels, from small local contexts to the state, communities are not being heard in the decisions regarding environmental policies or in their needs to protect their privacy or in their social needs.

The aim of this paper is to analyze whether communities, through their communicative processes, can contribute to more sustainable urban futures. The current smart city discourse relies on themes such as digital digital innovation, economic growth, resource efficiency [28] and concepts such as: 'technology', 'smart grids', 'big data', 'efficiency', 'infrastructure', and 'information' [19, 52]. An alternative storytelling is necessary to give rise to a democratic and progressive planning practice: stories can be a powerful tool in this respect [26, 51].

Communities can contribute to establish an alternative relation between digital and environmental sustainability by exploiting online communication. It should be possible to promote a different narrative to that of big technology companies and private stakeholders that can contribute to the creation of public space [40]. Public space constitutes the premises to build a more sustainable urban future. One in which the interests of government and companies are in balance with the needs of the citizens.

As argued in [40], an unexpected use of media can play an important role in the creation of public space, both in the digital and in the urban dimension. The spatial dimension is relevant in giving rise to communities that can contrast dominant institutional and corporate actors.

In this paper, we present a social media analysis of the Twitter communication of two grassroots communities (i.e., creative skilled migrants living in Amsterdam and Dutch elderly) to show that their voices can have an impact in giving rise to more sustainable cities in which social equity and environmental protection become priority themes. There needs to be an alternative to the discourse promoted by governments and big tech corporations which is often only in the direction of economic growth.

The analysis relies on an innovative methodology proposed in [41] that merges quantitative and qualitative methods. It is based on a language analysis of the geo-tagged data, in combination with a social network analysis, that shows the contribution of these groups to the smart city debate. It looks at urban sustainable development from the vantage point of new media, communication, and language technology [41].

Based on an investigation of the topics of discussion in Twitter, it can be shown that these two apparent different groups share instead important similarities. They both promote an alternative storytelling with respect to the smart city by addressing sustainability in their Twitter communication. This is the case especially for a specific group of creative migrants, that of the architects and designers that are concerned not only with the economic aspects of environmental sustainability, but also with the environment and social justice [42]. Some topics (i.e. circular economy) are also reflected in the communication of the pre-retirement age group of the old adults analyzed. The 67+ group, is especially interesting in this respect because it focusses mainly on environmental sustainability and climate change, by also addressing their political implications.

The analysis relies crucially on an identification of communities on social media since they can play an important role in the creation of public space (and the other way around). Public space is a space where people can discuss, fight for their rights and interests, work for the common good, and gain control over the data they produce. It will be argued that this space is the premise to build a more sustainable way of life.

These two groups exploit Twitter as a digital space of encounter where beliefs and values get confronted and can compete for domination. Even though there might not be a clear political purpose in their narrative, the interaction between the local and global level of communication (mediated by social networks) gives rise to a space that stimulates participation contributing to a more sustainable urban future. Twitter functions thus as a contact zone [50].

This paper is innovative in several respects. At the *methodological* level, it relies on social media data to investigate the narrative of two apparently different actors, that is creative skilled migrants working in the Netherlands and Dutch elderly whose narrative has not yet been analyzed in detail with respect to the smart city. The analysis combines in an innovative way language and social network analysis. The approach presented can complement more traditional works that focus on elicited data, such as focus groups or interviews (i.e. [16, 52]). Social media provides spontaneous and authentic data, that can reflect different voices that would normally not take part in more traditional data collections.

At the *theoretical* level, the paper contributes to the human-centered, smart city literature in which citizens are asked to participate in innovation processes [10, 12, 14, 28]. Both groups analyzed engage in social activities and in projects for the common good, this is the case of the urban designers as well as the elderly that are rather active in promoting local initiatives.

At the *policy* level, we show that a language analysis of social media communication can offer a useful instrument to urban planners and policy makers to work towards more sustainable urban futures in which environmental sustainability [17, 27, 56], social justice [22, 34, 53] and resilience to future shock [19, 28] become

the leading themes. There is the need to achieve a balance between corporate driven solutions and those ones arising from the needs and participation of the citizens [3].

2 Smart Cities and Sustainability

The smart city is an urban space shaped by global technology companies, governments, and knowledge institutions that collect and analyze data, regulating urban processes and making them more efficient [20]. It is in this way that data and sustainability are linked. More specifically, the smart city agenda aims to support sustainability, which is often understood as a function of innovation in relation with technology [21]. However, economic growth seems the main concern of urban development since data produced by devices and citizens are exploited by corporations and governments, often through public- private partnership. They create new markets and profit that often do not consider the needs of the citizens and of the environment.

In order to give rise to more sustainable modes of urban development, technology should serve the needs of the citizens and citizens should participate in innovation processes, as co-creators [57]. Data should be conceived as a common good and be open to local companies, social platforms, and organizations, creating long term public value. Citizens should not be mere data providers but decision-makers [8].

Data ownership plays an important role in environmental and social sustainability. Data are valuable and value-creating but are in the hands of big tech corporations that exploit them for their own benefits. In this context, it is imperative to regain control over the data produced by citizens. Data should be conceived as a common good and be open to local companies, social platforms, and organizations. They should be employed to serve the needs of the citizens and of the environment, creating long term public value [4].

The current pandemic due to covid-19 has highlighted the failure of the technocratic smart city model. A model that had already been subject to much criticism because it serves mainly the interests of coorporations and governments, rather than those of the citizens [1, 11, 19, 25, 31, 38, 54, 55].

Smart cities such as London or New York that are driven by data and algorithms failed to use smart technology to carry out contact tracing. They didn't manage to limit the spread of the virus and the high number of deaths. Smart cities proved not to be adequate to support the well- being of their citizens. Amsterdam, which has been much praised for its smart city policies [2, 8], doesn't have sufficient parks and green areas for people to breath fresh air and maintain distancing. Homes are not conceived to have the entire family working and living in the same space 24/7. The smart city is driven by technology, but the recent pandemic made even more clear that the use of technology on which it is based, serves mainly the interests of corporations and governments rather than those of the citizens.

A growing body of research and academic literature has argued for a different approach to the smart city, suggesting an alternative vision that considers the environment and the well-being of citizens as priority. The human-centered smart city

literature [2, 10, 12, 28, 38] asks for citizens' awareness and participation in innovation processes and for a view in which data and technology is being used in support of the environment and citizens' needs. This paper is embedded within this research line.

3 Public Space and Contact Zone

Public space is the necessary building stone on which a more sustainable smart city can be built. The well-functioning of public space is a crucial element to foster debate and political action. More specifically, [44] argues for an agonistic space in which subjects with conflicting views and interests can coexist and compete, leading eventually to the creation of new communities and political subjects. Agonistic spaces contribute to the development of a 'counter-hegemony' [, p. 151].45

We witness, however, a progressive privatization of public space by institutional actors and by global capitalism [35] that have taken over public spaces in the physical and digital dimensions [43]. However, (public) physical space is crucial because it structures co-presence and interaction patterns of people that create the conditions that give rise to communities [23]. As argued by Hillier and Hanson [24], social relationships between people can be fostered by spatial solidarity, that is through sharing the same local world and getting together in physical space and by transpatial solidarity trough sharing the same interests that can extend across physical space boundaries.

Since human beings live in a spatial dimension, in addition to a social and temporal one, there is an inevitable relation between spatial and social phenomena that influence each other [9, 23, 37, 53]. Therefore, public space plays a role in giving rise to communities, but at the same time, communities can operate to create public space.

Media are important elements in the creation of (public) space. This is especially the case for mobile media that have contributed to the fusion between the digital and the physical dimensions which is most evident in urban contexts [13, 15]. The privatization of public spaces in the city has run in parallel with the emergence of new digital spaces that favor transpatial solidarity since people can come together based on their interests and goals, as is the case in social media platforms, such as Twitter.

Twitter is particularly relevant in analysing the communication of the groups that are considered in this paper, that is creative skilled migrants and Dutch elderly since they employ it to promote their activities, discuss events and build their network. It is considered a space of encounter where information, beliefs and values are shared, leading to interaction and sometimes conflict: a digital platform that creates mobile meeting places for shared experiences [49]. It is a contact zone [50] which is a space for encounters both voluntary and involuntary, and thus a space for potentiality, for example through unexpected use of media such as the stratagematic actions discussed in [40]. Stratagematic actions are characterized by an unexpected use of the hybrid spaces created by mobile and social media: physical and digital, local, and global.

They produce side effects that could be exploited by communities to refine, define, and eventually reach their goals, if they become aware of their potential.

4 Methodology

Social media platforms can offer massive, dynamic and diverse data that allow for an investigation of the behaviours, opinions and feelings of their users. These are spontaneous and authentic data that allow for the creation of textual corpora based on millions of users. Social media data can complement more traditional data collections, such as those emerging from focus groups, interviews and surveys. They make possible to identify voices that might not easily emerge through traditional approaches since these data emerge from real-world situations, from various people and they are not elicited by the prompt of researchers.

In this paper, an innovative methodology is presented that is based on the creation of a sample of active Twitter users through computational techniques. Their collected data has been analyzed by focusing on a hashtag investigation of the communication topics of the two groups identified (cf. also [6]). An additional innovative aspect of the approach presented is the integration of the language analysis of social media data with a social network analysis to visualize the geographical distribution of the communication patterns of the two groups investigated.

4.1 Data Collection

The data collection carried out has focused on two specific groups that are relevant to analyse in the context of urban sustainability because they might highlight a different discourse from that of global corporations. The two groups are Dutch elderly and creative skilled migrants working in the Netherlands. The identification of these two groups of users, however, can be challenging.

Identifying elderly is rather complex because in Twitter, the age of users is not visible and, in addition, defining age is not a trivial task. We have opted for using chronological age to select users which have been further grouped in three classes, that is users below 55 years old, users between 55 and 67 and above 67 years old. These groups correspond to three life stages that are related to the active working life of the individuals (i.e., below 55), the pre-retirement stage (between 55 and 67) and post retirement (above 67). Users have been identified manually, starting from a profile that was created for the purpose of following organizations, related to ageing, that one could expect to have old adults among its followers. Users have been categorized in the three groups using various tactics, such as profile picture and/or age of birth present in the Twitter name. Data was then extracted automatically from the created sample.

This methodology has been adapted to create a sample of the other group of users under investigation, that is skilled creative migrants working in the Netherlands. Identifying creative migrants is even more challenging than the elderly since they do not characterize themselves as such.

The first step was to identify occupations related to creativity. Three different resources have been employed to single out the relevant creative industries and derive the corresponding occupations. The result was a list of 164 creative professions that were further categorized in 11 sectors, within the creative industries. The professions identified were matched with the profile descriptions of Twitter users. Additional criteria were used, such as migrants being located in The Netherlands. As in the case of the elderly, a profile was created on Twitter in order to follow several organizations related to creative industries that one could expect to have skilled creative migrants among their followers.

The final list of creative migrants was manually verified but a content analysis of the profile description of the users was also carried out to further verify the correctness of the selection. It is based on word frequency and it confirms the validity of the approach. As in the case of the elderly, data was then extracted automatically from the created sample. We refer to [41] for further details on the data collection of skilled creative migrants.

4.2 Analysis

The Twitter data collected from the two groups was analyzed by employing an innovative methodology that combines a language analysis of the (geo-tagged) data with a quantitative investigation of the communication patterns through social network analysis. While the language analysis reveals the interests and activities of the users, the social network analysis provides a geographical visualization of their communicative interactions.

The language analysis proposed relies on computational methods and focusses on the frequency of the hashtags employed by the users to investigate their topics of discussion. Hashtags are a way to add metadata to shared content and highlight in this way the debate that is being carried out on the platform [5, 18]. Hashtags are more informative and thus more interesting to investigate than normal words. A frequency analysis based on hashtags reveals the topics that social media users want to highlight and provide information about what interests them [39, 48].

In the case of the creative migrants, four groups of creatives present in our sample were analysed. The categories are 'writers', 'new media arts', 'fine arts', and 'architects and designers'. The aim was to investigate whether there are differences in the interests and communication of the various categories of creative skilled migrants, but especially their attitude towards sustainability.

The language analysis carried out can be connected to social network analysis to provide insights on the geographical distribution of the various patterns of communication possible in Twitter. The followers, reply and mention networks of the users were analysed.

In the case of creative migrants, the nature of the relationships between users has been investigated through a quantification and categorization of the users' connections in four dimensions: creative vs. non-creative and local vs. global users. The latter, that is, local and global users, have been calculated based on the geo-location provided. In this way, it is possible to investigate with whom creative skilled migrants interact and where these users are located.

The social network analysis provides insights on whether creative migrants are connected to more non-creative users than creative ones, for example. In this way, one can investigate whether they use the platform for professional or for private use. It is also possible to assess whether creative migrants connect more within the Netherlands or internationally. A visualization of followers, mention and reply networks also allows to analyse the level of engagement of these users within their network. Further details on the analysis of skilled creative migrants can be found in [41] and in[42].

The methodology proposed for the analysis of creative migrants adapts nicely also to the other group considered, that is the elderly, providing evidence for its validity.

More specifically, a frequency analysis of hashtags and words employed by the three age groups identified has been carried out. In the case of the elderly, the methodology has been extended by combining the hashtag frequency analysis with the geo-location information available in Twitter. This approach allows to investigate the spatial distribution of users that is particularly relevant in the case of urban sustainability. It provides an example of how digital sustainability and environmental sustainability are related. The data provided by the users make possible to assess whether certain age groups have an interest for environmental sustainability in connection with the place they live in and can play a role in stimulating an alternative discourse that triggers social action.

The geolocation information available in Twitter profiles, if present, makes possible to assess the distribution of the living places of the various users and to visualize it through maps. In this way, it becomes possible to investigate the interest of users for specific places and to analyze whether there is a correspondence between the places of residence and the locations users mention in their hashtags.

The importance of social network analysis within this methodology should be considered. It provides information on whether the message of the elderly gets broadcasted worldwide. It reveals their communication pattern within and outside of the Netherlands and makes possible to assess their impact in broadcasting their messages to different locations.

4.3 Results

The Twitter analysis of Dutch elderly reveals that location hashtags are used mainly by people living in the place that is being mentioned or close to it. It also shows that elderly above 67 exhibit an extensive use of location hashtags, especially locations within The Netherlands, as can be seen in Table 1. The expectation was that the elderly would mention mainly touristic places because of their available leisure time but this is not the case. A detailed analysis reveals that they use location hashtags to promote the city they live in, showing that they are connected to the local environment. Furthermore, a difference can be noticed in where people live, while big cities (i.e., Amsterdam and Rotterdam) are the domain of young people, elderly live in smaller places, as can be seen in Fig. 1.

The presence in tweets of hashtags related to nature and sustainability has been investigated to have better insight on the behavioural differences among the age groups in this respect. Previous literature has shown that young people don't have a strong interest in nature in comparison with elderly people [7, 47].

The elderly use more nature related hashtags than the other groups. The group 55–67 is the least interested in this topic, as can be seen in Table 2.

However, with respect to sustainability, the elderly are the least interested in sustainable development while the 55–67 group is the most interested one. The elderly use almost only unique terms and it should be noticed that only two terms are used by all three groups which are: 'climate' and 'climate change'.

The most frequent terms used by the under 55 group are those related to 'circular economy', followed by 'the green city' ('groenerstad'). The terms used by the 55–67 groups are very similar, and they also relate to circular economy: 237 of the 314 hashtags used are about it, as can be seen in Fig. 2.

It is interesting to notice, that the elderly belonging to the 67+ group mention instead rather different terms with respect to sustainability, in particular, the term 'circular economy' is not mentioned at all. On the other hand, the terms mentioned are mainly related to climate, climate change and climate actions, including terms related to a political dimension of climate change, as can be seen in Fig. 3.

Furthermore, terms related to the organic movement are being used. It seems thus that the elderly associate sustainable development mainly to the environmental aspects and not to the economic ones, as is the case for the younger groups.

To summarize: the elderly use location hashtags more than the other groups and they do not engage in the current sustainable development discourse based mainly

Table 1 Location hashtags

	Total number hashtags	Locations NL	Locations foreign	Percentage locations (%)	Percentage NL locations (%)
UN55	16076	758	287	6.5	4.7
OV55	7436	339	43	5.1	4.6
OV67	1545	100	16	7.5	6.5

Gebruikers per woonplaats

Fig. 1 Living places of all users

Table 2 Nature hashtags

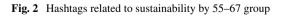|	Total number hashtags	Nature #	Number unique #	Percentage (%)
UN55	16076	243	123	1.5
OV55	7436	30	29	0.4
OV67	1545	27	24	1.7

Fig. 2 Hashtags related to sustainability by 55–67 group

Fig. 3 Hashtags related to sustainability by 67+ group

on economic issues, but instead they have an interest for environmental aspects and for nature. They seem to play a role in broadcasting and alternative discourse on sustainable development in which a bond is established between nature and human beings. In this context, it is relevant to investigate the network of the elderly to assess whether they can have an impact in promoting their messages.

The connections of the group under 55 are located in the centre of the country where are the big cities, that is Amsterdam, Rotterdam and Utrecht. In the case of the international network, connections are mainly located in the east coast of the United States, as well as in Australia and New Zealand which are English speaking countries, a language easily mastered by Dutch users.

In the group 55–67, the core of the network is located in the Randstad where are the big cities Amsterdam, Rotterdam, Den Haag and Utrecht. For the rest, the network is quite well spread across the country. With respect to the international network, the US is a place where many connections are located as well as in Oceania and in South Africa, probably due to language reasons. Users in this group have more connections outside of the Netherlands (i.e. 10,7%) than the younger group of under 55 (i.e. 9,2%).

The network of the 67+ shows relevant hubs in Utrecht and locations close to this city. As for the international network of the elderly, it can be noticed that it is less strong than that of the younger groups since most of the connections of this group are in The Netherlands.

Figure 4 shows the network differences among the three age groups, as expected the young group is the most connected but the elderly do show quite a strong network, as well.

As for the creative migrants, a social media analysis of their communication shows that they contribute to an alternative, sustainable idea of smart city. Co-creation and participation are important issues in the discourse of creative migrants, but they also argue for the importance of datafication of urban space and acknowledge in this way the role of government and corporations in data governance. They combine technology with a participatory and socially driven discourse based on events, initiatives and projects showing social and environmental engagement.

This is especially evident in the case of the group of architects and designers. They are interested not only in technology and data, two of the features of the smart city discourse but they relate them to the common good. They play an important
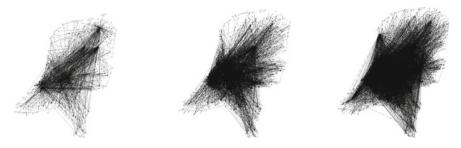
Fig. 4 Social network analysis of three age groups: from old to young

role in broadcasting grassroots initiatives aimed at social inclusion and the circular economy. An overview of the hashtags used by this group can be seen in Fig. 5, taken from [, p.7].41

Their discourse can contribute to give rise to a more emancipatory and innovative smart city agenda. They can raise awareness within civil society by broadcasting relevant topics and social, local activities through Twitter at global level, even beyond their professional circle, linking Amsterdam to the global networks of power represented by global cities. Further details on this analysis can be found in [41].

A qualitative thematic analysis of the communication of this specific group of creative migrants has provided more details and it has shown that these creative migrants play an important role in broadcasting grassroots initiatives aimed at social inclusion and the circular economy. They address several topics in this respect such as circular economy, alternative forms of energy but also climate change and sustainable

Fig. 5 Hashtags used by the group architects and designers

development. They are also involved in promoting projects that foster social innovation, inclusion, education and they promote makerspaces that trigger inclusion and participation. More details about the thematic analysis and its results can be found in [42].

5 Discussion

In this paper, two apparently different grassroots communities have been analyzed with respect to their social media communication. Similarities emerge from an analysis of the topics of discussion that was based on the frequency of the hashtags used. For example, they both address sustainability in their communication on Twitter. This is the case especially for a specific group of creative migrants, that of the architects and designers. They are concerned with the economic aspects of environmental sustainability and address several topics in this respect such as circular economy and alternative forms of energy like wind, solar, biofuel. Some of these topics can be found also in the communication of the pre-retirement age group of the elderly analyzed. For example, they mention topics like circular economy.

However, the elderly are especially interested in environmental sustainability and nature. Their vision of sustainability is different from older adults (i.e. the age group between 55 and 67) since those focus more on the economic aspects of sustainability.

What emerges from the analysis of the data of the creative migrants is that sustainability is a topic of discussion both in relation to work as well as in connection to their private interests. Architects and designers are concerned especially about economic sustainability, but they are involved in promoting projects that foster social innovation as well as inclusion and education. They also promote makerspaces that trigger inclusion and participation, but they are not very concerned about privacy or data ownership.

Even though we could refer to the elderly and the creative migrants as communities, they do not really profile themselves as such on Twitter, they are individuals that express their views and ideas as individuals and not as a community. They do not join forces with others. They exploit the available space in Twitter that can be seen as a contact zone, as a digital space of encounter where beliefs and values get confronted. However, they do not shape the space they occupy. There is a potential among those users to contribute to a different storytelling, but there isn't a clear political impact in their communication. The elderly and the creative migrants analyzed form groups that share certain characteristics, but they are not a community, yet.

The social network analysis carried out shows that creative migrants are more connected globally, while the elderly are more connected locally. On the other hand, the hashtag analysis reveals connections to local communities in both cases. These communication networks have the effect to create a different storytelling through local participation and these groups can broadcast these activities towards a more human-centred smart city, globally through their international networks. Both groups,

manage to exploit the digital and physical spaces that are mediated by their social networks.

It might be that this interaction between the local and the global level mediated by social networks might contribute to the creation of a public space. However, this space was not yet able to foster the creation of a community with a clear political purpose, but it shows potential that it might in the future.

6 Conclusion

The innovative methodology proposed in this paper relies on language and media but can have broad applications in urban studies: the results of the data analysis allow for an understanding of the storytelling behind the smart city discourse. This is important knowledge for urban planners and policy makers as is knowledge based on spontaneous data.

The hashtags employed by the creative migrants in their Twitter communication support social and environmental sustainability, similarly for what concerns the Dutch elderly analysed. The groups investigated are interesting because they provide a good example of the way digital and environmental sustainability interact. The data produced by these groups can promote an alternative human-centred smart city discourse. Citizens should become more aware of the relevance of the data they produce and make sure that they are being used to support their needs and not only economic growth.

The analysis of the communication of the two groups has revealed that they employ Twitter to broadcast local initiatives at a global level, creating an interaction between the physical urban dimension and the digital one through the social media platform. They give rise to an alternative discourse that has the potential to bring change if strategically exploited.

More specifically, elderly can play an important role in reshaping the discourse on sustainable development and redefine the relation between the human and the natural world, a necessary condition for a new perspective on sustainable urban futures. Evidence comes from Japan that is active in supporting the creation of communities, giving the opportunity to retired people to carry out caring activities in relation to agriculture, food and community support [46]. Japan is at the forefront in this respect since it precedes other countries in acknowledging ageing as an urban issue.

In this vision, elderly can play a very concrete role towards the creation of a more human-centred smart city. The elderly can act as innovators since they have time and a lifetime experience at their disposal. This is especially the case for Dutch old adults since they are at the forefront with respect to volunteering activities and social media use. It is thus important to give rise to initiatives to stimulate an alternative debate on sustainable development driven by volunteering activities where older adults can play a central role, for example through social media communication.

Environmental sustainability has received attention in the last years thanks to the active involvement of the younger generations through initiatives such as Fridays

for Future, but the elderly have not been much involved. They could instead play an important role since this paper has argued that interests of the younger age group and of the 67+ group with respect to nature is comparable. Social media could be exploited by both groups that could join forces to give rise to an active ageless community. The political interests of the 67+ group that emerged from the hashtag analysis carried out could be beneficial for the younger generation and could help in creating a stronger impact at political level and contribute to re-shaping the environmental sustainability discourse.

The current pandemic has shown the vulnerability of cities and challenged the smart city agenda. One wonders whether the sustainability discourse should be promoted in relation to the city or whether one should go beyond it. A recent exhibition by Rem Koolhaas at the Guggenheim Museum of New York, has drawn attention on what he calls the countryside. He defines with this term everything which is not city, that amounts to 98% of the earth surface. Koolhaas claims that rural areas are changing as consequence of the changes that occur in urban areas [33]. Transformations outside of the city are just as radical as those that occur in relation to the urban, an aspect often neglected. However, the countryside that is represented in the exhibition is subordinated to the needs of the city, without a clear identity, it accepts gentrification phenomena passively. The polarization that we have witnessed in recent political elections, in the US, but not only, shows that the non-urban spaces have their own identity that usually sharply conflicts with the urban ones. Polarization is often triggered by this subordinate role.

The Covid-19 pandemic has made the borders between the rural and the urban less sharp, it has brought many people to leave the city and to experiment new ways of living and new possibilities. There is the need to acknowledge the big transformations that have characterized the non-urban in the last years, exploit their potential and maybe conceive new ways of merging the rural and the urban in the future, as a way to support environmental and social sustainability and the existence of the human species.

References

1. Allen A, Lampis A, Swilling M (2016) Untamed urbanism. Routledge advances in regional economics, science and policy. Routledge, New York
2. Angelidou M (2014) Smart city policies: a spatial approach. Cities 41:S3–S11
3. Angelidou M (2015) Smart cities, a conjuncture of four forces. Cities 47:95–106
4. Bria F (2018) Our data is valuable. Here's how we can take that value back. The Guardian. https://www.theguardian.com/commentisfree/2018/apr/05/data-valuable-citizens-silicon-valley-barcelona. Accessed 15 Jan 2019
5. Bruns A, Burgess JE (2011). The use of Twitter hashtags in the formation of ad hoc publics. In: Proceedings of the 6th European consortium for political research (ECPR) general conference 2011, pp 1–9
6. Bruns A, Burgess JE (2012) Researching news discussions on Twitter. New methodologies. Journal Stud 13(5–6):801–814

7. Buijs A, Custers M, Langers F (2007) Natuur door andere ogen bekeken. Wageningen, Wageningen UR
8. Calzada I (2018) (Smart) citizens from data providers to decision-makers? The case study of Barcelona. Sustainability 10(9):1–25
9. Castells M (1996) The rise of the network society. Blackwell Publishers, Oxford, UK
10. Castelnovo W, Misuraca G, Savoldelli A (2015) Smart cities governance: the need for a holistic approach to assessing urban participatory policy making. Soc Sci Comput Rev
11. Cugurullo F (2018) Exposing smart cities and eco-cities: Frankenstein urbanism and the sustainability challenges of the experimental city. Environ Plan Econ Space 50(1):73–92
12. Dameri RP (22 Oct 2013). Searching for smart city definition: a comprehensive proposal. Int J Comput Technol 11(5):2544–2551
13. de Souza e Silva A, Firth J (2010) Locative mobile social networks: mapping communication and location in urban space. Mobilities 5(4):485–506
14. de Waal M, Dignum M (2017) The citizen in the smart city. How the smart city could transform citizenship. It-Inf Technol 59(6):1–11
15. Farman J (2012) Mobile interface theory: embodied space and locative media. Routledge, New York, NY
16. Fernandez-Anez V, Fernández-Güell JM, Giffinger R (2018) Smart city implementation and discourses: an integrated conceptual model. The case of Vienna. Cities 78:4–16
17. Gargiulo Morelli V, Weijnen M, Van Bueren E, Wenzler I, Salvati L, De Reuver M (2013) Towards intelligently-sustainable cities? J Land Use Mob Environ 1:73–86
18. Golder SA, Huberman BA (2006) Usage patterns of collaborative tagging systems. J Inf Sci 32(2):198–208
19. Hajer M (2016) On being smart about cities. Seven considerations for a new urban planning and design. In: Allen A, Lampis A, Swilling M (eds) Untamed urbanism. Routledge advances in regional economics, science and policy. Routledge, New York, pp 50–63
20. Hancke GP, de Carvalho e Silva B, Hancke GP Jr (2013) The role of advanced sensing in smart cities. Sensors 13(1):393–425
21. Haarstad H (2017) Constructing the sustainable city: examining the role of sustainability in the 'smart city' discourse. J Environ Planning Policy Manag 19(4):423–437
22. Harvey D (2008) The right to the city. New Left Rev 53:18
23. Hillier B (1996) Space is the machine: a configurational theory of architecture. Cambridge University Press, Cambridge, UK
24. Hillier B, Hanson J (1984) The social logic of space. Cambridge University Press, Cambridge
25. Hollands R (2015) Critical interventions into the corporate smart city. Camb J Reg Econ Soc 8(1):61–77
26. van Hulst M (2012) Storytelling, a model of and a model for planning. Plan Theory 11(3):299–318
27. de Jong M, Joss S, Schraven D, Zhan C, Weijnen M (2015) Sustainable–smart– resilient–low carbon–cco–knowledge cities; making sense of a multitude of concepts promoting sustainable urbanization. J Clean Prod 109:25–38
28. Joss S, Cook M, Dayot Y (2017) Smart cities: towards a new citizenship regime? A discourse analysis of the British Smart City standard. J Urban Technol 24(4):29–49
29. Kitchin R (2014) Big data, new epistemologies and paradigm shifts. Big Data Soc 1(1):1–12
30. Kitchin R (2014) The data revolution: big data, open data, data infrastructures and their consequences. Sage, London
31. Kitchin R (2014) The real time city. Big data and smart urbanism. GeoJournal 79:1–14
32. Kitchin R (2015) Making sense of smart cities: addressing present shortcomings. Camb J Reg Econ Soc 8(1):131–136
33. Koolhaas R (2020) Countryside. A report. Taschen
34. Lefebvre H (1996) The right to the city. In: Kofman E, Lebas E (eds) Writings on cities. Blackwell, Oxford
35. Lefebvre H (2003) The urban revolution (R. Bononno, Trans.). University of Minnesota Press, Minneapolis, MN

36. Martin CJ, Evans J, Karvonen A (2018) Smart and sustainable? Five tensions in the visions and practices of the smart-sustainable city in Europe and North America. Technol Forecast Soc Chang 133(4):269–278
37. Massey D (2005) For space. Sage, Thousand Oaks, CA
38. McFarlane C, Söderström O (2017) On alternative smart cities. City 21(3–4):312–328
39. Monachesi P, de Leeuw T (2018) Analyzing elderly behavior in social media through language use. In: Stephanidis C (ed) HCI international 2018–20th international conference, proceedings, Part II. Springer, pp 188–195
40. Monachesi P, Turco M (2017) New urban players: stratagematic use of media by Banksy and the Hong Kong Umbrella Movement. Int J Commun 11:1–18
41. Monachesi P (2020) Shaping an alternative smart city discourse through Twitter: Amsterdam and the role of creative migrants. Cities, 100
42. Monachesi P, Witteborn S (2021) Building the sustainable city through Twitter: creative skilled migrants and innovative technology use. Telemat Inf, 58
43. Morozov E (2011) The net delusion: how not to liberate the world. Perseus Books, Cambridge, MA
44. Mouffe C (2005) On the political. Routledge, London, UK
45. Mouffe C (2013) Agonistics: thinking the world politically. Verso, London, UK
46. Muramatsu N, Akiyama H (2011) Japan: super-aging society preparing for the future. Gerontologist 51:425–432
47. Nieuwenburg C, Staal EV, Winterwerp R, Zuuren TV (2011) Denkbeelden over de natuur. Utrecht University, Utrecht
48. Pandya A, Oussalah M, Monachesi P, Kostakos P (2019) On the use of distributed semantics of tweet metadata for user age prediction. Future Gener Comput Syst 102:437–452
49. Polson E (2015) A gateway to the global city: mobile place-making practices by expats. New Media Soc 17(4):629–645
50. Pratt ML (1991) Arts of the contact zone. MLA Profession, 33–40
51. Sandercock L (2003) Out of the closet: the importance of stories and storytelling in planning practice. Plan Theory Pract 4(1):11–28
52. Söderström O, Paasche T, Klauser F (2014) Smart cities as corporate storytelling. City 18(3):307–320
53. Soja D (2010) Seeking spatial justice. University of Minnesota Press, Minneapolis, MN
54. Trencher G (2019) Towards the smart city 2.0: empirical evidence of using smartness as a tool for tackling social challenges. Technol Forecast Soc Change 142(C):117–128
55. Vanolo A (2014) Smartmentality: the smart city as a disciplinary strategy. Urban Stud 5(51):881–896
56. Viitanen J, Kingston R (2014) Smart cities and green growth: outsourcing democratic and environmental resilience to the global technology sector. Environ Plan A 46(4):803–819
57. Zandbergen D, Uitermark J (2019) In search of the smart citizen: republican and cybernetic citizenship in the smart city. Urban Stud, 1–16