

Towards an inclusive and sustainable digitalisation of urban service delivery: Residents' utilisation of the digital property address system in Accra, Ghana.

Stephen Leonard Mensah, Master's student, University of Ghana (corresponding author)

slmensah77@gmail.com

Department of Geography and Resource Development

University of Ghana

Legon, Ghana

Louis Kusi Frimpong, Lecturer, University of Environment and Sustainable Development, Somanya, Ghana

Seth Asare Okyere, Visiting Assistant Professor, The University of Arizona, Tucson, Arizona, USA

Abstract

The digitalisation of urban service delivery and governance in most African countries has been identified as key to addressing the complex urban problems we are confronted with. In following suit, Ghana has introduced the Digital Property Address System (DPAS) as part of its smart urban management agenda. While the existing urban scholarship has engaged the discourse on the role of digital technologies in African urban economies, there has been little attention to the utilisation of these digital technologies and their implications for urban Africa's progress towards sustainable and inclusive cities. This paper traces the development of the program to examine the utilisation of this digital initiative and the factors that underpin its use among residents in Accra's suburban residential areas. Using qualitative and quantitative data collected from three neighbourhoods, the paper finds a low level of utilisation of the DPAS system in suburban Accra, raising critical concerns about the potential benefits of urban digital tools to the everyday life of suburban residents. The study also revealed that existing digital infrastructure, poor data connectivity, expensive data, and poor alignment of the digital system within urban governance functions limited widespread utilisation among suburban residents. The paper submits that the city government needs to get to the basics of smart urbanism: building necessary infrastructure, education, and training, and streamlining digital tools to the socio-cultural context of the urban population and citizen-engagement platforms as critical to assuring an inclusive digital system that allows all socioeconomic groups to benefit from the opportunities that digitalisation presents.

Keywords: Digitalisation, urban services delivery, inclusive, sustainable, Accra

Introduction

With the global urban population expected to increase to more than 50 percent in the next decade, building cities and systems that offer potential to everyone is a sine qua none for building inclusive and sustainable cities¹. Digitalisation which is regarded as one of the major transformations of socio-economic development has been a major feature across many countries². In view of this, public service delivery in most African countries is shifting from traditional means of delivery to the use of digital technologies³. This new mode of delivery is carried out through the establishment of public institutions that provide supervision to facilitate social and economic development, especially in urban areas⁴. This is because managing urbanisation inclusively and sustainably in African cities remains a daunting challenge for city planning and management authorities. Yet, while the promise of urbanization to drive economic growth still hold, inequities in the distribution and access to socio-economic opportunities, inefficiencies in urban service provision, and urban poverty make Africa's urban crises appear intractable, placing African cities on unsustainable development trajectories. It is in this context that the digitalisation of urban service delivery has emerged as a formidable response to the urban challenge.

The digitalisation drive even though offers many benefits for social and economic transformation, but its implementation has often been characterized by data insecurity, systemic failures, and socio-spatial inequities⁵. This situation is common in Africa, where digital initiatives have been characterized by a disconnection between design features and implementation environments, hence creating a design-reality gap^{6 7}. But to ensure equitable spatial planning in cities, digitalisation initiatives must be geared toward socio-spatial inclusion across various urban suburbs, and the sustainability of urban service delivery⁸.

¹ Beard et al. 2016

² Scholz et al. 2018

³ Maseko 2018

⁴ Maseko 2018

⁵ Kitchen 2016

⁶ Heeks 2003

⁷ Heeks 2002

⁸ Baud et al. 2018

In Ghana, most studies on digitalisation have focused on how it has improved public services⁹, the benefits and challenges that come with its implementation¹⁰, and the importance of designing an effective addressing system¹¹. Despite the relevance of these studies in highlighting the role of digitalisation in public service delivery, little is known about how their utilisation ensures inclusive and sustainable urban management. This is important because the Sustainable Development Goals (SDGs) 11 emphasize building resilient, inclusive, and sustainable human settlements¹², which is critical for addressing socio-spatial inequities in cities in global south countries like African cities¹³. By so doing urban residents can benefit from digitalisation initiatives introduced by their national and local governments. Therefore, this paper explores residents (i) perspectives on the role of DPAS in building sustainable and inclusive Accra (ii) utilisation of the DPAS (iii) factors hindering the utilisation of the DPAS. This paper is significant because firstly, it contributes to the digitalisation literature, by highlighting how recent digitalisation initiatives in African cities such as the DPAS is ensuring sustainability and inclusiveness. Secondly, it provides lessons for addressing socio-spatial inequities in digitalisation initiatives and urban services delivery. The next two sections present the roles of digitalisation and DPAS in sustainable and inclusive cities. This is then followed by the research setting and methodology, results and discussion, and the conclusion and policy implications respectively.

The role of digitalisation in sustainable and inclusive cities

The penetration of digital technologies in almost every aspect of human lives has occasioned many changes in how every facet of society is organised¹⁴. Yet, as cities embrace a digital culture in every sector of the economy¹⁵, socio-technical challenges undermine the operational efficiency and effectiveness of the use of digital technology use, with some of these challenges stemming from a lack of consultation and appreciation of on-the-ground realities¹⁶. Therefore, efforts toward inclusive digitalisation present opportunities for addressing the problems of marginalized communities and populations¹⁷. Nevertheless, the literature points out that vulnerable users are rarely informed or openly engaged in urban

⁹ Agbozo, 2021

¹⁰ Demuyakor, 2021

¹¹ Abebrese 2019

¹² Silver 2015

¹³ Dano et al. 2020

¹⁴ Gabrys 2016

¹⁵ Sareen 2021

¹⁶ Bouzarovski 2014

¹⁷ Sareen 2021

digitalisation initiatives and hence, are poorly positioned to make any meaningful contribution to the design and implementation of urban digitalisation processes¹⁸.

The role of digitalisation includes increasing access to support schemes for people, raising awareness of safety measures at their disposal, and helping authorities to provide services to urban residents' especially vulnerable users¹⁹. For instance, a study in South Africa revealed that several municipalities utilize digitalisation initiatives for the active development, planning, and provision of urban services such as utilities and local economic development²⁰. Likewise, a study in Kenya revealed that notwithstanding the complex situations of slums, digital technologies such as open mapping present opportunities for building sustainable renewable communities²¹. Hence, this paper by investigating the role of digitalisation in addressing the socio-spatial inequities in urban service delivery and urban planning underscores the critical role of digitalisation in the building of inclusive and sustainable cities.

DPAS and its potential to support sustainable and inclusive cities

The DPAS was launched in October 2017 by the president of the Republic of Ghana. It is expected to enhance urban service delivery such as household waste collection, easy navigation, and property identification. It is also expected to help address critical urban problems such as crime and insecurity²², as well as facilitate the implementation of key government initiatives such as banking and tax reforms and the national identification system²³. However, a situation where different agencies have taken turns to emboss different digital address plates on properties raises critical issues about operational efficiency and an indication of ineffective planning in the design and implementation phases. This will lead to members of the same house using different digital addresses, especially in a country dominated by a multi-habited housing system²⁴. The design and implementation of the DPAS have also failed to consider inclusiveness as it lacked active engagement with relevant stakeholders in the technology arena²⁵, and also failed to

¹⁸ Heeks 2003

¹⁹ McLaren and Agyeman 2015

²⁰ Maseko 2018

²¹ Ndemo 2020

²² Ayakwah et al. 2021

²³ Aboagye et al. 2018

²⁴ Andorful 2021

²⁵ Abebrese 2021

consider the socio-political, behavioral, and economic nuances of the implementation environment^{26 27}. This does not augur well for a country where the economy is eighty percent informal²⁸, and one-fifth of the total physical structures are for informal purposes²⁹.

Research setting and methodology

The study was conducted in three suburban communities located in two different municipalities in the Greater Accra Metropolitan Area (GAMA) (Figure 1). The Dome and Agbogba communities are located in the Ga East municipality. The municipality is characterized by mixed land-use and rapid residential development. The Ashale Botwe community is located in the Adenta municipality, which is one of the completely urbanized municipalities in the GAMA³⁰. It is characterized by mixed commercial and residential land-use and has a lot of public housing units accommodating the middle and high-income classes. The selection of the two fringe residential communities was based on the fact that previous studies have largely focused on communities within the main urban precinct. Meanwhile, the digitalisation agenda is expected to be inclusive and facilitate a digital culture among all groups of people and places in the city, hence the focus of the study on the urban fringe areas.

²⁶ Simons 2016

²⁷ Heeks 2003

²⁸ Oteng et al. 2021

²⁹ Ghana Statistical Service 2021

³⁰ GSS 2021

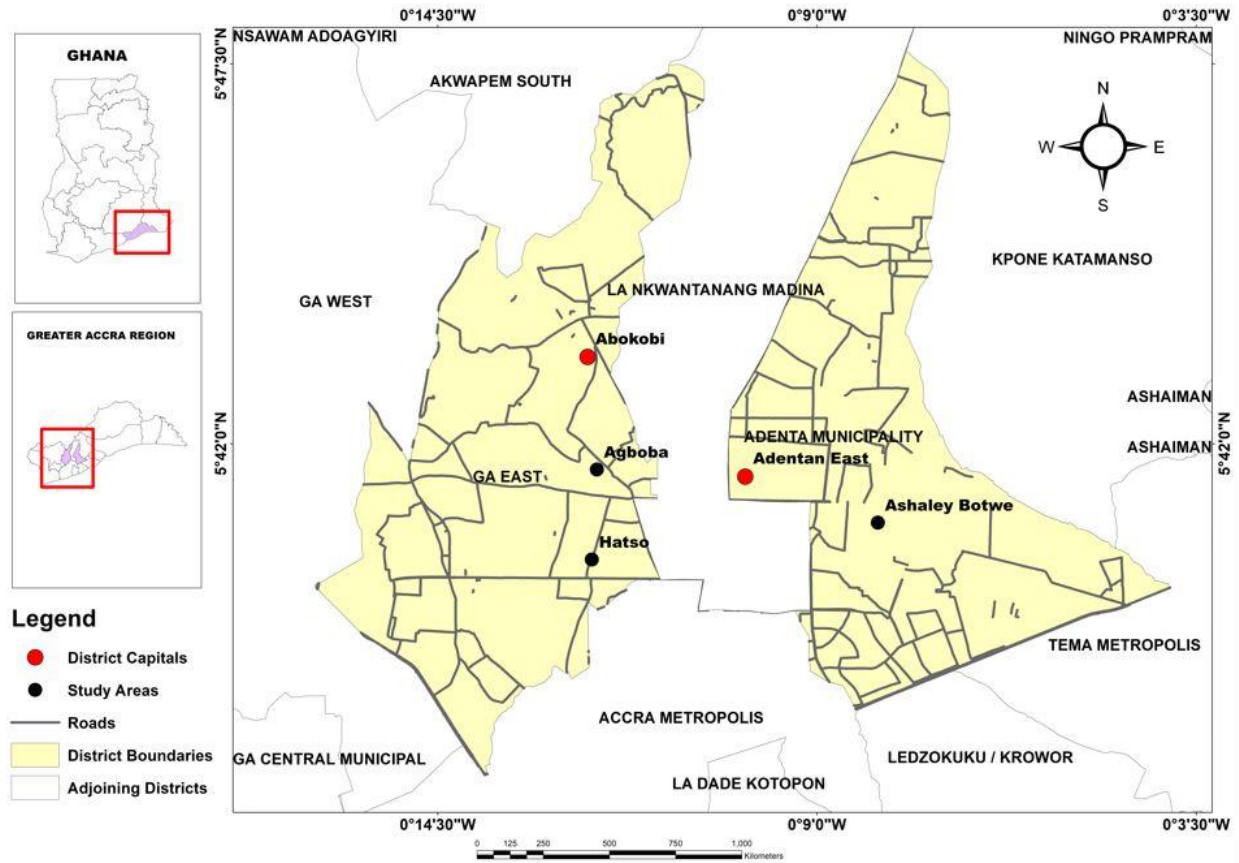


Figure 1: A map of the study areas. Source: (Frimpong et al. 2022)

The explanatory-sequential mixed methods design was used in the data collection and analysis. The use of this design provided the opportunity for complementing the quantitative results with the qualitative data to provide further meaning and clarification³¹. With regards to the collection and analysis of the quantitative data, the 2010 PHC data on households for the three communities were used in calculating the sample sizes using Slovin's formula at a confidence level of 97% and an associated margin of error of 3%³², at the end of the calculation, a total sample size of 999 was proportionally distributed to the three communities as 471, 325 and 203 for Ashaley Botwe, Agbogba, and Hatso respectively.

The sampling procedure was in two phases. The first stage involved the listing of houses in the three suburban communities to generate a sampling frame from which the respondents would be selected, while the second stage involved a simple random sampling of household heads from each house for the survey. Anonymity and confidentiality were assured, the consent of the respondents was sort, and hence

³¹ Creswell and Creswell 2018

³² Adam 2020

those who expressed disinterest in taking part in the survey were excluded. In each house, a household head was selected or in his or her absence a representative for the survey. The survey data collection was done within two months in 2021 after a pretest of the questionnaire, which allowed the opportunity to clarify some of the survey questions. The data was then analysed using the SPSS software and presented using descriptive statistics.

The gathering and analysis of the qualitative data followed suit and this was done within a month in 2022. The data was gathered using an interview guide from 15 respondents i.e. 5 residents from each of the study communities. The qualitative interviews ended after data saturation was reached. It was then analysed using thematic content analysis- where similar and contrasting responses were grouped and presented in quotations to support the quantitative data.

Results and Discussion

Perspectives on the role of DPAS in building sustainable and inclusive Accra

This section of the result presents the perspectives of residents on the role of the DPAS towards an inclusive and sustainable city where residents' aspirations are considered in the spatial planning of urban services delivery. The results show that the design and implementation of the DPAS did not factor in the views of residents. This has resulted in challenges such as street names that have no socio-cultural relationships with the people. For instance, one of the respondents mentioned that;

"I never heard the government involving anyone in this community, all that I saw was some plates have been pasted on my house and other houses in the community" (Resident, Ashaley Botwe).

On the question of if the digital address in the long term could provide opportunities for residents as part of the urban system, where they would conveniently be provided efficient services. One of the respondents mentioned that;

"It can be possible, for instance, if you are going to get documents like a passport and birth certificate, they will take it to know where you stay, so that they can get back to you if there is anything" (Resident, Hasto),

Confirming, the challenges that have evolved as a result of the introduction of unfamiliar street names, which have provided a disconnection between residents and their socio-cultural environment. One of the respondents mentioned;

“No one involved us, there should have been consultation to know the street names that the residents are aware of, not the foreign names that we have and cannot even mention them” (Resident, Hatso).

Findings from the results show that residents appreciate the potential of the DPAS initiative to provide an inclusive and sustainable urban service delivery. However, they mention that the lack of their input in the design and implementation phases will lead to a situation where they will not show interest in its use. This finding has been corroborated by previous studies^{33 34}, confirming that the lack of active engagement of citizens in the design and implementation of digital technologies in Africa would lead to its failure in the long term.

Residents’ utilisation of the DPAS

Table 1 presents results on respondents' use of the digital property address in their communities, or activities that necessitate its use. The results show that close to half of the respondents do not have digital property addresses. This finding indicates that a large proportion of respondents are yet to even experience the benefits of the DPAS given that obtaining a digital address is the starting point for any transaction or service that requires the use of the digital property address. Further, this finding also shows that even though respondents may have some ideas about the digital property address, the conditions or systems that must be put in place to necessitate its use may not be present now. The result further shows that about 53% of the respondents do not have the digital property address pasted on their walls or in front of their houses. The pasting of the digital address on the wall of buildings is an important component of the DPAS since it enables the location and easy identification of properties for which service can be delivered by government and private service providers. Further, while more than half of the respondents have less engagement with the digital addresses of their workplaces, less than half of them use it for locational purposes. Providing credence to these findings respondents revealed in the qualitative interview that:

“I prefer using the old address, which is easy to remember where ever you go. This one (digital address) I don’t even understand it and must always write it on paper when I need it” (Resident, Ashaley Botwe).

³³ Andorful 2021

³⁴ Heeks 2003

Table 1: Descriptive statistics of actual use

Variables		Frequency	Percentage
Does your building property have digital address?	Yes	502	50.3
	No	497	49.7
Do you have the plate of the address pasted on your wall (in front of your house)?	Yes	468	46.8
	No	531	53.2
Do you have digital address for your workplace?	Yes	321	32.1
	No	678	67.9
Have you benefited from a digital address from your workplace?	Yes	255	25.5
	No	744	74.5
When locating a place do you make use of the digital address?	Yes	379	37.9
	No	620	62.1

Source: Field Data, 2021

The results shows that most of the residents are yet to significantly appreciate the benefits of DPAS in their socioeconomic lives. This depicts a situation where the majority of them have not benefitted from the implementation of the DPAS and see it as alien to their culture. This finding gives credence to the design-reality gap between objective design rationalities and subjective implementation realities of the people who are intended to use it³⁵, and gives credence to the criticisms levelled against the design and implementation of the address system³⁶.

Factors that hinder utilisation of DPAS

The challenges associated with the use of the DPAS were also analysed using descriptive statistics. Table 2 shows the results of the individual challenges faced by respondents. The mean values shows that most of the respondents agreed to the various statements on the challenges with the use of the DPAS. In other words, respondents agreed to the statements that 'it was complex using the DPAS', 'they were not used

³⁵ Heeks 2002

³⁶ Simons 2016

for government transactions, and ‘it was cumbersome downloading the application. The qualitative data revealed that;

“Sometimes when you are downloading the software it takes time to download unto your phone. Also, the app uses internet and not everyone has a good internet connection to use the app, and that is a very big challenge for us” (Resident, Agbogba).

Table 2: Descriptive statistics of challenges

Variables	Mean (\bar{x})	SD (σ)
Uncomfortable using because of its complexity	2.17	1.131
Insufficient data to use the application	2.19	1.058
Not required for government and private transaction	2.79	1.101
Difficult to generate address and costly to operate	1.76	1.086
Cumbersome downloading the application	1.92	1.042
Agencies do not use the application and prefer I come over physically	1.30	1.125
Inadequate education on the use of the DPAS	3.69	0.733
I was charged a fee before the address plate was pasted on my house	2.33	1.112
I don’t know and understand the letters and numbers on the address	2.05	1.363

Source: Field Data, 2021

The findings of the study bring to fore the operational challenges that has bedeviled the DPAS. For example, insufficient data and handling complexities in downloading the app impede resident’s utilisation of the DPAS. These findings give credence to that of other related studies where high cost of internet data, software complexities, insufficient broad band and accessories limit the operationalization of digital initiatives in public management and urban service delivery³⁷.

Conclusion and policy implications

The main aim of this paper sought to highlight the role of the DPAS in building inclusive and sustainable digitalisation of urban service delivery. The study revealed that at its core, challenges such as lack of use by government agencies, poor data connectivity, lack of digital infrastructure, and active citizenship engagements in the design and implementation phases impede the utilisation of the DPAS among residents. Given the foregoing, this paper recommends that city authorities streamline digital initiatives

³⁷ Abebrese 2019

to the socio-cultural context of the urban population and deepen citizen-engagement platforms as this is critical in ensuring an inclusive digital system that allows all socio-economic groups to benefit from the opportunities that digitalisation presents. Further, the paper recommends bridging the digital literacy divide and deepening communication between city authorities and residents. Other ways of addressing the low utilisation of the DPAS include engaging local government authorities, bridging the gap between science and industry and ensuring inclusivity in the rollout of government policies and initiatives.

References

- Abebrese, Kwasi. 2019. "Implementing Street Addressing System in an Evolving Urban Center. A Case Study of the Kumasi Metropolitan Area in Ghana." *Graduate Theses and Dissertations*. Iowa State University. <https://lib.dr.iastate.edu/etd/16949>.
- Aboagye, Dacosta, Samuel Adu-Prah, and Christabel E. Ansah. 2018. "Assessing Social Vulnerability to Fire Hazards at the Kumasi Central Market, Ghana." *International Journal of Applied Geospatial Research (IJAGR)* 9 (4): 57–73. <https://doi.org/10.4018/IJAGR.2018100104>.
- Adam, Anokye M. 2020. "Sample Size Determination in Survey Research." *Journal of Scientific Research and Reports*, no. June: 90–97. <https://doi.org/10.9734/jsrr/2020/v26i530263>.
- Agbozo, G. Edzordzi. 2021. "Spatial Technologies, (Geo) Epistemology, & the Global South: Addressing the Discursive Materiality of GhanaPostGPS through Technical Communication." <https://doi.org/https://doi.org/10.37099/mtu.dc.etr/1172>.
- Andorful, Francis. 2021. "No Title." May I Have Your Attention Please; The Ghana Post GPS Data Is Outdated. 2021. <https://blog.wheregeospatial.com/2021/07/05/may-i-have-your-attention-please-the-ghana-post-gps-data-is-outdated/>.
- Ayakwah, Anthony, Isaac S. Damoah, and Ellis LC Osabutey. 2021 "Digitalization in Africa: The Case of Public Programs in Ghana." In *Business in Africa in the Era of Digital Technology*, pp. 7-25. Springer, Cham, https://doi.org/10.1007/978-3-030-70538-1_2
- Baud, Isa, Dianne Scott, Karin Pfeffer, John Sydenstricker-Neto, and Eric Denis. 2014. "Digital and Spatial Knowledge Management in Urban Governance: Emerging Issues in India, Brazil, South Africa, and Peru." *Habitat International* 44 (October): 501–9. <https://doi.org/10.1016/j.habitatint.2014.09.009>.
- Beard, Victoria. A., Anjali Mahendra, and Michael. I. Westphal. 2016. "Towards a More Equal City: Framing

- the Challenges and Opportunities.” *Growth*. Vol. 2015.
- Bouzarovski, Stefan. 2014. “Energy Poverty in the European Union: Landscapes of Vulnerability.” *Wiley Interdisciplinary Reviews: Energy and Environment* 3 (3): 276–89.
- Creswell, W. John, and J. David Creswell. 2018. *Research Design: Qualitative, Quantitative Adn Mixed Methods Approaches*. *Journal of Chemical Information and Modeling*. Vol. 53.
- Dano, Umar Lawal, Abdul-Lateef Balogun, Ismaila Rimi Abubakar, and Yusuf Adedoyin Aina. 2020. “Transformative Urban Governance: Confronting Urbanization Challenges with Geospatial Technologies in Lagos, Nigeria.” *GeoJournal* 85 (4): 1039–56.
- Demuyakor, John. 2021. “Ghana’s Digitization Initiatives: A Survey of Citizens Perceptions on The Benefits and Challenges To The Utilization Of Digital Governance Services.” *International Journal of Publication and Social Studies* 6 (1): 42–55. <https://doi.org/https://doi.org/10.18488/journal.135.2021.61.42.55>.
- Frimpong, Louis Kusi, Stephen Leonard Mensah, Seth Asare Okyere, Matthew Abunyewah, Stephen Kofi Diko, Seth Barnie Enning, and Joshua Mawutor Attigah. 2022 "Digitalisation for whom: the determinants of residents' use of the digital property address system in Accra, Ghana." *Smart and Sustainable Built Environment* ahead-of-print. <https://doi.org/10.1108/SASBE-06-2022-0121>
- Gabrys, Jennifer. 2016. *Program Earth: Environmental Sensing Technology and the Making of a Computational Planet*. Vol. 49. U of Minnesota Press.
- Ghana Statistical Service. 2021. “Ghana Population and Housing Census. General Report Volume 3A: Population of Regions and Districts.” Accra: Ghana Statistical Service. 2021. https://statsghana.gov.gh/gssmain/fileUpload/pressrelease/2021_PHC_General_Report_Vol_3A_Population_of_Regions_and_Districts_181121.pdf.
- Heeks, Richard. 2002. “E-Government in Africa: Promise and Practice.” *Information Polity* 7 (2–3): 97–114. <https://doi.org/10.3233/IP-2002-0008>.
- Heeks, Richard. 2003. “Most EGovernment-for-Development Projects Fail: How Can Risks Be Reduced?” *IGovernment Working Paper No. 14, Available at SSRN*: <https://ssrn.com/abstract=3540052> or <http://dx.doi.org/10.2139/ssrn.3540052>.
- Kitchin, Rob. 2016. “Reframing, Reimagining and Remaking Smart Cities.” In *Creating Smart Cities*, edited

- by R. Kitchin in: C. Coletta, L. Evans, L. Heaphy, 219–30. Routledge, London, 2016, pp. 219–230: Routledge.
- Maseko, Njabulo. 2018. *The Use of Alternative Service Delivery Mechanisms within the City of Johannesburg Metropolitan Municipality*. University of Johannesburg (South Africa).
- McLaren, Duncan, and Julian Agyeman. 2015. *Sharing Cities: A Case for Truly Smart and Sustainable Cities*. MIT press.
- Ndemo, Bitange. 2020. “Slum Digitisation, Its Opponents and Allies in Developing Smart Cities: The Case of Kibera, Nairobi.” In *Open Cities/ Open Data*, 129–48. Springer.
- Oteng, Samuel A, Esmeranda Manful, and Kofi Osei Akuoko. 2021. “Retiring in the Informal Economy: Implications for Social Policy Intervention for Ageing Workers in Ghana.” *Ageing International*, 1–18.
- Sareen, Siddharth. 2021. “Digitalisation and Social Inclusion in Multi-Scalar Smart Energy Transitions.” *Energy Research & Social Science* 81: 102251.
- Scholz, Roland W, Eric J Bartelsman, Sarah Diefenbach, Lude Franke, Arnim Grunwald, Dirk Helbing, Richard Hill, Lorenz Hilty, Mattias Höjer, and Stefan Klauser. 2018. “Unintended Side Effects of the Digital Transition: European Scientists’ Messages from a Proposition-Based Expert Round Table.” *Sustainability* 10 (6): 2001.
- Silver, Hilary. 2015. “The Contexts of Social Inclusion.” *Available at SSRN 2641272*.
- Simons, Bright. 2021. “Bright Simons: My Little Beef with Bawumia’s Digitisation Agenda.” 2021. <https://www.myjoyonline.com/bright-simons-my-little-beef-with-bawumias-digitisation-agenda/>.