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Connecting the Dots: Understanding Professional Development Needs of Istanbul's Makers for Circular Economy

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Abstract

With the dissemination and increased accessibility of makerspaces (e.g. fab labs, creative hubs, learning platforms), cities now present an opportunity for loosely managed, distributed fabrication opportunities to recapture embedded value in products and resources and re-distribute them for the benefit of the city. Istanbul Metropolitan City, with its rather large population and land, as well as 24 active makerspaces focusing on different industries and fabrication opportunities (e.g. education, entrepreneurship, sustainability), presents potential for initiating a robust network of makers (e.g. designers, engineers, craftsmen, investors, students, entrepreneurs) to explore and exploit novel ways of value recapture and to transition towards a local, Circular Economy. However, these stakeholders initially require an understanding of potential opportunities and barriers for collaboration, as well as equip themselves with skills and knowledge beyond the act of making (including alternative ways to conduct business, value recapture, Circular Design, collaboration, etc.) in order to sustain their operations from an economic perspective. This paper presents the initial results of (1) a survey revealing Istanbul's maker communities' goals, priorities, target groups, and skills related to the Circular Economy, and (2) their collaborative attempt of a future, circular economy vision for Istanbul developed as part of a generative workshop. The maker community representatives explored existing infrastructure, resources and stakeholders of Istanbul to connect the dots amongst them and reveal untapped, concealed local opportunities for collaboration and co-creation. This paper presents the analysis of these studies to reveal the professional development needs of these maker communities for transitioning towards a local, circular economy. As a result, the authors propose strategies for training, capacity building and skills development both relevant to the local context of Istanbul and in line with the global concerns around sustainability and the Circular Economy.

1 Introduction

Makerspaces, fab labs, hackerspaces and other variations of citizen fabrication spaces espousing creative communities have gained popularity and become increasingly commonplace over the last 20 years. For example, there were 150 fab labs around the world back in 2012 (Maldini et al. 2013), and at the time of writing this article there are over 1,800 fab labs registered on fablabs.io ("Labs | FabLabs" n.d.). It should also be noted that fab labs are only one variation of many spaces that accommodate makers, which are

either standalone spaces or communities, while others are part of different networks (e.g. Living Labs, Maker Faire, Coderdojo, Men's Sheds, etc).

Localization of production and consumption has long been discussed as an alternative to minimize the negative impacts of centralized mass-production, to enable local post-use opportunities and to empower local economy (Walker 2011; Dogan and Walker 2008). The advancements in digital desktop fabrication technologies (e.g. 3D printers, laser cutters) in terms of precision and reliability and their increased accessibility through digital fabrication labs or makerspaces make the localization of production and even individual fabrication possible. Coupled with global sharing of (ideally open) knowledge among makers, these technological means can espouse local, interconnected circular economies envisioned in Fab City initiative, in which the only travelling commodity is knowledge (Diez 2011). Makerspaces can enable frugal innovation in the Global South (e.g. Seo-Zindy and Heeks 2017; Redlich et al. 2016), or makers can address societal challenges and empower locals in emerging economies through the development of open-source appropriate technologies (e.g. Kostakis and Papachristou 2014; Zelenika and Pearce 2014; Buitenhuis and Pearce 2012; Pearce 2012) and the ability to create 'high-low tech' solutions (Kadish and Dulic 2015).

Beyond the global societal implications envisioned through the increased accessibility to fabrication means, knowledge and expertise, a network of local maker communities in cities presents the potential for grassroots initiatives addressing the societal and environmental challenges in their immediate environment. Open sharing of knowledge can empower these communities to undertake post-use processes such as repair and upgrading (Bonvoisin 2017), upcycling of materials (Richardson, Vittouris, and Rose 2010) and localisation of production (e.g. Kadish and Dulic 2015; Malinen et al. 2011). Such communities can utilize co-design methods to generate locally meaningful and sustainable outcomes (Ostuzzi et al. 2017) and empower vulnerable minorities such as people with disabilities (Hamidi et al. 2014). Sharing post-use related knowledge (i.e. repair, reuse and upgrading) is crucial for enabling people to undertake these activities, yet this aspect is generally overlooked (Holroyd 2017). Additionally, empirical studies indicate that the practices in makerspaces are not inherently sustainable and can easily become part of existing modes of production and consumption (Kohtala 2017; Fleischmann, Hielscher, and Merritt 2016).

Considering the vast potential of maker communities and other stakeholders in this ecosystem that (can) support these communities, there is unrealized potential for local circular economies in cities by and for citizens. Yet such communities need to be equipped with necessary tools and resources to enact this potential. For example, knowledge exchange among these communities is limited, as studies indicate the challenges makers face in actually documenting and sharing their work (Bakırlıoğlu and Kohtala 2019). There is also the challenge of sustaining these community initiatives beyond the economic challenges they face, especially when the communities are loose collectives oriented by social movement ideals – e.g. in our case, cosmopolitan localism for the Circular Economy. Hence, the challenge is encouraging existing maker communities to adopt sustainable and circular practices, in addition to promoting their own sustainability.

As part of the Pop-Machina H2020 project, our authors define 'makers' broadly as grassroots communities consisting of a variety of stakeholders collaborating on designing, fabricating, sharing knowledge, etc., for tackling local social and environmental issues and/or for collaboration for innovation and technology development. These stakeholders may be makers actively undertaking the 'making', citizens participating in the 'making' at varying levels from idea generation to assessment and fabrication, local and regional

governments supporting these grassroots collaborations and providing the infrastructure for them, NGOs and other organizations providing the capital necessary for these activities, and organizations focusing on the generation and dissemination of knowledge. Our authors are in the position of the latter as a group of researchers exploring the opportunities presented by such grassroots communities on establishing a local, generative, circular economy in Istanbul, Turkey. While the general purpose of the Pop-Machina project is to enhance, support and monitor Circular Maker Communities in 7 partner cities, in this paper we focus on Istanbul and aim to demonstrate the landscape of the local maker culture and understand their visions for a city-scale circular economy to identify potential areas for intervention in terms of professional development. Following this line of thought, the next section presents the methodology utilized to understand the professional development needs of Istanbul makers. It should be noted that the below set of methods were utilized to reveal an expanded set of data more than the professional development needs, however, the first analysis was about these needs to inform the following stages of the project.

2 Methodology

The sampling process started with desk research about the maker initiatives currently being developed in Istanbul and resulted in an initial list of 80 initiatives. After applying the inclusion/exclusion criteria (e.g. being part of the supply chain of making, enhancing community involvement, tackling environmental or social issues) developed by the Pop-Machina team, a final list of 23 maker initiatives was reached, and the members of these initiatives were invited to participate in the following activities.

The survey was developed in collaboration with other partners of the Pop-Machina project and aimed to examine the visions, skills, collaborations and structures of maker movement stakeholders and maker initiatives. The survey was shared with the 23 maker initiatives identified in the first stage by email, was answered by 18 of them, and collected information regarding geographic/spatial repartition, network, interactions, stakeholder visions, strengths, weaknesses, opportunities and barriers of cities. This information was analysed to reveal recurrent patterns especially around characteristics of Istanbul in terms of stakeholders' needs, skills and development opportunities regarding making.

The generative workshop aimed to introduce the Pop-Machina project to the maker community representatives and other related stakeholders (29 people from 25 initiatives and organizations) in the Istanbul maker ecosystem and to answer these main questions: what are the needs, resources, and goals of Istanbul for pursuing the four visions of the project [i.e. social cohesion (enhancing social connection between and within communities), circular and distributed production, sustainability (improving environmental quality and minimizing the depletion of resources), and urban regeneration (improving wellbeing and value of neighbourhoods and cities)], how should the project address these needs, resources, and goals, who are the people and organizations in Istanbul that need to be involved and become partners in the Pop-Machina project. As a result of this activity, the purpose was to have a better understanding of the current state in Istanbul in terms of needs, resources, goals, challenges and opportunities for interventions in relation to the integration of circular economy thinking into making activities. Stakeholders from environmental and sustainability organizations of the maker ecosystem were invited to include potential partners interested in promoting the circular economy through the maker movement.

The workshop consisted of three stages. The first stage was an envisioning activity around a 'city timeline' to gather information about the past, present and future of the city, which was then used to identify the

needs and resources of Istanbul's ecosystem. The second was a mapping activity to match identified needs and resources with the Pop-Machina values, outputs, and actions, as well as to identify new stakeholders that should be considered in the project. The third one was a geographical mapping activity about the needs, resources, and stakeholders related to the values of Pop-Machina in Istanbul.

For the purposes of understanding the professional development needs, the data from the survey and the workshop was analysed accordingly. The landscape of Istanbul maker culture was analysed in terms of the types and activities of existing stakeholders, and their visions for a local circular economy was analysed to unravel their priorities. The workshop revealed more information about vision categories, especially stakeholders' understanding of them as well as the gaps within. The needs, values and expectations of the stakeholders as reflected in the workshop also revealed what they consider they need in terms of professional development, while on the other hand gave our authors the opportunity to compare those with the larger distributed, regenerative circular economy vision of the Pop-Machina project. The following section outlines only the results directly related to the professional development needs of the makers and other related stakeholders in Istanbul.

3 Results

3.1 Maker Culture in Istanbul

The maker initiatives in Istanbul have varying foci in terms of the practices they undertake. There are initiatives that function as incubation hubs (e.g. Arcelik Garage, Acibadem Biodesign Centre, KWORKS), local and central government initiatives aiming to empower citizens on fabrication technologies (e.g. Basaksehir Living Lab, IMM Zemin Istanbul), and private digital fabrication labs (e.g. Makers Turkey, Maker Cocuk). Some initiatives focus on specific societal challenges, such as RobotEl focusing on robotic prosthetic hands for children with Amniotic Band Syndrome. One of the outcomes of the survey was to identify the types of these initiatives (e.g. knowledge, capital, administration) and to learn more about the kind of activities they are engaged in. Figure 1 presents an overview of the stakeholder types and activities.

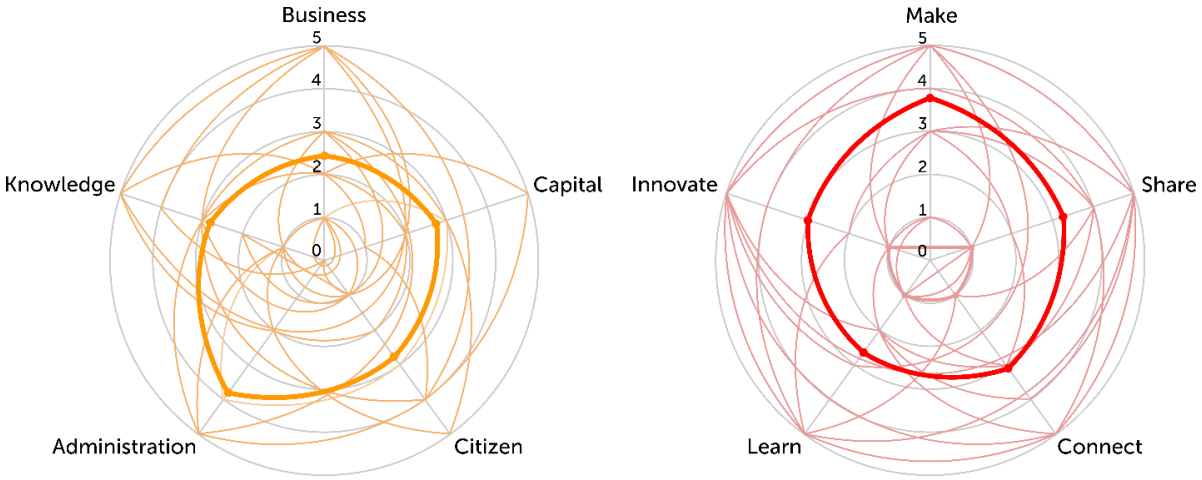


Figure 1: Types of stakeholders in Istanbul maker culture (left) and their types of actions (right) as revealed in stakeholder surveys

The left side of Figure 1 presents an overall breakdown of stakeholder types in Istanbul maker landscape. It should be noted that only three of the maker initiatives identified themselves as only one type of stakeholder, and most of them ranked their various roles as stakeholders. Each light-coloured line represents a stakeholder and how they identify themselves, while the thicker, darker line indicates the general distribution in Istanbul. It is visible that the 'administration' type of stakeholders are more common-place compared to others, which the authors attributed to the increasing number of initiatives set up by the various departments of the local and central government. Then again, while there are three initiatives that primarily self-identify as businesses, others do not specifically focus on the business implications of their initiatives.

The right side of Figure 1 identifies the activities these maker initiatives undertake in Istanbul. There is an even distribution among types of actions, 'making' not surprisingly being the prominent type of action. Sharing the outcomes and connecting with other potential stakeholders are deemed as secondary, however, it remains to be seen if this is actually the case. Finally, probably the most interesting outcome of this survey is the fact that the average of 'learning' activity is at the end of the list. As mentioned before, making typically involves collaboration and knowledge exchange, yet for Istanbul makers, it is somehow the least deployed activity. The reasons for this will be questioned in the following stages of this study.

3.2 Perspectives on city-scale Circular Economy

Pop-Machina concerns itself with the development of an urban vision through grassroots development and involvement, and this focus requires a collaborative attempt at forming the needs of citizens as well as their aspirations for their city. For the Istanbul case, Figure 2 presents the visions the maker initiatives are concerned about, as revealed by the survey. As can be seen, the urban development, or the regeneration of the city, is a priority for Istanbul makers, and production and sustainability are secondary. What is interesting to observe is that, although there are maker initiatives highly concerned with social cohesion, it is still the last item on the list on average. This is an interesting outcome considering the societal challenges in urban areas, as well as the challenges more prominent in Turkey, such as refugees (e.g. International Crisis Group 2018) and poverty (e.g. Soytemel 2013).

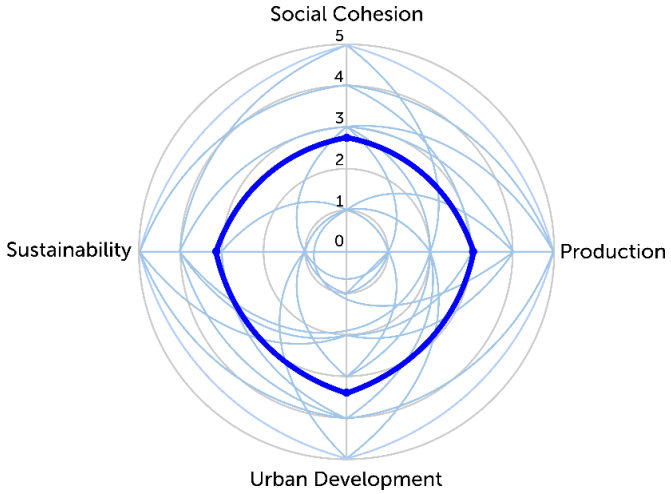


Figure 2: The visions of stakeholders in Istanbul maker culture as revealed in stakeholder surveys

During the workshop, Istanbul makers have detailed their visions and the routes they and other involved stakeholders should take to reach there. They have identified that existing maker communities lack

communication amongst them, which hinders the potential for collaboration. While they envision localized and decentralized production as empowering for these initiatives on the city and neighbourhood scale, the lack of communication and collaboration – which may be interpreted as coordination – is a challenge that needs to be overcome. This lack also presents itself as inaccessibility to relevant experts.

For all the vision categories, the awareness of the general public and policymakers came to forth as a challenge and a goal. For the sustainability category, it refers to raising awareness of carbon emissions, waste management and demand-driven fabrication. To enable local and demand-driven production, forging a culture of collaborative production came to forth as a priority. In addition, the availability and accessibility of venues where makers can sell and/or barter with their fabrications are considered to be an effective driver.

3.3 Training needs revealed

The workshop participants all mentioned the need for raising awareness of novel technologies and fabrication techniques, as well as sustainability issues. In addition to the suggestions for the general public and policymakers, they also mentioned their own training needs which can be grouped as follows:

- *Legislative processes*, especially around setting up and sustaining makerspaces, incorporating businesses with appropriate forms of association enabling and encouraging collaborative production and social good, tax-related and incentive eligibility issues, profit sharing strategies encouraging collaboration and cooperation vs. traditional partnership, employment and subcontracting strategies, etc.
- *Culture of Collaboration*, especially on communication, sharing projects and initiating collaboration among maker initiatives and with other stakeholders according to varying expertise. This also includes engaging the local community and general public to create visibility of activities, projects and alike.
- *Technical Training*, mostly focused on training 'mid-level technical staff' for makerspaces, capable of operating, maintaining and troubleshooting digital fabrication tools such as 3D printers and laser cutters.

These training needs are very valid considering the city visions and pathways they have formed. However, the latter is somehow problematic, as it immediately creates a hierarchical relationship among the members of the makerspace and will require further inquiry. In addition to these, as the moderators of the workshops, the authors also observed additional areas of intervention:

- There seems to be a limited understanding of sustainability among the Istanbul makers – one that puts emphasis on recycling/upcycling and composting yet overlooks *other strategies of the Circular Economy*, e.g. repair, refurbishing, remanufacturing, cascading, biochemical extraction.
- There are other institutions, non-governmental and governmental organizations, and *non-maker stakeholders* directly affecting and affected by a potential, city-level circular economy; yet, these *non-makers* (e.g. building managers, local cafés, etc.) were not mentioned during the workshop.

4 Conclusions

This paper presents the initial results of a survey and a generative workshop conducted with maker initiatives and related stakeholders in Istanbul with the purpose of understanding the current maker culture in Istanbul and revealing the opportunities for a local, regenerative circular economy. While the outcomes of this research are extensive and detailed, here our authors present the initial results informing the next

stages of this study by focusing on the training needs and wants of maker initiatives, not only for establishing a grassroots circular economy but also for sustaining it in the long-term.

The results indicate that Istanbul makers envision the city in the future brimming with salvaged green areas, prospering through a grounded distributed production culture to recapture embedded value in perceived waste and to nourish the cultural acts of making, and achieving zero-emission goals. To this end, while awareness of environmental and social issues among these makers can be observed, a lack of critical and comprehensive understanding of the opportunities for such a circular economy can also be observed. As such, in the next stages of Pop-Machina, our authors aim to make these opportunities more visible through a set of activities and training sessions. An initial list of such activities is as follows:

1. *It's more than recycling!* – a set of masterclasses introducing the opportunities of maker initiatives in CE strategies other than recycling. These sessions will be more informative and illustrative, rather than practice-based, with many cases from around the world to showcase the potential of maker initiatives in adopting different CE strategies.
2. *Maker Symbiosis Workshop* – inspired by *industrial symbiosis* (e.g. Rosado and Kalmykova 2019), this is a set of activities where makers map the local maker ecosystem, including the non-maker stakeholders, to reveal the opportunities for value recapture amongst them and collaboration.
3. *Maker Journeys through Legislation* – experience-sharing sessions where makers explain how they handled legislative matters, categorized according to different types of activities they conducted/participated.

While this is an initial list emerging from the analysis of the survey and workshop outcomes, our authors are planning to conduct interviews with makers to reveal more information about the 'learning' needs of the Istanbul maker ecosystem. The end-goal is to prepare a set of activities which can be implemented not only in Istanbul but also in other cities according to their own needs, preferences and visions.

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References

Bakırlıoğlu, Yekta, and Cindy Kohtala. 2019. "Framing Open Design through Theoretical Concepts and Practical Applications: A Systematic Literature Review." *Human-Computer Interaction* 34 (5–6): 389–432

Bonvoisin, Jérémy. 2017. "Limits of Ecodesign: The Case for Open Source Product Development." *International Journal of Sustainable Engineering* 10 (4–5): 198–206.

Buitenhuis, A. J., and J. M. Pearce. 2012. "Open-Source Development of Solar Photovoltaic Technology." *Energy for Sustainable Development* 16 (3): 379–88. https://doi.org/10.1016/j.esd.2012.06.006.

Diez, Tomas. 2011. "Fab City Whitepaper: Locally Productive, Globally Connected Self-Sufficient Cities." https://fab.city/uploads/whitepaper.pdf.

Dogan, Cagla, and Stuart Walker. 2008. "Localisation and the Design and Production of Sustainable Products." *International Journal of Product Development* 6 (3–4): 276–90.

Fleischmann, Katja, Sabine Hielscher, and Timothy Merritt. 2016. "Making Things in Fab Labs: A Case Study on Sustainability and Co-Creation." *Digital Creativity* 27 (2): 113–31.

Hamidi, Foad, Melanie Baljko, Toni Kunic, and Ray Feraday. 2014. "Do-It-Yourself (DIY) Assistive Technology: A Communication Board Case Study." In *Computers Helping People with Special Needs*, 287–94. Springer.

Holroyd, Amy Twigger. 2017. "From Stitch to Society: A Multi-Level and Participatory Approach to Design Research." *Design Issues* 33 (3): 11–24. https://doi.org/10.1162/DESI_a_00448.

International Crisis Group. 2018. "Turkeys Syrian Refugees: Defusing Metropolitan Tensions." Europe Report 248. https://www.crisisgroup.org/europe-central-asia/western-europemediterranean/turkey/248-turkeys-syrian-refugees-defusing-metropolitan-tensions.

Kadish, David, and Aleksandra Dulic. 2015. "Crafting Sustainability: Approaching Wicked Environmental Problems through High–Low Tech Practice." *Digital Creativity* 26 (1): 65–81.

Kohtala, Cindy. 2017. "Making 'Making' Critical: How Sustainability Is Constituted in Fab Lab Ideology." *The Design Journal* 20 (3): 375–94. https://doi.org/10.1080/14606925.2016.1261504.

Kostakis, Vasilis, and Marios Papachristou. 2014. "Commons-Based Peer Production and Digital Fabrication: The Case of a RepRap-Based, Lego-Built 3D Printing-Milling Machine." *Telematics and Informatics* 31 (3): 434–43. https://doi.org/10.1016/j.tele.2013.09.006.

"Labs | FabLabs." n.d. Accessed February 10, 2020. https://www.fablabs.io/labs.

Maldini, Irene, Bas Van Abel, Alex Schaub, Frank Kresin, and Javier Gimeno-Martinez. 2013. "The FabLab Amsterdam Users : A Survey on Their Profile and Activity .," no. February: 1–16. https://waag.org/sites/waag/files/Publicaties/fablabusersreport.pdf.

Malinen, Tiina, Teemu Mikkonen, Vesa Tienvieri, and Tere Vadén. 2011. "Community Created Open Source Hardware: A Case Study of" ECars-Now!"." *First Monday* 16 (5).

Ostuzzi, Francesca, Lieven De Couvreur, Jan Detand, and Jelle Saldien. 2017. "From Design for One to Open-Ended Design. Experiments on Understanding How to Open-up Contextual Design Solutions." *The Design Journal* 20 (sup1): S3873–83. https://doi.org/10.1080/14606925.2017.1352890.

Pearce, Joshua M. 2012. "The Case for Open Source Appropriate Technology." *Environment, Development and Sustainability* 14 (3): 425–31.

Redlich, Tobias, Sonja Buxbaum-Conradi, Sissy-Ve Basmer-Birkenfeld, Manuel Moritz, Pascal Krenz, Babsile Daniel Osunyomi, Jens P Wulfsberg, and Susanne Heubischl. 2016. "OpenLabs--Open Source Microfactories Enhancing the FabLab Idea." In *System Sciences (HICSS), 2016 49th Hawaii International Conference On*, 707–15. IEEE.

Richardson, Mark, Alex Vittouris, and Geoff Rose. 2010. "Socialised Transport: Increasing Travel Mode Diversity through Open-Source Vehicle Design, Upcycling, Natural Production and Distributed Production Methods." In *Australasian Transport Research Forum*.

Rosado, Leonardo, and Yuliya Kalmykova. 2019. "Combining Industrial Symbiosis with Sustainable Supply Chain Management for the Development of Urban Communities." *IEEE Engineering Management Review* 47 (2): 103–14.

Seo-Zindy, Ryoung, and Richard Heeks. 2017. "Researching the Emergence of 3D Printing, Makerspaces, Hackerspaces and Fablabs in the Global South: A Scoping Review and Research Agenda on Digital Innovation and Fabrication Networks." *The Electronic Journal of Information Systems in Developing Countries* 80 (1): 1–24.

Soytemel, Ebru. 2013. "The Power of the Powerless: Neighbourhood Based Self-Help Networks of the Poor in Istanbul." Women's Studies International Forum 41 (P1): 76–87.

Walker, Stuart. 2011. *The Spirit of Design: Objects, Environment, and Meaning*. London: Earthscan.

Zelenika, I., and J. M. Pearce. 2014. "Innovation through Collaboration: Scaling up Solutions for Sustainable Development." *Environment, Development and Sustainability* 16 (6): 1299–1316.