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Compressed Environmentalism: Greening Chengdu through Digital Platforms and Smart Housing Estates

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Abstract

While both digitalisation and environmentalism have become important topics for understanding China today, the intersection of these two issues is rarely discussed. With the coming era of Big Data, future development projects will no longer go through an Environmental Impact Assessment conducted by an official in person, but rather development plans will simply be submitted to a digital platform for approval. Additionally, Chengdu is now actively promoting Smart Housing Estates, which include geothermal heating, onsite water recycling facilities and digitalised metering of utilities directly connected to online bank accounts. Drawing upon fieldwork from Chengdu, this article critically examines what these changes mean for an "environmentally-friendly lifestyle". The dialectal relationship between the physical and digital relationships in these examples does not make them any more or less real, just qualitatively different. This difference is created not just through the compression of time-space, as found in many studies of digital technology, but also the compression of the labour it takes to be "environmentally-friendly". The article also examines the way that digitalisation has resulted in changes to social relations among my informants in Chengdu.

Keywords: time-space compression, labour, digitalisation, Sichuan, environmental impact assessment, smart cities

Digital technology plays an increasing role in the way we practice environmental behaviour or communicate information about the environment. For instance, digitalisation is claimed to support the realisation of the Sustainable Development Goals, but with variability from one country to the next due to contextualising factors (ElMassah and Mohieldin, 2020). While scholars have explored digitalisation in China through the desired sociality of migrant workers on social media (Wang, 2020) or the use of digital money to produce working-class subjectivities (McDonald, 2020), there has been little attention paid to the way digital technologies influence environmental actions. This is important to consider because Environmental Protection Agencies in China are looking to digital platforms of environmental information to strengthen environmental governance. From a different perspective, the city of Chengdu is also now actively promoting the development of "smart" housing estates, which have integrated technologies into their design that purportedly allow residents to live sustainable lifestyles more conveniently.

In this paper, I critically examine a similarity between these two examples of digital platforms and smart cities; namely that the technologies discussed compress the labour, as in the work or effort required for completion of an arduous task (Williams 1983: 177), needed for

people in China to engage in environmental action. Here I am thinking of the digital sense of compression, where the quality is forsaken in order to reduce the quantity of storage space taken up by a video or picture, for example. The two case studies discussed here also have their own set of implications. For instance, what will oversight of environmental governance look like if there are no human individuals doing the overseeing? Additionally, in what way does a lifestyle regulated by algorithms that are beyond our control constitute a "green lifestyle"? I will return to these questions in the conclusion by thinking about how the compression of labour is similar to the discussion of the postmodern condition of time-space compression (Harvey, 1989). Previous scholars have recognised this as digital technology's contribution to globalisation (Cairncross, 1998).

In China, it is possible that for some rural migrants, the creation of a digital self may allow them to feel more at home in the social relationships they have on social media than those they have in their villages or factories (Wang, 2020). Moreover, the different kinds of digital currencies available in China allow migrant workers to construct diverse forms of sociality that were perhaps less available to them through the use of paper money (McDonald 2020). We also know that the state security system in China has captured the everyday digital lives of ethnic minorities in Xinjiang province through excessive surveillance that can also generate profits for corporations selling digital tools and services (Byler, 2019). The current article will examine the way that digitalisation has become a part of our interactions with the non-human environment, which has also resulted in changes to social relations among my informants in Chengdu.

Digital Control, Labour and Social Relations

Digitalisation in China is often discussed primarily in the context of technological advancement and business innovation, particularly because of the rise of corporate stars like Ma Yun's Alibaba and Ma Huateng's Tencent. In this article, the digital world I am referring to is not just these computational technologies but also the cultural logic that has emerged along with the use of these technologies. Franklin argues that the cultural logic of digitalisation, namely increased control over social and biophysical processes, has become entangled within "a system of value production that can produce profit only by exploiting and dispossessing human life" (Franklin, 2015: xviii). This is an astute point from which to begin a critical analysis of the role digitalisation plays in urban development. However, it also suggests a paradox when digital technologies are used in, for instance, smart cities to promote sustainability - which at least on paper should aim to improve human well-being and reduce negative impacts to the environment (Kong and Woods, 2018). It is also useful to consider the role of platform urbanism (Rose et al., 2019), as big data is collected, analysed and translated into measures of control over an urban environment. While there may be ways to avoid these measures of control (Graham, 2020), it will be useful to examine such processes in other socio-cultural contexts, such as in mainland China, to determine the full range in which digitalisation affects human engagement with the environment. While increasing digitalisation may have a variety of implications for environmental consciousness (Lyons et al., 2018) it is important that we explore them critically.

Most analyses of environmental consciousness tend to focus on the way individuals perceive their environment or the discursive and ideological interpretations of the environment. When we do talk about environmental action, it is often discussed as behaviour rather than work. Only a handful of scholars have investigated the tasks of officials within environmental protection bureaus (Robertson, 2010; Ding, 2020) or the work that goes into making an

environmentally sustainable household (Peattie, 2010). Most of this literature is still concerned with norms, attitudes or the way people think, rather than the actual labour that goes into these activities. Some scholars have also explored the way digitalisation extends the exploitation of labour through the rearranging of socio-spatial relationships between producers and consumers (Graham and Anwar, 2018). Others have identified some unreflective literature describing how digital technologies will make the work of being environmentally friendly easier and effective (Kitchin, 2014; Mercea, 2012, Strengers, 2011). This kind of literature can be found in descriptions of China, where advances in monitoring technologies will reduce the need for officials to spend time in the field collecting environmental data (Fang et al., 2014). Similarly, it is said that Chinese households will live in smart cities and housing estates that make it easier to reduce, reuse and recycle (Tan-Mullins et al., 2017). There is a need to critically explore the impact of these technologies upon environmental action and social relationships through more empirically grounded studies; this study makes a contribution to this aspect of the problem.

The rise of digital technologies has certainly created new social relationships, but it has also served simply to extend older social relations in new directions (e.g. Sassen, 2002). Labour is one of those processes that creates social relations that should continue to have our deserved attention as digitalisation continues. In this article, I use labour to analyse the impact of new technologies on environmental action, not just to talk about the work that is supposedly made easier, but also to examine the way such changes are shifting how we relate to each other socially. There is a long history within social science research on China studying the maintenance of social relations, or *guanxi* (Yang 1994; Smart 1993), as well as the connection between social relations and labour (Walder 1986, Harrell 1985). While studies of automation and big data in Chinese factories have noted that workers find being replaced by robots to be a "natural" part of technological progress (Sharif and Yu, 2019), it is not entirely clear what this means for the social relations between workers themselves. Many studies have critically examined the way Big Data, social media, and automation are changing the way relate to each other (Ekbia et al., 2015; Sassen, 2002; Ziewitz, 2016). This article is an initial attempt to examine what these changes mean for the work residents of Chengdu do to live more sustainable lives and the way we relate to each other through such work.

Methodology

Much of the data in my research dealing with environmental action was collected ethnographically between January 2014 and July 2015. At the time I was quite interested in how different social groups perceive and act towards their local urban environment. In order to better understand how people in Chengdu live with a variety of environmental issues on a day-to-day basis, I conducted unstructured interviews in Chinese with 40 urban residents. I lived in Chengdu in an academic capacity for more than seven years and many of my initial informants were long-term friends who in turn introduced me to others. This included Qi Daina, who works for an institution that specialises in environmental impact assessments as detailed below. My conversation with her led me to explore the digitalisation of environmental impact assessment and what that meant for environmental governance in Sichuan.

Between August 2014 and April 2015, I also collaborated with a group of undergraduate researchers to conduct a study of environmental consciousness in seven housing estates in Chengdu. Chengdu's environmental NGOs and local neighbourhood management offices were in the process of developing ecological housing estate projects to create more sustainable ways of living in these communities. They had asked us to take a survey of residents' environmental perceptions and actions where these projects had been developed, as well as in

some communities where these projects had yet to be implemented.[1] Below I mainly discuss our survey of Tiramisu, one of the housing estates in our study, which is a massive, luxury housing estate with more than 2000 households located along Chengdu's Funan River. It is unique not just to Chengdu, but across all of Southwest China in its claim to be the first smart housing estate in the region. For comparison, I also briefly mention what we learned in Eastern Star, a slightly older housing estate that had approximately 200 households. Beyond the survey data we collected, I also conducted separate interviews in Chinese with members of the Tiramisu housing estate resident committee and the staff working for the housing estate management company responsible for onsite administration, security and maintenance. Detailed fieldnotes were taken during these interviews. It is through these interviews that I learned about the "smart" aspects of the Tiramisu housing estate discussed below.

In the following sections, I will first discuss the use of digital platforms for managing environmental impact assessments (EIA) and the automated control of pollution from centres of industrial production. In this section I will focus on the way big data and automation are influencing the labour of environmental protection officials in Chengdu and the relationships they have with managers of industrial sites. I will then discuss the operation of the "smart" aspects of Tiramisu, such as the water recycling system and the housing estate smartphone app where residents can check their energy usage. Here I will explore the way these supposedly labour-saving technologies affect social relations in the housing estate while allowing for a more environmentally friendly lifestyle. These two cases of digitalisation share a commonality in that the labour individuals use in order to be more environmentally friendly has been compressed. I then proceed to unpack the implications of this compression for Chinese society and governance.

Big Data Environmental Governance

Digital platforms of big data and automation are now becoming an integral part of conducting environmental governance in China. This can be seen most directly in the digitisation of China's Environmental Impact Assessment (EIA) system. EIA is an internationally accepted set of principles used to help policy-makers come to a decision about implementing development projects based on how much damage or benefit the project is likely to bring to the environment where the project is meant to be implemented (Ortolano and Shepherd, 1995). While this technocratic interpretation of EIA (Formby, 1990) has been popular in China, since 2003 the government has taken steps toward the incorporation of more than just a biophysical perspective of the environment into their analytical toolbox. The recent inclusion of social impact assessments and requirements for social participation in the assessment process have made EIA in China an effective political tool for preventing unrestrained development of the environment (Tilt, 2015). In China, conducting an EIA would normally require the scientist making the assessment to go to a local site and collect baseline environmental data to determine what might be affected by the implementation of a new development. It would also mean gathering data from local environmental protection agencies on the quantity of pollution currently emitted by nearby developments to determine if adding a new source of pollution would affect the environment's carrying capacity, or the maximum impact that can be sustained by the local environment considering the resources available. Most recently, the Chinese state has also required by law that all EIAs become transparent and accessible to the public (Ministry of Environmental Protection, 2013). This nationwide determination to increase transparency

[1] For a detailed methodological description of the benefits of using mixed methods to study these sustainable urban renewal projects and analysis of the way these projects did and did not affect environmental consciousness see Schmitt et al. (2021).

within the EIA system began about a year after my key informant, Qi Daina, had started her new position with an office specialising in EIAs in Chengdu in 2012. [2]

When these new transparency measures first started as trials organised by the Ministry of Environmental Protection in Beijing during late 2013 and early 2014, there was a great deal of trepidation among officials in Qi Daina's office in Chengdu. At the time, Qi explained to me:

> Right now, everyone is pretty nervous about the idea of allowing the public access to all of the EIAs. In particular, some of the older officials are not worried that the database will reveal their laziness in the past, but rather that they just do not know how to do their job very well. Most likely the older EIAs are a mess; so they are not excited about sharing that fact with the broader public.[3]

At first, it was not entirely clear how the digital EIAs were meant to be presented to the public. All they knew was that part of the new requirement included entering all the information in past EIAs into a digital platform. By early 2014, it had become more apparent that the Ministry of Environmental Protection intended to model their new digital EIA system on similar tools already in use by various security agencies around the country. For instance, in January 2014, as part of the training process Qi Daina and her colleagues took a trip to a state security department in Chengdu where they were able to interact with a platform shared with multiple security agencies. The focus of this platform, however, was religious centres throughout Sichuan Province. One of the features of the platform was that a user could click on any of the religious centres, say a Tibetan Buddhist temple in Western Sichuan, and gain access to the personal information of the monks registered within the temple complex, as well as any reports prepared by the Public Security Bureau related to the centre. The platform could also analyse the potential risk of social disturbance based on the data contained within the system, but they were not provided with details about how this worked.

Such an analytical system has large implications for the way Qi Daina previously conducted her job. Rather than going into the field to interact with local officials and the constituents affected by their decisions, big data analysis would allow much of this work to be done at a distance. That also would mean preventing Qi Daina from establishing social connections with officials and residents in these communities. This kind of work would then be different to the face and performative projects common in the performative governance used by environmental protection agencies in China (Ding, 2020).

While there has been a significant and effective crackdown on corruption throughout China (Keliher and Wu, 2016), this has not necessarily reduced the importance of social connections or even the material exchanges that accompany them. For instance, after a trip to a small county in southern Sichuan in 2014, Qi Daina came home with a massive box of mandarin oranges. When I inquired about the box, she replied:

> Well, they certainly cannot hand me an envelope full of cash anymore. To be honest, I like the oranges better, it is a specialty in their county. I will never be able to eat them all myself and can share them with my friends. Plus, I do not feel under as much of a moral obligation to help them as I would if they

[2] All names used throughout are pseudonyms.
[3] Personal interview, Chengdu, March 19th 2014.

> provided cash. To me it just means that they recognise my authority in the matter, but I do not think they are necessarily attempting to sway my decision with a box of oranges. That would just be silly.[4]

Here we can see that even in an era of corruption crackdowns, the need to establish face-to-face relationships and perhaps even receive gifts is considered important for environmental governance, or likely any kind of governance, in China today.

From this perspective, it is important to think about what an EIA system driven by big data will mean for the future of environmental governance, since this is the kind of platform that Qi Daina's office wishes to develop. Future EIA applications in Sichuan will utilise big data analysis methods to determine if the plans for a new project would push the carrying capacity of a region within Sichuan Province to unsustainable limits, and hence require adjustments to be made to the project's design. This is possible because all EIAs in China will also be connected through a GPS-linked platform, thereby integrating a measurable spatial element into quality control. Moreover, EIA is simply the first step a project must complete before gaining approval for construction. Afterwards, a project must continue to ensure its production processes conform to environmental quality regulations determined by regular monitoring.

In fact, the Sichuan Environmental Protection Agency had already been developing such a system for some time. In 2014, they released a "Pollution Source Map" to the public (Zhu, 2014) that allows users to determine whether a polluting industry is located near their home. By clicking on an industry in the platform, a user can discover the information that would be essential for filing an official complaint with the EPA. A second more extreme example is the use of perpetual environmental monitoring systems, such as in the Suzhou Industrial Park (SIP) in Jiangsu Province which links the monitoring system to a production facility's electrical grid connection (Ning, 2014). If at any point during the production process the monitoring system discovers levels of pollution in excess of the original design of the EIA, for instance from excessive dumping of pollutants into the local area's waterway, the system will automatically cut off the facility's electricity supply. While Sichuan has yet to implement such measures, Qi Daina visited SIP in March 2015 with officials from the Sichuan EPA as, according to her, it represents the future model of environmental management in Sichuan. Yet she was also wary about what such changes might bring, since it would mean she would no longer have any physical interaction with the industries and the local residents her work is supposed to govern. There is currently a dialectal relationship between the physical and digital ways in which she does her job that is already reconfiguring the way environmental management is done in China. By this I mean she currently still needs to go to the local area in question to take environmental measurements and interact with local officials to collect the data she needs which is then input into a digital database to complete her assessment. When this dialectic is completely separated, as it is at SIP, it will likely mean a further reconfiguration of the labour and social relationships needed for protecting the environment.

Some scholars still argue that there is not enough research available to justify integrating the use of big data into the evaluation of environmental performance for cadres or corporations in China (Song et al., 2018). This may be just a matter of time. These technologies appear to be rapidly coming online, with Sichuan recently announcing the establishment of a "three lines

[4] Personal interview, Chengdu, November 6th 2014.

and one list"[5] digital platform for creating environmental impact visualisations, intensification of analysis on environmental data, and ensuring "smart" environmental decision-making (Department of Ecology and Environment of Sichuan Province, 2020). The use of big data and automation for environmental governance in China is premised on a state security framework, which ensures a certain amount of distance between officials and the people they govern. Such frameworks allow officials to search for and analyse data without ever having to set foot in the field or communicate with people who might be impacted by the decisions made by their analyses. In this way, we can see that the labour of environmental officials becomes compressed as their work can all be done remotely through cloud computing and the reporting of data through digital platforms.

Smart Housing Estates

There is a great deal of promotion surrounding the development of China's Smart Cities (Sze, 2015), but some have noted how these projects can mask the contradictions that emerge between urban development and environmental protection (Pow and Neo, 2013). These "smart" concepts have also been scaled down to influence the design of entire housing estates. As mentioned above, the housing estate Tiramisu in Chengdu was one of the first to be designated as "smart" by the city government. Chengdu even provided financial support for the construction of the housing estate in order to draw the investment to the city and to keep it within a competitive market price. The city hoped that as a smart housing estate it would act as a model for future housing estate designs and stimulate interest in the Chengdu public for living in more environmentally friendly residences. Of course, there are a number of features that contribute to Tiramisu's "smart" status, most of which have some kind of automated or digital characteristic and are not necessarily environmentally friendly.

For instance, the central air unit of the entire housing estate is regulated by a geothermal heating and cooling system. During the construction of the foundation, a system of holes was dug deep into the crust beneath the building with one set to absorb warmth from closer to the Earth's mantle and a shallower set that would draw from the Earth's cool crust. Together this system provides cool circulated air for the housing estate during the summer and warm air during the winter.[6] Residents control the temperature in their house through a digital thermostat that will automatically regulate the flow of cool and warm air from beneath the surface directly to their home, providing them with the ideal temperature of their choosing. Residents are not charged according to their usage of this service but rather each household pays a set fee that is included in their other maintenance and management fees.

During our survey of Tiramisu, we interviewed 69 households and, to our surprise, discovered 28 households who owned stand-alone air conditioners. One household even placed an air conditioner in each of their four rooms, because they felt it might be necessary to keep their home feeling comfortable. While few residents complained about the central air system, we also found very few who were excited about or even recognised the fact that it is regulated

[5] The three lines and one list refer to a red line for ecological conservation, a bottom line for environmental quality, an upper-limit line for resource use, and a list of environmental permits. These are four complex, interconnected policies that have been promoted by the central government for the past five years (Ministry of Environmental Protection 2016) and deserve more attention from academic literature (but see Wang et al., 2020; Cheng and Li, 2019).

[6] The latter is particularly special for Chengdu residents as the city lies just below a geographic line that the Central Government designates as ineligible for investment in central heating. While winters in Chengdu are not particularly long, residents generally have to rely on wearing multiple layers of clothing all day long or use electric heaters to stay warm.

by geothermal energy technology that is unique to Chengdu. The staff who worked at the housing estate were the most excited about the geothermal system and they took me on a brief tour of the system to show off its advanced features during one of my follow-up interviews.

Another "smart" feature promoted by the housing estate was the digital metering system for water, electric and gas usage. While digital metering is common in Chengdu housing estates, Tiramisu had integrated their system into the Internet of Things (IoT) concept. Meter readings were sent to a digital platform in the housing estate that can be viewed through an app on a resident's smartphone. Technically, residents can pull up reports about their usage according to the month or even time of day to determine their peak usage and make attempts at further conservation. Residents can also set up automated payments for their usage by connecting their online bank account to their housing estate account. All the residents I talked to paid their bill in this way. Thus, while the digital system could provide them with greater information about their usage, once the bill became automated, they primarily forgot about this feature. Only when a sudden high charge was charged to their bank account would they think about using the service to inquire more closely about their usage of these natural resources. Residents explained that they very much enjoyed the convenience of these features, but none of them described how they used these digital technologies to reduce their levels of resource consumption.

Another prominent "smart" feature that touches on an environmental issue is the facility within the housing estate that separates drinking water from toilet water. All of the water that comes into the housing estate from Chengdu's urban water supply is first used in the kitchen and showers of individual households. Any excess water that flows into the household's drains is then collected by the housing estate, filtered and pumped back to the household to be used to flush toilets, which is then released into the Chengdu sewage system.

This system can be contrasted with a water conservation system I studied in an older housing estate called Eastern Star. In this case, residents worked together, travelling to landfills and construction sites to find materials to construct a large rainwater collection system within the central courtyard of their housing estate. Once the system was constructed, residents could use the water for flushing toilets, mopping floors or watering their gardens. Households collectively pooled money to fund the project and held regular meetings to discuss managing the system so it would not become clogged with leaves or become infested with mice in the dry season. Everyone we talked to in Eastern Star was quite proud of the success of this project and used the water when it was available. More importantly, residents appreciated the social connections that the project helped established between neighbours.

In contrast, most of the residents in Tiramisu we talked to about the water recycling system did not seem to pay much attention to it. Moreover, during our survey we also asked residents in Tiramisu whether or not their household had any means of conserving water and 39 residents said that they did not conserve water at all. This of course could be because they felt they did not need to actively conserve water since the water recycling system did it for them. However, we did encounter five residents who specifically mentioned the water recycler and another five who mentioned recycling shower water as an example of their conservation methods. Thus, it is possible that only a minority of the residents were aware that the automated nature of the water recycling system is helping reduce their impact on the environment.

Management of these "smart" systems is quite complex and requires that a housing estate management company hire employees with a certain amount of expertise in the use of

similar technology, as well as training them in how to manage the more unique features found at Tiramisu. In fact, in the first year after the housing estate was opened, a disagreement between residents and the original housing estate management company resulted in the company being removed from its position by the local government for negligence at the request of the residents (the details of the disagreement were kept private from me). It turned out that there was only one other company in all of China that the housing estate could hire as a replacement. As the Vice-Chairperson of the Resident Committee explained to me:

> Now we have a comparatively good relationship with the management company, but at the same time it is somewhat disconcerting that we are so dependent on them. There was a two-week period during the transition between the two companies where if something went wrong with any of these systems they simply could not be fixed. That, in fact, is what spurred us into forming a Resident Committee to ensure that a replacement for the management company could be found as quickly as possible.[7]

Making such collaborative decisions in Tiramisu is not easy. During my time at the housing estate, I discovered residents had very little social interaction with each other. According to one housing estate committee member most of the residents were from the smaller cities of Sichuan province.[8] Purchasing an apartment in Tiramisu was thought to be a good investment and it provided residents with the opportunity to shift their *hukou* (household residency) to Chengdu. In some cases, the houses were registered in the names of young children so that they would be able to attend good schools in Chengdu, a school gentrification process known in China as *xuequfang* (Hu et al., 2019). Because residents came from diverse backgrounds and different locations throughout Sichuan, it was quite difficult to establish a social network in the housing estate.

With this in mind, the new housing estate management company teamed up with a software engineering firm to develop a special app to connect residents to each other through their smartphones. It was through this app that residents could also follow their consumption of water, electricity and natural gas as well as input their bank information to setup automated payments. Additionally, residents had to use the service to make maintenance requests from the management company. Some residents told me that it was this second feature that was most successful at helping them become more accustomed to using the app. Finally, both the Resident Committee and the management company told me that they had high hopes that the app could be used in a manner akin to a WeChat Group, thereby helping stimulate social activity in the housing estate. Primarily, the Resident Committee hoped that the app would build greater solidarity should future conflicts arise which might require support of the majority of residents to resolve. However, none of the residents we interviewed used the app to organise any kind of social activity among housing estate members. In contrast with the regular physical social interaction found in the recycling and water conservation practices at Eastern Star, the

[7] Personal interview, Chengdu, December 16th, 2021.

[8] The reason for this is complex. Tiramisu is located in central Chengdu (within the 2nd ring road), but it is not a particularly popular neighbourhood. The housing estate also opened during the chaotic re-construction of the 2nd ring road. Wealthy Chengdu residents at that time were more likely to purchase a second home in the quickly developing south part of Chengdu as they did not need another home in the central part of the city. In contrast, wealthy residents from other cities in Sichuan were quite excited with the opportunity to purchase such a centrally located home. The re-construction of the 2nd ring road did not necessarily bother them because they might not need to move into the new apartment right away.

digitally-dependent interaction found in Tiramisu had not translated into a more vibrant sociality.

Digital Ecology in Chengdu: Compression of Time-Space, Compression of Labour

From what I have been describing in these two case-studies, there is an element of digitalisation that is working against the hope of the Tiramisu Resident Committee that things like their smartphone app will build greater solidarity in their community. Much of the globalisation literature has examined the way that technology has affected social relationships around the world. Technology has definitely played an important role in changing society, particularly in the compression of our conceptions of time and space (Hannerz, 1992). The way technology results in the compression of time and space has exacerbated the social inequalities that are created from the dominance of a global capitalist system (Harvey, 1989). The machine was the technology during the industrial revolution that helped Marx understand the crucial connection between labour and social class (Hornborg, 2001). Similar to the prolific use of the machine, technologies of automation when employed by corporations and the state can be used to erode solidarity within communities, who might benefit from cooperation, ensuring further exploitation of the labouring classes. I interpret Hornborg (2001) as saying that the use of machines and automation is a kind of compression of labour, and that the resulting social inequality is not unlike what has occurred due to the compression of time and space by technology as described by Harvey and other scholars of globalisation.

While previous scholars have noted that this time-space compression due to technological change is exploitative of labour (Franklin, 2015), more recently others have argued that space is not necessarily compressed for everyone, but rather is "continuously being reconstituted and reformed" (Graham, Andersen and Mann, 2015: 338). To a certain extent this is true within the two cases we have discussed here. Digitalisation has not occurred simultaneously across the Chinese technoscape, which is why Qi Daina was traveling to Suzhou to learn about the way automation and digital platforms could be used for pollution control. Moreover, to move beyond Franklin's (2015) primary concern about labour exploitation, the present study has asked a different question that reflects on how digitalisation is being used for environmentalist purposes. Here we are looking at the use of digitalisation for protecting the environment or supporting an environmental action. While labour exploitation may not be occurring in these cases, the digitalisation of environmentalism is changing social relationships in China, and it is worth reflecting on what that means for Chinese society.

Thus, this paper argues that digital technology is working to compress the labour of protecting the environment, but we can only understand this if we also recognise labour as a crucial component, not just for the creation of surplus value but also for the formation of social relationships. For instance, in the first example of the digitalisation of environmental governance, we can see that the labour of environmental officials becomes compressed as the collection and analysis of data can all be done remotely through cloud computing and the reporting of data through digital platforms. This has a dramatic impact on the social relationships between those who are responsible for ensuring that development projects reduce their impact on the environment. Primarily they no longer have to visit the actual location, resulting in a lack of familiarity with the individuals who are planning to implement the development project. To a certain extent, this is precisely the point of digitalising EIA and environmental monitoring. If government officials are less familiar with those implementing such projects, such as private contractors or CEOs, it reduces the opportunity that such officials might be bribed or coerced into ignoring obvious environmental violations. It is perhaps too

early to say if this aspect of digitalisation will be successful or not. However, another point is that these same officials will also not have the opportunity to become familiar with the local residents who will have to cope with the impact these development projects will have on the surrounding environment. When residents engage with the public participation aspect of an EIA to provide their own concerns, the lack of familiarity between the officials and the residents ensures that the impact such development projects could have on the community will seem all that more alien to an official responsible for reviewing the case of the EIA. This is most likely equally true for the state security technologies used to monitor religious organisations in China that gave birth to this form of environmental monitoring, as I described above.

Through the example of Tiramisu we can also see that digital technology compresses the labour of environmental action. The geothermal central air system in Tiramisu means that residents can live in a comfortable digitally regulated temperature that has minimal impact on the environment and they do not have to change anything about their lifestyle. Because residents can set up automatic payments from their online bank to cover their expenses accrued from using water, electricity and gas, a kind of "set it and forget it" mentality takes over, leading to questions about whether such systems even result in a net benefit to the environment (Herrero, Nicholls and Strengers, 2018). Additionally, with regard to the automated nature of the water recycling facility at Tiramisu, we have to question what it means to engage in an environmental action. The apparent lack of intentionality in recycling the water is definitely an example of compressing the labour that goes into conserving water. Without this intentionality many residents seem to be oblivious or lose interest in whether or not the technology is environmentally friendly. This begs the question whether environmentally friendly practices without intentionality can give rise to an environmental consciousness among residents. Finally, while there are other pre-digitalisation aspects of Chinese society, such as the *hukou* system, that play a role in the changes to a community's level of sociality, the compression of labour for protecting the environment should also be considered an important aspect. Even though Tiramisu tried to create a special app to connect residents, the Resident Committee discovered it was not necessarily useful for constructing sociality. It could be that Tiramisu was lacking the dialectal relationship between the physical and the digital that would allow for a reconfiguring of urban relationships in the community.

The two case studies of digitalisation of environmental action in China are revealing examples of the way digitalisation is changing society and the way we interact with the non-human environment. Monitoring technologies and big data allow EPA officials to govern the environment from a distance, making interaction with those impacted by their decisions supposedly instantaneous. Residents within a Smart Housing Estate can monitor and control the impact their apartment has on the environment from any location and receive continuous up-to-date information about their environmental impact. We can also see how relations between the non-human world and between members of society are impacted by the time-space compression that is a feature of digital technology. Although these two cases are mediated by digital technology, that does not make the relations they create any more or less real, it just makes them qualitatively different. In addition to the time-space compression created by digital technology, the two cases from Chengdu highlight that this qualitative difference in social relations emerges through the compression of labour that affects our interaction with the environment. As stated in the introduction, here I am specifically drawing on the compression metaphor from within digital technology; that we forsake the quality of our labour relations to compress the quantity of them. Again, the compression of the quality of our relationship with

the environment and with each other does not make such relations any less real. However, it certainly makes them different.

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