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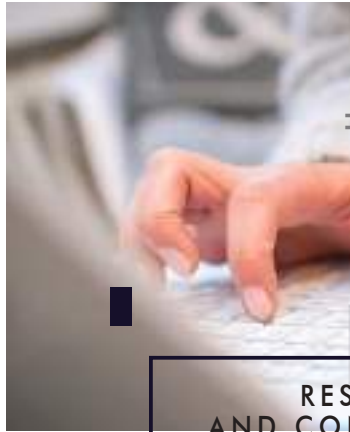
MAKE GOVERNMENT DATA BETTER:

POSSIBILITIES OF DIGITAL TECHNOLOGIES
IN CITIZEN-LED GOVERNMENT ASSET MAPPING
IN SURAKARTA



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■ INTRODUCTION

We are now living in the digital age. All we human beings do every day are very much related to data usage, collection, and production. Sometimes we are not conscious enough to recognize that we generate data, in particular, geospatial data in our daily life. However, we do generate data on our current locations and other information about specific places that we have visited when uploading something on Facebook, Instagram, Twitter, Google Map, to name a few.

Even the public sector relies highly on such digital platforms and technologies. It is not new any longer that the government, both

central and local governments, competitively uploads many posts on their social media and receives feedback so that they can improve the public service. In contrast to the past, data production is no longer the exclusive right of the state. Think about it. We no longer talk about data 'government'; however, we do about data 'governance.' Citizens have been invited to produce and improve public data. Either wittingly or unwittingly, citizens have become to play an active role in the co-production of public data. It is not by chance that so many smart city initiatives are all around us.



Therefore, the quality of the government's data could be doubtful if solely produced by the state. However, there is one area in which data that the government possesses are rarely open to public particularly within the Indonesian context: land. Citizens even hardly have a chance to produce or improve public land datasets. The Indonesian land governance system is not flawless: conflicts between modern and customary land laws; highly complicated land registration processes; and land scarcity in cities due to rapid urbanization.¹

Due to the global phenomenon of 'accumulation by dispossession' (Harvey, 2003), land in Indonesia has become more valuable assets than ever before thus one

of the most difficult domains to achieve open data governance. As more and more investors covet land, more and more poor and marginalized people lose their land. In rural areas, a large number of low-income and indigenous households are subject to deforestation and plantation. In many cases, these households migrate to cities. In urban areas, as these migrants cannot afford high land costs, they end up settling on vacant public or private land. This makes land governance worse.

This study focuses on a citizen-led government land asset data improvement project in the City of Surakarta (also known as Solo) which was implemented by a Solo-based architectural nonprofit organization at the city government's





request in 2017. The NGO whose name is ArkomSolo has been actively working on bettering the lives of people living in slums and informal settlements (informal *kampung* in the Indonesian context). Although it did not directly deal with kampung dwellers, this project is worth analysis for two reasons. First, it shows the way in which a community-based NGO with years of participatory-approaching experience takes advantage of digital technologies to improve and digitalize public data. Second, it uncovers how the NGO could utilize the digitalized datasets to achieve more just land governance, instead of considering the project as a mere technological approach. This is related to digital activism and advocacy.

This article is divided into five sections. Next section will briefly present theoretical considerations about the smart city, and traditional and more digital land mapping approaches. The third section will introduce the methodology of this study. The fourth section will illustrate the process of ArkomSolo's land mapping project titled Land Treasure 2017 in Surakarta. The fifth section will then discuss the results of the analysis and raise thought-provoking issues which came up during and after the project. Finally, conclusions with implications for future research will be given.

■ LITERATURE REVIEW

Smart City: *Data for Whom and for What?*

In the current era of big data, it is needless to place more emphasis on the importance of building enough and accurate data. In cities and urban areas where more than half the world's population resides, data are produced, collected and utilized every day and ubiquitously. There are infinite interactive processes in which both the government and citizens produce, collect, structure and utilize data. In particular, while data creation used to be the realm of the government in the past, nowadays citizens are one of the main actors who produce data or influence the government's data production in many ways (e.g., Offenhuber and Ratti, 2014).

In the geospatial domain, particularly, scholars find huge potentials of user-generated contents, coined as 'volunteered geographic information (VGI)' by Goodchild (2007: 212), as bottom-up data production and sharing through open-source platforms such as OpenStreetMap, Wikimapia and Flickr (Elwood et al., 2012; Goodchild, 2007; Haklay, 2010).

Although the production of data has been partly handed over to citizens, data management and utilization has become the *modus operandi* for the government to 'govern' its urban settings, and even worse, data have become the *raison d'être* of the government (Shelton et al., 2015). Smart city initiatives are a good example. Despite the contribution of the smart city to reducing urban poverty by representing more accurate geographies of poverty (for example, see Blumenstock et al., 2015), against a leitmotiv of the phrase 'smart city', many critiques concentrate on its nature of governmentality, which reflects what Michel Foucault argued a long time ago.

"Governmentality involves the way in which subjects perceive themselves and form their identities through processes of government which control, incite or suppress actions by drawing a line between what is 'acceptable' and what is 'unacceptable'"

(Vanolo, 2014: 885;
also see Hammett, 2018)

For example, informal or illegal activities are thus often labeled as 'non-smart' then need to be prevented and regulated.

Data on these activities are also often missing as ignorance, or at best, collected for enforcement. More neoliberal critics point out issues such as its production of socio-spatial data biases by travel route calculation and advice, and user reviews (Leszczynski, 2016), its act as a governing instrument by charging individual moral responsibilities as smart citizens (Söderström et al., 2014; Vanolo, 2014), and the risk of citizens' co-optation for achieving efficiency and optimization (Cardullo and Kitchin, 2018; Perng et al., 2018). Marginalized groups are more subject to these problems.



Mapping Slums and Informal Settlements

Conventionally, slums and informal settlements, a ubiquitous phenomenon in Indonesia and elsewhere in the Global South, are rarely represented on maps. Among many reasons behind is the reluctance of the state as map representation means the 'official' acknowledgment of those extralegal conditions as a political binding. Their occupation of land without legitimacy causes such reluctance of the state.



Cartography is “a form of knowledge and a form of power. [...] So the surveyor, whether consciously or otherwise, replicates not just the ‘environment’ in some abstract sense but equally the territorial imperatives of a particular political system.”

John Brian Harley,
a geographer and map historian (1988: 279)



Google

presents

Beyond the Map

Harley (1998) also explains the replication of such imperatives such as ‘deliberate’ distortions, ‘unconscious’ distortions, and ‘silence’ in representation. However, slums and informal settlements are no longer marginalized from mapping thanks to the wave of smart city initiatives armed with digital technologies these days. *Ta no Mapa* is a project for slums—locally called *favela*—in Rio de Janeiro, Brazil, commissioned by a world’s giant company Google. The favela mapping project over the last decade aimed to tackle the lack of publicly available digital data by involving residents and a city-based non-profit organization AfroReggae through VGI, thereby enhancing their recognition and visibility (Luque-Ayala and Neves Maia, 2018).

The project members believed that it would achieve the right of favela residents to the city in the end. They, in different groups with several paid residents, conducted fieldwork mapping for 10–15 ‘points of interest’ every day for two-four months by using GPS and Google Map Maker Mobile Buddy. Google evaluated

that the project improved location awareness in digitized ways so that more realistic business decision-making would become possible (ibid). Based on the collected data, Beyond the Map was officially launched in 2016 (<https://beyondthemap.withgoogle.com/en-us/>).

Similar approaches were made in Nairobi, Kenya where one of the most massive slum clusters in the world is located. The Map Kibera project (<http://mapkibera.org/>) since 2009 aimed to produce map data about slums in the Kibera area spreading across 550 acres of public land that are unavailable from the public sector (Hagen, 2010). Although a body of international organizations and scholars had mapped part of the area earlier, albeit not the whole, the information was rarely accessible for residents (Hagen, 2011). This led to the birth of Map Kibera. Partnering with local organizations and training residents, two Western development practitioners took advantage of the latest digital tools such as OpenStreetMap to represent so-far-invisible settlement areas.

Like Rio's Ta no Mapa, a large number of 'points of interest' were chosen and filled in with details including the quantity and quality, stories, all of which were collected in a grassroots manner. Map Kibera aimed to use mapping as a mode of protest to transform the existing unequal sociopolitical structures.

In the past, as John Brian Harley notes, "maps are preeminently a language of power, not of protest. [...] the means of cartographic production [...] is still largely controlled by dominant groups" (1988: 301; 302). However, the advent of new digital technologies and VGI is now changing the situation. Map Kibera has spread to other slum areas in the city such as Mathare and Mukuru, and at the same time, a separate project called Muhimu Mapping Project was launched for Muhimu slums by another group of Western volunteers in collaboration with young local volunteers.

However, several scholars doubt the full potential of digital slum mapping as a mode of digital activism and advocacy. New challenges are emerging. From Rio's Ta no Mapa, Luque-Ayala and Neves Maia (2018) find the re-incorporation of

structures and their increasing vulnerabilities. By examining Google's claim that the favela residents' visibility, recognition and therefore citizenship have become enhanced, the authors argue that its selective illumination of the businesses closer to major tourist spots stemming from economic motivations rather has exacerbated the socioeconomic and spatial inequalities.





points made by informal settlements communities by themselves. Furthermore, the mapping product, in reality, was rarely used or referred to by the government officials.

Although those mapping approaches with VGI are often considered as 'objective' representation of all existing objects, it is yet questionable. Here echoes what Harley (1989) argues earlier. "We often tend to work from the premise that mappers engage in an unquestionably 'scientific' or 'objective' form of knowledge creation. [...] It is better for us to begin from the premise that cartography is seldom what cartographers say it is" (1).

Further, Luque-Ayala and Neves Maia (2018) shed light on its focus on coding calculable components digitally and the failure of accommodating incalculable natures such as informal norms of power operation and orders. Such calculative incorporation of 'points of interest' has also been caught by other scholars (for other Brazilian favela cases, see Nemer, 2013). From her ethnographic observation of the Kenyan Muhimu Mapping Project, Poggiali (2016) witnessed the selective mapping practices of volunteers using GPS and editing on OpenStreetMap, not including the water

Therefore, there is a call for particular carefulness in the implementation of smart urbanism within the context of informal settlements, preferably beginning from the understanding of such space rather than merely applying technologies (McFarlane and Söderström, 2017; McQuillan, 2016). In smart cities or smart slums, the expression 'smart' here has to be "less about intelligent infrastructures and more about producing digital data to improve basic infrastructures in ways that reflect the needs and learning of marginalized urban communities" (McFarlane and Söderström, 2017: 319).



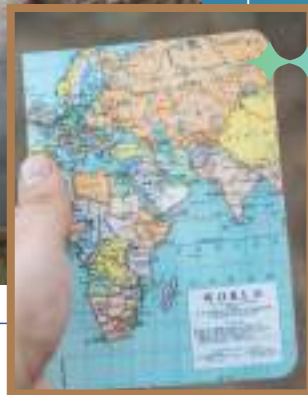
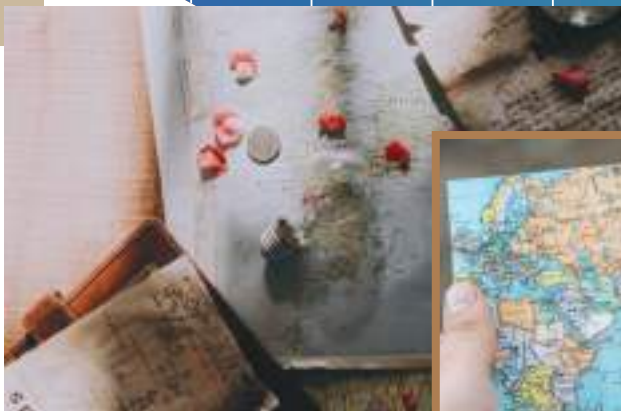
Learning from Traditional Participatory Mapping Methods: Citizen-Led Co-Production

The challenges in digital slum mapping make us turn our eyes back to traditional participatory slum mapping methods. Data of the people should be collected, produced and represented by the people and for the people. Within the context of slums, if the government carelessly digitizes land ownership data, marginalized groups are likely to lose their political influence to change the system.

Therefore, a body of literature shed light on the extensive possibilities of grassroots enumeration and mapping around informal land and settlements in the Global South (Archer et al., 2012; Ayson, 2018; Donovan, 2012; Joshi et al., 2002; Karanja, 2010; Livengood and Kunte, 2012; Patel et al., 2012; Sen et al., 2003). These articles commonly indicate that grassroots data gathering not only solidify communities and clarifies their needs but also enables them to access and negotiate with governments and politicians with the collected fine-grained data that those elites can hardly possess.

Also, the Slum/Shack Dwellers International (SDI)'s latest campaign, Know Your City (<http://knowyourcity.info/>), can be understood as approaches for the inclusion of slum dwellers into the formal (planning) system, in line with the rationales above. They not only count the number of residents and quantify physical and non-physical living conditions within each community but now also take advantage of digital technologies such as Geographic Information System (GIS) (Joshi et al., 2002; Livengood and Kunte, 2012; Sen et al., 2003).

Participatory mapping methods have already been integrated even into many government projects as a community participation process. In Indonesia, a lot of organizations such as the Rujak Center for Urban Studies, Kota Kita Solo, ArkomJogja, and Architecture Sans Frontières (Architecture without Borders) Indonesia have already employed these methods when working independently or together with the government.



Mitlin (2008) describes these participatory mapping approaches as citizen-led co-production in contrast to state-led co-production. According to her, co-production is the “joint production of public services between citizen and state, with any one or more elements of the production process being shared” (Mitlin, 2008: 340). While the conventional approaches by the state for co-production aim to achieve institutional advantages and resource efficiencies as a Weberian model of service delivery (Parks et al., 1981; Ostrom, 1996; Whitaker, 1980), citizen-led co-production aims to engage citizens in production activities to redefine the existing relationships for new democracy (Marschall, 2004; Mitlin, 2008). It has to be more than mere participation (Bovaird, 2007). Among various collective co-productive tools for slum communities

are participatory mapping, which has already widely accommodated and acclaimed by SDI and the Asian Coalition for Housing Rights (ACHR) (Mitlin and Muller, 2004; Muller and Mitlin, 2007; Patel, d’Cruz and Burra, 2002; Tomlinson, 2007).

There are issues and criticisms of the co-production scheme in participatory slum mapping. They center around the existing power imbalance in the real-world setting (Donovan, 2012; Huchzermeyer, 2011; McFarlane, 2011; McFarlane and Söderström, 2017; Patel et al., 2002; Watson, 2014). Reduction to technological approaches, lack of data ownership and risks of co-optation by the state are commonly pointed out. Often, community or NGO mappers become forced to choose their priority between products and processes.



On the one hand, scale also matters, particularly in digitalized mapping in relation to the degree of details to include and display: a neighborhood, city, regional, or country level. On the other hand, although Mitlin (2008) regards co-production as an alternative to old-fashioned and contentious social movements, the spirit of social movements as transforming the political system and realizing democracy still needs to be placed at the heart of co-productive mapping otherwise could be easily distorted in this digital era.

Bearing in mind as an analytic framework the criticisms of the smart city and digital participatory slum mapping reviewed above, through the ArkomSolo's Land Treasure 2017 case in the City of Surakarta, this research aims to investigate both the possibilities and challenges of participatory digital mapping for improving land governance particularly in relation to slums and informal settlements.



■ METHODOLOGY

This research, as a case study, focuses on the Land Treasure 2017 project which was organized and conducted by a Solo-based architectural NGO **ArkomSolo**. Arkom is an abbreviation of community architects (*ARsitek KOMunitas*) whose definition is a professional architect or para-architect who works for poor and marginalized communities and advocates their rights in the society. “The community architect is engaged with the ‘housing poor’ and works for job satisfaction rather than money alone. The community architect respects tradition, culture, people’s skills, and knowledge, and practices participatory methods” (Shah, 2014: 176). A group of Yogyakarta-based Indonesian architects formed ArkomJogja for post-disaster recovery after the 2006 earthquake. The spirit of ‘Arkomp’ has spread to some other cities in the country by the formation of sister organizations, and ArkomSolo is one of them to work for the City of Surakarta.

Land Treasure 2017 was one of the eight projects that ArkomSolo carried out for the city government in that year. The project aimed to identify 260 public assets in Kecamatan Jebres that are owned and recorded by the Surakarta City government (under the category of *Tanah Hak Pakai*), thereby proposing an opportunity to utilize land that is currently un-optimally used, possibly for slum and informal settlement communities.

One of the main reasons behind the city government’s request for land status identification is because a number of informal kampung have emerged and been developed over the past years. This phenomenon took place despite the city government’s strict land use regulations based on the Spatial Detail Plan (*Rencana Detail Tata Ruang* or RDTR) or the Building and Environment Layout Plan (*Rencana Tata Bangunan dan Lingkungan* or RTBL). The Surakarta City government attributes this mushrooming of slums to the non-utilization or underutilization of both state and privately-owned land including watersheds and railway strips (ArkompSolo, 2017).



The other reason is the lack of a full set of information about the government's land which is managed by the Office for Management of Revenue, Finance and Assets (*Dinas Pendapatan dan Pengelolaan Keuangan dan Aset* or DPPKA). Only a little information such as the area, location and utilization of land is kept in the city's database. Therefore, there was a desire of the city government to secure better land information database for spatial monitoring and zoning regulation enforcement, thereby facilitating accomplishing the mayor's vision called 3WMP—*waras* (healthy), *wasis* (smart), *wareg* (satisfied), *mapan* (steady) and *papan* (shelter). ArkomSolo's Land Treasure project for land mapping and database lied along with this objective.

The project spanned for more than three months from September to December 2017, with four citizen-participatory survey workshops in November. Although ArkomSolo drove the project, it is noteworthy that there was support from the city government including the provision of asset lists to be identified as well a number of socialization events with related stakeholders. ArkomSolo employed citizen-participatory survey on the identification in addition to document analysis of the Spatial Detail Plan (RDTR) and the Building and Environment Layout Plan (RTBL) concerning the existing zoning regulations.



There were 15 ArkomSolo staff members, including long-time interns and volunteers, and ten new college student volunteers recruited by an open call. They worked together on the field by applying digital technologies such as Google Earth and global positional system (GPS) tools that were combined with their traditional participatory community survey methods. During the project, ArkomSolo also developed a mobile application which showed quick check sheets to facilitate their field survey. The project ended up with a digitized land database built by identifying a lot of information and updating the current status of 153 public assets out of 260 that had been originally requested. The result was successfully digitalized as an editable desktop-based program to help the city government review, monitor and update information if necessary.

This study investigated the working processes of Land Treasure 2017 to elucidate the possibilities of using digital technologies in community-based methods to improve public data, thereby letting data be utilized more for communities in need as a form of digital activism and advocacy. This research

analyzed the materials obtained directly from ArkomSolo through previous fieldwork in Surakarta during January–March 2018. These materials include project's final reports submitted to the city government, PowerPoint presentation files, photos, visualized products, a self-developed mobile application, and a desktop-based program. This study also conducted semi-structured interviews with ArkomSolo staff members and volunteer participants in December 2018 to reflect their vivid experiences.

Figure 1. Location of Government Assets in Kecamatan Jebres Surveyed in the Land Treasure 2017 project ©ArkomoSolo

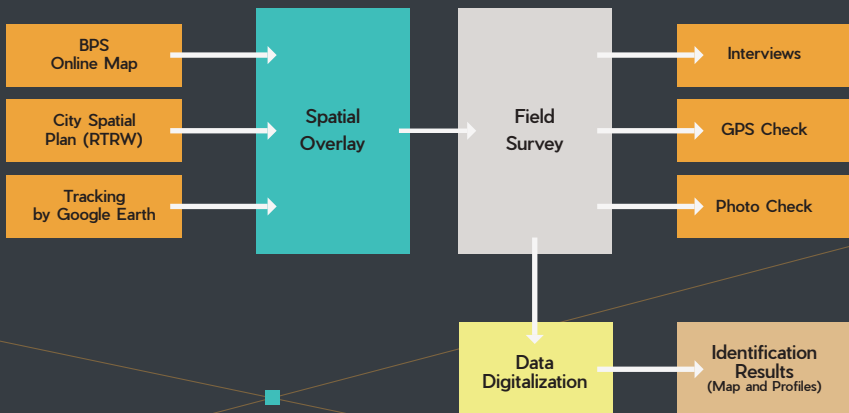


■ LAND TREASURE 2017 IN SURAKARTA

The Land Treasure 2017 project proceeded through three phases: data collection, survey, and analysis/mapping. Figure 2 illustrates the flowchart of the data collection, survey, and analysis process. For scrupulous data collection, the first stage was carried out in coordination with the land section of the Office for Housing, Settlements, and Land (*Dinas Perumahan,*

Kawasan Permukiman dan Pertanahan or DPKPP). Data collection also included a preliminary analysis of secondary data from the government, preparation, and designing survey questions. Workshop and field survey were categorized as survey, followed by the last step as analysis mapping.

Figure 2. Data Collection, Survey, and Analysis Processes



The project was done from September 2017 until December 2017 as shown in Table 1. The first step was carried out in September for the secondary data collection. Then the next phase was a spatial overlay and preliminary analysis.

After the preliminary analysis was done, the field survey was conducted on November 2017. Then the final stage was the analysis and mapping process that started in late November until December 2017.

Table 1. Research Timeline

No	Activities	Timeline
1	Secondary Data Collection	Mid-September 2017
2	Spatial Overlay and Preliminary Analysis	October-early November 2017
3	Field Survey	Mid-November 2017
4	Analysis And Mapping	Late-November until mid-December

The land survey consultancy team, ArkomSolo in this case, became connected with related institutions within and outside the city government including the National Land Agency (*Badan Pertanahan Nasional* or BPN). As the land management at the local level is still partly in hand of BPN, collaboration with the central-level agency was inevitable. As a pilot, one kecamatan was chosen for ArkomSolo's land treasure excavation: Kecamatan Jebres which is located in the northeastern part of the city.

There are two reasons behind the choice of Kecamatan Jebres. First, Kecamatan Jebres is the largest kecamatan in the City of Surakarta. Second, subsequently, the largest number of government's assets is located within the kecamatan. Under Kecamatan Jebres, a total of 260 public assets in the following 11 kelurahans were listed for crosschecking: Kelurahan Gandekan, Jagalan, Jebres, Kepatihan Kulon, Kepatihan Wetan, Mojosongo, Pucangsawit, Purwodiningratan, Sewu, Sudioprajan, and Tegalharjo.



Figure 3. Location of Kecamatan Jebres and Its 11 Kelurahan (Source: Wikimedia.org)

ArkomSolo collected secondary data such as the DPPKA's land records, RDTR, RTBL, BPN maps, and related laws and regulations to design the scope of the land survey. The city government also invited stakeholders such as kecamatan and kelurahan heads, and other government officials to inform this land database update work as a socialization procedure. This focus group discussion (FGD) process helped review the collected secondary data and prevent the mismatch between the data of DPPKA and the regional development planning agency (*Badan Perencanaan Pembangunan Daerah* or BAPPEDA).

The work of overlaying the land list from DPPKA with BPN Online maps and the City Spatial Plan (*Rencana Tata Ruang Wilayah Kota* or RTRW Kota) provided some merits (Figure 4). The DPPKA list included only a limited number of information such as kelurahan, area, functions with the facility's name, land HP number, and ownership certificate issuance date and number. In this sense, it is fair to say that the DPPKA list was focused on the information that had been received at the time of certificate issuance and disassociated with purposes for monitoring and future utilization.

The overlay with BPN maps and the City Spatial Plan enabled ArkomSolo to supplement the DPPKA list with the information about spatial patterns. Spatial patterns, designated by the City Spatial Plan, describe the distribution of space to be protected and developed so that guides the city government's direction for the next

20 years as an overview. Therefore, ArkomSolo could figure out a next step as comparing the functions approved on each certificate with the current uses, hoping that the city government would design a better means of spatial monitoring and enforcement.

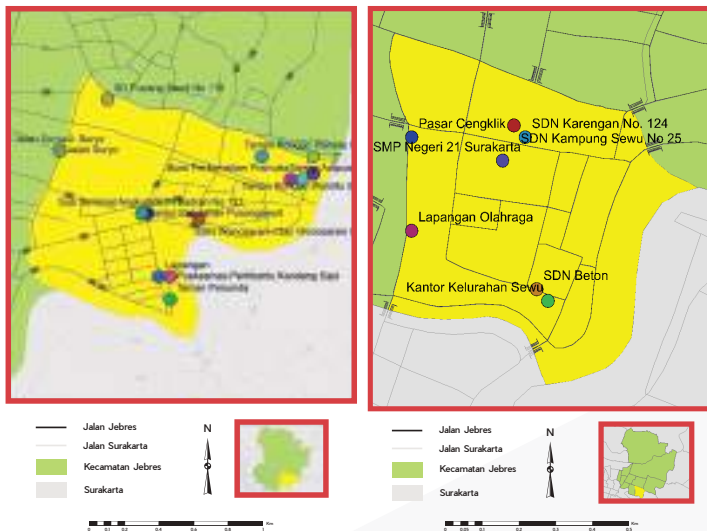


Figure 4. Example of Overlaying the Locations with BPN Maps: Pucangsawit (left) and Sewu (right)

©ArkomoSolo

More than 2/3 of the assets are situated in two kelurahans at the northeast fringe of the city: Jebres and Mojosongo; if kelurahan Pucangsawit is included, more than 80% in the three kelurahans on the city's northeastern periphery. In terms of spatial land use regulations, i.e., zoning, half the assets are designated as green open space (*ruang terbuka hijau*) and

education facilities (*sarana pelayanan pendidikan*). However, the average land size of each asset in those two categories is modest as 4,000–5,000m², whereas that of the assets for spatial waste disposal zone (*zona khusus TPA*) and special warehousing zone (*zona khusus pergudangan*) is enormous.



Kelurahan	Number of Assets	Areas (m ²)	Area Percentage Share (%)
Gandekan	7	8,524.00	0.61
Jagalan	17	55,687.00	3.97
Jebres	54	588,335.00	41.91
Kepatihan Kulon	6	20,574.00	1.47
Kepatihan Wetan	17	24,645.00	1.76
Mojosongo	97	405,201.00	28.87
Pucangsawit	23	183,826.00	13.10
Purwodiningratan	13	54,682.00	3.90
Sewu	11	30,759.00	2.19
Sudioprajan	8	16,030.00	1.14
Tegalarjo	7	15,414.00	1.10

Table 2. Distribution of the whole DPPKA Assets Based on Kelurahan



Table 3. Distribution of the whole DPPKA Assets Based on Zoning

Zoning	Number of Assets	Areas (m ²)	Area Percentage Share (%)
Green Open Space	89	484,489.00	34.52
Education Facilities	56	235,079.00	16.75
Special Waste Disposal Zone	2	170,324.00	12.13
Special Warehousing Zone	2	147,208.00	10.49
Movement Network	21	144,627.00	10.30
Social Cultural Facilities	6	81,279.00	5.79
Government Office	28	46,137.00	3.29
Housing	5	22,217.00	1.58
Sports Facilities	8	19,483.00	1.39
Trade and Service	10	18,798.00	1.34
Health Facilities	12	8,940.00	0.64
Unknown	3	7,055.00	0.50
Religious Facilities	6	5,794.00	0.41
Transportation Facilities	3	4,765.00	0.34
Absorption Zone	2	4,443.00	0.32
Public Service Facilities	3	2,352.00	0.17
Non-Green Open Space	3	552.00	0.04
Mixed Zone	1	135.00	0.01
Total	260	1,403,677.00	100.00

Before employing participatory field survey, ArkomSolo conducted some preliminary analysis work. At the preliminary analysis stage, they already discovered data deficiency issues. From the tracking by Google Earth with the name of each asset, for example, ArkomSolo managed to detect only 95 locations out of 260. Therefore, identifying the locations of the rest 165 assets inevitably became ArkomSolo's next step forward as there was no reference to those missing locations from the government side. A field survey by running with feet between presumable spots was naturally chosen as a data collection method.

As stated earlier, Land Treasure 2017 was a very new and pioneering project also to ArkomSolo when compared to the other seven projects being conducted simultaneously in 2017. Therefore, ArkomSolo referred to other organizations' previous work to design a field survey format. One reference was an international organization Slum/Shack Dwellers

International (SDI)'s community-based survey format. As the SDI format is specialized for the identification and profiling of informal settlements on a village level, it was not sufficient to government's land data record settings so needed to be modified (ArkomSolo, 2017).

Therefore, only some of the survey questions were adopted, such as geospatial data of land and its physical conditions including drainage, clean water access, wastewater management, waste management, electricity, telecommunication access, transportation accessibility, vegetation, and disaster proneness.

After this preparation, the actual field survey titled Land Treasure 2017 was held as two-weekend workshops in November 2017: on November 4–5 and 11–12, and during 9 AM–4 PM each day. A total of 25 surveyors, including ten college student volunteers and 15 ArkomSolo staff members went to the field in three teams.



ArkomSolo enlisted the help of geospatial information technologies to mine the ‘treasure’ of information from the listed land while still placing their credentialed participatory process at the core by employing citizen-participatory survey and interviews. First, one volunteer who was majoring in IT at AMIKOM University in Yogyakarta developed a mobile application displaying quick land information sheets. While the surveyors recorded their findings on a paper format, this app helped the surveyors do a fast check at every potential spot without bringing many items in hands so that they could get around as many spots as possible in a single day (Figure 5).

Second, the surveyors took advantage of a freeware GPS tool called GPS & Maps: Track Coordinates downloaded from the Apple Store so that they could quickly record geospatial information of each asset. This approach aimed to ease future data visualization by plotting the recorded coordinates using Geographic Informal System (GIS) software. However, due to the intrinsic margin of errors in the GPS app’s coordinate values, they always had to double check the coordinates with the ones from Google Map.

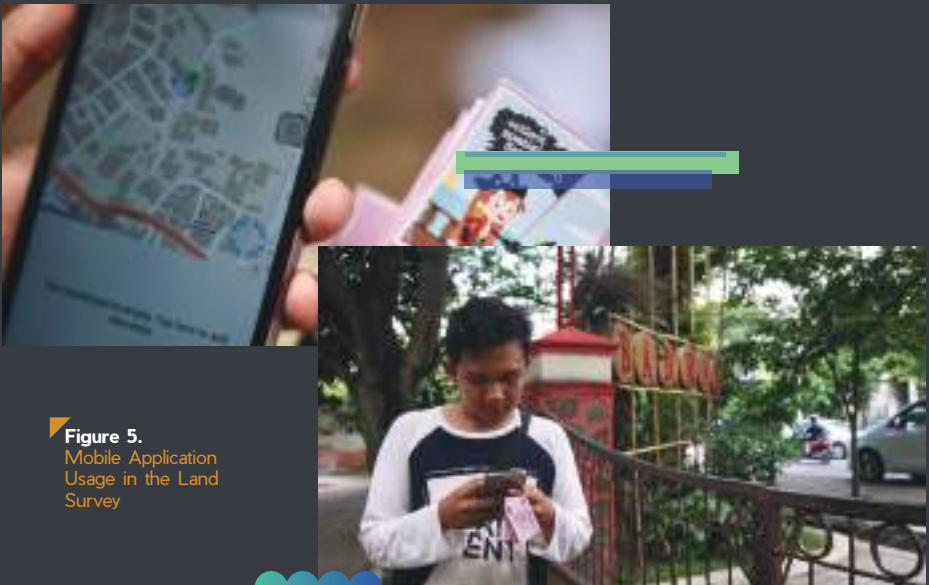


Figure 5.
Mobile Application
Usage in the Land
Survey





■ CHALLENGES

Although the surveyors were armed with IT tools, the field survey was always all but troubleshooting. It was challenging for ArkomSolo surveyors to find the locations of the 165 government assets which were not shown on Google Earth. While they visited each kelurahan office to obtain further information, they could verify only the number of assets within each kelurahan; locational information was entirely unobtainable at the kelurahan level. Next alternative was to wander around to look for white signposts that show the government's land ownership. The signposts that had been installed a long time before did not include other details than a simple public ownership mark, whereas the new signposts relatively displayed more helpful information.

Therefore, interviews with residents nearby became the last resort to ArkomSolo's identification work on the field. Surveyors made questions very simple, even without mentioning the name of a government facility that was supposed to be: "Where is a school nearby?", "Where is a community health center (puskesmas) nearby?" or

"where is a graveyard nearby?" RT/RW heads or random people on the street that the surveyors approached, however, sometimes had no idea of where it is. Then they introduced the surveyors to someone who might know or have more information. This process sometimes ended up with nothing but failure after five times inquiry.

Indra, a college student volunteer, majoring in architecture at Sebelas Maret University, talked about difficulties during the survey.² For example, HP 12 located in Kelurahan Gandekan, originally listed as a badminton court, had already been converted to an elementary school a long time ago, so he had to make an effort to find a person old enough to know the land use change. He also wondered why it was not marked although it was the city government who had made the changes with the head of kelurahan.

Putri, another architecture student volunteer from the same university, indicated one more challenge.³ She had problems in distinguishing every small alley (*gang*) not only because she was not a resident nearby but also because small alleys were not distinctly shown on both paper maps and Google Map. When community people said an alley name, she often hovered around a labyrinth of alleys

so that she had to ask other people several times again. Despite these challenges, ArkomSolo identified a total of 153 government assets in Kecamatan Jebres (Table 3 and Table 4). Roughly 60% of them would not have been nearly as successful without the community survey. The rest 107 assets that ArkomSolo failed to identify still have a huge missing link with the DPPKA list.

Table 4. Distribution of the DPPKA Assets Successfully Identified Based on Kelurahan

Kelurahan	Number of Assets	Areas (m ²)	Area Percentage Share (%)
Gandekan	7	8,524.00	0.73
Jagalan	11	37,080.00	3.16
Jebres	43	500,379.00	42.58
Kepatihan Kulon	4	19,116.00	1.63
Kepatihan Wetan	1	9,556.00	0.81
Mojosongo	43	339,476.00	28.89
Pucangsawit	14	169,762.00	14.45
Purwodiningratan	10	32,830.00	2.79
Sewu	8	27,534.00	2.34
Sudioprajan	5	15,405.00	1.31
Tegalharjo	7	15,414.00	1.31



Table 5. Distribution of the DPPKA Assets on the List Based on Zoning

Zoning	Number of Assets	Areas (m ²)	Area Percentage Share (%)
Green Open Space	39	484,489.00	34.52
Education Facilities	46	235,079.00	16.75
Special Waste Disposal Zone	2	170,324.00	12.13
Special Warehousing Zone	2	147,208.00	10.49
Movement Network	17	144,627.00	10.30
Government Office	14	81,279.00	5.79
Trade and Service	7	46,137.00	3.29
Sport Facilities	5	22,217.00	1.58
Housing	2	19,483.00	1.39
Social Cultural Facilities	4	18,798.00	1.34
Transportation Facilities	3	8,940.00	0.64
Health Facilities	6	7,055.00	0.50
Recharge Zone	2	5,794.00	0.41
Religious Facilities	2	4,765.00	0.34
Public Service Facilities	1	4,443.00	0.32
Mixed Zone	1	2,352.00	0.17
Total	153	1,175,076.00	100.00



■ FINDINGS

Some findings from the field survey are particularly noteworthy, such as land use changes and ill-maintenance of assets. Although a majority of the assets that ArkomSolo identified had been well managed as city or community infrastructure, many functional changes unrecorded on the list were also uncovered. Some public assets had been changed by both the government and local communities earlier. When made by the government, albeit through a legal procedure, changes were not updated on the DPPKA list. Such changes were sometimes on a facility level.

In other words, while an original building on public land was kept or marginally modified, its function had been converted

to another. For example, a community health center in Kelurahan Gandekan had become an elementary school, and a transportation terminal building in Kelurahan Mojosongo had been converted to an informal worker (*pedagang kaki lima*) shelter. Also, there was a case in which the whole area of a public asset had undergone changes. Ronggo Warsito Park in Kelurahan Pucangsawit on green open space zones already fell under transformation due to the Bengawan Solo River Embankment project for flood mitigation. A special waste disposal zone in Kelurahan Tegalharjo had been converted to a city park based on the government's greener vision. All these changes were not recorded on the DPPKA list.



One ArkomSolo staff member attributed the reason to the fact that the city government had lacked the awareness of the importance of regular update or that information sharing had not been done across different departments effectively.⁴ Also, changes on public land made by local communities in an informal or illegal manner had rarely been updated on the government side.

These changes resulted from the government's lack of maintenance and monitoring thus local communities sneaked out and appropriated the abandoned assets as parking lots, settlements or garbage fields, particularly in Kelurahan Mojosongo and Sewu. ArkomSolo recorded all these extralegal changes hoping that the update could be used for more effective utilization of assets, not for forced eviction or enforcement.



Figure 6.
Land Mapping Based
on the Survey Results
©ArkomSolo



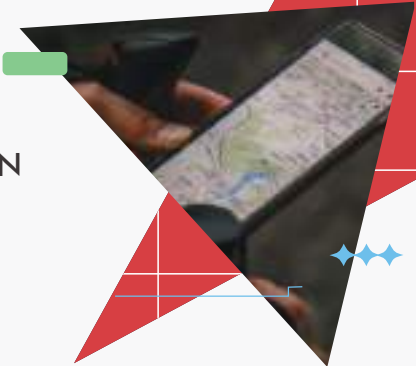


DIGITAL UTILIZATION FOR LAND IDENTIFICATION

The Land Treasure 2017 project ended up with a digitized land database consisting of some detailed information including the current functions, nearby neighborhoods, infrastructure conditions, transportation accessibility, and land certificate issuance. With the collection of land data mined from the ground, ArkomSolo structured a databased and developed a desktop application called Government Land Identification in Kecamatan Jebres (*Identifikasi Tanah Pemerintahan di Kecamatan Jebres*). This database application which is editable by anyone in the future was delivered to the city government.



When designing the layout of each public asset, ArkomSolo used Kota Kita Solo's Mini-Atlas project as a reference. However, the layout could not be copied directly due to several issues resulting mainly from the difference of scale, despite its high quality. While Kota Kita Solo's Mini-Atlas was produced on a kelurahan level so that many details such as small alleys and landmarks are omitted or loosely expressed, ArkomSolo's map was supposed to illustrate those details more noticeably.



In addition, although Kota Kita Solo's layout includes a rich set of demographic and physical information, information about land status and ownership is aggregated on an RW level. Land use or zoning information does not exist on the map. Therefore, ArkomSolo revised Kota Kita Solo's Mini-Atlas layout for its own purpose. Figure 7 and Figure 8 are the examples of a layout displayed in the application.

From Figure 7, you may notice that the current land use as an elementary school still fits the originally designated zoning as an educational facility but that a badminton court no longer exists there. Also, the kelurahan office is also currently occupying part of the land, although it has to be located in space whose zoning is assigned for government offices. Figure 8 shows four informal settler families live on the graveyard designated as open green space which does not allow any settlement development activities inside.





CIVIL SOCIETY ROLES ■ IN IMPROVING LAND MAPPING DATA

Despite about 100 missing assets failed to be detected, ArkomSolo's Land Treasure 2017 project was successful in that it improved the accuracy of the city government's land asset data. In particular, the scope of data collection, treatment, and mapping were not only limited to what the government had requested but expanded to what ArkomSolo believed would enrich the database. For example, while the Surakarta city government had a bit limited number of 'layers of interest' such as the information about locations, land use, and building function changes, ArkomSolo added way more layers of interest for its purpose for marginalized communities as well as for the city government. Their utilization of VGI including Google Earth, Google Map, a mobile GPS application and their self-developed land data mobile display application, combined with own traditional participatory mapping methods, effectively contributed to achieving their objectives.

It might be an interesting topic if the accuracy between Google Earth and OpenStreetMap is compared to see whether more locations would have been detected from the OpenStreetMap, but it is beyond the scope of this paper. The difference in the scale of interest, i.e., between a city scale for the city government and a small neighborhood scale for ArkomSolo, led ArkomSolo to care more about a mode of data collection and mapping—participatory field survey with IT-savvy young volunteers by VGI similarly as the Kenyan Map Kibera project. They modified Kota Kita Solo's exemplary Mini-Atlas maps to tailor a more micro scale.

Land Treasure 2017 also illustrates the interactive selection process of data scopes and digitizing methods. Data scopes define proper digitizing means, and vice versa, as digitization always causes limitations.

The ArkomSolo project shows that a mix of analog and digital methods is more desirable and effective. In many cases, NGOs that have built field experiences with communities for years possess more strengths than the government as they have a better understanding of ‘space’ on a micro scale (McFarlane and Söderström, 2017). Indra, a student volunteer from UNS, also shares his desire for the accommodation of more community-based field survey in the current Indonesian smart city wave to make data better.⁵

Another achievement of Land Treasure 2017 is that it has opened new domains in the management of public assets. ArkomSolo summarized those domains clearly in the recommendation section of the final report submitted to the city government.

First, they place a strong emphasis on the importance of periodic monitoring of city assets on a yearly basis. One staff member of ArkomSolo told he was surprised that the government had rarely updated the asset data since the creation. He said, after recognizing several land use and building function changes on their assets, now the city government is better aware of how crucial regular monitoring is.⁶ ArkomSolo

delivered self-developed desktop software to the city government so that they could carry out a review, monitoring, and updating on a regular basis. Kelurahan offices and communities could also be involved in those activities.

Second, although they stated seemingly neoliberal phrases such as ‘efficiencies’ and ‘optimization’ in the submitted report, ArkomSolo shows possibilities of citizen-led co-production to drive more inclusive cities through a government project. In the Indonesian reality in which many informal settlers reside on abandoned or under-utilized public land, land optimization would mean land clearing and normalization based on the designated land purpose. However, ArkomSolo calls for the city government to carry out a land allotment to appropriately fulfill the needs of low-income communities (*Masyarakat Berpenghasilan Rendah* or MBR) while also advising actions for original land functions. Despite the zoning violation of informal settlements on public land, ArkomSolo suggests alternative ways for land ‘optimization.’ ArkomSolo thinks that digital technologies are helpful for such utilization and management particularly on a kelurahan level or lower as they have more intimate relationships with the land.

■ LESSONS LEARNED

Land Treasure 2017 has not left only high and bright potentials of data co-production. Many obstacles and challenges were also uncovered during and after the project. Although ArkomSolo has promoted social advantages of digitalized land database and methods, how the Surakarta city government would utilize them is still nebulous. As data become easier to be collected, data also become easier to be misused. What if the government land data is used to carry out forced eviction and displacement based on zoning regulations? Better or not, Land Treasure 2017 reconfirms some mismatch between designated and current land uses on public assets.

A borderline again has been drawn between ‘acceptable’ and ‘unacceptable’ purposes based on the latest spatial plans such as RDTR and RTBL (Vanolo, 2014). It is unclear how many people actually living on, but green open space, the largest share of the Surakarta city government’s assets, is very common with livelihoods of informal

ubiquitous with livelihoods of informal settlements.

Those livelihoods of marginalized people are still, or more than before, at risk of threats. If those people and their activities were regarded as ‘non-smart’ for achieving the city’s 3WMP vision or any so-called smart city projects, they might be regulated and kicked out. Settlement demolition and eviction due to land disputes, albeit around private ownership, is an ongoing issue in Kecamatan Jebres and elsewhere of the city (SoloPos, December 19, 2018).⁷

The Public asset data have already been in the government’s hand back, and unfortunately, the civil society is not as strong as the government. It would take time to build more transparent, accountable and responsive data governance in Indonesia, particularly on land, which became the backdrop of the ‘One Map’ policy (The Jakarta Post, March 19, 2016).⁸





Second, more importantly, the sustainability of the co-productive mapping approach between the city government and ArkomSolo is yet unsecured. ArkomSolo, concerned whether digital data collection and mapping are reduced to mere technological approaches for reinforcing governmentality, makes every effort to open more grassroots possibilities in the current digital age.

Although ArkomSolo considers itself as a co-productive partner, to be fair, their engagement in the project is viewed more like a private consultancy to the city government. The City of Surakarta completed a similar project for 2 Kecamatans by the end of the year 2018: Banjarsari and Laweyan. However, it was a private consulting company specialized in IT geospatial work for years who was commissioned by the city government, not ArkomSolo. The Terms of Reference (TOR) shows a heavier focus on IT-related aspects. While the project workforce comprised one database expert, one programming expert,

one GIS expert, one computer operator, and one planning assistant, only three surveyors were assigned for field survey work. The scope of contents became relatively simplified ranging from location to address, coordinates, and land area and to current land allotment, land photographs, designation certificates, and video documentation, many of which are even not adequately shared with the public. You may see a set of minimal information from the city's Peta Aset Tanah website (<http://bppkad.surakarta.go.id/sinta/>).

ArkomSolo does not always necessarily need to be a partner for such a kind of projects, but at least, their know-how and experience could have been shared with the newly hired working group. An ArkomSolo member verified that they had not had any chance to meet their successor. Despite not knowing in detail, he circumspectly conjectured that Arkom's methods would not have been shared.⁹

■ CONCLUSION

Digital technologies definitely provide for us with higher potentials to make our society more sustainable and equitable than ever before. Citizens are no longer passive beneficiaries of data that the state produces and provides but are active data producers and users. It is not exceptional to witness a lot of individuals and civil society organizations who are IT-savvier than people of the government. There are more real-time data users and producers all around us.

In contrast, in many cases, the public sector lags behind the private or civil society sector in adopting state-of-the-art technologies. The state tends to adopt those technologies based on its needs and priorities in a selective manner. When it needs, the state pushes a strong drive such as smart city initiatives although many citizens have no idea of what they are actually. In certain areas, the state becomes more resistant to new technologies. Public land asset management is one such area.

Although there are some limitations, ArkomSolo's pioneering approach for improving the city government land asset data illustrates that the quality of public data can become better any time with the engagement of citizens and that such involvement has to be more genuinely participatory, not superficially with a check mark that people were there, when using the latest digital technologies. There are concerns that the digital age might reinforce the existing imbalanced power structure between the state and citizens as the state could wield more power with data in its hand, but there are also voices that civil society might have a stronger transformative power to exercise against the state. Not to make a citizen-participatory or led project such as Land Treasure 2017 left as a separate single project, persistent data-based activism and advocacy are necessary.

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¹For more details, visit this website: <https://landportal.org/book/narratives/2017/countries-indonesia-context-and-governance>.

²Interview on December 16, 2018.

³Interview on December 16, 2018.

⁴Interview on December 16, 2018.

⁵Interview on December 16, 2018.

⁶Interview on December 16, 2018.

⁷SoloPos. (2018, December 19). Sengketa Kertingan Baru Solo: Eksekusi lagi, ricuh lagi!. Accessed on December 19, 2018, from <http://soloraya.solopos.com/read/20181219/489/959833/sengketa-kertingan-baru-solo-eksekusi-lagi-ricuh-lagi>.

⁸The Jakarta Post. (2016, March 19). Needed: Better data governance. Accessed on December 21, 2018, from <https://www.thejakartapost.com/news/2016/03/19/needed-better-data-governance.html>.

⁹Interview on December 16, 2018.

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ABOUT CFDS

Center for Digital Society (CfDS) is the research center established by the Faculty of Social and Political Sciences, Universitas Gadjah Mada. The institution is created under the concern over the contemporary dynamics of socio-political condition of the world that is accentuated by the impeccable influence of information technology. The phenomenon triggers the new patterns and complexities in the society, and thus requires new approaches in managing such complexities.

CfDS pledged to delve more on the study of contemporary digital society, including related issues surrounding the topic; such as the issues of smart city and urban development. The emphasis is then put on the utilization of technology to shape the society in becoming digitalized, as well as to bring solvency to social issues.

Vision

Solving Social Problem and Accelerating Prosperity through Indonesia Digital Society

Activities

1. Research and Development
2. Dissemination and Publication
3. Education and Policy Advocacy

Research Scopes

1. Digital Governance
2. Digital Economy
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