

Smart Village and Rural Transformation: Opportunities and Challenges

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Abstract. The ubiquitous presence of digital technology and how this has reshaped the everyday life of people has been in the spotlight. Recent academic discussion regarding this topic has been dominated by the notion of ‘smart city’, generally associated with the injection of digital technology and information and communication infrastructure in the urban system. This paper aims to shift the current geographical epicentrum by zooming in on the main issues surrounding ‘smart village’. Being often seen as a peripheral geographical unit, the diffusion of digital technology in rural areas is interestingly unavoidable. Technocrats from both developed and developing countries have been increasingly attracted by the promises offered by the utilization of digital technology for rural development. To this end, the objectives of this paper are twofold. First, this study sketches what smart village actually means and how this concept has been adopted in several developing countries by virtue of literature review. Second, we use the case of Banyuwangi, Indonesia, to dissect the main drivers underlying smart village development. The data used for the second objective was mainly retrieved from a series of in-depth interviews with relevant actors in Banyuwangi in 2020 (online). This paper concludes the need to place smart villages as a means to achieve certain development priorities. In doing so, the three key drivers of smart villages, i.e., policy, technology, and human, should be utilized equally as (digital) technology alone is not enough to drive a city/region’s digital transformation.

Keywords: Banyuwangi; Digital technology; Rural transformation; Smart village.

1 Introduction

The relation between technology and development has long been a topic of discussion within academia [1], [2]. In particular, how technological advancement relates to and has affected the social world, including, *inter alia*, economic development and social change, has gained more and more traction among scholars, particularly within the realm of social sciences [3], [4]. Within this discussion, the topic concerning digital technology has in particular gained increasing appeal over the last decade [5]. Amid the penetration of digital technology into all

aspects of our everyday life at different geographical scales, the smart city has in particular become the most popular label, both within the academic world and policy circles [6], [7]. This concept in general refers to the use and development of digital technology in urban areas to improve the functioning of cities [8], [9].

In terms of geographical perspective, it is clear that the discussions and practices of digital technology tend to be centered on urban areas. On the other hand, villages (refer to administrative areas) or rural areas (refer to functional areas) are oftentimes overlooked within the mainstream discourses and agenda. As noted by PricewaterhouseCoopers [10], urban areas are viewed as one of the present-day global megatrends that should receive central attention. It is undeniable that the world has increasingly become more urbanized, where the majority of the world's population now lives in urban areas [11]. Meanwhile, in terms of economy, cities, especially large cities and metropolitan areas, have also become the center of global economic growth and capital accumulation [12]. In a somewhat controversial proposition that has yielded inconclusive debates within urban scholars, Brenner [13] has claimed that all development processes on planet Earth are in fact 'urban process' or what he dubbed 'planetary urbanization'. That said, development process and economic activities taking place in the non-urban areas such as oceans, villages, plantations, forests, and other areas on Earth is considered as part of capital accumulation processes through which (most of) the profits and benefits resulted are linked to and have returned to (the favor of) cities.

However, it should be noted that in addition to their sheen portrayal, cities also entail complex multi-dimensional problems, concerning social, ecological, economic, and infrastructure aspects. In terms of environmental issues, for instance, cities are the largest global producers of waste and greenhouse gas (GHG) emissions [14]. Therefore, urban areas are not only seen as a source of global problems, but can also be a source of solutions to these problems [15]. Given this narrative, combined with the expectation that digital technology can deliver solution to various development problems, it is therefore not surprising that discourses on digital technology are strongly intertwined with urban issues.

In this article we attempt to shift the geographical locus of digital technology experimentation by investigating the 'smart village' concept. To this end, the objectives of this paper are twofold. First, we provide a brief discussion on what smart village actually means and how this concept has been adopted in several developing countries by virtue of literature review. Second, we use the case of Banyuwangi, Indonesia, to zoom in on the drivers underlying smart village development. For the second objective, we deployed a particular framework that we will discuss later in the other part of this paper.

2 Digital technology and rural development in Indonesia

Although often being overlooked, rural areas in Indonesia have also emerged as key arenas for the experimentation of different forms of digital technology [16], [17]. Various actors, including government and private sector, have played an equally important role in the diffusion of digital technology in rural areas. The presence of the internet and the widespread use of smartphones, for example, have opened up opportunities for private actors to do business in these peripheral regions. In fact, several local Indonesian start-ups operating in the

agricultural sector, such as TaniHub, eFishery, and iGrow, have given farmers greater access to wider markets as well as to new knowledge of agricultural practices.

In the context of Indonesia, the inevitable penetration of digital technology into rural areas requires more attention. There are several considerations of why the coupling of digital technology and rural areas needs to be carefully noticed and studied. First, almost 50% of Indonesia's population still lives in rural areas [11]. Second, urban problems in Indonesia, especially due to rapid and over-urbanization, cannot be solved by cities alone, but also need to be concurrently addressed through crafting an apt development strategy in rural areas [18]. Third, policies related to the development and utilization of digital technology tend to disregard peripheral geographical areas such as rural area and peripheral economic sectors such as the agricultural sector [19].

Specifically in relation to the third aspect, there has been a view to see technology as a blanket phenomenon, thus disregarding the diversity of socio-economic landscapes in different places. Such a view may have resulted in digital inequality of (access to) technology that in turn would create a digital divide. The term digital divide (DD) refers to the inequality of access to information and communication technology between individuals or communities, including between communities in rural and urban areas [20].

From a geographical point of view, people in urban areas tend to have better access to varying infrastructures, including electricity and telecommunication. Such a condition is also clearly visible in the developed world. Rural residents in many of these countries have not fully enjoyed internet access. Referring to the data published by the (Organization for Economic Co-operation and Development (OECD), about 84.5% of rural households in the European Union (EU) member countries have internet access, compared to 91.4% of urban households [21]. The percentage of internet access in rural areas decreased in the case of several European countries with relatively lower economic levels (and relatively high economic inequality), such as France (77.1%), Portugal (71.2%), and Greece (68.7%).

In Indonesia, referring to the same OECD data source, in 2018 the percentage of households in rural areas with internet access was 51.9%, while in urban areas the number increased to 78.1%. This figure is relatively higher (which can be due to different approaches to measurement) with the indicators issued by the Ministry of Communication and Informatics of Indonesia (MCI) [22]. Referring to this national data, only 26.3% of rural households had internet access compared to 48.5% of urban households.

Given this inequality number, government intervention in the provision of more equitable telecommunication infrastructure and internet access becomes crucial. If standing from a business point of view, many private telecommunication companies tend to offer their services to urban communities mainly because of the large urban market and the availability of basic infrastructures. So, although the Indonesian central government has already implemented the Palapa Ring initiative (the construction of 36,000 kilometers of fiber optics) starting in 2007 in order to provide telecommunications services across all regions in the country, its implementation is considered not optimal [23]. For instance, in localities (*kota* and *kabupaten*) that have already obtained internet access, there are still gaps within each locality, especially between urban and rural areas [19].

3 Smart village: a brief overview

The smart village label seems to mimic its ‘older cousin’, i.e., smart city. Both of these labels have come to the fore following the ubiquitous presence and the rising prominence of digital technology. There is no single definition of what smart village or smart city actually means. Different scholars and institutions have their own interpretation and emphasis. In this paper we do not intend to explain the varying definitions surrounding smart village.

Amid its multiple interpretations, and similar to that of smart city, smart village generally refers to the incorporation of digital technology into the rural system to improve the overall village functioning. Indeed, both concepts share some commonalities. The first one relates to their desired outcomes. Both concepts put sustainable development as their ideal goals [24]. The second one relates to their multiple development aspects. As a ‘comprehensive’ rural or urban development strategy, both smart village and smart city concepts comprise multiple aspects, such as smart government, smart energy, smart people, and others [25], [26].

A striking difference is that due to its geographical characteristics, smart village, particularly in the context of developing countries, highlights the issue of ‘remoteness’ and how digital technology can help change the direction of these relatively underdeveloped regions [27], [28]. Another important issue that generally covers the conditions in both the developed and developing world relates to urban development. That said, smart village development is expected to help improve and generate more mutual rural-urban interrelations in the long run [29]. All-in-all, by adopting the smart village concept, it is expected that the fate of rural areas would change, not solely in terms of technical aspects, but also social and economic ones. In short, digital intervention is envisioned to help lead rural transformation.

Having received increasing attention in the developed world, the smart village label has been also adopted in many developing countries. How this concept is interpreted in these countries seems to depend on the rural characteristics, needs, and policy directions in each country. The following part briefly discusses the adoption of smart village in India and Malaysia. This part did not intend to make a comparative gesture to Indonesia, but rather aims to provide a sketch that there is, as we already mentioned earlier, no single model of smart village.

3.1 India

India has built its reputation as a global leader in the ‘smart city’ initiative, particularly through the country’s 100 smart city projects. However, in India the village is the heart of the nation since most of the country’s inhabitants still live in rural areas. In doing so, a number of programs have been implemented to support rural development, including ‘Provision of Urban Amenities in Rural Areas’ or PURA. Various initiatives have been also devised to integrate rural development with information technology, which are later known as part of smart village development [26], [30].

The Indian government started to realize the importance of ICT in rural areas in the 90s. An umbrella program spanning multiple departments would be the ‘National e-Governance Plan

(NeGP) initiative. Large infrastructures, including ICT infrastructures, across the country reaching as far as remote villages have been developed. NeGP was formulated by the Department of Electronics and Information Technology (DEIT) and the Department of Administrative Reform and Public Complaints (DARPC). However, the benefits received from NeGP initiative are felt to be far from optimal, mainly due to limited internet speed, availability of electricity, trained personnels, and awareness among farmers. In addition to this, the utilization of digital tools for sustainable rural development in the NeGP is considered to be less satisfactory due to lack of clear strategies and planning, given different rural situations [31].

Another prominent initiative is the Kisan Call Center (KCC). KCC is one of the main initiatives taken by the Ministry of Agriculture and Farmers Welfare in January 2004 to provide real-time agricultural and sector-related information to the farming community via toll-free telephone or cellular. KCC is a synthesis of two separate technologies namely, information and communication technology (ICT) and agricultural technology, both of which are domain specific, use open source software, and are India's most important tele-agri consulting service. This service can meet the needs of individual farmers because the information is provided in their native language and is relevant to their location. Apart from that, farmers also get valuable information related to new farming practices which also help in building the trust of the rural class to the government [32], [33].

One of the key ICT development policies in recent years is 'Digital India (DI)', which was launched on 2 July 2015. The motive behind the DI concept is to build a participatory, transparent and responsive system through digital technology. DI encourages the transformation of India toward a knowledge economy and digitally empowered society, good governance through synchronization and coordination in public accountability, digitally linking and delivering government service programs and mobilizing information technology capabilities across government departments. Through this project, government services are made available to all citizens digitally or electronically, eliminating the digital divide between rural and urban India. DI aims to connect villages across India through broadband highways, public internet access, universal access to mobile connectivity, e-governance, e-kranti electronic delivery of services, information for all through MyGov.in, electronic manufacturing target net zero import, early harvest programs, and IT for jobs—known as the nine pillars of DI. The various pillars are grouped into three core areas, namely digital infrastructure, digital-based governance and services, and digital literacy empowerment [34], [35]. Some of the projects under DI are [31], [36]: (1) Digi Locker for storing citizen documents digitally verified by the Department of Electronics and Information Technology; (2) Pradhan Mantri Grameen Digital Saksharata Abhiyan, released by the Department of Electronics and Information Technology is a scheme to empowers citizens in rural areas by training them to operate computer or digital access devices; (3) Bharat Net initiative, a high speed digital roadway to connect all *panchayats* in India; (4) E-literacy which provides digitally enabled e-learning services for those who are illiterate in villages to learn skills-based literacy; (5) Attendance.gov.in, the application of the Biometric Attendance System (BAS); (6) MyGov.in platform for sharing citizen input and ideas on policy and governance issues; (7) Swachh Bharat Mission (SBM) is a mobile app to achieve the goals of the Swachh Bharat Mission; (8) E-Hospital Application, (9) National Scholarship Portal; and (10) E-Sign framework for signing documents online.

3.2 Malaysia

The Malaysian government with the principle of ‘1 Malaysia, People First, Performance Now’ has developed and linked rural development through the ‘Government Transformation Program (GTP)’ which was introduced by the then Prime Minister, Najib Tun Razak in 2009. The GTP aims to reform public services and is designed to provide a roadmap towards achieving developed country status by 2020. The GTP has been implemented in three phases: (1) GTP 1.0 (2010–2012) focuses on the implementation of basic rural infrastructure, such as road repairs, access to clean water, 24-hour electricity access, and others; (2) GTP 2.0 (2012–2015) targets remote area development; (3) GTP 3.0 (2015–2020 and beyond) emphasizes the insertion of science, technology, and innovation in rural development. GTP focuses the government’s efforts on improving services in six national key result areas (NKRA): crime, corruption, education, rural infrastructure, urban public transport, and poverty. Additional NKRA—cost of living—was added in 2011. A specific focus area led by the Minister of Rural and Regional Development for improvement and short-term results of NKRA achievement was the improvement of basic rural infrastructure coordinated by the Rural Development team - National Key Results Area (RD-NKRA) [37], [38].

In addition to providing basic infrastructure, the RD-NKRA team also introduced the ‘21st Century Village (21CV)’. This program aims to catalyze economic development and transform rural areas into more developed and sustainable economic centers. 21CV consists of four transformation pillars: (1) investing in youth through the Rural Business Challenge (RBC); (2) investing in the potentials of rural agriculture by utilizing premium fruit and vegetables from the Entry Point Project (EPP); (3) investing in villages through cooperatives from the Sustainable Village Program; and (4) creating an integrated village through the ‘Rimbunan Kaseh’ program.

Rimbunan Kaseh adopts the Rurban (Rural-Urban) concept which aims to overcome the rural-urban dualism so that the rural-urban relationship becomes more symbiotic in various aspects, namely politics and administration, economics, demographics, socio-cultural, infrastructure and information, structural, innovative, technology, education, law and environment (commonly abbreviated as PEDITELE). Furthermore, in the development of the Rurban dualism phenomenon, the urban development gap can be reduced through the utilization and use of ICT and other means of communication between the rural and urban sectors. The federally funded Rimbunan Kaseh initially started in northeast Kuala Lumpur covering 30 hectares, consisting of a project to provide 100 affordable homes with recreational, educational and technology training facilities and a creative farming system designed to provide food, as well as additional income for villagers. This model is expected to be a good example of overcoming rural poverty by promoting environmental sustainability through technology [30], [39].

Malaysia also has other project related to digital initiatives within the framework of rural development, namely ‘Smart City Smart Village (SCSV)’, which is one of the projects in the Digital Malaysia initiative. This initiative was approved by the Global Science and Innovation Advisory Council (GSIAC) Malaysia in 2010 and is an extension of the Multimedia Super Corridor initiative introduced in 1990. This initiative has three main objectives, namely: (1) accelerate economic growth by providing connectivity and information to increase

productivity, (2) improve quality of life to be safe and protected for work, study, and play, and (3) support a greener environment for social and economic sustainability through improved resource planning. To support the development of SCSV applications, Honeybee Computing has been proposed as a concept based on advanced ubiquitous computing to develop smart farming applications [30], [40].

4 Analytical framework and method

In this paper we adopted the framework developed by Yigitcanlar et al. [41]. Although this framework is proposed to analysis smart city, we also find its usefulness for smart village. In short, this framework is developed based on an extensive literature review where various topics of discussions (and debates) concerning smart city have been synthesized and systemized into an input-process-output model logic. Based on this logic, this framework is divided into three layers (**Figure 1**). The first layer is the ‘input’ which is the city itself as the asset. The second layer is the three drivers, i.e., policy, technology, community (or in this paper we opt to use ‘human’), that form the ‘process’. The third layer is the ‘output’ which is the desired outcomes, i.e., productivity, sustainability, accessibility, wellbeing, livability, and governance. In this paper we only focus on the second layer: the three main drivers. Given the causal-link mechanism, the drivers are considered as a key starting point to understand of how a city/region’s assets have been utilized and then translated to achieve desired outcomes.

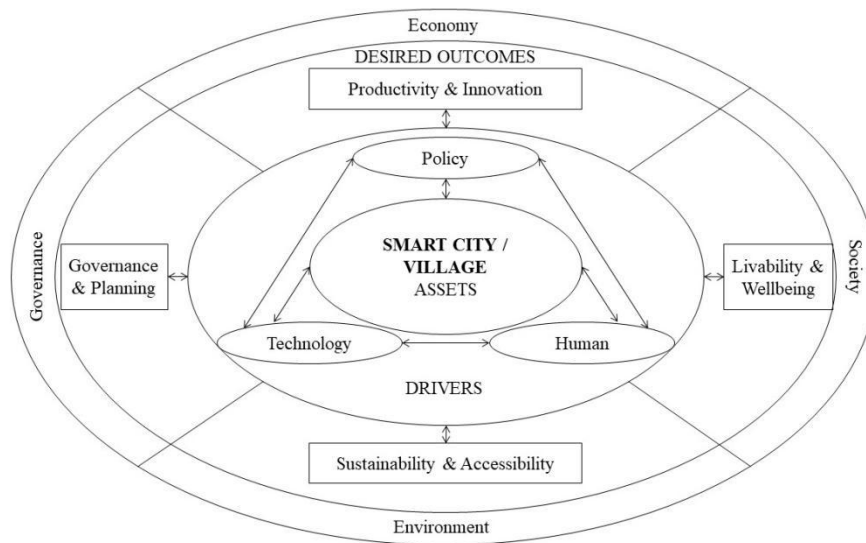


Fig. 1. Input-process-output model of smart city

The analysis of these drivers was mainly based on the primary data retrieved from a series of in-depth interviews with 12 key informants in Banyuwangi. These informants come from different backgrounds, notably local government from various departments (OPD), village government, local talent, community activist, tourism activator, and private entity. All of these interviews were conducted online from August to December 2020. Secondary sources such as

official documents, statistical reports, reputable media articles, relevant webinars, and relevant studies were also used to support and enrich our interview-based data.

5 Three main drivers of Banyuwangi's smart village development

Banyuwangi Regency is located in the most eastern part of the island of Java: this regency is therefore dubbed as the 'Sunrise of Java'. In terms of total land area, Banyuwangi is the largest regency (*kabupaten*) in East Java Province (5,782.50 km²) with a coastline of 175.8 km (Local Government of Banyuwangi, 2019). Banyuwangi's land use mainly consists of natural landscapes, i.e., forests (32%), plantations (14%), and rice fields (12%) [42]. Coupled with its mountainous area, mainly in the western and northern part of the regency, and beaches, Banyuwangi has a variety of natural tourism potentials to offer.

Banyuwangi, however, used to be an economic backwater. Even, this regency was nationally known as the center of occultism and mysticism. Before the introduction of tourism sector, Banyuwangi's economy relied so much on the agricultural sector. To amplify this peripheral status, although Banyuwangi has Bali as its neighbor, it has hardly reaped any significant economic benefits from its strategic geographical positioning. Banyuwangi was like a place in-between where its port became the only attractive place that functions as a hub connecting the island of Java with the tourism island of Bali. So, visitors from Java who intend to go to Bali have to cross from the port of Ketapang in Banyuwangi to the port of Gilimanuk in Bali and *vice versa*. The fate of Banyuwangi start to change gradually particularly since Abdullah Azwar Anas took office in 2010, where smart village development was also part of his development vision.

Some signs of progress can be seen to mark Banyuwangi's transformation. In terms of tourism, there has been a significant increase of tourist visits from 491,000 domestic tourists and 12,505 international tourists in 2010 to 5.3 million domestic tourists and 101,622 international tourists in 2020 (despite the covid-19 pandemic situation) (**Figure 2**) [42]. Meanwhile, the number of micro, small and, medium enterprises (MSMEs) have also increased from 269,267 in 2015 to 279,706 in 2019 [43]. About 14% of MSMEs in 2019 already went digital [43]. This digitalization process has been supported by the development of ICT infrastructure where all villages were already connected to the internet by 2019. Overall, viewed from the village development index (*indeks desa membangun*) and gross domestic regional product (GDRP) (**Figure 3 and 4**), Banyuwangi has experienced improved performance over the last five to ten years.

In the next part of our paper, we will briefly describe the three main smart village drivers underlying the transformation of Banyuwangi from a witchcraft district (*kota santet*) to a digital district (*kota digital*). As mentioned earlier in the framework section, to dissect Banyuwangi's smart village experimentation we focus on three main drivers, i.e., policy, technology, and human.

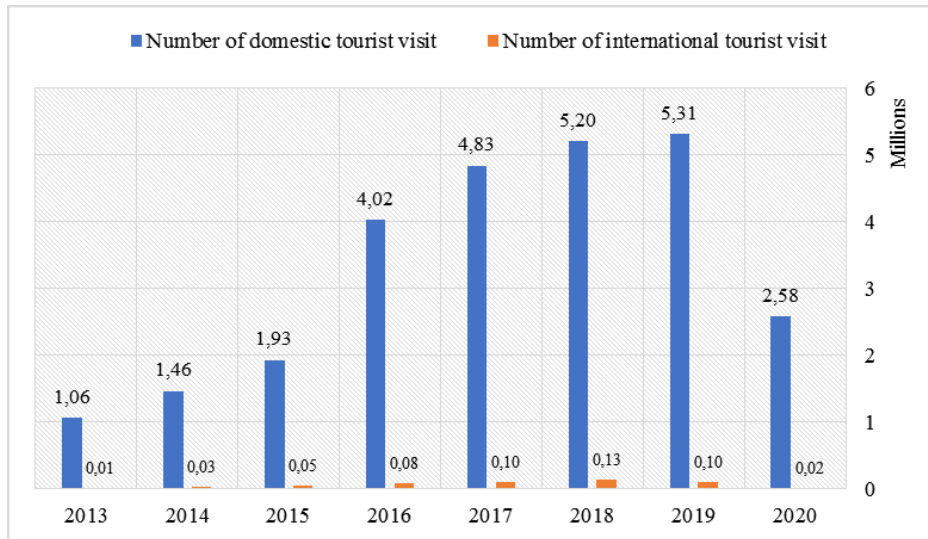


Fig. 2. Number of tourist visits in Banyuwangi [42]

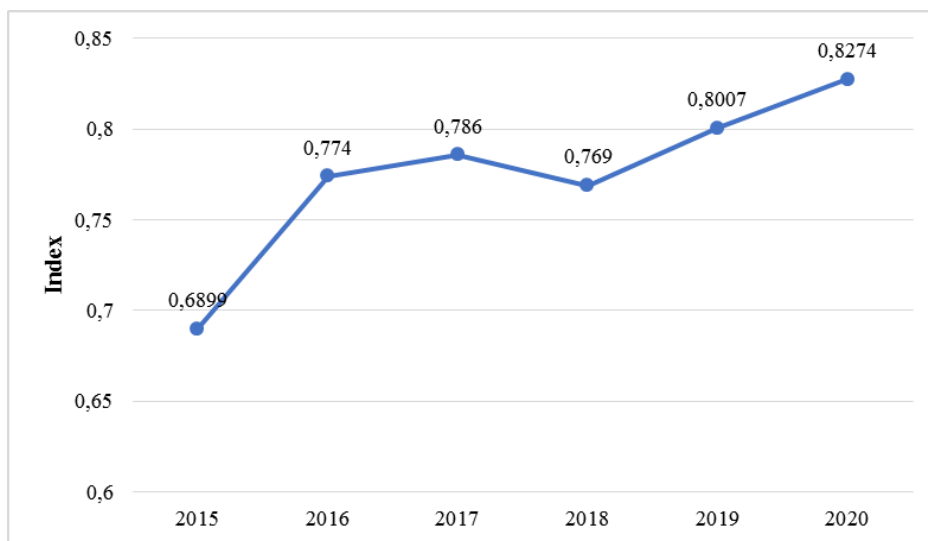


Fig. 3. Banyuwangi's village development index [42]

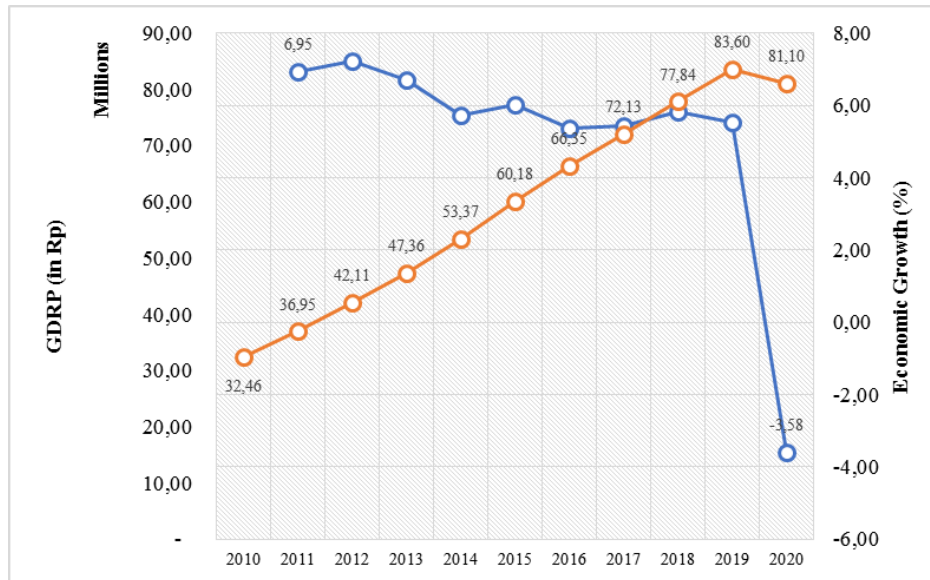


Fig. 4. Gross domestic regional product and economic growth of Banyuwangi [44]

5.1 Policy

The presence of well-sound policies has indeed played a critical part in driving smart village development in Banyuwangi. While technology is the signature component of smart village or city, policy is regarded as its foundational component as it can direct how technology will be used and developed. First and probably the most basic one is the policy regarding the development of information and communication technology (ICT) infrastructure. ICT infrastructure has been placed equally as other infrastructures, such as roads, bridges, and airport (Blambangan airport) as the regency's top infrastructures priority even within the period prior to Anas' leadership. When Anas took office, there was a specific mandate to allocate a proportion of village fund (*dana desa*) for ICT development, operation, and maintenance in all villages. This has been done because there is little chance that the private operators will invest in remote and lagging behind areas. Many of Banyuwangi's villages can be categorized into this type of areas.

Another important aspect of policy is that Banyuwangi focuses on certain sectors and principles of development, indicating a clear development trajectory of the regency. The most clear-cut one is that the tourism sector has been directed as the regency main economic driver that is expected to create multiplier effect. Due to the presence of a large number of low- and middle-income citizens, the development of tourism sector and other sectors should comply with the inclusive development vision. This inclusive vision has been thus elaborated in many (if not most) of Banyuwangi's development programs. Another important principle is that Banyuwangi's development should be based upon the development from and of its villages. A signature program of such village development would be the 'Smart Kampung' program. However, it should be noted that not all villages have enrolled in this program.

5.2 Technology

The second driver of smart village is (digital) technology. There has been a gradual utilization and development of digital technology in Banyuwangi. As discussed earlier, as part of ICT infrastructure development, Banyuwangi's local government had paved the backbone of Banyuwangi's digitalization process by installing internet infrastructure and Wi-fi points in some villages (*desa*) and all district (*kecamatan*) offices at first. This development had then been continued and expanded by Anas where all villages are now already connected to the internet. Additionally, Banyuwangi has also installed as many as 1,400 public Wi-fi points across different places.

In 2015 Banyuwangi's local government started to develop a digital system at the regency-wide level. In addition to the e-government system integrating all local government departments (OPD) and all government offices across different administrative levels (i.e., district and village offices), the local government has also initiated a number of applications to support Banyuwangi's digital transformation. The first notable project would be Banyuwangi Mall, a local online market-place which was developed by Banyuwangi's local government in cooperation with a national state-owned bank (BNI). Another digital system initiative in the economic sector is 'Osing Pay'. This is an electronic-based non-cash-payment application that was developed in cooperation between three parties, namely Banyuwangi's local government, a regional state bank (Bank Jatim), and a national private company (PT Veritra Sentosa Internasional). Furthermore, in the tourism sector, Banyuwangi's local government has developed a digital-based tourism management system through 'Banyuwangi Tourism' application. Unlike the previous two digital systems, the latter one was developed by Banyuwangi's local government independently by utilizing Banyuwangi's local talents.

This regency-level development has been followed by the development of digital system at the village level which is also known as the 'Smart Kampung' program. In this program, village office is directed to become a community center where various public-related services are provided and different activities are organized. This included many public services that used to be delivered at the regency and district levels are now given at the village level. The aim of this decentralization of governance and digital system is to bring government services closer to their citizens. In this program, the village office is also responsible for collecting population data, including collecting and managing poor residents' databases.

In some villages, customized applications have been developed by village officials and/or residents such as Dewitari which is a tourism application in Tamansari Village. Another example is SiPadu, a digital-based system initiated by Tambong Village. The residents have also used the internet individually to connect themselves to the outer world for social and economic purposes, including marketing their products through national and global online market-places.

5.3 Human

In terms of human drivers, we classify this into two categories: local state apparatus and citizens. There have been efforts to improve the quality of state apparatus through various means. The most basic one is by organizing trainings and facilitations so that the officials become more digitally literate and are able to support Banyuwangi's digitalization process. The second effort is to attract potential local high-quality talents by providing scholarships in reputable universities and opportunities for them to work in various local government sectors. It is expected that new ideas can be generated by these young local talents. Meanwhile, to support digitalization at the village level, two IT operators are stationed in each village office.

In the context of Banyuwangi, citizens are positioned more as beneficiaries of various services provided by the government. It is expected that they, including the poor residents, can enjoy a better access and quality of services, as well as a better transparency of these services' delivery. In general, while citizens tend to be an object of development, there are also some signs of citizens' active participation. In certain villages, together with village officials, village residents have generated new ideas and created different activities to support rural development. In Tamasari Village, for instance, the village-owned enterprise (BUMDes) and village residents have developed their houses as homestays for visitors. This village is located about 17 km (or about 30 minutes by car) from Ijen crater, the most well-known tourist destination in Banyuwangi. Many of these homestays are already listed in several national and global online tourism platforms, such as Pegipegi, Booking.com, and Agoda. Another form of active participation also includes the development of some digital applications as discussed earlier. However, these 'bottom-up' initiatives tend to be sporadic and did not occur in all villages.

6 Discussion and conclusion

Similar to its older cousin, i.e., smart city, smart village has been also used as a 'techno-centric' development strategy that is expected to address different aspects of rural development. While this concept offers some promises, the success (and failure) of its implementation depends greatly on various factors. In this paper we aim to unpack such a relatively 'success' story by focusing on the main drivers underlying smart village development in Banyuwangi, Indonesia. The drivers' perspective itself only constitutes a fraction of a larger framework developed by Yigitcanlar et al. [41]. Here, our focus can be viewed from two lenses. First, this focus can be seen as the limitation of this paper as it is unable to reveal the overall process underlying the transformation of Banyuwangi through smart village development. Second, and on the other hand, this focus can be also seen as an opportunity to dig deeper into certain things that are crucial to smart village development in Banyuwangi.

Viewing smart villages as a socio-technical system, the three main drivers discussed can provide insights into the extent to which equal attention should be given to other aspects than technology. As we have noted earlier, although (digital) technology is a crucial component of smart village, it is not the only factor driving the success of smart village development. In the

case of Banyuwangi, it can be gleaned that policy and human drivers have been also acknowledged and have therefore played an important part in Banyuwangi's rural transformation.

However, some elaborations on the drivers proposed by Yigitcanlar et al. [41] should be made as these drivers seem to reflect the empirical situation in developed countries. For instance, in terms of policy and in the context of decentralizing Indonesia, it is clear that the presence of supportive policy cannot be separated from the role of leadership. In Banyuwangi, the role of the regent has been crucial in directing the regency's development by focusing on a certain sector and by embracing several development principles, most notably inclusive development and development from and of villages.

Another elaboration is the discussion of local state apparatus in addition to citizens as part of the human driver. In many developing countries, including Indonesia, the state of local state apparatus to support digitalization process is far from ideal. This particular situation has pushed Anas to improve the capacity of its officials so that they will become the operational scaffolding underpinning the operation and development of the regency's digital government system. Another important thing related to the human driver is that active participation from village officials and residents have indeed played a significant role in changing the direction and progress of rural development. This can be clearly seen in the case of Tamansari village and some other villages.

All-in-all, from the framework that we deployed, smart villages should be viewed as a means (rather than an end) to achieve certain development priorities. In the case of Banyuwangi, the smart village concept has been adopted and adjusted in ways that are perceived to be more relevant to the needs and priorities of this regency. To fully utilize a city/region's assets, the three drivers should be treated equally and in an interconnected fashion.

Finally, from a regional planning and development perspective, smart village development should be placed within a multi-scalar governance framework where village(s) development is part of a city/region-wide development. In Banyuwangi, this multi-scalar issue seems to be in harmony. However further studies are needed to probe the actual inter-actor interactions and the (undisclosed) conflicts between the different actors.

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