



Article

Amidst Covid-19 Pandemic: An Adaptive Disaster Governance in Yogyakarta, Indonesia

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Abstract: Since Indonesia reported its first case of COVID-19 in the capital, Jakarta, in early March of 2020, the pandemic has affected 102,051,000 lives. In the second week of the month, the government mandated all sectors to take necessary actions to curb the spread. The research set out to evaluate how the disaster emergency response was carried out amid the COVID-19 pandemic in the Special Region of Yogyakarta (SRY). The research employs qualitative observation of adaptive governance variables, i.e., infrastructure availability, information, conflict mechanism, regulation, and adaptation. The research analyzed primary data collected from focus group discussions with key persons at the Local Disaster Management Agency, Local Development Planning Agency, and Disaster Risk Reduction Platform responsible for the crisis and included an online survey to validate data. The research revealed that the SRY had exhibited adaptive governance to the COVID-19 pandemic, as apparent by, among others, open-access spatial and non-spatial data, extensive combined uses of both types of data, and prompt active engagement of communities in the enforcement of new rules and regulations mandated by national and provincial governments. Furthermore, during emergency responses to COVID-19, the stakeholders provided infrastructure and information, dealt with conflicts in multiple spatial units, encouraged adaptations, and formulated emergent rules and regulations. For further research, we encourage qualitative analysis to confront other types of natural disaster for the research area.

Keywords: disaster; response; adaptive; COVID-19; Yogyakarta

Citation: Hizbaron, Dyah Rahmawati, Dina Ruslanjari, and Djati Mardiatno. 2021. Amidst Covid-19 Pandemic: An Adaptive Disaster Governance in Yogyakarta, Indonesia. *Social Sciences* 10: 92. <https://doi.org/10.3390/socsci10030092>

Academic Editor: Sigrun Kabisch

Received: 3 December 2020

Accepted: 1 March 2021

Published: 6 March 2021

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1. Introduction

It was 14 March 2020, or nearly a week after Jakarta, the capital of Indonesia, reported its first COVID-19 case, that a patient in Yogyakarta tested positive for the disease. As in other cities across the globe, numerous preventive actions have taken place, such as social distancing, physical distancing, a more hygienic lifestyle, self-quarantine, lockdown, and limited mobility through travel restrictions among regions (Ascani et al. 2020; Asongu et al. 2020; Djalante et al. 2020a; Moloney and Moloney 2020). Yogyakarta is a special administrative region (henceforth referred to as the Special Region of Yogyakarta or SRY) comprising five smaller units: the City of Yogyakarta, Bantul Regency, Gunungkidul Regency, and Kulonprogo Regency. Figure 1 shows a map indicating that the pandemic spread mostly in the City of Yogyakarta and Gunungkidul Regency and statistically increasing cases ever since the first patient. In the second week of May—coinciding with the end of Ramadhan and approaching Eid Mubarak, people would typically make domestic and inter-provincial journeys and return to their hometowns. Despite the travel restrictions issued, such mobility was believed to occur and contributed to the soaring positive patients in the city and Gunungkidul Regency in the middle of 2020.

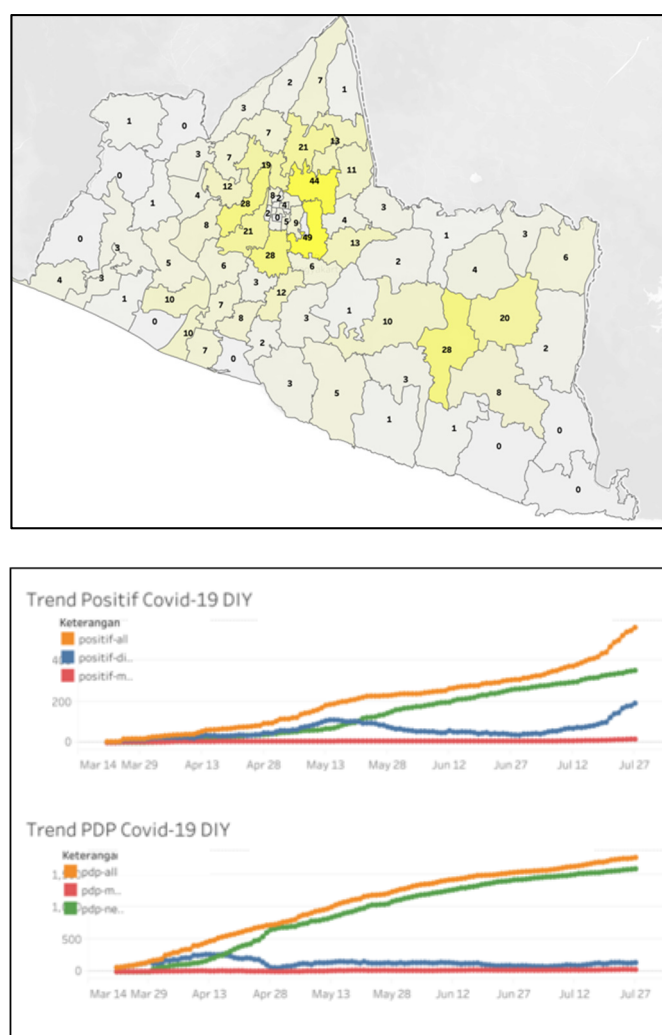


Figure 1. The distribution map and statistics of COVID-19 cases in the Special Region of Yogyakarta (SRY), Indonesia, per 29 July 2020 (source: <https://corona.jogjaprov.go.id/data-statistic>, accessed on 29 July 2020). Additional information: the gradation of the map indicates the increasing number of COVID-19 patients within each sub-administrative boundary.

The SRY is known as Indonesia's magnet of education and, as such, receives an influx of nearly 100,000 students annually. Consequently, it has been experiencing massive urbanization, with urban features sprawling, especially to Sleman, thus extensively converting agricultural areas to residential buildings to accommodate population growth. Settlements occupy 27% of the total SRY area (Pemerintah DIY 2018). In the second week of March 2020, the education sector started to minimize physical contact by conducting online teaching–learning activities, which, instead, encouraged students in Sleman Regency and Yogyakarta City to move to their hometowns in many regions across Indonesia. Such outgoing movements reduced the population size and inner-city mobility. Apart from its academic attractiveness, the SRY is also famous for its tremendous number of tourist attractions, and, because of the mandatory public health precautions enforced to curb the spread of COVID-19, the tourism sector is deemed to be the most severely affected.

The two paragraphs above imply that many narratives are formed amid the handling of the highly contagious COVID-19 disease and should be uniquely responded to by local authorities in the SRY, e.g., what are the first and foremost adaptation measures to take during the emergency response period of the pandemic in the SRY? Given that public health is fundamental in the emergency response phase, the Local Disaster Management Agency announced that the public and all economic sectors should maintain hygiene

and sanitation around the clock. As indicated from global practices, all those necessary precautions are the minimum requirements to prevent the spread of the virus, especially to vulnerable groups (TNP2K 2020). The national government of Indonesia has responded tremendously to overcome the pandemic (Djalante et al. 2020a). Accordingly, the research was designed to provide ideas for tackling the COVID-19 pandemic and possible courses of action during the disaster emergency phase, especially for the local level in the SRY.

In the context of disaster risk reduction, COVID-19 is a biological hazard threatening people from all demographics. Clinically, elderly populations with comorbidities, disabled groups, and essential sector workers are more vulnerable than the remaining productive group (Moloney and Moloney 2020; TNP2K 2020). However, if engaged in high mobility and close physical or social contact with other people, this does not necessarily mean that the latter are not equally vulnerable to the disease as the former. Identifying the vulnerable groups is essential in risk mapping. COVID-19 creates extensive risk as it affects a vast area and causes enormous counts of indirect losses, as well as transferable risk (i.e., the condition where people with symptoms spread the risk at unpredictable rates). In a natural hazard, it is highly likely that the source of threats can be spatially defined, allowing researchers to determine where to work, how to deal with the disaster victims, and identify damages and losses. As for the COVID-19 pandemic, the hazard is dynamic, and may create very dynamic spatial pattern, and thus threatens the entire area observed (Ascani et al. 2020; Asongu et al. 2020). Therefore, the rationale of the research is to add scientific discussion on how the government of Indonesia and the local government of the SRY make their best effort in handling the ongoing emergency situation due to the pandemic.

There were no adequate pre-emptions or precautions practiced before the first COVID-19 case in the SRY. As a region where the nation's best historical sites and educational attractiveness lie, the service sector that involves small- to large-scale industries is the vital gear in its economy, and it is home to many traditional, cultural, and educational enterprises. Geographically, the SRY is exposed to various natural disasters: volcanic eruptions, floods, typhoons, landslides, droughts, earthquakes, and tsunamis, making it a high-risk area. Socially, it has been considerably resilient to many natural disaster occurrences owing to the high social capital in the communities (Fauziyanti and Hizbaron 2020). Nationwide, the SRY is the earliest in establishing a disaster management board at the local level, and the institutional setting for disaster management is considered one of the best thanks to the disaster management platform developed almost 14 years ago—shortly after the 5.9 Scale Richter earthquake hit the area in 2006—with nearly 77 stakeholders who represent diverse community groups supporting it. During the disaster crisis, the stakeholders' involvement inspired the Indonesian Government to reinforce community-based disaster risk reduction as an integral part of its social-economic development, as stipulated in the Mid-Term National Development Plans for 2015–2019 and 2020–2024 (Pemerintah DIY 2018).

2. Research Context

Amidst various types of disaster, the adaptive governance focus in the research is specifically to confront COVID-19 pandemics. In other practices confronting other types of natural disaster, it is encouraged to conduct research on the specified disaster occurrence. As an integral element of development, any actions taken to strengthen disaster risk reduction (DRR) is an investment to ensure sustainable development (Hizbaron et al. 2018). Since the Yokohama Strategy and Plan of Action for a Safer World was formulated in 1994, the global commitment to pursue sustainable development through DRR has been flourishing. A decade later, the *Hyogo Framework for Action* (2005–2015), followed by the *Sendai Framework* (2016) and the *2030 Agenda for Sustainable Development* (2015), were among the many international commitments made to ensure that each nation ratifies the integration of DRR into its development plan. Hence, incorporating disaster risk reduction into development planning has been a prior agenda worldwide in addition to securing adaptive governance in each nation to meet the global commitment to DRR.

Governance is understood as any intentional shaping of the flow of events so as to provide or produce desired public goods (Parker and Braithwaite, 2003 in (Djalante et al. 2011)). As part of a governance system, the government is known as the political authority or state control that regulates the coordinating framework and protocol among stakeholders (Freeman 1998, in Djalante et al. 2011). Referring to the idea of governance, it takes the lead in formulating programs to achieve the outcomes or outputs desired in the development phase. During a crisis or emergency, it may take necessary control to overcome hurdles, including embracing as many stakeholders as possible to realize disaster risk reduction. Theoretically, the evolution of government mechanisms taking place in such a situation is relevant to the environment, and, as emphasized in adaptive management theory by Holling (1973), it is crucial to maintain ecological balance by taking necessary interventions that may affect the resilience of constituent ecosystems (Folke 2016; Holling 1973). In the context of the COVID-19 pandemic, this theory teaches the worldwide population to perceive the changing environment as part of “new normal” circumstances. To maintain resilience in such an immediate crisis, everyone should strictly comply with public health protocols, avoid close physical contact and crowds, and practice a hygienic and sanitary lifestyle.

Later on, adaptive environmental assessment (Gunderson and Light 2006) was introduced to reinforce the significance of environmental quality monitoring and evaluation to avoid ecological degradation and provide early situation analysis before any environment-related hazards take place. Here, the advocacy to take pre-emptive action, either active or passive environmental policies, should engage with numerous stakeholders while keeping each informed about the existing condition (Gunderson and Light 2006). In this case, as the enabler and regulator, the government should be able to assess severity levels of hazards, vulnerable groups, and risk potentials to create sustainable adaptive management in a long-term crisis.

The significance of risk information was then incorporated into the development planning agenda, as presented in the co-management concept (Plummer and Fennell 2009). Co-management suggests that environmental management should involve cross-sectoral management, such as resource and power sharing, either during normal conditions or crisis. Risk information within environmental management is essential to predict future likelihoods, estimate the number of vulnerable groups, and evaluate potential risks. As for resource and power sharing, the idea is to introduce the risk information embedded in one particular administrative unit to neighboring areas to indicate whether or not the source of the hazard, vulnerability, or potential risk are evenly distributed. Nowadays, the environment is exposed to various hazards: geological, hydrological, biological, and societal, which undoubtedly urge safer environmental protection using geo-safety, bio-safety, or agricultural sustainability concepts. This conceptual overview reveals that there are chances of disruptions to a governance system, and it needs to be adaptive to any potential hazards. The government should employ well-prepared and well-managed adaptive management to regulate normal conditions and accommodate crises. There are five critical factors to evaluate in assessing adaptive governance to disaster, as shown in Figure 2. The overlapping figure indicates that some of the actions taken in each of the variables are closely related to other variables. For example, in order to deal with conflicts, there will be rules and regulations.

The COVID-19 pandemic is unlike any geological, biological, or other potential hazard. This unprecedented event, has not yet equipped with defined guidelines. Ramifications are not limited to the necessary radical shifts or even shutdowns of many economic sectors worldwide. The pandemic spreads in risk-sensitive areas, like the SRY, where numerous types of geological and hydrological hazards exist and require local governments to control and invest much in disaster risk reduction. In the case of the SRY, the local government’s interventions receive abundant contributions from civic societies. Here, the research argues that, to pursue adaptive governance, there is an urgent need to incorporate multi-stakeholder assistance (Djalante et al. 2020a, 2020b; Shaw et al. 2020).

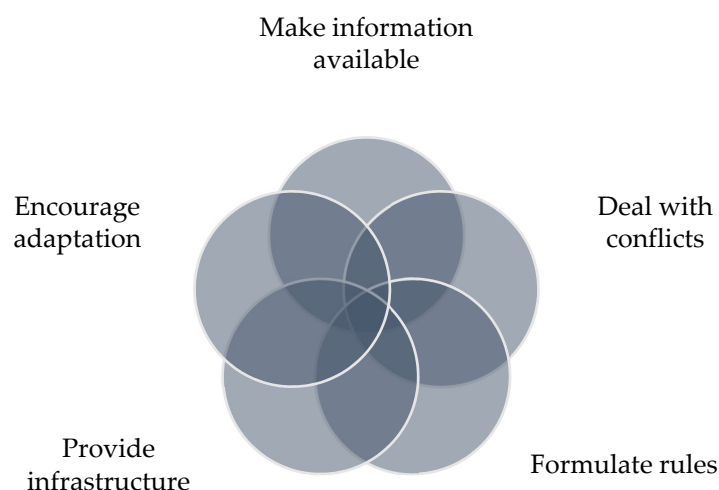


Figure 2. Adaptive governance factors, source: Dietz, Ostrom, and Stern 2003 in (Djalante et al. 2011).

How to understand disaster resilience? Mileti (1999) defines resilience as an ability to recover by one's own resources, and Norris et al. (2008) add that it is a process linked to any adaptive capacity existing in an area. Earlier, Bruneau et al. (2003) equated it to any structural mitigation taken and asserted that protecting infrastructure is one of the most prominent ways to achieve resilience. Indeed, efforts to limit infrastructure damage (i.e., resistance) have been critical issues in applied sciences (Cutter 2017). However, at its intersection with social sciences, resilience has been understood as the ability to absorb or mitigate consequences, which should be created by the community in the larger context. Restoring the pre-event state after the wake of a disaster becomes a crucial milestone, and the ability to recover and bounce back was a prominent discussion later on (Hizbaron et al. 2018). Each nation, committed to achieving disaster resilience, has taken necessary courses of action, which also applies to the COVID-19 pandemic (Bruneau et al. 2003; Cutter 2017; Norris et al. 2008).

3. Research Method

The research area was the Special Region of Yogyakarta (SRY), especially the Urban Greater Area of Yogyakarta, which includes the City of Yogyakarta and some parts of Sleman and Bantul Regencies that receive significant influences from urbanization (Hizbaron et al. 2012). The research focused on urban areas to describe how urban dwellers perceive the COVID-19 pandemic and carry out their daily praxis. With an underlying presumption that urban and rural responses to the crisis will differ, it is believed that key persons or representatives of urban dwellers will be able to elaborate on the process involved qualitatively. Additionally, the conceptual idea of developing adaptive strategies has been challenging for non-natural disasters (Eiser et al. 2012). Hence, the current research tested whether the adaptive governance factors were also applicable for non-natural disastrous events, like the COVID-19 pandemic.

Due to the circumstance, we collected data through an online forum group discussion (1 forum group discussion within 4-h session of discussion), to which three stakeholders representing three different stakeholders (government, academics, and civil society) were invited. The qualitative research involved collecting primary data from key persons of the Local Disaster Management Agency, Emergency Response Unit of Universitas Gadjah Mada, and the Disaster Risk Reduction Platform of Yogyakarta. The three key persons explored three crucial points mentioned in Figure 3 based on their respective experience, ideas, and knowledge acquired during their assignment as the appointed persons for their duty. The moderator of the online forum group discussion raised key questions, and collected responses by each stakeholder.

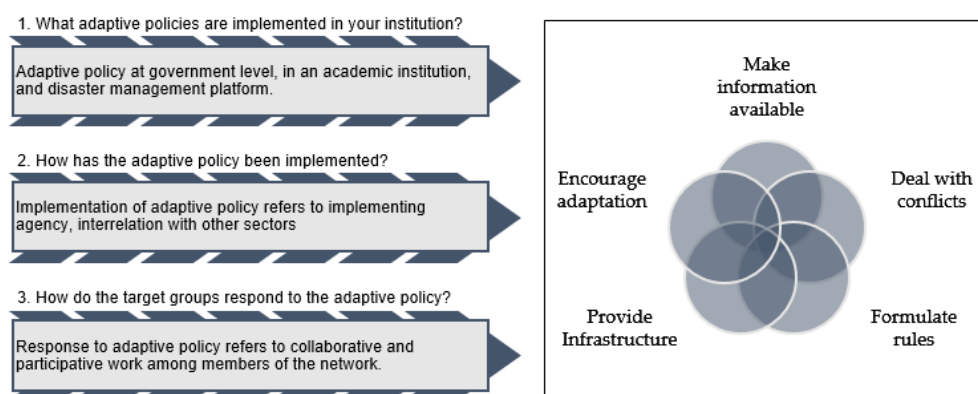


Figure 3. List of questions during data collection process.

The list of questions during data collection is presented in Figure 3. The research questions are broadly designed. This was aim accommodate broad range of praxes. The first research question addressed the implemented policies taking place at the government level and in academic institutions and disaster management platforms. The different policies complete each other, and contributed diverse variables of adaptive management. The main idea of the first question was to find the real praxis to pursue adaptive governance from each stakeholder and collect answers into the variables of adaptive governance. The second question, the implementation of adaptive governance, is an important research question to validate important factors that are influential during the implementation of the relevant policy.

After the data collection using the online forum group discussion, the responses from the stakeholders were classified into existing variables, as indicated by the theoretical background of adaptive governance. The temporal or sequence data were validated through the discussions. Most of the analysis was conducted qualitatively to ensure the flow of the process. Afterward, we matched the information given by the variables/indicators derived from relevant previous studies as references. We also collected ancillary data from mid-term planning documents, statistical datasheets, and many other references.

To complete the information gathered from the online forum group discussion, an online survey was also conducted (2 online surveys consisting of one question each), to collect additional information and verify the sequence of the process to handle COVID-19 outbreaks. There are two survey questions, covering the most important sector hit by COVID-19, and the order of the variables of adaptive governance according to the respondents' opinions.

4. Research Results

A reflection on previous theories showed that the handling of the COVID-19 pandemic did not adopt the disaster management cycle sought globally through the Hyogo to Sendai Framework. From March to September 2020, the whole world faced a long-term crisis without enough time to prepare for pre-disaster measures, and it was still longing for the post-disaster phase to complete the management cycle. Figure 4 indicates that the number of infected patients in the SRY was increasing slowly before soaring in July–August 2020.

The pandemic was dealt with slightly differently from natural disasters, meaning that its handling relied on reactive instead of proactive actions. COVID-19 spread in the SRY in no time and had surpassed every stakeholder's preparedness capacity, and it was not long (about one week) after the first case was reported that the circumstances signified a crisis phase (Figure 4). Figure 4 also indicates that the number climbed to a peak in December 2020, starting from August 2020. This crisis phase lasted for a long time, indicating no standardized guidelines and policies announced by either global commitments or central governments. A seemingly indefinite crisis phase is equal to when a population is faced with environmental degradation instead of stresses like droughts and land fires or shocks

like natural disasters, both of which have been handled reactively. This condition is generally prolonged and leaves fewer impacts on some objects but huge impacts on the rest. Therefore, the current research highlights the crucial part the environmental management theory plays in understanding how to deal with the COVID-19 pandemic.

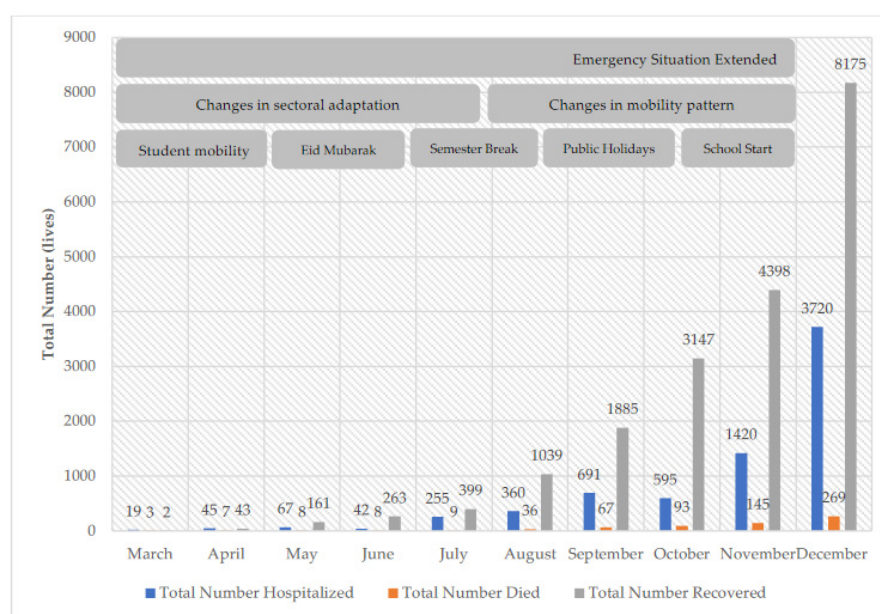


Figure 4. Update of COVID-19 cases in the Special Region of Yogyakarta (SRY) 2020, source: <https://corona.jogjapro.go.id/data-statistik> (accessed on 3 December 2020).

To curb the spread of COVID-19, the SRY Government took several actions bordering adaptive government praxis. Unlike any other major urban areas in neighboring provinces, the SRY did not restrain its residents with mobility-related policies. In fact, higher education students left the SRY from March 2020 since the education system shifted to online teaching. The working pattern in each sector also shifted, thus reducing the mobility pattern. However, some events, such as Eid Mubarak celebrations, public holidays (long weekend), and a new school semester, which encouraged students to attend school, triggered outbreaks (Figure 4). Additionally, the mobility pattern shifted tremendously (Figure 5), i.e., decreasing trips to retail shops, recreational nodes, grocery stores, pharmacies, parks, transit stations, and workplaces and increasing travel within residential areas (decreased mobility is indicated in the negative percentage in Figure 5). Such a mobility pattern indicates that during the COVID-19 pandemic, the major service sectors, especially transportation and recreation, received the most severe impact as the public visited service facilities and infrastructures less frequently than residential areas. Additionally, because the education sector was affected in many ways by the mobility restriction policy, the decreased number of students remaining in the region changed the mobility pattern.

Instead of mobility restrictions, the SRY Government, through the Local Disaster Management Agency, focused on gathering and compiling several variables into an effective tool to support the COVID-19 pandemic management, as described below (Table 1).

The research finding is presented in Table 1 below. Each of the key stakeholders experienced different policy implementations, processes, factors and also target groups as well as timelines of the process. Table 2 presents the roles of each key stakeholder in each variable of adaptive governance. Apparently, most of the roles were provided by the government, while the rest of the stakeholders play important roles in encouraging adaptation strategies. The massive work has been heavily conducted by the local government of the SRY, while academics and the Disaster Risk Reduction Platform have contributed to the

work tremendously. In more detail, the following is the stages of adaptive governance that took place in the SRY.

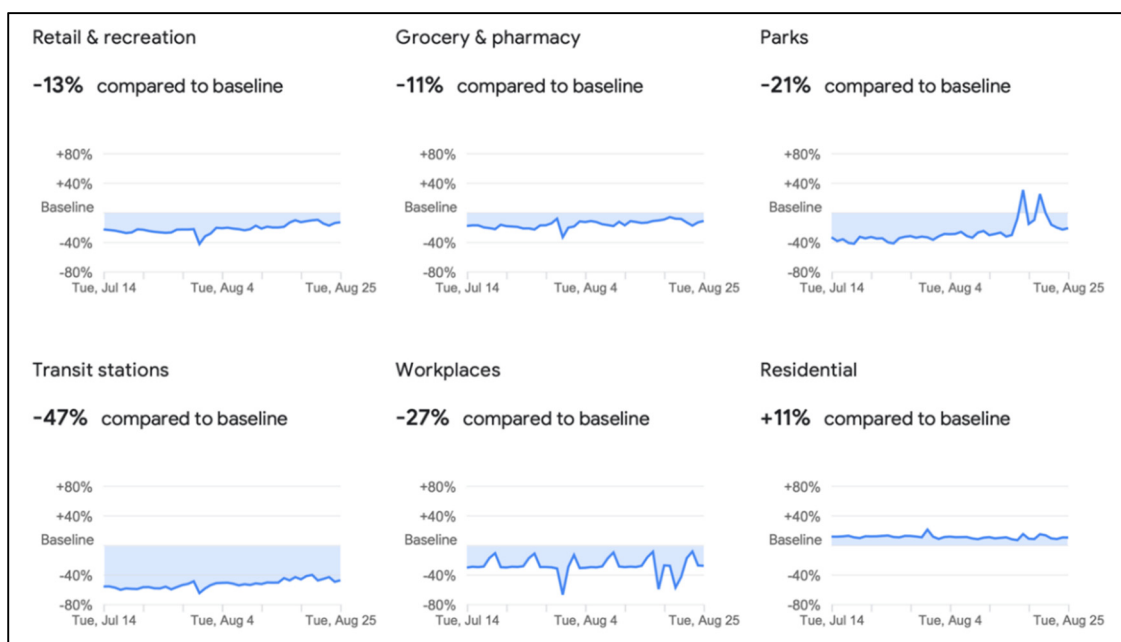


Figure 5. Mobility report by Google, source: https://www.gstatic.com/COVID19/mobility/2020-08-25_ID_Mobility_Report_en.pdf (accessed on 25 August 2020). Hyphen in the picture is a minus sign, which indicates decrease in mobility of the destined area.

Table 1. Data on the research finding.

List of Questions	Local Disaster Management Agency of SRY	Disaster Emergency Unit Universitas Gadjah Mada	Disaster Risk Reduction Platform
Adaptive policy	Release emergency status for SRY; “Work from home”; “School from home”; Essential workers protocols; Health protocols at all sectors	Follow government instruction to implement “work from home”; Conduct community service by disseminating information about health protocol implementation	Follow government instruction to implement “work from home”; Assisting government in evaluating adaptive policy; Campaign for self-adaptation at household level
Coverage of the policy	Community	Internal (university level); Community service target group	Internal (member of the platform); Community
Process of the implementation	Strengthening information to all; Providing ICT infrastructure to all; Ensure rules and regulations intact; Involvement from numerous sectors	Strengthening local knowledge; Improving community awareness	Economic strengthening by using technology; Improving community awareness
Supporting factors to policy implementation	National regulation; ICT information; Community awareness	Community awareness	Community awareness

Table 1. Cont.

List of Questions	Local Disaster Management Agency of SRY	Disaster Emergency Unit Universitas Gadjah Mada	Disaster Risk Reduction Platform
Hindrance factors to policy implementation	No guidelines on how to minimize risk; No risk scenarios; Lack of information on vulnerable groups; No situation analysis due to random symptoms	Lack of information and knowledge; No coordination among stakeholders involved	Poverty; Lack of communication among members to conduct collective action
Response of target groups	Target groups responded positively to the delivered information; however, low response by non-informal sector group due to limitation of income (battle between economy and health)	Target groups responded positively to the delivered information	Target groups responded positively to the delivered information
Time to start the policy	March 2020	March 2020 for following the government instructions; May 2020 for proposing community services	May 2020 for proposing community adaptation strategy

1. Making information widely available

Soon after the first case was reported, the local government established an information and data center (Figure 6). The official website is accessible through various media, such as the internet, phone/handphone, WhatsApp, Twitter, and direct communication via local key persons in each sub-district. The information is also accessible with Pocket Book, which was published immediately after the social meeting restrictions were issued in April 2020. The centralized data system was applied to ensure every stakeholder gets a one-gate command system via the Local Disaster Management Agency and the SRY Government.

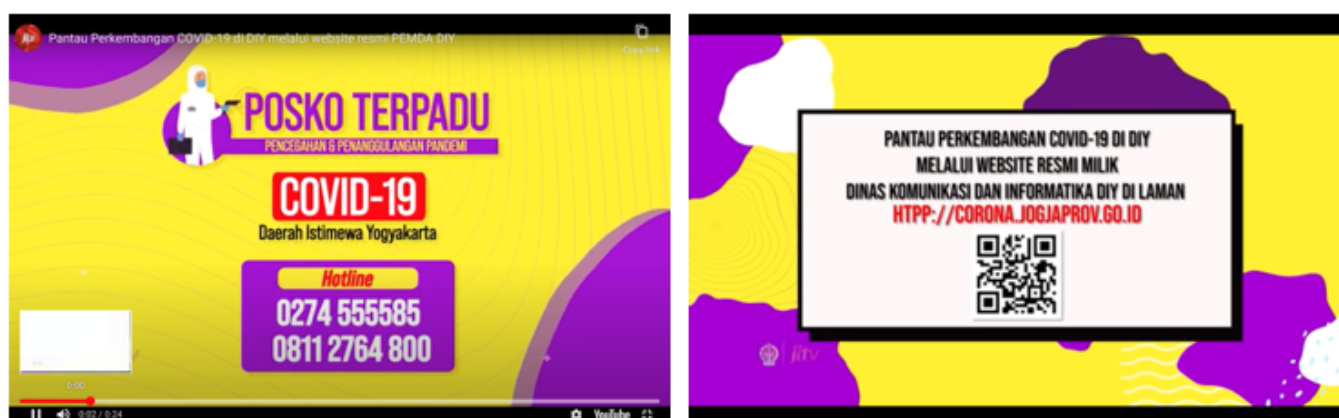


Figure 6. Information and data center of COVID-19 in the Special Region of Yogyakarta (SRY).

Table 2. The role of adaptive governance for each key stakeholder.

Adaptive Governance	Local Disaster Management Agency of SRY	Disaster Emergency Unit Universitas Gadjah Mada	Disaster Risk Reduction Platform
Making information widely available	√	√*	√*
Providing information, communication, and technology infrastructures	√	×	×
Formulating rules and dealing with conflicts	√	×	×
Encouraging adaptation strategies	√	√	√

Note: √*, the stakeholder was not generating information, however, this emphasizes their role to disseminate information.

Similarly, the academic institution generated medical information in the public domain, e.g., releasing various information about COVID-19 to local markets, kampung (sub-villages), banks, and schools with the help of the Disaster Emergency Response Unit (DERU). The information is presented in Indonesian and Javanese languages to minimize misunderstanding. Proper language selection ensures that risk communication is well implemented in the public domain.

Meanwhile, non-governmental organizations, such as Disaster Risk Reduction Platform SRY, known as Forum Pengurangan Risiko Bencana DIY, started the work by encouraging the public to stay home, comply with the social distancing policy (i.e., restrictions on social activities), practice a hygienic and sanitary lifestyle, and take care of each other to make use of and, at the same time, accumulate local social capital. The information was disseminated through public announcements from mosques, churches, local government offices (subdistrict or “kecamatan”), supermarkets, local food stalls, and many other public infrastructures. Making information widely and freely available is in line with the adaptive governance principles, as explained in [Djalante et al. \(2020a\)](#).

2. Providing information, communication, and technology infrastructures

Through the National Disaster Management Board, the Indonesian Government launched a web geographic information system (GIS) portal to monitor COVID-19 cases nationwide (<https://COVID19.go.id>, accessed on 27 July 2020). It offers large-scale data comprising information from provincial and local governments by translating the statistics stored in the local web GIS portal for the COVID-19 pandemic, e.g., <https://corona.jogjapro.go.id/data-statistik> (accessed on 27 July 2020) for the SRY. The statistics in question are the frequently updated counts of positive cases, recovered patients, and mortalities and are presented spatially by sub-district on a map (see Figures 7 and 8). These maps and statistics turned into an outstanding tool to help local people evaluate their mobility patterns (see Figure 8). The data are updated daily, and the Local Disaster Management Agency of the SRY acted as the responsible institution to release the information. The data were collected and updated from numerous health centers distributed in each sub-district in the SRY.

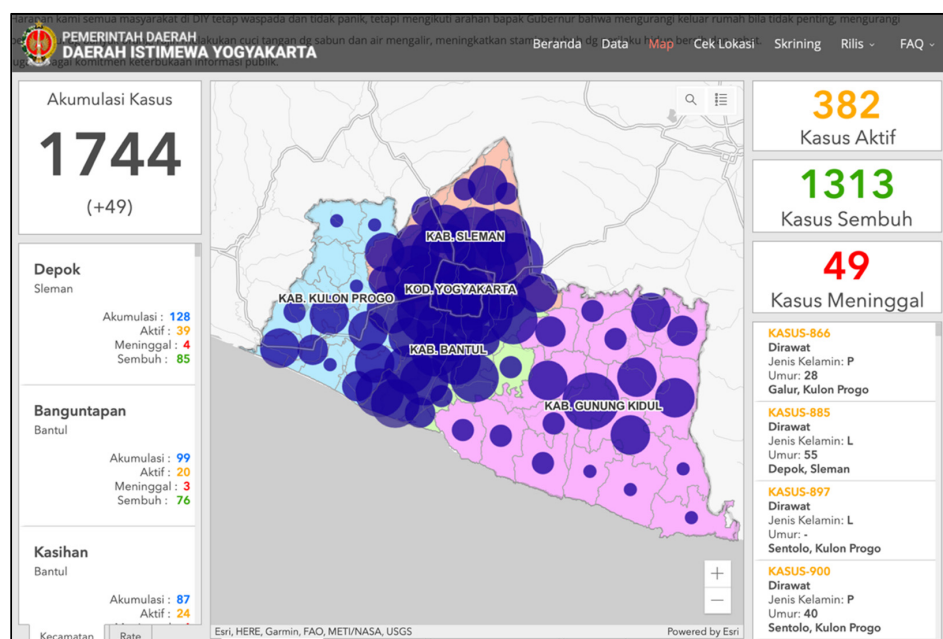


Figure 7. Web GIS portal displaying COVID-19 information and statistics and available relevant infrastructures in the Special Region of Yogyakarta (SRY), August 2020.

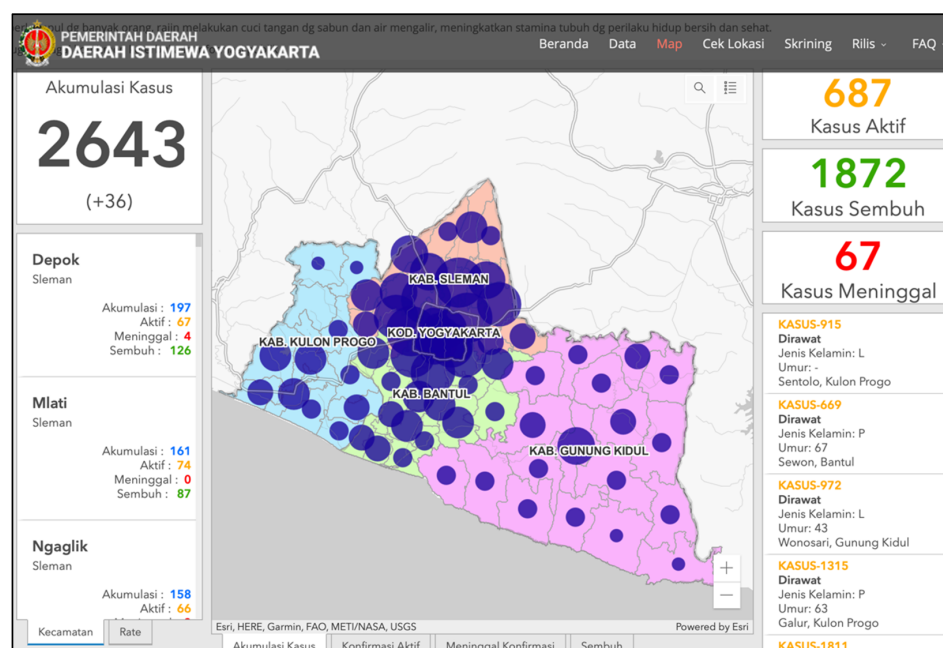


Figure 8. Web GIS portal displaying COVID-19 information and statistics and available relevant infrastructures in the Special Region of Yogyakarta (SRY), 1 October 2020.

Figures 7 and 8 present information on COVID-19 in each sub-district, and there are three important types of information presented daily: number of hospitalized patients due to COVID-19, number of deaths, and number of recovered patients. Figure 7 presents the distribution of data during August 2020, while Figure 8 presents the distribution of data during October 2020. The observation of both revealed that, from August to October 2020, Bantul Regency had a lowered number of positive cases, while the cumulative number of infected patients was concentrated in the City of Yogyakarta and Sleman Regency. Furthermore, most cases were found in the Urban Greater Area of Yogyakarta. The web GIS portal also provides a feature that allows users to check the number of COVID-19 cases

reported within a radius of 3 km, 5 km, and 7 km from their locations, thus helping local commuters avoid areas with a large number of infected patients (Figure 9).

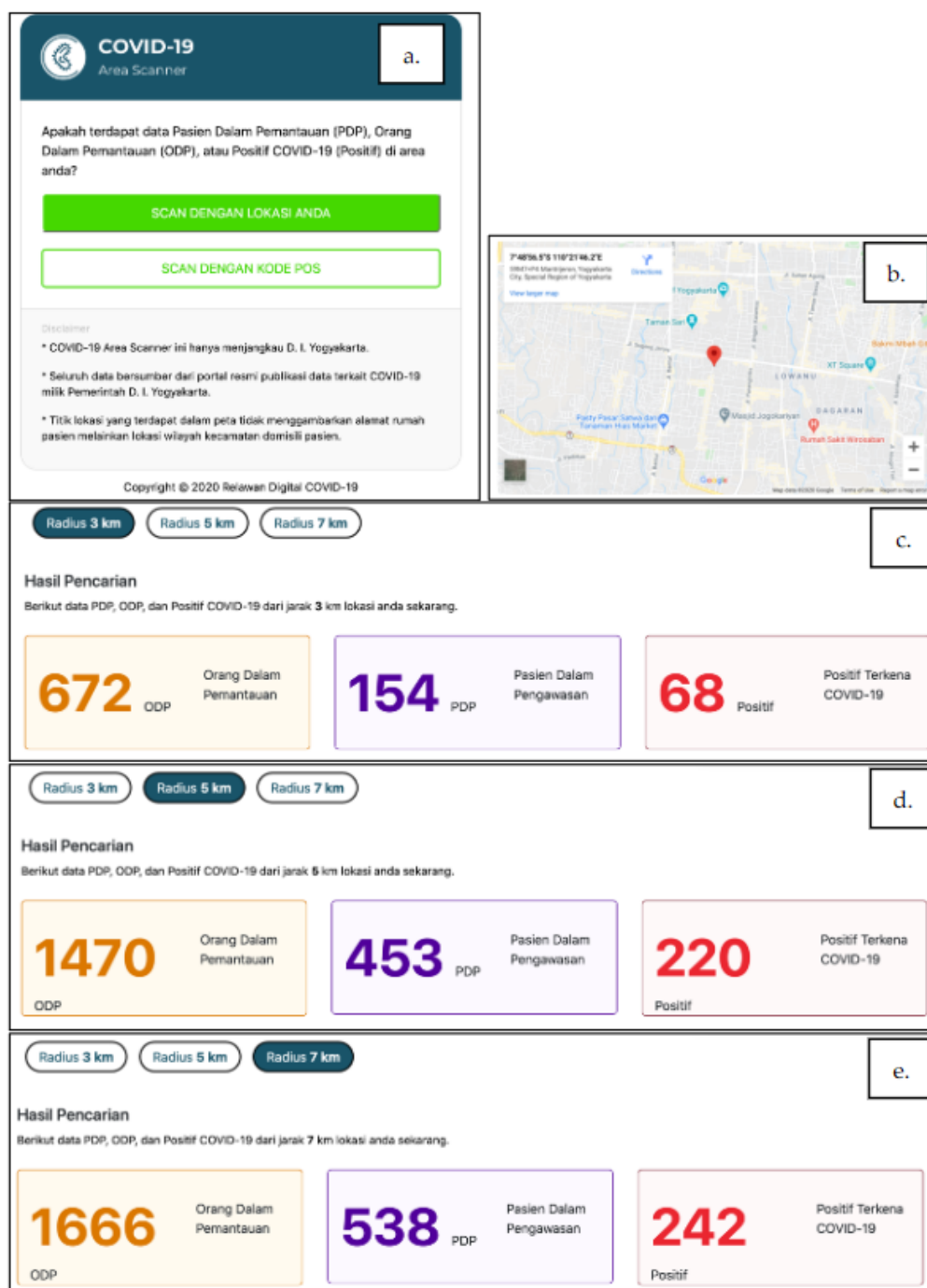


Figure 9. (a) Screenshot of the web GIS portal showing the number of COVID-19 cases reported on October 1 2020, from user's location within the Special Region of Yogyakarta (SRY); (b) Screenshot of user's location screening; (c) Screenshot of search result in the radius of 3 kilometers, which indicates there are 672 suspected patients with COVID-19, 154 patients observed for COVID-19, and 68 patients with COVID-19; (d) Screenshot of search result in the radius of 5 kilometers, which indicates there are 1470 suspected patients with COVID-19, 453 patients observed for COVID-19, and 220 patients with COVID-19; (e) Screenshot of search result in the radius of 7 kilometers, which indicates there are 1666 suspected patients with COVID-19, 538 patients observed for COVID-19, and 242 patients with COVID-19.

The technology also allows the public to search for the number of cases by ZIP code to ensure that their mobility within a small area is safe. It differentiates cases into people under observation (Orang dalam pemantauan or ODP), patients under surveillance (Pasien dalam Pengawasan or PDP), and infected patients. In addition, the web GIS portal provided by the SRY Government allows users to conduct independent screening. The main idea of providing infrastructure is to promote resilience during a long-term crisis, which coincides with the arguments stated in earlier publications (Bruneau et al. 2003; Mileti 1999; Norris et al. 2008). Prior scholars explain that resource provision or infrastructure protection is critical in achieving resilience. Similarly, the research revealed that local innovation in infrastructure provision contributed significantly to enhancing local knowledge of the current condition, educating the populations on the dynamic risk they are exposed to, and maintaining or achieving resilience.

Like the SRY Government that continuously updates the spatial data, the non-governmental organizations also contributed significantly during the crisis. For instance, the academic institutions also provided infrastructure to improve local understanding, as published on <https://pengabdian.ugm.ac.id/2020/05/03/providing-services-to-community-during-COVID-19-pandemic/> (accessed on 2 December 2020). Meanwhile, as a disaster management stakeholder, the academic institution also helped improve public knowledge using numerous approaches, e.g., disseminating information in local markets using the Javanese language (Figure 10) and establishing cooperation with local religious leaders to avoid physical contacts at mosques and minimize any potentially crowd-gathering activities. The approaches targeted mosques because they serve as a place of worship and a center for many social activities. Moreover, some restrictions were applied at the neighborhood level, e.g., not accepting a large number of visitors; for this reason, youth groups in many sub-villages put up caution signs or blocked the entrance to the neighborhood.



Figure 10. COVID-19 poster displaying restrictions and necessary precautions in different languages (Indonesian and Javanese).

The governmental, academic, and public domains provided different types of infrastructure. After receiving adequate information on the dos and don'ts in responding to the COVID-19 pandemic, hand washing sinks and stations were distributed and installed massively in public areas. Higher educational institutions, schools, offices, mosques, churches, supermarkets, shopping malls, local markets, hospitals, health clinics, banks, shops, and retail shops demanded basic infrastructures or standard equipment tools to support government interventions in the COVID-19 pandemic management.

3. Formulating rules and dealing with conflicts

Due to the health protocols on physical and social distancing, numerous essential sectors confront conflicts, such as the education sector and tourism, as well as services and public utilities. The regulation about the emergency situation also translated into a policy to immediately implement a “work from home” and “school from home” policy for several sectors such as education and many other sectors. By doing so, the virus transmission conflict is curbed. The SRY Government issued the Governor Decree No. 65/Kep/2020, declaring emergency status from 20 March until 29 May 2020, which was continuously extended to 30 June then 30 November 2020. The long-term emergency phase affected many sectors in many ways, and, since the recently issued regulation somehow successfully tackled the potential conflicts in these sectors, the two indicators were merged. For instance, most educational facilities in the SRY changed from direct face-to-face to online teaching—learning systems. Students rushed back to their hometowns as soon as the travel restriction was repealed in mid-May 2020. Informal sectors, such as restaurants, cafes, street foods, local room renting businesses, laundry shops, and other related enterprises that support students' stay in the SRY were affected severely. The Head of the Yogyakarta Education Agency issued Decree No. 188/630 concerning several adjustments that educational institutions should implement before starting a new school year, including enrollment, the grading system and its conditions, and the zoning mechanism, which all came down to the use of the real-time online system throughout June 2020. New students, including those in higher educational institutions, were restricted from coming to school and it was suggested that they join school programs online instead.

The tourism sector had reported a severe economic downturn to a recession. A survey has been conducted to evaluate which sectors have been hardest hit by the COVID-19 pandemic (Figure 11). The research question addresses which sector has been hardest hit during the COVID-19 pandemic. The online survey was completed by 134 random participants. The word cloud of the findings revealed that economic sectors, tourism, education, and the industry sector were the most mentioned by the respondents.

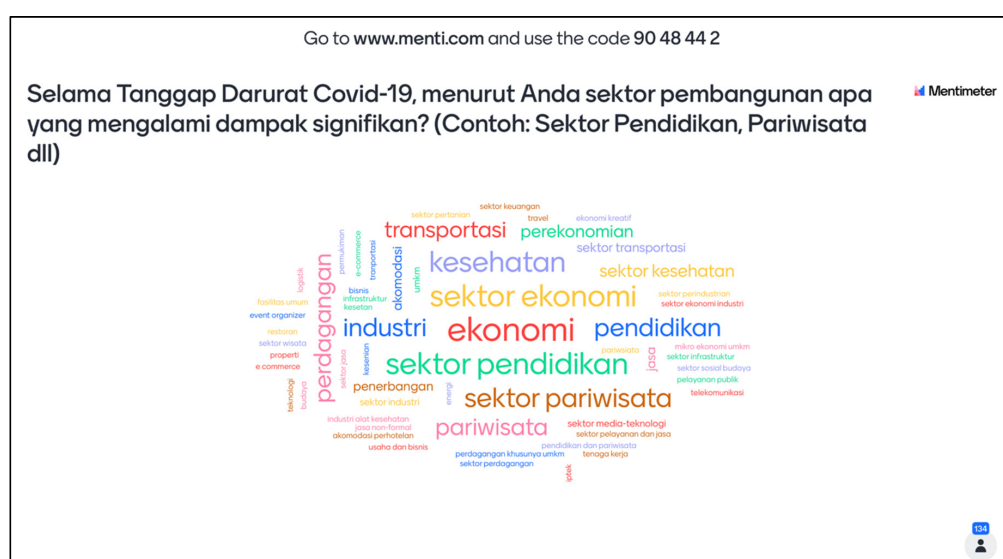


Figure 11. The online survey to identify sectors hardest hit by the COVID-19 pandemic in the SRY in 2020.

Mobility restrictions from March–early May 2020 nearly shut down entire travel businesses, hotels, accommodation, and many relevant enterprises. The SRY Government issued Decree No. 443/11652/SE/2020 on Implementing COVID-19 Prevention and Control Protocols in the Tourism Business Sector. Before re-opening a business, there were strict regulations to follow: submitting a competency-based assessment form for compliance with the standard health protocols to curb the spread of COVID-19, performing self-assessment to monitor and control the protocols implemented in the business premises, and significantly reducing the maximum capacity of provided facilities to meet the physical distancing criteria.

4. Encouraging adaptation strategies

The COVID-19 pandemic has impacted many small–medium enterprises (SMEs) across the globe. In the case of the SRY, the Disaster Emergency Unit of Universitas Gadjah Mada conducted a survey to evaluate how SMEs responded to the pandemic. Apparently, 72% of the surveyed SMEs stated that the pandemic had interrupted their daily business activities, while the remaining 28% claimed to operate regularly without significant interruption. Additionally, 73% of the SME owners stopped their activities to minimize economic damage, 23% continued running their business, and the other 4% abstained. This survey portrayed that SMEs, as the engine of the region's economy, tried to overcome the impacts of the pandemic by postponing and changing their trades. There is no question that the SRY is known to achieve resilience in many natural disaster events, but this statement needs to be revisited for the current long-term emergency phase, when participatory disaster risk reduction is highly suggested (Fauziyanti and Hizbaron 2020; IEU and IPPD 2020).

This research also tries to evaluate the community perspective on adaptive governance variables. Figure 12 indicates that the online survey of 167 respondents, who tried to put five variables of adaptive governance into order. The research finding revealed that the following variables are the most important to prepare during emergency situations to attain adaptive governance: (1) strengthening rules/regulations, (2) disseminating information, (3) conflict management, (4) community adaptation, and (5) preparing web-based system information. The respondents for two online surveys conducted in the research were acquired by different online survey links (online surveys from Figures 11 and 12), therefore, the number of respondents is different.

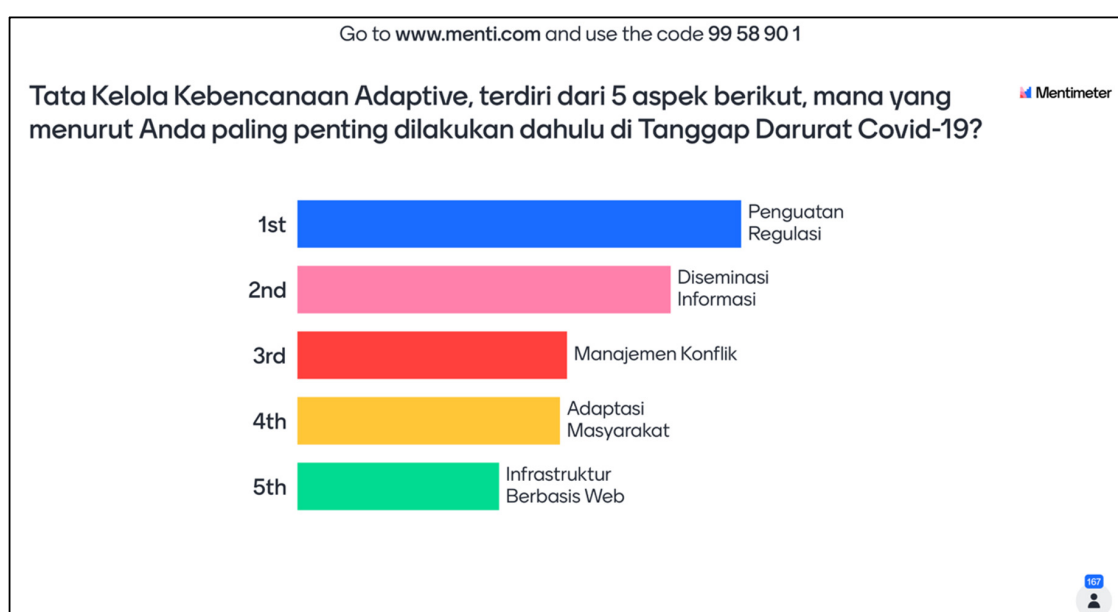


Figure 12. The online survey to evaluate variables essential to adaptive governance in the SRY in 2020.

The online survey has indicated that the variables can be in any order, however, all five variables are essential to form adaptive governance.

The SRY Government, the Disaster Risk Reduction Platform, and the Disaster Emergency Unit of Universitas Gadjah Mada have contributed significantly to encourage adaptation strategies. Donations of staple foods, vegetables, fruits, vitamin supplies, masks, hand sanitizers, disinfectants, and social security constantly flowed for vulnerable groups from many parties. Nevertheless, adaptation strategies, such as modifying economic activities, applying a web-based system to promote goods and services, and online shopping for groceries, snacks, fruits, and food, effectively kept the wheels of the region's economy turning. However, these strategies could not return the severely affected tourism and transportation sectors to their pre-pandemic states because most of the global population still minimized their mobility. Therefore, many tourism and transportation businesses changed to other sectors. Some groups or communities developed unique adaptation mechanisms: urban gardening, tree planting and re-planting in urban areas, and urban hydroponics that involved people in the neighborhood supplying local needs by increasing the use value of their limited land area. The community adaptive strategy leaves a very positive impression on the government, academics, and disaster management platform. They explained that the community responded positively to existing proposed policy, i.e., the community access to the ICT infrastructure, the collective groups at the local market and sub-districts responded positively in every process of information dissemination. The community also followed the rules and regulations to wear masks, keep their social and physical distance, and reduce their mobility.

5. Conclusions

This research has evaluated the response mechanism to the COVID-19 pandemic in the Special Region of Yogyakarta, Indonesia, by answering the research question, "What are the first and foremost adaptation measures to take during the emergency response phase of the COVID-19 pandemic?" Scientifically, differentiating adaptive strategies for natural and non-natural disasters is no longer the subject of debate among scholars as it has been arguably rebutted. The current research posits that the adaptive governance factors also apply to non-natural disaster events. Based on the qualitative approach (interviews with key persons) and data validation results (using ancillary data), the first adaptation strategy is to provide information and ICT infrastructure, and the foremost essential points for adaptation are formulating rules and regulations, mechanisms to deal with potentially arising conflicts, and means to encourage local adaptation. The research area has exhibited adaptive governance, as evident from (1) systematic information distribution that has been supported by adequate infrastructure, (2) immediate response by most critical sectors by complying with rules and regulations and performing necessary adjustments, (3) open access spatial and non-spatial data and their extensive uses, (4) prompt active engagement of communities in the enforcement of new rules and regulations mandated by national and provincial governments, and (5) stakeholders' involvement during emergency responses, i.e., in providing ICT infrastructures and information, dealing with conflicts in multiple spatial units, encouraging adaptations, and formulating rules and regulations. From the online survey, the research revealed that strengthening rules/regulations, disseminating information, managing conflict, community adaptation, and preparing web-based system information is important to adaptive governance. The different order of variables between the experiences of stakeholders and the opinions of respondents has indicated that these variables may be implemented in a different order for different cases, however, these variables exist in adaptive governance. In conclusion, adaptive governance promotes resilience-oriented mechanisms and has emerged with the help of existing resources in the area. The data collection using an online mechanism is a limitation to the research, which limits the possibility to explore more information from pragmatic experience, since it has been conducted during the pandemic situation. A proposed recommendation for further

research is to explore in more detail the impact, hindrance, and enabling environment of adaptive governance in the COVID-19 pandemic.

Author Contributions: Conceptualization, D.R.H., D.R., D.M.; methodology, D.R.H.; software, D.R.H., D.R., D.M.; formal analysis, D.R.H.; investigation, D.R.H., D.R., D.M.; resources, D.R.H.; data curation, D.R.H.; writing—original draft preparation, D.R.H.; writing—review and editing, D.R.H.; visualization, D.R.H.; supervision, D.R.H., D.R., D.M.; project administration, D.R.H., D.R., D.M.; funding acquisition, D.R.H. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by Graduate School of Universitas Gadjah Mada, grant number 1317/UN1/SPs/SKR/PL/2020.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on reasonable request from the corresponding author. The data are not publicly available due to ethical requirements.

Conflicts of Interest: The authors declare no conflict of interest.

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