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CONSIDERING SOCIAL CONTEXT IN BUILDING THE CO-DESIGN FRAMEWORK TO SUPPORT FLOOD DISASTER MITIGATION AGENDA IN THE URBAN CONTEXT

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Abstract. The role of the community is increasingly vital in the attempt to build a resilient city. However, the work to involve the general public in joining the disaster mitigation agenda is considered less effective. Co-design could be a suitable strategy for building public involvement in the mitigation agenda to become more focused and optimal. However, applying the co-design method must consider the context of its participants. This article reports a case study on disaster preparedness community activities to build a co-design framework that considers its social context. Case studies are conducted by investigating the influence of contextual factors on disaster mitigation activities by the SIBAT community in Surakarta, Indonesia. As a result, we recommended points that could be the basis for establishing a co-design framework. The recommendation points are that co-design needs to maximize the role of local leaders, designers need to build relationships with an informal approach with participants, co-design needs to provide tools that accommodate participants' spontaneity, and designers should act as motivators as well as facilitators.

Keywords: *Co-design, disaster mitigation, community, social context.*

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1. Introduction

The co-design method has its roots in the participatory design tradition in Scandinavia (Sanders & Stappers, 2008). The Western social and cultural context strongly influences the co-design framework, especially the liberal democratic model (Gregory, 2003). Co-design application outside the Western context is increasingly being carried out, especially in line with citizen empowerment activities sponsored by Western institutions. The difference in social contexts outside the West has become a concern for designers who intend to implement co-design (Puri *et al*., 2004; Elovaara *et al*., 2006). The influence of social context has been widely reported by design researchers, especially in public projects, including community empowerment. One of the community empowerment activities currently important is the effort to build city resilience against climate change since cities worldwide are increasingly affected by the threat of the climate crisis. Several studies and reports strongly suggest that cities should build

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resilience to climate change (Prasad *et al*., 2009; Jabareen, 2013; ADB, 2014; Orsetti *et al.*, 2022). The population concentration in urban areas increases the vulnerability of humans to be exposed to climate change. Especially in East Asia, where there are more than 30 megacities, resilient cities are becoming increasingly important (Prasad *et al*., 2009).

Flood disaster is still one of the main threats in urban areas (Tingsanchali, 2012). This phenomenon also occurs in Indonesia. One of the cities that are prone to flooding is Surakarta. The city is located in the province of Central Java, Indonesia and is crossed by the longest river on the island of Java, the Bengawan Solo. The Bengawan Solo stream is the estuary of many tributaries that flow along the city. These tributaries intersect directly with 43 villages out of 54 villages of Surakarta. The existence of these tributaries, completed with the geographical condition of Surakarta as a lowland area, makes the city a flood-prone place. Therefore, the historical record of flooding in Surakarta is always related to the overflow of the Bengawan Solo and its tributaries.

The city government has implemented flood mitigation programs through technical engineering and spatial planning. These programs range from developing green lines along the riverbanks and long-term flood control by dredging rivers to developing infrastructure and facilities for flood control (e.g. construction of sluice gates). One of the significant engineering to control flooding in Surakarta is optimizing the function of the Tirtonadi rubber weir at Kali Anyar river to reduce the flow of water entering the city (Khoiron, 2022). This rubber weir was recently upgraded to improve water flow control capabilities and its integration with another sluice in several tributaries.

These mitigation programs rely heavily on the engineering approach. They often do not consider the human affected directly by the disaster situation. Therefore, a mitigation approach involving the human aspect is needed to further strengthen flood disaster mitigation programs. This effort is referred to as the community-based disaster mitigation approach. Community-based disaster mitigation is a disaster management program that involves disaster-affected communities as the main actors. One community-based city resilience development program was initiated by the National Disaster Management Agency (BNPB). From 2015 - 2019 throughout Indonesia, the Disaster Resilient Village program was carried out in 136 districts/cities (Muryani, 2019). Especially in Surakarta, disaster-resilient communities have been formed in 14 villages. Even so, until now, Muryani's (2019) evaluation stated that the level of preparedness was still weak.

However, looking at the context of Surakarta, history records that its people have a long history of dealing with flood disasters (Taqobalallah, 2009). Communities with local wisdom can survive and manage the flood disaster situation. The people of Surakarta, especially those living on the banks of the river, have local wisdom in reading natural signs. One of them is knowing when a flood comes from observing rain patterns, air temperature and the movement of river flow (Dewi, 2018). Dewi added that the community calls this ability *titen* wisdom (a kind of sensitivity to natural signs or characteristics). This ability is considered social and cultural capital and can be the starting point for building a community-based disaster mitigation system.

The initiation to build a community of residents in the context of flood mitigation in the city of Surakarta has been carried out. In 2015, through the Community Flood Resilience program, The SIBAT - *Siaga Bencana Berbasis Masyarakat* (Community-Based Disaster Preparedness) community was established (Sibat Surakarta, 2021). SIBAT is a community formed by villagers who care about flood mitigation issues. This means that it is a volunteer-based organization of its members. Even so, SIBAT activities

are supported by the Indonesian Red Cross and coordinated with several disaster mitigation agencies. SIBAT works based on the principle of citizen volunteerism. The ethos of mutual assistance and the spirit of togetherness are the basis of its work. This is in accordance with the participatory principle of community-based disaster mitigation efforts. However, looking at the performance of SIBAT to date, there is a lack of optimality in terms of efforts to involve the broader community in implementing the SIBAT work agenda. At the same time, the involvement of the wider community (Surakarta residents) is essential in building community-based disaster mitigation efforts.

To address this issue, we argue that the application of the co-design method is considered appropriate to support the people's involvement agenda. The main principle of co-design is to include end users in the design process, which is very much in line with the principle of a community-based resilience system. Specifically, we find that co-design can channel the creative potential of residents in building a disaster preparedness system in Surakarta. We follow Sander and Stappers (2008), who emphasized that there is a shift in power between users and designers in co-design practices. This feature will allow residents to have more power to influence design decisions. In addition, we also amplified Sleeswijk Visser et al. (2005), who positioned end users in co-design practice as experts because of their everyday experiences. This is in accordance with the social context of disaster mitigation in Surakarta because residents have the strong cultural capital to be positioned as experts. However, there is no proper framework for implementing co-design that considers the social context of the people of Surakarta or Indonesia in general.

2. Research Objectives

This study aims to produce recommendations for building a framework for co-design methods in implementing a community-based disaster mitigation agenda considering Surakarta's social and cultural context. The co-design method is considered appropriate to support the community-based disaster mitigation system for several reasons. First, it empowers residents to be actively involved in designing a flood disaster mitigation system in their environment. Second, this method is considered to be able to accommodate the potential of local wisdom of Surakarta residents in flood mitigation programs.

Since the co-design method is rooted in Western traditions, we need to develop the framework for its implementation in the context of Indonesia, especially Surakarta. Therefore, this research needs to be done to support the community-based disaster mitigation system, especially in flood disasters. In a broader scope, the results of this study will support the achievement of a resilient city.

3. Participatory approach for resilient cities

In the last ten years, the city’s resilience has become one of the targets pursued by many city governments. The issue of resilience is explicitly included in the UN 2030 Sustainable Development Goals (SDGs). In the 2030 SDG document, target 1.5 seeks to build the resilience of the poor and vulnerable groups from their exposure and vulnerability to climate-related extreme events and other economic, social and environmental disasters (United Nation, 2015). While target 9.1 emphasizes the development of resilient infrastructure, target 11 aims to make “cities and human settlements inclusive, safe, resilient and sustainable”. Moreover, target 13.1 aims to

strengthen resilience and adaptive capacity to climate-related hazards and natural disasters (United Nation, 2015). From these target points, we conclude that a 'resilient city' is a significant target that needs to be achieved immediately.

A city's resilience is defined as the ability to activate the quality and processes of protection at the individual, community, institutional, or system level in times of danger or stress. It is also the ability to work together to maintain or restore function and comfort while adapting to new balances and minimizing the accumulation of new and existing risks and vulnerabilities (Patel & Nosal, 2016). From this understanding, we obtain that the emphasis on the human aspect is significant in achieving urban resilience. Several kinds of research on efforts to build community-based urban resilience have been carried out. Frantzeskaki (2016) explained the concept of community-based urban resilience as an effort to empower and involve the community to understand better capital and barriers in overcoming social vulnerability and natural disasters. Several case studies have also been conducted to develop community-based resilience systems. For example, Sjöstedt and Sturegård (2015) reported their research findings on a case study of implementing community-based disaster mitigation management in the Mekong Delta, Vietnam. Fabbricatti et al. (2020) summarized the experiences of major European cities in building community-based resilience by utilizing the cultural heritage of their communities. In addition, research on efforts to build community-based urban resilience, especially disaster mitigation programs in various cities in Indonesia, has also been carried out (Worowirasmi *et al*., 2015; Yusuf, 2015; Fedryansyah *et al*., 2018; Yunia *et al*., 2020; Khaira *et al*., 2020; Ekopriyono, 2021). These studies reported successes, obstacles, challenges, and suggestions for possible improvements in efforts to build a community-based disaster mitigation system in each context.

Some research on participatory approaches in building urban resilience systems provides a more detailed perspective on citizen involvement activities. We can learn lessons from case studies of participatory approaches to building disaster mitigation in urban areas in several studies (Hardoy *et al*., 2019; DeAsiain & Díaz-García, 2020; Umeidini *et al*., 2019). The application of the participatory method has positively impacted building community-based disaster mitigation. DeAsiain and Díaz-García (2020) stated that a participatory approach through a community-led development scheme provides more optimal results than government-led development in urban area regeneration programs to create a resilient city. However, the participatory approach in the case study could not fully provide space for residents to carry out their participatory roles. For example, in Umeidini's research (2019), the forms of citizen participation are still sporadic or have not led to the formation of a planned and structured disaster mitigation system.

For the role of citizens to be accommodated more systematically, a more structured facilitation process is needed. The co-design method provides an appropriate and flexible framework to accommodate citizen participation. The involvement of citizens as the user is believed to increase the design outcome. Carroll & Rosson (2007) have stated that user involvement is essential because of two factors: morally because the user needs to be heard as the one who is affected by design, and pragmatically because user involvement would produce a more successful outcome. The co-design method has been widely applied in various public projects in urban areas (Yasuoka & Sakurai, 2012; Cruickshank *et al*., 2013; Takeyama, 2014). However, since co-design is rooted in the Western democratic tradition (Gregory, 2003), its application in contexts outside the West requires adjustments due to the influence of local contexts.

Setiawan et al. (2019) have investigated the influence of local context on co-design methods. They stated that there was social and cultural context influence in the application of the co-design method. In more detail, they use four contextual factors to investigate four co-design practice criteria. They are divided into political power, socio-cultural, resources, and catalyst factors. These four factors become parameters for understanding context's effect on the co-design practice. In investigating co-design practices in Indonesia, they found that socio-cultural factors were the most influential factors in the implementation of co-design practices (See Table.1). Therefore, the application of co-design methods in building a community-based disaster mitigation system in Surakarta needs to consider its social and cultural context.

Table 1. Contextual factor influence on co-design criteria in the Indonesian context.
Source: Setiawan et al. (2019)

Co-design criteria	**Contextual factors influences**	**Co-design characteristic**
Decision-Making Power	1. Political power factor: Political climate, residue of the authoritarian regime, and centralistic policy of development: 2. Socio-Culture Factor: Indigenous philosophy: e.g Javanese philosophy	Decision making process: guided by the leaders
Collaboration	Socio-Culture factor: collective culture	Motivation to participate: Social obligation
Flexibility	Socio-Culture factor: collective action, craftmanship	Spontaneous flexibility
Outcomes-focused	Catalyst factor: Purpose of collaboration	Output: Functional product

4. Methods

The aim of this study was to build a co-design framework for supporting the flood mitigation agenda appropriate to the Surakarta context. We employed a single case study method to achieve this aim by investigating contextual factors' influence on the SIBAT regular activities. We expected the SIBAT community case study to provide data on the public's participation in the disaster mitigation agenda. The participants of this research were SIBAT administrators, SIBAT members, and the general public involved in the SIBAT program. The research team collected data through unstructured interviews, group interviews, and covert observations of SIBAT activities. The covert observation is vital to get information about participants' responses, opinions, attitudes, and gestures while involved in disaster mitigation activities carried out by SIBAT. In addition, we conducted documentary studies from various reports, news, and documentation of previous SIBAT activities.

We take lessons from the result and analyse the influence of contextual factors on the dynamic of SIBAT activities engagement. A tiered analysis will be applied to understand the influence of the social and cultural context in SIBAT participatory practice. We utilised the contextual factor Setiawan et al. (2019) built to analyse the SIBAT activities. The method they used was adopted in this study since it provides a comprehensive theoretical framework in building co-design frameworks considering the

socio-cultural context. Finally, the study produced a set of recommendations as a scaffolding to build the co-design framework appropriate for the Surakarta context.

4.1. Case Study: SIBAT

To understand the local social and cultural context, we need to trace the history of the founding of the SIBAT community. SIBAT was established from programs that attempt to strengthen the community in dealing with floods in Surakarta. The flow of the Bengawan Solo river that passes through three villages in Surakarta causes the area to be categorised as a flood-prone area. Therefore, in 2015, with the support of the International Federation of the Red Cross and Zurich Insurance, the Indonesia Red Cross initiated the Community Flood Resilience (CFR) program in those three villages. This program aims to increase the community's capacity and resources to reduce the level of risk from the threat and impact of floods. Residents are encouraged through participatory training to develop disaster mitigation capabilities to minimise the impact of the disaster on their environment. CFR begins by mapping and analysing the local environment's hazards, risks, vulnerabilities, and resources. These activities are followed by discussing and brainstorming with the community to identify and prioritise problems and needs related to compliance with disaster mitigation at the local level.

Furthermore, CFR began to involve the villager in disaster mitigation action. First, the initiator team conducted Vulnerability Capacity Assessment to develop information that internal and external parties in decision-making will use. Second, it is followed by the Participatory Rural Appraisal as an approach to empowering and increasing community participation in emphasising community involvement in all CFR activities.

Involving the villager in the CFR program became the initial basis for establishing the SIBAT. Membership of SIBAT was initially based on representatives from each village who volunteered to commit themselves to dealing with disasters in their area of residence. This commitment is essential, considering SIBAT consists of residents with various educational and occupational backgrounds. Awareness of threats and willingness to jointly commit to reducing disasters' impact are important assets for the volunteer spirit of the SIBAT member. Currently, the organizational structure of SIBAT is led by a head, a deputy and a treasurer. SIBAT has a total of around 20 people registered members. Registered members are the ones who have received basic disaster preparedness training.

After SIBAT was established, the CFR program continued through a training agenda for SIBAT members. The training curricula are Disaster Emergency Response. This training aims to increase the knowledge of SIBAT members in dealing with disasters to minimize the adverse effects of disasters, especially floods. The primary lesson started with the history of the Red Cross gives an initial understanding of the work of volunteerism. This lesson includes the code of ethics for humanitarian work as the basis for the work of the Red Cross. A series of basic training followed this lesson in handling resources amid a disaster, including command post management, assessment, logistics management, warehouse management, and distribution. Finally, it is followed by training in handling relief and evacuation victims, including basic life support, circulation support, first aid and evacuation, water rescue and simulation.

After the basic training, SIBAT initiated several mitigation programs. Currently, SIBAT is manufacturing greenbelts along Bengawan Solo banks (see figure 1). They plant vetiver as the main vegetation. Vetiver is important because it has the ability to conserve soil and water because of its strong, dense, and deep roots when planted on the

banks. The vetiver plant is also very useful in restraining the rate of erosion because it is not pruned, it is only allowed to grow so that the clump will grow large and dense. Another program is the construction of infiltration wells to reduce surface runoff and prevent or reduce the occurrence of floods. This attempt includes maintaining and increasing groundwater levels while reducing erosion and sedimentation. Another important program is making biopore holes for recycling the organic waste to produce compost. Organic waste that is buried in the holes can then support worms to create pores in the soil.

Learning from SIBAT journeys, we agree with raising the general public's involvement in building a resilient system. The head of SIBAT also supports that public participation is important because the current disaster threat is becoming more varied, not just flooding.

Figure 1. SIBAT members conduct daily care of the vetiver plant in the greenbelt along Bengawan Solo banks, by Setiawan (2022)

4.2. Data Collection

To understand how SIBAT carries out the participatory work, we approached the SIBAT's daily activities through several methods (see Table 2).

Covert Observation

First, we conducted covert observations. The covert observation here is not entirely covert. The researchers have asked consent from the SIBAT leader to conduct observations when joining members' routine activities. Covert observation is conducted in an open setting where researchers are present in the field openly. Bryman (2019) argues that an open setting in covert observation provides an advantage where researchers do not need to appear to be in disguise and remain themselves. In this observation, the researchers conveyed to SIBAT members that they wanted to study together by participating in their routine activities. This observation was conducted to get data related to patterns of behaviour, especially interactions among SIBAT members and the member to SIBAT leaders. In addition, we also engage in dialogue to build a sense of friendship and gain their trust.

On one occasion, we were involved in routine activities of caring for vetiver plants on the banks of Bengawan Solo. The research team who joined the activity found a pattern of interaction between members of SIBAT, members and the head of SIBAT, and between SIBAT and the general public. Observing these interaction patterns is very important to understand the social context of SIBAT members. The observation showed that the interaction in SIBAT was less hierarchical. This means there is no strict line of command between members and the head but friendship management. SIBAT members already understand the agenda, so the head does not need to give strict hierarchical orders. Even the head of SIBAT also asked a lot of questions (asking for opinions) to his members. When the researcher asked the SIBAT head how he kept the SIBAT agenda according to schedule, he replied that he only needed to remind his members to look at the commitment to the responsibilities of each person.

Table 2. Data collection method

Collection methods	Number of participants	Method detail	Findings
Observation	10 SIBAT members.	Covert observation of two SIBAT weekly routine activities. The first is the caring of vegetation on the riverbanks. Second, river waste cleaning activities. The research team joined these activities as conducted the observation.	Relations between SIBAT members and between members and leaders are non-hierarchical and tend to be equal.
Interview	SIBAT Head, 5 SIBAT members.	Unstructured interviews were conducted on the sidelines of SIBAT's routine activities in the field. The researcher approached the interviewees informally, by first asking if their consent to be interviewed.	Participants boldly and freely express their views in informal activity settings.
Group discussion	SIBAT Head, 12 SIBAT members.	The group discussion was held once involving members and the head of SIBAT. The discussion was designed to be two sessions; first, the involvement of the general public in the SIBAT agenda and SIBAT development in the future.	The dominant role of the leader can be seen in more formal collective activities.

Unstructured Interview

The second method is to conduct unstructured, informal interviews with the head and members of SIBAT. Informal interviews were conducted on several occasions, both on the sidelines of the SIBAT routine agenda and when the research team visited the SIBAT office (see Figure 2). Interview questions were directed around how SIBAT carries out internal and external coordination with stakeholders on other disaster mitigation issues. As the nature of the interview is unstructured, the question's theme can develop more broadly, including discussing the decision-making mechanism in the SIBAT organisation. In addition, these interviews indicate that the relationship between SIBAT members and the SIBAT head is a non-hierarchical ship, but rather a friendship relation.

An interesting finding is that this informal interview provides an overview of the strong communal culture in Indonesian society. We asked about their reasons for wanting to join a volunteer activity such as SIBAT. One of the sources said that the culture of gotong royong and solidarity to jointly protect the environment in which she lives is the

main principle she holds. Another source said that he felt he was part of the villagers, and was obliged to participate in maintaining the existence of his village, including protecting it from disasters. For us, this finding is an important cultural and social context peculiar to Indonesia, which must be taken into consideration in developing a co-design framework.

Figure 2. An informal approach to interviewing SIBAT members in their daily activities on site, by Setiawan (2022).

Figure 3. Group discussion to validate the initial findings, by Setiawan (2022).

Group Discussion

The group discussion, first, is to find out the views of the head and members of SIBAT on plans to involve the general public more broadly in the disaster mitigation agenda. Second, to discuss SIBAT development ideas in the future. This group discussion aims to validate the findings we have obtained from observations and interviews. From the interactions and dynamics during this group discussion, we obtained data regarding social and cultural factors that might specifically influence the implementation of the co-design method. For example, from observations, we get an illustration that the relationship between members and SIBAT leaders is non-hierarchical and tends to be

informal with a strong kinship. However, during the discussion in a forum with a formal impression, the SIBAT head's dominance emerged. Even though they are not very strong, SIBAT members show caution in their opinions. They appear to be freer and more courageous in their views when conducting informal interviews.

In group discussions, when we raised the issue of the idea of developing SIBAT in the future, initially, not many members gave specific answers. However, when the head raised the idea of developing the SIBAT agenda to improve the villagers' economy level, many ideas emerged from members. For example, members proposed the development of river tourism, the concept of a disaster-resilient tourism village. These findings indicate that cultural factors, in this case prioritizing leaders, still influence patterns of communal relations. We identified that the more formal an activity is, the stronger the leader's dominance tends to be. Conversely, when activities are informal, power equality is more visible.

We also identified challenges that could affect the co-design implementation. First, co-design requires the active role of participants to provide their ideas in the design process. However, we found that collecting ideas from participants was quite challenging at the beginning of the process. Second, we admitted that the role of the leader is somewhat dominant in activities considered formal, such as during the group discussion.

5. Recommendations for Building The Co-Design Framework

The findings obtained from observations, interviews and group discussions indicate that the egalitarian Scandinavian co-design framework that relies on the active participation of participants is quite challenging to apply in the Indonesian context. Moreover, there is a tendency for specific social and cultural relations, so that co-design must be carried out with different frameworks.

We use four contextual factors to understand the dynamics in SIBAT activities, especially aspects that might contribute to implementing the co-design method, such as decision-making, willingness to collaborate, and flexibility in collective work. We found that the four contextual factors influence how the co-design is implemented. These influences determine a series of recommendations that need to be considered in developing a co-design framework in Indonesia as follows.

5.1. Take advantage of the role of local leaders

Local leaders are chosen and accepted by the community to assist them in overseeing and carrying out functional changes in the community. Local leaders come from the community and are obeyed by the community, who can influence and regulate the community's behavior towards achieving collective goals. In the context of the SIBAT community, the leader and senior members can be considered local leaders. Considering cultural and political power factors, the character of co-design in Indonesia in terms of decision-making is still influenced by community leaders. This situation was seen in the preliminary workshop. For example, when we asked the members to write down the obstacles in organizing SIBAT's work, the majority were reluctant to give their opinion. Only after the SIBAT leader convinced them to express their opinion, they became more courageous in voicing their experiences. This does not mean that members do not have creative ideas. It's just that in the cultural context of Indonesia, there is a sense of inappropriateness if you precede the leader when speaking in a group toward outsiders.

Considering such a case, we propose to take advantage of the leaders' position when applying co-design practices. The role of the leader ranges into several points, as follows.

Motivator, this role is a motivator who encourages members to carry out positive activities. For example, it can be seen when SIBAT's routine agenda is cleaning the riverbanks. Facilitator, the leader also acts as a facilitator who provides assistance and becomes a good resource for tackling various community problems. The SIBAT leader is also a liaison between outside parties who want to establish communication with SIBAT activities

Mobilizer, as a guide or mover, to do something related to implementing the SIBAT agenda. For example, the research team witnessed that the SIBAT leaders took care of the riverbanks together with other members. Legitimator. The role of the legitimator means that they are used as a reference in establishing order and, at the same time, a guide for other community members, even though their relationship is not as strict as a hierarchical relationship. On several occasions, the leader was seen giving instructions on how SIBAT members should take a stand when, for example, they were involved in disaster mitigation programs with others stakeholders.

5.2. Building a relationship through an informal approach to the participant

One of the collective cultures of Indonesian society is marked by various collective activities carried out by community members. The community, such as SIBAT, can be society's guardian of social cohesion. From our interactions with SIBAT, we realized that building intense informal relationships with community members is very important when planning to design interventions. Members show a volunteer attitude in carrying out their activities. In line with Setiawan et al. (2019) research regarding the characteristic of collaboration in Indonesia, we also found that this attitude is based on social responsibility. During the interview, one member stated that his decision to get involved in collective activities at SIBAT was because he felt he was responsible for protecting and caring for the environment in which he lived. He did not place the responsibility solely on the government. We define that the attitude of kinship and solidarity among fellow villagers also drives the willingness to join. This finding underlies our suggestion about establishing informal communication with participants for an effective co-design process. The informal nature will encourage forming of familiarity relationships between designers and participants. This led participants to be more open and confident in expressing their views.

Establishing the informal relationships is important for several reasons. They were first reducing the hierarchical relationship between the designer and the participants since a hierarchical relationship hinders the dynamics of the subsequent co-design process. There is a general view in society that academics have a high intellectual capacity, and citizens should follow their directions (Pamuji et al., 2017). This understanding needs to be corrected. Establishing informal relationships with participants reduced these views. Participants also have a role and are expected to explore their ideas more optimally.

Second, building informal relationships with participants also reduces the dominance of local community leaders. Although the role of the leaders is quite important in organizing the co-design process, the role of leaders that is too dominant is contra-productive. Furthermore, participants will have more courage to express their opinions in the design process, knowing that their views are essential in co-design. This condition will result in a more democratic co-design process without leaving the role of local leaders as facilitators.

5.3. Designing tools that can accommodate the creative potential as well as the spontaneity of the participants

In co-design, tools are deliberately created to provide a wide choice for participants to contribute their creative ideas during the workshop. Co-design workshops often use tools like cards, sticky notes and blank paper to accommodate participants' ideas. However, we found Indonesian setting is somewhat different from the co-design model usually applied in the West, where the designer team has already designed the tools and design activities before the co-design process begins. Such a model is less able to respond to participants' spontaneity as experienced by participants in Indonesia.

During the interview, one SIBAT member said that he often had to improvise during activities because of limited tools. For example, they are making trash nets to clean up rivers. He said they usually get materials from around the river, such as bamboo poles. Another example we observed from the SIBAT members is their intense improvisation using their craftsmanship skills to solve problems. For example, they can use the objects they find along the river banks to design sitting facilities as a place to gather and talk. This spontaneous ability to utilize local materials must be adopted to develop tools in co-design processes. These findings amplify Setiawan et al. (2019) findings that the cultural context of Indonesian society with good craftsmanship is essential in implementing co-design practices. Therefore, necessary to maintain co-design flexibility by taking advantage of the participants' spontaneity and craftsmanship. Further exploration is needed to design tools and activities to accommodate participants' creative potential better. These tools and activities must respond to the spontaneity of participants in Indonesia.

The co-design framework in Indonesia should be able to respond to the spontaneity of the participants. This effort would make the co-design framework more flexible. The flexibility is achieved by conducting a planned co-design process while allowing participants to contribute spontaneously to the ongoing process. The workshop should also accommodate local site materials' potential in developing or improvising the tools.

5.4. Designers become facilitators and motivators

Observing the interaction of participants during the group discussion, we suggest that the designer's role cannot be entirely just a facilitator. Instead, designers also need to play a role as a motivator. The motivator's role is to encourage or motivate participants to be more actively involved in the design engagement process.

Therefore, the designers in Indonesia need to carry out the concept of a designer as a facilitator and motivator. As a facilitator, the first step is achieved by increasing the flexibility of the activity design and the tools used. Furthermore, designers also become motivators by encouraging participants to be more active in contributing to the co-design process. Quality-designed tools and activities will increase the effectiveness of co-design workshops, but the designers being facilitators and motivators will result in genuinely participatory workshops. Motivation needs to be given so that participants can explore ideas more deeply, think outside the box, and maximize the potential of their aesthetic experience. As a motivator, the designer must also maintain the participants' stamina during the co-design process. The co-design experiences showed that participants' stamina is needed not only in overcoming the lengthy co-design process but also when the design process is pressed for time or internal conflicts colour the design process. In

such conditions, the role of a motivator for the design team becomes essential so that participants still have the stamina to continue the design process.

In addition, the role of this motivator is also needed when building participants' confidence to give design proposals. What designers can do is give understand that their suggestions will affect the final design result. The designer also has to assure the participant to manage and maintain their proposals until it ends up being the final design decision. Maintaining and overseeing the design process is very useful in encouraging participants' self-confidence to unleash their creative potential.

6. Conclusion

The co-design process should not ignore the social and cultural context of the participants. Therefore, building a co-design framework appropriate to the participants' social and cultural context is necessary. The framework created will be the scaffolding for implementing the co-design method. As a scaffolding, it must be strong enough but simultaneously flexible in adopting the peculiarities of the local social and cultural context.

This study aims to set recommendations for developing the co-design framework for disaster mitigation in Indonesia. We conducted case studies on SIBAT activities. The case study results in some robust findings regarding the influence of contextual factors in SIBAT collective activities. We found that the dominant role of the leader was raised during the investigation. The leader's dominant position is more evident in formal activities than informal ones. Furthermore, we found that the cultural capital of SIBAT members in craftsmanship and spontaneity to respond to their surroundings could benefit the co-design practice.

Based on these findings, we propose several recommendations that can be used as fundamental principles in building a co-design framework. The first principle is to utilize local institutions. In this case, it can be in the form of local leaders or institutions that culturally have social power in organizing community activities. Second, build an informal relationship with participants, the main purpose of which is to create an equal relationship between the designers and participants. Third, designing tools that can accommodate the creative potential as well as the spontaneity of the participants—at the same time, designing flexible co-design activities. As a response to the spontaneity of participants in Indonesia, it allows real-time co-design to be carried out. Fourth, designers become facilitators and motivators. The design team must refrain from being too dominant in the decision-making process. But on the other hand, designers need to optimize their role as facilitators and motivators.

These recommendation points will then become the principles for establishing the co-design framework. However, this framework has not been proven successful in its application in real co-design situations. Therefore, in the future, it is necessary to carry out a testing stage to apply the framework of the co-design method.

This study attempts to build a co-design framework for disaster issues by conducting case studies on SIBAT activities. The case study produces several recommendations that can be used as fundamental principles in building a co-design framework. The first principle is to utilize local institutions. In this case, it can be in the form of local leaders or institutions that culturally have social power in organizing community activities. Second, build an informal relationship with participants, the main purpose of which is to create an equal relationship between the designers and participants.

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References

ADB. (2014). *Urban Climate Change Resilience A Synopsis 2014*. Manila: Asian Development Bank.

Bryman, A. (2019). *Social Research Methods (Canadian Edition) - 5th edition*. Oxford Canada.

Carroll, J.M., Rosson, M.B. (2007). Participatory design in community informatics. *Design Studies*, *28*(3), 243-261. https://doi:10.1016/j.destud.2007.02.007

Cruickshank, L., Coupe, G., & Hennessy, D. (2013). Co-design: Fundamental issues and guidelines for designers: Beyond the castle case study. *Swedish Design Research Journal*, *10*, 48–57. https://doi.org/10.3384/svid.2000-964x.13248

DeAsiain, M.L, Díaz-García, V. (2020). The importance of the participatory dimension in urban resilience improvement processes. *Sustainability*, *12*(18), 7305. https://doi.org/10.3390/su12187305

Dewi, A.N. (2018). *Praktik mitigasi bencana banjir masyarakat kampung Sewu kota Surakarta*. (Thesis). UNS, Surakarta.

Ekopriyono, A. (2021). Semarang city's resilient strategy facing Covid-19. *Jurnal Sosial Humaniora*, 25. https://doi.org/10.12962/j24433527.v0i0.8693

Elovaara, P., Igira, F., & Mörtberg, C. (2006). Whose participation? Whose knowledge? *Proceedings of the Ninth Conference on Participatory Design Expanding Boundaries in Design* - PDC '06, 105-114. http://doi:10.1145/1147261.1147277

Fabbricatti, K., Boissenin, L., & Citoni, M. (2020). Heritage community resilience: Towards new approaches for urban resilience and sustainability. *City, Territory and Architecture*, *7*(1). https://doi.org/10.1186/s40410-020-00126-7

Fedryansyah, M., Pancasilawan, R., & Ishartono, I. (2018). Peningkatan kapasitas masyarakat dalam manajemen penanggulangan bencana banjir di desa Cikeruh, kecamatan Jatinangor. *Jurnal Pengabdian Kepada Masyarakat*, *2*(2).

Frantzeskaki, N. (2016). *Urban Resilience A concept for co-creating cities of the future*. DRIFT, Erasmus University Rotterdam.

Gregory, J. (2003). Scandinavian approaches to participatory design. *International Journal of Engineering Education*, *19*(1), 62-74.

Hardoy, J., Gencer, E., & Winograd, M. (2019). Participatory planning for climate resilient and inclusive urban development in Dosquebradas, Santa Ana and Santa Tomé. *Environment and Urbanization*, *31*(1), 33–52. https://doi.org/10.1177/0956247819825539

Jabareen, Y. (2013). Planning the resilient city: Concepts and strategies for coping with climate change and environmental risk. *Cities*, *31*, 220–229. https://doi.org/10.1016/j.cities.2012.05.004

Khaira, N., Iskandar Faisal, T., & Veri, N. (2020). Program penanggulangan bencana berbasis masyarakat dalam kesiapsiagaan masyarakat menghadapi banjir sungai Krueng, Langsa Nanggroe Aceh Darussalam-Indonesia. *HJK*, *14*(4). https://doi.org/10.33024/hjk.v14i4.3044

Khoiron, K., Harlan, D., Soentoro, E. A., & Widyaningtias, W. (2022). A study on flood management with an integrated floodgate operation pattern at Pepe River in The City of Surakarta. In *The 4th International Conference on Sustainable Infrastructure and Built Environment (SIBE) 2022* (pp. 247–257). Bandung; ITB Press.

Muryani, C., Koesuma, S., & Yusup, Y. (2021). The readiness of villages in Surakarta City toward the disaster resilient village. *IOP Conference Series: Earth and Environmental Science*, *683*(1), 012066. https://doi.org/10.1088/1755-1315/683/1/012066

Orsetti, E., Tollin, N., Lehmann, M., Valderrama, V. A., & Morató, J. (2022). Building resilient cities: Climate change and health interlinkages in the planning of Public Spaces. *International Journal of Environmental Research and Public Health*, *19*(3), 1355. https://doi.org/10.3390/ijerph19031355

Pamuji, K., Ardhanariswari, R., Nasihuddin, A. A., Supriyanto, S., & Sukirman, S. (2017). Development of community participation model in managing the village government in Banyumas regency). *Jurnal Hukum Ius Quia Iustum*, *24*(4), 625–643. https://doi.org/10.20885/iustum.vol24.iss4.art6

Patel, R., Nosal, L. (2016). *Defining the Resilient City* (Working Paper 6). United Nations University Centre for Policy Research.

Prasad , N., Ranghieri, F., Shah, F., Trohanis, Z., Kessler , E., & Sinha, R. (2009). *Climate Resilient Cities - A Primer on Reducing Vulnerabilities to Disasters 2009*. Washington: IBRD - Worl Bank.

Puri, S., Byrne, E., Nhampossa, J., & Quraishi, Z. (2004). Contextuality of participation in IS design. *Proceedings of the Eighth Conference on Participatory Design Artful Integration: Interweaving Media, Materials And Practices* - PDC 04, 42-52. https://doi:10.1145/1011870.1011876

Sanders, E.B., Stappers, P.J. (2008). Co-creation and the new landscapes of design. *CoDesign*, *4*(1), 5-18. http://doi:10.1080/15710880701875068

Setiawan, A., Dunn, N., & Cruickshank, L. (2019). Geographical context influence on co-design practice between Indonesia and the UK context. *The Design Journal*, *22*(sup1), 763–776. https://doi.org/10.1080/14606925.2019.1595398

Sibat Surakarta – *Siaga Bencana Berbasis Masyarakat*. (2021). PMI Surakarta. Retrieved March, 17, 2022 from https://pmisurakarta.or.id/sibat

Sjöstedt, F., Sturegård, V. (2015). *Implementation of Community Based Disaster Risk Management in the Mekong Delta, Vietnam* (No. 5022). Lunds universitet.

Takeyama, N. (2014). Co-designing with weaving communities in Laos. *Proceedings of the 13th Participatory Design Conference on Short Papers, Industry Cases, Workshop Descriptions, Doctoral Consortium Papers, and Keynote Abstracts - PDC '14 - Volume 2*. https://doi.org/10.1145/2662155.2662235

Taqobalallah, R. (2009). *Banjir Bengawan Solo Tahun 1966: Dampak Dan Respons Masyarakat Kota Solo* (Thesis). UNS, Surakarta.

Tingsanchali, T. (2012). Urban flood disaster management. *Procedia Engineering*, 32, 25–37. https://doi.org/10.1016/j.proeng.2012.01.1233

Umeidini, F., Nuriah, E., & Fedryansyah, M. (2019). Partisipasi masyarakat dalam penanggulangan bencana di desa mekargalih kecamatan jatinangor. *Focus: Jurnal Pekerjaan Sosial*, *2*(1), 13. https://doi.org/10.24198/focus.v2i1.23115

United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development*. UN Doc. A/70/L 1. Retrieved March 20, 2022, from https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_RES_70_1_E.pdf

Worowirasmi, T.S., Waluyo, M.E., Rachmawati, Y., & Hidayati, I.Y. (2015). The community – based flood disaster risk reduction (cbdrr) in beringin watershed in semarang city. *Jurnal Wilayah dan Lingkungan*, *3*(2), 131-150. https://doi.org/10.14710/jwl.3.2.131-150

Yasuoka, M., Sakurai, R. (2012). Out of Scandinavia to Asia: adaptability of participatory design in culturally distant society. In *Proceedings of the 12th Participatory Design Conference: Exploratory Papers, Workshop Descriptions, Industry Cases*, Volume 2 (pp. 21-24).

Yunia, A., Pinariya, J. M., Forceila, D., & Ivana, L. (2020). Program berbasis masyarakat dalam upaya pengurangan risiko bencana di kabupaten pandeglang. *Communicare: Journal of Communication Studies*, *7*(2), 172. https://doi.org/10.37535/101007220205

Yusuf, P.M.S. (2015). Implementasi penanggulangan bencana berbasis masyarakat (studi pengembangan penanggulangan bencana desa tangguh di desa boboh kecamatan menganti). *Jurnal Ilmu Administrasi*, *12*(1).