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SUKUNAN VILLAGE, YOGYAKARTA, INDONESIA

Environmental sustainability through community-based waste management and eco-tourism

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Introduction

Increasing waste, one of the negative impacts of human activities, urgently needs to be addressed in the pursuit of sustainable development. The United Nations Agenda 2030 that sets the basis for the Sustainable Development Goals (SDGs) identifies reduction and recycling of waste as a target: 'By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse' (Target 12.5, UN 2015). Waste management requires coordinated efforts at the local level and can be done by the public sector (local government), private sector and civil society (organized communities and non-governmental organizations (NGOs)). This chapter analyses a successful innovative initiative of solid waste management in Sukunan, a village located in the peri-urban area of Yogyakarta, Indonesia. This is a project designed and driven by the local community in a collective and organized form since 2004. It has not only been sustained and improved for 13 years, but also replicated by other communities in Yogyakarta Province and Indonesia.

Sukunan village, Yogyakarta

Sukunan is a village in Gamping sub-district, Sleman Regency, Yogyakarta Special Province, Indonesia. It is located in the Metropolitan Area of Yogyakarta (which has a population of 1.5 million, while 4 million people live in the province, BPS 2017). Sukunan is situated in a peri-urban area, approximately 5 kilometers from Yogyakarta city centre, combining residential land use with farming and agriculture (see Figure 7.1).

Based on Indonesian administrative division, Sukunan is the lowest administrative governmental unit (village). It is organized in five neighbourhoods. In 2016, 253 families (1,117 people) lived in the village (Sukunan Village 2017). It occupies

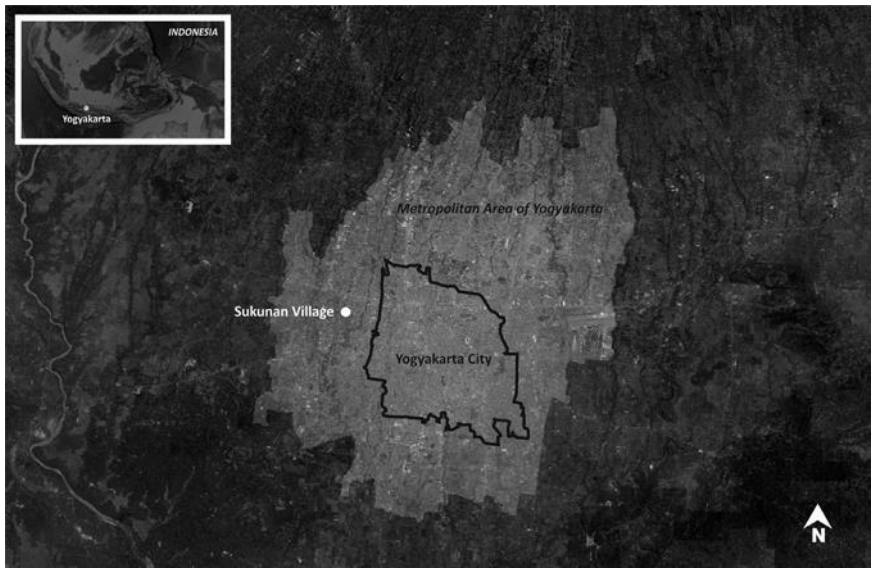

FIGURE 7.1 Location of Sukunan
Map by Sita Rahamani based on Google Map 2018

42 hectares (Razak 2010). Agricultural activities (especially rice fields) are the main livelihood for residents. The majority of household heads have only finished primary school and have low-skilled jobs (farmers, construction workers, street vendors, small-scale entrepreneurs and low-skilled public or private sector employees) with incomes below the minimum wage in Yogyakarta.[1]

The planning system is decentralized in Indonesia, with the local governments being responsible for giving planning permits and regulating land use, according to local and provincial urban plans (Law No. 26/2007 about Spatial Planning, Government of Indonesia, 2007). The local government elaborates local development plans that include sectoral targets, such as infrastructure, health and education facilities for specific areas, following national and provincial plans. Municipalities are organized in local departments. In Sleman, the Department of Public Works is responsible for housing, roads, bridges and the provision of clean water. Sanitation is managed by the Department of Health, while waste management is the responsibility of the Department of Environment.

In Sleman Regency, not all areas are well serviced due to the lack of financial resources. In the case of Sukunan, there were about 40 households who did not have toilets and defecated in open areas such as small rivers and irrigation canals in 2004. Dian Desa Foundation, a local NGO, conducted an examination and confirmed high concentration of E. Coli bacteria around wells near the river and irrigation canals (Tanaka 2008). Most families in Sukunan use underground water from their own wells that is boiled before drinking. The majority of roads are paved while

alleys are dirt roads. Before this community project started there was no organized waste disposal system in Sukunan.

The urban sustainability challenge: Solid waste management

Solid waste management constitutes a challenge for urban planning and sustainability concerning not only environmental aspects but also economic and equity aspects. In regards to environmental issues, our high-consumption society produces 1.3 billion tonnes of waste per year[2] and this is expected to increase to approximately 2.2 billion tonnes per year by 2025 (Hoornweg and Bhada-Tata 2012). Increasing waste is difficult to manage and pollutes oceans, rivers and air. Household solid waste has become a serious concern in urban areas (Dhokhikah et al. 2015).

In relation to equity, waste disposal affects most the residents of the cities of the Global South where there is limited capacity for formal solid waste management systems to deal with the waste produced (limited disposal locations and treatment plants and limited financial resources) and the system heavily relies on informal practices (Wilson et al. 2006). Additionally, poor groups are more vulnerable to the effects of weak waste management because they are not able to afford the payment of formal solid waste management services and therefore are not able to properly manage the waste in their neighbourhoods (WHO 2009). Most slums and informal settlements have no adequate system of garbage collection and disposal (UN-Habitat 2016). Although informal solid waste management practices, such as those by scavengers, constitute an important source of income, they expose people to high health risks (Colon and Fawcett 2006).

The United Nations Agenda 2030, which is the mainstream guideline document on development, recognises the importance of treating waste to create healthy and clean human settlements. Within the SDGs, Target 12.5 refers to 'substantially reduce waste generation through prevention, reduction, recycling and reuse' by 2030, contributing to achieve SDG 12 ('Ensure sustainable consumption and production patterns') and SDG 11 ('Make cities and human settlements inclusive, safe, resilient and sustainable') (UN 2015). Target 12.5 then relates to the three planning priorities of equity and social justice, environmental protection and economic development (Campbell 2016). Given that the SDGs have been agreed by all United Nations country members, planning programs, projects and activities should aim to contribute to their achievement.

Global waste management has recently become a highly discussed topic, as there is an increasing awareness of the enormous challenge it represents. Environmentally, planet Earth has no capacity to manage the produced waste, especially plastic. Levels of contamination and irreversible environmental damage continue to increase. Politically, countries that were receiving overseas waste such as China are no longer willing to do this. Hence, the only solution is for waste to be managed at the local scale, becoming mainly the responsibility of local governments and communities. There have been formal and informal practices implemented at the local level. In the Global South, there is a mix of both practices (Wilson et al. 2006).

The practices of the Zabaleen (garbage collector communities) in Cairo, Egypt, are well known. They started in the 1980s, although there had been waste collecting practices in the area as a livelihood strategy for nearly a century, and became a practice to be replicated in other countries. The Zabaleeen are rural migrants who maintain strong kinship and community bonds. They live in settlements on the urban fringe of Cairo. They collect and sort waste and then sell inorganic waste to intermediary buyers who later sell the waste to large companies. Organic waste is used to feed animals, which are also an important source of income for the Zabaleen. They informally handle one third of Cairo's garbage and have improved the capability of the city to manage waste, at no cost to the local government (Fahmi and Sutton 2006). In India, in the early 2000s, a local NGO initiated the 'Zero waste management system' program promoting community-based involvement in some upper- and middle-class neighbourhoods of Chennai and Hyderabad. It consisted of door-to-door household waste collection and the sorting of material (80 per cent organic and 15 per cent recyclable). Thus only the remaining 5 per cent of the household waste required handling by the local government. Households paid a fee to a community organisation for the collection service that was used to hire workers who collected and sorted the waste. The local government provided land and infrastructure for composting (Colon and Fawcett 2006). In Addis Ababa, Ethiopia, in the early 2000s, the local government created microenterprises to run door-to-door waste collection activities with the double aim of improving the municipal waste collection system and providing job opportunities as a vehicle to reduce the high level of unemployment. The system has received some criticisms, such as the failure to integrate formal and informal waste collection practices (Baye Alene 2018).

Indonesian cities produce about 200,000 tonnes of waste every day and nearly half of this is produced by households (Wijayanti and Suryani 2015). In Yogyakarta Province, the average production of waste per day is 644 tonnes. Only 65 per cent of that can be handled by the government (Public Works of D.I. Yogyakarta Province 2016).

In Indonesia, most waste is dumped either in officially designated areas or in illegal dumps, including roadsides and watercourses. Common issues of solid waste management are low commitment of local government to prioritise solid waste issues, scarce funding availability, and lack of proper institutional arrangements, public awareness and law enforcement (Mursito et al. 2013). Most of the waste is organic and can be used for compost while the non-organic components of the waste have market value for reuse or recycling (MacRae and Rodic 2015). Thus, there are many people who work as scavengers (sorting out waste in disposal sites, searching for items that can be sold or recycled). These informal livelihood practices imply a reduction of between 9 and 15 per cent of waste and benefit the city, saving money on collection, transport and disposal of waste and also cleaning areas and extending the lifetime of disposal areas (MacRae and Rodic 2015). The approach to manage solid waste management has changed in Indonesia since 2008 from an 'end-of-pipe' approach (management of the dumped waste) to 'reduction of the source' (waste produced by the household). Cities and residents are encouraged to optimise

waste reduction in every stage of waste processing, not only at the final disposal site (Mursito et al. 2013). One of the main challenges in relation to solid waste management is how to recycle or reuse most of the waste, without just 'cherry-picking' recycling material and leaving unmanaged large portions of waste. Thus, the learning of practices for handling and managing the waste becomes a key for the success of any solid waste management system.

Yogyakarta City, Sleman Regency and Bantul Regency are the three municipalities that form the Metropolitan Area of Yogyakarta. They have joined efforts to manage solid waste. Each municipality provides funding proportional to the waste disposed in the final disposal site. While this cooperation has been running since 1997, several issues have emerged to challenge improvement, such as institutional agreements between local governments, determining roles and responsibilities, financial contributions, continuous access to budgetary funds for operation and maintenance, and obtaining land that can be used as disposal sites (Friedman 2013). Economic and financial agreements become complicated. Collecting and processing waste is also an expensive service for local governments (Bohm et al. 2010). Indonesia spends between 80 and 90 per cent of the municipal solid waste management budget in collection costs (Hoornweg and Bhada-Tata 2012). In the case of Yogyakarta City for example, the local government paid IDR$1.4 billion (US$104,000) in 2015 for the solid waste to be taken to the final disposal site (Rusqiyati 2015).

Until the late 1990s, there was no solid waste management system in Sukunan. Waste was burnt or disposed anywhere in the village (irrigation canals, vacant land, and kerbside) and created a dirty, smelly and unhealthy environment. This also created conflicts with nearby farmers who complained about the increasing amount of garbage dumped in their fields. Plastic waste disrupted rice growth and damaged the rice. Sukunan villagers did not know how to manage waste and were not aware of the health risks associated with unmanaged waste.

The planning innovation: Community-based waste management

In 1997, the first author of this chapter (hereafter referred as 'project originator') moved from Yogyakarta City to Sukunan. After experiencing the problems associated with the lack of a solid waste management system in Sukunan, he decided to start implementing some practices for waste management. In 2002, using his knowledge and expertise as an environmental health practitioner, he developed a series of practical innovations to treat waste. First, he built a clay barrel composter to be used at home, allowing families to make compost and use it as fertiliser or sell it to local farmers. Second, he started separating waste at home, based on what he had learned from the practices developed by scavengers who were trading sorted waste to wholesalers. Later his wife started to develop handcrafts (wallets and shopping bags) re-using and recycling waste that could not be sold to factories, such as food packaging.

The project originator's family developed and tried these practices at home for about four months in 2002–2003. Once he was convinced of the feasibility of these practices, he started a process of dialogue with community leaders and other community members, creating awareness of the need to implement a waste management system in Sukunan. Initially only a small number of residents, including one of the community leaders, was interested in the project. Some villagers did not believe the project could be successfully implemented. There were concerns about the financial sustainability of the project and the difficulties of changing community practices. However, the main concern was about the project approach. The community was reluctant to participate in a top-down project that considered the community as 'an object of development'. There were several community meetings for residents to discuss ideas about the project and how they would like to implement it. It was essential for the community to understand that the project was driven by the community and the community itself would be making decisions about project development. This dissolved the initial resistance to the project. The residents were also attracted to the potential economic benefits from their waste management activities.

The project required financial support to commence. The community leaders tried unsuccessfully to get support from the local government and the private sector. Finally, at the end of 2003, a private donor from Melbourne, Australia, provided the required funding from the project to be started (only US$500). Although this funding is not a large amount for such a project, this private donation was essential to get the project started.

Innovation process

Between January and April 2004, the project originator and other residents worked on five main activities including: 1) community consultation through focus group discussions on the priorities and needs related to solid waste management practices; 2) establishment of a waste management team, which designed a plan for action in consultation with the community (this means that the plan was not done just by the team, but in consultation and collaboration with the community); 3) establishment of local rules for solid waste management; 4) community awareness and training on waste management practices; and 5) provision of solid waste management facilities (the community youth made 180 rubbish separation hangers and 66 rubbish bins). Thus, the project is based on the 3Rs (Reduce, Reuse and Recycle), considering that change needs to start at the household level and be later expanded to the community and city levels.

The project was launched on 25 April 2004. Sukunan community, representatives from local universities, the local media and donors attended the event. Since then the core of the project has remained the same, but over time some activities have been added. Currently the project consists of four main activities: 1) separation and disposal of solid waste; 2) reuse and recycling of waste for handcraft-making; 3) production of bricks with Styrofoam waste; and 4) training and raising awareness on sustainable solid waste management practices, including visits to the village by outsiders.

The separation of solid waste, the first activity, is done by each household in the community. Families that were initially not interested in the project slowly became involved. There were three factors that were identified as a cause of change in the community. First, 'predisposing factors' that showed that the increasing knowledge and awareness after several community meetings on the negative effects on health of untreated waste had turned around residents' perceptions. The community also noted the concrete results of the project through the use of recycled material. Second, 'enabling factors' related to the availability of facilities for sorting garbage and waste processing. The installation of sorting bins and learning on how to prepare compost made it easier for residents to start implementing these practices. Third, 'reinforcing factors' that were triggered with the elaboration of local guidelines for the community to manage the project and the overall waste management process, the support received from the community leaders and the economic benefits experienced by households once they started waste management practices.

Currently 85 per cent of the households in the village separate their waste. Four types of rubbish are separated: plastic, paper, glass and metal, and organic kitchen waste. Each household disposes the garbage in the recycling containers located around the village (there are currently 63 bins in the village, located in 21 'spots' – see Figure 7.2). Bins are emptied weekly and a collector takes the waste to Sukunan's garbage depot. Rubbish is sold to the recyclable goods traders bimonthly. The average waste sales are IDR$275,000 per month (about US$20), with IDR$100,000 used to pay part of the salary of the garbage collector[3] and the remaining IDR$175,000 deposited in the village fund. Each household also makes compost from the organic kitchen waste that is collected in clay pots. Garden waste and cattle manure is also used for compost made collectively by a group of residents. About 1.5 tonnes of compost is produced per month in the village and 60 per cent is used as fertiliser by the community and 40 per cent is sold to buyers outside Sukunan (the approximate income from this activity is IDR$480,000 per month – US$$35). The untreated waste is about 15 per cent of the total and is sent to a landfill as residual waste. The hazardous and toxic waste is collected and stored temporarily in the village and later handed over to the local government of Sleman, responsible for managing this type of waste.

The second activity is the manufacturing of handcrafts. A group of women started a project to make handcrafts with recycled food and beverage packaging collected in Sukunan. The group also buys recycled material from school canteens, small shops and restaurants outside the village. The group produces small items such as wallets, handbags, hats and school folders, which are sold to tourists visiting Sukunan. The income received from the sale of each item goes to the person who made the item (70 per cent) and some is allocated for buying materials (25 per cent). The remaining 5 per cent of this sale goes to the village fund. There are currently 19 women involved in handcraft making. Each one gets between IDR$750,000 and IDR$1,250,000 (US$55–92) per month from this activity. Progressively other recycled and reused items such as fabric, egg shells and old car

FIGURE 7.2 Sorting bins in Sukunan

Photo by Sonia Roitman

tyres have been added to plastic and packaging for the making of new items such as cushions, plates, aprons and re-usable cloth sanitary towels for women.

In May 2006 there was an earthquake in Yogyakarta and some houses in Sukunan were damaged. A group of seven young local residents, who had received some training on waste management practices in the village, started to fabricate bricks with Styrofoam garbage, which became the third activity of the Sukunan project. The bricks are made from one part cement, three parts sand and three parts granulated Styrofoam. The material mixture is inserted into an aggregate, pressed and dried in the sun. The bricks are used to build walls and were used to rebuild five houses of earthquake victims and later to build public facilities. The community also makes pots with Styrofoam, which are for plants to decorate the main streets of the village.

The fourth activity of the project consists of raising awareness on the importance of sustainable solid waste management within and outside the community. At the start of the project, there were several activities to educate children, youth and adults from Sukunan on this topic. These included socialisation of residents, with discussions on waste management practices, painting, playing games (like competition for rubbish collection) and also singing. A motivational song '*Sukunan Bersemi*' (Sukunan Blossom) and a poem '*Balada Seonggok Sampah*' (Ballad of the Rubbish Heap) were created.

Due to the success of the community-driven waste management system, both Sukunan and the project got attention from local and national media (newspapers, radio stations and TV channels). Thus, the village opened its doors to visitors who wanted to learn about this community innovative initiative. In 2009, the community decided to turn Sukunan into an Eco-Edu Tourism Village for environmental education and awareness. Between 2009 and 2017 Sukunan received over 65,000 domestic and international visitors, with an average of 600 visits per month, including several school groups. The revenues from these activities, as well as the handcrafts and the selling of recycled material, go to a Village Fund. This fund is used to carry out activities within the village such as training, social activities, village development and construction of public facilities.

Over the 13 years of existence, the Sukunan project has been regularly monitored and evaluated by the community itself. The analysis includes number of families involved in the separation of waste, number of families involved in composting-making, number of women involved in craft-making, and outcomes such as waste collected per month and funding obtained per month. Monitoring and evaluation of waste sorting activities are conducted by three parties: the waste management team, garbage collectors and community members. The results are reported monthly and discussed at the village level.

The Sukunan project has received several awards. In November 2004, the Ministry of Environment, Government of Indonesia, evaluated several waste management projects and Sukunan was chosen as the winner because of the innovative character of the recycling activities and the integrated character of the community's involvement because the project included children and young residents, in addition to female and male adults. In 2006, it was selected as one of the best practices of community-based solid waste management in Indonesia. In 2010, the project was selected as 'the best of the best' in the 'Green and Clean' competition in Yogyakarta Province. In 2012, the Minister of Environment, Government of Indonesia, visited Sukunan and the village was declared 'Pioneer Village in the Response to Climate Change'.

The Eco-Edu Tourism Village project is a successful urban innovation. It is a peri-urban practice aiming at improving the conditions of the living environment (Meijer and Thaens 2016). It also represents a 'self-protecting innovation' (Glaeser 2011) as the same community has created the solution to solve their own environmental problem. Although there are other community waste management projects in Indonesia, such as the project in the Monkey Forest in Bali (MacRae and Rodic 2015), the Sukunan project represents a step further due to the holistic emphasis of the project. It is not only about managing waste but also creating change and environmental awareness within the local community. The success also lies in the collective effort demonstrated by Sukunan residents, with the majority of the villagers (both female and male and from a diverse age range) engaged in the project.

There are eight important factors explaining the success of this project, as follows: 1) Sukunan has a clear vision elaborated through community discussion and engagement to preserve the quality of the environment; 2) there is strong

community commitment to carry out the project; 3) Sukunan established an organisation, which consists of trained personnel with strong commitment and solid internal bonds, to manage waste at the village level; 4) there are written local guidelines about waste management elaborated by the community and collectively agreed upon; 5) Sukunan residents participate in every stage of the decision-making process, empowering the community; 6) the project has been able to generate lucrative activities and home-based businesses for residents, which is considered a real economic benefit; 7) there is a solid and well-planned system for the recruitment process and involvement of community members in the project; and 8) Sukunan village is actively collaborating with other stakeholders, such as the government, private sector and universities to raise awareness on the value of community-based waste management initiatives.

Planning projects not only emphasise the importance of outcomes and end products but also the process to create change (Healey 1997). The Sukunan project shows the relevance of both process and outcomes. However, as discussed later, the project has not performed equally in the three areas of sustainability. The most significant outcomes are in relation to environmental benefits. Villagers have experienced the advantages of reducing waste, cleaning their living environment and reducing their health risks. Since there is no more burning of waste, the air is no longer polluted and residents can breathe fresh air. The village is cleaner and water flows are not blocked with waste. Illegal dumping sites have been eradicated from Sukunan. These are the main achievements of the project.

Nevertheless, social and economic achievements have also been important. The social results are about community participation, empowerment and engagement with the project. The majority of the residents (85 per cent) have become aware of the importance of solid waste management at the household level and involved in regularly conducting these practices at home. Community members have also acquired new skills, from learning how to mobilise and train their own community to sort waste and make compost, bricks and handcrafts. Additionally, there is a higher sense of cohesion within the community. The conflicts with farmers about garbage disposal that existed in the past have disappeared as waste is properly managed.

In regards to economic outcomes, residents are aware of the economic benefits of reusing, recycling and reducing waste. People on low wages have been able to increase their monthly incomes through selling compost and making handcrafts. Since they do it themselves, Sukunan residents do not have to pay for the waste management collection service by the local government (this is between IDR$10,000 and $50,000 per household per month – US$0.73 to $3.7 depending on waste volume), which represents a reduction in household expenses. The branding of Sukunan as an Eco-Edu Village and the prizes awarded to the community have turned the village in a tourist attraction. Visitors represent an additional source of income for Sukunan village (about IDR$54 million per year or US$4,000). In addition to these group benefits, the community member who works part time as waste collector gets an additional monthly income (IDR$400,000 or US$30).

As an Eco-Edu Tourism Village, Sukunan currently consists on seven centres of composting, 19 people involved in making handcrafts, one garbage depot (see Figure 7.3), an environmentally friendly house,[4] two farming areas, five waste-water treatment facilities where the water used by 150 households is treated, one centre for production of biogas from cow manure and a centre for *gamelan*.[5] The centres of composting are used for processing organic waste into fertiliser. The compost is used within the community and also sold to people outside the village. The waste bank of Sukunan is open every Sunday morning. Staff (community members) weigh the garbage deposited by each household, record information in a notebook and later sell the waste to wholesalers. Each waste-water treatment is used to process grey and black water from 30 households. The installations use biological waste-water treatment technology with a combination of anaerobic and aerobic systems. Effluent from the waste-water treatment is safely channelled into the rice field areas and rivers. A bio-digester of methane is used to treat the manure from 24 cows and the produced methane gas is used for cooking by local farmers. The centre of *gamelan* is used once a week by the community to practice *gamelan*. The Sukunan Tourism Village Team also offers the opportunity for visitors to learn how to play the *gamelan*. Two farming areas invite visitors to practice a variety of activities including ploughing fields using cows, land preparation, seeding, planting, weed cleaning and harvesting.

FIGURE 7.3 Waste depot in Sukunan

Photo by Sonia Roitman

Trade-offs

The project has faced challenges since its inception, as well as made some trade-offs over the implementation process. The first challenge was to realise that capacity building and raising awareness of the project within the community was not only important in relation to achieving the main outcome of the project (to have a cleaner village), but a requisite for collective action. The success of the project would depend on a collective effort. Therefore, it was a slow process of creating awareness and encouraging residents to participate that required the constant effort and strong commitment and enthusiasm from a few community members who acted as 'agents of change'. They also performed the role of 'environmental cadres' (Dhokhikah et al. 2015), who provide environmental counselling and guidance on waste management practices to the community. At the same time, the project leaders understood that it would not be possible to get all the community on board and they had to accept that not all residents would be participating in this project (85 per cent of the community participates).

The second challenge was to understand that this collective effort would also require negotiations within the community. Regular and open dialogue, both formally through organising focus group discussions and through informal meetings, was important. Creating this dialogue was also a slow process involving trust. It also led to some conflicts within the community. There was negative talk from several people in Sukunan community who felt they were not getting any financial benefits from the tourism activities within the village. This group argued only the Sukunan Eco-Village management team was getting economic benefits. This issue was solved by conducting a series of discussions which resulted in several agreements, such as opening opportunities for people outside the management team to be involved as tour guides and providing other services, such as snacks and beverages for visitors. A transparent schedule for task distribution was created so that many people could participate and benefit from tourism. Five per cent of the income from tourism is given to the village development fund for the establishment of public facilities, health services (especially for toddlers and senior members) and a community nursery for pre-kindergarten children. The distribution of the revenues from the sale of waste also created some community conflicts. Some residents felt they did not receive economic benefits because revenues were given to the Village Fund, not to each household. These residents argued that households that were involved in waste management were treated in the same way as those households that did not participate. The issue was solved by establishing a 'waste bank' open every Sunday where households could 'deposit' their sorted waste and receive some money for this. The revenues from selling the village waste were given to the waste depositor.

A third conflict was created with migrants moving to Sukunan over recent years. New houses have been built, mostly as boarding or rental houses. These 'temporary migrants' are less concerned about the waste management project and do not participate in sorting waste. Socialisation and persuasion have been conducted to solve this issue. The waste management team and the community

leaders usually meet face-to-face with house tenants to explain the waste management system. If these households do not want to participate in the project, they are given an alternative service. Waste can be collected from their homes for a service fee that is between IDR$20,000 and $50,000 (US$1.4 to $3.5) per household per month depending on the waste volume.

Conflicts and issues have been solved through discussions and negotiations within the community. Most of the conflict resolution is done informally, such as hanging out at food stalls, because residents then feel more free to express their concerns, provide information and discuss solutions. The Sukunan management team is involved in this conflict resolution and there are regular meetings to discuss problems and brainstorm solutions. Community leaders are also involved in these meetings.

Sukunan is a poor community and was not able to cover the initial financial costs of the project. This was the third challenge as the community realised the need for external final support since the government and the local private sector were not able to provide this support. Hence, the community had to reach further out to get private funding to initiate the project. The project was funded by an individual family from Australia. The funding had several requirements. First, the funds should be given by an institution trusted by the donors. Even though it was from an individual family, it could not be handed over directly to Sukunan village. The funds were given through the director of ACICIS (Australian Consortium for In Country Indonesian Study) to the Sukunan waste management team. Second, Sukunan management team had to submit a project proposal to the donors with the explanation of how the waste management project would be implemented for the funding to be released. Third, funding expenditure was detailed and reported by the waste management team to the donors and Sukunan community. All this was done to create transparency and accountability.

The project has already implemented several practices to reuse and recycle most of the waste. There has been an intention to incorporate more advanced eco-practices, such as rain harvesting, reuse of water, reduction of electricity consumption, use of clay pots to keep fresh food as a replacement for refrigerators and urine recycling to process human urine into liquid fertiliser for plants. These practices have been successfully implemented in one house in the village. However, they require more complex adaptation practices and resources. It is not yet possible for most households to implement these practices. These eco-practice technologies aim to inspire visitors so that they could be replicated or modified in other settings. This has been an important trade-off since the project leaders became more aware of the need to implement practices incrementally. These more advanced practices will require more time and would probably not be implemented by many households in Sukunan.

Conclusion

A critical question for planning under the SDGs is ‘How do we simultaneously protect the natural environment and reduce poverty and human injustice?’ (Campbell 2016, 392). The Sukunan project is an innovative successful project

that addresses these three areas of environmental concerns. Environmentally, it has been able to manage the majority of the waste produced in the village, through a bottom-up strategy collectively driven. Socially, the majority of the community participates in the project and makes decisions on project implementation. Economically, community members have been able to increase their incomes through the selling of recycled waste, compost and bricks and making handcrafts. An additional positive outcome has been that because of the success and notoriety that Sukunan has achieved, villagers feel very proud of their community and are willing to continue their efforts towards new innovation projects, such as more households treating their water and having their own organic gardens at home.

The Sukunan project is a very successful example of 3R solid waste management. By 2009 it had been replicated in 196 villages in Yogyakarta Province. The model was later developed into a waste bank model in 2009 and by 2015 had been implemented by 2,861 community groups in Indonesia (Ministry of Environment and Forests of the Republic of Indonesia 2015). In 2016, the model was replicated by community groups in Malaysia.

The success of the initiative depends on three critical aspects. The first one is the engagement and participation of the community and, as identified in similar projects, the community commitment to learning and constant effort (Bai et al. 2010). The second aspect is the existence of one or more leaders who can act as 'agents of change' or 'environmental cadres'. Additionally, community-driven projects usually face a financial obstacle to start the project and make it financially sustainable. In the case of Sukunan, the project would not have started without the external funding from international private donors (despite its small amount).

The 13 years of existence of the Sukunan project show its clear character of 'innovation', consisting of 'something proffered not as a one-off process but as something continuous' (Simone and Pieterse 2017, 18). The smooth implementation of the project only depends on the community, which is also the main beneficiary. The project does not currently rely on external supporters or facilitators, which contributes to the long life of this successful and innovative bottom-up solid waste management initiative. Despite the complex process of design and implementation, this project shows community-led initiatives can succeed and it offers a practical solution for Global South communities to take leadership on how to address SDGs 11 and 12 at the local scale.

Notes

1 The minimum wage in Yogyakarta is IDR$1,337,645 per month (US$90) (Decree of the Governor of Yogyakarta Province No. 235 / KEP / 2016, November 1, 2016).
2 It is believed that 6.3 billion tonnes of plastic have been produced worldwide up to 2015, with 79 per cent being accumulated in landfills or the natural environment, 12 per cent incinerated and 9 per cent is recycled (BBC News 2017).
3 The garbage collector is paid IDR$400,000 per month (one quarter of this salary comes from the sale of recycled waste, another quarter comes from the village tourism service, another quarter from the Village Fund and the final quarter from the environmental managers of Sukunan).

4 This house has a variety of simple green technologies such as water harvesting, natural home lighting and hydroponic vegetables.
5 The *gamelan* is a traditional Javanese musical instrument.

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