Installation Assistance Repeated Processing Technology Septictank (RPS) in Pahandut Seberang Village, Palangka Raya City

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Abstract. The people of Pahandut Seberang Village have long lived on the Kahayan Riverside area. The characteristics of the settlements in Pahandut Seberang Village are floating houses and pillar houses, most of which are located above the water. The river is used for water transportation, fishing, fulfilling daily needs such as bathing, washing, and as a source of drinking water. The Kahayan River problem is also a place for disposal of waste from human activities such as household waste. Human waste is dumped directly into water bodies because the toilets of the pillar houses on the riverside do not have septic tank facilities. To solve the priority problems of Partners, a solution to assist the manufacture and installation of Repeated Processing Septic tank (RPS) Technology for pillar houses in Pahandut Seberang Village is needed. The goal is to provide sanitation problem solving for settlement in Pahandut Seberang Village through training on the construction and installation of RPS. The methods used qualitatively include: (a) Finding concrete problems and priorities: the existence of a toilet on pillar house without a septic tank; (b) Offering ideas, making RPS to settlement who are located on pillar houses on the riverside; (c) Making activity plans and work procedures, and d ) Inviting Partner participation by providing training (creating and installing RPS). A special target has been achieved by giving a pilot RPS to settlement of Pahandut Seberang Village, by facilitating a house on stilts with the RPS. Outputs in the form of RPS goods and products and their specifications.

1. Introduction
One of the unique characteristics of Indonesia is its natural environment, which is the largest archipelago in the world, consisting of around thousands of islands that stretch from east to west and are inhabited by more than 300 ethnic groups. Indonesia consists of 34 provinces with physical diversity, a socio-cultural environment manifested in a settlement model, whether located in the mountains or riverside area. People in hinterland, mountainous or riverside area, are connected through forests and rivers to connect people from upstream to downstream areas as community accessibility, for example the Dayak people in Kalimantan. Settlements in Indonesia are located mostly on the riverside area. Riverside settlements reflect the history of urban development [1].

Palangka Raya City, the capital of Central Kalimantan Province, is a city located in the Kahayan Riverside area. The city of Palangka Raya is crossed by the Kahayan River. The Kahayan River has its headwaters in the heart of Borneo in the Muller-Schwane Mountains with its estuary in the Java Sea. The Kahayan River has a length of ± 600 km with a river width of between 100-200m. The settlements in Palangka Raya City are located on the right and left of the Kahayan Riverside Area is shown in Figure 1.
Palangka Raya City has a residential land area of ± 154 ha and a population of ± 310,000 people with a total of 56,000 households living in the Kahayan Riverside Area [2]. The people living in the Kahayan Riverside area consist of various ethnic, ethnic and religious backgrounds. People in the Kahayan Riverside area live and earn a living depending on the river. The people living in the Kahayan Riverside area build houses up to the riverside area. Settlements on the Kahayan River are divided into three types, namely floating houses, stilt houses and concrete houses [3]. Over time, these settlements have not become a priority in urban planning. Settlements in the Kahayan Riverside Area are categorized as slum settlements with river conditions impacting water pollution because there is no model of a toilet with a hygienic septic tank in the riverside area [4]. This residential area is classified as a slum with quality that is not suitable for habitation, due to the lack of adequate facilities and infrastructure [2].

The current urgent issue is that people living on the Kahayan River have a habit of pooping into the river because they do not have private toilets. Public toilets, namely floating toilets as public toilets that can be accessed by anyone who wants to use it. Floating toilets line of the Kahayan River. Floating latrines are giant trash bins for the people on the Kahayan Riverside area. Disposal of human feces that are not handled properly can cause contamination of surface water and groundwater which has the potential to cause the transmission of various kinds of digestive tract diseases [5]. Other effects can result in contamination of water and soil. River water pollution can be a source of infection and cause health hazards, such as water borne diseases which are easily infected. Other diseases are typhoid, paratyphoid, dysentery, diarrhea, cholera, worm disease, viral hepatitis, and gastrointestinal infectious diseases, as well as parasitic investment [5].

The problem that Kahayan River water is not suitable for consumption because it has the potential to cause kidney failure because it is contaminated with mercury and household waste [4]. This research aims at the active involvement of the community on the Kahayan Riverside area in order to change the culture of pup in the river body. The research target motivates the community to change the basic cultural mindset of the community to poop, so that it is reduced or even eliminated by dumping waste into the river, so that the environment on the Kahayan River is clean again.

The priority problem of research partners focus on houses around the Kahayan Riverside area of Pahandut Seberang Village. The Kahayan Riverside area is the absence of sanitation facilities, the houses on stilts where residents live are not equipped with septic tank facilities. This will pollute water bodies (rivers) and cause the impact of various diseases, especially digestive tract diseases. Based on the above problems, it is necessary to modify or innovate the septic tank at the community stage house in Pahandut Village, on the Kahayan Riverside area, Palangka Raya City [6].

Based on the priority problems above, a modification or innovation of a septic tank is needed that can be used by riverside communities with houses focus on houses above the river. The general objective of this research is to provide septic tank facilities for houses on stilts in Padandut Seberang.

Figure 1 Settlements on the Kahayan Riverside area, Palangka Raya City (source: Documentation of the Researcher’s Team, University of Palangka Raya, 2020)
Village. Meanwhile, the specific objective of this research is to train the manufacture, installation, operation and maintenance so that the community is able to mass-produce the RPS technology [6].

The output of this research is to try to change the behavior of the people living on the Kahayan Riverside area to care about sanitation, especially the availability of septic tanks at stilt houses by providing training solutions in the form of making and installing a RPS. By making a pilot, installing and promoting the use of a RPS in riverside area stage house latrines, it is hoped that it can reduce the impact of pollution in water bodies due to the content of organic waste (feces), so that it meets the quality standards of waste that can be disposed of into the river. Applying the RPS technology on the Kahayan Riverside area, it is hoped that the sanitation of the community living on the the Kahayan Riverside area will improve [6].

2. Method

The method of implementing the activity is qualitative by solving the sanitation problem of the settlements along the Kahayan River in Pahandut Seberang Village [7]. The implementation of community service is carried out through hands-on training, in the houses of the majority of the Dayak and Banjar tribes who live along the river (stilt houses), residents of RT.01/ RW.01, Pahandut Seberang Village, Pahandut District, Palangka Raya City. Main Problem is because every toilet house on river stilts must have a septic tank, sustainability is used in every defecation activity, and there is no single program target (i.e. useful for the wider community). Positive impact on the environment. The implementation period is effective for 5 (five) months. The description of science and technology that will be transferred to the village community is shown in Figure 2.

Figure 2. Research Locations for Pahandut Seberang Village (Quickbird Imagery, 2018)

2.1. Target Audience / Activity Partners

Activity partners are houses of RT.01/ RW.01 Pahandut Seberang Village, Pahandut District, Palangka Raya. The method of determining target partners is through a survey of housing locations for houses who have houses on stilts on the water, but do not have septic tank facilities. It is hoped that youth organizations in the locations will encourage, invite and become the driving force for their citizens to actively participate [6].
2.2. The Implementation Step

The implementation steps offered to the Partner and mutually agreed upon between the researcher and the Partner are as follows: (1) Initial preparations for approaching youth organizations and residents living on the Kahayan Riverside area. In this case, it is the residents of RT.01/RW.01 Pahandut Seberang Village, Pahandut District, Palangka Raya to implement this program. All components, both partners and research teams and students, are mutually responsible and help each other with the implementation of activities. (2) Extension is carried out in collaboration with local RT.01/RW.01 in the form of interactive discussions, including: (a) Understand the sanitation conditions in Pahandut Seberang Village settlements and survey the locations of Partners. (b) Giving arguments, motivation, ideas offered to partners as a solution (in the form of a RPS). (c) Survey, location determination, recruitment of Partner I and II members, and student involvement. (d) Disseminate activity plans and work procedures (solution steps), as well as partner participation. (3) Training and demonstration of making RPS for riverside stilt houses are carried out in 1 month, installation is carried out in 1 month, work tests are carried out in 1 month and evaluation is carried out in 1 month. So that the total implementation is carried out effectively in 4 months. (4) Partnership assistance in this activity program is in accordance with the length of the contract for the implementation of the Community Empowerment Assistance Lecturer Program, namely the 2020 research team [6].

2.3. Evaluation and achievement of success indicators

Evaluation and achievement of success indicators are carried out by checking the output and product specifications [8]. The output form that is planned is the method of manufacturing and product (goods) a RPS which can be used at the stage house of Pahandut Seberang Village, on the Kahayan Riverside area. A RPS design specification [9] includes: (1) Shape, adapted to the paralon pipe material in the form of a tube with the dimensions: (a) Length: adjust the height of the stage house; (b) Volume: adjusts the number of users (number of households); (c) Compartment design, this compartment will be divided into 4 zones [9], namely: (i). Zone of scum (scum) and gas. (ii) Deposition zone, (iii). Matured sludge zone, (iv). Exhaust zone. (2) Picture of a RPS Design. In general, the manufacture of a RPS uses materials from paralon pipes that are formed in such a way that a septic tank design is obtained by filling the four compartment zones as described above [6]. The picture of a RPS plan is as shown in Figure 3 [9] as follows:

Remark [9]:
1. The zone of scum (scum) and gas (10).
2. The zone of deposition (20).
3. Matured sludge zone (30).
4. Filtration zone (40).
5. Sterilization zone (50) (optional)
6. Drain zone (60).
7. Connecting pipe (closed conduit) (11).
8. Influent hole (12).
9. Filter hole (13).
10. Sludge disposal hole (31).
11. Filter holes (41).
12. Arrangement of the filter tube (42).
13. Ventilation duct (43).
14. Apparatus of holding place or a closed channel "U" 51.
15. Electrodes (52)
16. Final effluent pipe (53).
17. Taps (which can be opened during draining) (61).
18. Final drain pipe (62).

Figure 3. Cross section of the RPS so that its parts are visible [8]
3. Result and Discuss

3.1. Analysis of Riverside Settlement Patterns
Communities living on the Kahayan Riverside area build houses in three locations [10], including: (1) the house is far from the river area (land or above ground), (2) the house is located on the riverside (rather close to the river), (3) the house is located on the Kahayan River of the lower part of the river (above water) as shown in Figure 4. The majority of houses on the Kahayan River are made of wood with the following classifications: (a) houses on the ground, namely houses on the upper river bank, buildings made of various between wood and concrete and the position of the building on the ground, (b) houses on stilts, namely houses on the Kahayan Riverside area, with a height of 1-4 meters from the surface of the riverside, the height of the building occupancy varies depending on the location of the building and the landscape around the river, (c) floating house, which is a house on the lower level of the river (above water), it is mentioned namely floating building [10].

![Building Zone in the settlement on the Kahayan riverside area](image)

**Figure 4.** Building Zone in the settlement on the Kahayan riverside area

3.2. Circulation Pattern Analysis
Circulation pattern in the residential area on the Kahayan Riverside area has three types of roads [3], including: wooden bridge, is a passenger circulation route used by riverside communities to reach houses, to rivers or as a route for community interaction in riverside villages such as shown in Figure 5. The walkway on the riverside settlement was made with the construction of ironwood boards about 1-2 meters wide. These planks are installed in a row supporting poles which are attached directly to the river with a pole height of about 1-3 meters. The pattern of walkways in Kahayan Riverside settlements can be divided into three [3], namely: (1) longitudinal straight walkways flanked by rows of houses or alleyways; (2) the walkway is on one side only, while the other side is directly the river route; and (3) branch walkways with dimensions that extend at each branch meeting. This branching is analogous to a crossroads and following a river pattern/ curve as in a riverside village. In some cases, there are wide walkways that are usually used by the community [6], including: (1) as a public space for gathering and interacting; (2) as a children's playroom; (3) sports/ badminton room; and (4) at certain times such as festivals or community meetings it is used as a sitting room/ meeting room [3].
3.3. Work Procedure and Activity Plan (solution steps)

Work Procedure and Activity Plan (solution steps) for the assistance program for the development and installation of RPS in Pahandut Seberang Sub-district, Palangka Raya City [6] as follows: (1) The initial registration stage for students (houses on stilt of RT.01/ RW.01 Pahandut Seberang Village, Pahandut Subdistrict, City of Palangka Raya is held for 1 week. Registration is carried out based on a form that has been filled in by residents who live on the Kahayan Riverside area. (2) The number of students is limited to a maximum of 24 people, but the number of participants is not limited. (3) The facilities and infrastructure for the activities are provided by renting a local community hall or sub-district hall where Partners usually hold community discussions and deliberations. (4) Educators/trainers are the Community Service team from the research team assisted by Students of the Civil Engineering and Architecture Department, Faculty of Engineering, Palangka Raya University assisted by Posyantek Jekan Raya. Teaching is grouped into 3 sections, each of which is related to one another [6], namely: (a) Early Educator / Training Group, (b) Evaluation Group and (c) Monitoring Group. Each group shows the sequence of the stages of implementing the activity and each stage is given structured content and learning outcomes. (5) Working partners to support the implementation of this activity are: (a) Youth organization RT 01/ RW 01 Pahandut Seberang Village, Pahandut Palangka Raya Subdistrict as the perpetrator of the activity. (2) Residents who live on the Kahayan Riverside area of RT.01/RW.01 Pahandut Seberang Village, Pahandut sub-district, Palangka Raya City. (6) Work procedures and activity plans through the solution steps that are carried out are with the Partner to determine the location of a RPS placement at the stilt houses of the river bank residents, conduct education/training on making a RPS to Partners, test the tools and performance of a RPS (variations in the number of users) from (1-2) weeks: (a) Number of users (0 - 5) people or 1 household, (b) number of users (6 - 10) people or 2 households, (c) Number of users (11 - 15) people or 3 families, evaluation of activities, and monitoring of activities using a RPS by the community of Pahandut Seberang Village [6].

3.4. Success Indicators

Partners consisting of training members of youth organizations and residents living on the Kahayan Riverside area at RT.01/ RW.01 Pahandut Seberang Village, Pahandut Sub-district, Palangka Raya City are obliged to participate in organizing these community service activities [6]. Partner participation is realized by receiving training content provided by the research team which will later check the activity achievement indicators. The content of the training implemented in order to realize Partner participation is as follows: (1) Participating partners provide a training venue and a site for testing a RPS (community stilt houses on the Kahayan Riverside area). (2) Partners participate in finding stilts houses for the Kahayan Riverside settlement who meet the requirements for the placement of a RPS. (3) Partners Participate in finding residents who are willing to defecate in the pilot house on stilts with the a RPS facility. (4) Partners participate in the production of a RPS component which includes several compartments, namely: (a) Scum and gas zones; (b) Deposition zone; (c) Mature sludge zone; and (d) Discharge zone [6].
3.5. Activity results
Results of community service activities, especially at RT.01/ RW.01 Pahandut Seberang Village, Pahanud Sub-district, Palangka Raya City, in the form of contents provided and indicators of outcome as follows: Phase I [6]: (1) Together with Partners, determine the location of the RPS placement in the stilt houses of the residents on the Kahayan Riverside area. Load given: (a) Inviting Partners to find houses on stilts that are eligible for RPS placement as shown in Figure 6. (b) Inviting Partners to look for residents who are willing to defecate in a pilot pangung house with RPS facilities. (2) Conduct education/training on the making of RPS for Partners. Load given: (a) Preparation of tools and materials; (b) The manufacture of RPS components includes several compartments, namely: (i) Scum and gas zones; (ii) Deposition zone; (iii) Matured sludge zone; (iv) The discharge zone is shown in Figure 7.

Figure 6. Inviting partners to look for stilt houses for placement of RPS

Figure 7. Making RPS components (filtration zone)

Phase II [6]: Testing of RPS tools and performance (variations in the number of users) from (1-2) weeks: Performance indicators: the efficiency of the tool against the number of users and time variations as shown in Figure 8. Evaluation of activities. Performance indicators: (1) Partners know how to make RPS as shown in Figure 9. (2) Partners know how to install RPS on stilt house poles. (3) Partners know how to carry out RPS operations and maintenance as shown in Figure 10 [10].

Figure 8. Testing of RPS tools and performance in a resident's house

Figure 9. Partners know how to make RPS
Phase III [6]: (1) Monitoring activities (creation and use of RPS by Partners) as shown in Figure 11. (2) Some products (people can train other residents) through sanitation entrepreneurship. Performance indicators: (i) Cognitive: Partners are able to think how to make RPS. (ii) Affective: there is a change in emotional behavior from defecating directly into the river to using RPS. (iii) Psychomotor: Partners are moved to take advantage of RPS when defecating. Outcome indicators that show the extent to which Partner participation is seen from several aspects include: (1) Partners participate in observing the efficiency of a RPS on the number of users and time variations. (2) Partner knows how to make a RPS. (3) Partners know how to install a RPS on Kahayan Riverside settlement, living in stilt houses. (4) Partners know how to carry out operations and maintenance of a RPS. (5) Based on the learning process towards Partners, it is expected that the process will occur: (a) Cognitive: Partners are able to think how to make a RPS; (b) Affective: there is a change in the emotion of the partner's behavior, from defecating directly into the Kahayan River to using a RPS as shown in Figure 12; (c) Psychomotor: Partners are motivated to use a RPS in the toilet of the house on the Kahayan riverside settlement on stilts when defecating and urinating [6] as shown in Figure 13.

4. Conclusion
The Institute for Community Service of Palangka Raya University has carried out many research programs related to community service, one of which is the Community Empowerment Assistance
Lecturer Program. In year 2020 activity this time, the research team carried out community service through the Community Empowerment Assistance Lecturer Program in the form of the activity "Assistance for the Making and Installation of a RPS in Pahandut Seberang Village, Palangka Raya City". In this activity, we together with the Palangka Raya University research team will collaborate to educate/train Mitra I and Mitra II, namely youth organizations and residents of RT.01/RW.01, Pahandut Seberang Village, Palangka Raya City in making a RPS which will later will be used by residents who live on the Kahayan Riverside area. The Palangka Raya University Research Team also involved the role of students from the Department of Architecture and Department of Civil Engineering, Faculty of Engineering, University of Palangka Raya in implementing designs and providing training in making and installing a RPS on stilt houses in Kahayan Riverside settlement. The role of students is also used as a field for field practice for students, especially the Faculty of Engineering before going into society. Training quality management and the application of RPS technology will be carried out professionally with a control system, control and confirmation of the functions and duties of each team member. The step was started from making proposals, determining the location, recruiting students (partners), members of RPS user, and monitoring was carried out by the service team in collaboration with the Palangka Raya University Community Service Institute. The implementation of quality management, community service activities was carried out out well and on purpose. The results of the service activities were achieved from the preparation stage to the documentation and publication stage of RPS. Community service activity stages are divided into: (1) the preparation stage; (2) implementation stage; and (3) post implementation stage. Based on the implementation of the Community Empowerment Assistance Lecturer Program activities, conclusions can be drawn from this service activity, including: (1) RPS is an appropriate technology septic tank designed for houses on stilts by the river. (2) The community service process has been carried out, including: (a) Initial preparations made were to make an approach made to the management of youth organizations and residents who live on the Kahayan Riverside area. (b) Counseling in collaboration with local RT.01/RW.01 in the form of interactive discussions. (c) Survey, location determination, recruitment of Partner I and II members, and student involvement. (d) Socialization of activity plans and work procedures (solution steps), as well as partner participation (content provided and performance indicators). (3) Conducting training and demonstration of making a RPS for a stilt house in Kahayan Riverside area. (4) Partnership assistance in community service program. (5) Installation of a RPS for a stilt house in Kahayan Riverside area of Pahandut Seberang Village, Pahandut Sub-district, Palangka Raya City.

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