Indonesian Journal of Community Engagement
Jurnal Pengabdian kepada Masyarakat
Vol. 9, No. 1, March 2023, Page. 6-11
DOI: http://doi.org/10.22146/jpkm.77924

School Community Empowerment Program for Conservation of Riparian Vegetation around the Bedog River in Godean, Sleman

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Submitted: September 22nd 2022; Revised: January 10th 2023; Accepted: February 24th 2023

Keywords:
Bedog River
Educational society
Nurul Islam
Preservation and protection
River plants

Abstract Due to the increasingly intensive interaction between humans and the river, the riparian vegetation conservation program was implemented to keep the Bedog River sustainable. This program aims to provide awareness and a good understanding of the dynamic balance between human life and the river environment, especially the conservation of riparian vegetation as a river key system that can be done. To achieve these aims, three approaches were implemented, i.e.: 1) empowering SMPIT Alam Nurul Islam Yogyakarta as a pioneer of the school community concern in the conservation of riparian vegetation by forming a "riparian class" equipped with learning modules for practising plant identification and research on vegetation profile analysis, 2) disseminating the conservation of riparian vegetation concept through the introduction of river bio-monitoring method for students and group activities by cleaning out the trash while doing outbound in the Bedog River, and 3) the involvement of all parties in the conservation of riparian vegetation by holding several focus group discussions with teachers and communities around the Bedog River. As an outcome, ESD-based learning on the conservation of riparian vegetation is included in the Biology Subject at SMPIT Alam Nurul Islam Yogyakarta, particularly in practical work. Then, every time a school outbound activity is held on the Bedog River, it is always accompanied by a trash clean-up activity. Also, there are efforts to use the communal land next to the school as an educational forest along with riparian vegetation conservation land.

1. INTRODUCTION

Due to the increasing interaction between humans and rivers, the utilisation of rivers and riverbanks exceeds the environment's carrying capacity (Zuriyani, 2017). Rivers are almost no longer able to carry out their functions because almost all components of the river ecosystem cannot function properly. Reduction in the number and types of riparian vegetation is the most common condition, mainly due to massive changes in land for cultivation and residential areas. In addition, the increase in waste being channelled and piled up excessively has accelerated the destruction of riparian areas, including riparian vegetation. If this condition continues, there will be damage to populations, communities, even ecosystems and river flows which in the end will be very detrimental to human life.

One of the keys to the river ecosystem conservation program is a complete understanding of the river ecosystem with riparian vegetation as the main component. Riparian vegetation is plants that live in watersheds (riparian zones) as components of river ecosystems. Apart from providing nutrients and oxygen and absorbing carbon dioxide, riparian vegetation also absorbs surface water flow, retaining the shape of embankments and river bodies and preventing river bank erosion. Various other organisms as well utilise plants as a place to live. The branching system

ISSN 2460-9447 (print), ISSN 2541-5883 (online)
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of stems and leaves that make up the canopy is used by several types of fauna as nests, branches and twigs as a place to live for aerial flora and fauna. In contrast, roots as a place to live for sub-aerial flora and fauna, including some roots that enter water bodies will be created as nests by fish, shrimp or other aquatic insects (Lyon & Gross, 2005; Riis et al., 2020; Tabacchi et al., 1998).

Riparian vegetation has undergone a process of adaptation and is able to grow and associate well in the riparian zone to form a stable but dynamic ecosystem. Generally, the vegetation planted by the community in the riparian zone obtained from other habitats is generally unsuitable for growing. It will even disrupt the stability of the river ecosystem. Therefore, both conservation and utilisation of riparian vegetation conservation programs should be based on community empowerment efforts that are in direct contact with the riparian vegetation growing areas (Prasetyo, 2019). As a strategic step, this empowerment effort is carried out for the school community who are able to absorb and practice the conservation concepts more perfectly, as well as being the decision makers of future policies (Büssing et al., 2018; Saragih et al., 2021).

This program aims to provide mutual awareness and a complete understanding of the dynamic balance between human life and the river environment and strategic steps for riparian vegetation conservation efforts that need to be carried out. To achieve these aims, three approaches were implemented, i.e.: 1) empowering SMPIT Alam Nurul Islam Yogyakarta as a pioneer of the school community concern in the conservation of riparian vegetation by forming a "riparian class" equipped with learning modules for practising plant identification and research on vegetation profile analysis, 2) disseminating the conservation of riparian vegetation concept through the introduction of river bio-monitoring method for students and group activities by cleaning out the trash while doing outbound in the Bedog River, and 3) the involvement of all parties in the conservation of riparian vegetation by holding several focus group discussions with teachers and communities around the Bedog River. The program is implemented into a series of activities as priorities that are able to raise awareness of river care, especially the Bedog River in the Godean Sleman area (Figure 1). Education for sustainable development (ESD) is one method that is currently believed to guarantee the delivery of the concept of the conservation program (Filho et al., 2016; Little & Green, 2009). Educational societies who already understand the concept of conservation are expected to become future policymakers who always realise the importance of river conservation by preserving and protecting various components of river ecosystems especially riparian vegetation.

SMPIT Alam Nurul Islam is a junior high school located in Gumuk, Sidoarum, Godean, Sleman, Yogyakarta. The teaching and learning process at SMPIT Alam Nurul Islam emphasises knowledge and skills about the natural environment as the basis for developing the potential of students, which is then formulated through an integrated education curriculum. Correspondingly, this school's location is also right on the banks of the Bedog River, with good environmental and building arrangements without destroying the existence of plants on the banks of the river. These two conditions of SMPIT Alam Nurul Islam facilitate the implementation of this ESD-based community service program (SMPIT Alam Nurul Islam Yogyakarta, 2023).

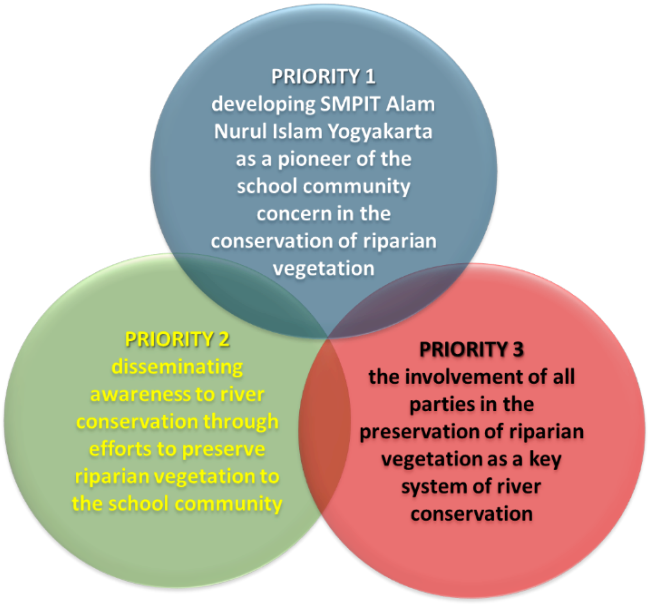

Figure 1 . Three approaches to school community empowerment programs

2. METHOD

The ESD concept, which underlies the conservation program, was progressively delivered using education and training methods. The insight into the conservation of riparian vegetation that is developed is expected to be able to support the concept of Education for Sustainable Development because it can balance: 1) the sustainability of economic values, 2) social justice and cultural values, and 3) the environmental sustainability of the Bedog River in Godean Sleman. It is hoped that the selection of the program basis in the form of the concept of Education for Sustainable Development will accelerate the achievement of the Sustainable Development Goals (SDGs) targets, especially caring for the environment and climate change, improving and preserving natural resources.

Educational and training methods and materials were designed to support teachers and students in understanding riparian vegetation conservation. As an output, knowledge and skills in plant identification, techniques for making herbarium and riparian vegetation monitoring using vegetation profile analysis method were given to students successfully. Furthermore, to ensure the sustainability of the program, three stages were applied: 1) incorporating the concept of riparian vegetation conservation program into the school curriculum through science subjects, especially in Biology, 2) assisting riparian vegetation monitoring activities by the school community through teachers and the vice principal of curriculum, and 3) dissemination of the program was carried out by inviting several local headmen

(village chiefs) as well as teachers and students from other schools around the Bedog River to take part in scientific discussion and Bedog River care actions by bio-monitoring and clean rubbish activities.

The school community empowerment program for riparian vegetation conservation around the Bedog river was implemented in three steps, as shown in Figure 2.

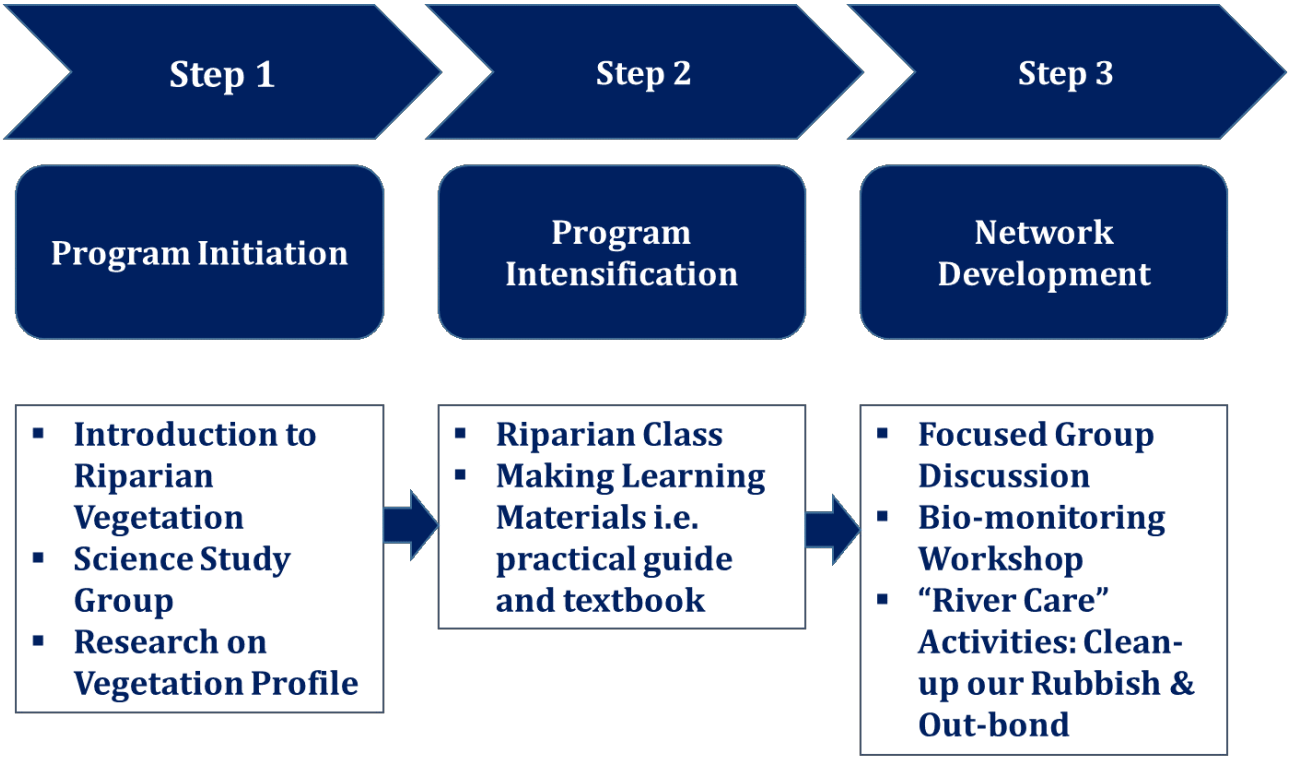

Figure 2 . Implementation of school community empowerment programs

Step one is the initiation of the school community empowerment program by holding several tutorials on introducing riparian vegetation to the science study group of SMPIT Alam Nurul Islam. The students were introduced to techniques for identifying and making herbariums and analysing vegetation profiles through group work in class and the field around the Bedog River. For program intensification, the second step is to deliver learning materials about riparian vegetation as part of the Biology subject. Learning is given to 8th-grade students either through mentoring in class or in the Bedog and Progo riverside areas to study differences in species composition between the two rivers. The third step is developing a network by involving several teachers from SDIT Alam Nurul Islam, SMPN 3 Gamping and MAN 1 Godean and the community around the Bedog River in the Godean area Sleman, such as Pundung Village and Perumahan Griya Indah. Through focus group discussion, the participants, i.e. teachers and community leaders, were directed to care about the river and riparian vegetation of the Bedog River through the actual action of cleaning up trash. The SMPIT Alam Nurul Islam students who had been accompanied in previous activities were also enriched by the introduction of the river bio-monitoring method as well as outbound activities along the Bedog River. After giving material on river bio-monitoring methods, the outbound and river cleaning up trash activities were carried out by students of SMPIT and SDIT Alam Nurul Islam on the Bedog River adjacent to the school location. In the future, every school outbound activity on the Bedog River is always accompanied by a trash clean-up activity.

3. RESULT AND DISCUSSION

The outputs of this school community empowerment program are presented in Figure 3, Figure 4, Figure 5, Figure 6, and Figure 7.

The introduction of knowledge and skills to recognise riparian vegetation using identification techniques, herbarium, and vegetation profile analysis in SMPIT Alam Nurul Islam can be delivered to the student. The learning process emphasises how to identify riparian plants through herbarium techniques and searching for dichotomous identification keys. Learning is given both in class and in the field. Each student makes a report on the results of plant identification. Subsequently, students in groups conducted a mini-research on the profile analysis of riparian vegetation with the guidance of the ESD Grant Team on the banks of the Bedog River around SMPIT Alam Nurul Islam. As an output of the program, a science study group has been formed as an interest group for students who study conservation efforts for riparian vegetation and greenhouses as a place to identify various types of riparian vegetation. Furthermore, the output at the intensification

stage is the inclusion of knowledge and skills in identifying and classifying riparian vegetation as learning materials for Biology Subjects for Class 7 at SMPIT Alam Nurul Islam. It is hoped that students' learning process will be more focused on critical, creative and strategic thinking systems, so that their ability to solve problems, including problems with riparian vegetation on riverbanks (Saragih et al., 2021).

The work steps undertaken are an initiation and intensification program established for SMPIT Alam Nurul Islam students who are expected to become a group of students who understand and are able to influence educated communities around the Bedog River to care about riparian vegetation. The school community is a future generation that will be very good if equipped with a complete understanding of the important value of conserving riparian vegetation as the main constituent of river ecosystems. Through this program, students will be equipped with the ability to identify and make herbariums and monitor changes that occur in river ecosystems, primarily components of a riparian vegetation. The program's continuity is ensured by including program material in Biology Laboratory Work for grade 7.

For the network development, river care activities were carried out involving several other schools as a form of the Bedog River riparian vegetation conservation program in Godean Sleman (Büssing et al., 2018). This empowerment program is planned to develop a network of Bedog River care programs in Godean, Sleman Regency, for the school community. Activities are carried out sequentially from focus group discussions, introduction to river biomonitoring training, and river care with outbound and clean rubbish. The focus group discussion was held in the SMPIT Alam Nurul Islam schoolyard and was attended by teachers and community leaders around the Bedog River in the Godean Sleman area. This forum discusses efforts that can be made to preserve the river, especially with

Figure 3 . Program initiation: tutorials on introducing riparian vegetation to the science study group of SMPIT Alam Nurul Islam

Figure 4 . Program intensification: (a) indoor of Riparian class and (b) outdoor of Riparian class

Figure 5 . Network development: focus group discussion amongst school community leaders around Bedog River in Sidoarum Godean located at SMPIT Alam Nurul Islam front yard (a) speakers of the focus group discussion and (b) participants of the focus group discussion

Figure 6 . Network development: river bio-monitoring workshop for students

Figure 7 . Network development "River Care" Activities: (a) Clean-up the Rubbish and (b) Out-bond

awareness efforts through the school community and community leaders. Several good experiences were conveyed in the discussion resulting in a shared learning process based on experiences between participants. The action participants agreed upon the next action to take action to care for the river and clean up trash with the students as the start of similar routine activities in the future. The results of the discussion also agreed to hold river biomonitoring training for teachers and students as part of the action to care for the river and clean up the trash. To make it interesting, the series of activities were packaged as outbound activities for teachers and students, which were held at the SMPIT Alam Nurul Islam school and the Bedog River on the side of the school building. The series of river care activities are expected to be useful as a basis for thinking about a comprehensive and sustainable river conservation concept.

It is hoped that the next impact will grow a sense of concern and mutual awareness of the river as a system with various components that make up the river ecosystem such as vegetation, animals, and microorganisms both living in the mainstream and in riparian zones among the people in Sleman and D.I. Yogyakarta in general. Stakeholders involved in this school community empowerment program play a role in all activities under the supervision of the UGM Faculty of Biology (Figure 8).

The empowerment of the school community based on the concept of education for sustainable development is very strategic, apart from serving as individual learning as well as community and institutional learning (Sancayaningsih et al., 2016). In the future, the interrelationships of the respective roles that are developed can continue in accordance with the initial pattern initiated by this school community empowerment program. School communities who already understand the concept of conservation are expected to become future policymakers who always realise the importance of river conservation efforts by preserving various components of river ecosystems, including riparian vegetation.

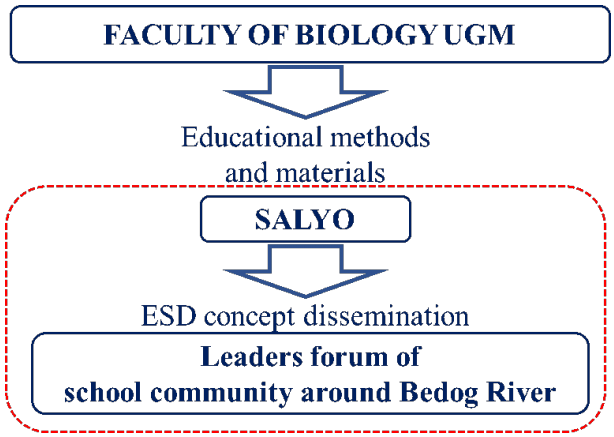

Figure 8 . The relationships and role of stakeholders

4. CONCLUSION

In conclusion, it can be conveyed that the concept of riparian vegetation conservation as a strategic step for river ecosystem restoration can be taught and trained for school communities. The school community is very good at accepting the concept of education for sustainable development so it is very strategic to play a role as a disseminator of concepts for the surrounding community. In this case, the riparian vegetation conservation program through empowering school communities around Bedog river in Godean Sleman was successfully carried out by making SMPIT Alam Nurul Islam or SALYO as the pioneer and disseminator of the program. Even though it has only been implemented at SMPIT Alam Nurul Islam, the use of riparian vegetation conservation material in Biology Laboratory Work for grade 7 shows that the concept can be incorporated into the school community.

ACKNOWLEDGMENT

This program was supported by the Education for Sustainable Development Grant Number 680/DIT.PM/2019 provided by DPKM UGM. Special thanks to Rury Eprilurahman, Ardyan Pramudya Kurniawan, Tiara Suryani, Mokhamad Nur Zaman and WaterForum Kalijogo team, who have strongly supported the implementation of the program. We would also like to express our gratitude and appreciation to teachers and school administrators of SALYO and the school and public community in the area around the Bedog River Godean, Sleman.

CONFLICT OF INTERESTS

We declare that there is no conflict of interest with any financial, personal, or other relationships with other people or organisations related to the material discussed in the manuscript. We also declare that all listed names are

entitled to become an author, and all have agreed on the final form of submitted manuscripts.

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