



Campus Setting as Living Labs: Lessons from IPB University, Bogor, Indonesia

Arif Satria¹, Alim Setiawan Slamet², Akhmad Kosasih³, Agus Purwito⁴, Iskandar Z Siregar⁵, Heriansyah Putra^{6*}

¹Faculty of Human Ecology, IPB University, Kampus IPB Dramaga, Bogor 16680, Indonesia

²Faculty of Economics and Management, IPB University, Kampus IPB Dramaga, Bogor 16680, Indonesia

³Directorate of General Affairs & Infrastructure, IPB University, Kampus IPB Dramaga, Bogor 16680, Indonesia

⁴Faculty of Agriculture, IPB University, Kampus IPB Dramaga, Bogor 16680, Indonesia

⁵Faculty of Forestry & Environment, IPB University, Kampus IPB Dramaga, Bogor 16680, Indonesia

⁶Office of Sustainable Campus Development, IPB University, Kampus IPB Dramaga, Bogor 16680, Indonesia

*corresponding author: heriansyahptr@apps.ipb.ac.id

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Abstract. IPB University in Bogor, Indonesia, has developed its campuses as living laboratories for education, research, community outreach, innovation, and business. The university's infrastructure under the living lab concept, such as forestlands, farmlands, wetlands, teaching factories, and business units, offer real-life opportunities for students and staff to create greater impacts to societies from their academic activities. This paper presents the lessons learned from IPB's campus setting as a living lab, focusing on how students and stakeholders can learn from the existing infrastructure and facilities, how research can benefit from a natural setting, and how the campus can serve as a model for sustainable living. Implementing living lab concept faces challenges as other new initiatives, particularly on the aspects of effective interdisciplinary works, formalizing the community of practices in which pool of experts are organized and knowledge management system is developed. In conclusion, in the era of emancipated learning implementation in Indonesia, IPB University's campus setting could provide a platform for facilitating activities related to science-practices/policy interface.

Keywords: Campus, Community of Practices, Knowledge, Natural Settings, Sdgs, Skill, Societies, Teaching Factories

1. Introduction

IPB University, located in Bogor, Indonesia, has declared itself as a biodiversity campus considering the campus setting which is dominated by green space. Recent discussion on campus management has decided to adopt a living lab concept which focuses on using a university's infrastructure and facilities, such as forestlands, farmlands, wetlands, teaching farms, teaching factories, and academic business units, as a platform for education, research,

community outreach, innovation, and business (1,2). Although the definition of living lab is still loose, this living lab has gained popularity as a tool for promoting green campus or sustainable campus criteria and indicators. Living labs are considered as innovations in the knowledge transfer ecosystem that could close the market with products, technology, and services (3,4). Therefore, it is essential to integrate educational experiences with technical and scientific knowledge (5,6). Many concepts and prototypes of technology have been developed and they need a testbed for evaluating technology readiness confirming new products and services are proven in a natural setting (7,8). It is also known that living labs can be applied in various settings, including urban areas, rural areas, housing areas, office areas, and also universities or other higher education institutions. In a university setting, the living lab concept can create real-life opportunities for students to apply skills and knowledge gained from their academic activities (1,2,9,10).

Universities capacity includes management and resources. Particular resources such as infrastructure and facilities that are managed by IPB University, including university education forests, farmlands, pilot plants, teaching factories and others, should be managed multidisciplinary or interdisciplinary to provide places for hands-on experiences both for teaching staff, students and visitors. Multidisciplinary or Interdisciplinary works and collaboration can be promoted, where different fields of interests and expertise can work together to solve complex problems (6,9). The living lab concept also can be used to showcase the implementation of principles, criteria, and indicators of sustainability.

Implementation of living lab concept opens up opportunities for universities to integrate education, research, community outreach, business, and innovation in their campus programs and activities in relation to sustainable development goals (SDGs). This paper aims to demonstrate the IPB University's campus setting that serves as a model for stakeholders to leverage existing campus infrastructure and facilities within the framework of living lab implementation and promote sustainable development.

2. Research Methods

The research approach is a case study appraisal of IPB University's effort to promote sustainability through living labs setting. A case study exposes the causal links and pathways from implementing a system or intervention. This paper demonstrates the IPB's campus setting, including the infrastructure as living labs and its benefit for students and researchers and supports sustainability. This study focuses on five sites of IPB University as the prime representative implementation of the living labs concept, namely i) Dramaga as the main campus, including the Biodiversity Campus, Agribusiness Technology Park and SDGs lake, ii) Gunung Walat University Forest in Sukabumi, iii) Jonggol Teaching Farm, iv) Science Techno Park in Taman Kencana, and v) Serambi Botani Outlets in Baranangsiang Campus.

3. Results and Discussions

3.1. Infrastructure as living labs at IPB University

IPB University provided its infrastructures as living labs spread across the IPB Campus sites, i.e., Dramaga as the main campus, Sukabumi, Jonggol, Taman Kencana, and Baranangsiang Campuses. Gunung Walat University Forest, located in Sukabumi and Jonggol

Teaching Farm, have areas of 359 and 269 Ha in size, respectively, that serve as an integrated infrastructures and facilities of learning, research, and business, such as forest practices for education, Sorinfer teaching factory for research and business and mini-plant palm oil mill. In the business area, IPB University has provided Agribusiness Technology Park and Serambi Botani Outlets as the frontlines marketing of IPB products resulted from innovation.

IPB University has also developed a green campus program. The campus's natural setting provides a unique opportunity to showcase sustainable practices and serve as a model for sustainable living, like SDGs No 14 and SDG No. 15. Policy and infrastructure have been promoted to support sustainable living, for example, Declaration of Biodiversity Dramaga Campus, the SDGs lake in Dramaga Campus and Gunung Walat University Forest in Sukabumi District as the main sites of interest. The selected infrastructures as living labs at IPB University are shown in Table 1. The infrastructures provide the campus landscape as living labs that offer opportunities for students and researchers to engage in site-based learning programs that garner environmental sustainability (10).

Table 1. Selected infrastructure as living labs at IPB University

No	Infrastructure	Site	Size (ha)
1	Gunung Walat University Forest	Sukabumi	359
2	SDGs lake	Dramaga	0.96
3	Biodiversity Campus	Dramaga	267
4	Agribusiness Technology Park	Dramaga	6.03
5	Jonggol Teaching Farm	Jonggol	269
6	Science Techno Park	Taman Kencana	3.00
7	Serambi Botani Outlets	Baranangsiang	5.35
Total			910.34

3.2. Benefits for Students

The living lab concept provides students real-life opportunities to apply skills and knowledge gained from their academic activities. For example, agriculture students can gain hands-on experience working on the university's farmlands, while business students can learn about entrepreneurship by engaging with the university's business units. The living labs also help the students to achieve the learning outcome, e.g., critical thinking and problem-solving.

The living lab concept also fosters creativity and innovation by encouraging students to think outside the classroom and come up with practical solutions to real-world problems. Hence, the living laboratories improve both students' academic skills (hard-skills) and soft-skills. Figure 1 shows the academic activity for wood sample collection training in IPB's Gunung Walat University Forest (GWUF). This site is also regularly used for field work sites to bring real experiences for students. Gomez and Derr (10) reported that a real-site learning experiences gain requisite knowledge for the field and develop their perspective of environment.



Figure 1. Academic activities (field works) in 359 ha IPB's Gunung Walat University Forest (GWUF), Sukabumi District, West Java, Indonesia

3.3. Benefits for Research

IPB University's campus setting offers a natural setting for research that can benefit various fields of study. For example, researchers studying ecology can conduct experiments in the university's forestlands, while researchers studying wastewater treatment can use the university's wetlands as a research site. The living lab concept also allows for interdisciplinary collaboration, where researchers from different fields can work together to solve complex problems. Figure 2 shows the result of the integration between research, innovation, and business in IPB's Agribusiness Technology Park (ATP) development of hydroponic media for melon yield improvement.



Figure 2. Development of Golden Melon using hydroponic media for yield improvement in IPB's Agribusiness Technology Park (ATP) in Dramaga, Bogor District, West Java

3.4. Benefits for Sustainability

The living lab concept aligns with the university's mission to promote sustainable living. The campus's natural setting provides a unique opportunity to showcase sustainable practices and serve as a model for sustainable living, like SDGs No 14 (Life below water). For example, the university's teaching factories can demonstrate sustainable manufacturing practices, while the university's farmlands can showcase sustainable agriculture practices. In the education sector, universities play an essential role in meeting criteria and indicators of sustainability. They can equip the next generation, provide the showcase, and use their expertise to influence stakeholders to adopt and model sustainability practices (9). Figure 3 shows a SDGs lake in IPB as the showcase of SDG 14.



Figure 3. Showcase of sustainability relating to SDG 14: Life Below Water, namely SDGs lakes in IPB's Dramaga Campus, Bogor, West Java

4. Challenges of Implementing a Living Lab Approach

Implementing a living lab approach in a university setting presents various challenges. One of the main challenges is implementation of interdisciplinary collaboration, where different departments and study programs must work together to achieve common goals. Another challenge is the existing community of practices, where individuals may resist change and new ideas. Additionally, a pool of experts and knowledge management system are required to ensure the success of implementation of the living lab concept, and support from university stakeholders is necessary to ensure the sustainability of the living lab approach.

5. Concluding Remarks and Future Recommendations

IPB University's campus setting as a living lab provides a unique opportunity for students and researchers to engage with nature and apply skills and knowledge to real-world problems. The living lab concept has numerous benefits for students, research, and sustainability. However, implementing a living lab approach in a university setting presents various challenges, such as interdisciplinary collaboration and support from university stakeholders. Hence, strengthening these aspects should be continued to improve the campus setting as the living labs. Overall, IPB University's living lab concept serves as a model for integrating education, research, and sustainability in its campus development.

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