Biodiversity in Urban Area: Potential Biodiversity of Tanjung Priok, North Jakarta and the Impact of Conservation Programs

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Abstract

The Jakarta area needs the protection of biodiversity through in situ and ex situ conservation programs as depletion of green area that covered only 14.9% of the total area. Conservation program to develop open space into green open space are implemented in some area of North Jakarta by private company such as PT Indonesia Power Priok POMU. The program is carried out in the Taman Hati Sunter Agung area, the Priok POMU area, and Warakas. This study aims to determine the current conditions regarding the conservation program, carbon sequestration, flora and fauna biodiversity, as well as obtain recommendations for optimizing the program, and positive both direct and indirect impacts. The results showed that the average carbon uptake in the Priok POMU Hydroponic House for an area of 24 m^2 is 243509,33 kg CO_2 Eq considered very high. At Taman Hati and Sunter Agung RPTRA for a land area of 2915 m^2 is 150402,34 kg CO_2 Eq and in the coastal location of the Priok POMU for an area of 2586 m^2 is 131854,97 kg CO_2 Eq considered still relatively high. At the Tabulampot Priok POMU for an area of 170 m^2 location is 4325,65 kg CO_2 Eq and Warakas location for an area of 77,857 m^2 is 2258242,29 CO_2 Eq considered quite high. The index value of flora species ranged in the high category (H'= 3,694; 3,509; 3.241; 4,225) and in the moderate category (H'= 1,979). The index value of bird species ranged in the moderate category (H'= 2,048; 1,163; 1,501) and in the low category (H'= 0,987). The index value of insect species ranged in the moderate category (H'= 2,299; 1,099; 1,787; 1,427). The index value of reptile species ranged in the low category (H'= 0,562; 0,562).

Keyword: Species diversity, conservation, urban area, impact program

1. Introduction

Jakarta as the capital city of Indonesia, is an area that has been built quite massively, so that until now green open space is only 14.9% of the entire city area. To achieve 30% green open space, the efforts made are to utilize every open space to be planted with annual and perennial plants. Therefore, PT Indonesia Power Priok POMU n which a power generation company operating in the North Jakarta area, committed to conduct plantation and conservation program, both in office area and community housing. The main aims of the company is to build a harmonious relationship in the midst of a sustainable environment and can provide the widest benefits to meet the expectations of stakeholders, and always operates in compliance with all applicable laws and regulations and even seeks to exceed them.

In line with the implementation of conservation programs in the Taman Hati, Sunter Agung, Priok POMU, and Warakas areas, Priok POMU considers it necessary to collect data and evaluate information on the status of biodiversity that has been managed in these programs by external parties and is expected to describe the implementation of the program. objectively and provide a new perspective in improving the program. The company committed to participate in the protection of biodiversity. This commitment is the implementation of environmentally sound development policies according to Law Number 32 of 2009 concerning Environmental Protection and Management and Regulation of the Minister of the Environment of Indonesia Number 3 of 2014 concerning the

company's performance rating program in environmental management which states that one of the performance evaluations carried out is exceeding compliance with biodiversity protection activities (Indonesia Power, 2020).

Efforts to maintain biodiversity are in line with the Regulation of the Minister of the Environment of Indonesia Number 3 of 2014 which states that the protection of biodiversity can include in situ conservation (within the species' original habitat), ex situ (outside the species' original habitat), and ecological restoration. Several in situ conservation programs include the maintenance of plant species which are native to Java in the North Jakarta area, several ex situ conservation programs include the maintenance of plant species outside the plant's natural habitat, and ecological restoration includes the reconstruction of coastal ecosystems in the PT Indonesia Power Priok POMU area (Indonesia Power, 2020).

1.1 Objectives

This study aims to determine the current conditions regarding the development program for the Priok POMU, Sunter Agung and Warakas Heart Parks along with their weaknesses and strengths, conduct a study of carbon sequestration and plant and animal biodiversity, as well as obtain recommendations for program development to be more optimal, both direct and indirect impacts.

2. Literature Review

Professor Dieter Helm has called for a Green Belt with 'lots of natural capital' including 'much greater public access' and 'woodlands located next to people'. Similarly, the third State of Natural Capital Report4 describes investments in natural capital that offer the greatest economic returns. Those that are particularly relevant in the Green Belts include woodland planting, wetland creation, expanding urban greenspace, improving the environmental performance of farming and managing catchments. Improvements could be financed through targeted incentives similar to the current Countryside Stewardship Scheme.

3. Methods

3.1 Calculation of carbon uptake lower plants / shrubs / land cover

The shape of the sample plot made according to field conditions is in the form of a square plot. The understorey biomass was measured in a destructive way, namely by cutting all parts of the vegetation above the soil surface from small plots measuring 0.5 x 0.5 m as many as 6-10 small plots.

Calculation of carbon for undergrowth on plots of 0.5 x 0.5 m by weighing the fresh weight (FW) and calculating the moisture content and dry weight (DW) of the understorey. The carbon content of plants under the plot is calculated by the formula (Wibowo *et al.* 2013):

$C\ tb/plot = FW\ tb \times fraction\ C\ (0{,}5)$

Calculating the carbon content of tb per hectare is calculated by the formula:

$C\ tb/ha = \frac{C\ tb/plot}{1.000} \times \frac{10.000}{0{,}25} m^2$ (plot area)

3.2 Diversity and Evenness

Species diversity is calculated using the Shannon-Wiener diversity index (H') with the following formula (Magurran, 2004):

H' = - $\sum pi \ln pi$

where:

H' = diversity index by Shannon-Wiener

pi = proportional abundance of each species

Magurran (2004) states that the range of diversity index values is: Low if H` < 1,0; Moderate if 1,0 <H`<3,0; High if H`>3,0

The research methods should elaborate on the method utilized in addressing the issues including the method of analysis. It should contain enough details allowing the reader to evaluate the appropriateness of methods as well as the reliability and validity of findings.

Evenness index formula:

$E = \frac{H'}{\ln S}$

where:

S = total number of species richness

E = evenness index

According to Krebs (1999), the evenness index value (E) is classified into 3, namely: $0 < E \leq 0.4$ meaning the population uniformity is small; $0.4 < E < 0.6$ the population uniformity is moderate; $E \geq 0.6$, then the population uniformity is high.

3.3 Jaccard Index

The status of biodiversity per area is obtained through the simplest biodiversity index, namely the number of species per area (S). To determine the trend of biodiversity from the beginning to the end of the year, it is more appropriate to calculate the difference in species composition. This is done with the Jaccard similarity index (SJ) (Magurran, 1988).

$$SJ = \frac{a}{a + b + c}$$

where:

a = number of species present in 2020 and 2021

b = number of species present in 2020

c = number of species present in 2021

If the number of species can indicate an increase or decrease in biological richness, the Jaccard similarity index shows changes in species composition from the two years. The Jaccard similarity index value indicates the same proportion of species from both years. A value of 1 indicates that species from 2020 are exactly the same as species from 2021 while a value of 0 indicates that species from 2020 are not the same as species from 2021. The smaller the Jaccard similarity index value, the greater the difference in plant species between the two years. Along with the number of new species, the Jaccard similarity index looks at how many species differ from the previous year.

In addition to calculating the number of species, levels of diversity and differences in species composition, the results of monitoring the biodiversity program are shown in pictures taken with cameras during the monitoring carried out in June 2021. The program conditions are described for future program evaluations.

4. Data Collection

The method for mangrove/coastal area based on purposive sampling as the representation of area. Data collection and collection activities include sampling vegetation data using the transect method. A total of 12 transects were made with a size of 20m x 20m or each transect made at locations with different gradations of environmental changes such as habitat, ecosystem or physiognomy conditions, each transect divided into 5 sub transects / plots, each measuring 20m x 20m for level data collection for trees > 10 cm in diameter at breast level; then a 10m x 10m plot was made to collect data on trees at the pole level with a diameter of 5 cm - 9.9 cm; plots of 5m x 5m for saplings measuring 1cm - 4.9 cm in diameter; Meanwhile, for seedlings, 2m x 2m plots were made for saplings <1 cm in diameter. Tree data collection includes stem diameter measured at breast height, total height, and branch-free height. Outside the mangrove area, data collection is carried out by means of a plant population census, and for the observation of fauna, carried out by the transect method.

5. Results and Discussion

5.1 Program Profile

The difficulty of finding an environmentally friendly location in the midst of the hustle and bustle of development in Jakarta has made the area of RT 015 RW 05 in Sunter Agung one of the selected locations in the Utilization of Land Yard (PTP). Previously this location was unused land and a lot of piles of garbage. The inauguration of the Taman Hati PKK RW 05 Sunter Agung coincided with the formation of the RW 05 Sunter Agung Farmers' Group (POKTAN). In 2017 in collaboration with the KPKP Sub-dept. (Seasonary Food Security and Agriculture) formed the Women Farmers Group (KWT) in vegetable cultivation program activities with the Hydroponic system of vegetable crops and medicinal plant cultivation (Figure 1). The Taman Hati PKK RW 05 program is a series of company efforts to assess the potential and plan it with the community in a participatory manner. The results of the analysis carried out by the company are then realized in a gradual and sustainable program planning. The innovations developed are adjusted to the stages and needs or readiness of the beneficiaries to implement the innovation. Broadly speaking, the activities in Taman Hati PKK RW 05 include the development of hydroponic plants, family medicinal plants (TOGA), waste banks, liquid and solid organic compost and the development of SMEs.

Figure 1. Horticultural farming and hydroponic plants in the Taman Hati PKK RW 05 Sunter Agung

PT Indonesia Power Priok POMU is one of the power generation units of the PLN subsidiary which is committed to participating in the protection of biodiversity. This commitment is the implementation of an environmentally sound development policy according to Law Number 32 of 2009 concerning environmental protection and management and the Minister of Environment and Forestry Regulation Number 3 of 2014 concerning the company's performance rating program in environmental management. Since 2017 Priok POMU has implemented a biodiversity protection program. In 2018 there were several protection programs that included in situ conservation such as the maintenance of native plant species of Java Island in the North Jakarta area, ex situ conservation such as the maintenance of plant species outside their natural habitats and ecological restoration with the reconstruction of coastal ecosystems in the POMU Priok area (Figure 2). In addition, there is the One Employee One Tree program, which is the planting of seedlings into the environment around the company by employees.

Figure 2. Fruit plants in pots (tabulampot) and the coastal areas Priok POMU

Healthy village Hijaunesia Power is a village assisted by Priok POMU since 2017. The program is a reforestation program by procuring ornamental plants and TOGA in a vertical plant system or verticulture called a vertical garden. TOGA is planted in pots with a vertical garden system arranged in steps to overcome the limited land in Warakas (Figure 3). There is a superior product of the fostered community in the form of starfruit syrup. In addition, Priok POMU also initiated a 3R-based waste bank program (reuse, reduce, recycle).

Figure 3. TOGA in a pot with terraces and Saung Hijau in Healthy village Hijaunesia Power Warakas

Impact of Biodiversity Protection Program

Table 1. Contribution and Impact of Biodiversity Protection Program PT Indonesia Power Priok POMU

Name of activity	Aspects and Impact	
Hydroponics and horticultural farming program	Spatial	Less land use with quite a lot of production. The land, which was originally a dumping ground for the cooking oil packaging industry, has become a green and beautiful Hydroponic Garden and horticultural agriculture.
	Financial	From the profits from the sale of organic vegetables/fruits, it can help the community in procuring tools and materials (seeds & fertilizers) for further capital.
	Efficiency	People don't have to walk far to the market to buy vegetables/fruits
	Hygiene	Vegetables/ fruits as a result of this program are better maintained in terms of cleanliness and health
	Planting Duration	Hydroponic vegetable growing time is faster so that marketing time is also fast

5.2 Taman Hati PKK RW 05 Sunter Agung

The Taman Hati PKK RW 05 Sunter Agung program involved 20 Neighborhood Units (RT) located in RW 05 Sunter Agung. Based on the intensity of community contributions in each RT, there are five RTs that play an active role directly, while the other 15 RTs play a role in supporting aspirations and materially for the sustainability of the MSME program - PKK RW 05 Sunter Agung. This activity has an indirect impact on residents in one sub-district of Sunter Agung, because the position of RPTRA and Taman Hati PKK can be accessed by all residents in the kelurahan of Sunter Agung. There are 22,467 families in Sunter Agung Village, where RW 05 is one of 20 RWs in the area. In 2020, as many as 94 species of plants were collected and planted in PKK Heart Park RW 05 either as additional or substitute a dead plant.

5.3 Office Area of PT Indonesia Power Priok POMU

Based on observations, obtained 60 species of plants in the Coastal ecosystem of PT. Indonesia Power Priok POMU and 51 species of plants in the tabulampot area and nursery house. Meanwhile, the results of monitoring and inventory show that the total species in hydroponic homes in 2020 are 28 species. Several plants have been distributed to various areas in Priok POMU so that the number of species present is not as much as in the previous year. Evaluation of plant maintenance needs to be done intensively. These types of plants include medicinal plants, horticulture, and wild plants in the vicinity.

5.4Healthy Village Program: Hijaunesia Power Warakas

The reforestation program in 2017 carried out planted 25 species, in 2018 there were 41 species, in 2019 there were 80 species, in 2020 there were an additional 25 new species, while in 2021 there were 64 additional types of ornamental plants and new TOGA planted in the Warakas area. Based on observations and plant inventories, 158 plant species

were found in the Warakas area in 2021. The inventory was carried out representatively in 5 RTs in the Warakas area. These results indicate an increase in plant species compared to 2020, which was 89 speciess (Indonesia Power, 2020).

5.5 Carbon Absorption

Carbon sequestration for the location of Green Open Space (RTH) in Taman Hati PKK RW 05 is located around RPTRA Sunter Muara in the form of plots of medicinal and horticultural plants, as well as a medicinal plant garden in Taman Hati. The following is the carbon sequestration value from the field study (Table 2).

Table 2. Plant Carbon Sequestration in Taman Hati Sunter Agung

Plot	Fresh Weight (g)	Dry Weight (g)	The carbon content lower plants per plot (g)	Carbon lower plants / ha (kg / area)	Carbon lower plants / ha (tons / ha) **
1	122,88	22,58	11,29	131641,40	5265656,00
2	120,91	19,39	9,70	113043,70	4521748,00
3	221,30	41,12	20,56	239729,60	9589184,00
4	170,43	29,97	14,99	174725,10	6989004,00
5	185,40	15,93	7,97	92871,90	3714876,00

From the 5 plots above, the average carbon uptake at the Taman Hati and Sunter Agung RPTRA locations is 150402,34 kg CO_2 Eq. This number is relatively high for a land area of 2915 m^2 and can be increased by planting trees of productive annual crops, such as fruit.

Carbon sequestration for the coastal protected area in Priok POMU is located around the mangrove ecosystem area and its surroundings. The following is the carbon sequestration value from the field study (Table 3).

Table 3. Plant Carbon Sequestration in the Priok POMU Coastal Protected Area

Plot	Fresh Weight (g)	Dry Weight (g)	The carbon content lower plants per plot (g)	Carbon lower plants / ha (kg / area)	Carbon lower plants / ha (tons / ha) **
1	168,35	14,33	7,17	74114,76	2964590,40
2	116,67	26,89	13,45	139075,08	5563003,20
3	274,40	32,60	16,30	168607,20	6744288,00
4	250,43	36,20	18,10	187226,40	7489056,00
5	135,56	17,45	8,73	90251,40	3610056,00

From the 5 plots above, the average carbon uptake in the coastal location of the Priok POMU is 131854,97 kg CO_2 Eq. This number is still relatively high for an area of 2586 m^2, but decreased compared to 2020. In general, the POMU Priok Coastal area is able to absorb and store carbon, most of which are Mangrove plants, which can store carbon in the form of biomass. The carbon sequestration for the Tabulampot Area and the POMU Priok Nursery Area can be seen in Table 4.

Table 4. Plant Carbon Sequestration in the Tabulampot Priok Area POMU

Plot	Fresh Weight (g)	Dry Weight (g)	The carbon content lower plants per plot (g)	Carbon lower plants / ha (kg / area)	Carbon lower plants / ha (tons / ha) **
1	99,00	20,53	10,27	6980,20	279208,00
2	82,00	14,22	7,11	4834,80	193392,00
3	13,00	5,23	2,62	1778,20	71128,00

4	114,60	10,91	5,46	3709,40	148376,00

From the 4 plots above, the average carbon uptake at the Priok POMU location is 4325,65 kg CO_2 Eq. This amount is quite high for an area of 170 m^2. In general, the Tabulampot area and the Priok POMU nursery house are able to absorb and store carbon, most of which are annual plants and fruits that can absorb and store carbon in the form of biomass. In addition to carbon sequestration, the plant species diversity index was also calculated.
Carbon sequestration for the Priok POMU hydroponic house and its surroundings can be seen in Table 5.

Table 5. Plant Carbon Sequestration in Priok POMU Hydroponic Area

Plot	Fresh Weight (g)	Dry Weight (g)	Carbon lower plants/ha (kg / 24m^2)**	Carbon lower plants/ha (ton/ha)**
1	24,0	13,0	64168,00	2566720,00
2	184,0	90,0	444240,00	17769600,00
3	125,0	45,0	222120,00	8884800,00

From the 3 plots above, the average carbon uptake in the Priok POMU Hydroponic House is 243509,33 kg CO_2 Eq. This number is considered very high for an area of 24 m^2. In general, the area around the hydroponic house area, especially in the nursery environment, is able to absorb and store carbon.

Carbon sequestration for the Warakas location is in the form of medicinal plants and ornamental plants in Warakas. The following is the carbon absorption value (Table 6).

Table 6. Plant Carbon Sequestration in Warakas

Plot	Fresh Weight (g)	Dry Weight (g)	The carbon content lower plants per plot (g)	Carbon lower plants/ ha (kg / 77857m^2)**	Carbon lower plants / ha (tons / ha) **
1	80,00	6,78	3,39	1055740,92	42229636,80
2	34,00	12,55	6,28	1954210,70	78168428,00
3	107,00	24,80	12,40	3861707,20	154468288,00
4	53,00	13,88	6,94	2161310,32	86452412,80

From the 4 plots above, the average carbon uptake at the Warakas location is 2258242,29 CO_2 Eq. This amount is quite high for an area of 77,857 m^2. The Healthy Village Hijaunesia Power Warakas is able to absorb and store carbon emissions, this can also be increased by planting annual trees, such as fruit or ornamental trees.

5.6 Diversity and Evenness of Flora Species

Table 7. Diversity and evenness of flora in the Taman Hati PKK, RPTRA Sunter Agung, PT Indonesia Power and Hijaunesia Power Warakas in 2021

Location	H‘	E
Taman Hati PKK and RPTRA Sunter Agung	3,694	0,751
Coastal Area of Priok POMU	3,509	0,857
Tabulampot and nursery house Priok POMU	3,241	0,842
Hydroponic house Priok POMU	1,979	0,841
Hijaunesia Power Warakas	4,225	0,835

The diversity index value of PKK RW 05 Heart Park is 3,694 (See table 7) or the diversity index of medicinal plants in PKK RW 05 Heart Garden is classified as high. This is an increase from the results of the diversity index in 2020 with a value of 2,753. The plants in the area of Taman Hati and RPTRA, Sunter Agung experienced an increase in

species and individuals in each plant due to individual succession in each plant and community activities that added plant species and individuals. The evenness index value of 0,751indicates that the population uniformity is in the high category. This value increased from 2020 which was previously worth 0,691.

The species diversity index in the coastal area of Priok POMU is 3,502 or the plant diversity index in Priok POMU is high. This is due to the data collection is carried out in a representative manner and the existence of intensive mangrove breeding in several areas, although the existing mangrove species have not increased. In addition, some plants experience drought so that intensive maintenance or replacement with new plants is needed. The evenness index value is 0,857 indicates the population uniformity is included in the high category. This value increased from 2020 which was previously valued at 0,827.

The value of plant species diversity in the Tabulampot area and the Priok POMU nursery was 3,241 which means it is quite high. Field conditions that were observed at that time were hydroponic houses where there was no treatment for planting vegetables, and the nursery house had not procured/added seeds either. So, we did a combined calculation between the tabulampot and the nursery house area. In addition, several plants in the form of seeds have been planted in various places around the company so that intensive seed procurement is required. The evenness index value is 0,842 indicates the population uniformity is included in the high category. The value of plant species diversity in the Priok POMU hydroponic house was 1,979 which means it was classified as moderate. The evenness index value is 0,841, the population uniformity is included in the high category.

The plant species diversity index in Warakas is 4,225 or the diversity index of vertical plants, medicinal plants, and surrounding plants in Warakas is quite high. This is because the addition of plant species due to succession or from local residents, is not proportional to the area in the village. The evenness index value is 0,835 indicates the population uniformity is included in the high category.

5.7 Jaccard Index

In addition to the diversity index value, the number of species was calculated using the Jaccard equation to see the number of species present in the early and final years. The calculation results are presented in Table 8.

Table 8. Jaccard similarity index value in Taman Hati, RPTRA Sunter Agung, Region PT Indonesia Power and Power Hijaunesia Warakas

Location	Sj
Taman Hati PKK & RPTRA Sunter Agung	0,28
Coastal Area of Priok POMU	0,27
Tabulampot & Nursery House Priok POMU	0,23
Rumah Hidroponik Priok POMU	0,41
Hijaunesia Power Warakas	0,61

Based on the Jaccard similarity index value in Taman Hati PKK and RPTRA Sunter Agung, 0,28 means that 28% indicates that the number of plant species in 2021 is not found in the types of plants in 2020, 2019 and 2018. In addition, this also shows that plants that grow in 2021 is almost the same as the plants growing in 2020.

The Jaccard similarity index value on the Priok POMU Coast shows 0,274 or 27,4% of plant species in 2021 different from plant species in 2017. This is because many new species are planted by employees or staff as one of the ecosystem protection programs on the Priok POMU coast. In addition, there are several plants that were available in 2017, but not in 2021, because they are annual plants (after harvest), and some have been eroded by the waves/cut down so they need to be replanted.

The Jaccard similarity index value in tabulampot and Priok POMU nursery area is 0,23 or 23%, indicating the number of different types of plants in 2021 with 2018. This is because several new plant species were planted by employees so that the abundance of the species increased. Henceforth, intensive care is needed to keep existing plants sustainable.

The Jaccard similarity index value in the Priok POMU hydroponic area was 0,87, meaning that 87% showed different plant species in 2021. Meanwhile, the Jaccard similarity index value in 2019 was 0,39 or 39% of the same plant species

as in 2017 decreased from 2018. However, the Jaccard similarity index value in 2020 was 0,12 or only 12% of the same plant species as in 2019, a decrease from 2017 and 2018. This is because many new types of plants are planted by employees so that the abundance of species increase. This is also accompanied by the distribution of plant seeds around the Priok POMU area, so that the existing plants in 2018 and 2019 have spread to various places within the company and are replaced with new types of plants in 2020. In the future, intensive care is needed to keep existing plants sustainable.

The Jaccard similarity index value in Hijaunesia Power Warakas is 0,61, which means 61% indicates that the types of plants in 2018 are the same as those found in 2017. The Jaccard similarity index value in 2019 is 0,26, which means 26% indicates that the plants in 2019 were the same as in 2017 and decreased in 2018. The similarity index value in 2020 was 0,19, meaning that 19% of plant species in 2020 were the same as plant species in 2017, and the similarity tends to decrease from 2019 and 2018. In 2021, the Jaccard similarity index value is 0,15 or 15% of plant species in 2021 the same as plant species in 2017, and the difference in species continues to increase every year. This is because many types of plants are used and processed by residents, especially fruiting plants and ornamental plants. Provision of new plant seeds and counseling about farming is very necessary as an increase in the biological wealth in the residential neighborhoods of residents.

5.8 Diversity and Evenness of Fauna Species

Research or observation of fauna is shown to get a picture of the state of wildlife found in the PT Indonesia Power POMU Priok area, Taman Hati and RPTRA Sunter Agung and Hijaunesia Power Warakas both in terms of the number of individuals, types and vegetation or habitats used by fauna. Good for resting, sheltering, nesting and foraging. The existence of wild animals as environmental bioindicators is influenced or determined by the state of the existing habitat in a place. The following is an illustration of the dynamics of fauna species in 2019 to 2021, presented in Figure 4.

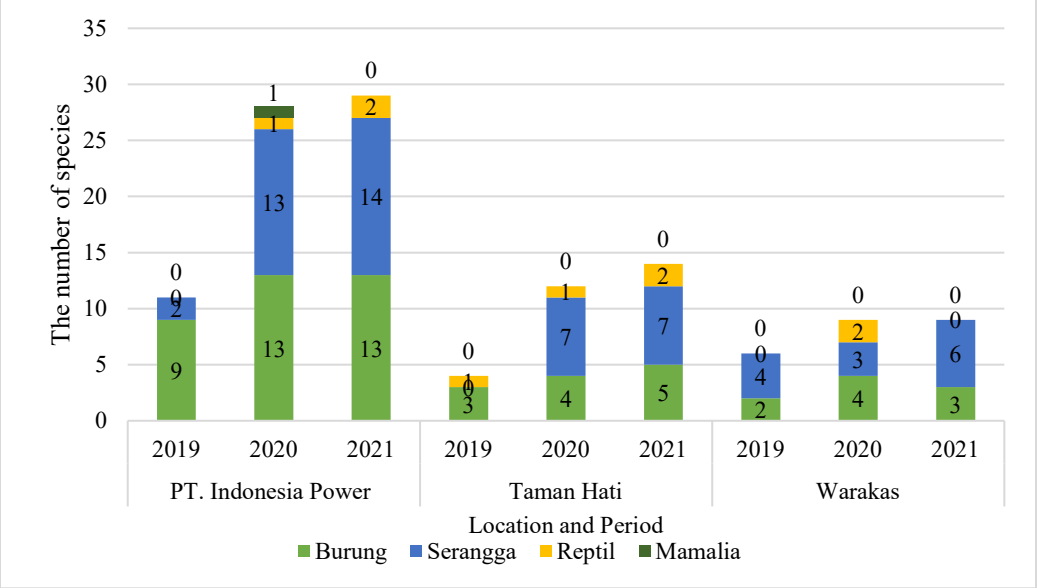

Figure 4. Graphic illustration of the dynamics of fauna species richness in the PT Indonesia Power area, Taman Hati and Sunter Agung RPTRA, and Hijaunesia Power Warakas in 2019 to 2021

The results of observations obtained that the diversity of fauna groups of birds, insects, reptiles and mammals in 2021 in the PT Indonesia Power, Taman Hati and RPTRA Sunter Agung, and Hijaunesia Power Warakas areas is presented in Table 9.

Table 9. Diversity of fauna species in PT Indonesia Power, Taman Hati, RPTRA Sunter Agung and Hijaunesia Power Warakas areas in 2021

Fauna Groups	Location			
	PT Indonesia Power	Taman Hati PKK Sunter Agung	RPTRA Sunter Agung	Hijaunesia Power Warakas
Bird	2.048	1.163	1.501	0.987
Insect	2.299	1.099	1.787	1.427
Reptile	0.562	0	0.562	0
Mammal	0	0	0	0

The results of observations made in the PT Indonesia Power Priok POMU area, obtained as many as 13 species of birds, 14 species of insects and 2 types of reptiles. The diversity of fauna species has a species diversity index value of 2,048 for birds, 2.299 for insects and 0.562 for reptiles. Based on the criteria of the Shannon-Wiener diversity index, the diversity value of birds and insects is moderate and the value of reptile diversity is low. Species diversity does not only mean richness or the number of species, but also the evenness of the abundance of each individual. The index value of evenness of species in the bird community is 0.799, insects is 0.871 and reptiles is 0.811 where this value indicates that the conditions of all species are evenly distributed.

The results of observations made in the Heart Park area of PKK Sunter Agung, obtained as many as 4 species of birds, 3 species of insects and 1 species of reptile, namely the garden chameleon (*Calotes versicolor*). The diversity of fauna species each has a species diversity index value of 1,163 for birds and 1,099 for insects. Based on the criteria of the Shannon-Wiener diversity index, both values are classified as moderate diversity. The evenness index value for birds is 0.839 and insects is 1.000. This value indicates that the distribution of birds in the location is quite even.

The results of observations made in the RPTRA Sunter Agung area, obtained as many as 5 species of birds, 6 species of insects and 2 species of reptiles. The diversity of fauna species each has a species diversity index value of 1.501 for birds, 1.787 for insects and 0.562 for reptiles. Based on the criteria of the Shannon-Wiener diversity index, the diversity value of birds and insects is classified as moderate. The value of reptile diversity is low. The evenness index value for birds is 0.933, insects is 0.918 and reptiles is 0.811. The three values indicate that the distribution of birds, insects and reptiles in the location is quite even.

The results of observations in the Hijaunesia Power Warakas area, obtained as many as 3 species of birds, 5 species of insects and 1 species of reptile, namely garden lizards (Eutropis multifasciata). The value of the diversity index of each fauna including birds is 0.987 and insects is 1.427. Based on the criteria of the Shannon-Wiener diversity index, the value of bird diversity is low, while the value of insect diversity is moderate. The evenness index value for birds is 0.898 and insects is 0.887. This value indicates that the distribution of birds and insects in the location is quite even.

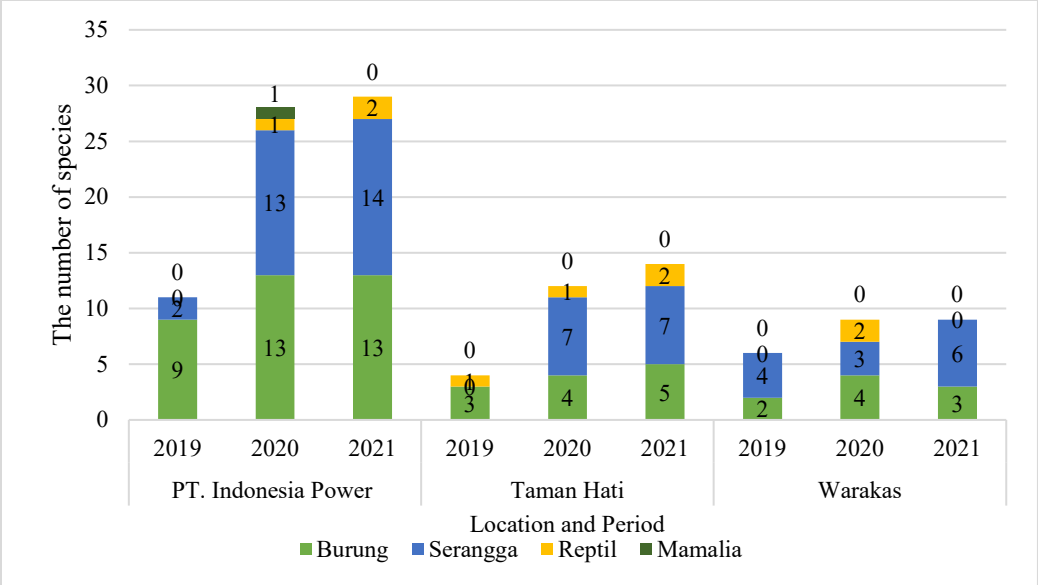

Figure 4. Graphic illustration of the dynamics of fauna species richness in the PT Indonesia Power area, Taman Hati and Sunter Agung RPTRA, and Hijaunesia Power Warakas in 2019 to 2021

6. Conclusion

There are several things that can be concluded from the Biodiversity Protection Program, namely: this program has an important role because it is in line with local government programs to develop green open spaces and urban agriculture. Program management has been carried out with a comprehensive approach, with the involvement of other parties such as local governments, companies, community organizations, and universities in implementing programs that have been running well. The continuity of the program is very important to improve and develop the sustainability of the capital's biodiversity which must be maintained for the sustainability of the succession of life.

By looking at the significant impact of the biodiversity protection program, several things need to be developed in the future. Recommendations for the Development of Mangrove Coastal Protection Areas in the PT Indonesia Power POMU Priok Area: The need for additional types of annual plants such as fruits in coastal ecosystem areas, special maintenance of mangrove plants and the addition of new types of mangrove plants and quick response actions when erosion occurs when planting seedlings new mangroves. Recommendations for Tabulampot Development: development of post-harvest techniques and cultivation, improvement and maintenance of plants and procurement of seedlings from Tabulampot saplings to be planted in various places. Recommendations for the Development of Nurseries and Hydroponics: development of post-harvest and cultivation techniques, Development of organic nutrition from local raw materials, improvement and maintenance of plants and verticulture and improvement and maintenance of plant seeds are needed specifically and intensively.

Recommendations for the development of the PKK RW 05 liver garden: addition of plant species, increased production with intensive cultivation techniques and verticulture and development of post-harvest techniques. Greennesia Warakas Village Development Recommendations: addition of plant species, increased production with intensive cultivation techniques and verticulture and development of post-harvest techniques.

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