

## Identification of the Role of Stakeholders in Sustainable City Forests, Case Study of Beringin Medan City Forest, North Sumatra, Indonesia

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**Abstract.** Management of forest cities becomes an essential strategy in strengthening environmental and social urban areas, particularly in facing the challenge of urbanization. This study aims to analyze stakeholders' roles, contributions, and strategies to increase synergy in the management of Medan Beringin City Forest. The MACTOR analysis method is used to understand the interaction between stakeholders and the factors influencing them. The results show that the involvement of various parties, including government regions, institutions, self-subsistent society, local community, and private sector, is essential in sustainable city management. City Government and Environment and Forestry Service's key roles in collaboration with other institutions are also seeded. Recommendation strategies can strengthen the effectiveness of management of forest cities, not only in Medan but also in other cities facing similar challenges.

**Keywords:** city forest; mactor; stakeholders

### INTRODUCTION

In an attempt to strengthen the function of environmental and social urban, managing forest cities becomes one of the important strategies that can be applied (Endreny *et al.*, 2017; Putri, 2023). The executives is a cycle completed by associations to design, sort out, direct, and control movements of every sort of authoritative individuals and use different accessible assets to accomplish hierarchical objectives (Kurniawan *et al.* 2022). Medan Beringin City Forest, as one of the integrated green areas, offers opportunities for his contribution to enhanced quality air, reduced temperature air, and room open green that the community can enjoy. In the era of globalization and development in urban areas, issues with the environment are one major challenge faced by many global cities, including Medan. One response to the challenge is developing and managing forest cities as effort mitigation impacts negative urbanization, like air pollution and increased temperature (Jim *et al.* 2018; Has *et al.* 2024; Marpaung *et al.* 2022). The Medan Beringin City Forest is an initial action that is expected to have a significant impact on environmental recovery. However, the successful implementation depends on the technical

management environment and the involvement and synergy between various stakeholders (Steenberg *et al.* 2019; Rambey *et al.* 2024).

The study of stakeholders' role in managing forest city sustainability becomes important to remembering its complexity and multidimensionality (Guarini *et al.* 2020; Marpaung *et al.* 2023). The main stakeholders in this context cover government areas such as maker policy and issue-focused non-governmental organizations (NGOs). Environmental and community users benefit Forest City and the potential private sector as a source of investment and innovative technology. Each stakeholder has different roles, interests and capacities in managing forest-sustainable cities (Ordóñez *et al.* 2019; Marpaung *et al.* 2022; Doucet *et al.* 2024).

Understanding the dynamics interaction between stakeholders and the influencing factor's involvement they in the management of forest cities is required to identify opportunities and challenges in the application draft forest city sustainability (Heikkinen *et al.* 2019; Marpaung *et al.* 2017; Rahmila *et al.* 2017; Yulianti *et al.* 2014). This study aims to analyze the role and contribution of each stakeholder in the

management of the Medan Beringin City Forest, identify strategies for increasing synergy and collaboration between stakeholders, and map the role of stakeholders towards sustainability based on urban forest management in the Beringin Medan City forest. Through this study approach, it is hoped that this case will find strategic recommendations that can strengthen the effectiveness of urban forest management in Medan and other cities that face similar challenges.

## METHODS

Researchers use an approach with data analysis methods, viz Mactor (Matrix of Alliances and Conflicts Tactics, Objectives and Recommendations). Analysis Mactor is used to know movement actors (stakeholders)

and internal strategies to overcome problems (Enserink et al. 2022); Tandio et al. 2023).

The results obtained from the analysis Mactor in the study show that the main actors involved in the sustainable management of Medan Beringin City Forest and objectives are the main things that will be achieved by actors (priority programs).

The stages carried out are researchers on analysis mactor, that is, identifying actors (stakeholders), identifying the goal that will be achieved by actors (stakeholders), formulating issues strategies listed, filling in matrix influence direct (MDI), filling matrix position assessment (2MAO), analyze from MACTOR software, the analysis results can be seen in **Table 1** Identification of Respondents/Actors/ Stakeholders.

**Table 1.** Identification Respondents / Actors / Stakeholders

No	Actors (stakeholders)	Code	Description
1	Department of Environment and Forestry	DLHK	The Department of Environment and Forestry's role is key in planning policy, managing forest city, coordinating between stakeholders, and supporting education and research for the continuity of forest city.
2	National Research and Innovation Agency	BRIN	National Research and Innovation Agency plays an important role in the research "Study of the Role of Stakeholders in Sustainable Urban Forests " by providing scientific data, developing methodology management forest city, and supporting making policy-based proof for the management of sustainable forest
3	City Government	PEMKO	The city government plays a vital role in managing forest cities' sustainability, covering policy, funding, education, cooperation research, and participation in society to ensure forest cities support the environment and the public's welfare.
4	tourism office	Dinpar	The tourism office's role is to develop a sustainable forest city as a destination tour, improve awareness

- of the environment, and work with other institutions to support the preservation of the environment and benefit the public's economy.
- 5 Development Planning Agency at Sub-National Level Bappeda Bappeda is responsible for formulating policy and coordinating studies for the management of forest city sustainability, ensuring the integration of the preservation environment in the planning development area, and facilitating cooperation across sectors for implementation.
- 6 Ward Ward Ward's role is active in managing forest city sustainability with participation community, monitoring the environment, and providing essential data for the study.
- 7 Micro, small, and Medium Enterprises UMKM Micro, Small and Medium Enterprises (UMKM) can contribute to research management forest city sustainability through innovation and product-friendly environment development. They support the local economy by creating fieldwork and promoting responsible products socially and environmentally.
- 8 Public Works Department of Spatial Planning DPUPR The Public Works Department of Spatial Planning plays a role in planning and organizing land use for forest cities. They determine the forest city's location to ensure the land's suitability and sustainability.
- 9 Social services Dinsos Social services play a role in identifying and overcoming issues related to the management of forest cities. They support studies through educational programs about the importance of preserving forests. This department also facilitates the public's participation in the management and preservation of forest cities.
- 10 General public Public Society plays a role in data collection and monitoring conditions in forest cities. They participate in planting activities and maintaining vegetation in the forest city. The community also contributes to socialization and

11	Environmental Non-governmental Organizations (NGOs).	NGOs	education about the importance of forest cities. Environmental Non-governmental Organizations (NGOs). Role in advocacy and development policy management forest city. Environmental NGOs also organize education and training programs for the public about the importance of forest cities.
12	Limited Liability Company	PT	Limited liability companies can fund research and project management for forest city sustainability. Companies can involve employees and society in the activity preservation of forest city as part of insufficient answer social company (CSR).

Source: Analysis results, 2024

Study This involves 12 respondents from the representative government, the private sector, and the public community. This institution is important in activity management in forest cities (Watkins et al. 2018; Escobedo et al. 2019). Those who have a deep understanding of the issues of City

Forest management, as well as the capacity to make supportive decisions about the sustainability of the City Forest, are the most important. Below is a list of objectives for developing the Beringin Medan City Forest area, presented in **Table 2**.

**Table 2.** List of objectives development Beringin City Forest area, Medan

No	Objectivity	Code	Stakes	Description
1	Guard Biodiversity and Ecosystems	A1	Ecology	Management forest sustainable city helps in the preservation of local flora and fauna species, as well as maintain a balanced ecosystem (A1)
2	Reduce the Impact of Climate change	A2	Ecology	City Forest's role in reducing carbon in the atmosphere through the process of photosynthesis, as well as helping reduce the effect of island heat in urban areas (A2)
3	Increase Environmental Awareness and Education	B1	Social	Build programs and initiatives that improve public awareness about the importance of forest cities and the role they play in the preservation environment (B1)

4.	Increase Quality of Life	B2	Social	Through the provision of rooms that can be accessible to the community, Forest City contributes to the mental and physical health of residents, as well as offers chance recreation and relaxation (B2)
5	Push Tourist Sustainable	C1	Economy	Developing forest cities as destinations for interesting tours can increase the economy through tourism sustainability (C1)
6	Adding Property Value	C2	Economy	The existence of a well-maintained forest in the city can increase the mark surrounding properties, providing benefits to the economy for owner property and government areas.

Source: Analysis results, 2024

## RESULTS AND DISCUSSION

Sustainable cities are very important for the management of forests. The party's role is significant when involving various parties (Escobedo et al. 2019). The involvement and role of irrelevant actors in government regions, institutions, self-subsistent society, community, and the private sector are crucial. They are invited to participate in city management and make decisions about the forest city of Forest. Citysource power, knowledge, and experience from various parties can create strong synergy when looking after the sustainable environment of a forest city. To overcome emerging challenges, as well as ensuring that the management of forest cities can walk in a way that is effective and efficient, at the same time give maximum benefit to the environment and society around (Wirtz et al. 2021).

### Matrix Influence Direct (MDI)

Matrix Influence Direct (MDI) Actor X Created an actor from the Table of actors ' strategies and explained that influence directly owned actors each other. Positions of the actors were assessed by how much

influence and level of dependency every actor has in stunting prevention and interviews depth gained from the actors filled in in a Matrix of Direct Influences (MDI) in MACTOR software so that obtained marks like shown in **Table 3** When there are several marks from the same actor, the entered value in the matrix is the average value of the answers given by representative respondents of the same actor.

### Matrix Influence Direct and Indirect or Matrix of Direct and Indirect Influences (MDII)

MDII matrix determines the influence of direct or no direct inter-second-order actors. Utility matrix This is more vision complete about the game Power competitive (one actor can reduce the number of other people's choices and influence it through actor intermediary) (Tandio *et al.*, 2023). The "sum" operation is used for calculating MDII, which does not produce (in matrix new this) scale. The same intensity is used to evaluate direct influence in MDI. Thus, MDII values are a good indicator of the importance of direct or not directly owned actors. Two indicators calculated from MDII:

- Level of influence, direct or not direct, of each actor (Ii, with adding rows).
- Dependency level direct or not direct of each actor (In, with add up column).

**Table 3.** Matrix Influence Direct (MDI)

MIDI	DLHK	BRIN	Pemko	Dinpar	Bappeda	Ward	UMKM	DPUPR	Dinsos	Public	NGO	PT
DLHK	0	2	4	2	1	2	1	1	1	1	1	2
BRIN	2	0	1	2	2	1	1	2	1	1	1	1
Pemko	4	3	0	4	2	2	1	3	3	2	1	1
Dinpar	2	1	4	0	1	1	2	1	2	1	1	1
Bappeda	1	1	2	1	0	1	1	2	1	1	1	1
Ward	1	1	3	2	1	0	1	1	2	2	1	1
UMKM	1	1	4	2	1	1	0	1	1	1	1	1
DPUPR	1	2	4	2	2	1	1	0	2	1	1	1
Dinsos	1	1	2	2	1	1	1	1	0	1	1	1
Public	1	1	2	1	1	1	1	1	1	0	1	1
NGO	2	2	2	1	1	1	1	1	1	1	0	1
PT	2	2	2	1	1	1	1	1	1	1	1	0

Influence assessed from 0 to 4 accordingly with importance possibility influence actor:  
 0: No influence, 1: Procedure, 2: Project, 3: Mission, 4: Existence

**Table 4.** Influence and Dependency Level Matrix -Actors within Sustainable Urban Forest Management

MIDI	DLHK	BRIN	Pemko	Dinpar	Bappeda	Ward	UMKM	DPUPR	Dinsos	Public	NGO	PT	Ii
DLHK	17	15	17	17	13	13	12	14	15	13	11	12	152
BRIN	13	13	15	14	13	12	12	13	13	11	11	12	139
Pemko	16	15	23	19	14	13	12	15	16	13	11	12	156
Dinpar	15	14	17	17	12	13	12	13	14	12	11	12	145
Bappeda	12	13	13	13	13	12	11	13	13	12	11	11	134
Ward	14	13	16	15	12	12	12	13	15	13	11	11	145
UMKM	15	13	15	15	12	12	12	13	14	12	11	11	143
DPUPR	16	14	17	17	12	12	12	15	15	12	11	11	151
Dinsos	13	12	13	13	12	12	12	12	13	12	11	11	133
Public	12	12	12	12	12	12	11	12	12	12	11	11	129
NGO	14	14	13	14	13	13	11	13	12	12	11	12	141
PT	14	14	13	14	13	13	11	13	12	12	11	12	140
Di	154	149	161	163	137	140	128	144	151	134	121	126	1708

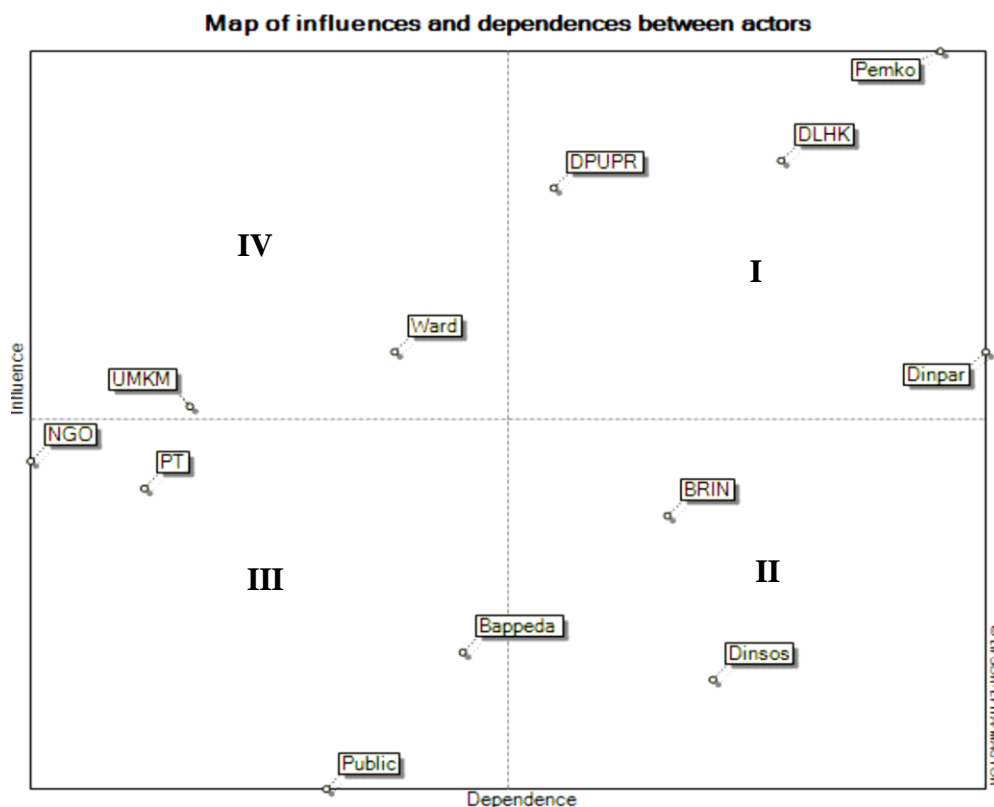
Value represents influence, direct or not direct, between actors. The higher the value of influence and dependency, the greater the actor's influence on urban forest management. Analysis of recent findings reveals that the Medan City Government emerges as the most influential entity in the

direct management of the Sustainable Urban Forest Management in Medan Beringin Forest, boasting a significant value of 156 **Table 4.** For dependency direct or not direct, DINPAR, PEMKO, and DLHK become the most dependent party to institutional others, with marks respectively 163, 161, and 154.



Third-party This will be at the forefront in determining policy management for sustainable living in the city forest Beringin Medan. On the other hand, NGOs have become the least active actors in managing the forest city of Beringin, with a value of 121. The low influence and involvement of the community in urban forest management is caused by limited support and participation

facilitated by the government and related parties. The role of government is vital in the management of forest city versus the role of private because the Government owns authority in the management city and inside is calibrated with the party sector private in going to continuity (Davies et al. 2017). The map of influence and dependency between actors can be seen in **Figure 1**.



**Figure 1.** Influence and dependency map between actors

Micro, Small and Medium Enterprises (UMKM) and Subdistricts (Wards) are included in quadrant I, with nature is very influential and influences the Department of Public Works Arrangement (DPUPR), the Department of Environment and Forestry (DLHK), the Regional Government (Pemko), and the Department of Tourism (Dinpar) **Figure 1**. Entered into the quadrant II with very influential and possessive nature dependency.

The National Research and Innovation Agency (BRIN) and the Social Service (Dinsos) entered into III with characteristic own since low that was d dependent tall. On

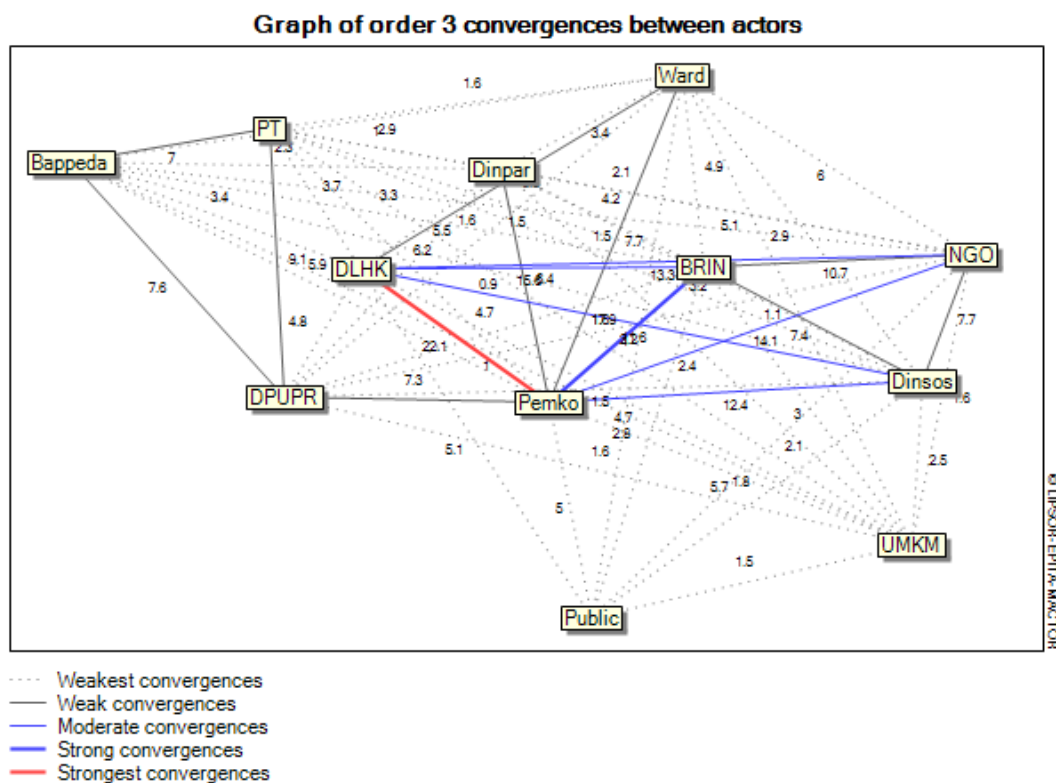
heightened Liability Company (PT), Regional Development Planning Agency (Bappeda), Non-Governmental Organizations The environment (NGO) and the general public (Public) enter into quadrant IV with characteristic influence low and dependent low.

### Convergence Between Actors

Map actor connection with convergence them (data in matrices 1CAA, 2CAA, 3CAA). That means more and more near actors, increasingly intense convergence. Convergence is approach delivery

interventions carried out in a way that is coordinated, integrated, and together for

sustainable management of City Forests to target priority.



**Figure 2.** Convergence map among actors in effort management forest city sustainable

In **figure 2**, the two actors have strong relationships and common goals: the Service Department of Environment and Forestry and the City Government. This matter explains that the City Government, the Environment, and the Forestry Service are very important actors who prefer strong power over others. Government city and departmental departments Forestry become the strongest actor in urban forest management in a sustainable way (Nesbitt et al. 2017).

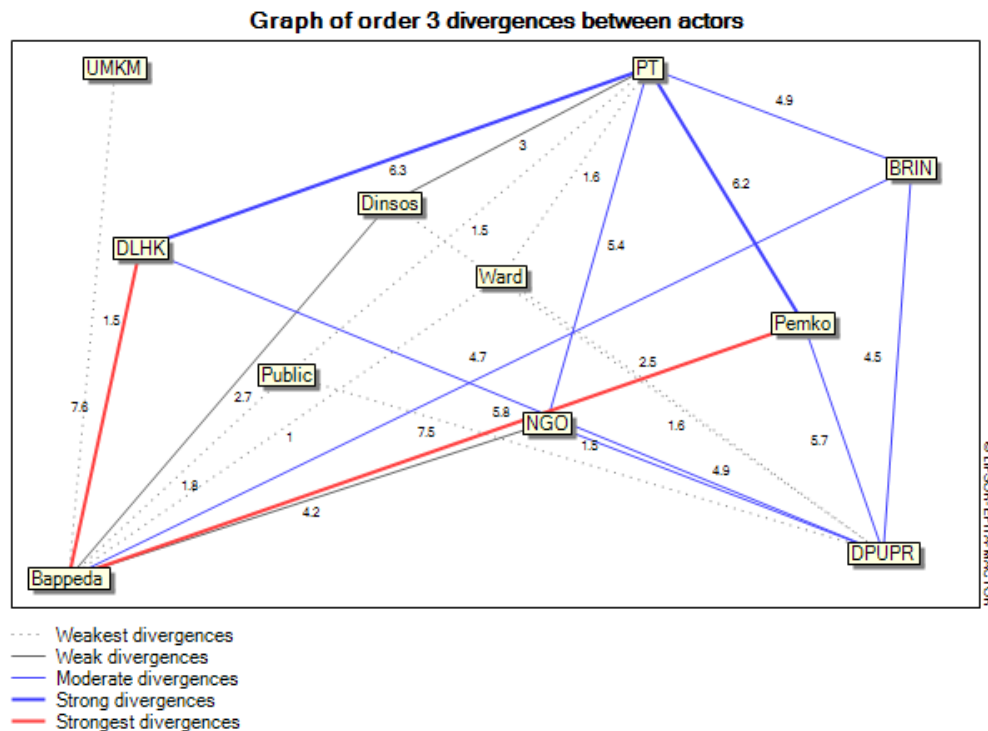
Management of forest city sustainability is not only an obligation from the agency City Government and Environment and Forestry Service but also involves a role and other institutions that influence sustainability. In terms of this, coordination needs to be built to

unite the goals and activities of the organizational units involved in regulations (Ahmady et al. 2016). Stated that the challenge in implementation convergence is still the existence of sectoral egos in each OPD because many still need to understand the sustainable City Forest program comprehensively (Kurniasih et al. 2023).

**Divergence Between Actors**

Chart divergence between actors, map actor third order against divergence (data in 3DAA matrix). This helps identify alliance and conflict potential. The bigger the value, the thicker the connection line becomes, and the taller the level of divergence between them, where the more Lots actors have different interests.





**Figure 3.** Strength divergence between actors in Sustainable Urban Forest Management in the Beringin Medan City Forest

The most pronounced divergence among three key actors: the Environment and Forest Service, the Regional Development Planning Agency, and the City Government **Figure 3**. This significant divergence indicates the presence of distinct interests or objectives among these entities. The divergence suggests that while each actor is involved in urban planning and environmental management, their specific goals or approaches to achieving sustainable development may differ. This variation in aims could potentially lead to challenges in collaborative efforts unless carefully managed. Understanding these divergences is crucial for fostering effective communication and cooperation among the actors, ensuring that their collective actions contribute to the overarching goal of sustainable urban and environmental planning.

**Actor Ambivalence**

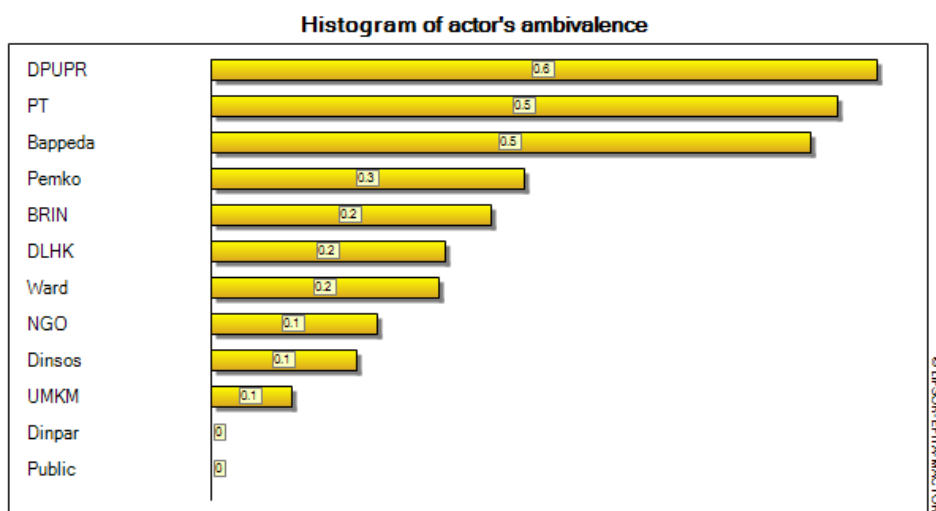
An ambivalent actor's position is convergent and divergent. This is to secure

what is objective and override different goals. Condition ambivalence This can be seen in the following histogram graph **Figure 4**:

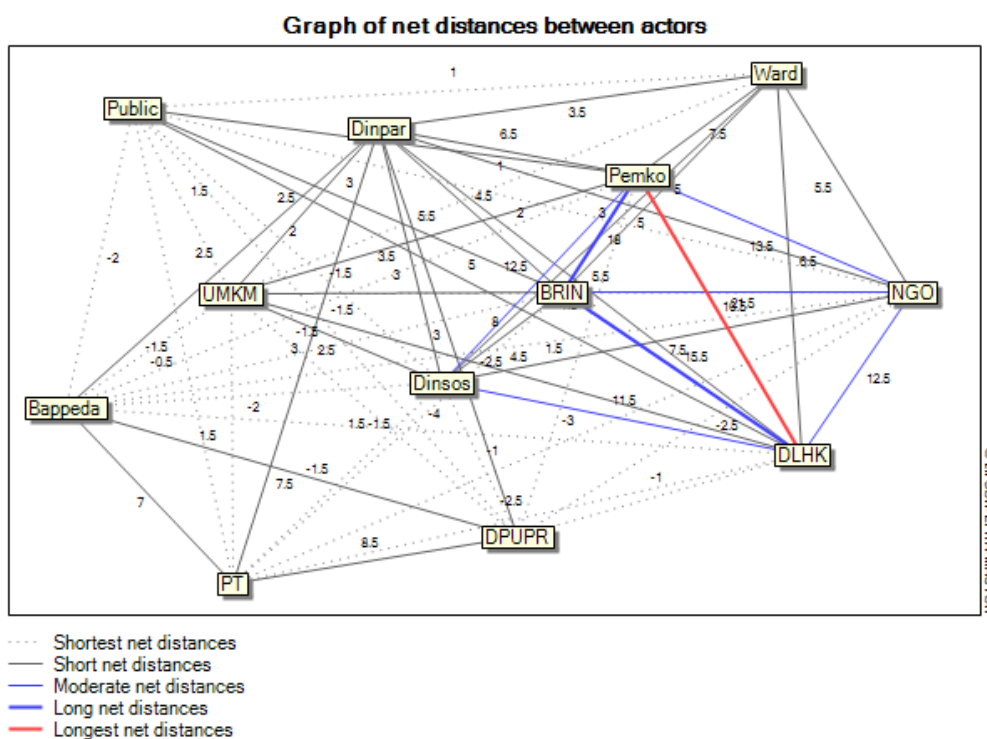
**Figure 4** shows that the Department of Work general stylist room became the most ambivalent actor in the management of forest city sustainability Beringin Medan. This actor shows a consistent attitude with that goal already set; however, behaving counter to the goal is not in line with them.

**Distance Between Actors**

**Figure 5** shows that the City Government and Environment and Forestry Service have a strategic position as regional actors in managing forest city sustainability in the forest of Beringin Medan. City Government and Environment and Forestry Service own distance the strongest alliance After it continued with the National Research and Innovation Agency.



**Figure 4.** Level of the ambivalence of actors to objective strategic in management forest city sustainable



**Figure 5.** Graph distance clean between actor

## CONCLUSION

In an attempt to create management sustainable forest cities, the engagement of various parties like government regions, institutions, self-subsistent societies, and local communities is very important. Involvement They are not only limited to

participation in activity management but also in making decisions to influence the sustainability of the forest city. Combine the power and experience of various parties to create synergy in the sustainable rest city. Government regional and environmental and forestry services are the most critical role in managing the Beringin Medan City Forest.

The Regional Government Service, Environment, and Forestry Service plays a vital role in planning, budgeting, supervision, preservation, education, conservation, rehabilitation, and collaboration for managing the Medan Beringin City Forest that is sustainable and beneficial for the environment and society.

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