

# Socio-Engineering and Transdisciplinary Approach for Infrastructure Workers' Settlement in the Nation's Capital

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**Abstract**— *In the designation of the nation's capital, besides considering the historical aspect, the geopolitical and geostrategic aspects of the region should also be considered so that Indonesia's strategic position in the world can be improved through the symbol of national identity that will play a role in the development process and in later use. Especially in the development process, workers' conduciveness should also be developed in order to become a model for development in Indonesia, considering that workers are expected to come from all over Indonesia. In the development process, in addition to provision of workers' settlement infrastructure, this research proposes that a transdisciplinary paradigm needs to be applied, especially socio-engineering, in order to create convenient conditions, technological competence, management commitment, and continuous communication between workers. The analysis is based on semi-structured interviews with purposive sampling criteria of 4 stakeholder representatives that include infrastructure workers, residential workers, contractors, and local residents. A result is obtained on the taxonomy of transdisciplinary implementation, especially socio-engineering for workers' settlement.*

**Keywords**— *Nation's Capital; Socio-engineering; Transdisciplinary.*

## I. INTRODUCTION

After Indonesia's independence in 1945, Jakarta was named as the nation's capital based on its crucial role in the process of Indonesia's independence and the many vital objects of the Dutch East Indies government located in Jakarta, which was viewed as helpful for the process of post-independence transfer of power. During the early period of independence, more precisely between 1946 and 1950, Indonesia's capital was once shifted to Yogyakarta due to political and security considerations at that time. However, on 17 August 1950, Indonesia's capital was returned to Jakarta until today (La Dossa & Riffi, 2018; Malik, 2012; Sabandar, 2016).

Jakarta then became not only the center of government, but also the center of trade, finance, services, entertainment, sports, culture, transportation, and education. Therefore, it is not surprising if Jakarta experienced extremely rapid urbanization process. Jabodetabek population increased from 16.8 million in 1990 to 28 million in 2010. This size of population is almost 12% of the total Indonesian population, and Jakarta becomes very dense because the size of Jakarta itself is only approximately 0.3% of the total Indonesian territory (Kusnandar, 2022).

Based on the considerations of current Jakarta's area capacity and also geopolitics and geostrategy, on 26 August 2019, President Joko Widodo announced that Indonesia's

capital will be moved to a new location that includes some of the administrative area of Penajam Paser Utara Regency and Kutai Kartanegara Regency in East Kalimantan Province. The new capital city would be called Nusantara. The location choice was based on the result of Bappenas research that showed that East Kalimantan Province has low risk of natural disaster, and also the consideration that it is close to the "Virtual Berlin Wall" region as an effect of potential post-cold war conflict in South China Sea. In addition, the location of Nusantara is also close to Balikpapan and Samarinda that have already developed with relatively complete infrastructure (Mayasari, 2022).

On its official website ([www.ikn.go.id](http://www.ikn.go.id)), it is mentioned that the Nation's Capital (Ibu Kota Negara/IKN) is built in order to achieve Indonesia's target of becoming a developed country, according to Visi Indonesia 2045. Built with national identity, it is mentioned that IKN will change the development orientation to become Indonesia-centric, and accelerate the Indonesian Economic Transformation. The website also mentioned the stages of this relocation and how Nusantara will be developed in the future. In 2022 – 2024, there will be an initial relocation stage to the Capital City Region (Kawasan Ibu Kota Negara/K-IKN), development of main infrastructure such as Presidential Palace, MPR/DPR RI Building and housing, and also including the initial relocation stage of Government Civil Employees (Aparatur Sipil Negara/ASN), development and operation of basic infrastructure for 500 thousand initial stage residents (Law of the Republic of Indonesia Number 3 of 2022 on Nation's Capital, 2022). The President of the Republic of Indonesia will celebrate the 79th Anniversary of the Republic of Indonesia in K-IKN on 17 August 2024 (Cakti, 2023).

Then in 2025 – 2035, it is envisioned that IKN will be developed to become a solid core area by developing the next phases of the city such as innovation and economic centers, completing the relocation of IKN central government, developing priority economic sectors, implementing incentive system for priority economic sectors, and achieving Sustainable Development Goals. After that, between 2035 – 2045, it was stated that in IKN will be built infrastructure and Three-City Ecosystem, with the goal of becoming a leading Foreign Direct Investment (FDI) destination for priority economic sectors in Indonesia, and to be in the top five primary destination in South East Asia (Dewi, 2023).

Finally, from 2045 onwards, Nusantara aspires to cement its reputation as the “World City for All” and to become a leading city in the world in terms of competitiveness, to be among the ten Best Livable City and to achieve net zero-carbon emission and 100% renewable energy at rated capacity, and to become the first city in the world with a population of more than one million to meet this target (Prasetyo, 2022).

The nation’s capital relocation is legislated through the Law of the Republic of Indonesia Number 3 of 2022 on Nation’s Capital. With regard to the forward vision of this relocation, Article 2 states that Nusantara Capital City has a vision of becoming the world city for all which is built and managed for the purpose of (a) becoming a sustainable city in the world; (b) becoming the economic driver of Indonesia in the future; and becoming the symbol of national identity that represents the diversity of the Indonesian nation, based on Pancasila and The Constitution of the Republic of Indonesia 1945 (Law of the Republic of Indonesia Number 3 of 2022 on Nation’s Capital, 2022).

The whole vision and aspirations of the nation’s capital may be difficult to achieve without first thinking about the facilities for the people who work on this project. The facilities in question in this case include settlements for the nation’s capital infrastructure workers. The infrastructure workers were established through Public Works and People’s Housing Minister Resolution Number 1419/KPTS/M/2021 on Nation’s Capital Infrastructure Development Task Force (2021) or also known as Satgas IKN. To support Satgas IKN, it was also mentioned that The Ministry of Public Works and People’s Housing (Kementerian Pekerjaan Umum dan Perumahan Rakyat/PUPR) through the Directorate General of Housing would prepare 22 towers of flats (rumah susun/Rusun) for construction workers in IKN area. The flats were built by PUPR Ministry in collaboration with KSO Wika Gedung and Adhi Karya with each tower having four floors with modular technology that can accommodate approximately 17,000 construction workers. The settlement that was built on 19.88 hectares of land with a budget of Rp 600 billion was completed in January 2023 (Maharani, 2023).

IKN will be built in stages. The first stage which is the preparation stage is executed from 2020 to 2024 with focus on the development of main infrastructure such as the Presidential Palace, MPR/DPR Building, and development of housing in IKN main area, especially for the workers. Development of housing for workers was carried out for 145 working days starting from 29 August 2022 and was completed on 20 January 2023 (Antara, 2022). On the official website of PUPR Ministry, it was mentioned that the process of this housing development for the construction workers involved 368 workers. To ensure workers’ safety and health, the Construction Safety Management System (Sistem Manajemen Keselamatan Konstruksi/SMKK) was applied in accordance with PUPR Minister Regulation Number 10 of 2021 (Public Works and People’s Housing Minister Regulation Number 10 of 2021 on Guidance for Construction Safety Management System, 2021).

In developing this housing for construction workers for IKN infrastructure, PUPR Ministry implemented three

development criteria with the principles of Environment, Social, and Governance (Lingkungan, Sosial, dan Tata Kelola/LST). This means, in developing the housing for construction workers in the form of 22 towers of flats, PUPR Ministry implemented green construction or construction products that are environmentally friendly and efficient in the consumption of energy and resources; with orientation for social convenience by providing better facilities for construction workers, and governance that is neat, healthy, efficient, and effective. The development of this workers’ housing by PUPR Ministry was indeed meant for accommodating 17,000 workers, but in the future, the increasingly massive development process is expected to increase the number of the construction workers to up to 233,000 in the next few years. This is why the initial stage of this workers’ housing development must serve as a model for future workers’ housing development (Jay, 2022).

This development of settlement for Satgas IKN and infrastructure workers was expected to be given serious attention by the government considering the socio-economic impact of relocating the nation’s capital. The nation’s capital relocation to East Kalimantan, admittedly, also considered the cultural diversity in the western, central, and eastern regions of Indonesia. According to 2022 data, economic contribution from the islands of Java and Sumatra was still dominant with Gross Domestic Product (GNP) generation of 80.11 percent. The prosperity level of the people in the western region was also higher than in the central and eastern regions of Indonesia. Data from Human Development Index (Indeks Pembangunan Manusia/IPM) as one of the indicators of prosperity showed how out of 21 provinces in western Indonesia, two provinces had IPM scores in the medium category (60-69) and the rest belonged to the high category (70 - 79). The IPM score in DKI Jakarta Province was even categorized as very high (above 90) in 2020. The opposite was true in the central and eastern regions of Indonesia. Of all provinces in the central and eastern regions, only four provinces were recorded to have high IPM, while the rest belonged to the medium category, with Papua as the province with the lowest IPM (Statistics Indonesia, 2022).

Therefore, it is evident that government’s plan to relocate the nation’s capital is also related to equal distribution of welfare and at the same time to gather cultural strength to become national strength. The nation’s capital relocation is expected to encourage population increase in the eastern region of Indonesia which is proportional with the increase of people’s needs. This will lead to growth of productive economic sectors, creation of jobs, ultimately leading to improvement of people’s income and prosperity. These goals are highly achievable considering the overall potential of Kalimantan that is rich in natural resources with tropical rainforest ecosystem, peat swamps, rubber trees, and mangrove that become the habitat for thousands of species of flora and fauna (Sunarharum, 2022).

However, various social problems also await this relocation plan, such as potential land conflicts in the future nation’s capital, gap in education between local people and immigrants, potential social conflicts between local people

and immigrants, and limited job opportunities. In addition, population booming is also expected to bring negative impacts on natural environment of Kalimantan such as potential increase in repurposing of forest areas into residential, industrial, infrastructure, plantation, agricultural, and mining areas; increased potential for flooding, water shortages, and diminished biodiversity (Purnama & Chotib, 2022).

Conversion of many forest areas into residential areas that leads to natural resource problems is still only a prediction and therefore it still needs to be proven. However, the government can show that development of settlements can have a positive impact on social, ecological, and also economic life in Kalimantan, starting with the construction workers' settlement development project in IKN area that has been completed in January 2023. Therefore, settlement development for construction workers in IKN area should consider what is called socio-engineering transdisciplinary approach. Socio-engineering approach is defined as increased references of resolution of social problems that often occur during the process of infrastructure development. Meaning, infrastructure development does not only use engineering sciences, but also humanity sciences. Success in using this socio-engineering approach is determined by four factors, namely convenience, competence, commitment, and communication (Reed, 1999; Laplume et al., 2008).

This research is to identify development model and strategy recommendations and also residential use for infrastructure workers using socio-engineering transdisciplinary approach in order to bring positive impact to social, ecological, and also economic life, based on analysis of the development of infrastructure workers' housing in IKN that has been completed in January 2023.

## II. LITERATURE REVIEW

The literature review in this research will explain two concepts related to transdisciplinary approach and socio-engineering approach.

### A. Transdisciplinary Approach

The word "trans" has a number of meanings. When associated with discipline (knowledge), transdiscipline may be interpreted as cross-disciplinary, interdisciplinary, or may also be beyond and outside of a whole discipline (Nègre, 1999). The purpose of transdisciplinary approach is to understand the world with all of its complexity, rather than to focus on one of its parts only (Nicolescu, 2018). Besides that, transdisciplinary approach can be viewed as intellectual space, as an area or place where the issues being discussed are linked to each other, explored, and opened to achieve better understanding. The purpose of transdisciplinary approach is to develop necessary views to explore a new meaning and a synergy (Batmang, 2016).

In its practical context in Institut Teknologi Bandung (ITB), transdisciplinary thoughts have been applied among others through a community development model at the Indonesian border by raising awareness of sustainable development. Social problems at the border are very diverse such as human trafficking, drug abuse, terrorism, illegal

business, illegal logging and illegal timber smuggling, illegal fishing, etc., which overall is impossible to be resolved through sectoral approach. This transdisciplinary approach involves various disciplines such as biology, environmental engineering, civil engineering, marine engineering, geological engineering, and other techniques, such as petroleum engineering, mining engineering, and chemical engineering, including also the involvement of social science disciplines in ITB. Transdisciplinary practice usually can be achieved by first developing a Pilot Area as a model. If the transdisciplinary practice in the Pilot Area is successful, it is assumed that similar model can be applied in another area.

In the context of this research, the construction of settlements for IKN infrastructure workers will be treated as a Pilot Area to be studied through transdisciplinary approach so that it can be used as a model to be replicated in similar development projects.

### B. Socio-Engineering Approach

Socio-engineering is an example of transdiscipline which specifically combines social systems (people and society) and engineering systems as one unified system. Human behavior is a variable that cannot be predicted exactly using mathematical science. This is a disadvantageous factor in an infrastructure development because it creates a lot of possibilities. Therefore, to achieve better development, socio-engineering approach is highly needed.

The socio-engineering approach that assumes the involvement of various parties in development is inseparable from project stakeholder management. Project stakeholder management has several cycles: identifying stakeholders, gathering information on stakeholders, identifying stakeholders' mission, determining stakeholders' strengths and weaknesses, identifying stakeholders' strategy, predicting stakeholders' behaviour, and implementing stakeholders' management strategy (Carroll et al., 2017).

There are four success factors in socio-engineering approach: convenience, competence, commitment, and communication, with details as follows:

- Convenience: sufficient funding, comprehensive contract documentation, resource availability, continuing stakeholders, competent project management.
- Competence: utilization of latest technology, correct emphasis on past experience, correct adoption of procurement routes, multidisciplinary/competent project team, bidding on the right designer/contractor.
- Commitment: clear objective and scope, commitment to project, project management support.
- Communication: involvement of community/stakeholders, elimination of obstructing information/communication channels, periodic progress meeting, feedback mechanism.

## III. DISCUSSION

The discussion in this research will be divided into several sections, namely implementation of socio-engineering approach which is the focus of this research, without leaving out discussion on implementation of transdisciplinary approach, and implementation of both approaches combined.

**A. Implementation of Socio-Engineering Approach**

Implementation of socio-engineering approach to infrastructure workers’ settlements at IKN starts from project stakeholder management cycle which starts by identifying stakeholders, especially those in the field. In this project, the stakeholders involved are (1) occupants/infrastructure workers, (2) settlement workers, (3) contractors, and (4) residents of settlement areas. For the next cycle i.e., gathering information on stakeholders, the information obtained with regard to the four stakeholders identified is as follows:

- (1) The number of occupants/infrastructure workers is estimated to be close to 17,000 and will be relocated gradually to IKN area.
- (2) The number of settlement workers is 368, including workers, experts, and also contractors.
- (3) Contractors come from 2 State-Owned Companies (BUMN) in the construction industry whose representation is included in the 368 workers and experts who worked on the settlements.

(4) Population of Penajam Paser Utara Regency according to statistical data of 2020 was 181,349 with density of 54 persons per square kilometers. The majority of Penajam Paser Utara Regency residents were Muslims (94.9%) and the rest were Protestants, Catholics, Hindus, and Buddhists. According to 2021 data, the Human Development Index (Indeks Pembangunan Manusia/IPM) in Penajam Paser Utara Regency was high (72.01).

Then in the next cycle, namely identifying stakeholders’ mission, the practical goals i.e., stakeholders’ goals in relation to their duty, will be differentiated from the general goals i.e., stakeholders’ goals as human beings. It is necessary to emphasize that this research focuses more on stakeholders’ general goals as human beings than on the practical goals. Knowledge of general goals was obtained from the results of semi-structured interviews with the representatives of each stakeholder who were selected through purposive sampling criteria, and the results can be seen in Table I:

TABLE I. Interview Result

	<b>Practical Goal</b>	<b>General Goal</b>	<b>Interview Reference</b>
(1)	To work on IKN infrastructure according to set procedure and time frame.	To get a decent and healthy housing both physically and spiritually; to be “humanized” as a worker.	“Hopefully the workers’ housing will be able to give us peace of mind and we can work smoothly and comfortably without worrying about basic facilities.”
Stakeholder Code	Practical Goal	General Goal	Interview Reference
(2)	To work on IKN infrastructure according to set procedure and time frame.	To be treated properly and humanely when working on the project; to be “humanized” as a worker.	“What is more important is that when we work, we get proper treatment, our lives are guaranteed during work and we can do various activities outside work well such as eat, rest, and worship.”
(3)	Supervise, design, and carry out the IKN infrastructure workers’ settlement project so that it runs according to procedure and completed within the set time frame.	To be able to work safely and comfortably, without physical or mental disturbances; everything goes well, whether the funding, planning, and implementation in the field.	“We as contractors hope that the work goes well, there is no problem in the funding, the planning is in accordance with the execution, and there is no disturbance whether in terms of the technical work and non-technical matters from local residents.”
Stakeholder Code	Practical Goal	General Goal	Interview Reference
(4)	To gain material and immaterial benefits from the presence of IKN in their area.	To receive proper treatment as local residents; to be “humanized” as native residents.	“After all, the presence of IKN in our place also means massive arrival of immigrants that may push us aside. We don’t want that to happen, we want to coexist peacefully and we even hope that we can improve our life quality with the presence of IKN here.”

The next cycle is determining stakeholders’ strengths and weaknesses. In general, the strength of all of the stakeholders is that they are all important elements in the success and continuity of IKN development in Penajam Paser Utara Regency. In terms of weaknesses, stakeholders (1), (2), and (3) alike have the potential to create social and ecological problems if the development is not carried out properly. The arrival of tens of thousands of immigrants almost simultaneously, undeniably, may create trash, waste, conflicts with the locals, and environmental damage in general. On the other hand, stakeholders (4) also have the potential to become the troublemakers if they refuse to compromise with the arrival of immigrants. This research will focus more on the aspects of weaknesses that must be resolved rather than strength aspects.

Meanwhile, with regard to stakeholders’ strategy, stakeholders (1) and (2) were considered to have no specific strategy in achieving the practical goals and the general goals,

and therefore they were passive. As far as stakeholders (3) were concerned, the strategy to meet the goals is through sufficient research on the development around Penajam Paser Utara Regency area, whether in terms of governance, development, ecology, or social. In terms of the ecological aspect, stakeholders (3) used eco-friendly green construction, while in terms of social aspect, stakeholders (3) used a persuasive approach first toward the locals including the indigenous communities. Meanwhile, with regard to stakeholders (4), the strategy implemented in meeting their goals was negotiating land compensation, job opportunities, natural resource sustainability assurance, and tribute to local residents.

Then with regard to predicting stakeholders’ behavior, the analysis that can be proposed about stakeholders (1) and (2) was that these two groups will behave consistently with their practical and common goals as long as the facilities and treatments given to these two groups are considered good and

satisfactory. By contrast, if the facilities and treatments given to these two groups are considered bad and unsatisfactory, their behavior will not be consistent with their practical and common goals. Meanwhile, with regard to stakeholders (3), predictions about their behavior can be more complex. Excessive focus on project execution may cause stakeholders (3) to ignore communication and collaboration with stakeholders (4), which may result in outputs that are counterproductive for their practical goals. Meanwhile, for stakeholders (4), their behavior is harder to analyze due to their relatively large number and heterogeneous people. However, it can be assumed that the behavior of stakeholders (4) may also hamper project execution if communication and collaboration from stakeholders (1), (2), and (3) does not happen very well.

The final cycle, which is implementing stakeholders' management strategy can be related to socio-engineering approach. Therefore, this last part must be able to summarize all of the cycles including the solutions which can be illustrated by the following table:

- Convenience in this case is divided into three aspects: physical convenience, ecological convenience, and social convenience. Physical convenience is related to complete facilities and infrastructure to support the specific goals and general goals of stakeholders (1), (2), and (3) in order to overcome the weaknesses and the predicted counterproductive behavior of the practical goals of IKN development project. Ecological convenience is related to care for the sustainability of the surrounding environment which is achieved through green construction implemented primarily by stakeholders (3). Meanwhile, social convenience as far as the analysis goes has been implemented only by stakeholders (3) and (4) through communication and collaboration efforts in the field. From these convenience aspects, a temporary conclusion can be drawn that the ecological convenience and social convenience aspects do not yet offer much more detail and are merely in the form of general descriptions.
- Competence in this case is divided into two aspects: professional competence and social competence. Professional competence is undoubtedly owned by stakeholders (1), (2), and (3) because it is their area of expertise. However, professional competence is irrelevant for stakeholders (4) due to their heterogeneity. Social competence is yet to be explained in detail because it hasn't become a concern for all stakeholders other than in the form of general descriptions. More importantly, social competence is not something that can be resolved through material transactions such as land compensation or opening of job opportunities, but rather through a more persuasive approach based on tolerance for common good.
- Commitment in this case is divided into two aspects: work commitment and social commitment. Work commitment is assumed to have been applied by stakeholders (1), (2), and (3) in the form of work contract and its compensation, whereas for stakeholders (4) work commitment is considered irrelevant due to their heterogeneity. Meanwhile, social commitment is defined as commitment to coexist

peacefully and respectfully for common interests. Social commitment is also something that has not been comprehensively discussed and is still more of general descriptions.

- Communication in this case is divided into two aspects: organisational communication and collaborative communication. Organisational communication appears to have been implemented by stakeholders (1), (2), and (3) as a consequence of their involvement in a project. Meanwhile, it is unclear whether or not collaborative communication has been implemented by all stakeholders including those related to stakeholders (4) other than in the form of general descriptions.

Therefore, the socio-engineering approach has indeed been taken in the development of IKN infrastructure workers' settlement, but it is not yet optimal and is still in the form of general descriptions, especially in relation to ecological convenience, social convenience, social competence, social commitment, and collaborative communication involving all stakeholders, namely residents/infrastructure workers, settlement workers, contractors, and residents of settlement areas. Attempts to sort out these downsides will be made through transdisciplinary approach.

#### *B. Implementation of Transdisciplinary Approach*

The transdisciplinary approach, as mentioned before, is an approach with emphasis on cross-disciplinary studies, interdisciplinary studies, or may also be studies beyond existing disciplines. In the above discussion, matters unsolved by the socio-engineering approach include those related to ecological convenience, social convenience, social competence, social commitment, and collaborative communication.

In terms of ecological convenience, the use of green construction alone is insufficient because it is still related to physical structures that are unsustainable to the behavior of humans who use them. To support ecological convenience, another approach is required which in this case may refer to literature of Bruno Latour that has significant emphasis on socio-technology aspects. According to Latour in his book entitled *Politics of Nature: How to Bring the Sciences into Democracy* (2004) and *Reassembling the Social: An Introduction to Actor-Network Theory* (2007), humans and non-humans must have equal position. Meaning, not only do we have to respect nature, but also all non-human actors, including objects and infrastructure as a part of the whole ecosystem. For Latour, humans, lands, and machines, for example, all have equal metaphysical position as flat ontology and do not need to be differentiated. At that point, ecological convenience is not defined symbolically in a representation that is referred to as everything "green", but rather embodies as an attitude of mutual respect for others including objects. Meanwhile, with regard to social convenience, a proposition that can be made is an approach based on cosmopolitanism. Cosmopolitanism is an idea offered by Kwame Anthony Appiah in his book entitled *Cosmopolitanism: Ethics in a World of Strangers* (2007). The core of cosmopolitanism teaching is to actually reject social convenience by requiring

each of us to study each other's differences without having to agree with them. But essentially, cosmopolitanism refuses to read differences as multiculturalism whose meaning ends at those differences without followup, but at the same time also rejects cultural positivism that equalizes various cultures in a universal paradigm. In cosmopolitanism teaching, we don't have to agree with or follow other people's different views, but we have to study why someone would do it. In the context of this project, social convenience is in fact gained through the effort of avoiding social convenience through cosmopolitanism view.

In order to solve problems related to social competence, a social information processing model is needed which focuses on cognitive processes that underlie selection, action, and evaluation responses. Using a computer metaphor, this social information processing model requires six nonlinear processes: (1) observation and coding of relevant stimuli, including social codes both nonverbal and verbal, both external and internal, (2) mental interpretation and representation of codes or signs, which means trying to understand what is happening during social interactions, (3) clarification of interaction objectives, (4) representation of situations drawn from long-term memory, (5) response decision or selection, (6) action and evaluation behavior (Crick & Dodge, 1994).

Meanwhile, with regard to social commitment, the proposition to be made is technology humanism that emphasizes the importance of technology to increase human prosperity. This idea of technology humanism is taken among others from a thought in education philosophy that considers that the use of digital technology is an effort to integrate the real world and the virtual world to make the teaching and learning process become simpler and more effective (Bykov & Leschenko, 2016). In technology humanism thought, technology is not considered as something to be avoided, but rather to be embraced as a part of social inevitability as along as its functions are intended for the good of the society itself (Harlick & Halleran, 2015). In the context of this project, the use of technology such as integrated application to the use of Artificial Intelligence (AI) should all consider not only the good of one stakeholder, but all stakeholders.

Finally, in terms of collaborative communication, what needs to be developed in this context is the idea of multiple intelligences proposed by Howard Gardner in his book entitled *Frames of Mind: The Theory of Multiple Intelligences* (1983). According to Gardner, there are eight types of human intelligence: harmonic and rhythmic-musical intelligence, spatial-visual intelligence, verbal-linguistic intelligence, logical-mathematical intelligence, physical-kinesthetic intelligence, interpersonal intelligence, intrapersonal intelligence, and naturalistic intelligence. Of all those types of intelligence, collaborative communication will become more optimal if the stakeholders master at least interpersonal intelligence, intrapersonal intelligence, and naturalistic intelligence. Interpersonal intelligence is associated with the ability to empathize and to collaborate; intrapersonal intelligence is associated with the ability for self-reflection and self-introspection; while

naturalistic intelligence is associated with sensitivity to the environment, including flora and fauna.

However, transdisciplinary approach is incomplete without its integration proposition. Integration in the context of this project is not merely carried out in the form of individual socialization which may be ineffective, but in the form of implementation into physical aspects (buildings, spatial plans) and also cultural aspects. Details of this implementation proposition are as follows:

- Repeated emphasis on the importance of respect for all life forms, not just humans, but also natural environment and non-humans. This emphasis is not just in the form of jargons, but also in the model of behavior shown by the leaders of each stakeholder to be followed by their members.
- Buildings and spatial plans designed by keeping in mind the coexistence of different stakeholders and also nature environment that protect each other's living space while maintaining the possibility to physically learn from each other.
- Socialization of social information processing model that is not only taught cognitively to all stakeholders, but also practiced while living in coexistence so that all decisions and actions are always mature responses to various social codes.
- Use of technology that always considers the benefits for humans and the environment and not simply intended for specific goals i.e., project completion, but also for the general goals of the stakeholders as human beings.

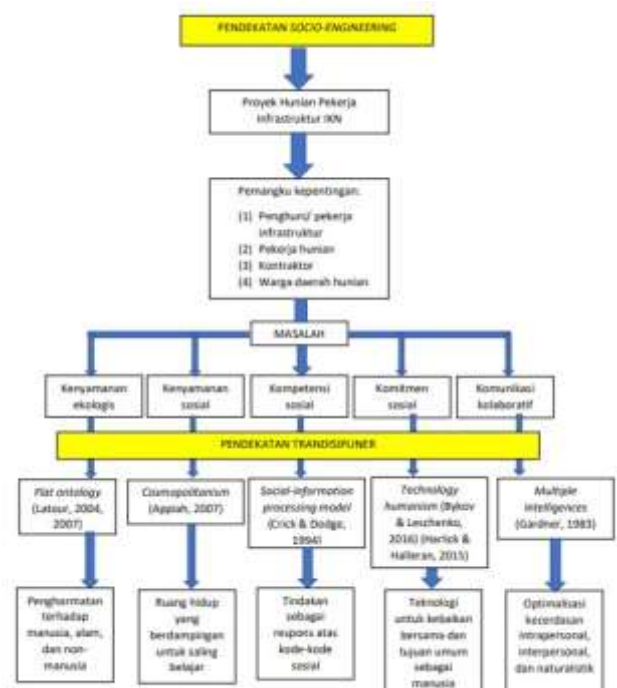


Chart. 1. Socio-engineering and Transdisciplinary Approach.

- Optimization of multiple intelligences, especially in terms of intrapersonal intelligence, interpersonal intelligence,

and naturalistic intelligence through constant education and practice both within the project environment and the society.

Therefore, the entire implementation of socio-engineering approach and transdisciplinary approach in the housing project for IKN infrastructure workers can be summarized in Chart I:

#### IV. CONCLUSION

Based on the discussion above, the conclusion of this research is as follows:

- The socio-engineering approach to IKN infrastructure workers' settlement breaks down four stakeholders in the field: residents/infrastructure workers, settlement workers, contractors, and locals/native people in the settlement areas, along with their problems, namely ecological convenience, social convenience, social competence, social commitment, and collaborative communication.
- To these problems, the resolution proposition based on transdisciplinary approach involves theories such as flat ontology, cosmopolitanism, social-information processing model, technology humanism, and multiple intelligences, which lead to implementation in the form of respect for humans, nature, and non-humans; development of coexisting living spaces for mutual learning; various actions taken as responses to social codes; utilization of technology for common good and achievement of common goals as human beings; and optimization of intrapersonal intelligence, interpersonal intelligence, and naturalistic intelligence.

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#### REFERENCES

[1] Antara. "Kementerian PUPR Targetkan Hunian Pekerja Konstruksi IKN Tuntas 2023." *Borneonews*. <https://www.borneonews.co.id/berita/283362-kementerian-pupr-targetkan-hunian-pekerja-konstruksi-ikn-tuntas-2023>. 18 November 2022.

[2] Appiah, K. A. "*Cosmopolitanism: Ethics in a World of Strangers*. W. W. Norton & Company". 2007.

[3] Badan Pusat Statistik. "Indeks Pembangunan Manusia menurut Provinsi IKN 2020-2022". 2022.

[4] Bykov, V. U., & Leschenko, M. P. "*Digital humanistic pedagogy: Relevant problems of scientific research in the field of using ICT in education*". *Information Technologies and Learning Tools*, 53(3), 1-17. 2016.

[5] Batmang. 'Pendekatan Transdisipliner (Suatu Alternatif Pemecahan Masalah Pendidikan)'. *Jurnal Al-Ta'dib*, 9(2), 44–54. 2016.

[6] Cakti, A. Otorita IKN siap wujudkan upacara HUT ke-79 Kemerdekaan RI di IKN. Antara . <https://www.antaraneews.com/berita/3399792/otorita-ikn-siap-wujudkan-upacara-hut-ke-79-kemerdekaan-ri-di-ikn>. 2023, February 16.

[7] Carroll, A. B., Brown, J., & Buchholtz, A. K. "*Project Stakeholder Management. In Business & Society: Ethics, Sustainability & Stakeholder Management (10th ed., pp. 495–510)*". Cengage Learning. 2017.

[8] Crick, N.R.; Dodge, K.A. "A review and reformulation of social information-processing mechanisms in children's social adjustment".

Psychological Bulletin. 115: 74–101. doi:10.1037/0033-2909.115.1.74. 1994.

[9] Dewi, A. R. "Membangun Peradaban Melalui IKN. Kementerian Keuangan Republik Indonesia". <https://www.djkn.kemenkeu.go.id/artikel/baca/15875/Membangun-Peradaban-Melalui-IKN.html>. 2023, January 31.

[10] Harlick, A. M., & Halleran, M. "*There is no app for that – Adjusting university education to engage and motivate Generation Z. International Conference New Perspectives in Science Education*". [https://www.researchgate.net/publication/273893292\\_There\\_Is\\_No\\_App\\_for\\_That\\_-\\_Adjusting\\_University\\_Education\\_to\\_Engage\\_and\\_Motivate\\_Generation\\_Z](https://www.researchgate.net/publication/273893292_There_Is_No_App_for_That_-_Adjusting_University_Education_to_Engage_and_Motivate_Generation_Z). 2015

[11] Jay. "Kementerian PUPR Selesaikan 16 Rusun Pekerja IKN, Ditargetkan Total 22 Rusun Rampung Awal 2023. Kementerian Pekerjaan Umum dan Perumahan Rakyat". <https://pu.go.id/berita/kementerian-pupr-selesaikan-16-rusun-pekerja-ikn-ditargetkan-total-22-rusun-rampung-awal-2023>. 2022, December 18.

[12] "Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Nomor 10 Tahun 2021 tentang Pedoman Sistem Manajemen Keselamatan Konstruksi, Pub. L. No. 10, Biro Hukum Kementerian PUPR". 2021.

[13] "Keputusan Menteri Pekerjaan Umum dan Perumahan Rakyat Nomor 1419/KPTS/M/2021 tentang Satuan Tugas Pembangunan Infrastruktur Ibu Kota Negara, Pub. L. No. 1419/KPTS/M/2021, Biro Hukum Kementerian PUPR". 2021.

[14] Kusnandar, V. B. "Dukcapil: Jumlah Penduduk Indonesia Sebanyak 275, 36 Juta pada Juni 2022. Kata data". <https://databoks.katadata.co.id/datapublish/2022/08/02/dukcapil-jumlah-penduduk-indonesia-sebanyak-27536-juta-pada-juni-2022>. 2022, August 2.

[15] La Dossa, Y., & Riffi. "Cerita Jakarta: Ceraan Gubernur Jakarta di Peristiwa Rengas dengkok". *Tagar.Id*. <https://www.tagar.id/cerita-jakarta-peran-gubernur-jakarta-di-peristiwa-rengasdengklok>. 2018, July 23.

[16] Laplume, A. O., Sonpar, K., & Litz, R. A. "*Stakeholder Theory: Reviewing a Theory That Moves Us*". *Journal of Management*, 34(6), 1152–1189. <https://doi.org/10.1177/0149206308324322>. 2008.

[17] Latour, B. "*Politics of Nature: How to Bring the Sciences into Democracy (C. Porter, Ed.)*". Harvard University Press. 2004.

[18] Latour, B. "*Reassembling the Social: An Introduction to Actor-Network-Theory (1st ed.)*". Oxford University Press. 2007.

[19] Maharani, A. S. A. "22 Tower Rusun Pekerja IKN Rampung Januari Ini". *Kompas*. <https://www.kompas.com/properti/read/2023/01/14/143000921/22-tower-rusun-pekerja-ikn-rampung-januari-ini?page=all>. 2023, January 14.

[20] Malik, A. "Jakarta Sebelum Proklamasi Kemerdekaan Indonesia". *Dunia Hukum*. <https://www.boyyendratamin.com/2012/08/jakarta-sebelum-proklamasi.html>. 2012, August.

[21] Mayasari, D. "Ibu Kota Negara Baru: Integrasi Infrastruktur dan Kelestarian Alamtruktur-dan-kelestarian-alam. Kementerian Keuangan Republik Indonesia". <https://kpbu.kemenkeu.go.id/read/1150-1404/umum/kajian-opini-publik/ibu-kota-negara-baru-integrasi-infrastruktur-dan-kelestarian-alam>. 2022.

[22] Nègre, A. "*A Transdisciplinary Approach to Science and Astrology*". C.U.R.A. (University Centre for Astrological Research). <http://cura.free.fr/quinq/02negre2.html>. 1998.

[23] Nicolescu, B. "*The Transdisciplinary Evolution of the University Condition for Sustainable Development*". In D. Fam, L. Neuhauser, & P. Gibbs (Eds.), *Transdisciplinary Theory, Practice and Education* (pp. 73–81). Springer International Publishing. [https://doi.org/10.1007/978-3-319-93743-4\\_6](https://doi.org/10.1007/978-3-319-93743-4_6). 2018.

[24] Prasetyo, A. "Tugas Berat Menanti. Media Indonesia". 2022, March 11.

[25] Purnama, S. J., & Chotib. "Analisis Kebijakan Publik Pemindahan Ibu Kota Negara". *Jurnal Ekonomi & Kebijakan Publik*, 13(2), 155–168. 2022.

[26] Reed, D. "*Stakeholder Management Theory: A Critical Theory Perspective*". *Business Ethics Quarterly*, 9(3), 453–483. <https://doi.org/10.2307/3857512>. 1999.

[27] "Undang-Undang Republik Indonesia Nomor 3 Tahun 2022 Tentang Ibu Kota Negara", Pub. L. No. 3, Republik Indonesia. 2022.



- [28] Sabandar, S. "Cerita Dibalik Aksi Pindah Ibukota ke Jogja". *Liputan6*. <https://www.liputan6.com/regional/read/2577674/cerita-di-balik-aksi-pindah-ibu-kota-ke-jogja>. 2016, August 15.
- [29] Sunarharum, T. M. "Perencanaan Pembangunan Ibu Kota Nusantara (IKN). Aspek Penting Mitigasi Bencana Dalam Perencanaan Ibu Kota Nusantara". 2022, November 19.