Control mechanisms in the third-generation planning. Case study: Control to realize sustainable cities

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Abstract. Since the last few years, Indonesia has experienced important events that bring significant changes to the social, political and economic life. The changes directly or indirectly impact the field of planning. With the challenging condition which grows fast and is more complex ahead, and the greater demands on the role of planning, it is required that planning should have higher quality. This paper seeks to answer some questions as follows: (i) How are changes in paradigm and also the development of planning model for the current transition era?, (ii) What is the best way to improve the quality of planning control on the last generation planning model to realize sustainable city?. Analysis steps that will be used to achieve the paper objectives are: (i) Review of planning and sustainable cities theory, (ii) Pattern recognition, (iii) Identifying control mechanisms and sustainable urban forms, (iv) conceptualization. Based on discussion about sustainable cities and control mechanism, some conclusions can be generated as follows: (i) The third generation planning model is based on the theory of expanded system, emphasizing on the constraint of capacity and the ability of planners within the context of larger environment, (ii) There are various theoretical studies that recommend prescriptive model or solution for sustainable urban form and structure. The concepts of Sustainable Cities can be grouped in Neotraditional Development, Urban Containment, Compact City and The Eco-City. The four models above have criteria, namely (i) high density; (ii) a high level of diversity; (iii) mixed land use; (iv) compactness; (5) sustainable transport; (6) passive solar design; (7) Greening Ecological Design. The three main activities in control mechanisms are: Monitoring and Recommendation; a comparative review of the facts (conditions that exist or are developing) with the purpose (expected conditions, set out in urban planning) and recommendations; Evaluation, a review on the intended purposes and can be followed up with revised purposes; Intervention/Actions toward existing conditions.

1. Introduction
Since the last few years, Indonesia has experienced important events that bring significant changes to the social, political and economic life. Changes that occur among others are in social and political field (from centralized power into decentralization, from Authoritarian into Democratic), in economics (from Centralized Financial Management into local-regional management, from local markets into global markets), in institutional field (the occurrence of globalization) as well as physical sector (the occurrence of Domestication). [1]

The changes directly or indirectly impact the field of planning. The demand for quality planning becomes a necessity to anticipate the changes that occur. It is not a secret that in Indonesia a lot of
existing plans merely serve as a ‘paper tiger’. They are conceptually and visually interesting and beautiful, but have very little influence on people's daily lives or can be said to be very weak in implementation. In reality, a lot of planning products which simply decorate the cabinets of governmental agencies can be found. Utilization and planning control becomes one of the critical points in the overall planning cycle. [2]

With the challenging condition which grows fast and is more complex ahead, and the greater demands on the role of planning, it is required that planning should have higher quality. Many factors affect the quality of planning, not to mention the dynamic factor of planning which always follows the existing paradigm. Whatever the paradigm is, the source of all paradigms is planning syntagm, as an essential process of planning. The planning model which is still widely used in practical and academic world in schools of planning in Indonesia is comprehensive rational planning model introduced around the 1940s. There have been a lot of criticisms related to the comprehensive rational planning model. As the first-generation planning model, comprehensive rational planning is considered too ideal, not focus, and the planning process requires large resources. Criticisms on the first generation planning model raise an antithesis which results in second generation planning. Since the 1960s there have been many models that attempt to refine and even remodel comprehensive rational planning model, such as advocacy planning model, incremental planning, medium-term planning, strategic planning, radical planning, etc. However, their practical application is still not widely used, especially in spatial or spatial planning.

One of the stages in comprehensive rational planning process that often serves as the critical point is utilization and planning control, a transitional phase of a plan at the conceptual level into an action to realize the plan at operational level [3]. On that basis, this paper seeks to answer some questions as follows: (i) How are changes in paradigm and also the development of planning model for the current transition era?, (ii) What is the best way to improve the quality of planning control on the last generation planning model to realize sustainable city?

Analysis steps that will be used to achieve the paper objectives are: (1) Review of planning theory, and other multidisciplinary literature that is related planning model. The aim is to deconstruct (“take apart”) a multidisciplinary text related to control mechanism in planning. The outcomes of this process are numerous themes, “planning model” in this case, that are related to control mechanism, (2) Pattern recognition. The aim is to note major patterns and concepts within the results of the first step. This second step looks for similarities or patterns within the sample and codes the results by concepts, (3) Identifying control mechanisms and sustainable urban forms —to recognize specific and distinctive control mechanism in sustainable cities, (4) Conceptualization—to find theoretical relationships among the identified concepts and control mechanisms.

2. Development of Planning Model

The characteristics of "first generation" planning, which are widely studied in schools of planning and are also practiced until the 1970s, are characterized as a rational process analogized as a scientific process in a research. Although various authors and planners sort first generation planning stages in more detail or more macro, or with different terms, but implicitly the first generation planning is based on the same assumptions and principles, as follows: (1)Formulation of the problem and the solution are two discrete stages independent of each other, (2) Planning approach must be rational and objective. The process is not only supported by one discipline alone, but involves many disciplines (multidisciplinary), (3) Solution in planning is optimal, which means that all relevant aspects are maximized to obtain a single value. This assumption and viewpoint are the basis for rational planning model, (4) Most decisions made by planners are based on the primary consideration of rationality, namely to develop alternative solutions and choose a solution or an alternative with rational criteria. [3]

The characteristics of second-generation planning are contrary with the previous generation planning described above. If the first generation planning process is dominated by a "tame problem" or a simple problem, then the second-generation planning is related to complex problem (wicked problem). ‘Tame problem’ is analogized as a problem in the game of chess or settlement of math problems. It is conceivable that every problem in the game of chess or math equation completion has a clear and definite
solution to resolve. Furthermore, if a problem has been solved, then the solution is used as a reference or even becomes the rule for those who face similar problems. [3]

It is different from the characteristics of complex problems (wicked problem) contained in second generation planning. The characteristics of 'complex problem' are as follows: (1) Every complex problem is essentially unique, (2) There is no fixed limit in complex problems. Each description of the problem is only temporary and is considered as a symptom of other problems, (3) Description of the complex problem can be viewed from various angles. The choices of viewpoint will determine the problem-solving method, (4) The exact number of potential solutions for the 'complex problem' can not be determined, and it does not have the quantitative benchmark that can be used in the planning process, (5) The benchmark of successful solutions does not use the value of 'right or wrong', but 'better or worse', (6) A planner can not do experimental activities, such as those carried out by scientists in the laboratory, so he is expected not to make a fatal mistake in the planning process, (7) Each implementation of a solution to a problem is a final and linear process which does not allow 'trial and error', (8) Considering that the description and understanding of a problem is temporary, there is no fixed rule associated with problem solving.

In this section a more advanced planning model will be described, namely the third generation planning. The basis of the third generation planning is system theory, which is developed by Heidemann [5]. With the intention that the very complex substance of 'planning' can be structured, system theory which serves as the basis for the planning model must be discussed once more.

This approach is based on the assumption that the theory of system isolates not only the relationship between the core or the element, but also its relationship with the environment. Such considerations structurally place elements of a system that is always related with the environment. The new paradigm of system theory, often referred to as a paradigm of system-environment, considers system as the formation of system-core fusing into a larger or bigger environment.

A planning model should consider all barriers and above qualifications. A search for a model is answered by a theoretical approach which was first revealed by a biologist Jacob von Uexküll [5]. The approach of von Uexküll theory confirms the theory of system-core/components and explicitly underlines not only limited perceptional ability of humans on the surrounding environment, but also limited cognitive capacities of humans and limited human ability to perform action. According to Uexküll, every organism including humans, can absorb only some of the stimuli produced by surrounding environment (the external world), and respond to it in a specific way. The response specifically affects the external environment and also re-provides stimuli to the organism. The closed-cycle by Uexküll is called a functional cycle.

![Figure 1. Functional cycle (Heidemann, 1992 adapted from Uexküll)](image)

Functional cycle can be articulated as follows (see figure 1 above): the external stimuli that affect each organism will be captured/perceived by Agents with the help of 'Sensory Apparatus' in 'Sensory
World'. In humans, 'Sensory apparatus' is known as sensory organs that have limitation in capturing all stimuli coming from the environment. If the stimuli from the environment cannot be detected by senses, these stimuli cannot be interpreted afterward. Cognitive Apparatus of an organism in the Cognitive World is a device or organ that has the capability and limitation to affect the desired action. The influence of an organism to its environment will use the 'Effectual Apparatus' in 'Effectual World' which is also limited according to the ability and the extent of 'Effectual World' of each organism.

3. Third Generation Planning Model
The above Uexküll model provides insight into various possibilities of the role of a planner, who perceives, thinks and acts (and proceeds in an organization), who has background levels of knowledge, and who lives in a neighborhood (which would also limit set of actions owned by a planner).

The basic idea of the third generation planning model can be described briefly as follows (See figure 2)

'Sensory World' in basic scheme of planning is defined as 'Understanding the situation'. This refers to the ability and capacity of a planner to perceive and interpret his environment. The stage 'understanding the situation' is a transition phase between the 'Life World' with the 'Planning World'.

Furthermore, 'cognitive world' in Uexküll model is translated as arranging/formulating instruction, where a planner with his capacity and ability formulating measures to determine or control appropriate actions. Instructions (in the form of plans, descriptions or directions) are measures for the third party to perform certain actions (e.g.: building public facilities, constructing roads, building houses or revitalizing the area).

In the adaptation of Uexküll model for basic planning model, the concept of 'effectual world' is translated into two parts, i.e. 'communication about behavior' and intervention. This is because planning process is dealing with complex conditions. In a more concrete term: planning should be understood as an activity in public domain, which cannot implement all instructions directly and quickly. Modification of the instruction that has been prepared in the 'planning world' is often necessary. The second part, a translation of 'effectual world' is an intervention because the source of planning is a change in the real world. As well as in the 'effectual world', 'setting' is also interpreted into two parts. This is done to distinguish between the situation before and after the intervention of planners.

In brief, it can be concluded that in a planning, minimally there are two (2) critical points prone to errors that can lead to declining quality of plans and planning. The first critical point is in the stage 'Comprehension the Situation', where there is a transformation of information from the factual level (Life World) to the conceptual level (Planning world). This stage is simply known as survey phase to understand the planning area. The point where there is a transformation of information in the form of

Figure 2. Basic scheme of planning (adapted from Heidemann, 1992)

| Life World | Planning World |
|------------|----------------|
| Comprehension of the Situation | Elaboration of Instructions |
| Communication about behavior | OUTCOMEs |
| SETTING | INTERVENTIONS |
plan at the conceptual level to the Factual level is the second critical point, known as 'Communication about behaviour' and 'Intervention' stages. Actually, there are still some critical points other than the two points of transition and analysis phase, but at the two critical points of transition, the possibility of information bias will be greater than at other points.

Understanding the planning area is indeed the first critical point. Based on existing experience there are some possibilities that result in bias information between the factual manifestation and conceptual articulation, causing low quality of data or information, and eventually low quality of plan. Events at the factual level can be transformed into data as a quantitative/qualitative description at the conceptual level, if the incident impressively leaves traces. Based on the characteristics, traces can be permanent, generally in the form of memory, or non-permanent, having the shape of a perception perceived by the senses. Representation of factual conditions or transformation of events – Traces – Data will involve three phases of activity, namely: Scanning - Recording - Measurement. The quality of flowing transformation will be highly dependent on the quality of the implementation of the three steps above or observation [5].

Scanning stage includes interpretation cycle, and so it is also known as the exploration-interpretation cycle. Interpretation mechanism is a reverse process of Events–Traces–Data into Data–Traces–Events as a representation of events on factual level. Interpretation process involves three stages of activity, namely: Decoding – Assignment – Ascription. Good quality of this mechanism (understanding) will become the foundation for the interpretation of events on the factual level with cognitive theoretical support.

If the first critical point is the transformation transition point from factual level to conceptual level, the second critical point is the transition point from conceptual level to factual level. The process that occurs is transformation from Plan in the form of directions or guidelines at conceptual level transformed into an event or activity at conceptual level. This mechanism includes three (3) features, namely: INTENTS-INTERVENTION-OUTCOME with development and testing cycle, known as the control cycle. Basic control cycle is composed of the combination of two cycles, they are: Monitoring-Recommendation-Evaluation-Purpose which is at the level of 'Planning World' and Monitoring-Recommendation-Intervention-Fact cycle which is at the level of 'Life World' [5].

4. Green City (Eco City) in the Context of Sustainable City

Since sustainable development was conceived as a new paradigm of development in the 1970s, "sustainability" has become a magical terminology that is widespread in planning documents at local, regional, national and even global level. Since then, the concept of sustainability becomes one of the themes that is often debated and used as a concept in urban and regional science as well as transportation. Sustainable becomes the most commonly used concept in urban planning in Indonesia and around the world. The shift of paradigm in the field of urban and regional planning and urban design has led to the need for a more holistic, inclusive approach to meet sustainability criteria.

Riddell in 2004 articulated the relationship between sustainability and urban planning through a statement: "Sustainability requires ways to satisfy the lives of all without exceeding the ecological capacity of the biosphere. Future-friendly towns and cities are key players in building a sustainable future. Since it is at the local level where infrastructure related design and policy shapes peoples' lives and resource consumption, towns and cities can be particularly effective in pioneering sustainability" [6].

There have been many theoretical studies in journals and textbooks that discuss and recommend a variety of models, theories and prescriptive solutions about the form and the structure of a sustainable city, along with criteria and the positive and negative aspects. The models and the concepts can be classified into four typologies of form and structure of urban space which are hypothetically considered as environmentally friendly [7]. Based on the description of typology above and also review of existing theory, it can be concluded that sustainable cities have the following criteria:
1. Density
The influence of density (along with the type of building) to sustainability, occurs through differences in energy consumption, goods and land for housing, roads and infrastructure of a city. High density and integrated land use not only reduce the use of resources, but also encourage social interaction through compaction. Kenworthy concluded some policies that can reduce energy consumption by increasing the density of the city, improving the quality of city center, optimizing land within city, providing good public transport alternatives, as well as limiting the infrastructure for private vehicles. Some alternative arrangements of buildings and KDB in the same level of density are described as follows [8].

2. Diversity
The diversity of activities is the essence of sustainable cities. Jane Jacobs popularized the concept of diversity which was later adopted widely by many models of urban planning, such as new urbanism, smart growth and sustainable development. Jacobs also wrote: “In dense, diversified city areas, people still walk, an activity that is impractical in the suburbs and in most grey areas. The more intensely various and close-grained the diversity in an area, the more walking. Even people who come into a lively, diverse area from outside, whether by car or by public transportation, walk when they get there” [9].

3. Mixed Land Use
Mixed land use or heterogeneous zoning allows for suitable land use which needs to get close to each other so as to reduce the distance between activities. Mixed land use is characterized by the diversity of land use functions in an area, such as housings, trades, services, offices, industries etc. The next impact is a reduction in the use of private vehicles for shopping, and going to work, school and recreation areas. The use of the concept of mixed land use at least ensures that a lot of city service facilities are located within a radius which can be reached by walking and cycling. Besides, the use of mixed land can revitalize parts of the city areas with the addition of new functions.

4. Compactness
Compactness of built environment is a widely accepted strategy to achieve a more sustainable urban structure. The concept of compaction is applied to direct the development of the city on the existing urban structure, so as to minimize the energy for transportation needs, water, goods and people. With intensification, which is the main strategy to achieve compaction, building density and activity can increase, so it ultimately leads to a more efficient use of urban land. Some studies (Acioly Jr. and Claudio C. 2000) consider that compaction is the most important typology to achieve sustainable city. For example, it is said that a sustainable city must be compact, solid, varied and powerfully integrated. The formed urban structure will be able to encourage people to walk with ease and reduce the desire to use private vehicles.

5. Sustainable Transportation
There is no doubt that transportation is the biggest problem in debates about environment relating to the form and structure of urban space. The interesting thing is that sustainability is defined as the minimization of mobility and length of a trip [10]. According to Handy, the form of a sustainable city must have the appropriate structure to carry out movements by walking and cycling and have efficient public transport. Besides, it must have a compact form and encourage social interaction.

6. Passive Solar Design
Passive Solar Design is a central point in an attempt to realize the form and the structure of sustainable urban space. The general concept is to reduce the energy requirements and provide passive energy usage through specific design. The design that affects built environment, in general is through building orientation and building density. The assumption is that the design, position, orientation, layout and landscape can encourage optimum use of lighting and microclimate conditions to minimize the need for heating or cooling buildings by conventional energy sources.
7. Greening

'Greening' of the city or green Urbanism also becomes an important design concept to achieve a sustainable urban structure. Green open space has the ability to contribute positively in the development of sustainable cities. Through greening it is expected that natural integration between nature and city will occur and the presence of nature in the life of urban society will be maintained.

5. Control Mechanisms in Creating Sustainable Cities

As noted in section 3 above, control mechanisms have different characteristics from 'understanding the situation' due to its divergent transformation with a high level of difficulty, namely: How to transform a plan in conceptual level so that it is capable of acting as directions or guidelines for desired actions in the factual level. What is the guarantee that the entire community or Planning Addressee conducts activities as planned? Monitoring and recommendation that continuously follow and attach to control mechanism are required. Therefore, in planning the term control is actually more appropriate to use than/to replace the term Realization [5].

![Diagram of Control Mechanism](image)

**Figure 3. Control mechanism (Heidemann 1992)**

A brief explanation about the main activities contained in control mechanism is described as follows:

5.1. Monitoring and Recommendations

Monitoring and recommendations are a comparative review of the fact (conditions that exist or are developing) with the purpose (expected conditions, set out in urban planning). Monitoring is the first step in the overall mechanism of area controlling to keep the appropriateness in space utilization with the assigned space function. This monitoring stage produces conclusion that serves as recommendation for the next stage. If the result of monitoring concludes that the plan for space utilization can direct and accelerate the development process and can be realized, the conclusion will recommend interventions or actions for achieving the desired state. Likewise, if a predetermined plan is not able to accelerate the development process or even slow it down, it is possible to revise or improve the existing plan. Thus, monitoring activities must be carried out periodically and in a sufficient period of time to be able to quickly find out deviation that occur in the field, and so intervention or required action can be done immediately. At this stage the role of planning information system becomes important.

5.2. Intervention /Treatment of existing conditions.

Transformation of guidelines contained in the plan into action is done through intervention. In this case intervention is a program of action to realize predetermined plan. All this time interventions which are often applied and commonly used are regulation or legislation, namely provisions which must not be violated and their sanctions. However, it is also important to take advantage of other interventional
devices with a better planning and this may make up a unity with mutual support. Interventional devices in question are:

1. Motivation
   Motivation aims to influence urban society to participate in using their resources and engage in the planning and realization. Motivation is associated with changes in attitudes or feelings. In a situation where the role of society is claimed to be more dominant in urban development and there are potentials that people have, motivational device is becoming increasingly important. Potentials in question are, for example, mutual cooperation that is still embedded in the community or the willingness to donate some properties or land for public interest. Some examples of instruments of motivation in creating a green city, among others: (1) Organizing events correlated with the aims of green or sustainable city, (2) Giving reward/awards for the achievement or support green city, (3) Training related to green city, (4) Seminars related to sustainable city.

2. Information
   Informational instrument relates to changes in the public's knowledge and views to support established purposes. The purposes can be achieved by introducing knowledge about current condition and facts, as well as procedures to be agreed. This information can make use of the lines of communication that already exist and thrive in urban areas, such as: oral communications through counseling, newspapers (especially KMD), radio, television, performing arts (performance for public).

3. Organization
   This instrument is disincentive, specifically associated with procedures which are permitted and should not be violated, along with the sanctions. Some examples of organizational instruments, among others: PERDA/PERBUP/PERWALI about Green Open Space, Corporate Social Responsibility (CSR) for Green Open Space, PERDA/PERBUP/PERWALI about tree planting requirement for arranging ID card, PERDA/PERBUP/PERWALI about tax dispensation for green open space, etc.

4. Installation
   Installation is the development of facilities and infrastructure in accordance with the provisions of urban planning to support desired activities. If regulation devices is categorized as disincentive device, the development of facilities and infrastructure is incentive device, namely to provide an added value in the form of ease, smoothness and benefits for people who abide by the rules or support the creation of expected condition.

6. Conclusion
   Based on above discussion about sustainable cities and control mechanism, some conclusions can be generated as follows

1. Development of planning from the first generation to the third generation has brought a fundamental change in any generated planning model. Each model has its own characteristics according to the challenges it must face. The third generation planning model is based on the theory of expanded system, emphasizing on the constraint of capacity and the ability of planners within the context of larger environment.

2. There are several theoretical studies that recommend prescriptive model or solution for sustainable urban form and structure. Those concepts can be grouped in Neotraditional Development model (including the New Urbanism, Transit Oriented Development, Transit Village, Transit Supportive Development, Transit Friendly Design), Urban Containment (including Urban Greenbelt, Urban Growth Boundaries - UGBs, and Urban Limit Line - ULL), Compact City and The Eco-City.

3. The four models above have similar criteria, namely (1) high density; (2) a high level of diversity; (3) mixed land use; (4) the form of a compact city; (5) sustainable transport; (6) passive solar design; (7) Greening Ecological Design. Studies about sustainable urban structure
and its form are followed with a search for city form that is able to (1) reduce dependence on motor vehicles, thus resulting in lower emissions and reducing energy consumption; (2) improve public transport services to be better; (3) increase accessibility; (4) reuse infrastructure and land that have been built; (5) improve the regeneration of urban areas; (6) improve the quality of life; and (7) protect green open space.

4. The three main activities in control mechanisms are: Monitoring and Recommendation; a comparative review of the facts (conditions that exist or are developing) with the purpose (expected conditions, set out in urban planning) and recommendations; Evaluation, a review on the intended purposes and can be followed up with revised purposes; Intervention/Actions toward existing conditions.

5. Control instrument is an intervention device that consists of Information, Motivation, Organization and installation, which are interrelated and support one another.

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