

## 균형적 능력개발의 매핑 및 측정을 위한 도구

- 개념, 방법론 및 배경 -

류재익<sup>1\*</sup>

## A Tool for Mapping and Measuring Sustainable Capacity Development: Concepts, Methods and Contexts

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### 요 약

최근 균형적 (또는 지속가능한) 발전에 매우 중요한 인자로서, 능력개발에 대한 토의 및 연구에 많은 관심이 집중되고 있다. 다면적 성격의 능력은 국제 학술단체 및 국제기관에서 여러가지 의미로 해석되고 있다. 능력개발은 지식과 행위의 배움을 증진시키는 자생적 능력향상의 프로세스로 간주되고 있다. 그러나 균형적 발전측면에서 볼 때, 대부분 주요능력의 연구는 추상적이고 실현적인 못한 수준에 머물고 있다. 이 연구는 균형적 발전과 연관되어 있는 능력개발의 국제적인 의미를 설명하고, 능력개발을 위한 에이전트 기반의 새로운 방안을 제시한다. 또한 자산, 자본 그리고 자원을 지닌 에이전트가 균형적 발전에서 어떻게 능력개발을 향상 시키는가를 설명한다. 균형적 능력개발의 정의를 국제적으로 처음 규명하고, 관련된 국제기관을 지원하도록 개념적 틀이 독창적으로 고안되었다. 이 연구는 균형적 능력개발을 측정하는 도구로서 에이전트 기반의 조직능력과 연계된 실용적인 공간자산매핑을 제시한다.

주요어 : 공간자산매핑, 능력개발, 에이전트 기반모델, 균형적 능력개발

### ABSTRACT

The discussion about capacity development (CD) has been spotlighted as significant drivers for sustainable development in recent years. Multi-dimensional natures of capacities would lead to various definitions of CD in international institutes and organizations. CD is perceived as an endogeneous process to improve actionable learning and knowledge, but most of core capacities still remain abstract notion and might be unreliable in sustainable development (SD). The paper first explicates international perspectives of CD in association with SD. An agent-based model is especially proposed to portray more details of CD. It illuminates the role of assets (or capitals, resources) in agents to impact on ingredients of CDs that are drivers or enablers for

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improvement of SD. A definition of sustainable capacity development is firstly articulated in international society and its conceptual framework is also creatively designed to assist concerned international organizations. The paper concludes by proposing practical spatial asset mapping linking to agent-based organizational capacity as a tool for measuring sustainable capacity development.

*KEYWORDS : Spatial Asset Mapping, Capacity Development, Agent-based Model, Sustainable Capacity Development*

## INSTRUCTION

Improvements of human well-being and ensurances of better quality of life for everyone through capacity development (CD) are recently challenging issues in association with the hearts of sustainable development (SD). Capacity building or CD is conceived as an enabler for enhancement of sustainability, but most recent approaches to CD might have a serious difficulty in describing as to what CD implies in practical usages and applications pertaining to operationalization of capacity, capacity assessment and identification of capacity indicators. This paper first examines international concerns and issues of CD. It scrutinizes the main goals and objectives of UNDP document and other major organization's reports as to what CD means and how CD could improve organization's abilities and cope with development challenges in a sustainable manner.

Being different from existing researches on CD, this paper explicates how CD could be related with SD and what kinds of interactive relationships between CD and SD could give rise to sustainable capacity development (SCD). SD is regarded as creating capacity for improving each person's well-being, living standards, and better quality of life. Capacities determined by the stocks of assets or capitals can be converted

to goods and services that may influence upon most part of quality of well beings. In this paper, an agent-based model is especially proposed to describe the pathway of CD as to how individual agents could reach to CD. This model is creatively designed for clarifying key elements of CD and the discourses of capacity and performance impacted by agent's interactions and communications through the role of developments, agent's missions and use of assets. A conceptual framework for SCD is newly created based on combinations between an agent-based model for CD and assets(or capitals) approach to SD. Existing international reports and documents have not yet suggested practical use of CD concept for human well-being and better quality of life in sustainable communities. Linking spatial asset mapping (Liou, 2004a) to an agent-based model, an integrated tool for measuring SCD is created for not only expounding multilateral characteristics of CD indicators, but also portarying spatial agent's capacities.

## CAPACITY DEVELOPMENT FOR SUSTAINABLE DEVELOPMENT IN TRANSITION

### 1. International perspectives of capacity development

Many international organizations and

institutes have made efforts to elucidate the concept of capacity building and CD at the individual to systemic level. In particular, more than three major international organizations have long played a major role in definition and implementation of CD initiatives and indicators (UNDP-GEF, 2003a; UNEMG, 2004; UNFPA, 2003; WBI, 2004). Most of them have concentrated on the identification of capacity's needs, assessment of national capabilities and the establishment of mechanisms of capacity building at policy or project level.

CD, including capacity assessment, has been one of UNDP's core business areas since the early 1990s. At the global level, UNDP plays a key role as a forum for facilitating discussion and advancing the international understanding of CD. At the country level, UNDP is also supporting thousands of projects developing and assessing national capacity (UNDP-GEF, 2003b). A few other international research institutes (DFID, 2003; GTZ, 2003; ISNAR, 2003) have also contributed to serious efforts for institutional and organizational capacities and performances. In fact, a serious difficulty remains in describing as to what CD implies in practical usages and applications since there are many different interpretations of CD depending on abstract notions that might be hard to translate into actions and objectives. This may be due to the fact that discussions of CD could not directly meet current requests of our well-being. In these circumstances, there might be critical argues for the goals and initiatives of CD if international organizations and institutes could not invent the feasible

way for a new paradigm of development. As the most leading international organization, UNDP significantly contributes to improvements of CD and defines a confident capacity assessment framework and CD indicators, there are, however, lacks of international consensus on their views and questions about the possibility of practical applications. Additionally, there might be no yet acceptable models and frameworks to portray real applications of CD in the context of SCD.

## 2. A new shape for capacity development in sustainable development

Like the concept of capacity building, CD is a process by which individuals, groups, organizations and societies improve their abilities to identify and meet development challenges in a sustainable manner. CD is the process whereby individuals, groups, organizations and societies enhance their capacities in terms of human, organizational, institutional and social capital (Lavergne, 2004). While the concept of capacity building often aims to build capacity or increase existing capacities by imported other capacity, CD is considered as an endogenous course of action and long-term process of knowledge learning and adaptation to change, to begin with existing capacities and assets (Lopes and Theisohn, 2003).

While there are several different types of capacity building model and framework, CD remains an initial stage of abstract notions because many aspects of capacities are concerned about simply qualitative discreptions about policy, strategy, participation, and monitoring & evaluation

(UNDP-GEF, 2003a). SD is concerned about creating capacity for raising each person's well being, living standards, and quality of life. Capacities determined by the stocks of assets or capitals at individual and organizational level can be converted to goods and services which contribute to human well being. From the perspectives of asset or capital developments, CD approach to the triple bottom line of capitals might not be compatible. In other words, SD's concept might have nothing to with CD. SD indicators do not agree with most indicators of CD. Thus, existing models and frameworks of SD approach to CD might need to be reshaped in the context of SCD.

## AGENT-BASED MODEL FOR CAPACITY DEVELOPMENT

Various models and frameworks for capacity building have been highlighted in recent years. Regarding as comprehensive term of capacity building, CD is often conceived as an establishment of individual capacity and achievement of organizational performance by ownerships of capital factors and forces of enabling environments.

Several types of assets or capitals could play a vital role in developments of human, economic, socio-cultural, natural, digital, physical, institutional and political factors. As long as investments of tangible capitals are still considered as the primary engine of CD, institutional and political approach to CD could be perceived as root cause of capacity. Meanwhile, social, environmental and economic capitals

approach to SD might need to be reconsidered in accordance with a new designs of CD. Especially, capital selection theory applied to community capacity building (Liou, 2004b) and capital theory for SD (Pearce and Atkinson, 1993) give birth to a new perspective of present-day issues and challenges of SD, and could bring about a better appreciation of multi-natural aspects of CD in SD.

Being different from existing models of CD, the model proposed is hinged on the concept of agent that has capabilities to hold or maintain ownerships of assets, capitals and resources shown in Fig. 1. It shows the process of CD beginning with individual agent's motivations of asset capacity leading to increase of existing capacities.

This diagram shows that capacity is increased and developed during the course of an iterative and long-term learning process and adaptation to change (UNFPA, 2003) that individual agent could understand the discourses of his capacity and how to cope with CD change over time. A building capacity often requires a number of linked learning process for individual agents and even organizations to continuously adapt to change. Individual agents recognize that knowledge learning and sharing makes it possible to modify their behavior and keep up with adaptation to the world. Since CD has been widely involved with institutional, organizational, economic, political and social issues in different dimensions, it is hard to suggest the holistic form or generic model to encompass a wide variety of CD characteristics.

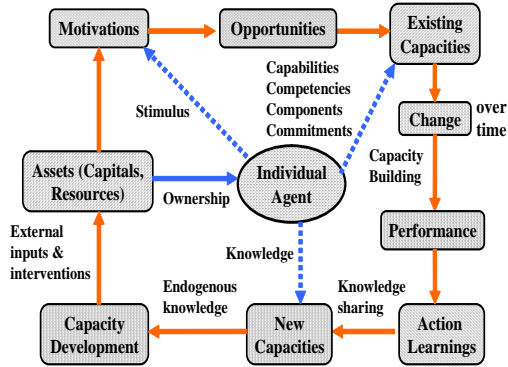


FIGURE 1. Key elements of capacity development

Thus, an agent-based model is used to portray different natures of person, group, organization and social institution that have various functions and multiple attributes. An agent is considered as people, things, associations, and societies that have goal-oriented properties in association with

policy, strategy, objectives, targets shown in Fig.2. An agent makes use of action to carry out their plan, project and task within the context of the role of economic, environmental and social development. A major potential of an agent-based model is to effectively represent diverse types of human and organizational motivations and interactions, and illustrate different attributes and properties of agents.

An agent-based model consists of not only decision-making of agents (human and organization) enclosing entities, entity roles, relationships, associations and role properties, but also environments of agent motivation, capacity, performance, ownerships of assets or capitals, and agent operations and interactions. A role is an abstract mission of agent's behaviors that are naturally goal-driven. It

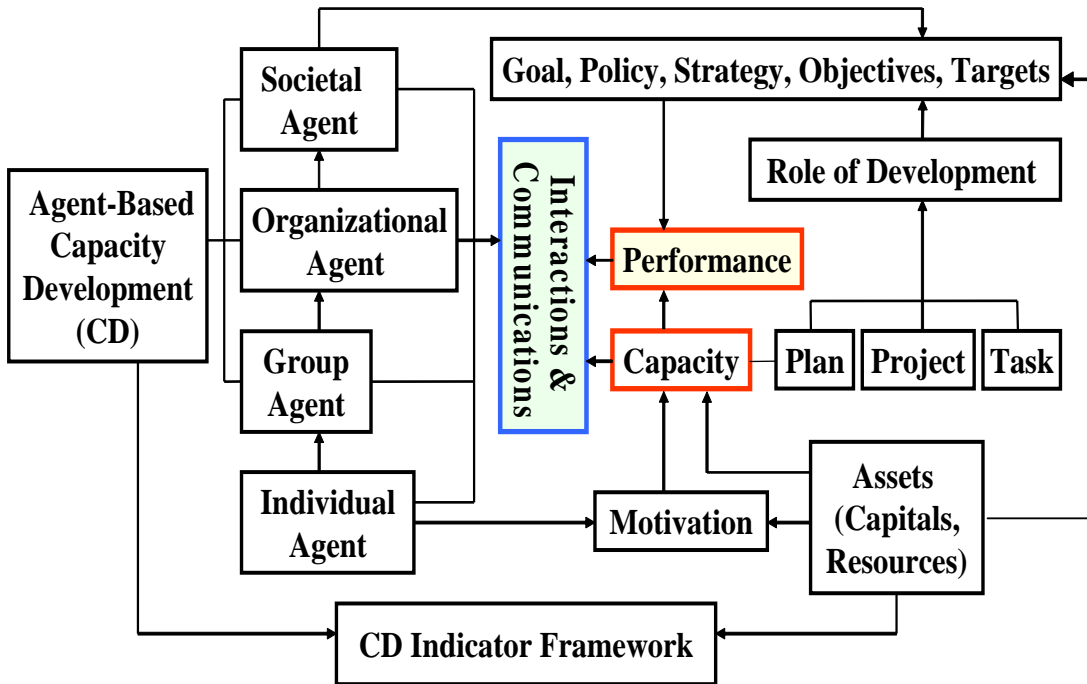


FIGURE 2. Agent-based model for capacity development

is related with the agent capacity or performance to complete plans, projects, and tasks in connection with some specific developments.

One of the most significant relationships between agents may be interactions or communications that are considered as the channels of capacity and performance's learning among agents. The sources of communications and interactions between agents are motivations to adapt to new capacities or to improve existing capacities through uses of assets (or capitals, resources). Especially, an agent-based model is expected to be useful to describe societal agents for depicting intangible characteristics of capacities and performances with regards to policy, strategy, objectives and targets.

## A CONCEPTUAL FRAMEWORK FOR SUSTAINABLE CAPACITY DEVELOPMENT

Although SD has a wide variety of objectives and indicators based on the three main areas such as economic, social and environmental issues, there might be little dominant consensus on a particular framework and model linking to CD. In fact, three capital-based framework is perceived as a prior to the concept of SD, but sustainable human society might be required for additional features pertaining to human, cultural, material, legal, political concerns. Assets are broad objects to symbolize the stock of wealth in a household, community and extra-communities that give rise to economic flows of capital. Assets are conventionally a vital factor to measure

degrees of individual capacity or well-being. Basically, an asset may become capital when it is invested to an individual business or household economic areas. Capital is often conceived as the stocks of asset and the quality of resources.

Many organizations often recognize capital as a major part of organizational capacities with regard to human, financial and built investments. In the meantime, capital categories are also regarded as SD indicators, but should not be seen as an attempt to measure all sustainability issues (UNSD, 2005). The right way of natural resource use and capabilities of environmental protection are having major impacts on the life support system of the earth. Regional assets are often considered as resource that are a type of engines of economic capacities in local and central government. At the global level, international organizations have played a key role as a forum for development cooperation (World Bank, 2002) in terms of a transfer of financial capitals, technical skills and natural resources regarding as a significant capacity for national developments. Fig. 3 illustrates a conceptual framework for sustainable capacity development (SCD) based on combinations an agent-based model for CD and assets (or capitals) approach to SD. There are, however, serious questions about how CD could be related to SD because two diverse definitions and natures of their original principles might not be compatible. Thus, little efforts have gone into concretely defining what SCD means even in a leading international organization.

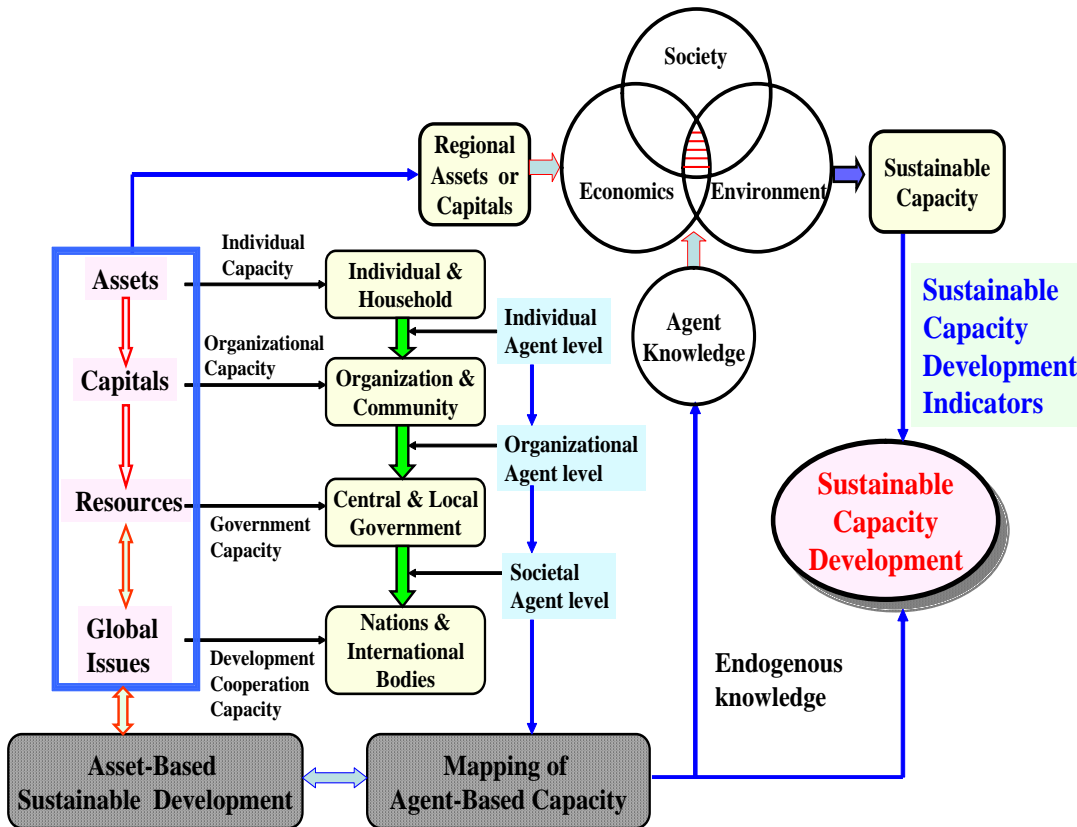


FIGURE 3. Combinations between asset-based and agent-based model

To a large extent, the difficulty arises from a very broad definition of CD and elusive understandings of the results to be expected from CD efforts. Based on UNDP's definition of CD and their core capacities, it is closely related with the ability to improve human well-being in association with world development and sustainable human development. It means that CD could play an important role as a driver for SD. Moreover, CD can include the way of enhancements for capitals (e.g. human, economic, etc) viewing as core components of organizational capitals (Morgan, 1997). Agent-based capacity with regional assets

(or capitals) could lead to sustainable capacity which endogenous agent knowledge is able to improve the capacity of SD.

Here, it is the first attempt to define SCD in international society as sustainable capacity for agent's ability (individuals, groups, organizations, systems) to perform their functions, ensure the better quality of life, and set and achieve objectives of CD through sustainable uses of assets, capitals, and resources (Liou, 2006).

### SPATIAL ASSET MAPPING WITH AGENT-BASED CAPACITY AS A TOOL

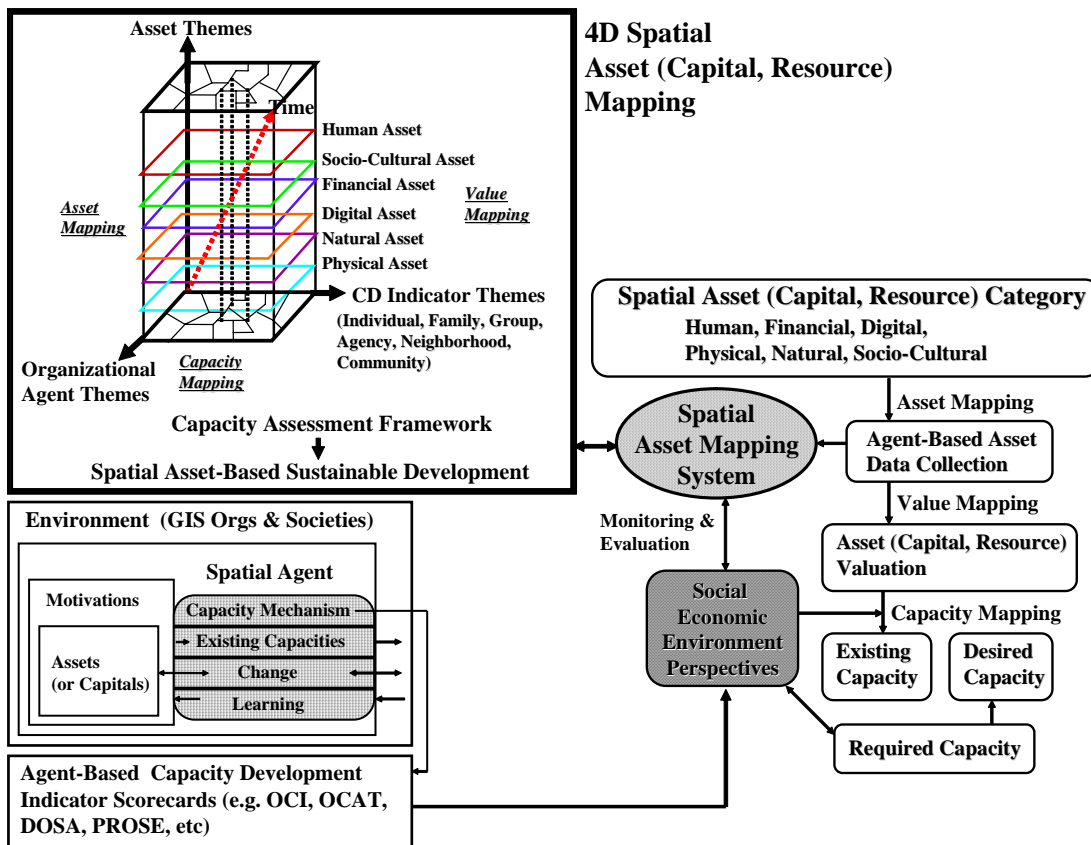


FIGURE 4. Measuring sustainable capacity development

### FOR MEASURING SUSTAINABLE CAPACITY DEVELOPMENT

Considering existing studies of SD and ongoing researches on CD in international institutes and organizations, there are some constraints and additional requirements for enhancing their outcomes and even serious questions about clear measures or indicators to be used for SCD. UNDP (2006) depicts a magnificent capacity assessment framework that is composed of three dimensions such as point of entry, core issues and cross-cutting capacities. This conceptual framework explains proper combinations of

three elements, but core issues are closely pertinent to organizational capitals of CD. It is, however, required for questionnaire surveys, and monitoring & evaluation techniques that need to be a part of visualization functions in space.

From the international perspectives of SD associated with GIS, Campagna (2006) describes a wide issue of GIS applications in SD. There are, however, no yet attempts to suggest an assessment tool for measuring SCD. Linking spatial asset mapping to an agent-based model for CD, an integrated approach to SCD shown in Fig. 4 is designed to not only explicate multilateral



characteristics of CD indicators, but also make use of spatial agent's concept within the 4 dimensional spatial asset mapping. Spatial agent has been used for describing diverse agent's behaviors and activities in space. Spatial agent is able to interact with other agents such as humans, institutions and a part of societal actors that complete his missions with specific individual or organizational motivations and approved capacities. Spatial agent acts to realize a set goals and objectives with existing capacities, but external environments of GIS businesses and societies are so unpredictable that spatial agent is required to adapt to capacity's change over time. Meanwhile, a number of approaches and tools for capacity analysis and assessment have been developed at the individual, organizational and societal level such as Organizational Capacity Indicator (OCI), Institutional Development Framework (IDF), Organizational Capacity Assessment Tool (OCAT), Discussion Oriented Organizational Self-Assessment (DOSA), Participatory Results-Oriented Self-Evaluation (PROSE). But most of them are used to describe specific knowledges, skills, institutional abilities, and human resource developments that would emphasize on organizational capacity and performances by questionnaire surveys.

However, th]suitable for illuminating a wide feature of SD and the principle of CD indicators is different from that of SD. In terms of CD in space, agent-based capacity might be viewed as a part of spatial attributes that could significantly impact on some developments of economic, environmental and social aspects. Therefore,

asset-based SD linking to asset mapping is designed to involve agent-based organizational capacity into SCD. In fact, asset mapping is a process of identifying and cataloging the inventories of tangible or intangible assets of individuals and groups, capitals of organizations, and resources of regional societies. Figure 4 shows feasible spatial asset (capital, resource) categories pertaining to asset, value and capacity mapping that repectively links to each of three themes. More than 6 assets (capital, resource) could be considered as a vital factor to improve an agent's capacity. Some of these assets such as physical and natural objects have been described and visualized in space. Particularly, on information about real estate, income, welfare and human resources has been used for decision-making of urban and regional planning and its development based on a parcel-map linking to sustainable national and regional development. These asset (capital, resource) informations are now collected and updated by traditional or modern mobile GIS technologies. Liou (2002, 2004b) has delineated the concepts and methods of asset mapping through visualization of 2D and 3D. Drived from analysis of Fig.2 and 3, the concept of agent's capacity is closely pertinent to ownerships and selections of asset (capital, resource) that paly a bigger role in CD as a major key for SD. Capacity mapping plays a significant role in some ideas on how policy-makers and planners could spell out their plan for sustainable community and regional development when comparing with current abilities and desired goals. However, more details of measuring agent-based CD

might be beyond the scope of the study.

Therefore, spatial asset mapping provides an analytical tool of asset capacity for an interpretation of individual, organizational and communal sustainability when classifying and analyzing the strength and weakness of social, economic and environmental assets (capital, resource). In the process of CD, organizational goals, policies and objectives can be changed over time and the capacity for desired knowledge, skill and capital might be updated or transformed. Thus, the 4 dimensional spatial asset mapping could be useful and expected to facilitate monitoring & evaluation of SCD since 2-3D concepts of spatial asset mapping have been used in GIS societies.

## CONCLUSIONS

A wide range of issues related to the three pillars of SD has been discussed for over a decade, there are however, very little international consensus on the relationships between CD and SD. The objective of this paper is to design a new concept of CD based on ability of assets (or capitals, resources) that are considered to be drivers and enablers for engine of developments. There are, however, serious questions about how CD could be related to SD because two diverse definitions and natures of their original principles might not be compatible.

In addition, 11 capacity dimensions at 3 levels (individual, organization and systems) of UNDP have some serious shortcomings to indicate specific agent's features in terms of their attributes of policy, strategy,

mission, role and interaction among agents. Thus, an agent-based model for CD is creatively designed and expanded to a conceptual framework for SCD because most international results of CD model and framework would remain an abstract notion or a little advanced feature of capacity assessment focusing on limited capitals or resources of organizational capacities. However, sustainable community developments and community capacity buildings need more broad scopes and contents which existing CD indicators could not explicate. Considering international interests and imperative demands for more details of CD and SD, an integrated approach to measuring SCD linking asset-based SD to an agent-based model for CD is newly designed for not only expounding multilateral characteristics of CD indicators, but also depicting spatial agent's capacities as a result of experimental research and project. [KAGIS](#)

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