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Asset-based Mapping Approach to Design for Poverty Informations

Jaeik LIOU[1※] · Jae-Yun KIM[2]

자산기반매핑을 이용한 가난정보 구축에 관한 연구

류재익[1※] · 김재윤[2]

ABSTRACT

Various researches and practices on asset management and asset-based mapping have been done with regard to engineering, industry, business and stocks marketing areas. Their notions and concepts are differently interpreted in response to different requirements. There are considerable research outcomes of management, operation and maintenance for physical, natural and digital assets. However, existing concept of asset management might have limitations to deal with diverse tangible or intangible assets at the individual/household/community level. In this paper, a conceptual framework of Hexad asset model is designed to explicate increase, decrease and other changes of assets flows as a geometric pathway. Particularly, consideration of lands and housing as important physical and natural assets to escape poverty not only leads to creation of an excellent 3D digital asset management, but also reaches to a new approach to asset-based mapping for a poverty information management and system.

KEYWORDS: Asset Management, Asset Mapping, Poverty Information, Hexad Asset Model

요 약

자산관리 및 자산매핑은 공학, 산업, 경영 및 금융등 여러 분야에서 관심 있게 연구되고 실무에 활용되고 있지만 각기 다른 차원에서 해석되고 있다. 대부분 물리적, 자원적 그리고 디지털 자산에 대한 관리 및 운영 그리고 유지보수에 상당한 연구성과가 있지만, 개인, 가구 또는 사회가 근본적으로 필요로 하는 여러가지의 유형 및 무형자산에 대한 관리는 기존의 자산관리 개념으로는 한계가 있는 듯 싶다. 본 연구에서는 개념적 핵사드 자산모델 제시하고 자산증가, 감소 등 여러 변화를 설명할 수 있는 기하학적 표현을 시도하였다. 특히 물리적 및 자연적 자산이 가난을 벗어나게 할 수 있는 중요한 요소로 판단되어 3차원적 수치지도를 자산관리에 도입하고 또한 가난정보구축을 지원할 수 있는 새로운 접근의 자산기반 정보를 소개하였다.

주요어: 자산관리, 자산매핑, 가난정보, 핵사드 자산모델

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1 충북대학교 정보산업공학과 Department. of Information Industry Engineering Chungbuk National University

2 (주)디아트코리아 D'Art Korea

※ 연락저자 E-mail: ryustom@yahoo.com

INTRODUCTION

Diverse applications and usages of asset mapping and management lead to different profiles and definitions of assets ranging from engineering, finances, industry to socio-economics. An asset management has often focused on countable or measurable characteristics of assets or capitals such as physical, financial and digital objects. This management is also considered to be an information-based form that offers accurate records of individual/households, community and local assets circumstances. Meanwhile, assets are often defined as right and claims to property, possessions, means, and knowledges that embrace tangible or intangible substances. This implies that assets can play a major role in economic powers and commercial bargains that not only provide more opportunities for capital dominances, but also protect future risks and vulnerabilities, and escape poverty alleviations and destitutions. Measuring diversities of six assets with regard to ownership and access in individuals and households are problematic questions because the mechanisms of assets inter-linkages are so complicate and volatile that existing concept of asset management might not be unable to assess status quo of poor households.

Mostly lands and housings are regarded as productive assets or even valuable future stocks. Lands and housings generally makes real income when space is rented or provides a site for household productions and small boutiques. These assets are directly or indirectly connected with a part of financial assets, but are used to physically measure human quality of lives, and land and environmental degradations. Measuring and building asset informations are concerned with creation of an asset map at the individuals/households level when local or commune authorities help poor households define their capacities and determine what assets are available to escape poor circumstances and improve their socio-economic abilities for basic human needs and desires.

A principal idea of GIS-based asset mapping or asset management is to assist in households and communities to estimate their assets as to how they can maximize the strengthes of their capacities and minimize risk and vulnerability of poor environments. In this study, to expound the relationships between asset and people's livelihoods, the Hexad asset model is proposed to suggest a conceptual framework of asset management and then examine semantic asset's flows or transfers by means of geometric pathways linking to geographic(or land) information systems. Detecting movable assets and collecting asset informations might be required for detailed descriptions of surveying and mapping with time that pertains to 2 or 3D real investigations of snapshots or visualizations for the real world, particularly descriptions of poor communities and households. This approach aims to not only depict more conspicuous pictures for living quality of life, but also provide an integrated manner for establishments of poverty informations within the frameworks of 3D digital asset management.

RELATED WORKS AND CHALLENGES

There are growing awarenesses of and interests for improvements of business, construction, service delivery and risk management in view of our assets. Different researchers use different

terminology to define the type of assets. They could lead to different applications and skills of asset management. Different definitions and concerns of asset management or asset-based mapping(Kretzmann and McKnight, 1996; Allen et al., 1999) are associated with a wide range of managements and operations of business (Schneider et al., 1997), engineering (DOT, 1999), finance(Gibson, 1996; Dunis, 2000; Acharaya and Acharya, 2002), real estate (Baird et al., 1999; Urquhart and Busch, 2000; Kaganova, et al., 2000), and sustainable livelihood(DFID, 1999; World Bank, 2000) and development. There might be still difficult to exactly circumscribe the scopes and extents of assets notions in industrial, infra-structural and techno-economic domains because assets are often used to describe tangible or intangible capitals, means, resources, possessions, holdings, wealthes, etc.

Since people are sensitive to cost/benefits of inputs(investments) and outputs(products), asset management would have been considered to be the main streams of business and economic operations, and management of facilities, stocks and customer relationships. Socio-economic and business approaches to assets have played important role in interpretation of the livelihoods of the poor, but might have limitations to explicate the relationships between asset and poverty information because interpretations of spatial analysis of physical and digital asset's distributions, dominations and influences are, today, important to determine the contents and contexts of poverty alleviation.

Asset management is the set of processes, tools, performance measures, risk exposures, business impact of costs and shared understanding that glues the individual improvements and activities. Australia and New Zealand are leading the world in such an holistic approach and use GIS technologies to manage overall characteristics of physical, natural and techno-economic asset information system(DPWS, 2001).

Asset managements might be conventionally used to describe locations and types, and status quo of tangible objects and types or classes in the fields of financial, physical, natural, and digital domains. Advanced descriptions of asset management are considered to be a broad business process and a decision-making framework that combines engineering principles with business practices(DOT, 1999; McNeil, 2000; PDC, 2002) and economic assessment with regard to disciplines, methods, procedures and tools for monitoring and controls of physical assets. To the real estate and its markets, assets are properties. When considering geo-spatial features, an asset management might be viewed as a part of spatial information managements enabling to efficiently and effectively underpin infra-structural assets in safe maintenances and regular inspections of material conditions.

Understandings of sustainable poverty information management might be a starting point of recognition of marginalized people who have often paucity of essential assets. A number of international organizations have developed operational frameworks and models of multi-dimensional assets and vulnerability definitions of poverty(Dercon, 2001) as more integrated approaches. DFID and World Bank's sustainable livelihoods approach, asset vulnerability framework and social risk management(Siegel and Alwang, 1999) focus on five categories of assets(so-called asset pentagon) and highlight the importance of access to these assets and

management of the their portfolio. DFID approaches and urban livelihood framework illustrate livelihood asset-building in conjunction with transforming organizational structures and institutional processes changes. These livelihoods approaches portray a conceptual framework and ideas of poverty alleviation. There might be, however, little evidences of practical benefits or outcomes when applying to realization of livelihood information on monitoring and appraisal of tangible or intangible assets transfers and changes. In addition, little considerations have been done with regard to place and location, temporal trends of asset's changes, and knowledge of the relationships between space, time and livelihoods. Furthermore, there might be few researches to describe viewpoints of asset management since asset owner or manager can be affected by the investment success or encouragement between sustainable development and social performance, and commercial participation towards equity of asset investment activities(UNEP, 2001).

Fig. 1 offers some ideas and raises questions about a conceptual framework of an asset management or asset-based mapping that focus on 6 categories of assets. In this research, Hexad asset model is proposed to expound a small part of generic concept of asset management consisting in a few modules such as asset management enablers, asset hierarchy, and asset-based mapping. These six assets could be linked to each other and seek to the pathway to alleviate lacks of asset poverty. Most of assets are regarded as tangible possessions that could be described as a part of systems consisting in classes, types, and objects. Superclass and subclass can be respectively

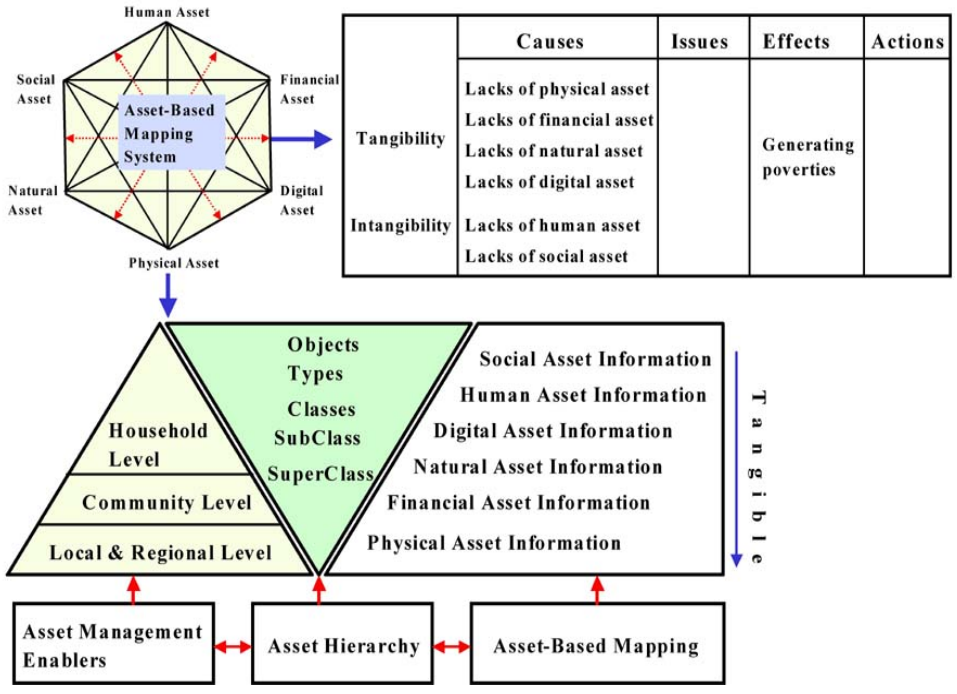

FIGURE 1. A conceptual framework for asset management

considered as a system and subsystem in response to multi-purpose applications.

Asset hierarchy enables even intangible assets to be regarded as countable objects, types or classes if causal diagram of poverty mind-map between causes and effects of five capitals (MacQueen, 1999) could be described as methods and designs of object-orientation in order to build an information-based asset management. To measure and evaluate the scopes of lacks between causes and effects of asset poverty, asset information should define a wide range of asset basic data or attributes such as asset type, name, location, value and price, etc. This information links to asset management enablers that can specify or visualize assets characteristics or circumstances of the poor household and community. This enabler seems to be an asset register system, geographic(or land) information system, workflow management, etc that enrich decision-making of planning and operation at the household and community level. An assets information connect with an asset-based mapping that can estimate extends of their asset's ownership ranging from individuals & household to local authority how poor households or individuals to assess their assets and to track their own progresses and developments. Basic information about individual and household asset's poverty is a core factor to measure their poor environment. Local authority should build on asset maps in terms of locations, poor contexts, economic status, land uses, real estate taxation, etc and classify their poor seriousness over time. This asset information helps decision-makers determine measures of anti-poverty actions, programs and strategies at the three different level.

ANALYSIS OF HEXAD ASSET INTER-LINKAGE FOR POVERTY INFORMATION

1. Geometric pathways of asset's flows

Assets are broad objects to represent the stock of wealth in a household, community and extra-community that gives rise to economic flows of capital in terms of investments, productions, consumptions and re-investment. The concept of assets is conventionally a vital factor to mostly measure degrees of poverty and vulnerability in poor urban and rural communities. Sherraden(1991) identifies six types of intangible assets such as access to credit(financial capital), human capital, cultural capital, informal social capital, organizational capital and political capital. Hulme et al.(2001) suggest more extended categories of assets as the dimension of poverty/well-being and indicate criticisms of the asset pentagon(human, social, financial, natural and physical capital) failing to incorporate political capital.

Human assets(or capital) are concerned with skills, knowledge, educations and capability to do jobs. Social assets are about the relationships between people and group with respect to morals, beliefs, trusts and networks. Financial assets are concerned about cash, savings, credit, bonds and stocks, etc. Natural assets are pertinent to land, forests, water, and animals, etc. Physical assets are associated with housing, infrastructure, facility and utility, equipment, etc.

In terms of assets category, our Hexad asset model includes five assets like asset pentagon. Digital asset might be essential to be added to them because digital asset plays a major role in

improvement of quality of living life and provides more opportunity for employments. Rights and ownerships of digital assets can tackle the digital divide and stop causal mechanisms of cycle of poverty(Liou et al., 2002). Although there are surely rooms for a full spectrum of asset categories coming from political, institutional, and other specific domains, several intangible asset categories might be subjective and could not be compatible with information-based asset management. Thus, six categories of asset are selected to explain possible combination and classification of assets based on the concept of Hexad asset model.

With regard to expression of asset's characteristics, different aspects of household economic portfolios(Haddad et al., 1994; Cohen et al., 1996), and livelihoods frameworks(DFID, 1999; Soussan et al., 2001; Rakodi and Lloyd-Jones, 2002) partly show asset's flows and the role of livelihood model. However, they do not explicate how asset can be changed and moved to other types of asset based on consideration of asset mapping and geographical contexts. It might be possible to measure asset's flows and the ratios between inputs and outputs of assets with the help of econometric analysis or advanced analytical tools and methods. Here, we do not deal with economic analysis of asset's flows, but concentrate on geometric disciplines to provide a semantic approach as to what asset management should be defined and how it can interpret dynamics of assets volatility in the GIS-based asset mapping process. The Hexad asset model put an emphasis on depicting dynamic changes of assets over time and providing semantic contexts for the relationships between asset poverty and poverty information.

When assets are acquired, most people and even poor households intend to increase their values and make planning for their use and management. Usage of and access to assets often determine physical well-being of(Cohen and Barnes, 1996) individuals/households to maintain their basic needs for consumptions, educations and health, etc. Individuals/households, community and even nations have access to assets of different types and these assets generate returns at different rates and levels.

Given limited access to any one asset, poor households look after alternative assets to satisfy their demands within reachable tangible assets. A serious focus is on the relationships or inter-linkages between different forms of assets as to how far they are convertible one into another, and how an assets growth can impact on the others. These questions might be critical debates on sustainable development and poverty management. Figure 2 shows a few representative geometric pathways and illustrates the concept of assets groupings or mixtures to explain assets flows. This geometric grouping has 4 types consisting of 2 or 5 assets around a central point. It might be presumed that this central point is a starting point of asset accumulation with zero value. When explicating shifts or transfers of asset ownership, those who have a maximum value of financial asset(e.g., physical, natural) can move to or hope to invest in one of other assets through consideration of demand and supply of access to asset. Many small sizes of triangles enable us to interpret more details of direct or indirect short ways of assets movements. In other words, Hexad asset model is composed of diverse types of triangle around a central point of diamond.

One of good ways to specify asset's flow is

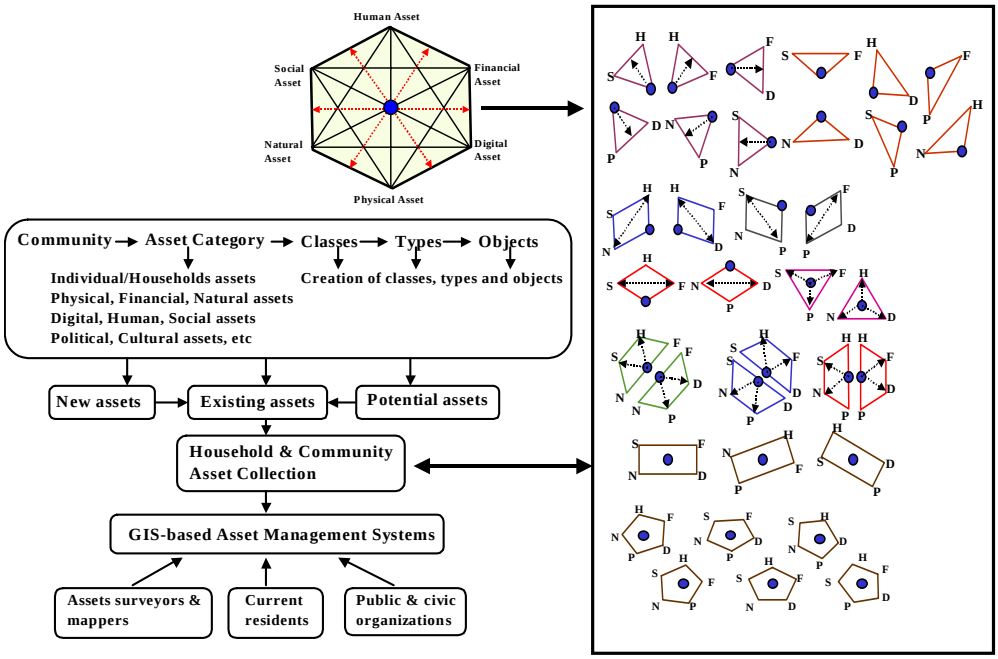

FIGURE 2. Geometric pathways of asset's flows

to create an asset map that illustrates usable and potential resources and properties. Asset maps provide households/communities with potential and useful information on asset's values and usabilities that enables them to tackle poor vulnerability and risk or forecast future of asset's importances. As a practical tool for collections and distributions of asset's information, GIS-based asset management can play an important role in monitoring and controls of asset life cycle in the spatial identification of individual assets or groups of assets.

Asset-based mapping process is not only to support neighborhood revitalization efforts and local economy, but also to provide poor residents with information on and participation in social services, educational programs, and anti-poverty strategies and actions, etc. The process of asset mapping or management should be linked to household survey in conjunction with GIS/LIS. Thus, an GIS-based asset management makes it possible to evaluate the strength and weakness of asset's capability because an important element of sustainable community development is to build up household and community-owned assets. However, it might require dynamic structures of organization and asset management system in conjunction with public & civic groups, voluntary residents and GIS specialists.

2. Hexad assets changes in space and time

With increase and growth of economic and industrial activities, it brings about inevitable changes of assets sizes and volumes over time. As illustrated in Figure 2, it is seriously hard to examine changes of capital flows that come from diverse activities of transactions and

commercial interactions at the household, community and local level. When assets flows are required to articulate a few questions about assets changes with regard to reasons and causes, and effects of actors activities, assets location and type over time at the micro level, existing sustainable livelihood frameworks or models might have drawbacks to deal with moving transaction of assets flows. Figure 3 shows that quantities of assets sizes and volumes are constantly changing and shifting from one to the others. Geometric changes of assets profiles are determined by a set of combination of substitution, cluster, increase and decrease, and trade-off in the form of continuous series of spinning, horizontal and vertical extension and rotation over time.

However, assets have common tendencies to keep or increase their values or combine in a multitude of different ways to generate positive livelihood outcomes around a central point of asset. Although sustainable livelihood approach starts with an analysis of peoples livelihood as to how assets have been changing over time, there are, however, little efforts to deal with actors(the poor) who are seeking for affordable places and jobs to escape their asset poverty.

Moving shelters and places from here to there always give birth to changes of a part of physical, natural and financial assets accompanying with even social assets. Moreover, actors interact with other actors in order to acquire profits and benefits in the course of commercial trades and businesses or something special. There are absolutely transitions of assets flows and alterations in space and time. An assets change could be examined by registrations or actions of commercial and legal transfers.

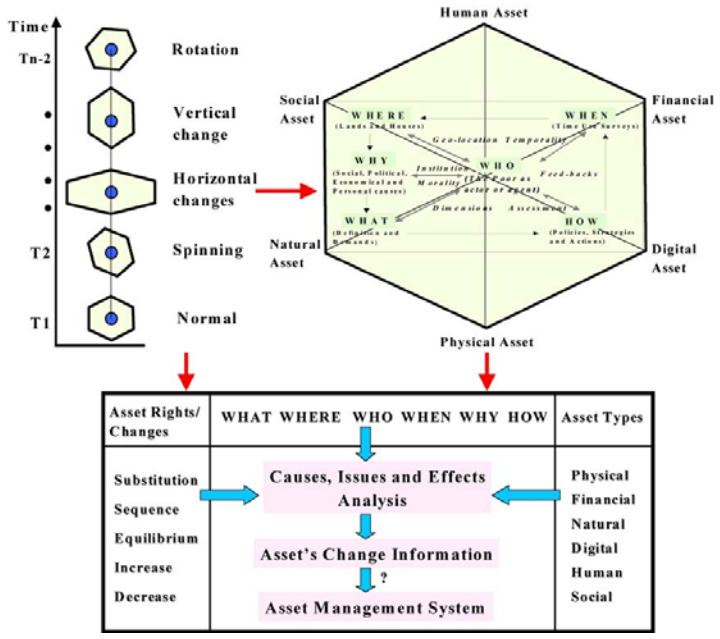

FIGURE 3. Assets changes management based on actors activities

Tangible assets are calculable to report increase or decrease of their values and amounts when actors activities bring about causes and effects of assets changes. Human and social assets are, however, considered to be unaccountable classes and components that are required to quantify their prices through certain methods.

Dasgupta(2002) has studied components of social organization(e.g., rotating savings and credit associations, irrigations management system) that make social capital a productive asset. To explicate changes or modifications of measurable assets status, an asset management connecting with civic taxation or human resource information enables to put all the data to each accountability of an asset as to what and where assets are, who has responsibility of ownership, when assets are acquired, why asset ownerships are changed, and how much assets are appraised over time. An asset management is used to respond quickly to those inquiries. Therefore, it can help communities to estimate their asset values and judge surroundings of poor households because an asset registers system can be used to accurately record every change to a specific asset – the 'who, what, when, why, where and how' that comprise each transactional asset's history. One of serious problems comes from data collections and assets surveys because most people might be unwilling to disclose their existing or future assets on account of burdens of taxations.

PROOF-OF-CONCEPT IMPLEMENTATION

Since 2-3D visualization techniques are today popular to simulate the real world, measuring and building asset informations in Hexad asset model are more easier to collect quantitative and qualitative data with their attributes through the Web-based user interfaces(Liou et al., 2002). Thus, our presentation might have drawbacks to embrace the overall informations about intangible assets if socio-economic asset informations could not be compatible with physical, natural or digital asset. This means that current GIS approach to poverty information needs more different functions of cartographic map and software's designs because poor households have diverse requirements for alleviation of asset poverty. Bigman and Fofack(2000) mention that the use of a GIS in the social sciences has progressed very slowly, and the application of spatial data analysis in econometric studies is still quite limited. Most uses of a GIS may remain in the very rough 2D display and manipulation of spatial data, and are based on census map at the small scale. Thus, the use of 3D digital map for poverty information might not be considerable or be premature.

In the meantime, most of people might expect that lands and housings are still popular assets and they can easily get something as actual capital investments and economic gains. In fact, the poor generally have access only to areas that have higher risks for health and environmental safety. Poor actors continuously look for appropriate locations and living conditions corresponding to their household incomes affordability of payment for land and housing rent, and transportation costs. Therefore, there are needs for improving our considerations of land information and poor interpretations process. The relationship between land and housing, and poverty is unquestionable

to be continuously discussed throughout the long history, given the prevalence of poverty in rural areas and even in urban metropolitans. Lacks of land and rural poverty are generally observed to coexist(Malik, 1998). When households and even community organizations talk about assets, they are normally referring to land and buildings in the context of real estates. These assets are often related with other types of physical assets such as facilities, equipments, and properties services, etc. Considering traditional census and household surveys with interviews to examine poor actors status quo, it requires huge expenses and time-consuming tasks to continuously maintain their individual information and data.

To notify status quo of poor household, buildings of asset information might be one of effective ways to measure their destitution and environmental degradation through physical assets investigation. This can be associated with geo-information management as a part of asset management enablers that often connect with socio-economic information including human and social asset information. Therefore, a prototype of land information for poverty controls and monitoring system based on asset management could be designed to scrutinize circumstances of poor households physical assets. We illustrate a feasible study for map control system of poverty management. It shows a certain area of Busan that surveying and mapping has a higher spatial resolution (1:1 scale) to figure out very details of information on real estate and household's circumstances. This 3D digital map is increasingly required for household surveys and other GIS domains. But, this 3D model might be on-going research focus that is not yet clearly defined their specifications in GIS. This experimental case implies that poverty information might be considered as a part of integrated asset information system when the notion of asset management can be extended to infra-structural, socio-economic and financial management.

Figure 4 illustrates a part of the households and buildings at the real scale as we just look at. It shows an implementation of poverty information on our 2D-3D vector map. Left 2D picture shows only a households location on a map with pertinent attributes of measurable information of assets. There are limitations of

FIGURE 4. 2D-3D poverty information management based on Hexad asset model

2D visualization as to what these households look like. This is still technical debates in current GIS software. 2D visualization shows more update function and information with regard to map search and its structure, and map index. Right 3D picture is made for real sensitivities of households perspective through very accurate surveying and mapping(1:1 scale) of each housing and building. It provides several functions of navigation techniques consisting in working view, bird view and helicopter view. It enables to look at different sights and speeds of asset status with the help of hardware system(e.g. shift and control, etc).

Although this 3D visualization is not a new technique, it provides more detailed level of surveying and mapping of housing and building for presentation of the poor household's circumstances. This 2D and 3D navigation approach to poverty management might not be experimented before. It means that detailed 3D digital map scale does not need to re-survey for making another different scales of maps. An important creation is associated with automatic conversion between 3D to 2D map. This is a real development of softwares breakthrough considering existing functions of GIS packages and GIS for poverty alleviation. This 3D visualization focusing on physical or natural assets offers a number of advantages that not only provide an asset management system for maintaining accurate records of individuals/households, and communities assets, but also assist in diminution of times and efforts for visualization of 2D map.

CONCLUSIONS

Assets are the things what your households and communities possess as tangible or intangible objects. Most engineering, facility management and even economic analysis focus on productive tangible assets and how they increase their values. Although the principle of asset management might have much similar purpose and aims that not only maintain assets preciousness and cost, but also alleviate unpredictable households risks and vulnerabilities through successful asset investment, different approaches to asset management would lead to diversities of assets awareness and application. Being different from existing asset model in technical and socio-economical domains, the Hexad asset model is proposed to focus on the principle of asset management and explicate the relationships of assets flows through geometric pathways. This model illustrates the reason of assets change in space and time that poor actors continuously interact with other actors to improve their assets capacity or to alleviate assets poverty around a central pivot of causes and effects of actors activities. As an evidence of measuring and building asset information, an empirical effort of 2D-3D visualization of physical and natural assets is illustrated to partly prove the concept of Hexad asset model. One of significant research contributions is associated with very accurate detailed level of surveying for housing and building, and other facilities as a 3D digital asset management. This can apply to real monitoring of increase and decrease of poor households assets when tightly linking to socio-economic asset information. KAGIS

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