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Analytical Tools in Landscape Architecture

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Abstract

Landscape architecture is a multidimensional approach that experts definit various aspects for it. Also, it is a interdisciplinary profession that find its way by interaction with different sciences. Cultural and natural environment, leisure times, visual arts, humanities sciences, technical sciences that are related to the nature understanding, plant species, infrastructures and many other fields are used in a target and arranged process for achieving the theory of landscape architecture. because of involving numerous variables parameters, academic review of this field has so many complexities. Despite of existing of researches that have been done in related to the landscape architecture dimentions and its qualities, there is a few specific methods and frameworks for checking the studies of this field yet. So this article is codified in the same line with this issue and the aim of it, is recognition of major tools that are related to analysing of different dimentions of landscape. It wants to make regular and arranged the studies of landscape field approximately. Analysis tools mentioned in the article are collected with reference to previous studies and then are catogorized based on their studing subject in the framework of mentioned objects for the landscape architecture. After a brief introduction of some tools, finally five case of them inclusive of LAA, VIA, EIA, SEA, SIA with aesthetics, environmental and sociocultural subjects and are more comprehensive are studied more. Characteristics of each tool in terms of methods and techniques to advance the process are described. finally we have an comparative checking between tools of an object to better understanding and ease selection. The conclusion of this article is determiner of a framework for classifng and introduction of existing methods of landscape analysing based on objects, tools and analysis techniques and can be a base article in the field of different dimentions of landscape studies.

Keywords

Landscape architecture, Objects, Tools, Analysis.

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History of research

According to the novelty of landscape architecture especially in Iran, there is not sufficient knowledge about the theoretical foundations, methods and analytical tools in landscape. Studies that are about the tools and techniques in landscape analyzing in available resources are scattered and discontinuous. In these resources each of analytical tools is individually investigated and according to them, there are cases of assessment. For example Rene Garcia in Social Impact Assessment Design Manual book explain LAA tool and its goals, Frank Vanclay in Social Impact Assessment book explain SIA tool, Genesis and its methods and Larry Canter in Environmental Impact Assessment article explain EIA tool and its methods. In landscape and visual impact assessment guidelines book translated by Manoochehr Tabibian, EIA and VIA are introduced with case studies. Despite of this research there is not still specific framework and methods for studies related to this area. So recognizing these tools in regular format and types of using them in studies is necessary.

Research questions

The main question of this research is what tools and methods can be used in analysis and evaluation of a landscape information. In fact, creating a context for understanding the properties of each tool to select appropriate analytical tools for each project and knowing more usable tools that are responsive for more project are the topics that this research is made to answer them.

Research method

Method of this research is descriptive analysis and required information have been collected through library method. In this study, first existing approaches landscape to frame up analytical tools have been mentioned. Analytical tools in article are collected with reference to previous studies and then are classified according to the subject of its study in framework of the mentioned approaches for landscape

architecture. After introducing a number of tools in each approach, the most comprehensive tools are specified and different methods to moving the tools process forward are described. Then accordingly, comparative study is conducted between them.

• Introduction

Those who work on the study of landscape architecture learn that how the design of outdoor or public spaces should be in terms of cultural identity, aesthetics, artistic, functional or performance and what should be considered. So landscape architecture spend important part of his life to learning in these fields. Attention to the artistic aesthetic leads to environment readability more. The cultural and of identity aspect contain typology issues and mental human and functional aspect means attention to the supplying of public needs of the audience or the users. According to many issues in design and study of landscape, it is essential to use guide tools that can deliver architect of ambiguity. Effective tools with special techniques for gathering, integrating and implementing information.

• Approaches to analyzing tools of landscape

Landscape architecture is a multi-dimensional approach that experts have described various aspects for it. Also it is an interdisciplinary professional knowledge that finds its way through interaction with various sciences. The cultural and natural environment, leisure, arts, humanities, technical knowledge related to understanding nature, plant species, infrastructure and many other areas in a targeted process are used to achieving theory of landscape architecture (Mansuri, 2004). Due to the involvement of many factors in analyzes of landscape, different dimensions defined by experts. For example it says that landscape architecture pursue three object function, culture and aesthetics at the same time (Mansuri, 2004). Another definition is: landscape is result of conceptual and aesthetic, cultural social and environmental dimensions (Bohnet and Smith, 2007). Distinction between these two definitions is replacing the functional dimension with environmental dimension in the

second definition. Functional dimension opposite of environmental dimension that has unit principles, has expanded relative concept that has a different definition in each project. So regarding to specified orientation of analytical tools of landscape, aesthetic, socio-cultural and environmental aspects indicate appropriate approaches for this research. In the following are some of the most common analyzing tools of landscape in the form of the mentioned approaches.

- **Conceptual and aesthetics approach**

First we introduce some of the tools that have been developed to assess the aesthetic perspective:

- **Visual resource management (VRM):** the process of managing visual change in the landscape according to accepted principles or objectives.

- **Landscape character units (LCU):** a zone or area within a landscape that has a common or distinctive visual quality. Landscape character reflects a combination of landform and geology, vegetation, hydrological systems, land use and human settlement.

- **Visual absorption capacity (VAC):** a calculation of the ability of a landscape to absorb physical development without resulting in a significant change in visual character or producing a reduction in scenic quality.

- **Visibility:** the measure of the extent to which an intervention may be seen from the surrounding area, from selected viewpoint or from sensitive use areas.

- **Visual quality (VQ):** an evaluation of the relative aesthetic quality of a given landscape or LCU. Visual quality can be determined by expert models grounded in research and precedent and/or local resident preferences of landscape types or features.

- **Visual sensitivity:** Visual sensitivity levels for a given landscape may consider the volume and nature of viewers, adjacent land use, VAC, VQ, visibility of a proposed intervention, local visual resource policy, and the presence of recognized scenic features, routes or viewpoints.

- **landscape aesthetics assessment (LAA):** it's a tool to identify landscape and aesthetic issues

associated with it.

Visual impact assessment (VIA): a component of an environment impact assessment (EIA) which evaluate the significant effects on the visual environment of particular development proposals (Talor, : 2-3).

After overview of above tools we want to have a closer look in terms of goals and evaluation methods to two of them that are more same in analyzing topic. So the choice is made easier for the designer and researcher. Each of the six prime tools are concentrated on a specific topic of visual landscape such as field of view, absorption capacity and sensitivity. VIA and LAA are more comprehensive tools in the study of visual landscape that several issues are placed in their function scope. So in the following we have a closer look to these two tools.

- **VIA (visual impact assessment)**

VIA is isolated and yet continuous process that serves in the general framework of the EIA. It aims to ensure that all their change and development on the landscape or visual views be included in decision-making.

The exact content of Landscape Assessment and visual effects according to the factors such as the scope of the agreement, officials and consultants and sensitivities of landscape and visual resources may vary dramatically (I.E.M.A, 2013).

Visual analysis methods

The most important principle that should be considered in visual analysis is the simulation field of view of an observer. So in the following, photomontage and digital maps methods are mentioned and in the introduction of these methods, required techniques are presented.

Photomontage or combine pictures

Photomontage is put together or overlaying the images with the aim of creating real-scrolling of landscape so that the quality and mood of the images could simulate the actual vision observers. In this

method, the exact location and focal length of camera field of view is important to prepare pictures which are normally taken with photographic camera. In the visual analysis performed by photos, it is important that the researchers record all the conditions at the time of shooting in such a way that allows repeated imaging of the same condition exists. For this reason, inter alia position of the image, time, angle, distance should be clear in visibility analysis (Karimi moshaver, 2014).

Other Indication techniques may seem appropriate in certain circumstances. For example overlaying and dimensional sketching and video simulation to showing movement e.g. Wind turbines.

Computer visualization

To date, always quality of skills and presentation techniques are increased and sketching techniques has improved significantly with preparing plan with computer. A wide and growing range of techniques and skills related to the field of vision of landscape is available and today, computer technology and multimedia can provide the best opportunities for landscape professionals. When the three-dimensional modeling was created, the evaluation of various aspects of development of any point within the range of models became possible. This technique has great potential, especially in relation to linear development, such as roads and crossing transmission lines. When the position and the main structure are modeled, various designing options can be produced easily and be compared (I.E.M.A, 2013). Three-dimensional Programs such as 3d max or three-dimensional program in auto cad, arc GIS or image processing applications such as Photo shop are software that provides visual evaluation with simulating the environment. Simulation soft wares can be used for quantitative analysis such as visibility. But when qualitative effects are supposed to also be analyzed, Photos inevitably have to be used because it determines the details in this regard only have to check through photos (Karimi moshaver, 2014). Choose a technique

for specific projects and ideas is related to the range and nature of the proposed development, the amount of available information, the timing and amount of considered funding.

- LAA: landscape aesthetics assessment

LAA is a tool for identifying landscape and aesthetics issues related to them. The objectives of the LAA are to:

- Identifying landscape and aesthetic issues that will impact the character and cost of a transportation project.
- Ensure that the landscape and aesthetic qualities of a corridor have been considered as required by law.
- Identify issues related to the character of architectural features and details
- Identify issues that relate to the selection of materials for a project
- Identify issues related to colors and color schemes
- Identify appropriate design themes
- Inform entities about the opportunities for cost sharing
- Gather information that will assist in estimating development costs (Garcia, 2015).

Five approaches or models are distinguished to studying visual landscape quality which is objectivistic or subjectivist.

The ecological model: an objectivist approach defines landscape quality as independent of the observer and entirely determined by ecological or biological features in the landscape. Within this model the observer is seen as a user of the landscape and a potential disturbance.

The formal aesthetic model: also an objectivist approach characterizes landscapes in terms of formal properties such as form, line, unity and variety. These properties are seen as inherent characteristics of the landscape that can be assessed by appropriately trained individuals (e.g. landscape architects).

The psychophysical model: takes a position between the objectivist and subjectivist approach. It aims to establish genera relationships between measured physical characteristics of a scene (taken from photographs or geographical databases) and

landscape preferences.

The psychological model: a subjectivist approach, characterizes the landscape in subjective terms by relying on human judgments of complexity. Mystery, legibility, etc. these judgments are then related to an array of cognitive, affective and evaluative dimensions of landscape experiences.

The phenomenological model is the most subjectivist model. It focuses on how each individual assigns personal relevance to landscape attributes in personal interpretations of landscape encounters.

After reviewing the strengths and weaknesses of each approach, it is concluded that a careful merger of the psychophysical and psychological approach might well provide the basis for a reliable, valid and useful system of landscape quality assessment.

Assessment methods of landscape beauty

Several methods and frameworks for the assessment of scenic beauty and landscape quality have been developed. Some of these methods are largely expert based with rather weak links to the perception-based models. However other methods have explicitly taken peoples preferences as a starting point.

The scenic beauty estimation (SBE) method is a psychophysical method developed by the US forestry department. The SBE method estimates scenic beauty judgments for various natural scenes. These judgments are then statistically related to measurable landscape characteristics through regression analysis. The relationship between

measurable landscape characteristics and perceived scenic beauty is used to predict or evaluate landscape management alternatives for their impact on scenic beauty.

A more recent method is the visualands Framework. This framework links visual indicators to theories of landscape perception and preference. It identifies nine key visual landscape aspects: naturalness, stewardship, disturbance, historicity, visual scale, image ability, ephemera, coherence and complexity. For each of these aspects, landscape attributes and elements contributing to its expression in the visual landscape are identified. This framework presents a comprehensive approach to describing visual landscapes and assessing visual effects of landscape change using data sources such as photographs, land cover data, airborne photographs and field observations (Sundli Tveit, 2012).

Comparative checking of LAA and VIA

In Comparison VIA and LAA as comprehensive tools in the aesthetic approach to selecting tool easier, we see that VIA study the visual effects on nature and LAA study the assessment of beauty and quality of landscape before or after the development and pay attention to all aspect of objective and subjective human perception in addition to exploring landscape in different times and places while VIA tool consider only objective aspect after development (Table 1).

• Ecological approach

First, some of the tools that have been developed for environmental assessment of landscape are presented

Table 1. Characteristics and analytical tools VIA and LAA. Source: authors.

Analyze method	Assessment method	Assessment goal	Assessment type	Tool	Approach
• Field expert analysis	• photomontage or combine pictures • visualization computer	after development	Physical	VIA	Conceptual and aesthetic
• Field expert analysis • Questionnaires / interviews	• scenic beauty estimation method (SBE) • visualand framework method	before development after development	Physical and qualitative	LAA	

briefly:

- **Ecological footprint (EF)**

This analysis measures the impact of human activity upon nature. The footprint expresses the land area that is required to feed, provide resources, produce energy, assimilate waste and to reabsorb its CO₂ output from fossil fuels through photosynthesis (Bond, 2002).

- **Environmental impact assessment (EIA)**

It is a process by which the identification, prediction and evaluation of the key environmental effects of a development are undertaken and by which the information gathered is used to reduce likely negative effects during the design of the project and then to inform the decision-making process (I.E.M.A, 2013).

- **Environmental management system (EMS)**

Is a structured framework for managing of significant environmental impacts. The latter vary between organizations, but typically will include waste, emissions, energy use, transport and consumption of materials (IIED).

- **Life cycle assessment (LCA)**

Is a method for assessing the environmental considerations of a product or service throughout its entire life cycle. A complete life cycle includes everything from raw material extraction, processing, transportation, manufacturing, distribution, use, re-use, maintenance and recycling to final disposal (Seppala, 2003).

- **Life cycle costing (LCC)**

Is a technique to estimate the total cost of ownership. In the building and construction industry, LCC is applied to quantifying costs of whole buildings, systems and building components and materials. The technique can assist decision-making for building investment projects (Davis Langdon Management Consulting: 2006).

- **Strategic environmental assessment (SEA)**

Is defined as a strategic framework instrument that helps to create a development context towards sustainability, by integrating environment and sustainability issues in decision-making, assessing strategic development options and issuing guidelines to assist implementation (Rosario Partidario, 2012).

- **System of economic and environmental account**

- **(SEEA)**

The SEEA central framework is based on agreed concepts, definitions, classifications and accounting rules. As an accounting system, it enables the organization of information into tables and accounts in an integrated and conceptually coherent manner. This information can be used to create coherent indicators to be used to inform decision-making and to generate accounts and aggregates for a wide range of purposes (United Nation, 2014).

- **Multiple attribute analysis (MAA)**

It helps in complex assessments with better looking and recognition. This tool conclude four basic elements: limiting complex of alternatives, balance between properties, incomparable unites, decision-making matrix. (Marshall and Norris, 1995).

Also In this approach, two number of above tools which are more similar in assessment topic are exploring more punctual with a view to goals and methods of their assessment therefor its easier for designer and researcher to choosing appropriate tool. EIA and SEA are tools to making guidelines for balancing development and environment in more various topics and are more comprehensive.

- **Strategic Environmental Assessment (SEA)**

In 1989 SEA was introduced as a concept and a term in the context of a European research project. Strategic is an attribute that qualifies ways of thinking, attitudes, actions related to strategies. Many definitions and understandings of strategy exist but they all relate to long-term objectives. This guidance follows a strategic thinking model which is understood as having a vision over long-term objectives, flexibility to work with complex systems, adapting to changing contexts and circumstances and be strongly focused on what matters in a wider context (time, space and points of view) defined as a strategic framework instrument that helps to create a development context towards sustainability, by integrating environment and sustainability issues in decision-making, assessing strategic development options and issuing guidelines to assist implementation. SEA in

a strategic thinking approach has three very concrete objectives:

- Encourage environmental and sustainability integration (including biophysical, social, institutional and economic aspects), setting enabling conditions to nest future development proposals.
- Add-value to decision-making, discussing opportunities and risks of development options and turning problems into opportunities.
- Change minds and create a strategic culture in decision-making, promoting institutional cooperation and dialogues, avoiding conflicts (Rosario Partidario, 2012). The strategic thinking model in SEA is structured in three fundamental stages in a cyclical process (Table 2): 1- SEA context and strategic focus. 2- Pathways for sustainability and guidelines. 3- A continuous stage of follow-up, process linkages and engagement.

SEA methods

Here, some analyze methods related to this tool are named. Some of these tools are introduced in explanation of other tools (Rosario Partidario: 2012).

- Experts groups
- Participatory techniques for assessment
- Stakeholder analysis and mapping (SAM)
- SWOT analysis (SWOT)
- Network analysis
- Social and economic analysis
- Opinion surveys to identify priorities
- Consensus building processes
- Cost-benefit analysis, sensitivity analysis and multi-criteria analysis

- Geographical information systems (GIS)
- Land use analysis
- Modeling analysis

Environmental impact assessment (EIA)

EIA, of which landscape and visual assessment are essential components, is an environmental management tool which has been in use on an international basis since 1970. it is a process by which the identification, prediction and evaluation of the key environmental effects of a development are undertaken and by which the information gathered is used to reduce likely negative effects during the design of the project and then to inform the decision-making process. EIA is a complete process concluding (I.E.M.A, 2013):

- Gathering environmental information
- Describing a development or other project
- Predicting and describing the environmental effects of the project
- Defining ways of avoiding, cancelling, reducing or compensating for the adverse effects
- Publicizing the project and the environmental statement including a clear, nontechnical summary of the likely effects, so that the public can play an effective part in the decision making process
- Consulting specific bodies with responsibilities for the environment
- Taking all of this information into account before deciding whether to allow the project to proceed
- Ensuring that the measures prescribed to avoid, cancel, reduce or compensate for environmental effects are implemented

Table 2. Three stages of the strategic thinking model in SEA. Source: Rosario Partidario, 2012.

Stage 1: context and strategic focus	Stage 2: pathways for sustainability and guidelines	Stage 3: follow-up
<ul style="list-style-type: none"> • Decision problem • Object of assessment • Problem framework • Governance framework • Strategic reference framework • Assessment framework • Critical decision factors, Assessment criteria, indicators 	<ul style="list-style-type: none"> • Trend analysis Strategic options Assessment of opportunities and risks guidelines 	<ul style="list-style-type: none"> • Monitoring • Control • evaluation

EIA methods

Several activities are required to conduct an environmental impact study, including impact identification, preparation of a description of the affected environment, impact prediction and assessment, and selection of the proposed action from a set of alternatives being evaluated to meet identified needs. The objectives of the various activities differ, as do methods for accomplishing

the activities. The term method refers to structured scientific or policy-based approaches for achieving one or more of the basic activities.

Table 3 contains a delineation of eighteen types of methods arrayed against seven activities that are typically associated with an EIA study. An X in the table denotes that the listed method type is or may be directly useful for accomplishing an activity. However, the absence of an X for any given type

Table 3. Types of methods in EIA. Source: Canter.

Types of methods in EIA	Define issues (scoping)	Impact identification	Describe affected environment	Impact prediction	Impact assessment	Decision making	Communication of results
Analogs (case studies)	x	x		x	x		
Decision-focused checklists (MCDM, MAUM, DA, scaling or ,rating or ranking weighting)					x	x	x
Expert opinion (professional judgment, Delphi, adaptive environmental assessment, simulation modeling)		x		x	x		
Expert system (impact identification, prediction, assessment, decision making)	x	x	x	x	x	x	
Laboratory testing and scale models		x		x			
Matrices (simple, stepped, scoring)	x	x		x	x	x	x
Monitoring (baseline)			x		x		
Monitoring (field studies of analogs)				x	x		
Networks (impact trees and chains)		x	x	x			
Overlay mapping (GIS)			x	x	x		x
Photographs and photomontages			x	x			x

of method does not mean that it has no usefulness for the activity. It merely suggests that it may be indirectly related to the activity (Canter, 1999).

With due attention to plurality of methods, after considering the table we explain two of them (matrices and expert systems) which have more function

Matrices

A matrix is a grid-like table that is used to identify the interaction between project activities, which are displayed along one axis and environmental characteristics which are displayed along the other axis. Using the table, environment- activity interactions can be noted in the appropriate cells or intersecting points in the grid. Entries are made in the cells to highlight impact severity or other features related to the nature of the impact. For instance:

- Ticks or symbols can identify impact type (such as direct, indirect, cumulative) pictorially
- Numbers or a range of dot sizes can indicate scale or
- Descriptive comments can be made.

Expert systems

Expert or knowledge- based systems are used to assist diagnosis, problem solving and decision-making. A number of such computerized systems have been developed for use in EIA, primarily at the

early stages of the process. For example, screening and scoping procedures have been automated using a number of rules and a data system, which encodes expert knowledge and judgment. The user has to answer a series of questions that have been systematically developed to identify impacts and determine their significance. Based on the answer given to each question, the expert system moves to the next appropriate question.

Like GIS systems, expert systems are an information- intensive, high- investment method of analysis. As such, they are limited in their current use and application, especially by many developing countries. However, they also have the potential to be a powerful aid to systematic EIA in the future, not least because they can efficient means of impact identification (UNEP: 2002).

Comparative checking of SEA and EIA

In comparison between SEA and EIA for easy selection, EIA with a short time view, explore development effects on environment and SEA with a long time view; explore environment effects assessment on development. It means that environment help to regulate situations for development strategically and SEA must explore that whether these situations are considered in development process or not. This

Table 4. characteristics of analytical tools EIA and SEA. Source: authors.

Analyze method	Assessment method	Assessment goal	Assessment type	tool	approach
• Field expert analysis	<ul style="list-style-type: none"> • Elaborative rest and scale models • Matrices • Monitoring (field studies of similar case study) • Networks and ... 	after development	Physical	EIA	environmental
• Field expert analysis	<ul style="list-style-type: none"> • Participatory techniques for assessment • SWOT analyze • Advantage and price analyze, sensitiveness analyze and multicriteria analyze • Geographical information system (GIS) and ... 	before development	Physical	SEA	

subject has made an important view to understanding SEA rule and supports this concept that SEA is for composition environmental subjects in development process (Table 4).

• **Social cultural approach**

Also In this approach there are numerous tools. Such as:

Gender Impact Assessment (GIA): helps to estimate the different effects of any policy or activity implemented in terms of gender equality. The purpose of GIA is to help the introduction of a gender perspective into the planning process. It should be carried out at an early stage of policy making process and at the end of a policy cycle. Its techniques are: describe the current situation, analyze future trends and probable development without policy intervention, assess the implications of these for existing and future employment or enterprise policy, determine the priority to be attached to adopting policies that activity promote gender equality, identify what can be done within the scope of different agencies to progress action in the area i.e. assess alternatives and decide on action plan (Scott).

Social impact assessment (SIA): Social Impact Assessment includes the processes of analyzing, monitoring and managing the intended and unintended social consequences, both positive and negative, of planned interventions (policies, programs, plans, projects) and any social change processes invoked by those interventions (Vanclay, 2015).

Socio-economic Impact Assessment (SEIA): is a useful tool to help understand the potential range of impacts of a proposed change, and the likely responses of those impacted if the change occurs. It can be used to assess impacts of a wide range of types of change, from a proposal to build a new freeway to a proposal to change access to a natural resource such as a forest or the ocean. This understanding can help design impact mitigation strategies to minimize negative and maximize positive impacts of any change (department of the environment and heritage, 2005). Between above tools, GIA is about professional topic

of gender. With due attention to extensiveness of social and economy definition, SIA and SEIA tools have similar and wide topic; with this difference that in the SEIA, economy is also calculated. So with due attention to existing definitions, SIA and SEIA tools have more performance and are more comprehensive. SIA tool also is a base for SEIA. So we explore SIA punctually.

Social impact assessment (SIA)

SIA arose alongside EIA in the early 1970s primarily as a regulatory tool. The international principles for SIA defines SIA as being the processes of analyzing, monitoring and managing the intended and unintended social consequences, both positive and negative, of planned interventions (policies, programs, plans, projects) and any social change processes invoked by those interventions e.g. the planned construction of new infrastructure such as airports, bridges, bypasses, dams, highways, mines, pipelines, ports, transmission corridors, wind farms, as well as commercial agriculture and agroforestry developments and the creation of nature conservation areas. Social impacts are changes to people's way of life, culture, political systems, environment, health, personal and property right, fears and aspirations. In table 5, fourfold phases of SIA are introduced (Vanclay, 2015).

SEA methods

Existing methods of SEA are different with due attention to goals and parts of this process.

• **Stakeholder Analysis**

The objectives of this analysis are identifying stakeholder and political economy analysis. Stakeholder analysis is used to identify those who might be or have a vested interest in a proposed policy reform and to understand their concerns about and interests in the proposed reforms. It also used to understand the relative influence of stakeholder groups and how they interact. A variety of tools, including focus groups and workshops can be used to analyze stakeholders' interests and interactions (Lawlor, 2013).

• Participatory impact assessment, monitoring and evaluation

The objectives of this assessment are collecting own data, experimental and quasi-experimental techniques, participatory and non-experimental techniques. The method is flexible and can be used to measure various dimensions of well-being, including both quantitative and qualitative measures. Participatory tools used in this method include participatory mapping, ranking, matrix scoring, impact calendars, radar diagrams and proportional piling. All of the tools used in this method involve semi-structured interviews and focus group discussions. The sampling technique will depend

on the time and resources available. The sample may also be stratified by gender, livelihood strategy, ethnicity, etc. (Ibid).

• Economic Modeling

The objectives of this model are prediction based on economic data and experimental and quasi-experimental techniques. Economic modeling can be used to predict the impacts of policy reforms on a range of well-being indicators. The term economic modeling is used here quite generally to describe a wide array of models. Most frequently these models are used to consider how reforms affect prices to predict impacts on consumption income, and the distribution of poverty (Ibid); (Table 6).

Table 5. Phases of social impact assessment. Source: Vanclay, 2015.

1. Understand the issues	2. Predict, analyze and assess the likely impact pathways	3. Develop and implement strategies	4. Design and implement monitoring programs
<ul style="list-style-type: none"> • Understand proposed project • Clarify roles & responsibilities • Social area of influence • Community profiling • Inform communities • Inclusive participatory processes • Scope issues • Assemble baseline data 	<ul style="list-style-type: none"> • Social changes & impacts • Indirect impacts • Cumulative impacts • Affected party responses • Significance of changes • Project alternatives 	<ul style="list-style-type: none"> • Address negative impacts • Enhance benefits & opportunities • Support communities with change • Establish a grievance mechanism • Negotiate impacts & benefits agreement (IBA) • Develop social impact management plan (SIMP) • Establish partnerships to implement SIMP • Implement ongoing social performance plans 	<ul style="list-style-type: none"> • Indicators to monitor change • Participatory monitoring plan • Implement adaptive management • Evaluation & periodic review

Table 6. Characteristics of analytic tool SIA. Source: authors.

Analyze method	Assessment method	Assessment goal	Assessment type	tool	approach
<ul style="list-style-type: none"> • Field expert analysis • Questionnaires / interviews 	<ul style="list-style-type: none"> • Stakeholder Analysis • Participatory impact assessment, monitoring and evaluation • Economic Modeling 	after development	Physical and qualitative	SIA	Social cultural

Discussion and conclusion

Because of ambiguities that existed in organizing and assessing of landscape informations, some tool were drafted that each of them was effective to guiding a specific part of studies. With due attention to tools characteristics and projects type, the needful tool of process is recognized and work process go forward with attention to selected tools methods. Recognition of tools to using them in different cases can help designer in studying and designing process especially in ambiguities of its beginning steps. To furtherance this recognition, tools are contained in mould of landscape architecture approaches. In conducted studies it was specified that these tools are different by numerous parameters such as type of approach, goal, analyze methods, kind of assessment and other parameters. Also some of them are more comprehensive and ambient. In environmental approach, EIA and SEA tools; in conceptual and aesthetics approach, VIA and LAA and in social cultural approach, SIA are more comprehensive and ambient. In Comparison between VIA and LAA as more comprehensive tools in the aesthetic approach, its recognized that VIA study the visual effects on nature and LAA study the assessment of beauty and quality of landscape before or after the development and pays attention to all aspects of human perception such as objective and subjective and also explores landscape in different times and places while VIA considers only objective aspects after development. In comparison between SEA and EIA, EIA with a short time view, explores development effects on environment while SEA with a longtime view; explores environment effects assessment on development. It means that environment help to regulate situations for development strategically and SEA must explore that whether these situations are considered in development process or not.

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