



PUBLIC DEMAND FOR ECO-EFFICIENT CONCEPTS IN URBAN DEVELOPMENT

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ABSTRACT. Global warming has brought new challenges to urban development worldwide. Built environment and cities are estimated to cause some 40-70% of the environmental impacts. This questions our current urban development practises and challenges us to find new solutions to manage the issues. The purpose of this study is to identify feasible eco-efficient concepts that can be implemented in the urban development process. These concepts are identified with a constructive research method, where potential concepts are originally identified from literature and further enhanced with thematic expert interviews, and finally, the suggested concepts are tested with a questionnaire and presented in an integrated framework for the eco-efficient concepts to better understand the requirements and opportunities in public urban development. The results showed that the urban development concepts that were most appealing to public stake holders were; an integrated design process, eco-efficient traffic and transportation solutions, and eco-efficient complementary development. Local energy procurement and management was also perceived as relatively lucrative services when developing eco-efficient urban areas. This study provides an extensive information platform (different ideas, themes, and concepts) to promote eco-efficiency in urban development in order to maintain and improve the sustainable quality of life and welfare in our urban society.

KEYWORDS: Urban development; Eco-efficiency; Sustainability; Customer concepts; Cities

1. INTRODUCTION

Climate change and global warming has brought new challenges to urban development worldwide. The built environment and cities are estimated to cause the majority of environmental burdens. This questions our current urban development practises and challenges us to find new solutions to manage the issues.

The importance and urgency of this sustainability challenge is underlined by numerous politicians as well as professionals within the field of sustainable development. Björn Stigson,

the president of World Business Council for Sustainable Development states that there is a great potential to decrease world energy demand and reduce carbon emissions with obtainable knowledge and technology (WBCSD, 2007). The Finnish ministry of housing proclaims that it is crucial to address these particularly, in urban development, since the decisions made today will have a long-term effect on our society (Finnish Ministry of the Environment, 26.2.2009).

Additional political pressure to promote sustainable urban development is affected by

demographic changes towards urbanisation globally. Gueye (2007) states that in 2008 the urban population surpassed the rural population, in addition the urban population occupies 2% of the terrestrial surface. Future projections indicate that 70% of the world's population will live in cities, coincidentally, that is the same year when developed countries should have reduced their CO₂ emissions by 80%, according to the European Council for an Energy Efficient Economy (2009). Both national and international institutions are stipulating environmental eco-efficient directives in order to coordinate and lead the transition towards a sustainable urban society. Hence, urban development has to adjust to new requirements and values in order to respond to the demands of a sustainable society.

In order to promote sustainable development we have to engage the potential in the built environment and the construction industry. Construction, buildings, and infrastructure are the main consumers of resources (material and energy) according to several authors (Huovila and Koskela, 1998; UNEP, 2007; Heinonen and Junnula, 2011). In the European Union buildings require 40% of the total energy consumption and the construction sector generates 40% of man-made waste. The developers' key and opportunity to add value to urban development in the future lies in reducing the use of energy and waste in both building services and maintenance.

The complexity of urban development is combined with the specific challenge to mitigate climate change (IPCC, 2007; European Community, 2002) and the key role of the built environment in the mitigation. The pay-back time of some property-related climate actions is close to zero, meaning saving energy can also save money (McKinsey and Company, 2009). According to UNEP (2007) the present building stock worldwide is responsible for 30-40% of energy use carbon emissions.

In Europe, it has been estimated that about 40% of national energy use and GHG emissions are related to energy consumption, and merely heating is estimated to represent 10% of the total GHG emissions in both the EU-15 and EU-27 countries (European Environmental Agency, 2008; European Commission, 2005; Moll et al., 2005; Reinders et al., 2003). Also other developed countries, such as Australia, Canada and the US, have found that household energy consumption is the largest single societal demand causing carbon emissions (Shiel, 2009; Norman et al., 2006; Bin and Dowlatabadi, 2005; Munksgaard et al., 2000; Lenzen, 1998).

When developing a sustainable community it is imperative to grasp the complexity of an urban area and its various functions. It is not enough to improve the energy efficiency of an individual building or a certain element in the urban structure; instead the whole environment along with its functions has to be sustainably improved. One dimension in the discussion has been the idea to increase renewable energy on the energy supply side (Bürger et al., 2008). On the other side Heinonen and Junnula (2011) performed a study where they analysed the carbon footprint of the Helsinki metropolitan area with life cycle assessment. As stated above 40-45 % of the total emissions originate from buildings. A significant portion of the carbon footprint was derived from building and property maintenance (15-20%). Heinonen and Junnula (2011) revealed that carbon emissions originating from heat and electricity, and buildings and property do not automatically decrease as we move towards denser urban structure. Additionally, Heinonen and Junnula (2011) have discovered that the portion of carbon emissions is significantly lower in urban areas where there are proper commuter train connections. Furthermore, Heinonen and Junnula

(2011) indicate that public transportation is clearly a low-carbon option, and functions as an important substitute for private driving. Thus, by analyzing and comprehending the different functions within an urban structure the sustainable improvements will add even more value to the development process and the society.

Cherry (2007) emphasises that sustainability is not a question of technological innovations; it is how to combine existing technology when developing the city structure. Regardless of how the sustainability challenge is approached, there are always people whose decisions and actions influence the outcome. At the end, they use the services and products that are produced by industries. Thus, households, i.e. consumers have been suggested to be a good starting point for estimating sustainability in society. In addition, homes are crucial centres for pro-environmental behaviour to take place (Reid et al., 2010).

When examining developing countries, the challenge lies in providing sufficient sustainable urban development in phase with the exploding urbanisation. This massive demand for sustainable development can easily lead to less cost-efficient execution when eco-efficiency is not emphasized enough. Hence, the developing countries have the opportunity to be a forerunner in greening cities and economies; they cannot afford to replicate the mistakes made by developed countries (Hart, 1997).

In order to avoid misinterpretation between the terms eco-efficiency and sustainability in the paper they are clarified herein. Eco-efficiency is defined as a quantitative relation between the quality of life produced (in form of services and products) and the use of natural resources, finite energy sources, emissions and waste (Lahti, 2008). On the contrary, sustainability is not restricted to technical outcomes and functionality, but is more of an ideology

used to reshape our society to sustain in the long run.

At the moment, there is an enormous urgency to develop solutions for sustainable urbanisation and urban development. The size of the challenge with limited resources in cities calls for immediate identification of the most feasible actions for redeveloping the urban areas. The purpose of the study is to identify sustainable urban development concepts that improve the eco-efficiency of cities, to understand which of those concepts respond best to the cities demand, and to suggest the most feasible (willingness-to-pay) concepts.

2. RESEARCH METHODS AND DESIGN

This study utilises a constructive research approach (Kasanen et al., 1993; Labro and Tuomela, 2003; Lindholm, 2008). Constructive research represents problem solving through creation of models, diagrams, organisations and concepts. The constructive research approach is of normative nature and is significant in industrial economics and widely used in technical sciences, operations analysis, mathematics, clinical medicine, and planning sciences. Creativity and innovativeness are the main sources in solving the problem and creating the construct. It is important that the solution functions in practice (Olkkonen, 1994).

The research results are presented as a framework of eco-efficient concepts in urban development. Jabareen (2009) has established an 8 phased procedure for creating conceptual frameworks for multidisciplinary phenomenon. Jabareen (2009) defines a conceptual framework as a network or "a plane" of interlinked concepts that together provide a comprehensive understanding of a phenomenon or phenomena. In addition to the conceptualization creation phase supplementary empiric components are combined to this research approach.

The eco-efficient concepts that will be created in this study are analogous to the concepts created by Jabareen (2006; 2008). Jabareen (2006) identified design criteria from which he constructed thematic urban form-concepts that can be utilized in design evaluation. Furthermore, Jabareen (2008) creates a multidisciplinary conceptual framework consisting of 7 concepts to enhance the complex understanding of sustainable development. The eco-efficient concepts constructed in this study will focus on the construction industry and how to improve eco-efficiency for cities.

Methods used for data collection are literature review, thematic expert interviews and a questionnaire directed to the primary customer (client) in urban development in Europe, i.e. cities and municipalities. It is important to note that the constructive research methodology is present during all these employed methods.

The study is designed and performed in four distinct phases according to the research approach. In the first phase, future requirements and challenges are examined by means of a literature review. Different ideas, themes, solutions, and implementations to promote eco-efficiency in urban development are recognised and identified from the existing literature.

In the second phase, the thematic expert interviews are performed. Twenty-one experts from different stakeholder groups within the field of urban development were interviewed (Table 1). A university, research institutes, city planning offices and a construction developer company were included in the thematic interviews. The purpose of thematic interviews was to further recognize and identify feasible eco-efficient concepts both from supply and demand side in order to obtain a comprehensive general view of the eco-efficient opportunities within urban development.

Table 1. List of experts for the thematic expert interviews

Title	Organisation
Development Director	City of Helsinki
Chief of General Planning	City of Helsinki
Development Manager	City of Helsinki
Chief of General Planning	City of Espoo
Project Director	City of Vantaa
General Planner	City of Porvoo
Professor (Acting)	Aalto University
Director, Professor	Centre for urban and Regional Studies – Aalto University
Director, Professor	Finnish Environment Institute
Research Professor	Technical Research Centre of Finland (VTT)
Chief Research Scientist	Technical Research Centre of Finland (VTT)
Senior Researcher	Technical Research Centre of Finland (VTT)
Managing Director	Strategic centre for Technology and Innovation of the Built Environment (RYM Oy)
Managing Director, Researcher	Urban Research TA Ltd (KTA Oy)
Environmental Director	Helsinki Energy
Sustainability Manager	Skanska AB – Sustainable Development
Marketing Manager	Skanska Oy – Commercial Development
Design and Planning Manager	Skanska Oy – Residential Building
Project Manager	Skanska Oy – Residential Development
Unit Manager	Skanska Oy – Infrastructure
Project Development Manager	Skanska Oy – Business Development

The thematic interviews were unstructured in order to encourage innovative discussion and in-depth analysis when necessary. The supporting questions in the interviews were: What will be the cities' eco-efficiency demands for the future in urban development in terms of green values, energy production, renovation, and lifecycle leadership? Is it possible to develop feasible customer concepts to respond to these demands? And, would the cities be interested in investing into these concepts?

Table 2. List of cities for the questionnaire

Municipality	Population	Questionnaire answers
Helsinki	583 350	11
Espoo	244 330	8
Tampere	211 507	4
Vantaa	197 636	4
Turku	176 087	3
Oulu	139 133	3
Jyväskylä	129 623	1
Lahti	100 854	3
Kuopio	92 626	2
Kouvola	88 174	2
Pori	82 786	3
Joensuu	72 704	2
Lappeenranta	71 814	1
Hämeenlinna	66 455	1
Rovaniemi	59 848	1
Vaasa	59 175	3
Seinäjoki	57 024	1
Salo	54 889	2
Kotka	54 774	1
Mikkeli	48 688	1
Total	2 591 478	57

The third phase of the research design was the customer (cities and municipalities) oriented questionnaire. In this phase, concepts identified from the literature and thematic expert interviews are tested in the 20 largest cities (by population) in Finland (Table 2). Altogether, 57 of 168 questionnaire answers were received which stands for a 34% respondent participation. The first part of the questionnaire examined the cities' own engagement and use of legislative authority to promote sustainable development. The main part was to examine

the importance of different eco-efficient urban development concepts identified in previous phases, as well as, the customers' willingness to invest in these concepts. The last part of the questionnaire covered open questions where the customer could request for certain eco-efficient solutions from different stakeholders within the urban development process.

Finally, an eco-concept framework is presented in order to provide a more holistic picture of the overall demand and feasibility of different eco-concepts. The framework also tries to help readers to better understand the actual requirements and opportunities in eco-efficient urban development.

3. RESULTS

Eco-efficient concepts by literature

The eco-efficient concepts promoting sustainable urban development identified from the literature are presented below with a name, description, and primary literature sources:

1. Public/Private engagement in urban planning - collaborative planning

Collaborative planning is defined as a function, where the local detailed plan is prepared in partnership between the municipal authorities and the developers. Conventionally, the public sector alone is responsible for conducting the detailed plan in Finland (Nykänen et al., 2007). During the urban development process incentives to promote eco-efficiency are usually split between different stakeholders. If the public sector alone approves the binding detailed plan, significant factors promoting eco-efficiency may have been overlooked. Väyrynen (2010) claims that by incorporating different developers and stakeholders in the planning process visions, knowledge, and new perspectives promoting eco-efficiency can be gained. By engaging the private sector in the urban development sector in an early stage; new perspectives concerning energy efficient

design solutions, renewable energy solutions and suitable practises for reducing energy demand can be developed together through collaborative planning. The earlier on (pre-design phase) different expertise groups are involved in the development, the more they can impact the buildings (areas) energy performance (WBCSD, 2007).

2. Enhancing sustainable lifecycle leadership – a holistic approach

When considering the life cycle effect of an urban area or structure, a long-term perspective is crucial for the assessment (Gueye, 2007). A fragmented urban development process leads to design decisions that are unsustainable considering the lifecycle of the area. A holistic approach to lifecycle leadership can entail a more continuous urban development process, where every stakeholder understands the whole process instead of optimizing their own function. Väyrynen (2010) investigates root causes in the conventional development process which are derived from lack of sustainable lifecycle leadership. Due to these discontinuances of the urban development processes, innovative ideas promoting eco-efficiency never reaches an implementation phase (Majamaa et al., 2008). E.g. innovations regarding design solutions that have a substantial life cycle impact on the buildings energy performance and maintenance costs might be overlooked due to discontinuance in processing information. A building may have been designed to be maintained in a certain way to achieve low energy costs, due to lack of information between the construction phase and the operational phase the intended energy level is never achieved.

3. Enabling eco-efficient policies

Today, we have the appropriate knowledge, technology, and skills to develop eco-efficient urban areas, but we lack sufficient policies and regulations to attain the required market change. A survey conducted by the World Business Council of Sustainable Development

indicates that many building industry professionals adopt new eco-efficient practices only if they are required to by the policies and regulations. In order to attain a sufficient market change the government could promote eco-efficient policies such as; establishing a carbon price through taxation, subsidizing low-carbon innovation technology and promoting behavioural changes through information and setting standards (WBCSD, 2007).

4. Developing financial models for eco-efficient marketing

Another issue to address is the financial feasibility and investment attractiveness of eco-efficient urban development. Considering the overall costs of a building from the original investment perspective, the energy cost occurring during the long life cycle seems minor and consequently have been insignificant for the investors and many other decision-makers. A considerably higher energy price would certainly stimulate financial attractiveness. One way to strengthen the financial demand and competitive advantage of eco-efficient buildings is by certifying buildings according to their ability to reduce negative impact on the environment and human health. These green building certificates should be fully utilised as financial tools to market eco-efficient development in the real estate market worldwide (Bonde et al., 2009). Another way of enhancing financial feasibility in the energy service market is by promoting Energy Performance Contracts (EPC). The idea with EPC is that the energy service company is responsible for cost saving guarantees for project duration of 5-15 years in relation to the building owner (European Energy Service Initiative, 2009).

5. Integrated design process

The urban development design process is diverse and complex involving many stakeholders. Each stakeholder has his own ways of promoting eco-efficiency, but if the process is fractured and distinctly phased, eco-efficient

design solutions cannot be optimized. By improving interaction at an early design stage greater levels of eco-efficiency can be achieved (WBCSD, 2007). Additionally, an urban development design process involves a significant amount of information to be managed, analysed, shared, and coordinated appropriately. A study done by Nilsson (2007) revealed that local authorities in Sweden does not manage information sufficiently in order to achieve eco-efficient development solutions because they separate the projects into categories instead of analysing eco-efficiency comprehensively. Kuronen et al. (2010) have suggested that the urban development should be viewed as one system instead of several subsystems in order to promote sustainability.

6. Local energy procurement and management

Utilisation of local resources and local energy production is becoming increasingly significant when promoting eco-efficient urban development, especially the use of renewable energy resources (Huovila and Koskela, 1998; Bourdeau et al., 1998). In order to achieve zero net energy for buildings and urban areas, building energy demand has to be decreased, energy has to be produced locally using renewable or recycled energy, and locally produced surplus energy has to be shared and managed with an intelligent grid infrastructure to achieve optimal energy consumption (WBCSD, 2007).

7. Eco-efficient complementary development

In order to thoroughly decrease energy consumption and greenhouse gas emissions by improving energy performance of buildings and urban areas it is not enough to concentrate on new construction. Complementary development (renovation and refurbishment of the built environment) is the key to improve the standard of living and sustainability in the future (Verbeeck and Hens, 2005; Heinonen and Junnila, 2011). Additionally, when analysing

office buildings, studies have shown that with relatively small investments and focusing on relevant aspects, environmental impacts can be significantly reduced (Junnila, 2009). Verbeeck and Hens (2005) accentuated that it is imperative that complementary development is economically feasible, and typically the most cost-effective eco-efficient solutions can be found when it is done as a part of a general refurbishment.

Eco-efficient concepts from expert interviews

The thematic expert interviews resulted in additional eco-efficient concepts that were not originally recognized in the literature. In addition, the concepts identified in the literature review (presented above) were all confirmed through the interviews. The additional potential eco-efficient concepts for urban development identified were:

8. Extending developers business to maintenance

The majority of the interviewed experts proclaimed that developers should make a longer commitment to projects including operation, maintenance, and facility management. The fundamental intention in extending developers commitment in an eco-efficiency context is that the developer will invest in quality and low energy costs when having the responsibility and risk for the project for a longer time period. If developers commit to the operating phase of urban structures, they will simultaneously enhance sustainable lifecycle leadership (concept 2) by welding together two distinct phases of the conventional urban development process (emphasized in 13 of 21 thematic expert interviews, spring 2010).

9. Developing financial models for eco-efficient renovation

Financial models for eco-efficient renovation were widely recognized by the interviewees, a concept that is strongly related to complemen-

tary development (concept 7). It is urgent that financial models are developed to resolve issues concerning divided ownership and willingness to invest in renovation projects. The major challenge is to find a common incentive for all stakeholders in the development project. The interviewed experts suggested that it would be easier to commence with large real estate owners in order to set a successful pilot project or alternatively negotiate with the public sector to increase the permitted building volume of the building (or area) to finance the eco-efficient renovation. Several experts also remarked that it is important to market the project with a new “brand” and accentuate the future value of the area (emphasized in 13 of 21 thematic expert interviews, spring 2010).

10. Eco-efficient traffic and transportation solutions

A concept concerning eco-efficient traffic and transportation solutions evolved due to a wide recognition from the interviews. The experts accentuated that, instead of focusing on individual sub-structures, the challenge lies in developing urban areas that are holistically eco-efficient. When managing people and material flows, eco-efficient traffic and transportation solutions are becoming increasingly important. Traffic and transportation solutions are fundamental to the urban area and its functionality, which is why they are dealt within the beginning of the development process. Once certain traffic and transportation solutions are implemented into the urban structure, it is difficult to remould and modify them (emphasized in 9 of 21 thematic expert interviews, spring 2010).

Questionnaire results for prioritized eco-efficient concepts

The customer oriented questionnaire represents the third stage of this study. The purpose

is to identify what are the eco-efficient concepts the customers (cities and municipalities) are willing to promote and/or invest in. All the eco-efficient concepts identified in the literature review and thematic expert interviews are included in the questionnaire template provided for the customer.

The two main parts of the questionnaire focuses on investigating future challenges and investment willingness for the provided eco-efficient concepts. The respondents were supposed to choose exactly three (of ten) eco-efficient concepts based on two factors. First, the previous experience and comments from the tentative recipients of the questioners emphasized heavily the streamlined version of the questionnaire as a way to attain a greater number of answers. Second, as the objective was to identify the most interesting concepts the top three approaches for answers was selected in order to guide the respondent to focus only on the few most interesting concepts.

In order to get a more profound understanding of how customers themselves engage in sustainable development, certain questions examined the cities independent use of legislative authority to promote eco-efficiency in urban development. Additionally, the respondents were asked how they currently manage eco-efficiency in their operations and by what means would they wish to promote sustainable urban development in the future.

In order to achieve a comprehensive perception from the customers, the questionnaire was sent and answered by different administrative units within the city (respondent distribution): city management (25%), planning and land use management (28%), real estate management (12%), premise management (11%), financial management (2%), service management (4%), economic development management (4%) and others (directors/managers for significant urban development projects) (16%). Over 50% of the respondents were from city management,

and planning and land use management which included several mayors, planning directors and land use directors responses.

In total 57 of 168 answers were received with 34% participation. Every city of the 20 largest cities in Finland (by population) submitted one or more answers. These 20 cities represent 60% of all 106 cities in Finland and count for 48% of the whole Finnish population. Furthermore, the 20 largest cities represent 70% of all investment funds directed to urban development of Finland, this indicates how significant the development demand is in these cities.

In the first main part, the most important eco-efficient concepts considering future urban development were identified. Precisely three concepts were chosen per respondent, the results were as follows:

I. Integrated design process	67%
II. Eco-efficient traffic and transportation solutions	65%
III. Eco-efficient complementary development	42%
IV. Local energy procurement and management	25%
V. Enhancing sustainable lifecycle leadership	21%
VI. Enabling eco-efficient policies	21%
VII. Extending developers business to maintenance	21%
VIII. Developing financial models for eco-efficient marketing	11%
IX. Public/private engagement in urban planning	9%
X. Developing financial models for eco-efficient renovation	9%

In the second main part the respondent was required to identify (precisely three concepts) eco-efficient concepts that they would be willing to invest in. The results were as follows:

I. Integrated design process	58%
II. Eco-efficient traffic and transportation solutions	56%
III. Eco-efficient complementary development	54%
IV. Local energy procurement and management	35%
V. Public/private engagement in urban planning	25%
VI. Extending developers business to maintenance	19%
VII. Enabling eco-efficient policies	18%
VIII. Enhancing sustainable lifecycle leadership	14%
IX. Developing financial models for eco-efficient marketing	9%
X. Developing financial models for eco-efficient renovation	9%

The results from the customer oriented questionnaire indicate that there are three concepts promoted by municipalities: Integrated design process, eco-efficient traffic and transportation solutions, and eco-efficient complementary development. The results also indicate that public/private engagement in urban planning is considered as a relatively insignificant concept in the public decision-making for the future (9%), but still a concept that the public sector would invest in (25%). Similarly, eco-efficient complementary development gained more investment attractiveness (54%) compared to its future importance (42%). It is to be mentioned that the aggregate percentages does differ with 6% since the respondent had the option to suggest an eco-efficient concept in addition to the ones provided by the previous research. The few suggested concepts were all strongly related to the provided concepts.

The attractiveness of the integrated design process shows the public demand for involving more experts and stakeholders around the

same table at an earlier phase of the development process. Hence, the integrated design process has an ability to trigger and generate additional eco-efficient design solutions into the development. Since eco-efficient traffic and transportation solutions and eco-efficient complementary development are favoured, one can assume that the cities have understood the urgency and potential in upgrading and revitalising the existing urban structure and improving commuting and transportation.

It is interesting to notice that local energy procurement is seen as an important element when developing eco-efficient communities. The concepts of collaborative planning and extending developers business to include maintenance implies that the cities are willing to give the developers more input to the planning phase and more responsibility to the maintenance phase. If the developers are extending their operations they are also increasing their liability, which can be seen as a risk and an opportunity. The reason why sustainable lifecycle leadership received low acceptance is interesting and probably because of the lack of practical solutions and instant value added. Surprisingly, financial models for marketing and renovation are seen as relatively unimportant issues, perhaps the cities see that financing is an issue between the developer and the investor.

4. FRAMEWORK FOR ECO-EFFICIENT CONCEPTS IN URBAN DEVELOPMENT – KEY FINDINGS

In order to better understand the relationships of the identified concepts and attain a comprehensive perception of the requirements and opportunities in urban development the results were further processed and presented in an integrated framework of future trends for eco-efficiency in urban development. The

findings of the study were categorized under three main topics: A) Directives and regulations, B) life cycle of the urban structure or building and, C) operational tools and business opportunities.

The framework (Figure 1) presents these three categories. The section on the left side is reserved for directives and regulations (A.) which affect different phases of urban development; the concept for enabling eco-efficient policies (3.) is situated there. These new policies and regulations should be seen as opportunities rather than restrictive elements. The section in the middle represents the life cycle of the urban structure or building (B.). Concepts which are defined as processes are placed in the life cycle span, starting with public/private engagement in urban planning (1.), followed by integrated design process (5.) and finally eco-efficient complementary development (7.) as an upgrading process. Moreover, Figure 1 portrays the eco-efficient concepts investment willingness (public demand) in both numbers (percentages) and the size of the figure representing the concept (not precise in scale).

The section on the right side is reserved for operational tools and business opportunities (C.) and is placed logically in line with the life cycle analogy. Eco-efficient traffic and transportation solutions (10.) is placed in the beginning of the development phase since traffic and transportation solutions are fundamental to an area, they are also planning decisions that are prepared by the cities and are therefore strongly connected with public/private engagement in urban planning (1.). Enhancing sustainable lifecycle leadership (2.) is recognized as a vision or aim for the urban area and is therefore present in the whole framework.

Local energy procurement and management (6.) are elements that are considered in the design phase and are therefore placed alongside the integrated design process (5.). In

the beginning of development projects financial feasibility and marketing are of great importance, thus, developing financial models for eco-efficient marketing (4.) is placed at the beginning of the development process. Extending developers business to include maintenance (8.) is rationally placed equally to the use and operation phase in the life cycle. As stated previously, financial models for eco-efficient renovation (9.) are an important part of eco-efficient complementary development (7.) and are therefore placed jointly.

When analysing Figure 1 we discover that the left side is represented by the government (cities and local authorities) who direct eco-efficient directives and regulations of the development process. On the right side we

have practical tools and business opportunities that can be implemented by the developer into the urban development process. Hence, it is crucial that the public and the private sector work together when addressing the urban development challenge (KPMG, 2010). In Finland PPP (public-private partnership)-project development has increased as a result of a certain demand for additional resources to fund urban development projects (Majamaa, 2008; Väyrynen, 2010).

The concept framework contributes to a comprehensive perception and understanding of eco-efficient opportunities in urban development which can be used, for example, to improve communicating towards customers and the general public.

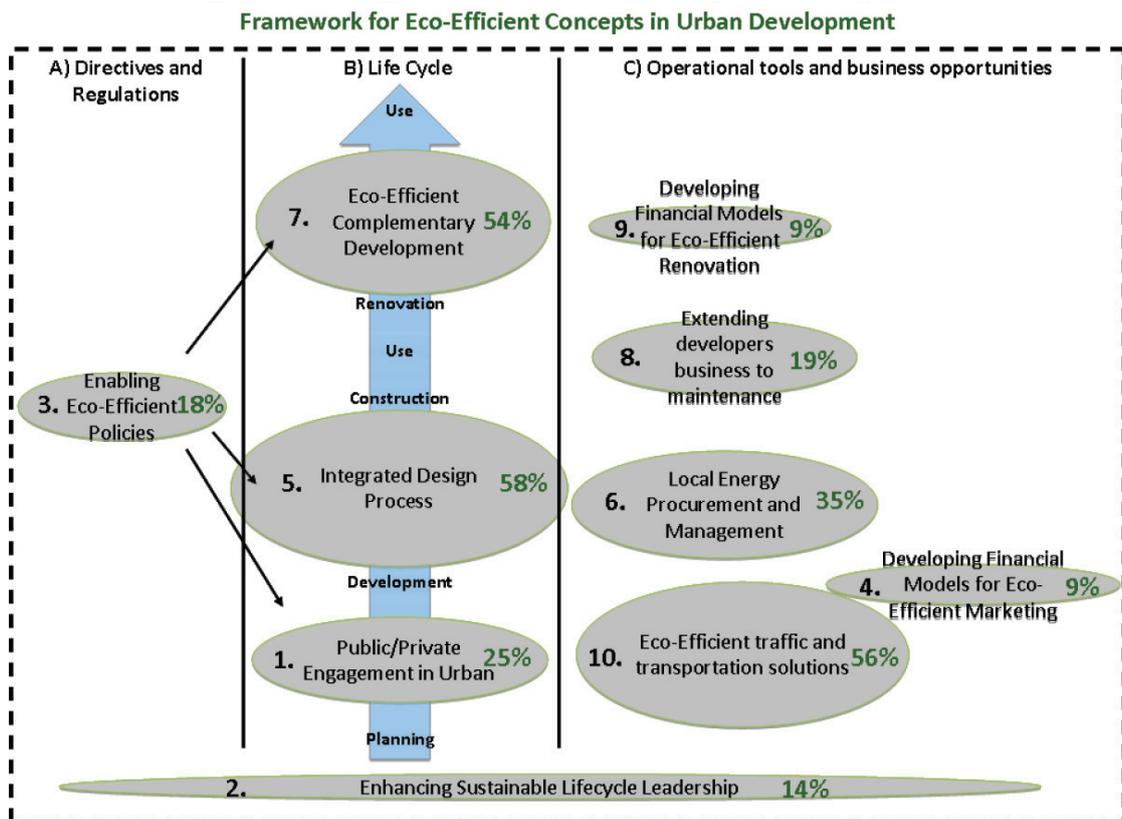


Figure 1. Framework for eco-efficient concepts in urban development. The percentage value signifies the cities invest willingness for each concept

5. DISCUSSION

Climate change and global warming directs new requirements in the built environment and urban areas, due to the relative amount of environmental burdens they produce. This study tried to identify eco-efficient concepts in urban development that are called for by local authorities (cities and municipalities) in the future. The eco-efficient concepts presented in this study can be used to tackle and manage these rising sustainability issues. By understanding the cities' most urgent needs in urban development, new solutions, and concepts can be created and developed in order to respond to the sustainable challenge.

The achieved key findings are presented in the framework for eco-efficient concepts in urban development (Figure 1). The three most favourable concepts were; Integrated Design Process, Eco-efficient Traffic and Transportation Solutions, and Eco-efficient Complementary Development, according to both categories studied. Willingness to promote and willingness to invest were also highlighted as important by the thematic expert interviews. An unexpected outcome was the low interest in new financial models, which still was emphasized by numerous experts.

Even though the local authorities would not serve as the customer in the development procurement process, they have a powerful opportunity to act as the prime mover by requiring and improving eco-efficiency within their sphere of authority. Cities can utilise their legislative authority, regulations, and fiscal policy to support sustainable development. According to Taipale (2004), there are different tools that can be used by the local authorities to promote eco-efficiency, e.g. regional policy (land use management), plot policy, eco-efficient building code, public procurement policy, and implementing eco-efficient cost-mechanisms.

If these concepts are applied in practice and the developer commences to extend

operations towards the maintenance phase and the planning phase, there is a risk that certain responsibilities during the development process become vague, uncertain and risks (financial, legal and technical) are improperly divided between different actors (local authorities, developer, investor etc.). For instance, in PPP-projects, which are considered a highly effective solution to produce and maintain economic and social infrastructure (World Bank, 2010), the public and private sector makes a contractual agreement where skills, knowledge, resources, and other assets are shared to provide services for the general public. Each party of the agreement attains a certain risk that correlates with a potential profit for the development project.

Presumably, eco-efficient concepts and models for urban development will increase in the construction market. Nevertheless, to achieve a competitive advantage for these concepts a feasible financial element has to be included along with a certification system to demonstrate the social, economic and environmental value added to the developed area.

Evaluation of the research

Kasanen et al. (1993) states, that the evaluation criteria for a constructive research approach is the constructs' functionality, which questions relevance, simplicity, and applicability. The empiric contribution utilised in this study is relatively vast and diversified, although a higher participation rate for the customer questionnaire would have been desirable. It is relatively challenging to compare the final eco-efficient concepts together with the previous results since there are no direct comparable constructs within the field of urban development. However, with the acquired empiric data more or less similar concepts would have been created by an outstanding person.

In evaluating this framework Jabareen (2009) underlines certain limitations of a conceptual framework analysis. For example,

different researchers may have different conceptions of the phenomenon which leads to a creation of different “planes” of the conceptual frameworks. Jabareen (2009) also presents advantages for conceptual frameworks which are flexibility, capacity of modification and understanding of the phenomena. As for theoretical contribution of the conceptual framework (Figure 1), this study presents different ideas, themes, and concepts for promoting eco-efficiency in urban development which were validated with a questionnaire.

The validity of the customer oriented questionnaire should be examined; fortunately, numerous answers from the Helsinki metropolitan area (Helsinki, Espoo, and Vantaa) were received. Finland’s 20 largest cities (by population) participated in the questionnaire which represents around 60% of Finland’s official cities population and 70% of the investment funds directed to urban development (Statistics Finland, 2009). Thus, the questionnaire represents a significant segment of the Finnish public sector within urban development, however a larger sample of answers would have further verified the results.

Furthermore, the key findings, concepts along with the framework, could be generalized into other markets with similar conditions. The interest to address the challenge of sustainable urban development through wider concepts seems to be prevailing in other environments as well, since five out of six emphasised concepts were already suggested by the literature. Additionally, the framework for eco-efficient concepts in urban development provides an extensive foundation for further research and development of new concepts to respond challenges in urban development.

6. CONCLUSIONS

Eco-efficiency is becoming more and more significant in today’s construction industry if we are to respond to the threat of climate

change and expanding urbanisation. Cities and the built environment are estimated to cause the majority of environmental burdens. By utilizing existing knowledge and technology there is a great potential to decrease energy demand and carbon emissions worldwide. As building directives and regulations are becoming more severe, new eco-efficient practises are evolving in order to address the market change in urban development.

This study utilized a constructive research approach where the research methods consist of a literature review, thematic expert interviews, and a customer oriented questionnaire. Through the literature review and the thematic expert interviews ten different eco-efficient concepts were recognized and identified. The purpose of the customer oriented questionnaire was to examine these eco-efficient concepts concerning significance and willingness to invest. The questionnaire was directed to Finland’s 20 largest cities (by population) which represent 70% of the Finnish investment funds directed to urban development. Finally a framework for the eco-efficient concepts was created in order to better understand the requirements and opportunities in urban development in the future.

The results indicate that three eco-efficient themes were accentuated above all others; integrated design process, eco-efficient traffic and transportation solutions and eco-efficient complementary development. Additionally, local energy procurement and management was distinguished as a substantial element when developing sustainable urban structures. Astonishingly, the importance of feasible financial models for sustainable development received low favourability from the questionnaire, even though several experts emphasized their significance.

The concepts portrayed in this study can be used to add value to the customer (city and municipality), end-customer (residents of the area), and the developer (market share). This

study provides an extensive information platform (different ideas, themes, and concepts) to promote sustainability in urban development. Furthermore, this study provides a framework that can be used in research and practical operations.

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SANTRAUKA

VISUOMENINĖ EKOLOGIŠKAI EFEKTYVIŲ KONCEPCIJŲ PAKLAUSA MIESTŲ PLĖTROS KONTEKSTE

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Pasaulinis atšilimas miestų plėtrai visame pasaulyje atnešė naujų iššūkių. Skaičiuojama, kad statiniai, jų aplinka ir miestai atsako už maždaug 40–70 proc. poveikio aplinkai. Tai verčia abejoti esama miestų plėtros praktika ir ragina ieškoti naujų sprendimų, kaip spręsti šias problemas. Tyrimo tikslas – nustatyti įmanomas ekologiškai veiksmingas koncepcijas, kurias galima įdiegti vykstant miestų plėtros procesui. Koncepcijos nustatomos taikant konstruktyvaus tyrimo metodą, kurio metu potencialios koncepcijos randamos literatūroje, vėliau patobulinamos atliekant teminius pokalbius su ekspertais, o paskui pasiūlytos koncepcijos patikrinamos pagal anketą ir įtraukiamos į integruotą ekologiškai efektyvių koncepcijų sistemą, kuri leidžia geriau suprasti visuomeninės miestų plėtros reikalavimus ir galimybes. Rezultatai parodė, kad suinteresuotoms visuomenės grupėms patraukliausios buvo šios miestų plėtros koncepcijos: integruotas projektavimo procesas, ekologiškai efektyvūs eismo ir transporto sprendimai, ekologiškai veiksmingas papildomų erdvių ir patalpų vystymas. Vystant ekologiškai efektyvias miesto zonas, vietinis energijos pirkimas ir valdymas taip pat laikomi gana pelningomis paslaugomis. Šiame tyrime pateikiama išsami informacijos platforma (įvairios idėjos, temos ir koncepcijos), skatinanti ekologiškai efektyvią miestų plėtrą, idant urbanizuota visuomenė palaikytų ir gerintų darnią gyvenimo kokybę bei gerovę.