



## The Critical Establishment of Livability for Sustainable Community in Future Cities After Fossil Oil Reduction

Cemal Inceruh<sup>a\*</sup>

<sup>a</sup> Department of Architecture Faculty of Architecture & Design, Zirve University, TURKEY

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### ABSTRACT

Throughout the literature reviewed, conceptual overlap emerged between livability and sustainability. While several studies used these concepts interchangeably, a greater number of resources referred to livability and sustainability as separate and discrete concepts. But, the concept of sustainability as “meeting the needs of the present without compromising the ability of future generations to meet their own needs”, will not be valid after the end of the main living resource; oil. The concept of livability will not be only related to qualities and living conditions, but, in coming future, it will assume maintaining the basic needs of a city’s communities; such as food, shelter and transportation. Therefore, livability will be critical for establishing sustainable community after shortages in these basic needs. The dependency of living on fossil oil and related production, principles, strategies and planning guidelines for future livability will be discussed for the period of after fossil oil reduction.

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## 1. Introduction

While several challenges exist for countries, localities, and their regional planning organizations, the lack of consensus concepts to define, classify or expand on livability appear to hinder widespread adoption and implementation. In these circumstances of economic crises and future scarcity of resources all over the world, the definitions for livability and sustainability may not exist. In another words, we have to look for a new concept of livability and sustainability, especially, in the period of oil reduction, or may be in the period of after oil. Thus, the ramifications of Peak Oil are so serious, “The situation is desperate. This is the world’s biggest

\*Corresponding author (Cemal Inceruh). Tel/Fax: [+90342 2116666 Ext.6908](tel:+903422116666). E-mail addresses: [cemal.inceruh@zirve.edu.tr](mailto:cemal.inceruh@zirve.edu.tr), [cinceruh@yahoo.com](mailto:cinceruh@yahoo.com). ©2015. International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies. Volume 6 No.2 ISSN 2228-9860 eISSN 1906-9642. Online Available at <http://TUENGR.COM/V06/071.pdf>.

serious question (Ruppert, 2003).

The problem, however, is not “running out of oil” as much as it is “running out of cheap oil,” which is the resource upon which every aspect of industrial civilization is built. Oil plays such a fundamental role in the world economy that we need not “run out” of the stuff before we run into a crisis of untold proportions. The more demand for oil exceeds production of oil, the higher the price goes. The higher the price goes, the more dislocations the world economy suffers. The more dislocations the world economy suffers, the more resource wars the human population endures.

Researchers, in these circumstances, are still busy in developing the definitions and concepts of both sustainability and livability regardless of what we are going to face in the near coming years of the after oil or after cheap oil. Many interpret this definition as meeting the needs of the present generation without compromising the ability of future generations to meet theirs. It is also referred to as the triple bottom line concept, because it includes considerations for the economy, the environment and social quality of life (Amekudzi e 2011). This definition is stated as if all resources will continue to meet future needs. But the problem here is that the most important and most dependent resource of life is going to finish soon. On the other hand, Livability is most often used to describe the diverse aspects of society, surroundings, and shared experiences that shape a community. Thus, livability is focused on the human experience of place, and is specific to the place and time.

However, livability and sustainability are distinct concepts, although there is substantial overlap and they may be occasionally used interchangeably. Both notions are multifaceted, dynamic, flexible, and powerful. These concepts are fluid and expansive terms for complicated, complex, and sometimes, conflicting concepts, especially, when we think of a future that will not be able to meet its needs. This paper will develop a new concept of livability and sustainability for the future of no oil or at least no cheap oil.

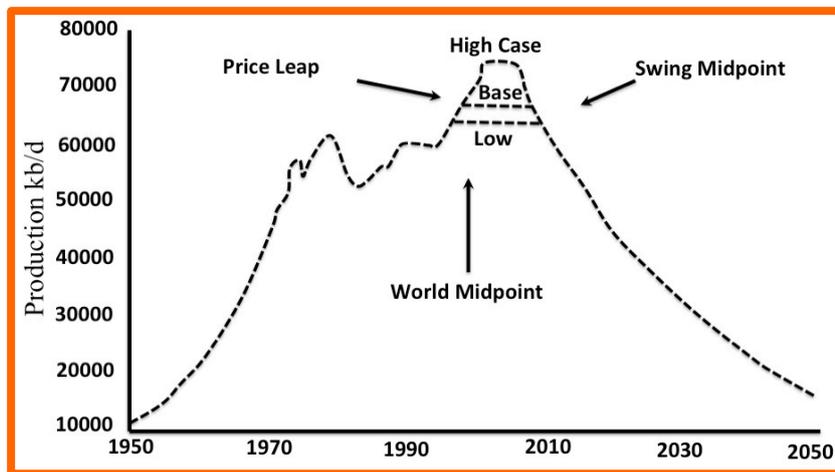
## **2. The Effects of Reduction and End of Oil on Livability in Cities**

The most wildly optimistic estimates indicate 2020-2035 will be the years in which worldwide oil production peaks. Generally, these estimates come from economists who do not grasp the dynamics of resource depletion. Unfortunately, even in the best-case scenario, petrochemical civilization will begin collapsing by the time today’s newborns are old enough to be drafted (Savinar, 2004).

Unfortunately, we won’t know we have hit the peak until 4-6 years after the fact. Even on the upslope of the curve (Figure 1), oil production varies a bit from year to year due to factors such as war, weather, and the state of the world economy. It is possible that worldwide oil

production peaked in the year 2000 as production of conventional oil has grown only slightly since then (Figure 1). The production of so called “non-conventional” oil may extend the “oil-peak” into what Richard Heinberg (2003) calls, “the petroleum-plateau,” that with much luck and prayer, will last until about 2015. The oil companies have quietly acknowledged the seriousness of the situation. For instance, in a February-1999 speech to oil industry leaders, Arco chairman Mike Bowlin stated, “The last days of the age of oil have begun.” (BP, in Savinar, 2004). In fact the entire way of life revolves around the consumption of petrochemicals and fossil fuel energy:

**A. Modern food production depend on oil:** The size of this ratio stems from the fact that every step of modern food production is fossil fuel and petrochemical powered: Pesticides are made from oil; Farming implements such as tractors and trailers are constructed and powered using fossil fuels; and Food distribution networks are entirely dependent on oil. Most of the food at your local super market is packaged in plastic, which comes from petroleum (Pfeiffer, 2003). Oil-based agriculture is primarily responsible for the world’s population exploding from 1.5 billion at the middle of the 19th century to 6.4 billion at the beginning of the 21st (Savinar, 2004). As oil production went up, so did food production. As food production went up, so did the population. As the population went up, the demand for food went up, which increased the demand for oil. Simply, the end of cheap oil means end of oil-powered agriculture, which means the end of cheap food, which means the end of billions of lives.



**Figure 1:** World Oil Production, 1950-2050 (Campbell. 1998)

**B. The delivery of fresh water depend on fossil fuels:** Fossil fuels are used to construct and maintain aqueducts, dams, sewers, wells, to desalinate brackish water, and to pump the water that comes out of your faucet. Seven percent of the world’s commercial energy consumption is used to deliver fresh water (Hoffman, 2004).

\*Corresponding author (Cemal Inceruh). Tel/Fax: [+90342 2116666](tel:+903422116666) Ext.6908. E-mail addresses: [cemal.inceruh@zirve.edu.tr](mailto:cemal.inceruh@zirve.edu.tr), [cinceruh@yahoo.com](mailto:cinceruh@yahoo.com). ©2015. International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies. Volume 6 No.2 ISSN 2228-9860 eISSN 1906-9642. Online Available at <http://TUENGR.COM/V06/071.pdf>.

C. Everything in the modern world is dependent on oil: In addition to transportation, food, water, and modern medicine, mass quantities of oil are required for all plastics, the manufacturing of computers and communications devices, extraction of key resources such as copper, silver, and platinum, and even the research, development, and construction of alternative energy sources like solar panels, windmills, and nuclear power plants.

It is not just transportation and agriculture that are entirely dependent on abundant, cheap oil. Modern medicine, water distribution and national defense are each entirely powered by oil and petroleum derived chemicals. Moreover, transportation, food, water, and modern medicine, mass quantities of oil are required for all plastics, all computers and all high-tech devices. Some specific examples may help illustrate the degree to which our technological base is dependent on fossil fuels: regardless of cars oil consumption, the construction of a car will consume an amount of fossil fuels equivalent to twice the car's final weight. (Deffeyes. 2001); The construction of the average desktop computer consumes ten times its weight in fossil fuels (Deffeyes. 2001); the production of one gram of microchips consumes 630 grams of fossil fuels (Deffeyes. 2001); Contrary to popular belief, the internet consumes tremendous amounts of energy (Deffeyes. 2001); the infrastructure necessary to support the internet consumes 10% of all the electricity produced in the United States (Deffeyes. 2001). Last but not the least, it is hard to precisely quantify how much energy is necessary to construct and maintain a modern city (concrete, asphalt, highways, etc.). On the other hand, buildings are the major source of global demand for energy for which, today, more than 41.7% of fossil oil consumption is used by buildings sector (Architecture 2008).

At the very top of these issues, the vulnerability of our food system to sudden changes was demonstrated during the fuel crisis in 2001. A sharp increase in the price of oil or a reduction in oil supplies could present a far more serious threat to food security and is likely to as oil enters its depletion phase. Food production and distribution, as they are organized today, would not be able to function. Although food supplies in wealthy countries appear to be secure and choice, in terms of thousands of food products being available at supermarkets, seems limitless, this is an illusion (Grissom, 2005).

I am not pointing out these problems, and their likely consequences, in order to cause panic. There is a solution to these dilemmas; one will help us address the remaining ones. It is not a simple or easy strategy and it will require a coordinated and sustained national effort. Therefore, the challenges, here, sets at these issues are, mainly, based on three key issues food, transportation and shelter (housing). Consequently, the new concept of livability will be based on these triple bottom-lines concepts (Figure 2).

### 3. The Alternative Concept of Livability for Sustainable Community after Oil Reduction

According to NARC (2002), a shared, definitional framework for livability is established by the Interagency Partnership for Sustainable Communities, formed in 2009, as “Livability is most often used to describe the diverse aspects of society, surroundings, and shared experiences that shape a community; and includes set of economic, spatial, and social components”. And set the famous six livability principles as; i) Provide more transportation choices; ii) Promote equitable, affordable housing; iii) Enhance economic competitiveness; iv) Support existing communities; v) Coordinate policies and leverage investment; and vi) Value communities and neighborhoods.

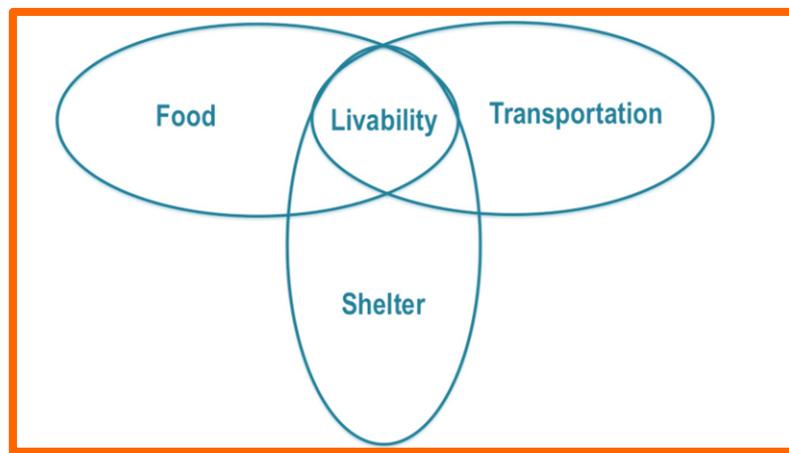
From the definition stated by NARC, we can conclude that livability does not always line up with sustainability; it is greatly strengthened when approached within a sustainable framework that includes environment, equity, and economy. This alignment of present goals within a sustainable future allows for a comprehensive and integrated planning framework that can guide development and investment effectively and efficiently in a manner that meets the vision of both livability and sustainability after oil reduction.

However, to develop an alternative livability for the period of after oil crash, the alternative principle will be based on the triple bottom lines concepts (key issues) illustrated in Figure 2: The food, Shelter and Transportation. Because once these bottom lines concepts are provided in an area or in a community, the area is livable. Therefore livability now can follow a line parallel with specific modifications on the existing six principles (stated by NARC, 2002) of livability (listed above) for the livability concept after oil reduction. Thus, these new principles will be as follows: i) Enhance economy based on food production; ii) Develop alternative systems/Methods/Concepts for food production; iii) Promote energy-sufficient affordable housing; iv) Encouraging urban self-sufficient community/neighborhoods; v) Stating policies for alternative Livable environment; and vi) Provide alternative transportation choice;

After oil crash or end of cheap oil, the urban population will suffer all the effects stated in the previous part of this paper (Part 2). Therefore, people will not look for luxurious living standard as stated in today’s sustainability and livability principles and objectives; such as spacious open places, neat and nice looking environment of fresh air, and solar systems using very expensive solar panels. But rather they will look for the basic needs, the Food, Shelter and Transportation (Figure 2). The urban population needs food to survive and an income to provide a living. The direct solution is embedded in food production. But, the urban areas have limited lands to cultivate. Therefore, intensive food production and food industry is the main key issue

\*Corresponding author (Cemal Inceruh). Tel/Fax: [+90342 2116666 Ext.6908](tel:+903422116666). E-mail addresses: [cemal.inceruh@zirve.edu.tr](mailto:cemal.inceruh@zirve.edu.tr), [cinceruh@yahoo.com](mailto:cinceruh@yahoo.com). ©2015. International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies. Volume 6 No.2 ISSN 2228-9860 eISSN 1906-9642. Online Available at <http://TUENGR.COM/V06/071.pdf>.

(as income) to be taken into consideration in developing the new concept of livability. The second basic need is transportation. People need to move and transport their goods. So that alternative transportation (unlike those depending on oil) is another key issue to be consider in the concept of livability of after oil reduction. Last but not the least, shelter is the most important key issue that must be provided locally and in a compact form with decent basic requirement for the quality and construction materials that is not dependent on oil energy neither in construction process nor in its manufacturing. Therefore, the existing concepts and definitions of sustainability and livability must be revised to provide adequate principles, definitions and objectives to cope with the circumstances of after oil period. Thus, principles, criteria and objectives (listed in Table 1) are developed to realize the concept of each principle to sustain livability after oil reduction.



**Figure 2:** Illustration of the Triple Bottom Lines Concept (key issues) of Livability

As a result, representative definitions of livability for after oil livable cities can be deduced from the modified principles, their explanations and their related choices/objectives; in addition to oil reduction effects and consequences that will affect our needs to livability in the near coming future. Thus, the new definitions for livability after oil reduction/crash are stated at three levels/considerations; at community housing level, at future food needs level, and at local planning process and transportation level; as follows:

- After oil crash livable communities are places where transportation, housing and food production have been coordinated so that people have access to adequate, affordable and environmentally sustainable travel options depends on alternative energy.
- After oil crash livable future is one that is enduring, vibrant, responsible (civil), and offers a desirable life resources. This requires a balance of three key goals: vibrant communities providing their food locally, vital sufficient transportations, and affordable sufficient-energy housing.

- Finally, livability is best defined at the local level where a livable community recognizes its own unique identity and places a high value on the planning processes that help manage growth and change to maintain and enhance its community character locally.

**Table 1:** The Proposed Livability Principles and their related issues for After Oil Reduction.

Modified Principles	Explanation	Choice
1. Enhance economy based on food production	Zoning could be used to legitimize urban agricultural activities. Adding an urban agricultural zoning designation may protect urban farms or community gardens from rapid development.	Permissive districts that allow many types and scales of cultivation, animal husbandry, agriculture-related structures, and some farm-related commercial activity must be denoted in the comprehensive plan of the city.
2. Develop Alternative Systems/ Methods/ Concepts for food production	The elements of this system must be viewed in relationship to other elements, where the outputs of one element become the inputs of another.	Permaculture is to create stable, productive systems that provide for human needs, harmoniously integrating the land with its inhabitants.
3. Promote energy-sufficient affordable housing	Expanding energy-sufficient housing voices for people. The designing of human habitat with food production system in urban in compact form to minimize distance of travel.	Land-use planning and community building criteria will provide harmonious integration of human dwellings, microclimate, annual and perennial plants, animals, soil, and water into stable productive communities.
4. Encouraging urban self-sufficient community and neighborhoods	Involvement of governmental funding toward existing communities as mixed-use development and land recycling to increase community revitalization, and establishing projects at the neighborhood scale.	To promote local communities to make the step into commercial production, Mixed-use development is the backbone of urban development. Walkable communities can only mean densely populated areas.
5. Stating policies for alternative livable environment	Increasing the effectiveness of all levels of government to plan for future growth, including locally generated renewable energy.	The local planning private citizens follow the plan into an urban living style of smart energy choices.
6. Provide alternative transportation choice	Maintain safe, reliable and economical transportation to decrease transportation cost, reduce nation's dependence on foreign oil and promote public health.	Electric cars perform poorly and require fossil fuel, walking, riding a bike or using light rail service will meet these criteria.

#### 4. Guidelines Promoting Livability in Cities after Oil Reduction

The rapid expansion of cities has resulted in an unsustainable consumption of land and natural resources that is placing a considerable burden on rural areas. Concurrently, recommendations guidelines for planning issues (as supplementary to this proposal) can be presented for planners to consider the following questions for future livable cities:

- What are the possible urban agricultural activities for a livable city?
- What can be allowed in a widespread way with little controversy?

\*Corresponding author (Cemal Inceruh). Tel/Fax: [+90342 2116666](tel:+903422116666) Ext.6908. E-mail addresses: [cemal.inceruh@zirve.edu.tr](mailto:cemal.inceruh@zirve.edu.tr), [cinceruh@yahoo.com](mailto:cinceruh@yahoo.com). ©2015. International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies. Volume 6 No.2 ISSN 2228-9860 eISSN 1906-9642. Online Available at <http://TUENGR.COM/V06/071.pdf>.

- What can be allowed, but controlled?
- What can be allowed, but only in some places?
- Are there some places where specific activities should be particularly encouraged?
- Who are the likely participants and how can positive relationships be fostered?

Additionally, adhering to these principles creates principles that allow developers, as well as the state or local government. The principles included:

- Preserve Open Space and Natural Environmental Areas for food production;
- Integrate urban open spaces with rural lands and activities for food production;
- Create a Range of Housing Opportunities and Choices;
- Take Advantage of Compact Building Design;
- Create Walkable Neighborhoods;
- Consider Mix Land Use;
- Provide a Variety of Transportation Choices; and
- Discouraging dispersed, automobile dependent development at the urban fringe.

Furthermore, proximity principle is a straightforward concept in Eating Oil, where production processes must be located as near to the consumer as possible. When applied to food supply, local food systems in the form of home-delivery box schemes, farmers' markets and shops selling local produce would replace imported and centrally distributed foodstuffs. Consequently, a radical reduction of fossil fuel inputs to agriculture and construction of housing, accompanied by an increase in labor inputs and a reduction of transport, with production being devoted primarily to local consumption. Thus, facing high fuel prices, family farms and small business establishments will declare bankruptcy in record numbers.

## 5. Conclusion

Oil will not just "run out" because all oil production follows a bell curve. This is true whether we are talking about an individual field, a country, or on the planet as a whole. Oil is increasingly plentiful on the upslope of the bell curve, increasingly scarce and expensive on the down slope. The peak of the curve coincides with the point at which the endowment of oil has been 50 percent depleted (Figure 1). Once the peak is passed, oil production begins to go down while cost begins to go up. What all of this means, in short, is that the aftermath of Peak Oil will extend far beyond how much you will pay for gas. The consequences would be unimaginable. Permanent fuel shortages would tip the world into a generations-long economic depression. Millions would lose their jobs as industry implodes. Farm tractors would be idled for lack of fuel, triggering massive famines. Furthermore, the stock market of houses will collapse, and etc.

We still have time to take an action to cope with this problem of oil shortage. I think we are not yet late to take the action of building our livable cities and peaceful environment. Let us start by considering ‘no oil’ in planning, designing and constructing our settlements. Let us teach our children about After Oil and its ramifications. Let us promote a vegetable rich diet, or at least reduce our meat consumption as much as we can. Let us start using our bicycle or public transportation instead of our car, whenever possible. Let us establish community cooperative car. Let us reduce our use of electricity as much as possible. Let us consider taking an organic farming class or joining a local food cooperative. We all need to learn about soil and non-oil-powered agriculture. Let us begin thinking how we are going to survive. It is still an ongoing research, so that let us come altogether in a discussion arena to promote livability and sustainability before being too late to cope with such catastrophe. Only then we can provide a livable city and sustainable community.

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\*Corresponding author (Cemal Inceruh). Tel/Fax: [+90342 2116666](tel:+903422116666) Ext.6908. E-mail addresses: [cemal.inceruh@zirve.edu.tr](mailto:cemal.inceruh@zirve.edu.tr), [cinceruh@yahoo.com](mailto:cinceruh@yahoo.com). ©2015. International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies. Volume 6 No.2 ISSN 2228-9860 eISSN 1906-9642. Online Available at <http://TUENGR.COM/V06/071.pdf>.

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**Dr. Cemal Inceruh** is a teaching Professor in the Department of Architecture at Zirve University. He completed his BScp (1988), MSc and Ph.D. (1994) in Urban Housing Environment & Design at Middle East Technical University (METU), Turkey. Dr. Inceruh worked as a faculty in the following departments: City Planning at METU-Turkey, Urban Design & Landscape Architecture at Bilkent University-Turkey, Landscape Architecture at King Faisal University, and Architecture Engineering at Sultan Qaboos University, Oman. He designed many Urban & Landscape projects, involved in Accreditation processes, established Architectural Departments/ programs.

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