

REDISCOVERING THE PRINCIPLES OF ECO-CITY AS SPATIAL ATTRIBUTES IN TRADITIONAL HOUSING SETTLEMENT: THE CASE OF URFA IN SOUTHEASTERN ANATOLIA

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Abstract

Urban spaces are generally defined and created by physical and non-physical entities. Among these entities buildings play important role in defining urban spaces. These open spaces come into being as a part of building (a private courtyard), as spaces between buildings for semi-public activities in cul-de-sac (as extensions of indoor/courtyard), or as common public gathering and thoroughfare spaces, in a settlement. Yet, these spaces have been studied and analyzed according to different physical and social aspects. But, this paper studies these spaces in different manner inspired from Dominsky's three domains "Reuse, Reduce and Recycle" of the outcomes of sustainable settlement. However, in this paper, these three "Rs" are used as tools to enhance the sustainability of urban spaces and their ecological importance for a society both physically and morally. The objective of this paper is to explore the criteria of ecological sustainability and adaptation of changing society to traditional Anatolian settlements, and to derive physical issues and features of sustainable design and planning for new settlements in hot arid regions.

Keywords

Reuse reduce recycle, courtyard, urban space, urban ecology, sustainability, Cul-de-sac.

Introduction

The current ecological considerations in housing environment create the necessity of a specific type of house construction, appear to be the result of a new phenomenon in human environment. The hightech housing construction technology resulted by Multi-story tenement buildings do not provide direct access to green space and traditional sustainable life style in Turkey. Therefore, micro and macro-climatic conditions and air quality have become worse in Turkey's multi-story housing environment, and moreover types of flats are not in accord with social requirements in south-eastern Turkey, whereas livable conditions; such as the needs of city dwellers' to: micro-climate, noise and pollution protection, healthy living conditions, usage of ecologically safe construction materials are indispensable factors in a settlement. In this respect much can be learned from traditional housing, as this paper will show at the hands of a case study in Urfa (Turkey).

Urfa is an important historical town in South Eastern Anatolia -in the northern part of Mesopotamia (Figure. 1). Its climate is arid;

having a low relative humidity and high daily and seasonal temperature differences. The lowest temperature recorded in January and February is 2.9oC, and the highest temperature in July and August is 42.7oC. The prevailing wind is from the Northwest and West directions (Ören, 1996).



Map 1: Location of Urfa City [Source: IBS-Ankara, 2003].

Ecological design aims to maintain a balance with the natural environmental system as far as possible use favorable environmental factors to the maximum (Polui, 1992). In this context, Tony Dominski (1992) distinguishes three domains/stages in the evolution of an eco-city: to Reduce, to Reuse, and to Recycle. But, in this paper, the flexibility of physical, functional and social potentialities of outdoor spaces in traditional Urfa are tested in a hypothetical framework within these suggested three domains of eco-city. Moreover, the Dominski's three domains of an eco-city will serve as a framework to explore:

- The criteria of ecological sustainability in traditional Anatolian settlements;

- Issues/features to be learned for the planning and designing new sustainable settlements in Anatolian hot arid climates; and

- The challenge to the preservation of traditional settlements and their adaptation to city changing society.

However, the physical design criteria and features of ecological sustainable settlements derived from traditional Urfa will be detected to design and plan new settlements in hot arid regions.

Reduce

Hypothesis: The physical configuration of old Urfa city is constructed in a way to reduce the indices of climatic, social, functional, economic and energy saving.

The physiological comfort in hot arid climate buildings and streets had to be adapted to summer and winter conditions. Both individual and public spaces are shaded with building elements (Figure 1); and projected roofs provide shaded outdoor living spaces. The projected windows and projected rooms over narrow streets are typical features in Urfa, used, to provide additional shade and give inhabitants a chance to over-look on-and-along streets, which also provide security in the street. Such a public control on streets reduces illegal events from happening (Figure 2). Although the high heat storage capacity of thick walls reduces the impact of solar radiation, it is also necessary to minimize the exposure of exterior walls to radiation. Thus, it is one of the best solutions lies in planning compact buildings that provide shade to each other. Traditional houses of Urfa

have been built with heavy, thick walls of mud, masonry and stone (Figure 3). Whereas, the rooms are arranged so that they overlook the courtyard with its plants and water fountain, in which pleasant view is provided (Figure 17).

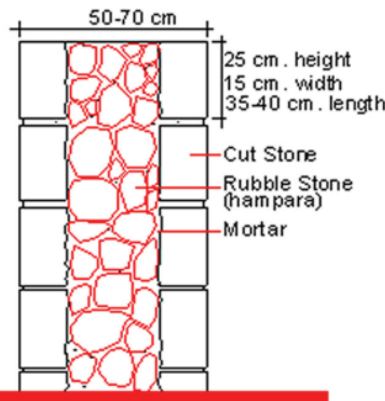
The courtyard, with its plants, is the source of light control, where shade is provided as the sun moves across the sky, and a portion of that light is used all day for indoor living purposes with a reduction in glaring absorbed by plant materials (Figure 4).



Figure 1: A street in Urfa shaded by buildings (Source: Authors).



Figure 1: : Projected rooms on Urfa public spaces provide additional shade (Source: Authors).



3.



4.

Figure 3: Section of a stone bearing wall (Source: Authors).

Figure 4: All Hayat (courtyards) bearing wall receive light all-day (Source: Authors).

In hot arid Urfa, natural ventilation greatly reduces daytime interior temperatures, which then closely follow the outdoor fluctuations, throughout the day. As the low humidity in the region allows an adequate sweat evaporation rate from the body even in still air, the indoor air movement need not be great to ensure comfort. Thus, these problems are controlled in several ways in Urfa such as:

i) The settlement is compact and well oriented to minimize the infiltration of south-eastern dust laden winds (Figure 5). The compactness of Urfa settlement and orientation of its spaces (Figures 5 & 8) reduce the probability of receiving undesired wind, thus, pleasant living is provided;



Figure 5: Aerial view of Urfa (Source: Authors).

ii) The building-complex provides shade and protection from wind hazards for public and private zones such as mosques, shopping arcades, narrow streets and courtyards. In case of large open spaces (private courtyard and public gathering places), trees and pergolas

play this role;

iii) The living habitats are adapted to cope with the hot wind and solar radiation problems. For instance, the minimum openings on exterior walls (Figures 10 & 24) reduce the day time radiation and hot wind; as shading and water elements, in the courtyards, reduce aridity/dryness, increase humidity, and cool the air in the courtyard space (Figure 17). Such a modified micro-climate provides comfortable zone for resting and sleeping in late afternoon. People, also, sleep on rooftops as well in courtyards during cool evenings and nights (Figure 6).

The most important function of ventilation (cooled by water, shade and plants) in the traditional Urfa houses is cooling the structure of building when the indoor temperature is above outdoor temperature. In case of a building is not ventilated, the temperature of the indoor air reaches that of the surrounding interior wall surface, because air has a very low heat capacity. Therefore, the interior air temperature fluctuates around the average of the external surface temperature (because of thickness of building structure). To increase ventilation within the house, wind catchers are constructed on top of the roof to catch the cool Northern and Western winds (Figure 7). These elements channel the air through air-canals to rooms and Eyvan/s (Figure 17). The term "Eyvan" is derived from a Persian word "avian", which originally meant "open place". It is a covered space, and closed at three sides, but completely open to the fourth on the courtyard (Yagi, K. 1980). Actually the Eyvan is a raised floor, serves as a circulation zone to rooms on its two sides, and it is used as a semi-closed living space (Figure 17).

The courtyard with its elements reduce sun radiation and reduce aridity/ dryness: sometimes two Eyvans, one facing the north to provide shade in the courtyard in summer, the other oriented to the south, receives solar radiation during winter. In addition, Plants, such as trees, and potted shrubs and flowers provide shade, pleasant odor and increase humidity in the courtyard.



Figure 6: Sleeping in courtyard (Source: Authors).



Figure 7: Cool wind catcher on the roof (Source: Authors).

In general, most streets of Urfa settlement are axially East-West and Northwest-Southeast oriented (Figure 8), to receive the prevailing wind of this region. Whereas, the North-South streets are rare and have to be meandered in all cases to prevent and reduce Southern sun radiation in summer (Figure 9). Hence, all these streets are partially shaded to reduce thermal gain in outdoor spaces (Figure 10).



Figure 8: Plan of traditional Urfa city (Source: Alper, 1986)



Figure 9: Meandering of a street provides shadings (Source: Authors).



Figure 10: Dead-end streets in Urfa (Source: Authors).

Shading the courtyards and other open spaces in the settlement (by both buildings-mass and plant materials) minimize heat gain; thus, reduce consumption of energy required for cooling during summer time. On the other hand, during winter, deciduous trees in courtyard, winter Eyvan-facing the south (Figure. 17), and windows of second floor rooms, are all exposed to winter sun and heat gain, which in turn reduces energy consumption required for heating during winter time. Therefore, families spend most of their daily-time in courtyards, which reduces electricity consumption in the settlement. Moreover, the compact form and narrow streets made Urfa a pedestrian car-free settlement (Figures 21, 22 & 23) minimizing distances, which in turn reduce fuel consumption, air pollution and other mechanical substances

that in turn minimize urban infrastructure costs (i.e. minimum amount of pipes are used for running water, sewage disposal, and pavement components). Furthermore, this compact form, of such a living environment, provides all essential human needs in a neighborhood (i.e. security, comfort ability and reliability, and spaces for social engagement). This engagement is provided actively by functioning in space with its element, and passively by enjoying a pleasant scenic quality (of fountain, plants and the ornamented columns and arches). Families and neighbors socialize in the courtyards, on the streets, and in the economically designed and shaded public spaces in the commercial core (Figures 11 & 19) which reduces space consumption in the settlement. And living in extended family reduces the consumption of

urban land, destruction of natural landscape, and the consumption of natural resources (i.e. water, soil, wood, stone, sand, etc.).

The dead-end streets (the prevailing urban element), in Urfa, provide shaded private spots (spaces) for comfort, relaxation and passive engagement for families and neighbors (Figure 10). Whereas, the public spaces are designed on the basis of private courtyards (in form and contents) with large shading trees and water elements such as a fountain pool and linear canals which run throughout and penetrate (underneath) the settlement for courtyard irrigation and climate modifying purposes. Whereas, seating elements are designed for active and passive engagement with space in the public realm. All these public space elements are subject to juxtapose commercial activities in Urfa (Figure 11).

In addition to providing shade in the courtyards, the variety of plants (olives, vine, citrus fruits, fig and pomegranate) provides fruit and food for the families. Also, planting-beds in these

courtyards serve as kitchen gardens, supplying seasonal vegetables for the family (Figure 12). Furthermore, agricultural crops that grow (in courtyards and around the city) are dried and prepared for winter use in the courtyard paved space and on top of the building roofs (Figure 13). This local food supplies, reduces the amount of money spent on food purchase, and creates small-scale local chain of food supply. In addition to agricultural activities for food supply, animal husbandry (i.e. chicken, sheep, goats, rabbits, pigeons, and alike) generally take place in large courtyards (Figures 14 & 21); which in turn reduces space consumption for these activities in the settlement.

This agro-food supply and animal husbandry in traditional Urfa settlement is relevant to the term stated by Dive, S. (2002) as "permaculture" (Permanent Culture) which is very good example of sustainable living that integrate aspects of urban structure design with natural flows of energy and natural principles. The term Permaculture in Urfa is a sustainable living style strives for the harmonious integration of human



Figure 11: Public gathering spaces in Urfa (Source: Authors).



Figure 12:Vegetation in courtyards (Source: Authors).



Figure 13: Food preparing and drying in courtyards (Source: Authors).



dwelling, micro-climate, annual and perennial plants, animals, soil, and water into stable productive communities.

Reuse

Hypothesis: Existing buildings (public and private), open spaces (courtyards, streets and public gathering spaces), landscape and other supplementary elements are still actively used in the traditional way or, can without major physical modifications, be changed to other uses. Therefore, old buildings and spaces in Urfa are fully used and reused in different manner in time and space.

The family private buildings and their related open spaces are reused to accommodate different functions. The roofs of these buildings are not only used for weather protection, but

also they are reused to accommodate drying food and clothes, night sleeping, roof gardening (Figure 15), and as view-looking terrace (Figures 15 & 16). On the other hand, the Eyvans (in courtyard yards) are used as living space in summer and winter; but spatially are reused for food preparation, seating, playing, sleeping, family gathering, and circulation between two rooms (Figures 6, 13 & 17).

The courtyard in Urfa is called “Hayat” (in Turkish) means ‘Life’. It is the most important family place in Urfa. Doubtless, “Hayat” is also the micro-climate modifier house-element. Therefore, all daily activities, practiced by the family, take place in this space. Hence, it is functionally a flexible spatial element which can be reused to accommodate different uses, such as, a playground for children, a garden, a place for family gathering, food preparing, vegetation,

washing and drying clothes, a place for animal care and husbandry (Figures 13, 14 & 18), a house circulation area, a welcoming entrance, a place for weddings and other ritual activities (Figure 19), a place for carpet weaving, and sleeping (Figure 6).

Among the public buildings, for example, Khans were historically used as hotels, stables and whole sale places. Nowadays, these buildings, with their courtyards, are transformed into shopping centers (Figure 20) and cafés (Figure 11). On the other hand, the streets of old Urfa are now fully utilized as multi-functional space, e.g.



Figure 14: Animal husbandry in urban Urfa (Source: Authors).



Figure 15: Roof garden (Source: Authors).



Figure 16: View-looking terrace (Source: Authors).

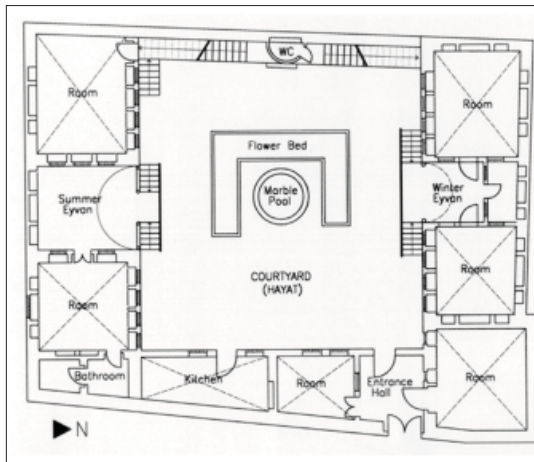


Figure 17: Layout of urban house in Urfa showing location of Eyvans (Source: Akkoyunlu, 1989).

public thoroughfare, children's play areas, wind channeling corridors, and, female neighbors' meeting area, especially in the case of Kabalti-under-bridge building over semi-public and private cul-de-sac streets (Figure 22). On the other hand, public meeting places are mostly used by the males of this community (Figure 11). Generally these men's spaces are juxtaposed with commercial activities (Figure 20), and reused to accommodate recreational and other public gathering activities. These spaces and activities are shaded by large trees and pergolas, and supported with cafes and mobile seating elements (chairs and tables) that can be moved with moving shade throughout the day. In all of the cases, these naturally climatically modified places over-look on pools (fountains) and water canals (Figure 11). The plant materials, in both private courtyards and public gathering spaces, are multi-functional elements used as natural visual elements, fruits supplier, shading and climate-modifier elements. However, fountains, wells, water canals, pools, and similar elements (Figure 11) are still being used for various original purposes, such as: recreation, climate-modifier, water supplier, etc. Hence, when these urban elements come altogether in

a settlement (as in case of Urfa), they are used and occasionally reused to serve human needs, climatic requirements, and improve the quality of life in the settlement.

Recycling of Spatial Attributes Over Time

Hypothesis: The traditional Urfa provides flexible settlement pattern which allows recycling of space once it has become dysfunctional while the overall settlement pattern and its environmental and social functions are maintained. It is a matter of recycling of spatial attributes over time as:

Daily and Seasonal Cycles of Indoor and Outdoor Use of Space

Among the climatic factors, sun radiation plays very important role in cycling the usage of both private and public spaces through time (daily and seasonal). The shaded spaces are the most desirable spaces, to be used in summer time of Urfa. Activities change location over space as sun moves in the sky, and so does shade in space. The same thing can be said when spaces receiving sun in winter. Therefore, the settlement pattern, in Urfa, is so dynamic and



Figure 18: Drying/washing clothes in courtyards (Source: Authors).



Figure 19: Weddings in Urfa, always take place in courtyards (Source: Authors).



Figure 20: Open and semi covered shopping places (Source: Authors).



Figure 22: Streets for multi-use in Urfa (Source: Authors).



Figure 23: Winter use of streets (Source: Authors).

flexible to receive sun in winter and to provide shade in summer.

The shaded ground floor of the building is fully used in daytime during summer (Figures 6, 13, 16 & 17). Whereas, the second floor and building's roof, mainly, are not used in the day times, because they are exposed to sun in summer daytime. But to enjoy evening breezing, these spaces are fully used in summer evening for sitting and sleeping purposes. On the other hand, the north facing Eyvan is fully used in summer, whereas the south facing Eyvan is used in winter for sitting, sleeping, working, and eating and food preparation (Figure 17). Therefore, the Eyvan (as a courtyard element) is cyclically used over seasons. On the other hand, plant materials play important role in modifying climate in the courtyard for such daily and seasonal cycling of using courtyard space (Figures 4 & 12), where the deciduous trees allow sun rays to heat the space in winter and provide shade in summer.

In the public realm, the shaded portions of streets are fully used in summer (Figures 1, 9 & 22) for pedestrian circulation, meetings and

children play activities, while sun receiving parts are totally unused in the this time. In contrast spaces exposed to sun, in the streets, are fully occupied by pedestrians and playing children in winter (Figure 23). On the other hand, the market place in traditional Urfa is a unique one. Its uniqueness is in its physical and architectural structure in relation with outdoor spaces and climatic constraints. It is composed of closed covered and open parts.

The shops have two display windows on opposite sides. One looks to open courtyard, and the other looks to vaulted corridor. In rainy and summer times, the vaulted corridor is occupied by customers and displayed items and goods for shopping purposes. Whereas, the sides opened to courtyard, are used in summer and spring times for the same purposes (Figure 20). Therefore, space is not wasted and the cyclical use of spaces is possible throughout the year in historic city of Urfa.

Long-Term Re-Cycling Use of Space

Usually, urban open spaces and architectural structures witness certain physical modifications

with the changing social and economic developments. These modifications range from radical to slight physical changes. But when physical identity stays constant (as a factor), functions change (as a variable) with these changes and developments in the long term. The settlement pattern of traditional Urfa adapts to changing social, economic and environmental conditions in the private realm (houses) of the settlement. And physical structures and functions/activities were able to cope with these conditions in the long term of changes. On the other hand, functions/activities changed in the public realm with changing social, economic and technological requirements in the long term of these changes; while physical pattern/structures were constant without any modification that can be mentioned. For example, the Khan (Caravanserai) structure used to be constructed to host travelers and trade-men with their animals. Meanwhile, these Khans serve as hosting, commercial and workshop activities. Pensions are in the second floor over look on Khan's courtyards and fountain. The cafes, bars, shops, handcrafts workshops take place in the ground floor of the Khan benefiting the openness of the courtyards, shade, water-fountain and vaulted corridors of the Khans (Figures 11 & 20). The animal places of the khans are, now, converted to car/motorcycle parking and storage areas. Other public and large buildings nowadays are fully used as pensions small hotels and restaurants. Where as public streets and thoroughfares are perfect spaces for walking, strolling and communicating for Urfa inhabitants and tourists. These outdoor urban spaces became as spaces in which people can enjoy outdoor life and pleasant atmosphere that the traditional settlement pattern of Urfa provides morally, visually and physically in the

long term. The public spaces and structures in addition to private houses/streets are and used to be the most desirable living environment. Hence, such a traditional pattern (of Urfa) is a very good example to answer all ecological, spatial and social requirements in a settlement. Moreover, the continuous use and occupation on spaces of such environment explains its sustainability and the recycling usage of spaces in both short and long term of recycling of spaces.



Figure 24: Harmonious co-existence of natural soft and hard materials (Source: Authors).

Conclusion and Remarks for Sustainable Settlement

The traditional settlement of Urfa provides continuous usage of spaces in daily, seasonally and in long term, in both indoors and outdoors in addition to preserving cultural heritage of this area. An aerial glance on traditional Urfa (Figure 5), or walking down in its streets, explain that the built-up environment is designed together according to climate-requirements, use of natural resources and cultural heritage of this region. The respect to nature is reflected in the use of materials, colors, man-nature balance, and in the pleasant appearance of the built-up environment (Fig. 24). The ecological living in traditional Urfa provides not only sensitivity to nature with its components, but also it provides a Permaculture (Permanent-Culture) that deals with food production and animal husbandry. In addition, both the indoor and the outdoor spaces of traditional Urfa are flexible enough to answer different living conditions in different time periods (morning, evening, seasonal and occasional) without deteriorating the quality of urban life.

Meanwhile, there are developing trends in the developed countries to rediscover traditional and indigenous construction techniques, material, and methods to provide ecological, sustainable, healthy, and living environment. The settlement pattern and criteria of ecological sustainability in traditional Urfa are very good examples to be considered in providing such living environment. These criteria fit not only the region of Urfa, but also the region of Southeastern Anatolia and hot arid regions of the neighboring countries (Syria and Iraq).

The construction materials (i.e. mud, masonry and stone) must be seriously considered in the production of manufactured construction materials. Such materials play important role, with other design elements and criteria, to moderate the climatic conditions of the region. As considering such construction materials, construction methods and techniques must be considered to reduce solar radiation and heat gain- and-transmission in this hot arid region. The compactness and orientation of settlement must be considered to provide shade in open spaces, which will reduce the consumption of materials in construction and shading private and public spaces. However, to provide pleasant living, compact form and orientation of the settlement, also, reduce the probability of receiving undesired hot wind. The width of streets must be considered for the same purposes. Whereas the streets in the settlement layout must be East-West and Northwest-Southeast oriented to receive the prevailing wind of the region. The indispensable North-South streets must be meandered to prevent Southern sun radiation. Efforts must be done to design pedestrian streets as much as possible to provide car-free settlement to lower air pollution and to increase safety in such compact settlement. Spatial qualities must be enhanced in semi-public spaces and dead-end streets to encourage neighbors to socialize, and to maintain privacy in outdoor.

As architectural design criteria, projected roof, rooms and windows (over-look streets) will provide not only shade in outdoors, but also public control on streets and other public spaces; which will, in turn, provide security in a settlement. The minimum openings on exterior walls must be considered to maintain societal-

religious requirements, and to reduce daytime radiation and hot wind. Cool wind catchers must be constructed on roof and well oriented to catch cool Northern and Western winds to be channeled through vertical air canals to cool and ventilate rooms and interior living spaces.

Plant materials (i.e. trees, shrubs, potted plants, flowers and ground covers) must be widely used to increase humidity and to provide shade in private, semi-public, and public spaces. Public gathering spaces must be shaded by large trees/canopies to provide shade, and maintain identity in these spaces. This will encourage people to meet and communicate. Such spaces must juxtapose commercial activities to increase the livability of spaces for security and recreational purposes. All the above-mentioned plant materials must be edible landscape elements; where, kitchen gardens, community gardens, and even city farms must be designed in the settlement to enhance the sustainability of the community. Animal husbandry (i.e. chicken, sheep, goats, rabbits, pigeons, and alike) must be considered to reduce the amount of money spent on food purchase and to create local chain of food supply. The roofs of buildings must be of multifunctional to dry food and clothes, night sleeping, roof gardening, and view looking terraces.

Courtyards with plant materials and water elements must be designed among buildings (as semi-private/public spaces) to increase the definition of clustered communities. The courtyard (with its shading elements) concepts are considered as an indispensable open space element in South-eastern Anatolia. It is the most important family place in the region. It is called "Hayat" (in Turkish) means "Life",

where all daily activities of female and children take place. Economically, it is not wise to design such courtyards in each house unit (as in old Urfa), but it can be more communal. It can be designed as flexible spatial element to accommodate different uses, such as, children play, garden, gathering, food preparing, vegetation, and place for weddings, and ritual activities. This space will increase the livability among residential units.

Water is another important element in hot arid region. It is originally used for different purposes, such as, climate modifier, irrigation, visual and sound elements for relaxation and drinking. It is also, historically, used in different forms: pool, fountain, well, canals, etc. Therefore, water element must be designed for the same purposes to provide and ecological sustainable living environment.

Last but not the least, spaces, buildings, and construction techniques must be subject to adapt climatic, social, economic and technological changes through time periods of daily, seasonally and long term. Doubtless, there are many things to be learned from indigenous and traditional settlements in the region of Anatolia for the sake of providing peaceful and livable environments.

As final note, Traditional Urfa and its squatter-vernacular settlements have to be critically analyzed not only by city planners, architects and landscape architects, but also by urban sociologist and economists, to provide clues for the designers who are about to provide eco-, geo-, and sustainable urban environments.

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