

**ECOLOGICAL ROLE OF GREEN ROOFS IN SUSTAINABLE URBAN DEVELOPMENT****DR. MAHDI VATAN PARAST<sup>a1</sup>, DR. HAMID SAREMI<sup>b</sup> AND HADI SHOKOHI<sup>c</sup>**<sup>ab</sup>Quchan Branch, Islamic Azad University, Quchan, Iran<sup>c</sup>Department of Geography, Shirvan Branch, Islamic Azad University, Shirvan, Iran**ABSTRACT**

Urbanization extension, the need to increase residential areas and pathways and non-normative constructions gradually phased causes reduction lush and vibrant green spaces and natural environments in urban communities, particularly in the macro cities and central areas. Given the importance and need for green space in urban residents' physical and mental health, In recent years several approaches has been thought to compensate for the shortage of urban space in different countries Structural Engineering .One of these strategies is also taken into consideration since long time in our country Iran is to create green space on roofs or green roofs (Roof Garden). The high added value of land and lack of urban green space' area in Iran caused that using of green roof technology in Iran be suitable and useful choice metropolises of our country due to improved quality and sustainability of urban environments. The matter of green roof system in our country is not new but it is a new idea that its related benefits are limited to large and unlimited use of them. One of the solutions for wide implementation of green roofs system is to define and analyze the form of sustainable urban development policies. In order to justify the green roof system in our country Iran. Approach to scientific research - applied research methods, descriptive and analytical. Green roofs, green spaces, urban gardens, green systems, sustainable development. This article has been conducted based on studies and documents of library and published articles in this field and its object is making use of the urban sustainable development criteria in order to make green roof system justifiable in our country, Iran. The approach of this study is scientific - applied research and its research method is descriptive and analytical.

**KEYWORDS:** Green Roofs, Green Spaces, Gardens, Urban Green System, Sustainable Development

Urban green space development and their correct, reasonable and fair distribution in the cities, especially in urban centers, In a manner to be appropriate to the urban construction is considered to be one of the major challenges of contemporary metropolises, Since the urban green and open spaces are often seem free of direct economic values , contractions extension that has huge profit and benefit in the local and government sector investment in short time has been caused upward increase in the rate of land use in service to economic interests in short-term and urban green spaces development compared with other investments enjoys of less funding support (Organization of Tehran Municipality's Parks and Green Space, 2010).

"Green Roofs are a viable ecosystem which provides a favorable environment for the urban milieu and urban residents and makes it more efficient and stable."(Meyer Kohi, 2010).

Bringing greenery and even effective to homes roofs in the cities means creation of green area, elegant, semi-public (shared) for residents of that building that in this way the quality of life (the satisfaction of environment ) rises. (Proficiency Social Science website).

The applied use of green roofs of buildings in cities shall be deemed as optimal utilization possibility and more better, suitable of urban lands.

Therefore can make gain of unused space on the rooftop where always exposed to sunlight at a low cost to create a garden. (Organization of Tehran Municipality's Parks and Green Space, 2008).

Land for urban green space creation in cities is scarce and very expensive; one of new ideas to recover for this shortage and meet human needs to urban green space is the strategy of green roofs and green facades creation. Green roofs and facades including environmental technologies that shaped influenced by natural processes and have been considered in many countries of worlds in recent years and cover the units with residential, office, education, healthcare, tourism, entertainment, and sport and Pilgrimage usage in urban areas.

In fact, the green roofs and urban green views of city is part of managers' effort and endeavor to built cities area sustainable and one of the modern solutions for resolves urban environmental problems. (Razavian & others, 2010).

Green roof is made with objective of changing dead space in to a dynamic space. These roofs have effective role on urban ecological efficiency and favorable quality creation to urban life. (Bagh Nazar Research & scientific Journal No. 20, 9<sup>th</sup> year, 2012).

### **Green Roofs Definition**

A green roof is a roof of a building where its all or some part is covered with herbs that be planted over a waterproof layer. The roof may include additional layers such as a drainage barrier root, or irrigation system. The term green roof refers to the environment's issue and will not be included the roofs that only their color is green. (Wikipedia, the free encyclopedia). Green roof is actually the roof that plants grow on its surface.

Plant diversity of such a structure can be of the roof covered with artificial grass so that be roof garden, that is covered with plants used in landscape design.

To green roofs need plants that can opposed against the harsh and tame environment of roof and in the conditions of dehydration, freezing, storms and....etc.

A green roof implementation detail is not much different with conventional roofs and consists of wet – thermal insulation, waterproof coatings, sand, and Suitable caps.

Green roof projects require materials and components that enable maintenance - drainage of moisture and provide plant maintenance according defined standards in the building (Razavani & others, 2010).

### **Development**

Development lexically, including similar meanings, such as social change, social growth, social development, modernization and progress.

Development in the Moin Persian dictionary means expanding and spacious. It also means leaving of ((wrapper)). In terms of modernization theory, wrapping is the traditional and culture society, and its related values that modern societies for being modernization should be existed from the traditional stage. (Azkia, 1985).

Development in its today's meaning was common among communities that, increasing class divisions has found more accelerated with mechanized industry and This process soon spread to the extent flooded communities (Ghadiri Aslai, 2006).

The development is a process and ultimately leads to the values and these values are relevant to the people who want to follow the development process. (Masyra, Shibar, shobir, 1987).

Development can be considered living level evolution and reaching to the ideal conditions in the area of Economic, Social and Cultural that will bring realization concepts of freedom, justice, social dynamics, human development and economic growth, social and cultural rights. (Zahedi Asl, 2002).

### **Sustainable Development**

Sustainable development is development that consistently meets the needs and is considered the individuals satisfactory along with enhancing the quality of human life (Robert Allen, 1980).

World Commission on Environment and Development (WCED) defines sustainable development as a paradigm of development that meet human needs without destroying the ability of future generations. (Jennifer. A, 2000)

The term sustainable development was born in decade of 1980, in which the actual adaptation of human societies actions interaction with the environment and nature, and building an environment in which people live lies. (Jennifer. A, 2000).

The concept of sustainability plays a major role in the survival of a city and since long time that a new concept has been entered in matters of urban development policy to achieve a sustainable city. (Azani, 2005)

### **Urban Sustainable development**

Theory urban Sustainable development is provided in order to protect the natural resources. Theoretical principles of this approach is proposed in direction of maintenance of current and future resources through optimum use of land and entering waste to non-renewable resources. (Blowers, 1994).

Peter Hall defines urban sustainable development likewise: the developments of the A form of modern development that guarantees sustainable development of cities and urban communities of future generations. (Rahnama&, Abbaszadeh ,2009).

Sustainable urban development , is a development that respond to the needs of the population , so that it is ensuring the survival and durability , while

water, soil and air, i.e. three important elements that are essential for humans do not be polluted and unused.

In terms of spatial, sustainable urban development means a changes in land use and density levels to meet the needs of residents in the areas of housing, transport, leisure and food to be taken up so that over time keep city habitable living and viable according to environment and continuance in economical point of view and maintain socially cohesive (Blowers, 1994).

### Green Roofs history

Roof garden design and ideas and cultivated plants on them since ancient times by the Iranian since 2,500 years ago and has been used on the roof ziggurats and up to 600 years BC was built in the Hanging Gardens of Babylon by the Babylonians. After that it used has been used till hundreds of years ago, especially in Western Europe.

But it's still its formation method in the local climate is not well recognized. In the Middle Ages and the Renaissance also the instances green roofs garden have been developed in the countries of France and Italy that mostly formed by government and in public buildings. In 1600 a German converted his house's terrace into gardens and till 1875 terraces and rooftops in Germany and Russia have developed into gardens and green spaces. Although roof gardens dating back many centuries in Scandinavia, but the new method with the progress of this roofs was developed in Germany in the 1960s and it has since developed in many countries. At present 10 percent of the German roofs includes of green roofs. (Yazdani & others, 2011).

The beginning of applied use of roofs spaces, dating back to the late 19<sup>th</sup> century and early 20<sup>th</sup> century. With the urban construction acceleration and increasing in urban land prices in cities such as New York design and idea of practical use of roofs space, especially in urban centers as roof garden and green space was evolved.

The history of green roofs and vertical gardens goes back to the Hanging Gardens of Babylon and the Roman Empire, and in response to population pressures in urban areas. (Nharly & others, 2011).

Romans also put trees over the tombs of Augustus and Hadryn. During the Renaissance also terraced gardens like steeper and green roofs have been

existed in the city of Genoa. In Russia of 17<sup>th</sup> century, upside down gardens in Kremlin has been considered, and in the 20<sup>th</sup> century AD, the houses were decorous and adorned by vertical gardens and roofs with green spaces in Tashkent, Tbilisi and Dushanbe and even St. Petersburg Airport.

Le Corbusier and Frank Lvydrayt were the first thinkers and advocate the modern use of green roofs or balconies as functional green space.

Le Corbusier was the first person who used green roof in the 21<sup>st</sup> century. Since the early 60<sup>s</sup> in 20<sup>th</sup> century, taking into consideration for environmental quality in urban textures and environmental challenges in large cities, especially in the central areas of cities, revealing the phenomenon of heat island and urban energy crisis, a new wave of approach to the green roof on the new concept of present-day all have been began from Northern Europe. Parks and green spaces organization, Tehran, Iran, 2010).

We are witness of Green roofs quantity expansion in Germany in the 80's in urban scale, in such a manner that its annual growth reaches to 15 to 20 percent. In 1996, only ten million square feet of green roofs were built in Germany. The most Share of this growth rising is beholden to a law passed by the government's allocation of credits and subsidies to municipalities for the construction of Green roofs goats on the roof of the urban buildings. According to statistics for year of 2006 over than 75 municipalities of cities in European countries have arranged plan for municipal green roof and their slightly extension at the municipal level to plan and to execute the instruction Green roofs in urban areas has became in the implementation order.

In the Austrian city of Linz to construct green roofs for residential and commercial units with roofing surface of more than 100 square meters became compulsory.

In Asia the country of Japan and particularly Tokyo in the category (construction of green roofs) has been pioneer. So far in 2001, legislation was enacted in Tokyo, which buildings with more than 1000 square meters must allocated at least 20% of their roof area to green space. City Authorities are planning over the past 15 years with this law create the amount of 1,200 hectares of green space on the roofs of buildings. But with the

current pace of work may be done during the next 12 years. (Nearly & others, 2011).

In Iran also is considering the historical background use of brick and mud in architecture of Iran moss and lichen covered and all kinds of plants on the roofs of various buildings of different states in Iran like Azerbaijan, Mazandaran and Gilan, has been used in mountain areas and villages that it's a typical is Masoleh village where the roof of lower houses is as patio of the upper house. Although green roofs in most European & Asian countries and north America as new and growing element have been emerged, but in many countries, especially in our country, Iran green roofs is considered as an unknown and strange element. Have been witness of some projects in this context in past but it has not been expanded and developed consistently.

**The world famous green roof - California Academy of Sciences – Renzo Piano**



**A view of the village of Masoleh-IRAN**



**Source: Manzar Intent journal**

In city of Tehran the complex ofomid town in the North East of Tehran (1976), which in its view of the

strip flower built where shrubs and a variety of plants have been planted and stored in it.

Also the green space has been created in A - S - P Building in northern Amir Abad zone and Shaid Hakim Highway (1976) in view of two sides and strip around of the roofs and terraces of its floors lavishly. And the jardinières or flower places have been designed and included in terraces of Nyavaran residential tower in about 300 meter of south of Nyavaran cultural house around this place in 13 flowers.

Although in the mentioned examples in Tehran city, the main problem of designing and creating green space with decorative non structural role is to create sustainable green spaces in the neighborhood, and a model for the development of green roofs. (Sharghi& Mohtashami, 2007).

In city of Mashhad the religious capital of Iran in its eastern part, also according studied Research in area of middle east the elaborative or detailed plan of this city that from the north to the Ghaem highway, from south to Vakil Abad Boulevard, from East to Azadi Highway, from West to the Palestine ,sadeghi Boulevard and Mousavi Ghouchani boulevard terminated. Due to the public uses with high and suitable level in primary review can be say that most of the buildings in the area have capability of green roofs construction in terms of the strength of the existing buildings. (Saeedi Rezvani& Moaref Dost, 2012).

Isfahan city the Islamic Iranian culture and civilization capital in central Iran, is also considered poor due to urban green spaces. The dry climate that its green space capita at present is 24 square meters this green deficiency can be compensated by green roofs and vertical greenery area. Vertical landscaping is an appropriate solution that the city parks and green spaces organization of Isfahan has been used.

Buildings, walls, concrete blocks are uniform perspective that only cause eyestrain of citizens and obstacles of Isfahan city from other side causes that could not provided vertical green space in all areas of this city where green space landscape at present, is a solution that Isfahan municipality has adopted.

So far about 10 public buildings such as Farshadi parking - Court Bar Association and 8 Sanitary services of City level were selected as a pilot and sample and It is also supposed that municipality implemented a

construction project of green area on the Johan Nama large organ in order to create green roof, walls and green facades. Also the walls of Highways to do this project has been considered and growing of multi-walled garden of flowers is placed on the agenda too, so that In addition to the appearance view the existing pollutions in this city somewhat be reduced. Also it is supposed the largest landscaping projects built on the roof of the Municipal Center parking coming soon and be open for public use. Leveling this area with urban passages and the lack of

distance between the surfaces of the earth is one of the defining features of this project. ([www.imna.ir](http://www.imna.ir)).

The plan includes street network - Landscaping - Waterfront and four gardens. Create this plan is in form Persian gardens and along Chehel sotun of its another features)

He largest green roof of Iran in Isfahan the roof of the municipal central parking



Source: ISNA News

### Green Roofs Types

Garden roofs or green roofs base on operating system, depending on the cultivated depth and extents of needed plants are divided into three main categories as follows:

- Wide System (Extensive)
- Focused System (Intensive)
- Box Planter System

#### Wide- Extensive System

1. These roofs do not require much maintenance. Require little watering.
2. They are covered with moss, grass or creeping plants (progressive).
3. They are including one or two types of plants only and are shallow planting environment.

4. This system is used for time that at least once weight is far more fashionable.
5. This kind of roofs like Norwegian grass are built on flat steep roofs.
6. In These roofs Plants are used with deep roots of 40 to 100 mm.
7. Dust cover, soil height is between 50 to 100 mm.
8. Ultimate load of approximately between 50 to 100 kg per square meter is saturating.
9. They can be installed on any type of roofs.
10. These types of systems are very convenient in industrial structure.
11. This type of coverage has efficiency where does not required to be in ace.
12. It is recombined regarding sloping roofs and most places the slop of 10 to 20.
13. In the slope exceeding 30 percent requires the use of anti- wear is worn and tools. (Razavi et al , 2010).

**Typical extensive green roofs: Children's Hospital, Florence, Italy**

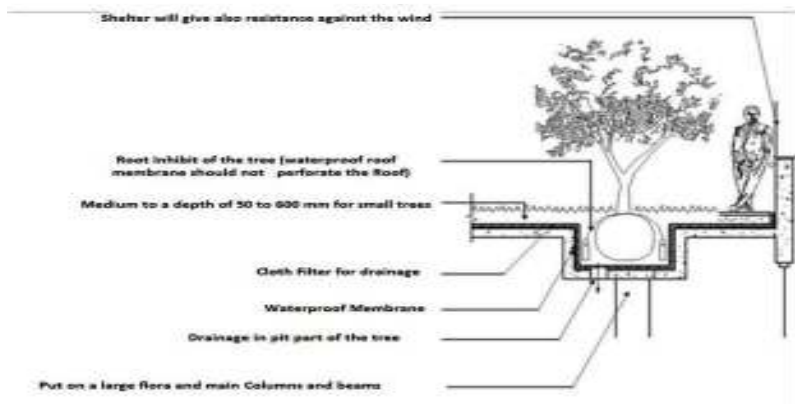


Reference: (a site Landscape Engineering, Islamic Azad University, khorasgan branch- Isfahan, Wikipedia)

**Green Roof System centered: Intensive**

1. This system oppose to Extensive System need to handling, irrigation, fertilizer and other maintenance and consideration aspects.
2. It is mostly alike the parks where their Access is easier.
3. This type of green roof consists of different types of plants are designed similar to a theme park.
4. These systems are required conventional deep of soil to grow large plants and common grasses. (Between 150 to 1500 mm).
5. Some of these roofs consist of large trees and water views that this matter particularly for the roofs where also have public access need to the building structure fundamental strengthen.

Typical green roof centralized on Chicago's City Hall – Details of centralized green roof implementation



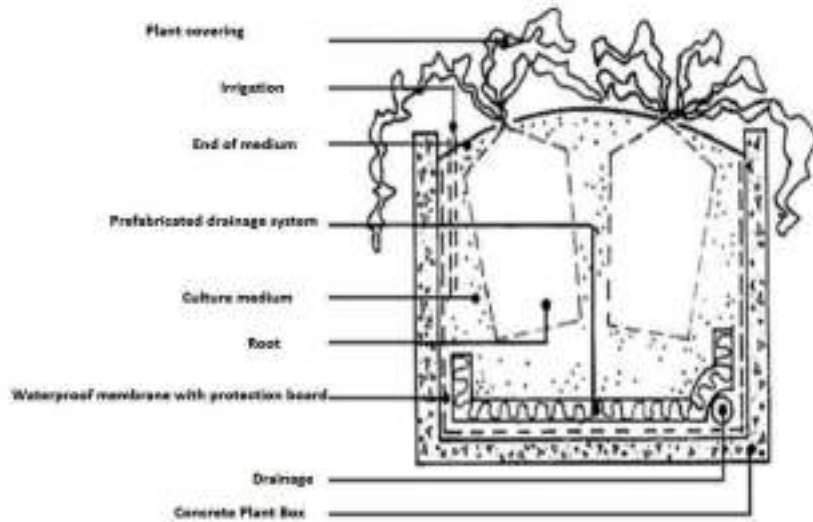
Source: Wikipedia

### Planter Box System

1. Using this system, on the roof of the buildings is useful where roof garden they do not have the functionality.
2. The irrigation in this system will be possible by a simple irrigation drip.
3. This type of system is much more appropriate for buildings that are individual ownership.
4. In this system, herbs are planted and kept in special box that covers all or part of the roof.
5. Planting environment of this system is discontinuous from green roof system.
6. This system does not require to roof insulation and due to less pressure building can be a Suitable alternative for centralized green roof systems.

### Green Roof Box Samples

Source: (Arg Iranian website)



### Green roof component

The overall classification performance of roof gardens (green roofs) is as follows:

**Plant layer:** Given that green roofs are lightweight as possible, designed, they often include a cover that can grow in the middle and low maintenance or no maintenance to grow in little depth of soil with low attention and or even without care.

**Growing medium:** Growing medium is Spaces in which the plants will be grow and developed. Medium should be light and its weight should be about 900 kilograms per cubic meter is case of wet.

A suitable simple mixture consists of 1/3 Sand and 1/3 porous rock and 1/3 artificial humus and

containing manure wood vegetable decayed broth, constitutes suitable Medium.

**Drainage layer:** This layer is placed between the medium and the protection layer to allow water can flow into the drainage system of building wherever of green roof. Including 35-50 mm poly ethylene (Recycled material available) with glass wool on it.

**Protection layer:** This layer consists of coverings that protect roofing and insulation system from leaks and water penetration.

**Roof construction:** Roof Membrane or damped insulation layer that protect the roof from water dripping and leaking. Membrane used in form of waterproof

monolithic layer and also in shape of interconnected sheets. (Yazdan Dad&others, 2010).

### Green roof systems

Green roofs irrigation are provided in two methods i.e.:

1. Artificial irrigation, in this system that used manual and automated methods in both the approaches adequate moisture is supplied for soil and roots.
2. Natural irrigation (rain water), in this case, the excess water to the damp of soil stored through the drainage layer and water purifier and it does not need watering again for relatively long period.

### Plants used in Green Roof

For Green roofs construction should use of the plants which their root system do not hurt the building. The use of plants in mountainous areas that have strong roots can cause damage to the gradual destruction of the building and handling injuries to it. Like Zhoni Prussia and Softwood trees because of including vertical roots, need more depth, because of reason also crossed from small cracks in the building and will be its gradual degradation. Of plants such as Kiwi - Clover - Chpqq (Caspian - rodbari - Zagros) - Wallflower - papytal ( has climbing stems and is very tolerant and shade-friendly) - weed called hops rising in the north of Iran and grows in the Arasbaran forest - hair glue (evergreen climbing shrub) - grape - grass seven points - and ... ([www.greenroof.ir](http://www.greenroof.ir)).

### Green Roofs Benefits

Addressing to this technology can be considered the largest positive environmental changes and the most important urban achievements to reduce pollution and temperatures in major cities. Vertical green space development of European homes and town houses with using roofs planting save energy about 100 million dollars annually. In the European countries, most of citizens have found that potting on the roofs of their homes reduces heat and temperature especially in the hot season.

Studies show that the roofs where have been potted the flower do not absorb more than 77 Fahrenheit degrees, whereas the usual roofs without potting absorb heat up to 140 ° F and a therefore because of absorbing less heat are effective to reduce air pollution and amount

of energy consumption. (Dabbaghian & Hoshmand, 2009).

### Advantages of using of Green Roofs on Buildings

1. In dimension of ecological and diversity protection.
2. And habitat creation - urban life quality ecology improvement.
3. in climate dimension, adjusting for the effect of urban heat island, cooling affect - reducing the effects of wind and cold insulation.
4. in the quality of the urban environment dimension: improving air quality (refined aerosols) - exchange of oxygen and carbon dioxide - noise reduction (soundproof) - reducing rainfall runoff volume (retention level waste) - Increase Quality prevent water pollution - reducing electromagnetic radiation by up to 99 percent.
5. and economic – cultural dimension : reducing the cost of artificial ventilation (cooling in summer) - Increase operational lifetime of the roof insulation - Recreation and Health (increased life span) - increases the sense of space - saving energy ( insulation in winter) - create additional green space ( Naherly&others,2011).
6. Improving the landscape around the building.
7. The height of the plants on the roof caused drying of the roof.
8. Reduction of roof temperature from 60 degrees to 25 degrees.
9. It will play a major role the relaxation and mental and physical health of urban residents.
10. It makes possible cover roofs quicker than any other construction in sizes up.
11. The Green Roofs System (green roofs) is designed in manner that their lower layer acts as insulation, drainage and prevents root penetration into the roofing. Thus garden without watering can to stay healthy and vibrant for a month in the summer, and its Maintenance and inspection can be up to two times a month. ([Www.greenroof.ir](http://Www.greenroof.ir) & [www.daneshju.ir](http://www.daneshju.ir)).
12. Increased life span and provide a consistent and pleasant environment for users of buildings (Tofan, 2007).
13. needless to much watering and caring. (Mozaffari, 2010).
14. Reducing the urban heat effect that the green roofs also cause to regulate temperature and reduce the urban heat island. (Soflai&Rahimi, 2006).



The main benefits of green roofs include: increasing energy efficiency, improving air quality, reducing the heat island effect, adjust the temperature, storing floodwater and increase roof life.

#### Costs related to the creation of green roofs

A green roof, which is designed and implemented fundamentally according to the regional climate, buildings type, system used (Planter BOX, Intensive, and Extensive) and plants that can be grown will cost on average 5 to \$ 35 per square foot. ([www.naturalheritage.com](http://www.naturalheritage.com) Blogfa.com).

We will not face to any problem regarding cost to create green space on the roof since our first objective is the green space **creation**. Even we can use of plants such as alfalfa that has not certain planting and maintenance cost, While can grown the species such as tomatoes and peppers in this environment that has its own beautiful product. ([www.greenroof.ir](http://www.greenroof.ir)).

The costs of constructing and equipping a green roof are not that much high and probably allocated less than 5% of the costs to itself. While that whatever the number of residential units in a campus who have attempted to construct a green roof is more, its costs are divided among more families and will have less financial pressure into every household.

#### Disadvantages of green roofs

1. The maintenance issue of constructed green roof.
2. The need to strengthen the existing roofs structure to establish green roof so that, in fact, most of the roofs are not designed for human presence.
3. To adapt the design these roofs the climate conditions of working area will be unsurprisingly difficult.
4. Green roofs require to an acceptable yield, most of the existing roofs due to the weight of the load requirements of soil and plants are not suitable for having a green roof. ([www.archnoise.com](http://www.archnoise.com) & [www.sefidbam.ir](http://www.sefidbam.ir)).
5. The disadvantages that occur over time include: spill - settling of fine particles of soil and soft - creating a drainage problem - hardening of the soil surface crust - creating a pool - damage to the filter layer - infiltration and gradual penetration of plant roots and planted trees on roofs - thick and heavy roof. (Yazdani & others, 2010).

#### Sustainable Development and Green Space System

Sustainable development is a new area that pays attention to politics and culture at the same time and also emphasizes the economy -business and industry. It has supported environment and coexistence with nature and protect the equal rights of humans and deals to domestic and international affairs, Development is a comprehensive and multi-dimensional issue that is applicable not only in the economic area, but also consider quality extension of the of human life, the environment and changes in cultural vision of people. Development in the 21st century achieves the desired results if goes beyond the quantity level and create profound changes in community organizations and intellectual vision.

If these changes be Institutionalized the aspects of public participation in the planning system will be guaranteed.

Green architecture, green roof systems also has been defined in direction to the fundamental objectives of the sustainable development, while include sustainable development roots will follow it's contain components. (Keshtekar & others, 2010).

#### Green Roof Systems and Sustainable Development's Elements

The sustainable development consists of three pillars i.e. Development sustainability, economic sustainability, social sustainability and environmental sustainability.

Economic sustainability: To maintain and improve the current state of the economy without natural resources are destroyed. that this stability causes:

- I) Reduce the cost of repair and modernization: Insulation life increases with help of green roof.
- II) Energy Production: That green roofs reduce a building's energy exchange. Plants convert heat and soil moisture through evaporation to moisture that this process leads to cooling of buildings and cooling inside buildings reduce reflection of heat and the speed of heat loss in cold weather is dependent on the moisture rate of content layers. An extensive green roof will increase 25 percent insulation on average. (Szewczyk, 2003).
- III) Flood Control: Green Roof System reduces gill and water drainage up to rate of 10 to 50% and the rest of water also at other times will drain. Use of this

system reduces drainage channels about 30% and remaining of water from shallow channels watered plants green roof and about 30 % of remaining will be refined and goes to deeper channel and 40% immediately by evaporation through plants found its way, to the atmosphere and noting will be left on land.

- IV) Use Location: Green roofs are provided additional spaces for activities which this matter in large cities where are flooded of buildings, cars and populations are essential. Due to the high value of land prices in metropolis of Iran especially Tehran this is a very important advantage of using this system.
- V) Social sustainability: Human and human communities are basic pillar of sustainable development. The goal of sustainable development is the comprehensive development that cannot be possible without social development. Social development is emphasized on the objectives, such as cultural identity - social cohesion - organizational development - Citizen Participation – human empowerment and enabling mobility. The overall goal of sustainable development is to achieve a dynamic and lasting community that this matter is not possible except environment protection . (Del Barrio, 1998). Green roof construction leads to job opportunities creation.
- In public Green Roofs are allowed the possibility of cultural and information exchange between residents of the building .Children in constructed green roofs can play in the , adults could exercise and old people can get rest without any disturbance and sound in green and flowered spaces.
- VI) Environmental Sustainability: This sustainable emphasis on use reduction of natural resources and non-renewable energy wasting energy prevention - reducing waste production and stress on reuse and recycling of waste – using materials returnable to nature and reducing pollution in agriculture and industry . Environmental sustainability is important in relation to architecture and environmental issues that are threatening the human future and forced architects forced to remedy. (Elliott, 2006).

A city can be healthy the considerable area of urban environment allocated to parks particularly to gardens and in it significantly to the urban environment, will be and in environment, cleanliness along with the of acoustic and biological cycles are given more importance.

## **Sustainable development agents and their role in the development of green roofs in Iran**

### **Government**

Governments bounded to follow the sustainable development components of at all levels of programs and policies. Governments in third world countries are able to assume the leadership role in the field of sustainability. Governments are able to grant legislation Favorites in line with current sustainable development and social mobilization at various levels of community giving. Governments can help to stimulate the private sector directly and indirectly by creating favorable conditions to in this area.

Without government support and mobility as the most important factor for sustainable development, cannot guaranteed the national development, endogenous, balance and stability in third world communities. (Perry, 2003).

Governments can, in some cases, installing green roofs in form law like land that has been unused and have green space usage - areas that are in pollution crisis, - factories – workshops and all buildings and residence that are polluting the environment- All buildings and facilities related to the organizations responsible for landscaping, environment, and related agencies- grant special support such as roofs superior plans of green roof or encouraging Associations of the Environmental lovers. And the creation of base to design and implementation class park with green space standards in areas where faced with high density.

### **International Organizations**

International organizations with a vision to the future world that in the light of globalization will have a greater role in their determination and our country Iran also in the areas of capacity making for a new challenge in another momentum planed and with enhancing the communications with the international organizations can play important role in area of necessary technology development same as green roof.

### **NGOs**

These organizations have vital role in organizing and realization of participating democracy these public institutions in order to be free from the bonds of a very fertile field of informal activities have found the suitable atmosphere to contribute to the debate on sustainable

development .public organizations that acted in all level of local as well as international are enable in expanded network organize their extensive and diverse communication.

## CONCLUSIONS

Today, to contrast with the negative effects of rapid urbanization the various solutions provided by experts, one of these solutions is green roof and facade systems implementation of the building is in cities. Using of these systems has impacts and benefits for many contemporary cities. Sustainable development has profound implications in three areas:

- Environmental Sustainability
- Economic sustainability
- Social sustainability

Only when we can use the benefits of green roofs and be hopeful to its stability and continuity that run and implemented In terms of sustainable development macro plans and the green tracking system directory.

Taking into consideration the quality of the environment in the contexts of urban and environmental Threats in large cities such as air pollution, appearance of urban heat island phenomenon, the energy crisis and the construction of urban green roofs, this time because of their environmental benefits and as the ecological solution is considered. Green roofs today in the most cities of developed countries and the Populous in the world that , due to increasing in the prices of construction and ground floor reduction will be faced with the lack of space and have been replaced as a alternative of urban green space or parks. In the last century roofs due to their practical interest and at present because of their environmental benefits are green, integration of these two ideas and adding numerous social benefits resulting from the application of these spaces, Local governments can line with sustainable development and sustainable management of urban green roofs take important steps. Creating a green space in the sky scrapers roof of high buildings, especially in large cities in reducing air pollution and clean air is effective, And finally living alongside nature, especially plants necessary for the human body and spirit.

## RECOMMENDATIONS

1. It is recommended that installation and implementation of green roofs on the building's roof becomes law.
2. Run the green roof on the building needs to take place.
3. It is suggest that green roofs be used in the Horticulture field and socio - economic involution.
4. Use plain irrigated by the water instead of planting in soil with a much lower cost of land is on the rooftop (this system has been practiced on roofs in Mexico - Columbia - Morocco – Montral- Canada, Singapore).
5. Do more extensive research on the types of plants suitable for deployment Compatible climate zone conditions .on the roofs.
6. Performance and construction of green roofs in the city is encouraged by administrators, saving energy will cause a lot of discussion and a good profit from this investment will create.
7. System Design using rainwater to irrigate green space built on the roof of the building is recommended.
8. The use of materials, use materials that are affordable and also Sbznsrand any harm to the roof space.
9. Set and change the height of the building to improve the terms of use and chimneys Hvakshhay better and more residents and people from the green roof.
10. The state attempt to build green roofs on buildings of government agencies such as municipalities - Environment - universities and public places such as hospitals - Recreation - cultural - religious and commercial centers to encourage more people and motivating them to construct green roof.
11. Payment of state funds to people with low incomes.
12. Simple Rules and certain provisions for the implementation of green roofs.
13. Requires the engineering organization to design a green roof on the building drawings.
14. Payment of government assistance without change by increasing energy efficiency.
15. Recommended qualified teams for training and deployment of rooftop gardens are created to design and implement such systems based on the specifications of each building, existing conditions and pay.

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