

Environmental and Urban Planning Aspects of the Introduction of Green Parking Lots in Tashkent

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Abstract: This article is dedicated to the importance and necessity of designing green parking lots in the city of Tashkent. Green parking lots are environmentally sustainable and energy-efficient, helping to reduce the impact of the transportation system on the environment. The article discusses the existing issues in Tashkent's transportation infrastructure, the increasing air pollution, and the role of green parking lots in combating climate change. The article also provides practical recommendations for the construction of green parking lots in Tashkent.

Key points: Green parking, green infrastructure, sustainable development, energy efficiency, climate change, air pollution, renewable energy, green spaces for vehicles, green transportation system, plants in parking lots.

Enter

Tashkent city Uzbekistan large economic , industrial and transportation center as is developing . Population number increase , vehicles movement growth and in urban planning intensive changes ecological problems to the surface This is bringing . problems following main in directions manifestation will be :

1. Atmosphere of air contamination

Tashkent city cars the number according to in Uzbekistan leader in place stands Every day face thousands of vehicles fuel i turn on as a result into the atmosphere carbonate anhydride (CO₂), nitrogen oxides (NO_x), and another harmful substances divides In 2021 went to research according to :

- ✓ To the atmosphere being released of waste **70% vehicles** contribution right will come
- ✓ From transport coming out a pollutant substances city of the population breath get to diseases take coming main is a factor [1].

2. Green of regions reduction

City population dense located in the regions green fields size enough at the level not . World health storage on the recommendation of the World Health Organization (WHO) according to , city population for 1 person to someone **50 m² green area** need if yes , in Tashkent this indicator average **10-15 m²** what organization This will main from the reasons one is the transport infrastructure expansion and buildings construction for green zones is a contraction [2].

3. Transport system problems

Transport system of Tashkent basically personal to cars directed this is it the following consequences take coming :

- **Traffic jams:** In the city center traffic jams as a result fuel i spending and the air contamination level is increasing.

- **The congregation of transport ineffectiveness:** Types of green transport (for example , electric cars , ecological buses) are enough level not developed .
- **Pedestrians and bicycles for of convenience absence:** This city population personal from cars to use forced is doing [3].

4. Water of resources contamination

From vehicles came out a pollutant substances it's raining waters through sewage to systems and as a result to the rivers falling This is water resources quality makes it worse and to the environment damage brings

Tashkent city Central of Asia the most big from cities one become his territorial-climatic condition and in transport infrastructure problems green parking lots when designing important importance occupation is enough This in the department of Tashkent natural-geographical features and in the transport system there is spaces analysis we do

Geographical location

Tashkent city of Uzbekistan in the northeast, Chirchik river in the valley located His climate continental as follows properties has :

- **It's hot write:** July in the month average temperature up to +35°C that 's enough city the heat inside island " effect strengthens
- **Cold winter:** January in the month average the temperature is around -2°C will be Vehicles during this period fuel i spending and waste significant increases .
- **Harvesting:** Per year average rainfall 450–500 mm falls It's green regions for comfortable conditions creates , however in winter on the roads snow and ice from melting harvest has been water transport infrastructure damage delivers

Climatic problems

- ✓ summer in season of air high temperature from asphalt harmful gases to exit take will come
- ✓ In winter of temperature decrease of roads to slip inclination increases this and transport safety for risk gives birth [4].

Vehicles growth

Last in years Vehicles in Tashkent the number fast in paces increased is going As of 2023 according to :

- ✓ in Tashkent from **600 thousand more vehicle** to the list received
- ✓ For every 1000 people average **300–350 cars** right it comes while traffic jams and into the atmosphere waste of size to increase take is coming

The congregation of transport restrictions

- **Buses and metro:** The congregation transport networks still of the population all layers for comfortable it's not . Tashkent metro basically city to the center service does , city on the edges regions while buses and marshrutkas with limited .
- **Ecological of transport not developed :** Electric cars , ecological buses and bicycles system current to be done slow is passing

Traffic jams and parking lot problems

- **Traffic jams :** Especially in the morning and evening in hours city in the center main on the roads traffic jam noticeable at the level increases .
- **Parking lots lack of :** in Tashkent official parking lots the number on demand relatively less Many people cars road on the edges or illegal in places stop stands This is the case to pedestrians and to other vehicles risk gives birth .

- **Stop of places ecological requirements answer does not give :** There is parking lots environment save technologies with not equipped

of Tashkent territorial-climatic conditions and in transport infrastructure empty spaces green parking lots current reach the need strengthens In this the following factors in consideration is taken :

- **Summer the heat decrease :** Green parking lots the sun its rays devourer plants through city microclimate improves .
- **Air cleaning :** From vehicles coming out harmful gases swallow for green regions set up reach important
- **Aesthetic Importance :** City view beautification for green design residences set up to be done population marriage quality and of the city charm increases .

Main part

Green parking lots concept

Green parking lots cars stop and storage for intended fields they are ecological stability provide for green areas , energy thrifty technologies and to the environment damage does not deliver materials with is equipped . This parking lots the following properties has :

- **Green landscape :** Trees , bushes and another green plants with covered areas .
- **Stable technologies :** The sun panels , rain waters collection systems and electric cars for power stations .
- **High ecological standards :** Air cleaning , heat swallow and carbon track to reduce directed design .

Green of parking lots advantages

1. Ecological benefits :

- ✓ In the atmosphere carbonate anhydride (CO₂) absorber plants through the air cleans .
- ✓ Urban microclimate well , " heat island " effect reduces
- ✓ Water flow manage for it's raining waters filtering systems .

2. Social and economic benefits :

- ✓ of the city aesthetic appearance improves and recreation to the population for comfortable conditions creates
- ✓ Green design through from the place efficient to use provides that while city infrastructure the pressure reduces
- ✓ Transport system ecological in terms of stable does

3. Technological and innovative benefits :

- ✓ Electric cars power up infrastructure through green of technologies development help gives
- ✓ Energy thrifty lighting and ventilation systems electricity from energy to use reduces

In the world progress projects examples

1. Vertical parking lots , Singapore

- ✓ Many p layered parking lots green walls and roof plants with covered
- ✓ Air filtering systems and it's raining waters collection technologies installed .

2. Santa Monica Green parking lot , USA

- ✓ The sun panels with equipped , electric vehicles for power stations there is .

✓ In architecture plants with covered regions and ecological of materials used .

3. Millennium Park Garage , Chicago

✓ the city center green parking lot become his top part as a park service does

✓ Atmosphere the air cleaning for green landscape with equipped .

4. in Tokyo ecological parking lots , Japan

✓ Vehicles comfortable location with together , vertically gardens and energy efficient lighting to systems have

Tashkent Conditions: Regional-climatic conditions and in the city's transport infrastructure spaces [2].

Regional-climatic conditions

Tashkent city subtropical continental to the climate have It 's hot Summer and cold winter seasons with separate stands Green parking lots when designing this conditions account get important :

- **It's hot write** : summer in season temperature up to $+35^{\circ}\text{C}$ will rise . Green regions shady places providing heat reduces
- **Cold winter** : Down to -2°C in winter falling temperature to the transport infrastructure damage to bring can Green parking lots it's raining and snow waters for filter to systems have to be need
- **Harvesting** : 450–500 mm of precipitation per year observed . It's green regions watering and water collection systems current to do for comfortable conditions creates

the transport infrastructure empty spaces

1. **Traffic jam problems** : in the center of Tashkent traffic jams each day surface will come Cars number increase this the problem is deepening .
2. **Parking lots Lack of** : Cars the number according to there is parking lots demand satisfy ca n't Many people cars illegal in places is stored .
3. **Ecological Problems** : Vehicles waste city the air is polluting . This is the people of Tashkent to health negative effect is showing .
4. **Bicycle and pedestrians for Infrastructure** : Pedestrians and cyclists for special roads enough This is not public from transport use reduces and personal to transport was demand increases .
5. **Ecological modes of transport undeveloped** : Electric cars and ecological buses system still wide This is not used in the transport system . stability reduces .

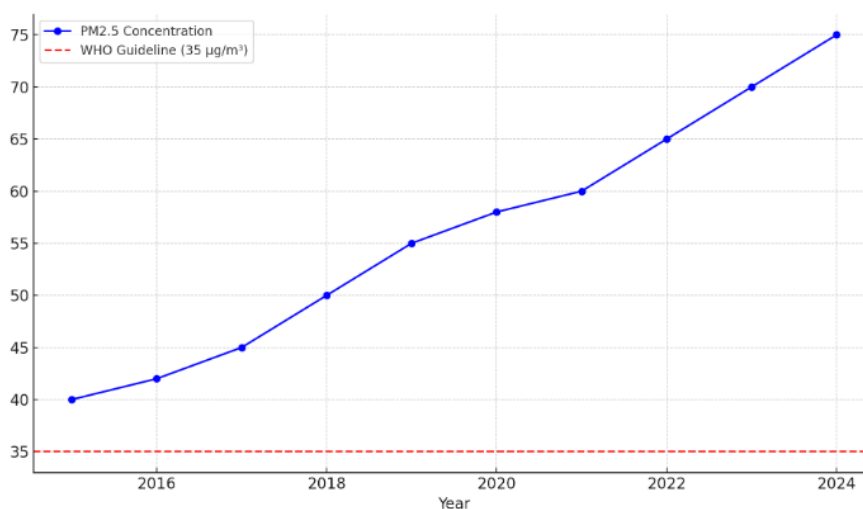
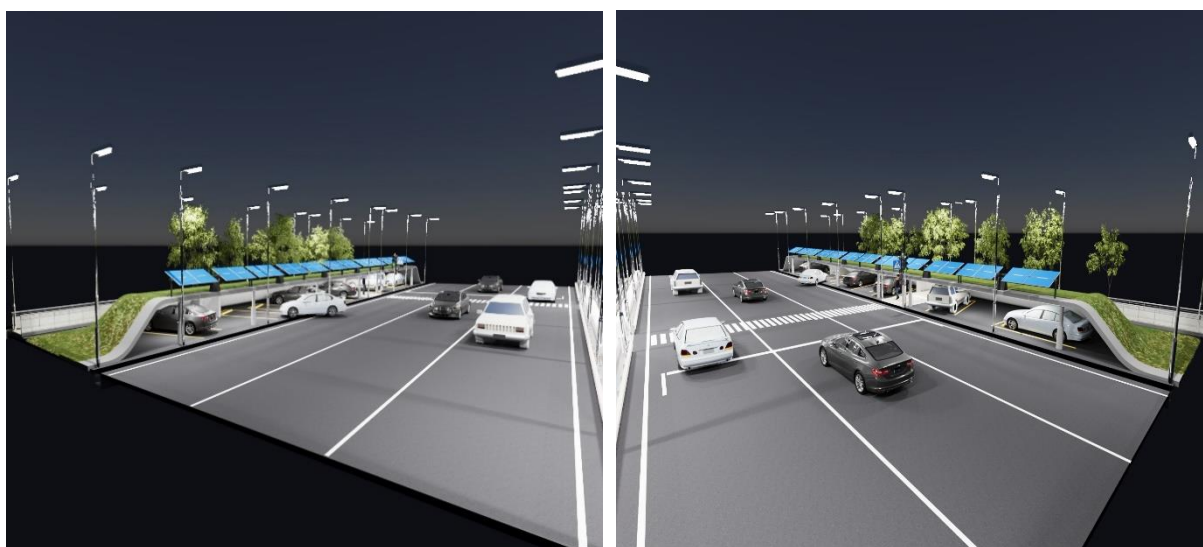


Figure 1. 2015-2024 in Tashkent regarding PM2.5 pollution level

2024 year for included data (75 m g/m^3) city of air contamination level continue doing tumor shows . Red line while the world health storage organization (WHO) . recommendation done maximum with a limit (35 m g/m^3). compared without , in Tashkent the air of quality significant level deterioration represents This is in the city of Tashkent green parking lots design relevance represents [1].

Projective offer

Of Tashkent territorial-climatic condition and in the transport system empty spaces account received without green parking lots design not only ecological stability to provide , perhaps of the city's transport system efficiency to increase service does In the world progress from projects learning and them local to the circumstances adaptation for Tashkent successful results to bring can.



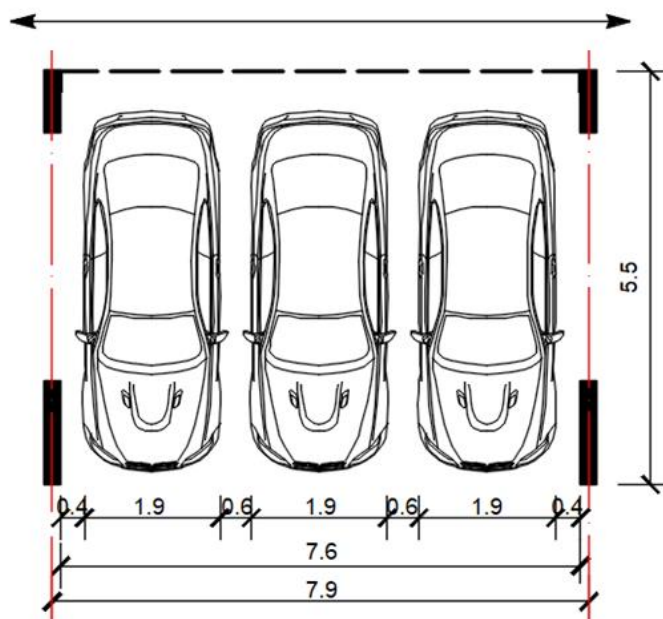
Picture-2

picture-3

1-2 pictures. The proposed green parking project around the street network of Tashkent city.

This project allows the use of a temporary parking lot underneath, without damaging the green area, by designing it as a slope. Due to the increasing number of electric cars in our country, we used solar panels in our project. This is important for the economic viability of our parking lot.

The distance between the columns of the load-bearing elements of the parking lot is 7.9 m, which allows you to place 3 cars, taking into account the necessary protection zones (pic. 4).



Picture-4. Parking lot

To ensure the safe movement and positioning of cars, the pitch of the columns in the transverse direction is variable, but the distance between the columns according to the location of the cars is 5.5 m [3].

Summary

Designing green parking lots in Tashkent is an important measure to ensure environmental sustainability and reduce the negative impact of the urban transport system on the environment. Green parking lots are not limited to providing space for traffic, but also play an important role in improving energy efficiency, reducing air pollution, and combating climate change. These projects will improve the well-being of urban residents, conserve biodiversity and create opportunities for efficient water management. Green design, plants and the use of sustainable resources can give a new direction to the future development of parking lots in Tashkent.

Also, economically, green parking lots provide effective solutions to the problems associated with the increase in the number of vehicles. The implementation of green parking lots can be beneficial not only ecologically, but also economically and socially. Taking into account the best practices and scientific recommendations for the construction of green parking lots in Tashkent, the wide implementation of these concepts will greatly contribute to the improvement of the overall environmental condition of the city.

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