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Article Title

Role of Urban Parks in Climate Change Adaptation: The Fundamentals for Establishment of Indicators with a special focus on Punjab, Pakistan

Abstract

Urban parks are the essential city elements which provide eco benefits in the current time of rapid urbanization and industrialization. Climate change produced due to such human activities generated significant impacts. Climate change is a major phenomenon observed in the environment at global level. Pakistan is among the top ten countries who are facing climate change at the fastest rate. Indicators are the parameters which can measure the climate change rate and adaptation level of urban parks for appropriate monitoring and outcomes. Certain factors and indicators are required to be identified and a framework should be established to evaluate the urban parks. A system is required to be developed to assign the weightages to the established indicators for evaluation and monitoring of urban parks to increase their effectiveness and functionality. Urban parks can provide sustainable adaptation if monitored and evaluated successfully.

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Title

Role of Urban Parks in Climate Change Adaptation: The Fundamentals for Establishment of Indicators with a special focus on Punjab, Pakistan.

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Contents

Abstract

Urban parks are the essential city elements which provide eco benefits in the current time of rapid urbanization and industrialization. Climate change produced due to such human activities generated significant impacts. Climate change is a major phenomenon observed in the environment at global level. Pakistan is among the top ten countries who are facing climate change at the fastest rate. Indicators are the parameters which can measure the climate change rate and adaptation level of urban parks for appropriate monitoring and outcomes. Certain factors and indicators are required to be identified and a framework should be established to evaluate the urban parks. A system is required to be developed to assign the weightages to the established indicators for evaluation and monitoring of urban parks to increase their effectiveness and functionality. Urban parks can provide sustainable adaptation if monitored and evaluated successfully.

Keywords:

Urban Parks, Climate Change, Adaptation, Indicators

Introduction:

Urban Parks and Climate Change

Urban parks have numerous benefits, ranging from health promotion to biodiversity conservation and environmental sustainability. Parks are in existence in almost all the densely populated cities. The need of the time is to make them functional according to the current adaptation requirements of a changing

climate. Sustainable food production, conservation of nature, and city resilience are the critical issues required to be resolved for better livability(Rinaldi & Tan, 2019).

Urban parks are required to be ecological, restorative, and aesthetically pleasing in unison. The unison of all three is the challenge for many densely populated and highly urbanized cities like New York, Seoul, and Singapore, where space is a limited commodity. The growth in urban population, worldwide, is permeating the demand for resilience and adaptation to climate change (Rinaldi & Tan, 2019).

The idea of planning urban parks within and around the city for environmental sustainability and pleasing aesthetics started in 1867 in England. Liverpool was one of the largest industrial cities of earlier times. Sefton Park was planned as a public park to balance the industrial elements and to generate a pleasing space for the citizens (Programmes, n.d.).

Urban parks are considered to be the strategic elements for sustainable development and quality livability in modern cities also especially those that are facing challenges like industrial functions and increasing population (Taghizadehvehed, 2019).

In Urban South (including India, Brazil, Kenya, and South Africa), urban parks can be considered as tools for spatial segmentation while considering biodiversity conservation and environment(Landy, 2012).

The need of the time is to adapt to climate change. Climate change is impacting globally. Almost all countries are victims of climate change. The regions like Latin America and Asia are among the highly vulnerable countries. One billion citizens are living below the poverty line in these areas. It is expected that by 2030, 77 million people from urban areas will be added to the list if climate change is not addressed (Institute, n.d.).

The need and capacity to adapt are not being considered in planning and policies. The development should consider adaptation to enhance the resilience (Institute).

According to a study, by 2050 two two-thirds of the world population will be living in cities. The rise in urbanization will be a more critical challenge while considering resilience. The biodiversity

conservation, resilience, and adaptation plans are required to be thought out in the current times to save future centuries. Urban parks provide many beneficial opportunities to plant trees and to develop rain gardens within the park's landscape (Conservancy, 2020).

Planting trees in city parks can benefit the environment with great deliverables. Conserved trees in protected landscapes and in urban parks can store more carbon dioxide than younger ones. The aligned trees, i.e., planted in a row as generally in park boundaries, can act both as barriers and storage spaces that can store pollutants to re-enter the surrounding communities (Conservancy, 2020).

According to research conducted in 56 cities around the globe, including all continents, urban parks are working as carbon reservoirs, as the soil sampling of urban parks showed the equivalent amount of carbon as in natural areas near the cities. So, the role of urban parks is extremely important in climate change adaptation. The urban parks are the city features that provide the cities with a strength to be resilient (Council, 2023).

Adaptation through Urban Parks

Parks are the heart of cities around the globe. They directly improve the lives of nearby residents by providing health benefits, recreational opportunities, and minimizing the impact of climate change. They act as cooling islands and provide relief from heat. They also increase the process of evapotranspiration while maintaining the green coverage. The shade available in parks is crucial for the neighboring communities. This shade reduces the solar radiation, providing many health benefits like protection from skin cancer and liver spots. Parks in urban areas act as a sponge to filter heat and pollutants through branches and leaves, thus reducing air temperature in surrounding areas (Sjoholm, 2022).

Focusing on the adaptability, environmental criteria, including energy, water management, transportation, waste recycling, etc., are important elements. These elements can be transformed and made more beneficial through urban parks. Thus, to increase the adaptability in the cities, urban parks can play a vital role (Taghizadehvehed, 2019).

Identification and Evaluation of Indicators

The current and future plans are required to be considered by adopting adaptation parameters worldwide. Numerous measures have already been taken and planned for future considerations to address this issue. The need of the time is to evaluate the effectiveness of these implemented measures, so that it can be observed what needs to be improved for appropriate adaptation to climate change (Pearce-Higgins et al., 2022).

To evaluate the effectiveness and progress, factors and indicators should be identified and should be measured. This evaluation and monitoring of factors and indicators will provide evidence of success or failure. The interventions taken in this regard can be checked on the ground and can also be tracked to determine whether the actions resulted in the expected response (Pearce-Higgins et al., 2022).

Significance of Indicators for Urban Parks Worldwide

Indicators are the things that can be measured. The success or failure threshold can be observed while identifying the related indicators and further evaluating them (Facility).

The identification and monitoring process of indicators has been illustrated in Figure 1 as follows:

Figure-1

Identification and Monitoring of Indicators (Facility)
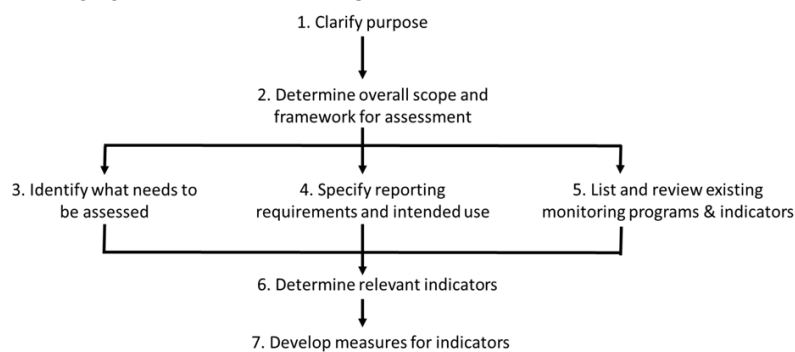
Urban regeneration is significant at the current time, to be integrated with urban resilience. This can result in conserved biodiversity and ecosystems. Every element of the urban area is required to be dealt with while considering suitable solutions to increase the resilience in the aspect of climate change worldwide (Lehmann, 2023).

The concept of "Urban Metabolism" should be applied, in which cities are believed to be living organisms. Natural ecosystems and human-generated activities should balance each other for a sustainable environment (Lehmann, 2023).

The cities are increasing in density, and to balance it, access to urban green spaces like parks should be enhanced. Although the need for financial benefits and facilities is stretching the population from rural to urban areas due to which requires more infrastructure and built area. But this can be balanced with urban parks, as can be seen in Sweden's city of Malmö, which is known as "City of Parks". Malmö is providing economic and social benefits in combination with environmental sustainability and resilience at the same time (Lehmann, 2023).

The urban parks effectiveness to build resilience or microclimates needs to be monitored and measured. This can be done through identifying and evaluating the indicators. Indicators are the yardsticks to observe the functions of urban parks. Urban parks indicators are much more significant nowadays, as compared to park policies and operations (Chan et al., 2018).

The indicators can show the measurement of important park elements by considering which relevant actions can be planned to minimize the problems. The overall condition and quality of the park can be measured through indicators (Chan et al., 2018).

Evaluation of identified indicators is a process by which urban parks can be assessed. The assessment is based on the necessities that are essential to be generated from the parks. The value

and worth of the park can be assessed while considering required features like security, environmental sustainability, climate change adaptation, etc. The progress for achieving goals can be monitored through evaluation. The quality, usefulness and development funding can be planned according to the assessment made(Wang et al., 2022).

The efforts to minimize the impacts of climate change are in process at the global level. Countries from all over the world are concerned about climate change and its adaptation. Asian countries are also working on it. India is very concerned about climate change. It was ranked 7th in 2019 among all countries of the world that are facing extreme weather issues due to climate change. The country was highlighted in recent years as having the world's most polluted cities. To mitigate the climate-related issues, India is working on nature-based solutions. The country is advocating resilient cities by promoting green infrastructure and environmental sustainability. The researchers are indexing and measuring the factors and indicators related to the impacts of climate change(Hussain et al., 2024). The country is working on possible strategies for their mitigation and to achieve Sustainable Development Goals (SDGs) 11 and 13, as illustrated in Figure 2:

Figure-2

Adverse impacts of climate change and possible strategies while considering achieving SDGs 11 and 13 (Hussain et al., 2024)
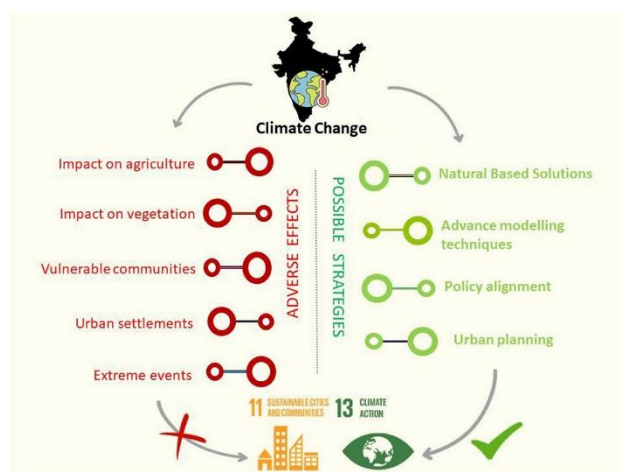
Strategies to adapt to climate change through urban parks and other green spaces are also being focused on in other Asian cities, other than India, like Taipei from Taiwan, Fukuoka from Japan, and Hanoi from Vietnam(Mabon & Shih, 2021).

Research and practices related to climate change adaptation are focused on Europe and North America, but the focus in Asian cities is limited. Due to the growing need and significance of climate-related issues and concerns, Asia is putting efforts into adaptation strategies(Mabon & Shih, 2021).

All three cities, i.e., Taipei, Fukuoka, and Hanoi, have existing plans for climate change adaptation, but the coordination among knowledge, research, and implementation needs to be improved for better adaptation. Each city has its own social, economic, and political context, for which climate change adaptation factors and indicators will be different. Some indicators might be the same due to the common subtropical environment of these cities. Rapid urbanization and development are also being channelized and balanced with the urban green spaces. Thus, these countries are focusing on improving the climate by identifying proper concerns to get appropriate results(Mabon & Shih, 2021).

Malaysia is also a country in Asia having growing cities. Industrial emissions, carbon production, and energy consumption attributes are focused indicators for climate change adaptation, as illustrated in Figure 3:

Figure-3

Climate change challenges in Malaysia due to urban urban-centric population (Mohammad Sabri et al., 2023)
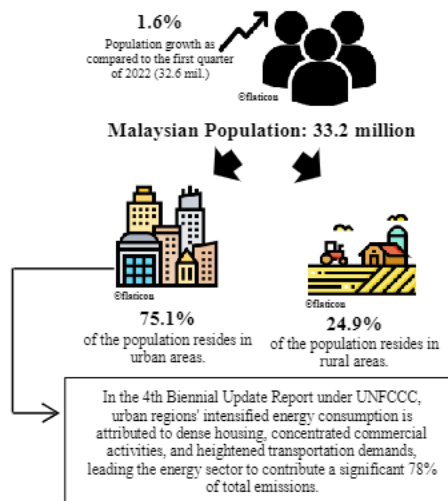
Urban green spaces, particularly small urban parks, are considered to be crucial city components to adapt the climate change in Malaysia. They are being studied for their high benefits related to ecosystems and improving the quality of life in cities (Mohammad Sabri et al., 2023).

Selection of Indicators

The selection of indicators is based on the identified problem, adaptation action, and attribute. For example, floods are being caused due to climate change. The adaptation action will define the indicators for the said problem, i.e., number of old houses (which can be eroded), etc. (Facility, n.d.)

The indicators are of many types. What type of indicator is required for the research is based on the action or result we need to obtain. Some important types of indicators are illustrated in Figure 4 as below:

Figure-4

Types of Indicators (Centre, 2015)

TYPE OF INDICATOR	DESCRIPTION
Participation Indicators	Interest and participation of locals and backers in what's happening (who).
Progress Indicators	Measure what happened, against what you wanted to happen.
Possibility Indicators	Changes in belief about what's possible and enthusiasm for the next step (can do/do next).
People Indicators	How have people's situations changed?
Policy/Systems Change	Track changes to thinking, funding, policies and approaches (now being done differently).

Functions and Typologies of Urban Parks in Different Regions

The function and typologies of urban parks in different regional zones are important to identify for the analysis of sustainable development, urban greening, and climate change resilience. Categorization of urban parks is essential to be studied to observe the impact of urban parks in the zone of their location.

Each park has a particular function to facilitate the public, which identifies its typology. A study conducted in China identifies 12 typologies of urban parks illustrated in Figure 1 (a&b) as under:

Figure 5 (a)

Typologies of urban parks based on their functions in China (Cao et al., 2021)

(a) Comprehensive park	(b) Community park	(c) Amusement park	(d) Botanical garden
(e) Zoo	(f) Heritage park	(g) Forest park	(h) Historical garden
(i) Waterfront park	(j) Wetland park	(k) Sports and fitness park	(l) Recreation park

Figure-5(b)

Definition of each typology (Cao et al., 2021)

	Definition
Comprehensive Park	With abundant recreational features, corresponding facilities, and large land scale, and suitable for all kinds of public outdoor activities
Community Park	A concentrated green space with a small area for recreational features and facilities for nearby residents
Recreational Park	A small open park for the public to relax and walk outdoors
Sports and Fitness Park	A special park with sports and fitness facilities for various competitions and training as well as for daily leisure, fitness, and sports activities
Waterfront Park	Close to a city's river or beach; employs vegetation, bank slope, or water surface as a special park feature
Historical Garden	Historical importance with a high visibility garden
Botanical Garden	A scientific research unit that investigates, collects, identifies, introduces, domesticates, preserves, and promotes plants and their uses as well as provides a garden with public access
Heritage Park	A park dominated by important historical sites and/or memorials
Wetland Park	A park of predominantly grassy wetlands
Forest Park	A park built with a large area of artificial or natural forest as the main attraction
Zoo	A place where wild animals are exhibited for public educational purposes or study
Amusement Park	A large park with a variety of large recreational facilities for the public

Research conducted in Australia explains that every park is different from another park, i.e., no two urban parks can be similar, as every park has its own age, type, surroundings, land development practices, funding constraints, facilities, and size. Every park has its own behavior to adapt (Byrne & Sipe, 2010).

While considering the above-mentioned characteristics, there are 6 types of parks depending upon their functions as illustrated in Figure 6:

Figure-6

Basic Typology of Urban Parks in Australia (Byrne & Sipe, 2010)

Type	Size (ha)	Typical Densities	Visit Length	Facilities	Naturalness	Image
Pocket park/ Playground/ Dog park	< 1	<50+ persons per ha	10 minutes – 1 hour	Few facilities – typically just play equipment and maybe benches	Few natural features – just a small grassed area with a few shade trees.	
Neighbourhood park	0.11 – 4.9	40 – 100+ persons per ha	30 mins – 1.5 hours	Limited number of sports facilities. Play equipment, picnic sites, BBQ facilities & green-space set aside for organised sport.	Larger areas of lawn, a field or two for organised sports and plantings of ornamental vegetation with shade trees. Some areas of impermeable surface.	
Community park	5 – 9.9	50 – 200+ persons per ha	30 minutes – 3 hours	Some active recreation or organised sports facilities. May include community centre.	Large areas of managed landscape, abundant lawn, shade trees and ornamental vegetation. Larger areas of impermeable surface.	
District park	10 - 24.9	50 – 1,000+ persons per ha	1 hour – 5 hours	Many sports facilities. Community centre, sports fields for football, soccer basketball courts, tennis courts etc.	Generous areas of managed landscape abundant lawn, shade trees and ornamental vegetation. Several grassed areas dedicated to organised sports. Several areas of impermeable surface.	
Regional park	25 – 500+	<150+ persons per ha	2 hours to 1 day	Range of facilities e.g. large scale recreational activities – field sports, archery, canoeing, nature trails etc.	Abundant natural features, mixture of managed landscapes and endemic vegetation. Much lower percentage of park is comprised of impermeable surfaces.	
Nature/ wilderness park/ National Park	25 – 1000+	<10 persons per ha	½ day to 1 week +	Few if any active recreation or organised sports facilities.	Few managed features and largely dedicated to preservation of endemic species. May include a landscape feature such as a wetland, hills or canyon(s). May contain interpretative signage.	

All the above-mentioned parks increase in size and number, i.e., larger parks exist in smaller numbers and small parks exist in larger numbers, as illustrated in Figure 7:

Figure-7

Parks Range (Byrne & Sipe, 2010)
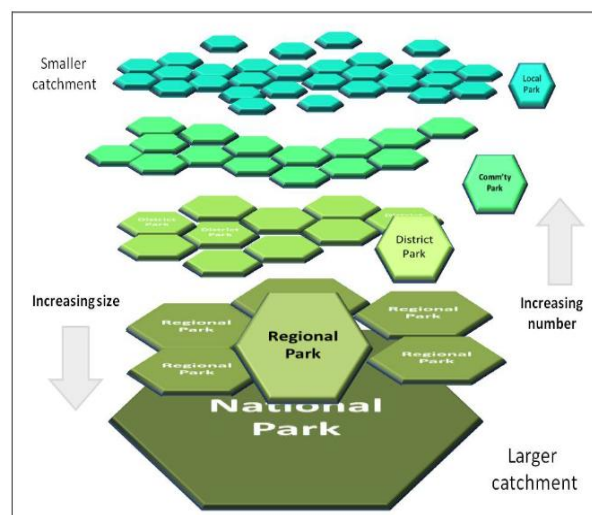
In the United States of America, there are many parks with different typologies depending on their functionality. The parks of the US are illustrated in Table 1 as below:

Table-1

Types of parks in the United States of America

Sr.#	Park type	Area	Target Population/ Use	Example
1.	Pocket Park (County)	Less than 1 acre	For people living and working in the immediate area/ for providing a limited casual open space	A pocket park in Arlington County)
2.	Common Green (County)	Minimum 1 acre	For people living in a neighborhood or larger area/ for relaxing in green lawns, recreational activities, festivals, performances, and special events	Point State Park in Pittsburgh (County)
3.	Civic Plaza (County)	Minimum of 1 acre	For people from larger areas and generally located at urban squares or street intersections/ for recreational, commercial, special events, or festivals related activities	Reston Town Center (County)
4.	Recreational Park (County)	The size of the park depends on the facilities provided	In a densely populated urban area, for local people, workers, and visitors/including athletic fields, multi-use courts,	

Sr.#	Park type	Area	Target Population/ Use	Example
			and recreational facilities, the size of the park depends upon the facilities provided	A recreational park in Fairfax County)
5.	Linear parks (County, n.d.)	Minimum 8 feet wide and length depends upon the adjacent trail, including trailheads, way finding signage and ornamental features		An example of linear park (County)
6.	State Park (Beggs et al, n.d..)	Size is smaller than national park	For national and international visitors/ to preserve natural area like dessert, water feature, trees etc.	John Pennekamp Coral Reef State Park, USA (Park)
7.	National Parks (Beggs et al, n.d..)	Size depends upon the identified area to be preserved but greater than state park	For national people and international visitors/ they preserve the natural geographic features	Grand Canyon National Park, Arizona (Service, n.d.)

In Pakistan following types of parks are being used as illustrated in Table-2:

Table-2

Types of Parks in Pakistan

Sr.#	Park type	Area	Use/Target Population	Example
1.	National Park (Embassy of Pakistan Copenhagen, n.d.)	Size depends upon site identified generally a minimum of several hundred acres	To conserve the identified natural areas/ for national and international visitors	Margalla Hills (Embassy of Pakistan Copenhagen)
2.	Provincial Parks (G. o. T. Punjab)	Size depends on site identified	To conserve the identified natural area or built heritage/ for national and international visitors	Greater Iqbal Park (G. o. T. Punjab)
3.	Recreational Parks (Pakistan, n.d.)	Size is upto several acres or depends upon the facilities provided	Include cultural activities, sports area, play area, green lawns etc./ for local people and visitors	Fatima Jinnah Park Islamabad (Pakistan)
4.	Central Parks (Travelot, n.d.)	Size is upto few acres	Include festivals, sports activities, play areas, water features etc./for local people and visitors	Bagh-e-Jinnah Faisalabad (G. o. T. Punjab)

Sr.#	Park type	Area	Use/Target Population	Example
5.	Local Parks (Victoria, n.d.)	Size is up to a couple of acres	Include lawns, water features, sport facilities, etc./for local residents.	

Azizabad Park at Karachi (Rao, 2021)

An Analysis of Urban Parks in Punjab, Pakistan

Pakistan is among the top ten countries of the world that are highly vulnerable to climate change. Pakistan has seen 10,000 fatalities and a loss of $4 billion due to climate-related weather events like floods, heatwaves, droughts, food insecurity, etc. Due to climate-related concerns, people are moving from rural to urban areas for better life opportunities, and a great burden is being created on the cities that are not able to manage the previous load of urbanization (Siddiqui, 2022).

The country has four provinces. Punjab is the most populous province of Pakistan. It has more than half of the total population of the country. It is the second-largest province of the country by area (Britannica, 2024).

Urban Parks of Punjab

Out of the 194 urban areas, five cities have been selected in this research to study the urban parks. 1 mega city, i.e., Lahore, which is the only mega city of the province. 2 large cities, i.e., Faisalabad and Rawalpindi. 2 intermediate cities, i.e., Bahawalpur and Dera Ghazi Khan, also known as DG Khan. Figure-8 is illustrates the classification of cities in Punjab Province:

Figure-8

Classification of cities in Punjab Province (Unit, n.d.)

POPULATION RANGE	NO. OF CITIES	CLASSIFICATION	% POPULATION	EXAMPLE CITIES
10 M +	1	Mega City	28%	Lahore
1M – 10 M	4	Large City	24%	Rawalpindi, Gujranwala Faisalabad Multan
250K-1M	13	Intermediate City	15%	Sahiwal, Bahawalpur, Sargodha, DG Khan, etc.
100K-250K	38	Small City	7%	Attock Bahawalnagar Chishtian Haroonabad etc.
<100K	138	Towns	18%	Liaqatpur, Depalpur, Talagang, Murree, etc.

The selected cities not only represent the major urban areas of Punjab but also cover almost all directions of the province, geographically, to have a combined picture from every part of the province, i.e., North, South, East, West, and Central. The selected cities are also the divisional headquarters.

The parks of all these cities are planned and managed by the Parks and Horticulture Authority of the respective city. The details of the parks of each selected city have been illustrated in Table 3 as under:

Table-3

Details of Parks in Selected Cities

City Name	Total Parks	Total Area	Major Parks	Sustainable Initiatives Taken
Lahore	893(L. Parks and Horticulture Authority, 2024b)	2209.55 Acres(L. Parks and Horticulture Authority, 2024b)	1. Bagh-e-Jinnah 2. Racecourse Park 3. Greater Iqbal park 4. Gulshan-e-Iqbal Park (L. Parks and Horticulture Authority, 2024b)	1. Miyawaki Forest 2. Afforestation 3. Food gardening 4. Rainwater Harvesting (L. Parks and Horticulture Authority, 2024b)
Faisalabad	355 (F. Parks and Horticulture Authority, 2024)	485.33 Acres (F. Parks and Horticulture Authority, 2024)	1. Bagh-e-Jinnah 2. Kaleem Shaheed Park 3. Canal Park 4. D-Ground Park 5. Dhobi Ghat park 6. Nawaz Sharif Park (F. Parks and Horticulture Authority, 2024)	1. Miyawaki Forests 2. Urban Forest 3. Afforestation 4. Green-composting 5. Food gardening (F. Parks and Horticulture Authority, 2024)
Rawalpindi	52 (R. Parks and Horticulture Authority, 2024)	872.34 Kanals (R. Parks and Horticulture Authority, 2024)	1. Allama Iqbal Park 2. Potohar Park 3. Rawal Park (R. Parks and Horticulture Authority, 2024)	1. Rainwater harvesting 2. Miyawaki Forests (R. Parks and Horticulture Authority, 2024)
Bahawalpur	23 (B. Parks and Horticulture Authority, 2024)	52.81 Acres (B. Parks and Horticulture Authority, 2024)	1. Fareed Park Commercial Area 2. Madr – e – Millat Ladies Park 3. Shadrah	1. Urban Forest 2. Miyawaki Forest (B. Parks and Horticulture Authority, 2024)

City Name	Total Parks	Total Area	Major Parks		Sustainable Initiatives Taken
			Children Park 4. Special Children Park 5. Eid Gah Park 6. Rohi Park (B. Parks and Horticulture Authority, 2024)		
DG Khan	21 (D. G. K. Parks and Horticulture Authority, 2024)	77.59 Acres (D. G. K. Parks and Horticulture Authority, 2024)	1. Jinnah Park 2. Kashmir park **3.** Ghazi park (D. G. K. Parks and Horticulture Authority, 2024)		1. Miyawaki Forest (D. G. K. Parks and Horticulture Authority, 2024)

The role of management and current pictures of the major parks are explained below:

Urban Parks of Lahore

Urban parks of Lahore are being planned and managed by the Parks and Horticulture Authority Lahore (PHA-Lahore). PHA Lahore was established in 1998 by the Government of the Punjab-Housing, Urban Development & Public Health Engineering Department (L. Parks and Horticulture Authority, 2024a).

The city has 893 parks in total. Major parks are Bagh-e-Jinnah, Jilani Park, Greater Iqbal Park, and Gulshan-e-Iqbal Park (L. Parks and Horticulture Authority, 2024b)

The details of the major parks of Lahore are as under:

Gulashan-e-Iqbal Park, near Allama Iqbal Town, is one of the largest parks of Lahore. Its total area is 67 acres. The park includes green lawns, rides, a manmade lake, and a small zoo (Taimoor, 2022).

Some of the park's glimpses are as follows:

Figure-9 (a&b)

Gulashan-e-Iqbal Park (Tripadvisor, n.d.)

Figure-9a

Figure-9b

Bagh-e-Jinnah

Bagh-e-Jinnah is a historical park in Lahore. Its old name was Lawrence Gardens. The parks include a library, Mosque, botanical garden, green lawns, and children's play area (L. Parks and Horticulture Authority, 2024b).

Some of its pictures are as follows:

Figure-10 (a&b)

Bagh-e-Jinnah (Ali, 2023)

Figure-10a   Figure-10b

Jilani Park

Jilani Park, previously known as Race Course Park, is a famous park in Lahore located at Jail Road. The park includes green lawns, an artificial lake with a waterfall, a restaurant, and a children's play area.

The park was best known for horse racing till the 1970s; later, the race course was shifted to another place (L. Parks and Horticulture Authority, 2024b). Some glimpses of the park are as under:

Figure-11 (a&b)

Jilani park (Jilani (Race Course) Park)

Figure-11a   Figure-11b

Greater Iqbal Park

Greater Iqbal Park was previously known as Minto Park. The park has a 125-acre area in total. It includes an artificial lake, 800 feet 800-foot-long

dancing fountain, a library, a food court, and green lawns (G. O. Punjab).

An aerial view and pictures of the park are as follows:

Figure-12

Greater Iqbal Park (Atlas, 2023)

From the above pictures, it can be observed that the parks of Lahore are being managed properly for the general public. Hard and soft landscape elements are being provided for the user's benefit.

Urban Parks of Faisalabad

There are 355 parks in Faisalabad managed by PHA Faisalabad since 2014. Major parks of the city are Bagh-e-Jinnah, Kaleem Shaheed park, Canal park, D-Ground Park, Dhobi Ghat park and Nawaz Sharif Park (F. Parks and Horticulture Authority, 2024).

The details of the major parks of Faisalabad are as under:

Bagh-e-Jinnah

It is the primary park of the city with an area of 32 acres. It was built in 1902 by the British Government. Main features of the park are green lawns, historic and modern fountains, rides, and Miyawaki forest (Parks and Horticulture Authority-Faisalabad, 2024). Pictures of the park are as under:

Figure-13 (a&b)

Bagh-e-Jinnah (F. Parks and Horticulture Authority, 2024)

Figure-13a   Figure-13b

Kaleem Shaheed Park

It is the largest park in the city with an area of 52 acres. It was built in the 1980s. Its main features are green lawns, a children's play area, and food gardening (F. Parks and Horticulture Authority, 2024). Its pictures are as under:

Figure-14 (a&b)

Kaleem Shaheed Park (F. Parks and Horticulture Authority, 2024)

Figure-14a   Figure-14b

Canal Park

Canal Park is the longest park in the city, with an area of 14 acres. It was built in the 1990s. Its main features are a canal, an artificial lake, a zoo, a children's play area, and a food court (F. Parks and Horticulture Authority, 2024). Some of its glimpses are as under:

Figure-15 (a&b)

Canal Park (F. Parks and Horticulture Authority, 2024)

Figure-15a

Figure-15b

D-Ground Park

This park is located in one of the main commercial areas of the city. The total area of the park is 8 acres. It was built in the 1960s. It includes green lawns, flower beds, and a children's play area (F. Parks and Horticulture Authority, 2024). Some of its glimpses are as under:

Figure-16 (a&b)

D-Ground Park (F. Parks and Horticulture Authority, 2024)

Figure-16a

Figure-16b

Dhobi Ghat Park

Dhobi Ghat park was built before the independence of Pakistan by the British Government in early 1900s. It was developed in the 1950s with an area of 6 acres. The park has two sections, i.e., one for recreational activities and green area, and the other for political and religious activities like religious camping, political gatherings, rallies, etc. (F. Parks and Horticulture Authority, 2024). Some of its glimpses are as under:

Figure-17 (a&b)

Dhobi Ghat Park (Parks and Horticulture Authority-Faisalabad, 2024)

Figure-17a

Figure-17b

Nawaz Sharif Park

Nawaz Sharif Park is a newly built park inaugurated in August 2024. Its area is 6 acres. It includes green lawns, a children's play area, and an artificial lake (F. Parks and Horticulture Authority, 2024). Some of its glimpses are as under:

Figure-18 (a&b)

Dhobi Ghat Park (F. Parks and Horticulture Authority, 2024)

Figure-18a

Figure-18b

Urban Parks of Rawalpindi

There are 52 parks in Rawalpindi managed by PHA Rawalpindi since 2014. Major parks of the city are Allama Iqbal Park, Rawal Park, and Potohar Park (R. Parks and Horticulture Authority, 2024). The details of the major parks of Faisalabad are as under:

Allama Iqbal Park

Allama Iqbal Park, previously known as Nawaz Sharif Park, is located on Murree Road, Rawalpindi. The park has green lawns, flower beds, open badminton courts, and a children's play area (R. Parks and Horticulture Authority, 2024). Some glimpses of the park are as follows:

Figure-19 (a&b)

Allama Iqbal Park (R. Parks and Horticulture Authority, 2024)

Figure-19a

Figure-19b

Rawal Park

Rawal Park is located on Rawal Road. The park has green lawns with ornamental plantations, a cricket playing area, and a children's play area (R. Parks and Horticulture Authority, 2024). Some glimpses of the park are as follows:

Figure-20 (a&b)

Rawal Park (R. Parks and Horticulture Authority, 2024)

Figure-20a

Figure-20b

Potohar Park

Potohar park is located on Dhoke Munshi road. The park has huge green lawns, a cricket play area, and a children's play area. Some glimpses of the park are as follows:

Figure-21 (a&b)

Potohar Park (R. Parks and Horticulture Authority, 2024)

Figure-21a

Figure-21b

Urban Parks of Bahawalpur

There are 22 parks in Bahawalpur with an area of 52.81 acres managed by PHA Bahawalpur since 2014. Major parks of the city are Madar-e-Millat Ladies Park, Fareed Park, Rohi Park, and Eidgah Park (B. Parks and Horticulture Authority, 2024).

The details of the major parks of Bahawalpur are as under:

Madar-e-Millat Ladies Park

Madar-e-Millat park has green lawns, flower beds, and a children's play area. Some glimpses of the park can be seen as follows:

Figure-22 (a&b)

Madar-e-Millat Park (B. Parks and Horticulture Authority, 2024)

Figure-22a

Figure-22b

Fareed Park

Fareed Park has green lawns, flower beds, and a children's play area (B. Parks and Horticulture Authority, 2024). Some glimpses of the park area are as follows:

Figure-23 (a&b)

Fareed Park (B. Parks and Horticulture Authority, 2024)

Figure-23a

Figure-23b

Rohi Park

Rohi Park is located on Ahmedpur Road. The park has green lawns, flower beds, and a children's play area (B. Parks and Horticulture Authority, 2024). Some glimpses of the park are as under:

Figure-24 (a&b)

Rohi Park (B. Parks and Horticulture Authority, 2024)

Figure-24a

Figure-24b

Eidgah Park

Eidgah Park has green lawns, flower beds, and a children's play area (B. Parks and Horticulture Authority, 2024). Some glimpses of the park are as under:

Figure-25 (a&b)

Eidgah Park (B. Parks and Horticulture Authority, 2024)

Figure-25a

Figure-25b

Urban Parks of DG Khan

There are 21 parks in DG Khan with an area of 77.59 acres managed by PHA DG Khan since 2015. Major parks of the city are Jinnah Park, Kashmir Park, and Ghazi Park (D. G. K. Parks and Horticulture Authority, 2024). The details of the major parks of DG Khan are as under:

Jinnah Park

Jinnah Park is located on Jail Road. The park has green lawns, flower beds, and a children's play area (D. G. K. Parks and Horticulture Authority, 2024). Some glimpses of the park are as under:

Figure-26 (a&b)

Jinnah Park (D. G. K. Parks and Horticulture Authority, 2024)

Figure-26a

Figure-26b

Kashmir Park

Jinnah Park is located on Jail Road. The park has a public library, green lawns, flower beds, and a children's play area (D. G. K. Parks and Horticulture Authority, 2024). Some glimpses of the park are as under:

Figure-27 (a&b)

Kashmir Park (D. G. K. Parks and Horticulture Authority, 2024)

Figure-27a   Figure-27b

Ghazi Park

Ghazi Park is located on Vidor Road. The park has mechanical rides, green lawns, flower beds, and a children's play area (D. G. K. Parks and Horticulture Authority, 2024). Some glimpses of the park are as under:

Figure-28 (a&b)

Ghazi Park (D. G. K. Parks and Horticulture Authority, 2024)

Figure-28a   Figure-28b

Results and Discussions:

From table 1 and figures 5(a&b), 6, and 7, it can be deduced that similar typologies of parks are available, at the international level, based upon their functionality. Names can be different, which can vary country to country, like neighborhood parks in Australia are known as local parks in Pakistan. Regional parks in China are known as central parks in Pakistan. Hence, urban parks are available in all countries and for all related activities. They may vary in number and towards climate change adaptability.

Urban parks are the key elements for a city through which the relationship between residents and nature can be regenerated. Ecosystems and biodiversity conservation can be enhanced by providing parks in cities to balance between the built and green areas. At present, the Earth is facing issues related to climate change. The impacts of climate change can be minimized through urban parks while taking actions for the regeneration of nature. It can be done through intelligent landscaping and by taking sustainable initiatives like reducing pollution levels, sustainable

production of food, and conserving nature through urban parks.

Conclusions and Recommendations

Management of urban parks around the globe is working to introduce sustainable initiatives and to conserve nature through various techniques. But still, adaptation to climate change through urban parks has not been observed. The adaptation level can be observed by identifying indicators and estimating the contribution of urban parks to this cause. Consequently, the required parameters can be deduced through which the existing situation of urban parks can be estimated for further planning for the future.

Adapting to the changing climate is a big challenge at the current time. New initiatives and measures are being taken by the concerned authorities, scientists, and researchers to minimize the adverse impact on the environment. But still, there is a huge space that needs to be filled with the new knowledge for the betterment of our Earth.

Through this research, the importance of urban parks in climate change adaptation has been highlighted. Further research is essential through which a comprehensive framework, based upon factors and indicators, is required to be established. This framework should include a systematic and comprehensive literature review to identify and develop the indicators. These established indicators are further important to be ranked according to their significance. Their validation should also be checked for its relevance. Weightages to these indicators should be assigned based on an appropriate methodology.

Finally, a matrix comprising all of the above-mentioned parameters should be developed to estimate the contribution of city parks in adaptation towards climate change. That matrix should apply to all urban parks worldwide. The validation of this matrix can be checked by applying it to certain selected parks initially.

This monitoring of urban parks will play a pivotal role in taking appropriate decisions regarding the adaptation to climate change.

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