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Editor: Assoc. Prof. Dr. Semra ARSLAN SELÇUK

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Editor

Assoc. Prof. Dr. Semra ARSLAN SELÇUK

Vice Editors

Güneş MUTLU AVİNÇ

Ayşenur COŞKUN

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ARCHITECTURAL RESEARCH Current Studies and Future Trends

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FOREWORD

Today, rapidly developing technologies, interdisciplinary and transdisciplinary research carried out in every field directly affecting the design and production processes in the discipline of architecture. This book has been designed with the theme of the present and future of research in the field of architecture and was created with contributions from the disciplines of architecture, planning, landscape architecture and interior architecture.

The chapters in the book show that one of the most fundamental research areas of the architectural discipline today is "sustainability" and the methods and technologies used for this purpose. It is clear that decreasing resources, increasing population and environmental problems are the main agenda of today's architectural researches as well as the focus of future studies.

We would like to thank the authors who have contributed to this book for their valuable chapters and the staff of Livre de Lyon Publishing House for their support in the publication process.

Semra ARSLAN SELÇUK
Güneş MUTLU AVİNÇ
Ayşenur COŞKUN

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CHAPTER 9

FOREST THERAPY OPPORTUNITIES IN MIDDLE- EAST: A CASE STUDY IN AJLOUN

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1. Introduction

In the past, the human connection with nature was closely related. The residential places were more integrated with nature, providing food, natural resources, recreation, and even therapeutic resources (psychologically and physically). With the development and expansion of cities and the transport network, building technology has become dependent on green spaces and forests in the suburbs and on the outskirts of cities. City life has become routine, characterized by stress and tension, so people are looking for a place to change this routine and break the closed box surrounded by technology and cell phones.

The growing interest in environmental stress has been accompanied by a rapid accumulation of evidence indicating that the environment can elicit substantial stress in people living in urban environments (Ulrich *et al.,* 1991).

Furthermore, it is broadly conceived that the natural environment can enhance human health (Frumkin, 2001). Today, the use of forests has changed over time from spiritual and resource extraction sites to recognize their value in providing a variety of complex ecosystem and environmental services and social functions (Elands *et al.,* 2010). Forests have expanded from natural resources to health-promoting resources, and the number of investigations on the therapeutic effects of forests has increased (Kim *et al.,* 2021). It is recognized that new and emerging ways of encouraging people to utilize forests sustainably for human health benefits need to be embraced (Elands *et al.,* 2010).

Forests cover 31% of the global land area. Approximately half the forest area is relatively intact. More than one-third is primary forest. The total forest area is 4.06 billion hectares or approximately 5000m^2 per person, but forests are

not equally distributed around the globe (FAO and UNEP, 2020). More than half of the world's forests are found in only five countries (the Russian Federation, Brazil, Canada, the United States of America and China), and two-thirds (66 per cent) of forests are found in ten countries (Figure 1).

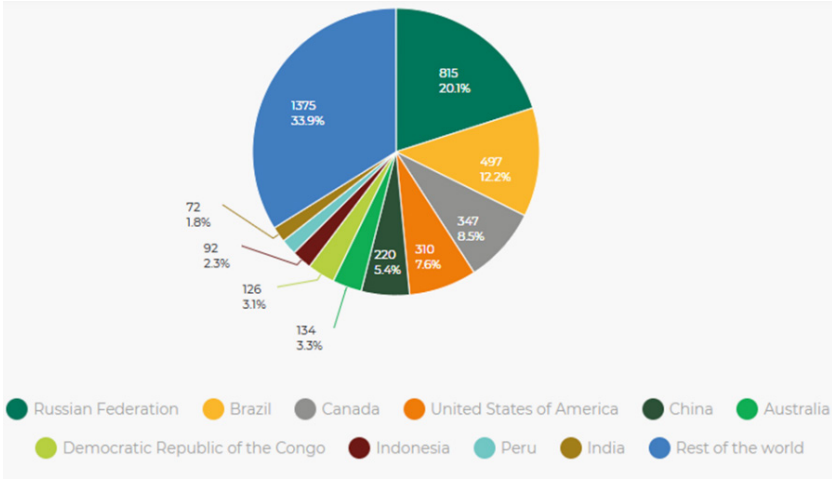

Figure 1. Global distribution of forests showing the ten countries with the largest forest area, 2020 (million hectares and % of world's forest) (FAO and UNEP, 2020)

On the other hand, the Arabian Peninsula is one of the most restricted regions in the Middle East by its forest resources, with a distribution of not even one per cent of its total area (Table 1).

Table 1. Distribution of forests in Arabian Peninsula (Worldbank, 2020)

Countries	**Land Area (sq. km)**	**Forest Area (sq. km)**	**Forest area (%)**
Bahrain	780	7	0,9
Iraq	434,128	8250	1,9
Jordan	88,780	975	1,09
Kuwait	17,820	62,5	0,35
Oman	309,500	25	0,008
Qatar	11,490	0	0
Saudi Arabia	2,149,690	9970	0,46
United Arab Emirates	71,020	3173	4,47
Yemen	527,790	5490	1,04
TOTAL	3,610,998	27,953	0,77

This study investigates forest therapy possibilities in countries with limited forest resources, such as Jordan. Although 1% of Jordan is covered with forests (FAO, 2010), Ajloun is a prominent area with its forest reserve and is selected as a study area.

It is aimed to analyze the sample area whether there are suitable forest therapy opportunities or not. General information was obtained, the biodiversity and ecotourism possibilities were examined. Source values have been tried to be presented with maps created with the help of ArcGIS.

2. Forest Bathing/Forest Therapy

However, the health and wellbeing effects of forests, in particular, have been more substantially researched in countries rich in forests or where they play a significant part in the everyday lives of locals, such as Japan or Finland (Farkic *et al.,* 2021). Forest healthcare activities such as forest bathing are primarily applied in an extensive forest far away from the urban area and large forest parks in a metropolitan area or its rural surroundings (Wu *et al.,* 2021). Forest bathing "Shinrin-Yoku" can also be defined as a new recreation type in forests that have focused more closely on forests' mental health benefits (Gürbey *et al.,* 2020).

The term Shinrin-yoku (Forest Bathing) was coined by the Japanese Ministry of Agriculture, Forestry, and Fisheries in 1982. As a research-based healing practice, forest bathing can be defined as a process intended to improve an individual's mental and physical relaxation by connectedness with the forest (Park, 2007). Forest bathing is considered the most widespread activity associated with forest and human health (Park *et al.,* 2010).

Forest bathing is a healing activity that helps maintain health and increase immunity. It reduces stress, depression, anger, fatigue, confusion, recovers cognitive functions, gastrointestinal tract, respiratory diseases, and lowers blood sugar and cardiovascular system diseases, increasing sense of relaxation and helping treat eating disorders (Park *et al.* 2021; Gürbey *et al.,* 2020).

Biodiversity is an essential component by offering different dimensions to the forest bathing participants. The therapeutic effects vary in various types of forest. Although coniferous forests which are capable of high emitting monoterpenes are preferable (Gürbey, 2020), Liu et al. (2021) stated that all three forests (mixed, deciduous and coniferous) were beneficial to lowering blood pressure and heart rate; effectively reducing negative emotions and boost positive emotions but the mixed forest had a more substantial therapeutic effect. Still, there is a lack of studies reporting the impact of canopy density; forest areas with high canopy cover should not be preferred to feel safe (Kim *et al.,* 2021; Gürbey, 2020).

3. Ajloun Forests, As an Area Eligible For Forest Therapy

All research and studies point to the importance of forest therapy, and as research progresses, this methodology can be taken seriously. In some countries, their geographical locations and vegetation cover help them develop and develop their forests, especially if these forests are rich and varied and have characteristics that make them suitable for this purpose.

The Middle East region (Especially the Arab countries) is one of the regions with a diverse climate and has distinctive characteristics. The diversity in climate has led to the variety in the natural environments that make up this region.

Jordan, being a country with a distinguished and intermediate location among the countries of the Middle East, has gained geographical, climatic and environmental importance, making its lands contain forests, pastures, plains and desert areas.

Located at the intersection of three continents with varied physical characteristics and landforms, Jordan has a rich and diverse ecosystem. It encapsulates four biogeographical regions and thirteen different vegetation types, with 2,622 vascular plant species representing 1% of the world's flora. Among which 100 are endemic, including the *Iris nigricans* & *Iris atropurpurea*, some of the few wildflowers familiar to Jordanians (Obeidat, 2019).

The forest vegetation in Jordan can be divided into natural forests composed of evergreen shrubs, pine and juniper forests, and broadleaf forests. Artificial or manufactured forests are areas afforested artificially by the Forestry Department since the 1950s. The afforested regions are found in all registered forest lands in Jordan. They are planted mainly with *Pinus halepensis* and *Acacia saligna*. The survival rate varies from 0 to 75% (NBSAP, 2020).

Jordan contains five main ecosystems (Gharaibeh, 2010):

1. The Jordan River Ecosystem: The Jordan River derives water from Lake Tiberias and drains into the Dead Sea. The Jordan River area and its extensions are considered one of the biologically significant areas. It includes a percentage of natural habitats and vital complexes threatened with extinction or weak. One of the advantages of this system is that it constitutes a global economic value in terms of forests, hunting, religious sites and tourist activities.
2. Dead Sea Ecosystem: Available information on distinctive plant and animal species.
3. Ecosystem Gulf of Aqaba: The island of Aqaba is the marine port in Jordan, where the coast extends to 27 km^2 for rare species of plants, animals and fish.

4. Highlands Ecosystem: Hovering over the average altitude of the Mediterranean Sea and extending from the northern highlands (Ajloun) down to the Petra region in the south, in which all the forests in Jordan grow from that the areas appear not to exceed 1%, rising in various species globally and locally important flora and fauna.
5. Desert Ecosystem: A display system in large areas in public spaces (80%), in public outdoor spaces (less than 20 mm/year). In this system, on sites important for bird migration, Jordan weights the bottleneck of the main migration corridors of birds. It may contain a large number of endangered plant and animal species.

3.1. Ajloun's Location and General Information

The Governorate of Ajloun is located at the northwestern corner of the Kingdom with the geographical alignment of 32°19'49.62" north latitude and 35°44'52.24" east longitude (Figure 2). Ajloun Governorate covers 412 km^2 and is considered the second smallest Jordanian Governorate after Jerash, with land characterized by agriculture, sparse forests and grassland (FAO, 2019; Al-Kheder *et al.,* 2016). The estimated population of the Governorate at the end of 2020 was 199400 (1.84% of Jordan) (Department of Statistics, 2021). There are five districts in the Greater Ajloun Municipality: Ajloun, Ain Janna, Anjara, Sakhra and Kufranjeh (Table 2).

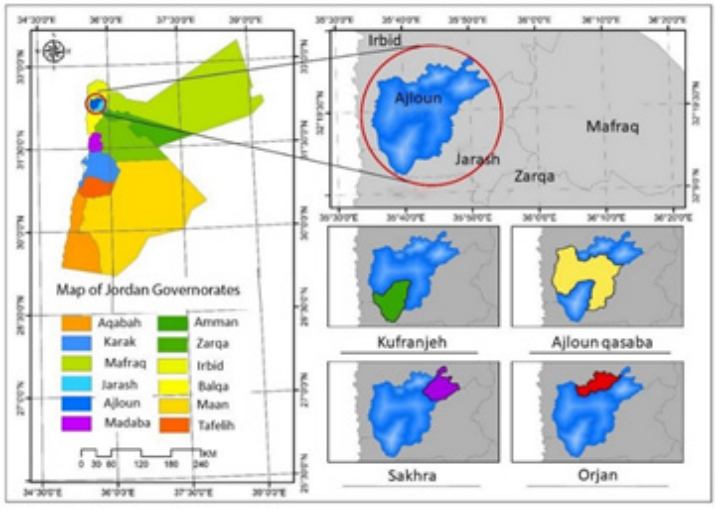

Figure 2. Ajloun's location in Jordan and other cities and the districts of Ajloun (By Ghaida A. Irmeili)

Table 2. The distance between Ajloun and other Jordanian cities (by Google map).

Name of the city	The distance (km)	Time (80 km/hour)
Irbid	32	30 min
Jarash	26	20 min
Almafraq	68	50 min
Amman	77	60 min
Zarqa	71	55 min
Madaba	105	90 min
Albalqa	73	55 min
Karak	192	2 hour and 30 min
Maan	283	3 hour and 30 min
Tafileh	256	3 hour
Aqaba	397	5 hour

Ajloun Governorate is a mountainous area of 224-1236 m and distinguished in the forests from the *Quercus calliprinos, Ceratonia siliqua, Pistacia palaestina* and *Arbutus andrachne*, beside the considerable number of springs, moderate climate and the fertilized soil (Figure 3-4) (Gharaybeh, 2015; RSCN, 2015).

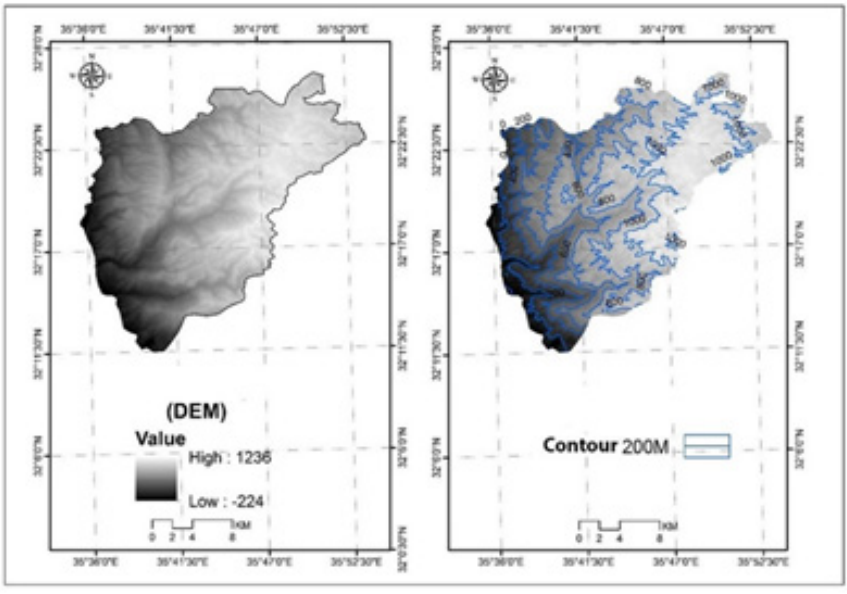

Figure 3. Digital Elevation Model (DEM) of Ajloun (By Ghaida A. Irmeili)

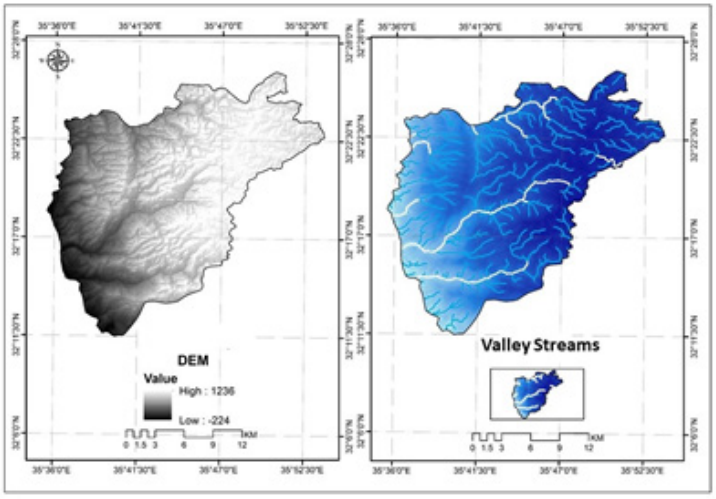

Figure 4. The streams of the valleys in Ajloun (By Ghaida A. Irmeili)

3.2. The Climate and Rainfall

Ajloun has a dry sub-humid Mediterranean climate characterized by long, hot and dry summers and short, cool and wet winters (Al-Bakri *et al.,* 2008). The average rainfall is 750 mm, the average temperature in winter is 5 C°, and the average temperature in summer is 30 C° (URL-1).

The distribution of rain and temperatures in the Ajloun governorate has shown in Figure 5.

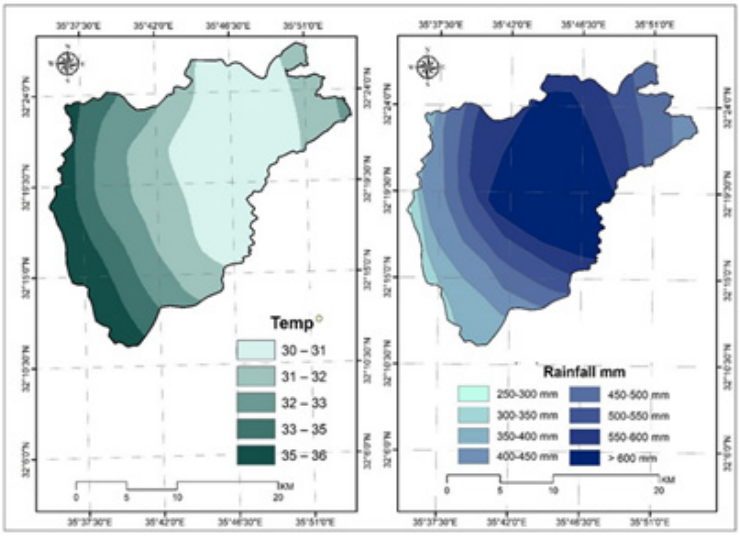

Figure 5. A GIS map shows the distribution of rain and temperature on the lands of Ajloun.

3.3. Ajloun Land Cover

The uses of lands in Ajloun vary to include: residential lands, pastures, forests, closed and open trees, rainfed and irrigated lands and fields.

The most significant land use in Ajloun is for rain-fed orchards, followed by grasslands. Forests (closed and open trees) account for 30% of the land area (Figure 6-7) (FAO, 2019).



LAND COVER CLASSES	DISTRICTS		TOTAL km²	TOTAL %
	Kufranjah	Ajlun		
Irrigated orchards	2.04	0.50	**2.53**	**0.6**
Irrigated herbaceous crop	2.04	0.73	**2.77**	**0.7**
Rainfed herbaceous crop	2.67	6.01	**8.68**	**2.1**
Rainfed orchards	18.15	105.77	**123.92**	**29.5**
Closed trees	0.53	50.17	**50.70**	**12.1**
Open trees	6.42	61.88	**68.30**	**16.3**
Woody vegetation	0.62	0.48	**1.10**	**0.3**
Grasslands	34.42	76.91	**111.33**	**26.5**
Build-up	5.57	19.84	**25.40**	**6.0**
Bare soil	11.25	8.72	**19.97**	**4.8**
Undifferentiated bare rocks	2.37	2.39	**4.76**	**1.1**
Bare rock granite	0	0	**0**	**0**
Chert plain	0	0	**0**	**0**
Basaltic plain	0	0	**0**	**0**
Sandy areas	0	0	**0**	**0**
Saline soil	0	0	**0**	**0**
Extraction site	0.51	0.29	**0.80**	**0.2**
Saline waterbody	0	0	**0**	**0**
Natural waterbody	0	0	**0**	**0**
Artificial waterbody	0.01	0	**0**	**0**
Wetlands	0	0	**0**	**0**
Wadi	0	0	**0**	**0**
Mudflat	0	0	**0**	**0**
TOTAL LAND	**86.59**	**333.70**	420.29	100

Figure 6. Aggregated land cover statistics of the Governorate by district, source (FAO, 2019).

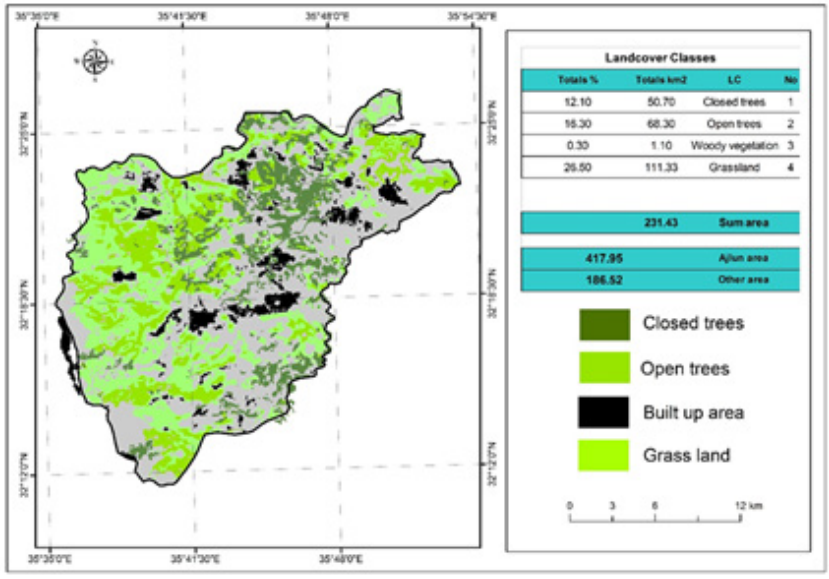

Figure 7. Map for distribution of forests with the built-up area in Ajloun, by GIS according to the satellite image from Land Cover Atlas of Jordan, 2019 prepared by FAO.

3.4. Ajloun Forest Reserve

Established in 1987, Ajloun Forest Reserve covers an area of 13 km^2 located in the Ajloun highlands north of Amman. It consists of Mediterranean-like hill country, ranging from 600 - 1100 m above sea level, with a series of small and medium winding valleys. Its ecological importance is represented by the Evergreen Oak vegetation type, which is typical of the northern highlands of Jordan. As part of the Mediterranean biogeographical region of the country, it is dominated by open woodlands that account for a significant part of Jordan's forested area, which does not exceed 1% of the country's entire land area (Figure 8-9) (RSCN, 2021a).

Ajloun contains several forest areas where tree canopy density varies from 10% to 90%, including open and closed tree areas. The most critical and densest area is the "Ajloun Forest Reserve", characterized by important biodiversity and different types of trees.

The area of closed trees, "which define as the level of tree canopy density is very high "is 51 km^2, while the area of the open trees, "which define as the level of tree canopy density is medium," is 68 km^2, with a total of 119 km^2 in the city of Ajloun, which is 30% of the land in general (Eiten, 1968).

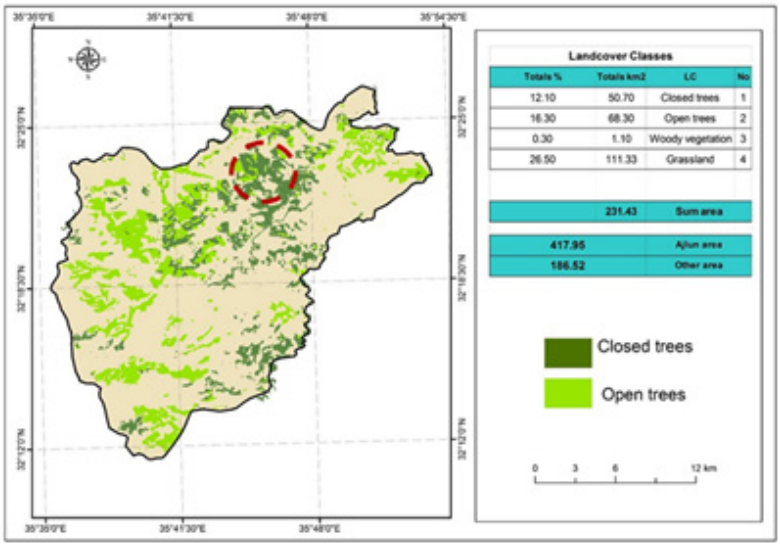

Figure 8. Map for the boundaries of protected area (Reserve), By GIS according to the satellite image from Land Cover Atlas of Jordan, 2019 prepared by FAO (Edited by Ghaida A . Irmeili)

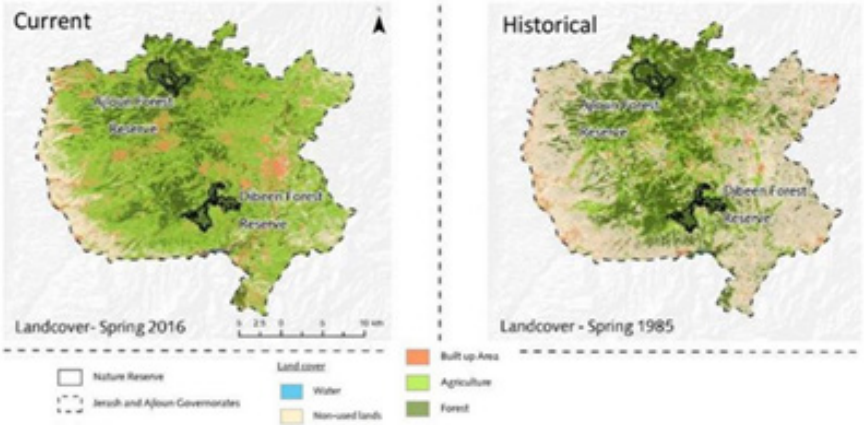

Figure 9. The location of Ajloun forest reserve and the landcover of Ajloun (RSCN, 2016)

3.5. Biodiversity in Ajloun Forest Reserve

Along with stretches of *Quercus calliprinos*, the thriving woodlands of Ajloun are dominated by *Ceratonia siliqua, Pistacia palaestina* and *Arbutus andrachne*. Throughout the years, these trees have been necessary to local people for their wood and quite often for their medicinal and nutritional value or simply as a

food source. These woodlands also support a wide range of plant and animal biodiversity. A wide variety of wildflowers thrive in the Ajloun forest, including the Black Iris, several orchids and wild tulips, several of which can be found in CITES appendices. In 2000, Ajloun Forest Reserve was announced, by BirdLife International and The Royal Society for the Conservation of Nature (RSCN), as an Important Bird Area in Jordan (RSCN, 2015). Ajloun Forest Reserve holds several faunal species, which is restricted in its distribution to the forested habitats of Jordan, such as the Stone Marten and the Persian Squirrel. Moreover, other species were recorded in Reserve, including the Wolf, Asiatic Jackal, Hyaena, Red Fox and the Indian Crested Porcupine (RSCN, 2021b).

As cited in Tadros and Ananbeh (2018), Thomas et al. (2010) performed an inventory at Ajloun to quantify the tree biomass, quantify structure and composition. The results of their study show that *Quercus coccifera* is well-represented in all diameter classes, including the recruitment class; *Arbutus andrachne* and *Pistacia palestina* are present in far fewer numbers. Ananbeh (2010) conducted another monitoring survey_for threatened plants operated in Ajloun reserve and showed that the highest diversity of threatened plant species with four Orchid species are *Cephalanthera longifolia*, *Limodorum abortivum*, *Ophrys transhyrcana* and *Orchis anatolica*. The most abundant threatened plant species were the *Orchis tridentata*, followed by the *Cephalanthera longifolia*, which showed the higher specimens recorded during the study.

Tadros and Ananbeh (2018) registered 100 species belonging to 34 families in the Ajloun Forest Reserve. The study showed that the high-altitude vegetation cover evergreen oaks, Atlantic oaks, and maple trees, followed by shrubs, climbers and grasses. It was found that the dominant plant is the evergreen oak, followed by the Palestinian oak.

3.6. Ajloun Forest Reserve and the Green List

International Union for Conservation of Nature (IUCN) Green List is a global campaign for successful nature conservation. At its heart is the Green List Sustainability Standard that provides a global benchmark for meeting the environmental challenges of the 21st century. The IUCN Green List offers locally relevant expert guidance to help achieve fair and practical conservation results in protected and conserved areas. It can help guarantee that wildlife and ecosystems can survive, thrive and bring value to communities everywhere (IUCN, 2018).

The green list considered several aspects of the Ajloun Forest Reserve site, including natural, ecosystem service, and cultural values (Table 3).

Table 3. The site value of Ajloun reserve forest according to the GREEN LIST, IUCN, 2018)

1. NATURAL VALUES			
Monitoring of Values	Thresholds of Success	Condition of Values	Summary of Trends And Results
Ajloun Forest habitats Forest health checks and monitoring for species, habitats and coverage is carried out routinely and reported	Maintain at least 40% woody cover, and aim to achieve 50% woody cover -50% ground cover by 2020.	Forest habitats – especially evergreen oak stands – are in good condition.	Overall regeneration of the Reserve continues and feeds into management activities
Biodiversity including special, rare and endemic species Bird species, in particular, are monitored in the Reserve as well as in the surrounding landscape	Special, rare and endemic species are present and preferably in stable numbers over a five-year average period.	All values are stable, and the majority demonstrate slow increases.	Good protection and improved habitat are generally suitable for most species. Some succession issues may occur. Integration with broader landscape and Debeen PA is actively promoted
Roe Deer population Reintroduction success has been monitored regularly since the release of 26 site-bred roe deer in 2006.	The Roe deer population in the Reserve and surrounding area is viable and at least 100 individuals are identified using the Ajloun habitat.	Roe deer are well established in the Reserve but also in surrounding areas. 2018 estimate of 120 individuals.	Roe Deer is well established and viable.

Table 3 continued. The site value of Ajloun reserve forest according to the GREEN LIST, IUCN, 2018)

2. ECOSYSTEM SERVICE VALUES			
The site ecosystem services are not technically identified. Still, they are referred to in the management plan, such as the regulating services of clean air, oxygen providing, and provision of natural resources like grazing ground, medicinal plants and herbs.			New integrated monitoring plan under development for 2019.
3. CULTURAL VALUES			
Visitor education and engagement in Nature Monitor the impact of tourism on local livelihoods, culture, forest integrity, and visitor experience.			Visitors numbered over 16,000 in 2016 and 18,000 in 2017.

3.7. The Ecotourism in Ajloun Forest Reserve

The most crucial component of RSCN's solution to integrate the local communities in its conservation programs was nature-based low impact ecotourism. Ajloun Reserve covers 12 km^2 from the remaining fragile and fragmented forest patches in northern Jordan. Ecotourism infrastructure and facilities (cabins, restaurants, trails) have developed to attract users to stay overnights in the area, which only received limited numbers of day visitors before establishing the Reserve. The Reserve was linked with the surrounding historical and cultural attractions, creating benefits and alternative income to the local communities and rehabilitating local houses along the hiking trails as stop points for food and beverage. This ecotourism product depends on natural and cultural resources, low level of technology with a low negative impact on nature respecting the site carrying capacity (Figure 10, 11) (Altawalbeh, 2018).



Figure 10. Ajloun Forest Reserve (Altawalbeh, 2018).

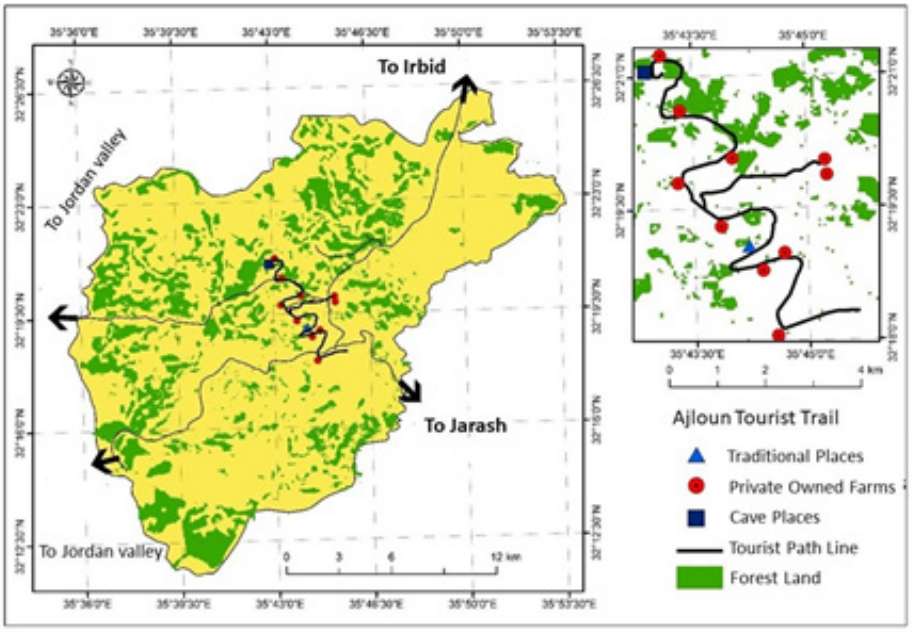

Figure 11. A GIS map of the Ajloun tourist route, the source is the tourism development of the Greater Ajloun Municipality, by Ghaida A. Irmeili.

Ajloun nature reserve has two trails (El-Harami, 2014). Both courses can be visited by guided or self-guided:

a. Easy Trail: It is a scenic viewpoint about (2 km) and takes 1-2 hours. This trail starts from the campsite and reaches the summit of a nearby hill overlooking the Reserve. The return trip goes past the breeding enclosures of the roe deer.
b. Moderate Trail: This trail consists of a Rockrose (8 km) and needs 4-5 hours to do. The visitor passes across heavily wooded valley ridges, villages and olive orchards and offers beautiful panoramic views of the West Bank and Syria.

The Reserve and the area surrounding it are dotted with ruins. The most famous is Salahidin's Ajloun Castle (1184 AD), and the most intriguing is the Mar Ilyas (Elijah) Church, one of the oldest churches in Jordan (El-Harami, 2014).

The number of visitors coming to the area increased after the opening of the tourist and visitors trails and projects, as these projects were able to prolong the stay of the visitor in the Ajloun area and the Reserve, where visitors can visit this area and walk in the tourist trails in addition to eating traditional meals.

Table 4. The number of visitors for Ajloun reserve
(IUCN, 2018; Jordan Times, 2020).

The year	Number of visitors
2016	16,000
2017	18,000
2018	40,983
2019	60,000

4. Conclusions

Forest therapy or forest bathing, which has emerged as a rising trend in recent years and focuses on the healing benefits of forests, is widely practised in Far East countries with dense forest resources such as Japan, China and Korea, and more recently in Europe and America. It is accepted worldwide as a health-based concept whose effects are proven day by day with increasing scientific studies.

Being in contact with nature and benefiting from its healing effects, especially after the pandemic, made easier accessibility of forest areas with high biodiversity necessary.

Ajloun is a prominent place on a national and regional scale with its different tourism activities. The solid ecological and cultural diversity in Ajloun is pointed out the city as a central tourism region in the northern part of Jordan.

Ajloun is one of the rare and distinguished forests with its natural components, location, rare trees, a unique biodiversity system, tree density, numerous water springs and moderate climate. These features make Ajloun Forest Reserve an important area for forest therapy or forest bathing. It is also an area capable of environmental development if attention is given.

Although Jordan has limited forest resources, it has entered the IUCN greenlist with the Ajlun Forest Reserve. Ajloun Forest Reserve has also been named one of the world's top 100 sustainable destinations by Green Destinations for 2018, recognizing its responsible and sustainable tourism initiatives (RSCN, 2021).

Forest therapy is a modern concept but old in content; employing the environment in treating and correcting humans is one of the most important things that help to integrate humans with nature. Existing trails in Ajloun Forest Reserve can be used for forest therapy. The proposal of Ajloun as a forest therapy area is an appropriate opportunity to develop this concept in the Middle East because Jordan is strategically located with the rest of the countries and is the most stable and the safest country at present and is very well known for medical tourism. With projects supported by scientific studies, Ajloun may become the first forest therapy base of the Middle East in the future.

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