A model for environmental management in arid areas, with focus on tourism development
A case study of desert areas in Iran

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Abstract:

In spite of their prevalent fagile ecosystems, arid areas enjoy numerous human-based and natural attractions that are in some cases unique in natural world.
Finding of this study well reveal that arid areas of Iran enjoy a great number of potential capacities, the most important of which are as follows:
-specific natural relief, including highlands, deserts, lakes, rivers, springs, etc.
-vegetation coverage specific to arid areas, wonderfully adapted to its natural environment;
-specific wildlife;
-Rural and urban architectural attractions, including for instance, existing carevanseras, pavements and other tourism capabilities.
Regarding the available capacities for tourism development and the role it can play in socio-economic and political aspects, necessary directions has been provided for this purpose.Adequate investment can, thus, play a central role in development of both domestic and foreign tourism activities.

Key words: arid area, tourism sustainable development; tourism attractions; desert area

1 introduction

presently, tourism industry is experiencing increasingly rapid changes. no boundary can be conceived among different societies in the context of global village.Emergence of new tourism areas is a world-wide phenomenon.It is now largely believed that arid areas have the potential to meet the needs of those who dwell in those areas.Also, an interest in solving the problems related to climatic conditions, aridity, water deficit, soil sensivity,…Has resulted in many national, regional and international actions for both a better understanding and an optimised utilization of the arid areas.

2 Materials and methods

The study area covers inland deserts of Iran, with an area around 320,000 km^2. This area that constitutes nearly 20% of national geographical area is encompassed by Elborz and Khorassan mountains in the north, central mountains in the west and eastern mountains in the east.These areas are each subdivided into some sub-areas or zones,The most well-known of which are Dasht-e-kavir and Kavir-e-loot in northen part and southern part respectively.
In this study both descriptive-analysis and applied research methods have been used according to the type of objective and methodology geographical information, including climatic factors, flora and fauna communities, urban and rural settlements and tourism attractions constitute the statistical universe of this study.Also, for data-gathering, different

instruments including maps, satellite and aerial photographs, as well as field and documentary studies have been employed.

A case study map

3 Results and discussion

The factors responsible for dry weather are as follows:

- High regional temperature caused by radiation of sunshine;
- High pressure caused by pressure centers (especially subtropical high pressure);
- Oceanic coastal streams;
- High mountain ranges and high plateaus;
- Lack of exposure to the marine impacts (distant from marines and oceans); and
- Absence of upward movement of air even in the moist air and weather turbulences.

One of these factors or more can be responsible for dry weather in an area. In the selected area for this study, however, subtropical pressure is the major factor for this phenomenon. That is to say, warm moist air in the Equator moves upward and releases its humidity in the form of rain. Then at the same altitude it moves towards poles (i.e. north and south). Rotation of the earth causes a major part of the air to sink in 30 degrees Meridian. Here, the air is distributed, without being allowed to move upward. The result is an arid area, where Iran lies for most part. Accordingly Iran is located in an arid and semi-arid area with consequent arid and semi–arid ecosystems.

The current problems and limitations may fall into two categories:

a. Natural limitations inherent in arid ecosystems; and
b. Problems or constrains created due to inadequate understanding of appropriate utilization of arid ecosystems.

Precipitation pattern in the area is characterized by both low average annual (less than 50mm) and disproportionate distribution. Poor vegetation coverage, scarcity of water resources, and saline soils are other natural limitations. This holds true to the extent that no water resource can be found in many parts with Loot desert (Kavir-e-Loot) in eastern Iran as a distinctive instance.

In terms of temperature, dry weather coupled with dry soils and air, causes intensive soil erosion by occasional winds and storms. It also leads to the movement of sand-dunes and emergence of new shapes or landscapes.(Estelaji,shariat panahi,2003,49)

Also, human being creates problems in this regard, merely because he doesn't know how to deal appropriately with arid areas for utilization purposes. In the selected area, for instance, some irrational acts such as excessive use of saline water for irrigation, cultivating steep lands, plowing in wrong direction, over-grazing, burning plants and the residues, as well as cutting trees and collecting soil humus, have resulted in the loss of vegetation coverage and intensified soil erosion. Also, excessive use of chemicals along with inappropriate waste disposal (land fill) and sewage systems have infected or polluted soils in some regions.

As far as water resources are concerned, irregular digging of deep wells and lack of adherence to defined boundaries, have decreased groundwater levels in many regions.

In spite of climatic limitations in arid areas, there are also a variety of potentials that need to be identified and utilized. Studies in the selected area well reveal following potentials as currently available capacities: (kardavani,1999,373)

- Solar energy;
- Wind energy;
- Salt pits;
- Coal mines;
- Uranium mines;
- Sand and gravel pits;
- Copper, zinc and lead mines;
- Clay soil and China clay mines;
- Natural touristic attractions such as appealing landscapes in arid areas,

including landscapes created through blowout, desert rock-revetments, eroded features, dunes, dried salt domes, water catchments, salt lakes, wild life, uncommon and scare ground cover(plantation coverage), etc; and

- Practicing irrigated agricultural and horticultural activities (providing that appropriate utilization methods in arid areas are adequately taken into consideration).

These potentials may well provide proper setting for investments in research, industrial, manufacturing, and tourism activities.

In spite of the fragile ecosystems,arid areas mostly enjoy many human- based and natural attractions that are in some cases quite unique in the world.Natural features and relifs like dunes,salt domes, badlands, salt lakes, fresh and saline water springs, and animals well- adapted to hard-to-live circumstances,are just few instances of wonderful natural phenomena one can see in an arid area.Zerophylus and halophyte plants, from small bushes to 6-meter high shrubs, are other natural picturesque sceneries that only deserts can offer.Also, human-based attractions like historical monuments, type of architecture and materials used for construction purposes, the ways desert-dwellers produce and subsist or deal with aridity, drought or water deficit,etc; are other striking views that can attract tourists.

In general, results of this study fall into following categories:

3.1 Natural attractions and perspectives

3.1.1 Highlands:

Several mountain ranges like siyahkooh and Nakhjir have provided this plain with a picturesque view.

3.1.2 Plains:

Plains like Dasht-e-Baghoo, and mobarakeh plain with relatively dense vegetation coverage of different species, as well as plain such as Dasht-e-Nesar, and Dasht-e-sineh shekarab as the habitats of endemic wildlife, offer attractives views to tourists.

3.1.3 pelaya(deq):

In arid areas, Pelaya, also known as deq, is a flat basin, in which water is collected on a periodic basis.It is, thus, a shallow, salty, and lake-like basin that turns into an area coverd with cracked polygons of puddle clay in the time of drought.

(shayan ,s. 1390:302) Instances of this spectacular natural phenomenon are available in kavir national park. Kashkooli, Parzard,Sorkh and Haji Mohebali, are some of the deqs, mostly located in the north-east of the park.

Figure 1

3.1.4 Rivers and springs:

Band ali khan is the most important river in the reserved area of kavir. Downstream branches of Qarachay River also run in the area. These rivers are both habitats of a number of hydrophyte migratory birds in winter and xerophyte birds in other seasons.

There are in numerable spring in kavir national park, that are mostly attractive for tourists as the watering troughs of wildlife Abundence of reeds and tonsils in the margins of these springs as the water troughs of wild goats and roams, for instance, amplifies the tourism attractions of the region. Shahi Siahkooh, Ain-ol-Roshd, Hawze Anamajd and sefidab,are some of the well-known springs in the region.

3.1.5 Vegetation coverage:

Located in the margins of kavir,nation. All park dry climate and considerable ground cover specific to desert and semi-desert areas. The plant communities in mountainous areas are of steppe nature. Xerophylus and halophyte plants have a particular position in the flat plains of kavir national park. In order to resist against low water, high temperature, saline soils and arid environment, these plants use different mechanisms for adaptation. This feature has given them a specific spectacular view.

Figure 2

3.1.6 Wildlife:

Animals of different species in the area have also adapted themselves to live under arid circumstances. Mammals like deer,zebra,wild goats and roams, as well as carnivor like leopard,cheetah,wolf,hyena and wild cat live in the western part of central kavir. Also, vultures live in basins, rivers, highlands, vallegs and plains of the region.

Figure 3

3.1.7 Tourism attractions in maranjab kair

Located in the east of kashan and adjacent to the historical silk road, maranjan kavir enjoys many tourism attractions like salt lake, shifting sand dunes, and a historical caravansaray. The latter with a relatively short distance from Tehran, is already being visited by many domestic and foreign tourists in the dry seasons.

3.1.7.1 Salt lake:

With an average length of 30 km^2 and width of 25 km^2,salt lake is spread out like a white crystal carpet. The extended size and magnificence of the lake with its geometric arrangements of salt crystals, makes every visitor astonished. The attractiveness of sargardan Island(wander Island) in the lake is much more magnified in winter,when it offers itself to migratory birds, in particular, flamingos.

Figure 4

3.1.7.2 Sand dunes:

12 kms to the east of caravansaray, one may readily visit shifting sand dunes. In spring when the dunes are covered by vegetation,their movement or displacement with the wind blows creates such really picturesque scenes.

Figure 5

3.1.7.3 Dastkan well:

Though adjacent to the largest salina of Iran, Dastkan well provides visitors with a quite, palatable fresh water.

3.1.7.4 Maranjob carevansaray:
In the southern margion of the lake and quite adjacent to a water-rich aqueduct(kariz), there is maranjab caravansaray this brick-made structure, which is crossed by a well-known branch of silk road,has been recently rebuilt by cultural heritage organization. This square castle-like building has been built in safavid era.

Figure 6

3.2 Human-based attractions

The remainders of human activities all around the kavir well reveal that it had been populated and a residential center in the past times. It also indicates the creative methods people used to employ to adapt themselves with the circumstances of the arid environments. Major monuments of these sorts in this vast area are as follows: rural and urban tourism attractions ,caravansarays,castle and bastions,cisterns or water reservoirs, shrines and aqueducts (Department of the environment,1386:63).

3.2.1 Urban tourism attractions:
Urban areas are important for tourism purposes from two aspects. First, they are origin of tourist trips due to population pressures and depressions caused by work activities. Second, urban centery mostly enjoy adequate facilities for subsistence and recreation,as well as for economic, business, industrial, cultural, political, sanitary, communicative and leisure time activities, besides historical and tourism attractions There are cities within and around kavir plain. Houses, buildings, passage ways, open spaces and the architecture and old texture of these cities are highly affected by weather factors and hard climatic conditions. However, they mainly possess a variety of visual landscapes and views that can be attractive to many interested people (Armaghan s.2006:125). Damghan city, located in the northern margin of kavir plain and semnan city, the capital of semnan province,in the north-west of kavir plain are among important cities with a number of historical, cultural, architectural and relegious attractions. Qom and Kashan cities, both located in the northern margin of kavir plain are well-known for their historical, cultural, and religious monuments.The former is famous as a major tourism-pilgrimage city. Jundaq, a suburb of Khor city , located 350km north-east of Sfahan, is limited in the east by southern margin of kavir plain.

Figure7

3.2.2 Rural turism:
rural areas and their residents are related to tourism industry in two terms. First, rural environments provide visitors, specifically domestic ones, with suitable summer quarters and spaces to have pleasurable leisure times. Second, what rural people offer to visitors as foodstuff or handicrafts, is a helpful means for subsistence economy of rural areas.

Figure 8

In the margins of kavir plain, and even somewhat within the plain, one may find villages that due to the hard climatic conditions can be conceived as the lost paradise in the heart of the hot kavir (desert). Some of these rural areas are as follows:

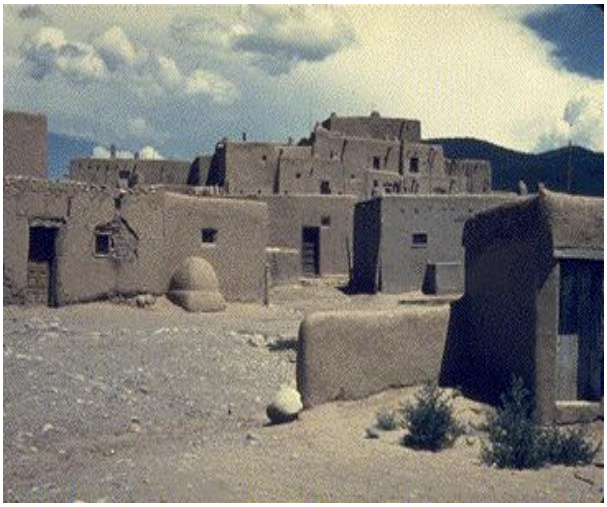

Figure 9

3.2.2.1 Mesr village:
this village is located 45 km east of jandaq. The dwellers live on animal-husbandry. Saffron and wheat are the major agricultural produce.sand dunes and vegetation coverage laden with tamarisk and halloxylon shrubs and alm trees have created a picturesque scenery. A reed bed 6 kms east of the village,with its pleasant view is the water though for animals in the region.

3.2.2.2 Bayazeh village:
Bayazeh, a village located 52 kms south-east of khor in isfahan province,has an ancient citadel (arg) erected in sassanian times. However, unfortunately this historical monument is going to be completely ruined, merely because it does not receive due attention. Jaame mosque, the oldest mosque in the village, that has been erected in safavid era, is another historical-religious relic. Old houses with large pools, several summer and winter rooms, and long tall halls that make the air cold enough in summer time,show that how man could once cope with the natural conditions.With their star-laden sky at night time, and the calmness they offer the visitors, these villages are quite suited for tourists accommodation. However, ammenities are needed to provide visitors with tourist services.

3.3 Approaches sustainable development in arid ecosystems

According to field studies in the selected area, as far as management and sustainable development in arid areas is concerned, the following approaches can be well applied to diminish limitations for optimized utilization of resources in such areas all over the world:

3.3.1 Modifying saline and alkaline soils

It is not advisable to develop lands in arid areas where shortage of water is common, or no adequate facilities are available for canal construction or conveyance of fresh water. However, mineral resources can be appropriately utilized where irrigable water or adequate facilities for conveyance of water are available.(kardavani,2001,40)
In this regard, measures have been taken in the selected area as follows:

- Constructing drainage systems;
- Removing alkaline top soil;
- Leveling and plotting out farmlands;
- Leveling farming plots and removing bulky clods;
- Applying minerals to modify alkaline soils;
  Surface washing with fresh water;
- Improving land with mineral and organic fertilizers;
- Planting saline-resistant plants on due time; and
- Adopting appropriate methods for plantation and irrigation.

3.3.2 Controlling soil erosion (soil conservation)

The mentioned studies also reveal that every year a very huge amount of high quality soil is eroded in the area. To scale down the effects of this process, successful measures have been taken in the selected

area that can be used in other similar areas as well. These measures are stated hereunder.

Controlling soil erosion through following watershed management practices:

- Direct practices : building bench traces and trace systems as well as loose rock dams; and
- Indirect practices: creating and improving vegetation coverage coupled with pasture reserving;

Stabilizing sand-dune

This is done through creating vegetation coverage, building shelter belts, and applying oil mulch;

Protecting and improving vegetation coverage;

Complying with appropriate farming principles: crop rotation, plugging in correct direction, terracing, constricting diversion channels for spilled over water, and making use of animal manure to improve both soil and yields.

Figure 10

3.3.3 Decreasing soil infection

Considering the previously mentioned factors that cause soil infection, measures have been taken in this regard in the selected area. These measures are mainly as follows:

- Improving soil with manures or a combination of manures and fertilizers;
- Using chemicals with low durability in plants and soils for controlling pests and weeds;
- Reducing harmful pests through biological controls;
- Building channels for collecting waste water and sewage; and
- Making compost out of waste materials and litters.

3.3.4 Optimizing water uses

As a major problem, arid areas suffer always from shortage of water. However, studies in the selected area have provided this area and other similar areas with useful measures to catch up with this ever lasting problem. These measures may fall into following categories:

Controlling surface water for further uses through:

- Constructing storage dams;
- Using motor pumps for lifting up water from valleys and rivers;
- Detaching fresh water tributary streams from those with saline water; and
- Shifting channel line towards places that need water.

Utilizing and enhancing groundwater resources through:

- Constructing underground aqueducts (Qantas) in arid areas and conveying water from water-abundant regions to water-dearth regions via underground canals;
- Constructing deep and semi- deep wells in compliance with the defined boundary for well-digging;
- Making greater use of springs or fountains as water resources; and
- Making greater use of carestic and underground water resources.

Softening (desalinating) saline water;

Collecting rainwater through:

- Land modifying and cleansing, constructing suitable canals and gutters, condensing soils, and making flat lands uneven;
- Sprinkling chemicals like silicon, latex, sodium salt, and tar;
- Covering top soils with synthetic materials; and
- Covering land with asphalt, concrete, mosaics, etc.

Promoting drip irrigation and other low–input methods.(kardavani,2001,11)

3.3.5 Utilizing natural resources available in arid areas

In spite of the delicate and fragile ecosystem as a natural constraint in arid areas, there are also a variety of potentials for utilizing natural resources that may well compensate for the problems. The authors' studies in the selected area have revealed many useful approaches or measures in this regard that can be well workable in other areas with the same climatic conditions. These measures are as follows:

Taking advantage of wind and solar energies for different agricultural and industrial uses;
Utilizing sandy regions as sand or gravel pits;
Making use of sandy regions for artificial nourishment of underground waters;
Building industrial sites in sandy regions; and
developing sandy regions as farmlands through following processes:
- Leveling land;
- Plotting land and preparing it for irrigation;
- Irrigating prepared lands with flood water; and
- Cultivating land and improving it with humus and organic materials.

Utilizing clay soil pits;
Amending clay soils for agricultural purposes;
Utilizing sand pits;
Utilizing salt pits; and
Making investment on other mineral resources and establishing the related industries.
(Estelaji, 2002, 47)

Conclusion:

Recognizing natural attractions of arid and semi-arid areas in Iran may catch up one with an understanding that in spite of misconceptions about arid environments as void-of-attraction areas, and despite the hard natural conditions in these areas that exacerbate such misconceptions, desert areas enjoy many natural and human-based attractions that no other natural area can provide. This uniqueness in terms of natural reliefs, amplifies the beauty and attractiveness of arid areas. A spring, or a shallow saline river in an area where no rain has fallen for several years, is quite appealing and attractive, especially when it is used by specific birds and animals.

Natural reliefs and features like badlands, salt lakes, springs with fresh and brackish water, and deqs, all have their own specific beauty. Animals adapted to hard living conditions, as well as abundance of zerophylus and halophyte plants, from small bushes to 6-meter high shrubs that only deserts can offer, have a quite different show case of beauty. Human-based attractions such as historical relics, types of architecture and materials used for construction of rural and urban buildings, and the way desert-dwellers produce and subsist or deal with aridity, drought and high temperature for long dry seasons, are all other appealing landscapes that can attract many tourists or visitors.

Recommendations:

Regarding the fact that above-mentioned phenomena can be attractive for those interested in nature and tourism, following recommendations are proposed to the concerned organizations or agencies to provide adequate infrastructures needed for encouraging domestic and foreign tourists to visit arid areas which is beneficial for development of tourism and desert-dwellers.

Current livelihood conditions and the way resources are used in the areas endangered by drought and desertification, fail to meet adequate linving standards. In addition, traditional livelihood pattern is based mainly on pasture farming. Managerial measures, thus, need to be taken for both poverty alleviation and environmental protection in the area as follows:

- Strengthening and reinforcing rural organizations for managing rural affairs and rangelands;
- Developing industrial activities according to the potentials and capacities of arid areas in terms of energy and mineral resources;
- Promoting and encouraging natural resources participatory management, with emphasis on using modern technology for conservation on of the environmental and natural resources; and
- Establishing periodical credit funds for rural investors so as to facilitate initiation of rural industries or businesses.

Raising mere basic knowledge dose not suffice to deal with desertification process in arid areas. Thus, managerial activities need to be taken in to consideration for pertinent information and monitoring systems. Some of managerial activities needed for this issue are:

Creating and enhancing an environmental information system at national level;

Improving rural infrastructures, and conducting national, provincial and local assessments to ensure network–wise cooperation between existing environmental information and monitoring systems;

Raising the capacity of national institutions for environmental data analysis so as to practice close control over biological changes; and

Encouraging public collaboration and education on environmental protection with emphasis on anti-desertification efforts.

- Selecting appropriate sites for building few-dags accomodation complexes or facilities adjacent to villages, wetlands, springs and other suitable places in desert and semi-desert areas.
- Establishing relatively low-cost places in marginal cities for long stays not less than one month.
- Constructing appropriate access roads from marginal cities to deserts and points with attractive human-based and natural reliefs.
- Changing national parks like kavir national park and the protected area or desert basins into zoo parks, and providing them with required facilities including roads, sings, transportation media, etc. for touring by vehicles.
- Building museums for historical relics found in arid areas around kavir, and museums for regional wildlife and vegetation coverag in urban and rural few-days accommodation facilities.
- Establishing exhibitions in tourists accommodation facilities for showing desert-dwellers products handicrafts equipment and tools,etc.
- Organizing ceremonies for honoring the renowned scholars, poets,… of the area, in tourist- receiving cities or in the villages where they have been born.
- Organizing seminars, congreses and syposiums under the themes related to desert and semi-desert areas.
- Organizing tourism activities in desert areas through establishing tours specific to the same area.
- Providing air-visiting facilities for tourists.
- Organizing tours for riding camels, bicycles, automobiles and motorcycles in kavir (desert areas) for the interested tourists or visitors.
- Providing tourists with services like food-supply and guiding activities that can be rendered by local people.
- Providing social and cultural contexts for presence of tourists to be welcomed by local communities in rural desert areas.
- Taking measures needed for security and safety of both domestic and foreign tourists in desert and semi-desert areas through establishing new gendarmerie station and building upon existing ones.
- Introducing and making known human-based and natural landscapes in those areas through different propaganda and advertisements activities to attract the interested tourists.
- Training the manpower in tourism techniques to serve tourists in hotels, restaurants and tourists guiding centers.
- Providing specifically within-desert cities and villages (like jandaq and mesr) with infrastructural ammenities needed for development of tourism.
- creating facilities needed for some desert-specific sport activities like sand-skiling and desert-traversing by motorcycles.
- Installing both fixed and mobile gas stations and repair shops across tourist roads in the area.
- Selecting mesr and bayazeh villages as the tourism target villages and conducting detailed studies about providing facilities and infrastructures needed for development of rural tourism in kavir.
- Selecting cities within and around kavir, including jandaq, Damghan Kashan and Qom as tourism target cities and providing them with the infrastructures needed for development of tourism in desert urban areas.

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