

## **An environmental approach to regional development and deprivation in the Ghezel-Ozan Watershed**

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### **Abstract**

As part of a broader effort to bring about social justice in the 1980s, Iran's Plan and Budget Organization (PBO) carried out a series of studies titled "Regional Disparities Investigation". All development indicators pointed to the Ghezel-Ozan Watershed (GOW) as one of the most deprived regions of the country. The Ministry of Construction Crusade was commissioned to launch a planning project at the GOW scale in 1993. Taking an environmental approach to regional development aimed at alleviating deprivation, this article attempts to elucidate the contributions, on the one hand, of natural resource factors such as climate, water, soil, flora, etc. and, on the other, of development planning efforts. The main conclusions based on the findings of the project are: a) historically, a spatial pattern of natural resources largely determined the appearance of thousands of scattered small villages, one third of which are now deserted; b) the region's climate and terrain were not favorable to the formation of communication networks and urban centers, with the result that villages were dependent upon the services of urban centers outside the region; c) economic activities such as traditional animal husbandry and agricultural practices are largely responsible for the ongoing deterioration of resources; and d) regional development efforts have been neither spatially integrated nor institutionally sustained.

*Keywords: Ghezel-Ozan Watershed, natural environment factors, regional development efforts, settlement spatial structure, socio-economic deprivation.*



## 1 Introduction

The core thesis of this paper is that given the relatively invariable natural setting of Iran's Ghezel-Ozan Watershed (GOW), which can historically account for the relative backwardness of the region, it is mainly the inadequacies of regional planning efforts that are responsible for persistent deprivation of the region's rural communities, contributing in turn to ongoing environmental degradation.

Ghezel-Ozan is the longest river in Iran, extending 1400 km and consisting of four tributary areas. It runs through parts of five north-western provinces of Iran and drains 49,587 square km constituting one of the country's 37 watersheds (see Table 1 for more details).

Table 1: Summary of GOW characteristics as of 1990.

Provinces	Partial Province Areas (km <sup>2</sup> )	Rural population (1000)	Urban population (1000)	% Urban	No. Of settlements
Zanjan	18,112	392	274	41	863
Kordestan	14,175	263	122	32	721
East Azarbyjan	11,521	325	90	22	901
Hamedan	1,752	69	0	0	97
Ardabil	4,027	107	36	25	293
Total	49,587	1,165	552	31	2,875

Iran has engaged in a variety of regional planning setups over the past six decades, typically identifying planning regions by a combination of neighboring provinces, single provinces or counties. However, in the case of GOW the planning region was identified with the watershed in an attempt to alleviate the country's regional disparities by taking into consideration the fact that most livelihoods in the region depend directly on natural resources—especially water, flora and soil within agricultural plains.

## 2 Deprivation characteristics

It has been well researched and proven that rural poverty and environmental degradation are two correlated processes that typically indicate circular causation. The Ministry of Construction Crusade's (MCC) 1993 planning project attempted to take account of a variety of factors contributing to the problematic situation. Among these were the natural factors of climatic traits, water, soil, flora and natural disaster potentials. These were analyzed together with the region's spatial structure as a part of development planning efforts. In order to



portray the developmental gap between GOW and the rest of the country it suffices to enumerate the most important indicators related to rural communities, of which GOW ranks lowest. The region's principal sources of deprivation are human resource decline, traditional production practices and spatial structure diseconomies.

According to the latest available Human Development Index calculated for 26 provinces of the country, Zanzan, Hamedan, and Kordestan ranked 22<sup>nd</sup>, 23<sup>rd</sup>, and 25<sup>th</sup> respectively. East Azarbyjan and Ardabil provinces enjoyed better positions at 12<sup>th</sup> and 15<sup>th</sup> places respectively [1]. However, one should bear in mind that these aggregate indicators of whole provinces are not representative of more depressed rural areas within GOW.

Historically, GOW provinces have had the highest out migration from rural areas to the urban centers of other provinces, especially to the Tehran Metropolitan Region. Taking into account that the migrants in question are largely young, the trend has exacerbated socioeconomic problems of both the origins and the destinations of migration. As a result of this push-pull phenomenon, one third of the region's 3,716 villages were deserted between 1976-1996. The most recent census indicates that one third of the rural workforce in GOW's five provinces is illiterate, clear evidence of persistent deprivation in the region given that the same indicator at the level of the country's rural areas is 6% [2-6].

### **3 Contribution of natural factors to development**

#### **3.1 Climate and development**

Climatology of GOW puts it in the cold zone category. 70% of the region is characterized as semi-arid-cold. Despite its hilly and rugged terrain and while ranking as highest settlement density area in GOW, two thirds of the villages are scattered in this area. This situation places inter- and intra-regional accessibility at the top of the development problems list. The problem is most pressing during cold seasons when energy sources are desperately needed and frozen rural roads present great transportation obstacles.

#### **3.2 Water and development**

A total of 4.7 billion cubic meters of water is procured annually in GOW, of which less than one fifth goes to agricultural production, household and industrial uses. The rest builds up at the Sefidrood Dam reservoir at the border of the watershed. The dam has been constructed for purposes of hydroelectric generation and irrigation of agricultural plains of the downstream Gillan. The river discharges into the Caspian Sea at the end of its journey.

The precipitation regime of GOW, raining during cold months of March and April, is asynchronous to the irrigation season, commonly in August and September. Such a regime is considered counterproductive to the agriculture sector. Table 2 below reflects negative underground hydrologic balance, while Figure 1 below indicates high dependence of rural communities upon surface



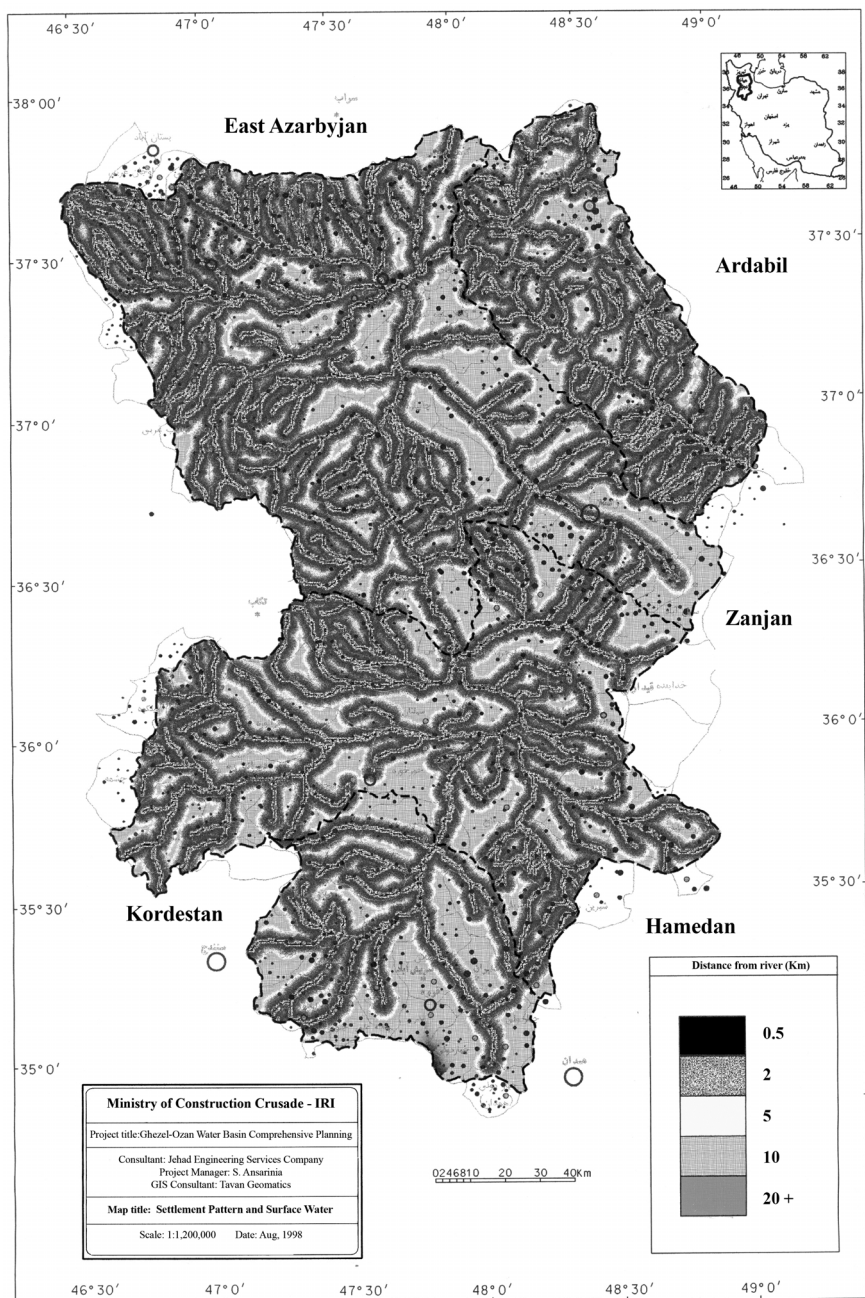


Figure 1: Settlement pattern and surface water spatial distribution.

Table 2: Hydrology balance of GOW and its tributaries.

Tributaries Hydro. data	Telvar	Ghezel- Ozan Ajichai Sojas	Gharanogho Idoghmosh Zanjanrood	Ghezel- Ozan Arpachai	Total Ghezel- Ozan
Area (SQKM)	6,560	15,619	20,136	7,274	49,588
Water procured (MCM)	423	1,257	2,265	762	4,707
Ag. uses	115	209	409	100	833
Ground. Water balance	0	-12	-4	0	-16
Surface Water discharge	290	1,029	1,825	647	3,891

water [7]. A regression analysis concerning the relationship of settlement patterns and surface water network indicated -0.64 to -0.76 correlation coefficients, suggesting that the majority of villages are located within close proximity of main and tributary rivers.

### 3.3 Soil and development

Second only to water, soil is the most important resource for agricultural production. Due to time requirements for the natural processes to generate soil, in the order of several centuries, it is considered a non-renewable resource. More than 200,000 rural families' livelihoods are dependent upon 2.3 million hectare of agricultural land. From the stand point of soil conservation and suitability, the study shows that three quarters of farmers live and produce on an incompatible class of land [7].

The majority of agricultural production on this class of soil is dry farming, which has a significant contribution to soil erosion. This and a multitude of other activities erode more than 26 million cubic meters of soil a year, flowing through rivers and ending up as sediments in the Sefidrood Dam reservoir. This means the reduction of the reservoir's water holding capacity and shortening of its lifespan. A time series study of out migration and areas of high soil erosion demonstrates a close spatial correlation between the two trends in the region (see Table 3 and Figure 2).

### 3.4 Flora and development

In GOW, traditional animal husbandry based on free grazing in open pasture continues to prevail. As a result, a large part of farmers' livelihoods depends on



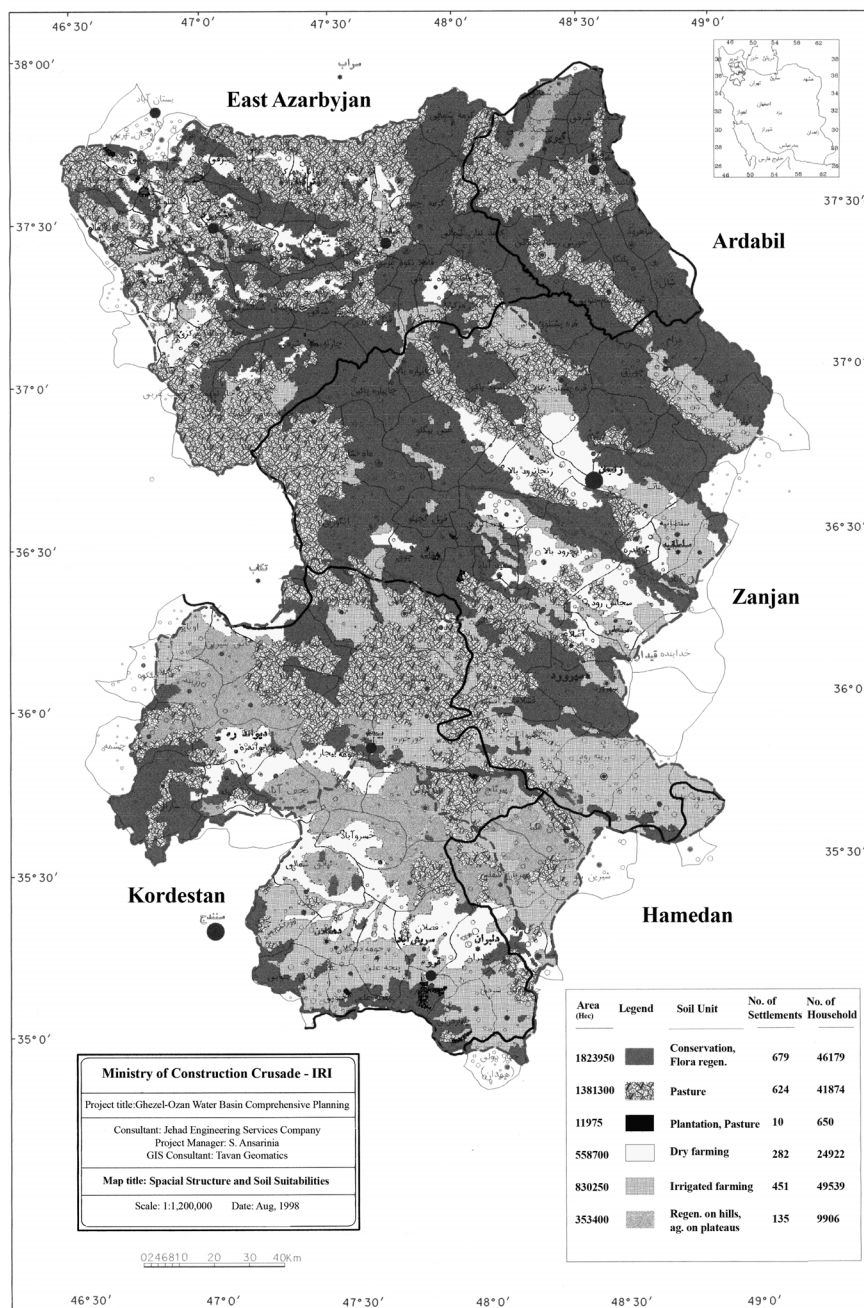


Figure 2: Settlement pattern and soil unit suitability.



the availability of pasture. Grazing capacity of 2.14 million hectares of pasture is estimated for 5.9 million animal units, whereas the flora of the region is tolerating a livestock population of twice that figure [7]. The study also indicates the pressure that is on the pasture class, representing 40% of all classes, which is rated as poor in existing conditions and degrading in trend (see Figure 3 below).

Table 3: Soil suitability and existing use incompatibility in GOW.

Soil Suitability Type	Area (1000 Hec)	% of GOW area	Rural Population (1000)	% of rural population	Incompatibilities
Conservation Flora Rgn.	1,824	36.8	227	23.0	High livestock density
Grazing	1,381	27.9	251	25.4	High livestock density
Grazing/Tree plantation	12	0.2	4	0.4	Forests clear cutting
Dry farming	558	11.3	150	15.2	Non-technical plowing
Irrigated farming	830	16.7	297	30.0	Traditional irrigation
Flora Rgn. on hills/ Ag. on plateaus	353	7.1	60	6.1	Overgrazing

### 3.5 Natural disasters and development

The past couple of centuries highlight the great losses and considerable vulnerability of rural communities like those in the GOW to factors ranging from changes in social and economic capital to natural disasters, especially to earthquake. In June 1990, the Manjil earthquake that registered 7.7 on the Richter scale took the lives of forty-thousand people and injured thousands more, a considerable portion of whom resided in rural areas of GOW. In March 1997, an earthquake measuring 5.2 in Ardabil province had a death toll of more than 900 and left 35,000 homeless. Several factors play decisive roles in determining an earthquake measuring 5.2 in Ardabil province had a death toll of more than 900 and left 35,000 homeless. Several factors play decisive roles in determining the vulnerability of rural communities of GOW: primitive building technologies, low resistance construction materials, proximity to hazardous areas, and lack of preparation for natural disasters. As the Ardabil earthquake demonstrated, more than one fifth of the GOW population is highly vulnerable to ground shaking probabilities within the watershed [8] (see Figure 4 above and Table 4 below).



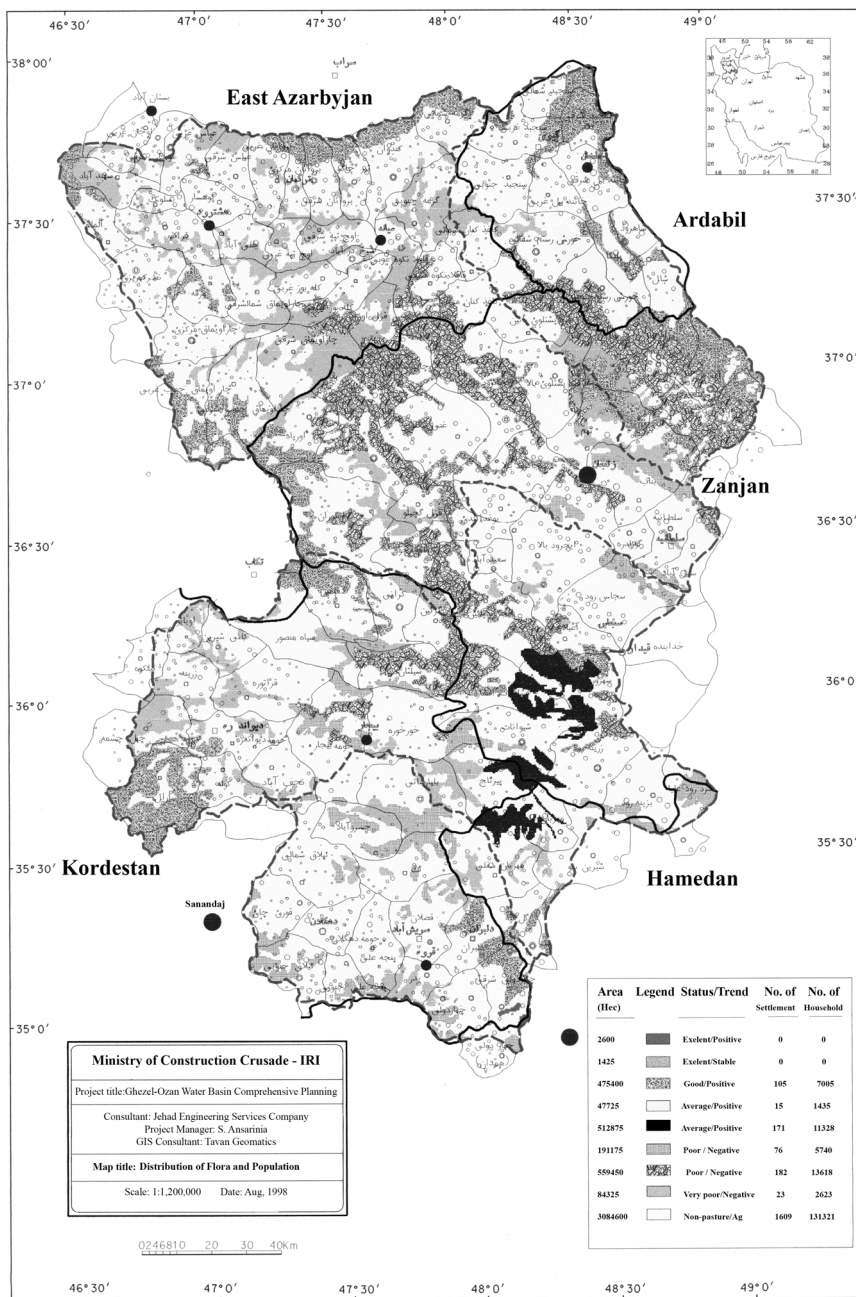


Figure 3: Settlement pattern and flora situation.





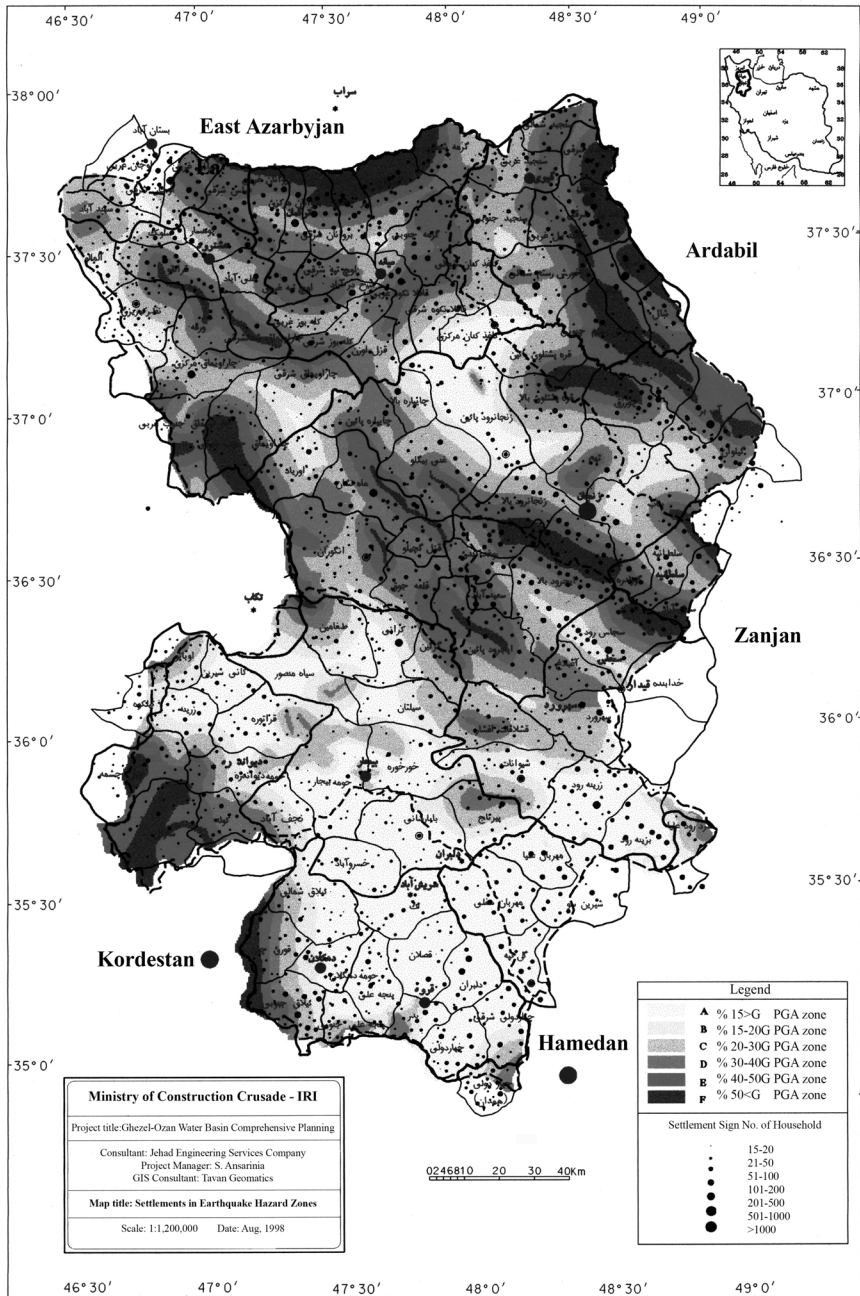


Figure 4: Settlement pattern in earthquake hazard zones.

Table 4: Population distribution in earthquake hazard zones.

Hazard Zones	Very intense >50% G	Intense 40-50% G	Moderate 30-40% G	Low <30% G	GOW in hazard zones
Settlements	135	272	440	1,870	2,817
Households	11,061	31,742	33,158	112,429	188,429
% of Pop.	6	16	18	60	100

Table 5: Spatial structure characteristics of GOW.

Provinces in GOW	% Settlement under 100 household	Population density Person/Km2	% Pop. taking medium to long distance educational trip	% Settlement dependent on distant health facilities
Zanjan	80	22	3.0	66
Kordestan	92	18	4.2	76
E. Azarbyjan	88	27	4.0	84
Hamedan	61	26	5.0	76
Ardabil	84	27	5.5	72

#### 4 The watershed spatial structure

Investigation of spatial structure of GOW included, inter alia, an extensive flow study of goods and services interaction among settlements within and without of the region. In addition to running a disaggregated/weighted gravity model for 1,000 settlements, more than 15% of villages of over 1,000 inhabitants were surveyed to analyze dependence of populace on a group of 17 governmental and private services and goods providers [9]. Some indicative results of these analyses are summarized in Table 5 above.

#### 5 Spatial planning endeavors

Regional development efforts by Iran's central government date back to the late 1940s when the Plan and Budget Organization was first established. Within the two consecutive 7-year National Development Plans beginning in 1948, only a few regions such as Jiroft and Dasht-e-Moghan were selected for intensive agro-industrial investments. The development of regional planning in later national plans up to the Islamic Revolution of 1979 indicates an evolution from sectoral investment projects to comprehensive regional plans mainly focusing on



provinces to national spatial strategic planning. After the Revolution and despite an unfavorable political milieu, PBO strived with several other ministries to maintain and advance the technical wing of spatial planning by preparing several regional and district plans.

Table 6: Core factors affecting development of GOW.

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Regeneration potential of 2.7 Mhec of pasture (%65 of GOW)</li> <li>• 1.6 Mhec of fertile land (%33 of GOW)</li> <li>• 2.3 MQM of surplus water</li> <li>• Topological potential for hydroelectricity</li> <li>• Ground water recharge potentials</li> <li>• Ample Karstic geo-formation</li> <li>• Fishery potential in some rivers</li> <li>• River oriented sports potentials</li> <li>• Cultural and eco-tourism potentials</li> <li>• Competent soil &amp; water research institutions</li> <li>• Agro-industrial employment potentials</li> <li>• Wealth of planning studies</li> </ul>	<ul style="list-style-type: none"> <li>• Overgrazing on pastures of over %5 slope</li> <li>• Twice livestock population as pastures feeding capacity</li> <li>• Too early start and too long grazing</li> <li>• Geo-strata susceptible to erosion</li> <li>• Critical fall of groundwater level</li> <li>• Inefficient irrigation practices (%30 efficiency)</li> <li>• Depth, texture and slope limitations of soil</li> <li>• Lack of spatially efficient distributed central places to serve villages</li> <li>• Too many very small villages scattered all over GOW</li> <li>• Unsustainable planning efforts</li> </ul>

Iran's six decades of sporadic regional planning is fraught with upheavals mainly due to the following factors: a) persistence of centralism of national government; b) dominance of sectoral ministries over spatial integration of public investments; c) lack of enabling laws to support regional planning and development; d) policy instability from one national plan period to the next; f) and, finally, a lack of private and public participation in the development process. More recently, the foundation of spatial development planning has been undermined by the closing of the PBO, effectively abandoning the fourth Five Year National Plan and the Long Term Development Vision of the country. On top of this, the Ministry of Construction Crusade was dissolved right at the time when the GOW Development Plan was approved in 2000, an unfortunate event for the region to say the least. Today, public investment decision making currently revolves around an ad hoc and shortsighted process.

## 6 Conclusions

"The environmental crisis is an outward manifestation of a crisis of mind and spirit. There could be no greater misconception of its meaning than to



believe it to be concerned with endangered wildlife, man-made ugliness, and pollution. These are part of it, but more importantly, the crisis is concerned with the kind of creature man is and what we must become in order to survive” - Lynton K. Caldwell (1972).

Given an inefficient spatial structure and a production mode contributing to environmental deterioration, we have seen that GOW cannot sustainably support several thousand villages scattered over a 50,000 square kilometer area. However, one must bear in mind that the foundation of an environmental sustainability approach rests on an institutional culture. Thanks to planning studies, GOW has well known weaknesses and strengths. Spatial development planning is supposed to stop the vicious circle of social deprivation-environmental degradation by shoring up weaknesses and taking best advantages of strengths (see Table 6 below).

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