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[Research]

Environmental impacts assessment of construction and utilization phases of tourism projects in Karun Dam IV, Iran

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ABSTRACT

There is a strong mutuality between tourism and environment via the creation of feedback mechanisms, since tourism often places adverse effects upon the quality and quantity of natural and cultural resources of the destination, leading to its qualitative and quantitative degradation. Within the Environmental Impacts Assessment (EIA) studies, various methods have been proposed to assess and analyze the environmental impacts. The Rapid Impact Assessment Method (RIAM) has been used in the present study to assess and analyze the environmental impacts of Karun Dam IV touristic area. The outcome of the study indicates that the developments in tourism can have considerable negative effects on the physical and biological parameters in construction and utilization phases. For the optimum utilization of the resources and facilities of the area throughout the year, and the amelioration of social welfare of the inhabitants and their ability to enjoy the auspices of tourism development, the touristic- developmental activities besides the Karun Dam IV should take place by the observation of environmental management programs. This will lead to considerable positive effects in the Southwestern Zagros area.

Keywords: environmental impacts assessment, RIAM, tourism development, Karun Dam IV.

INTRODUCTION

Touristic activities are inextricably intertwined with the environment, both natural and built. Hunter believes that this relationship is reciprocal, bearing coexistence between the tourist and the environment (Hunter 1997). In many regions of the world we have seen that tourism can have many impacts on built and natural environment. At the same time, tourism can be beneficial to the natural environment by providing a motivation for environmental conservation. Mathieson & Wall (1982) in their work on the impact of tourism, suggested that: "tourism can also be credited with extending environmental appreciation". It has made people more knowledgeable about the environment. Nevertheless, overall, it is difficult not to come to the conclusion that tourism generally has a negative impact on the natural environment (Swarbrook 1998). The social-culture impacts of tourism usually occur slowly over time in an unspectacular fashion. They are also largely invisible and intangible. Yet the social impact of tourism is usually permanent with little or no opportunity to reverse the change once it has taken place. When the social impact of sustainable tourism has been considered the focus has normally been upon the "host community"(Sharpey 2009). Most of the times however, there is a certain conviction

to protect the host society from the negative and invasive byproducts of tourism.

All in all, due to the complexities of tourism byproducts assessment in general and economic outcomes in particular, the geographical dispersion and magnitude of this activity, the subjective diversity, and the related overlaps, the definition of the term "tourist" and the related concepts finds some intricacies (Movahhed 2002).

In fact, the program impacts assessment tries to indicate the physical and behavioral changes in the environment that have occurred as outcomes of the project. Although the primary goal of the impacts assessment is to measure the rate of success in achieving the special aims of the program, all the impacts that the project bears upon the society will be investigated.

From among three types of assessment, assessing the project impacts is the most difficult assessment from a methodological point of view; if performed successfully however, it provides the most important findings for decision makers (Seifoddini 2003).

The aim of assessing the environmental impacts of the projects is to move toward the mitigation of the impacts on the natural and built environment.

The environmental conditions of each area consists of the major physical, chemical, biological, economic, social, and cultural factors affecting the very environments and the areas surrounding the projects.

The first step therefore, is the recognition of all the affective and affected environmental parameters of the project, making possible the estimation of the kind and severity of the impacts while having an eye on the environmental conditions of the area.

After recognizing different activities of the project and the environmental factors of the physical, chemical, biological, economic, social, and cultural spheres, and studying the ecological sensitivities of the project area, the next step is to recognize the impacts of the project on the environment (Patton 1986).

MATERIALS AND METHODS

Different methods have been proposed to assess and analyze the environmental impacts in EIA studies, each being employed according to the limitations and capabilities and especially based on the impacts criteria. Based on the aforementioned factors, selecting the optimal method requires numerous investigations about the kind of impacts, sensitivities and characteristics of the environment, and the available information and time, making possible a variety of methods with respect to the project nature. Generally, the focus of all the impacts assessment methods is on creating a list of possible impacts on the environment of the area. Current methods consider the environment to be a dynamic system consisting of some natural and social subsystems; on the one hand, the impacts are investigated in temporal and spatial dimensions (Pastakia *et al.* 1998). There are also several studies about environmental research methods (Monroe 1986; Rees 1990; Hunter & Green 1995; Hall & Lew 1999; IAIA, 1999; Medlik 2003; Trivedi 2004; Esther & Rohini 2007). With respect to the aforementioned subjects and the due investigations, the Rapid Impact Assessment Method (RIAM) has been selected as a base for the assessment and investigation on the environmental repercussions in the Karun Dam IV touristic area. The difference of the RIAM with other assessment methods is its ability to detect the source of the impacts, inasmuch as one can differentiate and detect each factor of the project that bears an effect on each environmental component. In this method, a checklist is used at the first step to make early detection and anticipation of the impacts. In fact, the aim of preparing this checklist is to recognize different dimensions of the impact on the environment. By employing the quantitative method, this checklist easily enables the researcher to specify different aspects of each effect from different viewpoints.

Therefore, this kind of checklist makes possible the detection of the details of each potential impact for the assessors (Jensen *et al*. 1998).

Among the advantages of the RIAM to other methods is the possibility to assess and describe the indices allocated to each parameter and the severity of the impacts on them caused by the implementation of the project (Gilpin 1995). The criterion for grading each impact index in the matrix is indicated in Table 1.

How each cell in the matrix in graded is also depicted in Table 2.

Table 1. Grading criterion for each impact index in the matrix.

Impacts criterion		Grades in the quantitative matrix
Primary criterion	**Leveling**	
continuity	short term	0.25
	medium term	0.5
	long term	1
severity	little	1
	medium	2
	high	3
scale	immediate	1
	ecological	3
	socio-economic	5
nature	positive	+
	negative	-

In this way, it is possible to summarize and analyze the impacts by grading each index. So, the grades allocated to each index are multiplied by each matrix cell; and the outcome indicates the level and volume of the impact that each activity puts on each environmental factor. The nature of the impacts is indicated by positive or negative signs (notably, the empty cells indicate a non-impact state of the activities upon the environmental factors). At the end, by the algebraic summation of the cell points on each matrix, the impacts of all the activities of the project of construction and utilization phases on each environmental factor are indicated. Thus the summations and analyses of the matrix results form the basis of decisions about the temporal and spatial priorities of the management and monitoring programs for each environmental parameter.

Study area

The tourism area of Karun Dam IV is located between longitude 50° 16' to 50° 46' and latitude 31° 35' to 35° 53'. It is located in the borderlines of Chaharmahal -va- Bakhtyari and Khuzestan provinces. There are 17 districts and 39 rural districts in the border limits of the Province. Lordgan and Ardal are among the townships located in the Province. The area of Karun Dam IV is located in the territory of Iranian Power and Water Resources Development Company.

Fig. 1. The position of Karun Dam IV.

RESULTS

The quantitative matrix of the impacts of the Karun Dam IV touristic area in both construction and utilization phases is provided in Tables 2-7.

Construction phase

Analyzing the impacts of the construction phase of the project on the physical environment.

Among 62 anticipated impacts of the construction phase of the Karun Dam IV touristic area, 34 impacts are related to the physical environment, all of them have negative influences. Most of the impacts are assorted under the category of the short term impacts.

At the construction phase, the surface water sources and then the air quality of the area are mostly affected by the activities of the project. The most important surface water sources in the Karun Dam IV touristic area are Bazoft and Armand rivers upward the Dam and the Monj River downward it. The construction site of the Karun Dam IV is located 4 kilometers downward the point where Armand and Bazoft rivers confluence, while Monj River meets Karun approximately 500 meters down the Dam construction site. Since the agricultural lands are located adjacent to Karun Dam and River, the construction debris, massive amounts of soil, stone, and unusable plants, the garbage and sewage from the construction sites and residential camps, and the fuel and oil emanated from construction machines penetrate the surface waters directly or via currents, polluting these resources and intensifying the solid suspensions that make the water more opaque.

The most important activities affecting the air quality include grading, expurgation, excavation, embankment, the activities of construction machines, the transportation of materials, and at the next step the consumption of resources and energy, the construction of buildings, facilities, and also accessable roads. These factors negatively affect the air quality in the most areas surrounding the site. After the air quality, the important problem is the topography of the land due to the height variation in the site (min. 800m, max. 2600m a.s.l.) Which becomes problematic because of the soil excursion caused by grading and other pre-construction steps. Another impact of the project is the change in the quality and quantity of the ground water sources, and the soil contamination, mostly caused by unrestrained sewage production and disposal. Notably, the severity of the aforementioned impacts highly depends on the technologies used in the fuel and energy sector, and the implementation of sewage management rules in the construction phase. Noise pollution and earth vibration are the next important side effects of the project caused by grading, excavation, embankment, residence building, access route constructions, and the movements of light weight and high weight vehicles. Since the side effects of the project that affect the inanimate environment has direct or indirect effects on the biological parameters as well, there is a necessity for environmental precautions that minimize the impacts of each activity of the project on those environmental factors.

Analyzing the construction phase impacts of the project on the biological environment

Among all the anticipated impacts of the construction phase of the Karun Dam IV touristic area (62 impacts), 11 happen in the biological environment. Notably, all the anticipated impacts on this environment have a negative nature, most being assorted under the medium-term impacts.

The major impact of the construction phase on the biological environment lies upon the Karun River, since upon the construction of the Karun Dam IV a part of Isfahan-Khuzestan road will be flooded by the water flow; thus the necessity to construct the alternative roads in Isfahan-Sharekord-Izeh-Ahvaz direction as well as Isfahan-

Boroujen-Lordegan direction consisting of the 2nd part of Monj-Bidleh road (5.5 km) and the alternative Sharekord-Izeh road (16 km) is due.

When the construction operations and access road buildings commence beside Karun River, the suspended particles caused by the operations increase; this causes the water to become less clear, especially in autumn.

The increase of the suspended particles in the water can predisposes the mucus and gill diseases in fish and hard-shell animals. The increase in sedimentation can also engrave the scavengers that live in the riverbed, especially centipedes.

Considering the nature of the activities in the area in the construction phase, the plants and animals diversity and their protective value as well as the plants density, are negatively affected by expurgation activities. Since there is no sensitive and protectable plant or animal in the area of the project, the repercussions of the project in this respect are not anticipated to be so severe. Noteworthy the nearest area under the authority of the Environment Protection Organization is about 3.5 km from the site.

The area is located in the upper hand of the site, and some heights separate the areas from each other, rendering the effects on the protected area negligible.

Analyzing the construction phase impacts of the project on the social, economic, and cultural environment

Among all the anticipated impacts of the construction phase of the Karun Dam IV touristic area, 17 out of 62 impacts belong to the social, economic and cultural environment. Generally, in touristic projects most of the positive effects of the construction phase may be anticipated in the socio-economic environment and its different parameters. Like the aforementioned environments, different environmental factors in this environment are also assorted under different components based on their diversity, and the possible effects of the project on them in the implementation area are quantitatively indicated. Therefore, among the social, economic, cultural and environmental effects, the most important negative ones included the perspective and landscape of the area, employing the lands and also the increased traffic in the roads toward the areafollowed by the environment hygiene.

Notably in addition to the negative effects, some positive effects are also anticipated in this environment. So that, job and revenue creation and thus the improvement of life quality and the decrease in the outgoing immigrants are of the most positive outcomes of the project implementation.

Among all the anticipated impacts in the utilization phase, 15 out of 42 impacts belong to the physical and chemical environments. According to the evidents, most of the impacts upon the physicochemical environment are negative in the utilization and construction phases. The investigation of the impacts analysis matrix shows that the mostly influenced environment from the physicochemical point of view is the surface waters, mostly taking place by the presence of tourists and the utilization of quays and water sports such as jet ski, ferries, and boat sailing. Furthermore, the sewage discharged by the tourists and employees in the area can also cause contamination in the soil and ground water, if not disposed properly.

Among all the anticipated impacts in the utilization phase, 4 out of 42 impacts belong to the biological environment. All the anticipated effects in this environment have a negative nature and operate within a medium-term time span.

Notably, the multitude of most of the effects in this environment goes beyond the immediate area, at least extending to the ecological effects area of the project. Since there is no rare plant or animal species in the area of the project, the repercussions of the project for plant coverings and wildlife

are anticipated to be mild. Notably, the nearest area under the authority of the Environment Protection Organization is about 3.5 Km from the site. This area is located at the upward of the site, and some heights separate them from each other, rendering the effects on the protected area.

Table 2. The quantitative matrix of the effects of construction phase on the physical environment.

	grading and expurgation	excavation and embankment	providing loan resources	constructing quays and facilities on the lakeside	constructing buildings and access routes	the activities and movements of machineries	transportation of building materials and other materials	the consumption of resources and energy	the creation and disposal of sewage	the creation and disposal of recyclables materials	the employment of human resources	Sum
Total (air quality)	-0.75	-0. 5	-0.75	-	-0. 5	-0.75	-1.5	-0. 5	-	-	-	-5.25
Total (noise level)	-0.75	-0.75	-0. 5	-	-0.75	-0.75	-1.5	-	-	-	-	-5
Total (surface water sources)	-1	-1	-	-1	-	-1	-	-	-1	-1	-	-6
Total (ground water sources)	-	-	-	-	-	-1	-	-1	-1.5	-1.5	-	-5
Total (soil sources)	-0.5	-0.5	-	-	-0.25	-0.5	-	-1	-1	-1	-	-4.75
Total (topography and form of the earth)	-2	-2	-1	-	-	-	-	-	-	-	-	-5
Total (seismological considerations)	-	-	-	-	-	-	-	-	-	-	-	-
Sum	-5	4.75	-2.25	-1	-1.5	-4	-3	-2.5	-3.5	-3.5	-	-31

Table 3. The quantitative matrix of the effects of construction phase on the biological environment.

	grading and expurgation	excavation and embankment	providing loan resources	constructing quays and facilities on the lakeside	constructing buildings and access routes	the activities and movements of machineries	transportation of building materials and other materials	the consumption of resources and energy	the creation and disposal of sewage	the creation and disposal of recyclables materials	the employment of human resources	Sum
Total (plant overing)	-1	-	-	-	-	-0.25	-0.5	-	-	-	-	-1.75
Total (wildlife and habitats)	-01	-	-	-	-	-0.5	-0.5	-	-	-	-	-2
Areas under the authority of the Environment Protection Organization	-	-	-	-	-	-	-	-	-	-	-	-
Total (the maritime ecosystem of the area)	-2	-	-	-2	-	-0.5	-	-	-2	-2	-	-8.5
Sum	-4	-	-	-2	-	-1.25	-1	-	-2	-2		-12.25

Table 4. The quantitative matrix of the effects of construction phase on the economic and social environments.

	grading and expurgation	excavation and embankment	providing loan resources	constructing quays and facilities on the	constructing buildings and	the activities and movements of machineries	transportation of building	the consumption of resources and	the creation and disposal of	the creation and disposal of	the employment of human resources	Sum
Total (population and immigration)	-	-	-	-	-	-	-	-	-	-	+1. 5	+1.5
Total (jobs and revenues)	-	-	-	-	+1.5	-	+1.5	-	-	-	+1. 5	+4.5
Total (education)	-	-	-	-	-	-	-	-	-	-	+1. 5	+1.5
Total (hygiene)	-	-	-	-	-	-	-	-	-0.25	-0.25	-	-0.5
Total (traffic)	-	-	-	-	-	-0.75	-0.75	-	-	-	-	-1.5
Total (perspectives and landscape)	-0.5	-0.5	-	-1	-	-0.25	-	-	-0.25	-0.25	-	-2.75
Total (land utilization)	-0.5	-	-	-	-1	-	-	-	-	-	-	-1.5
Sum	-1	-0.5	-	-1	+0.5	-1	+0.75	-	-0.5	-0.5	+4.5	1.25

The utilization phase

Analyzing the effects of the utilization phase on the physical and chemical environments

Table 5. The quantitative matrix of the effects of utilization phase on the physical environment.

	selling the residential, trade, etc. places	using the available facilities (hotels, shopping centers, etc.)	utilizing the quays and water sports	absorbing tourists	perspective creation and landscape expansion	transportation and parking	sewage creation and disposal	creating and recycling the recyclable material	employing human resources	Sum
Total (the air quality)	-	-0.5	-	-	-0.5	-0.5	-	-	-	-1.5
Total (noise level)	-	-	-0.5	-	-	-0.5	-	-	-	-1
Total (surface water resources)	-	-2	-2	-	-	-	-1	-1	-	-6
Total (ground water resources)	-	-2	-	-	-	-	-1	-1	-	-4
Total (soil resources)	-	-2	-	-	-	-	-1	-1	-	-4
Total (topography and form of the earth)	-	-	-	-	-	-	-	-	-	-
Total (seismological considerations)	-	-	-	-	-	-	-	-	-	-
Sum	-	-6.5	-2.5	-	-0.5	-1	-3	-3	-	-16.5

Analyzing the effects of the utilization phase on the biological environment

Table 6. The quantitative matrix of the effects utilization phase on the biological environment.

	selling the residential, trade, etc. places	using the available facilities (hotels, shopping centers, etc.)	utilizing the quays and water sports	absorbing tourists	perspective creation and landscape expansion	transportation and parking	sewage creation and disposal	creating and recycling the recyclable material	employing human resources	Sum
Total (plant covering)	-	-1	-	-	-	-	-1	-1	-	-3
Total (wildlife and habitats)	-	-1	-	-	-	-	-1	-1	-	-3
Total (the marine ecosystem of the area)	-	-2	-2	-	-	-	-1	-1	-	-6
Total (the areas under the authority of the Environment Protection Organization)	-	-	-	-	-	-	-	-	-	-
Sum	-	-4	-2	-	-	-	-3	-3	-	-12

Analyzing the effects of the utilization phase on the social, economic, and cultural environments

Table 7. The quantitative matrix of the effects of utilization phase on the economic, social and cultural environments.

	selling the residential, trade, etc. places	using the available facilities (hotels, shopping centers, etc.)	utilizing the quays and water sports	absorbing tourists	perspective creation and landscape expansion	transportation and parking	sewage creation and disposal	creating and recycling the recyclable material	employing human resources	Sum
Total (population and immigration)	-	-	-	-	-	-	-	+3	-	+3
Total (jobs and revenues)	+3	-	-	+3	-	-	-	-	+3	+9
Total (education)	-	-	-	-	-	-	-	-	+3	+3
Total (hygiene)	-	-	-	-	-	-	+2	+2	-	+4
Total (traffic)	-	-	-	-3	-	-3	-	-	-	-6
Total (scenes and landscapes)	-	-	-2	-	+3	-	-	-	-	+1
Total (infrastructural services and facilities)	+1.5	+1.5	-	+3	-	-	-	-	-	+6
Total (expansion plans of the future)	+1.5	+1.5	-	+3	-	-	-	-	-	+6
Sum	+6	+3	-2	+6	+3	-3	+2	+5	+6	+26

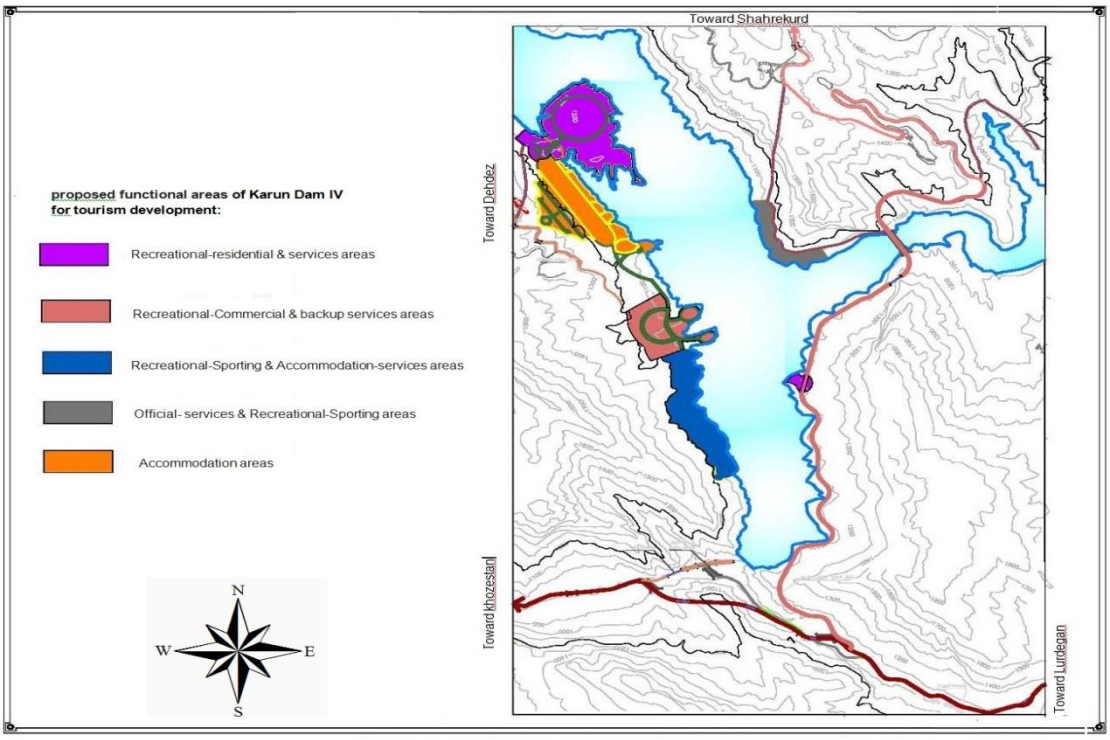

Fig 2. proposedfunctionalareas of Karun Dam IV for tourism development.

CONCLUSION

The studies conducted after the analysis of the Karun Dam IV touristic area project indicate that the project bears considerable negative impacts upon the physical and biological environments in construction and utilization phases. As mentioned above, the pollutants (or contaminants) including air pollutants, recyclable materials and sewage are potential water, soil and air pollutants. To control such pollutants and contaminants, therefore, the program for the environment management in both construction and utilization phases has been proposed. The temporal and spatial priority for considering the environmental precautions as well as the guarding programs for each environmental parameter is indicated based on the negative points acquired by each. So that, the Karun Dam IV Lake, being located beside the touristic area, is the most vulnerable ecosystem, inasmuch as it is prone to contamination if sewage and recyclable materials are disposed into it. Therefore, the implementation of the recycleable materials management and sewage refineries to produce clean sewage as well as periodical monitoring and sampling of soil and water resources of the area must be pursued via stronger binds.

On the one hand, the social, economic, and cultural environment of the investigated area receive considerable benefits in local-national job and revenue creation as well as further capital absorption, development, reduced immigration, and infrastructural facilities.

Conclusively therefore, the implementation of the Karun Dam IV touristic area project leads to better usage of resources and facilities throughout the year and the amelioration of social welfare of the inhabitants and their taking benefit of the tourism auspices in the Southwestern Zagros if and only if the environmental considerations take effect.

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ارزیابی اثرات زیست محیطی فازهای ساخت و بهره‌برداری پروژه‌های گردشگری در سد کارون چهار

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چکیده

تقابل بین گردشگری و محیط زیست از طریق به وجود آمدن مکانیزم‌های بازخوری، بسیار عمیق است؛ چرا که گردشگری اغلب اثرات قابل توجه‌ای بر کیفیت و کمیت منابع طبیعی و فرهنگی مقصد برجای می‌گذارد. همچنین پایداری توسعه گردشگری نیز از طریق تنزل در کیفیت و کمیت این منابع تحت تأثیر قرار می‌گیرد. از این جهت شایسته است قبل از هر گونه برنامه‌های عملیاتی در این حوزه اثرات و تأثیرات زیست محیطی آن با روش‌های مختلف برآورد شود. در این پژوهش برای مطالعات ارزیابی و تجزیه و تحلیل اثرات زیست محیطی منطقه گردشگری سد کارون چهار، از مدل ارزیابی اثرات سریع و ماتریس اثرات بهره برده شده است. نتایج تحقیق حاکی از آن است که فازهای ساختمانی و بهره‌برداری پروژه‌های گردشگری می‌توانند اثرات منفی قابل توجهی بر پارامترهای محیط فیزیکی و بیولوژیک تحمیل کنند. پیشنهاد می‌شود اگر بخش‌های دولتی و خصوصی تمایل به توسعه پروژه‌های گردشگری در محدوده سد دارند، برای کاهش اثرات مخرب زیست محیطی و همچنین افزایش سطح رفاه اجتماعی و برخورداری ساکنان محدوده منطقه از مواهب توسعه گردشگری، و همچنین برای پیامدهای مثبت قابل توجه در منطقه زاگرس جنوب غربی، توسعه این پروژه‌ها مشروط به اعمال برنامه‌های مدیریت زیست محیطی منسجم و سالانه شود.

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