

Strategies to Manage Ecotourism Sustainably: Insights from a SWOT-ANP Analysis and IUCN Guidelines

Table S1. Details of respondents ($n = 40$).

Type of organization	Organization	Number of Participants
Governmental	Department of the Environment of Tehran Province	6
	Administration of natural resources of Tehran province	4
	Municipality of Tehran metropolis	4
	Universities (academic experts)	8
	Bureau of Tourism Education and Planning	3
	Administration of Natural Heritage Conservation	3
Non-governmental	Society of Iranian Tourism	3
	Association of adventurous tourism of Tehran	2
	Home of Tourism of Tehran	2
Tourism Industry	Travel agencies of Tehran	5

Table S2. List of dimensions, variables, and indicators of negative impacts of ecotourism for four different Protected Areas in Iran.

Dimensions	Variables	Indicators	References
Physical-environmental	Environmental pollution	(1) Increase of environmental pollution (water, soil, air, noise, visual)	Butler (1999); Innes & Booher (2000); Bell & Morse (2001); Miller (2001); Yoon et al. (2001); Céron & Dubois (2003); Dhakal & Imura (2003); Gabrielsen & Bosch (2003); Ko (2005); White et al. (2006); Castellani & Sala (2010); Lee & Hsieh (2016); Wang et al. (2016); Zhang et al. (2017)
	Ecosystem	(2) Increase of destruction of natural ecosystems (mountains, forests, deserts, wetlands)	
		(3) Increase of change in ecosystem structure and function	
		(4) Decrease of ecosystem services	
		(5) Increase of habitat devastation	
		(6) Increase of habitat fragmentation	
		(7) Increase of land use/land cover (LULC) changes	
	Wildlife habitat	(8) Increase of wildlife hunting (poaching)	
		(9) Increase of species extinction	
		(10) Increase of wildlife migration	
	Vegetation	(11) Increase of change in wildlife behaviour (feeding, migration, reproduction)	
		(12) Decrease of quality of vegetation	
		(13) Increase of cut down trees and shrubs	
		(14) Decrease of high-density pasture	
	Biodiversity	(15) Increase of fires in forests and pastures	
		(16) Decrease of biodiversity	
Socio-cultural	Resources consumption	(17) Decrease of rare or dominant species	Hall (2000); Yoon et al. (2001); Céron & Dubois (2003); Lee (2009); Taghvaei & Akbari (2010); Sigala (2012); Tanguay et al. (2013); Mascarenhas et al. (2015); Zhang et al. (2020)
		(18) Decrease of renewable resources (water, soil, air)	
		(19) Increase of water resource consumption	
	Waste and sewage	(20) Increase of energy consumption and types of fuels	
		(21) Increase of waste generated by ecotourism	
	Safety	(22) Increase of sewage generated by ecotourism	
		(23) Increase of accident rates	
		(24) Increase of road traffic	
	Environment/protection	(25) Decrease of access to emergency services	
		(26) Decrease of environmental health level	
		(27) Increase of destruction of natural, cultural, historical and man-made attractions	
		(28) Increase of visiting time and presence of tourists in PAs	
		(29) Increase of threat to strict natural zones and sensitive habitats	
	Access	(30) Increased numbers of tourists in PAs	
		(31) Increase of tourists visit to the area	
		(32) Decrease of access to facilities and tourism infrastructure	
	Security	(33) Increase of road infrastructures and transportation networks	
		(34) Increase of constructions and tourist accommodation	
	Culture	(1) Decrease of social security	Hall (2000); Yoon et al. (2001); Céron & Dubois (2003); Lee (2009); Taghvaei & Akbari (2010); Sigala (2012); Tanguay et al. (2013); Mascarenhas et al. (2015); Zhang et al. (2020)
		(2) Decrease of tourist educational programmes	
	Satisfaction	(3) Decrease of novel cultural and moral values among local residents	
		(4) Decrease of loyalty to local values and traditions	
	Participation	(5) Increase of change in cultural of local communities from the current situation	
		(6) Increase of change in quality of life standards	
	Justice	(7) Decrease of satisfaction of local communities	
		(8) Decrease of participation in nature protection and development of sustainable ecotourism	
	Population	(9) Decrease of access to facilities and local infrastructure	
		(10) Decrease of access to facilities and educational services	
		(11) Increase of change in job opportunities for local communities	
		(12) Decrease of local household income	
		(13) Increase of cost of local households	
		(14) Increase of migration of local residents	

Economic-institutional		(15) Increase of change in density of local residents	
	Employment and income	(1) Increase of change in various employments	
		(2) Increase of economic pressure among households	
		(3) Increase of change in income of local communities	
	Cooperation	(4) Increase of conflicts among governmental and non-governmental organisations	
		(5) Decrease of cooperation among governmental and non-governmental organisations in planning and decision making	Bottrill & Perace (1995); Hall
	Monitoring and control	(6) Decrease of monitoring and control in protection of the area	(2000); Céron & Dubois
		(7) Decrease of monitoring and control on ecotourism activities	(2003); Taghvaei & Akbari
	Rules and regulations	(8) Decrease of attention to protective rules and regulations	(2010); Chávez-Cortés &
		(9) Decrease of implementation of strict legal guidelines	Maya (2010); Torres-Delgado
		(10) Decrease of access to local laws and regulations	& Palomeque (2014);
		(11) Decrease of adherence to laws and regulations	Mascarenhas et al. (2015);
	Institutional element	(12) Decrease of quality of governmental and non-governmental institutional performance	Zhang et al. (2017); Tucker
		(13) Decrease of quality of managers performance in training and information	(2020); Qiu et al. (2020)
		(14) Decrease of quality of environmental guardians' performance in protection of area	
	Local prices	(15) Increase of prices, including commodities, accommodations, and property	
	Economic activity	(16) Increase of change in economic activities and income	
	Ethical principle	(17) Decrease of beliefs and notice of ethical principles	

Table S3. Relative preference values for pairwise comparisons (adapted from Saaty, 1996).

Intensity of importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to objective
3	Moderate importance	Experience and judgment slightly favour one over another
5	Strong importance	Experience and judgment strongly favour one over another
7	Very strong importance	Activity is strongly favoured and its dominance is demonstrated in practice
9	Absolute importance	Importance of one over another affirmed on the highest possible order
2,4,6,8	Intermediate values	Used to represent compromise between the priorities listed above 1, 3, 5, 7, and 9

Table S4. Descriptive profile of the respondents ($n = 40$)

Characteristics		Frequency (n)	Percentage
Gender	Male	27	67
	Female	13	33
Age	Less than 30 years old	6	15
	30-40 years old	9	22
	40-50 years old	18	45
	More than 50 years old	7	18
Education	Bachelor's degree	2	5
	Master's degree	18	45
	Ph.D. degree	20	50
Employment	Employed in the Department of the Environment of Tehran Province	14	35
	Employed in Cultural Heritage, Tourism, and Handicrafts Administration of Iran	6	15
	Employed at a university (academic experts)	20	50
Tourism Management Experience	Less than 5 years	8	20
	5-10 years	9	23
	10-20 years	16	40
	More than 20 years	7	17

Table S5. Mean levels for ecotourism impact indicators (total = 66 indicators) based on 5-point Likert scale ratings (very low to very high) by tourism management experts ($n = 40$) for four different protected areas in Iran (results of round 1 of Delphi method). Gray highlights indicate the highest mean values, meaning the greatest impacts.

Dimensions	Variables	Indicators	Lar National Park		Jajrud Protected Area with Sustainable Use of Natural Resources Areas		Tangeh Vashi National Natural Monument		Kavdeh Wildlife Refuge	
			Mean dimensions	Mean	Mean dimensions	Mean	Mean dimensions	Mean	Mean dimensions	Mean
Physical-environmental	Environmental pollution	(1) Increase of environmental pollution (water, soil, air, noise, and visual)		3.44		4.45		4.77		3.88
		(2) Increase of destruction of natural ecosystems (e.g., mountains, forests, deserts, wetlands)		2.26		4.44		4.35		3.77
		(3) Increase of change in ecosystem structure and function		3.80		4.62		4.25		3.65
	Ecosystem	(4) Decrease of ecosystem services		2.32		3.83		4.11		3.34
		(5) Increase of habitat devastation		1.24		1.30		1.30		1.23
		(6) Increase of habitat fragmentation		2.21		4.53		4.08		4.15
		(7) Increase of land use/land cover (LULC) changes		1.98		4.75		3.75		3.20
	Wildlife habitat	(8) Increase of wildlife hunting (poaching)		3.68		3.48		3.23		4.85
		(9) Increase of species extinction		3.58		3.64		3.28		4.62
		(10) Increase of wildlife migration		3.88		3.58		2.46		4.76
		(11) Increase of change in wildlife behaviour (feeding, migration, reproduction)		3.62		3.54		3.04		4.52
	Vegetation	(12) Decrease of quality of vegetation		4.30		3.38		2.15		3.18
		(13) Increase of cut down trees and shrub		4.22		3.37		3.35		3.11
		(14) Decrease of high-density pasture		4.41		3.45		3.66		2.94
		(15) Increase of fires in forests and pastures		3.25		3.96		1.45		2.84
	Biodiversity	(16) Decrease of biodiversity		3.40		3.26		3.56		4.48
		(17) Decrease of rare or dominant species	2.72	3.34	3.10	3.18	3.03	3.42	2.83	3.54
		(18) Decrease of renewable resources (water, soil, air)		2.36		2.86		3.38		2.72
	Resources consumption	(19) Increase of water resource consumption		1.85		2.90		3.33		2.68
		(20) Increase of energy consumption and types of fuels		3.28		2.80		2.20		2.47
	Waste and sewage	(21) Increase of waste generated by ecotourism		3.22		2.75		3.78		2.33
		(22) Increase of sewage generated by ecotourism		1.65		2.60		3.67		2.26
	Safety	(23) Increase of accident rates		2.77		1.33		3.55		1.87
		(24) Increase of road traffic		2.85		1.45		2.22		1.60
		(25) Decrease of access to emergency services		1.54		1.60		2.27		1.34
		(26) Decrease of environmental health level		1.08		1.15		1.26		1.17
	Environment/Protection	(27) Increase of destruction of natural, cultural, historical, and man-made attractions		2.83		2.41		3.48		2.11
		(28) Increase of visiting time and presence of tourists in PAs		2.54		2.45		3.45		2.20
		(29) Increase of threat to strict natural zones and sensitive habitats		3.18		2.62		3.18		3.95
		(30) Increased numbers of tourists in PAs		2.51		2.48		3.72		1.72
		(31) Increase of tourists visit to the area		1.15		1.23		1.36		1.27
	Access	(32) Decrease of access to facilities and tourism infrastructure		1.32		3.22		1.48		1.43
		(33) Increase of road infrastructures and transportation networks		2.25		4.48		2.42		1.66
		(34) Increase of constructions and tourist accommodation		1.30		4.58		2.38		1.52
Socio-cultural	Security	(1) Decrease of social security		3.33		4.02		3.45		3.68
		(2) Level of tourist educational programmes		3.30		1.42		2.20		2.05
		(3) Decrease of novel cultural and moral values among local residents		3.28		3.00		3.62		2.30
	Culture	(4) Decrease of loyalty to local values and traditions	2.65	3.11	2.98	3.21	2.88	3.60	2.71	2.44
		(5) Increase of change in cultural of local communities from the current situation		3.09		3.32		4.00		2.62
	Satisfaction	(6) Increase of change in quality of life standards		3.00		3.48		3.41		1.75
		(7) Decrease of satisfaction of local communities		2.82		3.40		3.28		3.64

Economic- institutional	Participation	(8) Decrease of participation in nature protection and development of sustainable ecotourism	3.55	3.71	3.24	3.76		
		(9) Decrease of access to facilities and local infrastructure	1.38	2.66	3.07	3.40		
		(10) Decrease of access to facilities and educational services	1.42	2.28	2.73	3.27		
	Justice	(11) Increase of change in job opportunities for local communities	2.85	2.95	2.51	3.20		
		(12) Decrease of local household income	2.20	3.11	2.26	2.80		
		(13) Increase of cost of local households	2.35	3.35	1.74	3.11		
	Population	(14) Increase of migration of local residents	2.50	2.57	1.37	1.40		
		(15) Increase of change in density of local residents	1.62	2.36	2.80	1.32		
	Employment and income	(1) Increase of change in various employments	2.04	2.80	2.03	1.75		
		(2) Increase of economic pressure among households	1.72	2.68	2.18	2.00		
		(3) Increase of change in income of local communities	2.18	2.55	2.28	2.12		
	Cooperation	(4) Increase of conflicts among governmental and non-governmental organisations	2.38	4.00	3.00	2.37		
		(5) Decrease of cooperation among governmental and non-governmental organisations in planning and decision making	2.53	3.78	3.12	2.54		
	Monitoring and control	(6) Decrease of monitoring and control in protection of the area	3.55	3.70	3.65	2.66		
		(7) Decrease of monitoring and control on ecotourism activities	3.21	3.55	4.05	2.48		
		(8) Decrease of attention to protective rules and regulations	3.50	3.62	3.85	3.65		
	Rules and regulations	(9) Decrease of implementation of strict legal guidelines	3.48	3.50	3.60	3.86		
		(10) Decrease of access to local laws and regulations	3.35	3.20	3.52	3.40		
		(11) Decrease of adherence to laws and regulations	3.30	3.42	3.43	3.48		
		(12) Decrease of quality of governmental and non-governmental institutional performance (by increasing the number of tourists)	3.17	3.25	3.38	3.22		
	Institutional element	(13) Decrease of quality of managers performance in training and information (by increasing the number of tourists)	3.05	3.12	3.30	3.11		
		(14) Decrease of quality of environmental guardians' performance in protection of area (by increasing the number of tourists)	2.8	2.90	3.21	3.05		
	Local price	(15) Increase of prices, including commodities, accommodations, and property	2.62	2.32	1.88	2.76		
	Economic activity	(16) Increase of change in economic activities and income	1.45	2.15	1.75	2.88		
	Ethical principle	(17) Decrease of beliefs and notice of ethical principles	1.38	1.76	1.56	1.52		
Total mean			-	3.05	-	2.94	-	2.76

Table S6. Mean levels for ecotourism impact indicators based on 5-point Likert scale ratings (very low to very high) by tourism management experts ($n = 38$) for four different Protected Areas in Iran (results of round 2 of Delphi method). Gray highlights indicate the highest mean values, meaning the greatest impacts.

Dimensions	Variables	Indicators	Lar national park		Jajrud protected area		Tangeh Vashi national natural monument		Kavdeh wildlife refuge	
			Mean dimensions	Mean	Mean dimensions	Mean	Mean dimensions	Mean	Mean dimensions	Mean
Physical-environmental	Environmental pollution	(1) Increase of environmental pollution (water, soil, air, noise, and visual)		3.41		4.32		4.38		3.58
		(2) Increase of destruction of natural ecosystems (mountains, forests, deserts, wetlands)		2.20		4.25		4.30		3.64
		(3) Increase of change in ecosystem structure and function		3.77		4.50		4.22		3.46
	Ecosystem	(4) Decrease of ecosystem services		3.28		3.70		4.11		3.34
		(5) Increase of habitat fragmentation		2.10		4.55		4.00		3.85
		(6) Increase of land use/land cover (LULC) changes		1.94		4.80		3.70		3.20
	Wildlife habitat	(7) Increase of wildlife hunting (poaching)		3.67		3.46		3.22		4.65
		(8) Increase of species extinction		3.54		3.60		3.28		4.40
		(9) Increase of wildlife migration		3.82		3.56		2.58		4.48
		(10) Increase of change in wildlife behaviour (feeding, migration, reproduction)		3.50		3.5		3.12		4.27
	Vegetation	(11) Decrease of quality of vegetation		4.23		3.36		2.23		3.18
		(12) Increase of cut down trees and shrub		4.14		3.24		3.36		3.09
		(13) Decrease of high-density pasture		4.42		3.42		3.68		2.94
		(14) Increase of fires in forests and pastures		3.27		3.86		1.42		2.84
	Biodiversity	(15) Decrease of biodiversity		3.38		3.18		3.82		4.15
		(16) Decrease of rare or dominant species		3.26		3.10		3.40		3.18
	Resources consumption	(17) Decrease of renewable resources (water, soil, air)	2.77	2.36	3.14	2.74	3.07	3.36	2.84	2.75
		(18) Increase of water resource consumption		1.78		2.82		3.30		2.68
		(19) Increase of energy consumption and types of fuels		3.25		2.71		2.16		2.57
	Waste and sewage	(20) Increase of waste generated by ecotourism		3.10		2.66		3.76		2.33
		(21) Increase of sewage generated by ecotourism		1.70		2.57		3.63		2.26
	Safety	(22) Increase of accident rates		2.68		1.30		3.52		2.15
		(23) Increase of road traffic		2.80		1.42		2.20		1.88
		(24) Decrease of access to emergency services		1.54		1.58		2.28		1.55
	Environment/protection	(25) Decrease of environmental health level		1.23		1.26		1.33		1.27
		(26) Increase of destruction of natural, cultural, historical, and man-made attractions		2.77		2.38		3.45		2.25
		(27) Increase of visiting time and presence of tourists in PAs		2.48		3.38		3.40		2.36
		(28) Increase of threat to strict natural zones and sensitive habitats		3.11		2.47		3.16		3.77
		(29) Increased numbers of tourists in PAs		2.48		2.33		3.68		1.77
		(30) Increase of tourists visit to the area		1.22		1.18		1.26		1.22
	Access	(31) Decrease of access to facilities and tourism infrastructure		1.38		3.15		1.45		1.51
		(32) Increase of road infrastructures and transportation networks		2.20		4.62		2.36		1.66
		(33) Increase of constructions and tourist accommodation		1.45		4.76		2.35		1.52
Social-cultural	Security	(1) Decrease of social security	2.7	3.37	3	4.00	2.93	3.46	2.76	3.88
		(2) Level of tourist educational programmes		3.32		1.38		3.27		2.11

Economic- institutional	Culture	(3) Decrease of novel cultural and moral values among local residents	3.33	2.74	3.06	2.98	2.8	3.17	3.60	2.35
		(4) Decrease of loyalty to local values and traditions	3.18					3.25	3.58	2.55
	(5) Increase of change in cultural of local communities from the current situation		3.11					3.38	4.15	2.72
	Satisfaction	(6) Increase of change in quality of life standards	3.00					3.60	3.36	1.86
		(7) Decrease of satisfaction of local communities	2.75					3.48	3.25	3.58
	Participation	(8) Decrease of participation in nature protection and development of sustainable ecotourism	3.55					3.72	3.2	3.62
		(9) Decrease of access to facilities and local infrastructure	1.38					2.63	3.11	3.50
	Justice	(10) Decrease of access to facilities and educational services	1.48					2.27	2.73	3.32
		(11) Increase of change in job opportunities for local communities	2.85					3.00	2.55	3.20
		(12) Decrease of local household income	2.32					3.08	2.08	2.85
		(13) Increase of cost of local households	2.45					3.30	1.52	3.15
	Population	(14) Increase of migration of local residents	2.68					2.51	1.37	1.46
		(15) Increase of change in density of local residents	1.85					2.36	2.80	1.35
	Employment and income	(1) Increase of change in various employments	2.11					2.74	2.25	1.80
		(2) Increase of economic pressure among households	1.82					2.63	2.36	2.08
		(3) Increase of change in income of local communities	2.20					2.55	2.54	2.23
	Cooperation	(4) Increase of conflicts among governmental and non-governmental organisations	2.42					4.06	3.00	2.38
		(5) Decrease of cooperation among governmental and non-governmental organisations in planning and decision making	2.63					3.90	3.12	2.40
	Monitoring and control	(6) Decrease of monitoring and control in protection of the area	3.62					3.82	3.70	2.96
		(7) Decrease of monitoring and control on ecotourism activities	3.32					3.61	4.00	2.58
	Rules and regulations	(8) Decrease of attention to protective rules and regulations	3.51					3.70	3.80	3.7
		(9) Decrease of implementation of strict legal guidelines	3.48					3.52	3.72	3.84
		(10) Decrease of access to local laws and regulations	3.40					3.11	3.60	3.41
		(11) Decrease of adherence to laws and regulations	3.30					3.45	3.48	3.55
	Institutional element	(12) Decrease of quality of governmental and non-governmental institutional performance (by increasing the number of tourists)	3.18					3.30	3.37	3.33
		(13) Decrease of quality of managers performance in training and information (by increasing the number of tourists)	3.05					3.00	3.30	3.22
		(14) Decrease of quality of environmental guardians' performance in protection of area (by increasing the number of tourists)	2.85					2.80	3.22	3.05
	Local price	(15) Increase of prices, including commodities, accommodations, and property	2.78					2.28	2.09	2.80
	Economic activity	(16) Increase of change in economic activities and income	1.53					1.88	1.66	2.70
	Ethical principle	(17) Decrease of beliefs and notice of ethical principles	1.37					1.72	1.55	1.72
Total mean			- 2.73	-	-	-	-	3.06	3	2.8

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