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The development of new cities on environmental impact assessment

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Abstract

Environment effects evaluation can be used by planners and urban development managers as a tool for recognition survey and comparison of different urban development effects. the suitable effect evaluation method for this kind of development Ulrich includes a variety of activities is an Iranian Leopold matrix that measures each activitys effect on different environment components and gives it a number between -5 (very bad or destructive) and +5 (very good or useful). The most important negative effects of New Cities in construction level considering its location and environmental specification are changing the natural land shape changing the valleys morphology changing the natural hydrology system plant and animal settlement destruction and cutting the animal immigrative paths. In population habitancy level the most important effects on spate behaviours changing the animal food and immigration. The most important solution for reducing the mentioned problems in construction level are to obey the natural land shape prevention of extra land preparation minimum change in land preventing a long operation level and in population settlement level traffic management. Appropriated disposd sewerage network development keeping natural immigration paths making urban green spaces and a kind of jungle belt to restrict the illegal development.

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Introduction

In few last decades, many issues in environment have caused human society to comprehend that his activities' spreading in environment is without boundary and on the other hand, environment has limitation that is not extendable even with the best imaginable technologies indefinitely (Booth A G, 1984,) and lack of attention to these limitations will accompany environment destruction during economic development (Botequilha A L and Ahern Jack, 2002).

So, every productivity of nature should be after assessing resources and in the frame of environment capacities and ability.

Conservation and improvement of urban environment is possible through environment responsibility and guarantee which is through decrease of reliance to natural resources, minimizing air pollution avoidance of earth pollution , productivity of energy, ecological variety and reusing or cleaning burnt lands that finally lead to improvement of life quality.

(Leopold A,1949)sustainable development is defined as development that presents generation needs without endangering future generation abilities to meet their own needs.

Sustainable development needs environmental planning approach in which is kept all legal levels from sustainable development. Assessment of environment effects as well as helping planning is one of the improvement means for achieving this goal. (Gunderson LH and Holling CS, 2002).

Urban sustainable development is an active and non-stop process in response of changing economic environmental and social pressures. (Nouri J and Malmasi S, 2004).

Now, environment is discussed as third Olympism element after physical education and culture (Osborn F and Whittick A,1979).

Social-economic development and growth is unavoidable but conservation of natural resources should always be considered by attention to appropriate and sustainable development principle. Sustainability means today's habitants of supposed local, rural, urban and country community live and develop so that next generation continues to live a noble life and (Rees W, 1996) conservation and improvement of urban environment is possible through environmental possibility and guarantee that is through reduction of reliance to natural resources, minimizing air pollution, avoidance of earth pollution, energy productivity, raising environmental variety and reusing or cleaning burnt lands that finally leads to improvement of life quality.

(Schaffer Frank, 1970) On one hand, scarcity of resources and on the other hand, happening of environmental crises makes extreme concern at different human levels which its result is necessary for considering environmental criterion at development activities.

So planners' development programs face these questions increasingly how to assess program sustainability of suggestive development in the scale of city and region. (Hardey Dennis,1991).

The purpose of this study is the most important negative effects of New Cities in construction level considering its location and environmental specification which are changing the natural land shape , changing the valleys morphology, changing the natural hydrology system plant and animal settlement destruction and cutting the animal immigrative paths. In population habitancy level, the most important effects on spate behaviours are changing the animal food and immigration.

Materials and methods

Method: there are many different methods for preparing reports like check list (Shariaat and Monavari, 1375), Matrix (Leopold, 1949; Canter, 1978), overlapping the maps (Mc Harg, 1969) and methods of system analysis to prepare a report of assessing environmental impacts of a plan or project. Mostly all of these methods in 4 fundamental phases are common: identifying the project and its main activities executing and exploitation stage, identifying the project's environment (physical , biological , economic , social environment) evaluating and predicting the project effects according to projects activities and environment features, providing actions for reducing predicted significant negative considerable effects and finally providing constancy plan and managing provided actions for reducing negative effect. In the present case study, the matrix method of evaluating mutual effects of Leopold is used which changes have been made in scoring and its scoring range. The advantage of using matrix rather than the others is that it is quantitative and in the case of inexperienced evaluator and valuing is wrong, because of averaging all the parameters, that mistakes become accommodated much and there is no crack in the conclusion.

In this method, important activities of the project in construction and operating are brought in the matrix columns and in matrix's lines, environmental factors including physical, biological and economic-social environment which are affected by the project activities are written (table1).

In the next phase, a line is drawn in the square of intersection place of each activity and each environmental factor that effect on each other. Above the line a number is written from range of -5 to +5, in proportion to intensity of effect where is negative or positive and below the line according to being temporary or permanent on the letters of P (permanent) or T (temporary) is written. The concept of the numbers -5 to +5 and the range of change has written in table 2: Algebraic average of the existing values for project's activities and environmental factors in columns and matrix's rows (separately for Ps and Ts) which always is between -5 and +5, is calculated and is respectively in the below and left of the matrix. The average of the rows show the effects and the average of columns related to the consequence of the projects to reduce effects and consequences of the project.

Table 2.

For positive consequences or effects	For negative consequences or effects
4.1 to 5 excellent or very good	-4.1 to -5 destructive or very intensive
3.1 to 4 good	-3.1 to -4 intensive or bad
2.1 to 3 average	-2.1 to -3 average
1.1 to 2 poor	-1.1 to -2 poor
1 to 0 little	-1 to 0 little

Table 3. Matrix of evaluating environmental effects and consequences of Pardis– construction stage.

Project actions / Environmental factors		Construction stage							sum	
		Land rem-oving	Excavation and emban-kment	Building road and acce-ssibility	Body of water-courses	Building bridge over water-course	Providing borrow resources	Const-ruction	Values' mean of P	Values' mean of T
Physical environ-ment	Quality of background voice		-4 T	-3 T			-3 T	-4 T	0	-3.5
	Regime of surface water	-4P	-4P	-3P	-4P	-3P	-4P	-4P	-3.7	0
	Morphology of valleys' network		-5P	-4P	-5P	-4P	-4P	-5P	-4.5	0
	Soil erosion	-5P	-5P	-4T	-3T	-3T	-4P	-4T	-4.6	-3.2
	Sedimentation	-4P	-5T	-4T	-3T		-4T	-4T	-4	-4
	Land shape	-4P	-5P	-4P	-4P	-4P	-4P	-5P	-4.1	0
	Density of plant covering	-5P	-4P	-3P				-4P	-4	0
Biological environ-ment	Animal settlements	-4P	-4P	-4P	-4P	-4P	-3P	-4P	-3.9	0
	Behavior patterns of animals	-4P	-5P	-5P	-4P	-4P	-3T	-4P	-4.3	-3.1
	Animals' immigration	-4P	-4P	-4P	-4P	-4P	-3P	-4P	-3.9	0
Sum	Values' mean of P	-4.25	-4.5	-3.9	-4.2	-3.8	-3.1	-4.3		
	Values' mean of T	0	-4.5	-3.6	-3	-3	-3.3	-4		

Table 4. Matrix of evaluating environmental effects and consequences of Pardis– productivity stage.

Project actions / Environmental factors		Construction stage						sum	
		Popu-lation habi-tancy	Water consu-mption	Fuel consu-mption	Back-water prod-uction	Hyst-eresis prod-uction	Daily and recrea-tional actions	Values' mean of P	Values' mean of T
Physical environment	Quality of background voice	-4P					-3P	-3.5	0
	Regime of surface water	-4P	-4P		-4P			-4	0
	Morphology of valleys' network				-3P	-3P	-3P	-3	0
	Soil erosion						-3P	-3	0
	Sedimentation	-3P			-3P	-4P		-3.3	0
	Land shape					-3P	-2P	-2.5	0
Biological environment	Density of plant covering	-3P	-2P				-3P	-2.6	0
	Animal settlements	-4P					-5P	-4.5	0
	Behavior patterns of animals	-4P				-5P	-4P	-4.3	0
	Animals' immigration	-4P				-3P	-4P	-3.6	0
Sum	Values' mean of P	-3.8	-4	0	-3.5	-3.6	-3.8		
	Values' mean of T	0	0	0	0	0	0		

Conclusion

Number and most important effect types of effects and negative environmental consequences of Pardis development are summarized in tables 3 and 4.It is necessary to mention that all development effects of new cities are not negative and this kind of development has positive effects on economic, social and cultural environment but considering the emphasis of this article has been on physical and biological environment, mentioning of positive social and economic effects is avoided.

Actions which have negative important effects on physical and biological environment (more intensive than -3.1) and need to present corrective actions , are specified based on intensity as following:

Actions by having negative effects by intensity of -5 to -4.1

In construction stage: 4 permanent effects (P) include removing lands, excavation and embankment, body of watercourse, construction.

1temporary effect (T) includes excavation and embankment.

In productivity stage

It doesn't have permanent and temporary in productivity stage.

Actions by having negative effects by intensity of -4 to -3.1

In construction stage: 3 permanent effects (P) include building road and accessibility, making bridge over watercourse, providing borrow resources from location.

1 temporary effect (T) includes building road and accessibility, providing borrow resources from location.

In productivity stage: 5permanent effects (P) include population habitancy, water consumption, backwater production, hysteresis production, recreational actions of habitants temporary effect (T):nothing.

Table 5. sum result of environmental effects (matrix columns) of Pardis development in construction and productivity stages.

Intensity of effects (columns)	Number of permanent effects(P)		Number of temporary effects(T)	
	Construction stage	Productivity stage	Construction stage	Productivity stage
0-1	0	0	0	0
1.1-2	0	0	0	0
3-1.2	0	0	3	0
4-1.3	3	4	3	0
5-1.4	4	0	1	0

Table 6. sum result of environmental consequences (matrix columns) of Pardis development of in construction and productivity stages.

Intensity of consequences (columns)	Number of permanent effects		Number of temporary effects	
	Construction stage	Productivity stage	Construction stage	Productivity stage
0-1	0	0	0	0
1.1-2	0	0	0	0
3-1.2	0	4	1	0
4-1.3	5	4	3	0
5-1.4	4	2	0	0

The most important environmental factors which influence on project's actions and therefore, they need to present improvement designs are specified based on consequence's intensity in the following:

Negative consequences are lower by intensity of -5 to -4.1

In construction stage: 4permanent effects (P) include changing morphology of valleys' network, soil erosion, and behavior patterns of animals
temporary effect (T)includes nothing.

In productivity stage

4 permanent effects (P) include insecurity of animal settlements , behavior patterns of animals, changing land shape.
Temporary effect: nothing.

Negative consequences are lower by intensity of -4 to -3.1

In construction stage: 4 permanent effects (P) include changing regime of surface water, Sedimentation in waterways, reducing density of plant covers, insecurity of animal settlements, animals' immigration.

temporary effect (T)includes increasing voice level of region, soil erosion, sedimentation in waterways, changing behavior pattern of animals.

In productivity stage: 4 permanent effects (P) include increasing voice level of region, changing regime of surface water, sedimentation in waterways, animals' immigration.
temporary effect (T)includes nothing.

Discussion and suggestions

Planning and development of new cities can have much irreversible and irrecoverable effect on construction stage and productivity stage considering extension of development level and amount of manipulation in the environment and without considering environmental aspects. We can predict many effects and consequences can be predicted by a tool namely evaluating environmental effects before performing the project and we can present corrective actions and improvement designs. This tool is used in evaluating effects of different development types in the country and it has been effective wherever suggestive actions were performed.

By using this appropriate tool, chosen way which is taken by development and stage scale, is important. number of existing patterns limit to theory and use of first tool and planning stage and minimum works which are done, have shapes in choosing appropriate way with development scale (Nouri and Malmasi,2004),The model of ecological destruction which is one of the methods of systematic analysis in evaluating environmental effects for specifying sensitive regions to types of macro development such as agriculture, industry and urban development in massive extension such as natural drainage basins, is used for one urban region and detailed urban uses such as residential, commercial and recreational uses and etc. In present article, this tool is used for predicting effects of new urban development by choosing appropriate method successfully. Although passed law has not existed for applying ecological principle and conserving environment in the past and at the time of promoting development approach of new cities which operating staff of this kind of development observe it but recently this law is passed and applying use of this tool has been shown in this article, its suggestions can be helpful in preparing executive instructions of mentioned law and as performers' guides and urban development planners. It is expected that effects and consequences of this kind of development can be minimized by practical commitment of managers and urban and regional planners using mentioned results and suggestions. Mentioned suggestions and results can be applied in similar cases in different regions. In following tables, necessary corrective actions are presented for reducing effects and negative consequences of design by segregation of performing stage (construction) and productivity.

Table 7. Suggestive and corrective actions for reducing negative effects due to project's actions over environment parts – construction stage.

Type of effect	Type of environment	Type of action	Corrective actions
Permanent (construction stage)	Physical	Removing lands	Avoiding unnecessary and extremely removing of lands outside its design limits. Lack of using chemical herbicide leads to destruction of planet covering after distributing in non-target environments. Removing surface layer of soil and piling in suitable location for reusing in making green space.
		Excavation and embankment (cleaning and preparation)of lands	1. Obeying natural land shape in order to avoid extremely excavation and embankment as much as possible. 2. Limiting excavation and embankment operation when possibility of water erosion (because of raining) and wind erosion (because of unfavorable weather) is minimized. 3. Avoiding lengthening excavation and embankment operation that leads to water and wind erosion during the year.
		Body of natural watercourse (building drainage ducts of surface water)	1. Avoiding shape change of longitude profiles of natural valleys as much as possible. 2. Body of valleys in the way that minimum change has in the natural latitudinal profiles of valleys. 3. Conserving communication between neighborhood valleys from upstream to downstream . 4.Using impermeable materials (e.g Brick and brick) in body of valleys and conserving their plant covers
		Construction of buildings and residential, commercial ,administrative ,... flats	1.Considering higher density (more floors) to reduce construction level. 2.Using local building materials and construction patterns in consistent with climate to reduce energy consumption in productivity stage. 3.Limiting construction for existing demand to avoid evacuating buildings' capacity and more destruction of environment.

Table 8. Suggestive improvement actions for reducing negative effects due to project's actions over environment parts – construction stage.

Type of effect	Type of environment	Effective parameters	Designs of suggestive improvement
Temporary (construction stage)	Physical	Quality of background voice	1.Obviating technical defects on time that leads to extra noise. 2. Limiting machinery actions in daily hours.
		Regime of surface water	1. Avoiding dam over main valleys to use water. 2. Avoiding omitting and blinding waterways even secondary waterway.
		Morphology of valleys' network	1. Avoiding manipulation and change to longitude and latitudinal profiles of main valleys. 2. Obeying natural shape of valleys and lack of changing their natural shape as much as possible. 3. Conserving communication between neighborhood valleys from upstream to downstream. 4. Avoiding omitting and blinding waterways even secondary waterway.
		Soil erosion	1. Limiting excavation and embankment operation when possibility of water erosion (because of raining) and wind erosion (because of unfavorable weather) is minimized. 2. Avoiding lengthening excavation and embankment operation that leads to water and wind erosion during the year. 3. Avoiding plant cover omission in unnecessary cases that leads to intensity of erosion.
		Sedimentation	1. Lack of taking borrow materials from bed of rivers of design range. 2. Lack of doing excavation and embankment actions at the time of season currents in privacy of waterways. 3. Lack of piling materials and fuel that it should be transmittable to waterways. 4. Avoiding disposal of waterback and hysteresis and urban trashes in watercourse and waterway 5. 3.Avoiding plant cover omission in unnecessary cases that leads to intensity of erosion and sedimentation.
	Biological	Animal settlements	1. Location of city and lateral installation like location of landfilling and sewage refinery with distance and appropriate situation outside its 4 regions. 2. Avoiding destruction of small possible settlements that are in design range especially settlement of scarce animal and plant species and danger of extinction and conserving these settlements in urban parks.
		Behavior patterns of animals	1. Avoiding location of city and lateral installation like location of landfilling and sewage refinery in settlement or animals' truancy. 2. Considering appropriate bridges or underpasses in location of intersection of paths of animals 'immigration (wildlife) with paths of city accessibility. 3. Doing various building actions like clearing and preparation of lands and building lands out of its production season and animal generation.
		Animals' immigration	1. Location of city, accessibility's paths and lateral installation like location of landfilling and sewage refinery with distance and appropriate situation rather than animal settlements. 2. Considering appropriate bridges or underpasses in location of intersection of paths of animals 'immigration (wildlife) with paths of city accessibility. 3. Doing various building actions like clearing and preparation of lands and building lands out of its production season and animal generation.

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