

Methodology of environmental impact assessment for regional development

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Abstract—In the light of a serious of environmental impact assessment and environmental planning for economic developing areas in Tianjin, the paper stressed on the significance and task, the principals and lines as well as major contents of EIA for regional development. In addition, the paper went further into some details and practical problems relating to assessment techniques such as the determination of total amount controlling targets, setting up index systems, optimization of environmental planning programme etc., of the EIA for regional development.

Keywords: regional development; environmental impact assessment; China.

1 Introduction

Now, China is developing by leaps and bounds. Propelled by the policy of reforming and opening, many regions have set up developing areas to promote economic development, in order to create better investment climates and attract investments from home and abroad. Because the developing area is characterized by high-intensified exploitation, centralized investment, board-scale construction and high-speed development, the damage on regional ecological environment and unreasonable exploitation and utilization of resources may be involved. Therefore, an urgent problem waiting to be solved is to make regional environment and economy develop coordinately.

2 The significance and task of EIA for regional development

The EIA for regional development is estimating the influences of regional development on environment before exploiting and utilizing a region on large scale then, on this basis, carrying out regional environmental planning, namely deploying resources reasonably in order to acquire the best benefits with the least investment and to prompt region's sustainable development. The EIA is not only the good guide for regional economic construction, but also a strong measure on deepening the policy of reforming and opening and making the environmental protection as an important part of developing areas' policy.

3 The principals and lines of EIA

3.1 The basic principals of EIA

A. Consistence between regional environmental exploitation and social-economic development;

B. Consistence between partial, immediate benefits and overall, forward benefits of a region;

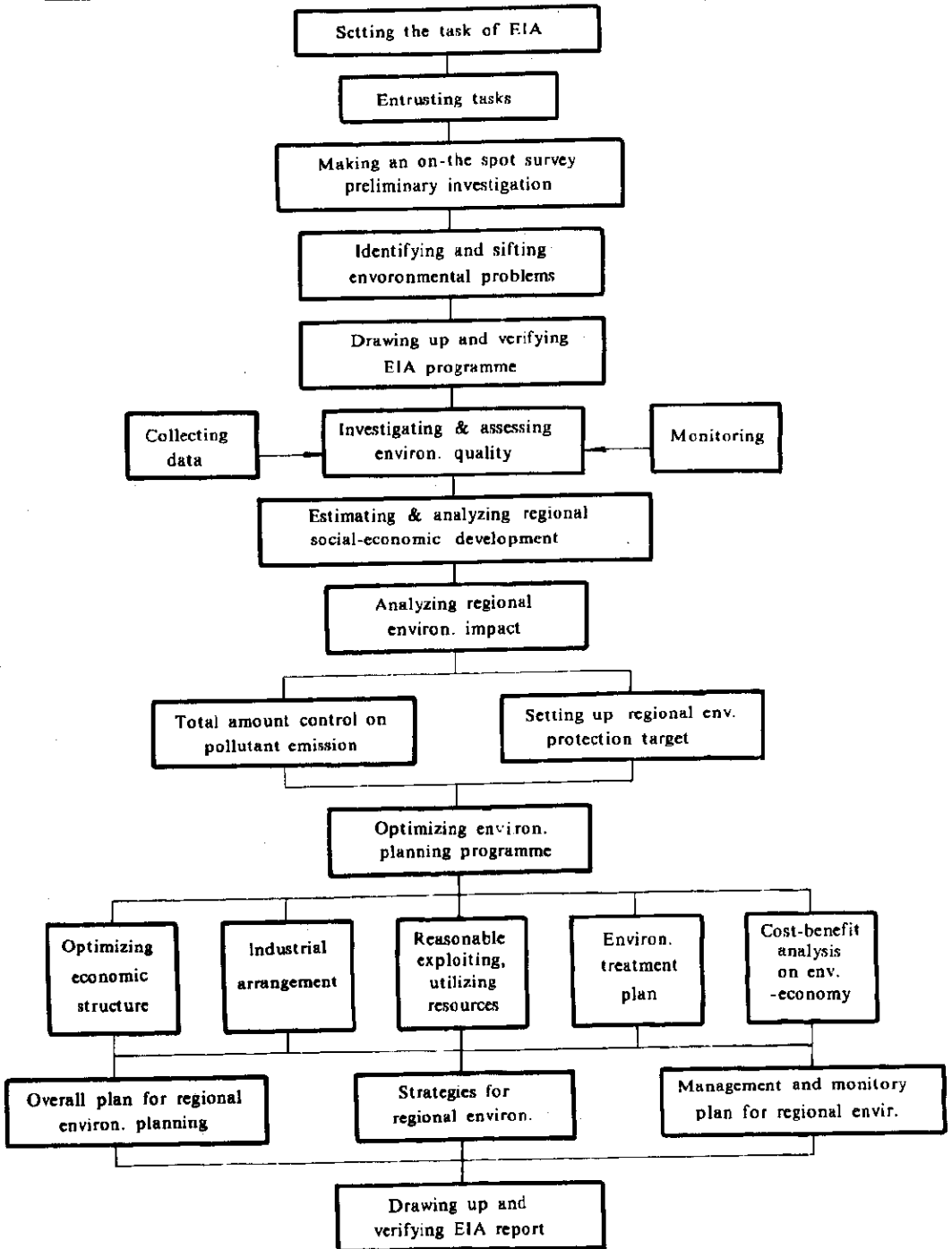


Fig. 1 The procedures of EIA

C. Overall analysis of the influences of regional exploitation on environment, including the influences on natural resources, biological resources, social-economic environment and living qualities.

D. The practicality of EIA. Environmental planning and protection strategies should tally with the actual situations of a certain region, in addition, they must be practical in techniques, reasonable in economy, dependable in effect and easy to be implemented.

3. 2 The basic lines of EIA

On the basis of regional environmental investigation and environmental quality monitoring, assessing the current situations of a region; combining with region social-economic developing plan and objectives, identifying the principle factors impairing environment, raising the major problems in developing processes, analyzing the range and degree of influences of economic development on environment and determining environmental bearing capacities, setting up the index system of total amount control on pollution emission and regional environmental protection (including target selecting, target values analyzing). Basing on these, optimizing environmental planning programme including reasonable exploitation and utilization of resources, optimizing the economic development patterns, rationalizing the layout of a region and, adjusting environmental protection plans. Once the projects of total amount control is satisfied, enacting the overall plan for environmental planning, management and monitoring as well as strategies for region's continued development (Fig. 1) showed the procedures of EIA.

4 Major contents of EIA

4. 1 Designating the ranges of assessment zone, sifting environmental problems and determining the range and key points of the works of EIA

Generally, the developing area is designated as assessment zone. If necessary (e.g. there are other developing areas, industrial zones or susceptible objects, for example, natural protection zone etc., around the developing area), the assessment zone could be enlarged. In such cases, the developing area is designated as focal point to be assessed.

Secondly, analyzing the influences of developing activities on environmental resources in order to find out major environmental problems, then giving these problems a preliminary analysis.

For the influences of regional development on environment is various and every region has its specific characteristics, the EIA should focuses on those points which are significant and have long-term influences, also, it should stress on the influences or regional development on natural resources, ecological environment, living quality as well as social-economic environment.

4. 2. Investigation and assessment of present environmental conditions

The purpose of this work is revealing the background data on the characteristics of regional resources and natural environment as well as current situations of social environment. It provides the basis for determining regional environmental bearing capacity (in order to access the influences of regional development on environment), at the same time, it provides the background data used in region environmental planning. The steps of investigating and assessing present environmental conditions include:

A. Investigating regional natural environment, including collecting the data on geographical position, geological features, soil and stone, surface and underground water, hydrometeorology, vegetation and so on.

B. Investigating social environment, focusing on current administrative division and land utilization; current industrial structure and distribution of the resources for economic development; traffic and transportation; water supply; sources, ways, ranges covered and efficiency of heat and electricity supply; communication; quantity, structure and distribution of population; social service, living quality, employment, cultural and historical relics and natural protection zone and so on.

After the investigation on natural and social environment, we will have an overall knowledge on the bearing capacity of regional environment and the potentiality of social development.

C. Investigating present pollution sources and assessing environmental quality

Investigating present pollution sources within assessment region to determine major pollution sources and major pollutants. Besides assessing routine environmental quality factors to reveal the degree of pollution, order of Equal Standard Pollutant Loading and environmental bearing capacity of the region, we should also assess other factors according to the specific situation of a region. At the same time, estimating possible pollution sources and pollutants after region's development from the overall and long-term views, and determining the environmental concentration of these pollutants as background values.

4.3 Overall analysis of the influences of regional development on environment

First, clearing out the programme and indexes of regional social and economic development; pointing out the industrial structure, scale and distribution of developing region, manners and amount of water, energy supply after development; how to improve and rebuild related municipal equipment (e. g. sewage, waste-water treatment plant, roads, etc.) to match the demand of regional development; the commerce, finance, culture and education as well as population increase after development.

On the basis of these works, giving a macroscopic analysis on the possible influences of regional development on natural physical resources, ecological resources, economic development resources and living qualities. Natural resource analysis should stresses on atmosphere, water and soil etc. According to the regional planning programme, analyzing the sorts, amount, manners of pollutant emission and the pollution controlling measures, determining major assessment factors, standards and ranges, using analogical investigation and diffusion model to estimate major pollutants' pollution degree and range. The work of analyzing the influences of regional development on environment should not too detailed. This means estimating the influences of macroscopic pollution sources according to regional development targets. But for the significant sources (including extant and future), besides determining their source strength and sorts of pollutants, one should also stresses on their influence on other assessment zones and susceptible objects, so detailed analysis may be involved. Different from the EIA for constructional projects, there are a lot of unknown factors in the EIA for regional development, so it is difficult to estimate the source strength, therefore, besides regional overall plan, one could also use analogical investigation in practical works. For example, in the EIA of Tianjin Tanggu Developing Zone, we adopted the amount of SO_2 per

10 thousands Yuan output value creates of 13 middle coastal cities and that of Tianjin as objects of analogical investigation (EIA, Tanggu, 1993). When analyzing the influences on economic development, one should focus on the influences on industrial environment, farming, forestry, animal, fishery environment, municipal equipment and tourism resources. As for living quality, stressing on the aspects of population variation, employment, wages, culture and education, recreation and commerce and so on.

4.4 Optimizing regional environmental planning programme

This is the most important step in regional overall plan. After keeping abreast of the present conditions of environmental quality and the influence of economic development on environment, enacting the overall plan for adjusting industrial structure and arranging industrial distribution as well as related environmental protection measures. The success or failure of the work directly influences the sustainable, steady and coordinate development of a region.

Determining the targets of total amount control is an important step in optimizing region environmental plan. Because the concentration control used before is not very reasonable, we should replace it with total amount control in the EIA for new developing areas. The targets of total amount control should be reasonable, practical and satisfy the demand of regional overall plan. In addition, rational designation of total amount controlling zone affects the target values, whether or not the total amount control can be implemented and the effects of total amount control, also, it affects the apportionment of every total amount controlling units. For example, because the Tanggu Economic Developing Area is only 5.54 km², it is clear that designating the area as total amount controlling zone is unreasonable, so, we designated the whole Tanggu District, which is 64 km², as total amount controlling zone and considered the developing area as one unit, then, making use of the methods stipulated in GB/T 13201-91 to estimate total amount controlling targets and apportionment of the developing area (EIA, Tanggu, 1993).

By far, the methods of total amount control on wastewater is difficult to be unified. For the functions of receipt water are different, the methods for calculating their environmental bearing capacity are different. Total amount controlling indexes should satisfy the environmental quality of regional receptor water and should give an overall consideration to the characteristics of region environment, the municipal equipments around, and social-economic development etc. In view of the various conditions of different developing areas, different methods for calculating indexes values are available. For example, using self-purified ability of a river to estimate index values if wastewater is emitted directly into the river, while considering the bearing capacity of ocean when the water is emitted into a sea through municipal sewage conduit.

Setting up the index system for the coordinate development of environment and economy is an important basis for optimizing environmental planning programme. This system must be overall, and should be selected on the basis of overall consideration of the relationship among environment, economy and living quality. Fig. 2 shows the index system we enacted in the EIA for Tanggu Developing Zone (EIA, Tanggu, 1993). Among these indexes, the indexes mainly include environmental quality indexes and pollution control indexes, while the major indirect indexes are the social-economic indexes related to environment and indexes of regional municipal construction. With the index

system, regional environmental characteristics and environmental bearing capacity and on the basis of analyzing the continued development of regional industry, demonstrating the rationality of developing area's type and scale and comparing different developing patterns.

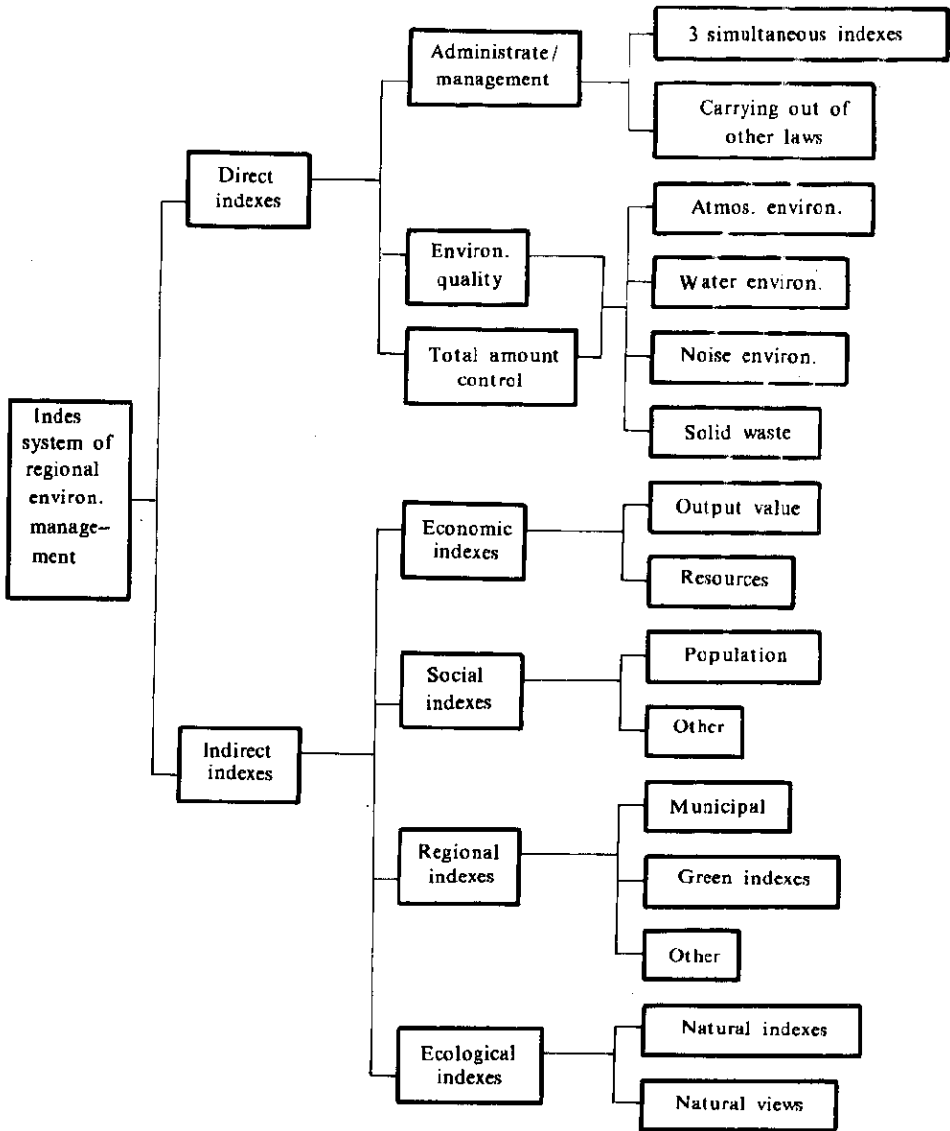


Fig. 2 The index system in the EIA for Tanggu developing zone

According to the total amount controlling indexes of regional environment, analyzing the pollution characteristics of different profession relating to regional development

and the feasibilities of pollution control on the view of economy and techniques, then fully considering to adopt the centralized pollution treatment measures and to utilize self-purified ability of environment and finally, comparing different plans for environmental protection and treatment. To do the work, we may list all possible plans at first, then analyzing and comparing them one by one to find out the best one. In the environmental protection plan of Tianjin Xiqing Development Zone, researchers compared 3 plans, including A: spot-source treatment; B: overall treatment of spot-source and developing area, and C: spot-source treatment combining with strengthening self-purified ability of South Pollutants Emission River. After analysis and comparison, they drew the conclusion that C plan is better than A and B. So, in EIA report, they suggested the developing area make use of the river course of middle reaches in the river and the pits, pools, low-laying areas and large-dimensioned salinized soil to set the compound ecological treatment engineering as stabilization pool to land treatment to river course purification system. The investment of the plan is equal to 1/3—1/5 of that to built waste-water treatment plant. So, C plan is not only low-investment, low-cost and high treatment effect, but also has large bearing capacity, therefore suit to the long-term development of the area (EIA, Xiqing, 1993).

4.5 The environmental protection strategy and implement plan for regional development

After appropriate plan for regional development is determined, putting forward the environmental protection strategy and implement plan for regional development according it. Environmental protection strategy includes overall plans for arrangement and adjusting of industrial structure, for total amount control of pollutants, for overall protection and control of regional pollution as well as for regional environmental management and monitoring.

Under the situation of deepening reform and accelerating economic development, National Environmental Department of China stipulated clearly that: EIA must be carried out before an economic developing region is on road and developing region should take part in regional overall decision actively. This decision will undoubtedly propel the implement of EIA for regional development on national scale. Also, we should continually sum up our experiences and make EIA, the tool for propelling regional environment and economy to develop coordinately, play a more important role in the economic construction of China.

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