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The state of the environment in Mexico

Research Article

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Abstract: The present work evaluates the state of the environment in Mexico based on indicators of the present status of the country's natural resource management, social and economical conditions and anthropogenic modifications. The Mexican environment is interpreted as a spatially open system having a historical character that is essentially determined by the continual interaction between nature, society and economy. The landscape approach is followed, considering as units of territorial analysis each one of the 145 biophysical environmental units included in the national physiographic regionalization. The assessment of 16 indicators for each biophysical environmental unit was made considering their regional environmental integrity problems, the degree of disarticulation of their structure and function, and the alteration of their territorial structure, all of which determine whether or not they accomplish their environmental functions and achieve environmental stability. The classification of the state of the environment included 5 categories in 8 combinations represented in the map of the state of the environment in Mexico for the year 2008. The map shows that nearly 47.10% of the country's surface has an environmental status ranging between unstable and critical, the problematic areas being mostly concentrated in the southeast and center of the national territory.

Keywords: Environment's state • Mexico • landscape approach • Geoecology • Geography

1. Introduction

Having precise information about the state of the environment is one of the essential elements for defining strategies for worldwide sustainable national development. In that regard, Achim Steiner, Under-Secretary-General of the United Nations and Executive Director of UNEP, stated: "Access to accurate and reliable information on the state of the environment, currently a challenge in the region, is a pre-requisite to achieve transformational change" [1].

To implement environmental management processes in developing countries requires, in addition to resources and organizational measures, truthful and confident information about the characteristics and state of environmental systems, in particular, of the forms in which environment is managed within territories [2]

To that effect, it becomes relevant to use scientific categories that not only meet the requirements of environ-

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mental research but that can also de coherently applied in policy implementation and in the articulation of the population's expectations [3]

The ecological planning of the Mexican territory required application of a series of cartographic models that allowed for establishing a basic prospect of future territory occupation and for orienting the implementation of federal policies in a sustainable way, in agreement with the country's environmental policies.

The present work is a part of the prognostic stage (stage III) of the research project "Program of General Ecological Planning of the Territory" (POEGT, for its Spanish acronym), which was supported by SEMARNAT [4] during the years 2008 and 2010 and coordinated by the authors of the present work, as a basis for establishing present and future policy formulating conditions (i.e., the contextual, trends and strategic scenarios of the Mexican environmental regulation) for the national territory of Mexico. One of the important previous steps of the prognostic stage was to establish a diagnostic of the environmental situation of the national territory of Mexico, which was expressed in the Map of the State of the Environment in Mexico and established as the contextual framework of the above-mentioned prognostic stage.

2. Theoretical Considerations

The present evaluation of the state of the environment in Mexico used the landscape approach of Geoecology that is based on the fundamentals of landscape geography mainly developed in Europe [5–11], but also in North America [12, 13] and Latin America [14–17].

The concept of landscape, fundamental for geoecological research, has been altered over time. The content of the concept of landscape is redefined for each one of the levels of interaction between Nature and Society: the Natural Landscape, the Anthropic-Natural Landscape, the Cultural Landscape and the Visual or Perceived Landscape [18]. The present work is based on regional physiographic units that are interpreted as anthropic-natural landscapes or geoecological units.

The databases derived from the landscape approach are unique because they provide a synoptic view and quantitative evaluation of the condition of natural resources and their space-time [19]. This approach can support various tasks related to the implementation of environmental policies and, eventually, become the basis for land-use planning [20].

The state of the environment represents the degree of conservation in natural systems and the potential for production activities of natural and environmental resources [15]. In that sense, the state of the environment has a clear spatial manifestation, not only depending on the type and degree of human activity, but also on the intrinsic properties of natural systems on which such activities take place; the state of the environment is differentially distributed throughout the territory. The state of the environment is a property of the natural entities modified by human actions along time and is expressed for a given point in time.

3. Materials and Methods

The evaluation of the State of the Environment for the year 2008 was made using as basic natural entities the Biophysical Environmental Units (BEU) of the Biophysical Regionalization of Mexico [21, 22] which represent the regional physiographic landscape units (geoecological units).

145 BEUs of the national territory of Mexico were evaluated by means of overlaying 15 indicators separated into three groups: indicators of natural resources management problems (land use, soil degradation, degradation of vegetation and degradation due to desertification); indicators of anthropic modification (length of roads, extent of urban areas, surface area of water bodies and population density) and; indicators of socioeconomic status (social marginality, mean educational index, mean health index, housing overcrowding, housing consolidation, industrial assets, rate of municipal economic dependency and percentage of laborers per remunerated activity per municipality). Annex 1 shows the categories of each indicator and their defining criteria.

The database for the classification and assessment of the above-mentioned indicators was derived from a set of maps at a 1:2 000000 scale that were elaborated during the Characterization stage (stage I) of the POEGT. Data about natural resource management problems were obtained from the maps of loss of ecological habitat and their biodiversity potentials [23], loss and degradation of soils [24], and extension and distribution of desertification processes [25]. The available land use maps were used [26] to define the types of territorial utilization, and while evaluating the intensity of anthropogenic activities in the territory, new information was generated from a base map by means of GIS applications. The information used for establishing the social consequences of the types of land use and anthropogenic activities was obtained from the maps of social marginality [27], mean educational and health indexes [28, 29], housing overcrowding and consolidation [30, 31] industrial assets [32], rate of municipal economic dependency, and percentage of laborers per remunerated activity per municipality [33].

The BEU map was overlaid with each of the above-mentioned maps using the GIS software ArcGIS, 9.3, which allowed for classifying in each BEU the values of the 15 indicators using 5 categories: Very low, Low, Medium, High, and Very high. Several statistical methods were applied for assigning a general categorization of the particularly predominant value (% of surface) of the indicator in each BEU. Subsequently, the importance of each socioeconomic indicator was assessed during statistical weight. In addition to the above-mentioned indicators, presence or absence of other spatial criteria, such as presence of mining activity, categorization of croplands presence of natural protected areas and availability of surface and groundwater, was recorded per BEU.

In addition to the indicators described above, the integrity problems of each BEU were also considered, taking into account both the degree of disarticulation of their structure and function and the alteration of their territorial structure, which determine whether or not environmental functions are accomplished. Finally, BEUs (Regions) were assigned a category for their state of the environment:

- **BEUs in stable state:** These units are physical geographic regions that are characterised by low to median values of biophysical degradation corresponding to socioeconomic level and anthropogenic modification. However, in some cases, socio-economic indicators signal high levels of social degradation, such as poor housing consolidation or low industrialisation (refer to Annex 1, with those showing a point score lower than 33).

Bordering the limit of the next category are transitional regions whose values fall under the category of **stable to moderately stable**, which are stable regions where the degradation process is more intense, indicating a tendency toward pushing them into the next category. In particular, denoted in this group is higher degradation of social indicators, such as the average health index, which is quite low (refer Annex 1, with a score of 34 to 38).

- **BEUs in a moderately stable state**: The next category constitutes physical geographic regions characterised by low indicator values for biophysical degradation and anthropomorphic modification with some high to very high values of degradation in economic indicators, while social indicators do not exceed the highest value (refer to Annex 1, with a point value of 39). A second group of BEUs in this category (refer to Annex 1, with values from 40 to 43) are characterised by high to median values of degradation in biophysical as well as economic indicators. Both groups present high to median values with regard to the average health index.

Nearing the border with the next category is a transitional value of regions considered to be **moderately stable to unstable** (refer to Annex 1, with values of 43 to 48). These are regions that are moderately stable with a tendency toward strengthening degradation processes, and generally have median values of biophysical indicators, low values with regard to anthropogenic modification, and high to very high values with regard to social and economic indicators. These are generally regions that comply with their socio-economic functions but at a low level. These regions show evidence of a loss of natural potential and degradation of some of their natural components, maintaining their structure and functions, affecting the quality of life for the populations that depend on them.

- **BEUs in unstable state**: These are regions that present high to very high values in the biophysical indicators, specifically in one or two biophysical components, most common was high to very high vegetative degradation. Social indicators show high to very high degradation, particularly in the average health and education index and those associated with overcrowding and quality of life. The same occurs in the economic indicators; of which in the majority show very high values (refer to Annex 1, with a point value of 49 to 53). Socio-economic functions degenerate with evident loss in natural functions and the presence of intense degradation processes with threatened structural and functional stability greatly affecting level and quality of life for the populations that depend on them.

- **BEUs in critical state**: In this category we include regions in transition classified as **unstable to critical with a critical environmental state** (refer to Annex 1, showing a point value greater than 54). Biophysical indicators, specifically vegetative and soil degradation, characterize these regions, where soil values are low to very low and have high amounts of desertification. At the same time, the sum of the high values is attributed to anthropogenic activity due to a variety of factors: the high urbanization level, construction of dams or reservoirs, or high population density and, in particular, socio-economic indicators with very high degradation values in the majority of the units.

- **BEUs in very critical state:** Those in which structural and functional stability have been altered, with loss of natural potentials and degradation of natural components such that the regions can no longer accomplish their assigned socioeconomic functions or allow for sustaining the quality of life of the human population. Regions in an extremely critical state are not distinguished.

Ultimately, taking into account the information from the indicators that were assessed for each BEU and following experts' criteria, the state of the environment was categorized for each BEU. Annex 1 shows BEUs in a critical state. The resulting proposal was submitted for consideration to numerous experts from the different dependencies of the Federal Public Administration in eight regional

workshops held once in Tuxtla Gutiérrez, Chiapas; twice in México City; twice in Guadalajara, Jalisco; and once in Hermosillo, Sonora; Mérida, Yucatán; and Oaxaca, Oaxaca. In parallel, two national public consultations were conducted through the Internet. Experts on the state and federal level submitted their criteria and proposals for category changes, in particular to the critical state category. The proposal presented an argument for changing the category of certain regions considered 'unstable' and 'unstable to critical' to be reconsidered as 'critical', and defined a new category for three regions as 'critical to very critical'.

4. Results

The results of the assessment of State of the Environment for each BEA are presented in Annex 1. Some results from the estimation of the surface covered by the established categories that are of note are, among others: soil degradation processes are absent in 49.8% of the surface, while 50.2% has some degree of degradation, in particular, medium to very high soil degradation is displayed in 8.4% of the country. Also, 47.9% of the territory of Mexico presents some level of degradation of the vegetation cover, of which 22.27% is very high, 14.26% is high, and 4.31% is low, while only 0.4% of the country's territory shows anthropogenic modification in less than 10% of the original cover. The surface of the country showing anthropogenic desertification processes is 27 642.36 km^2, of which 7 430.19 km^2 show a very high degree of desertification, 3 722.26 km^2 exhibits a high degree, 14 260.30 km^2 is moderately desertified, and 2 228.61 km^2 has a low degree of desertification. The total length of highways in the country is 86 462.69 km. Twenty-eight percent of the BEUs presented a moderately urban area, 64% were between low and very low, and 28% were categorized as highly and very highly urban. Twenty-eight percent of the BEUs had a high category of surfaces of bodies of water and the remaining BEUs ranged between the very low and low categories. Sixty-four percent of the BEUs had social marginality categories between medium and very high.

Figure 1 shows the Biophysical Environmental Units and the State of the Environment in Mexico for the year 2008. A total of four Biophysical Environmental Units in a critical to very critical state were defined by these experts (BEUs: 72, 97, 129, 132,) and were determined to be located in the States of Guerrero and Oaxaca. At the same time, sixteen Biophysical Environmental Units were determined to be in a critical state (BEUs: 36, 61, 81, 82, 83, 84, 85, 86, 128, 131, 133, 140, 142, 143, 144, 145), located principally in the States of Oaxaca, Guerrero, Chiapas, Puebla and Nuevo León. They defined eighteen units in the unstable to critical state (BEUs: 52, 67, 73, 74, 75, 78, 88, 99, 100, 101, 118, 124, 125, 126, 127, 130, 134, 139.) located in the States of Oaxaca, Guerrero, Chiapas, Michoacán, Colima, Puebla and Veracruz. This result in a total of thirty-nine regions determined to be in an 'unstable state' and located predominantly in the southern and central portions of Mexico. They also determined there to be a total of twenty-one units in a 'moderately stable to unstable' state, twenty one regions in a state considered 'moderately stable' and twenty-six considered 'stable' and 'stable to moderately stable'. These three final groups were determined to be located in the north and north - central portions of Mexico.

The calculations for each category by the surface they occupy (Table 1) show that 47.10 % of the country is in a state between unstable and critical to very critical. In other words, they are territories where the environmental units have begun to show difficulty in complying with the socio-economic functions assigned to them, with evident loss in their natural resource potential and presence of intense degradation processes. These territories are under a real threat to the stability of their structures and functions, with great impact to the level and quality of life for their dependent populations; they have urgent need for attention to environmental crises. By surface area, only 39.25% of the country complies with the socio-economic functions assigned to them, conserve their natural resource potentials without loss or degradation of natural components, maintain their structure and function, and allow for a higher level and quality of life for the dependent population. A small percentage, 13.66 % of the surface area, maintains a moderately stable to unstable categories. These are territories that also demonstrate a great need for attention to environmental issues. Due to its significance, breadth and holistic essence, the evaluation results of the State of the Environment in Mexico,

Table 1. Area occupied by the categories of state of the environment in the territory of Mexico (2008).

State of the environment	Area (Km^2)	Percent (%)
Stable state	186046.83	9.58
Moderately stable to stable state	288 062.91	14.83
Moderately stable state	288 375.95	14.84
Moderately stable to unstable state	265 478.07	13.66
Unstable state	558 392.51	28.74
Unstable to critical state	207 970.86	10.70
Critical state	123 317.93	6.35
Critical to very critical state	25 394.19	1.31
Very critical state	0.00	0.00

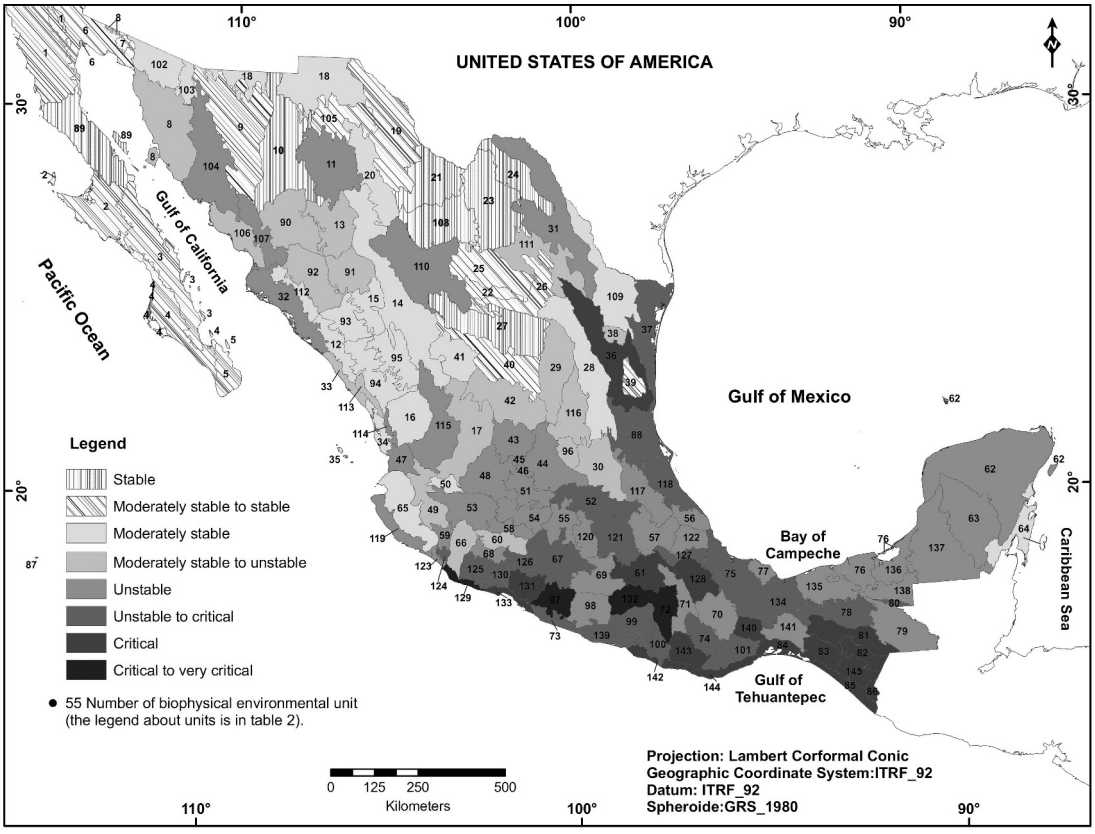

Figure 1. The map of the state of the environment in Mexico.

BEUs: Biophysical Environmental Units.

1. Sierras de Baja California Norte; 2. Desierto de San Sebastián-Vizcaíno; 3. Sierra La Giganta; 4. Llanos La Magdalena; 5. Sierras y piedemontes El Cabo; 6. Desierto Altar; 7. Volcanes El Pinacate; 8. Sierras y llanuras sonorenses occidentales; 9. Sierras y valles del norte; 10. Sierras y cañadas del norte; 11. Sierras y llanuras tarahumaras; 12. Pie de la Sierra sinaloense central; 13. Meseta chihuahuense norte; 14. Sierras y llanuras de Durango; 15. Meseta duranguense norte; 16. Cañones Nayarit y Durango; 17. Sierras y valles zacatecanos; 18. Llanuras y médanos del norte; 19. Sierras plegadas del norte; 20. Bolsón Mapimí; 21. Llanuras y sierras volcánicas del norte; 22. Laguna Mayran; 23. Sierras y llanuras coahuilenses; 24. Serranía El Burro; 25. Sierra La Paila; 26. Pliegues Saltillo-Parras; 27. Sierras Transversales; 28. Gran sierra plegada; 29. Sierras y llanuras noroccidentales; 30. Karst huasteco norte; 31. Llanuras Coahuila y Nuevo León norte; 32. Llanuras costeras y Deltaicas Sinaloa; 33. Llanura costera Mazatlán; 34. Delta del Río Gran Santiago; 35. Islas Marías; 36. Llanuras y lomeríos Nuevo León y Tamaulipas; 37. Llanura costera tamaulipeca; 38. Sierra San Carlos; 39. Sierra Tamaulipas; 40. Sierras y lomeríos Aldama y Río Grande; 41. Sierras y llanuras del norte; 42. Llanuras y sierras potosino-zacatecanas; 43. Llanuras Ojuelos-Aguascalientes; 44. Sierras y llanuras del norte de Guanajuato; 45. Sierra Cuatralba; 46. Sierra de Guanajuato; 47. Sierras neovolcánicas nayaritas; 48. Altos de Jalisco; 49. Sierra de Jalisco; 50. Sierras y piedemontes Guadalajara; 51. Bajío guanajuatense; 52. Llanuras y sierras Querétaro e Hidalgo; 53. Depresión de Chapala; 54. Sierras y bajíos michoacanos; 55. Sierras Mil Cumbres; 56. Sierra Chiconguiaco; 57. Depresión central; 58. Sierra neovolcánica tarasca; 59. Volcanes de Colima; 60. Escarpe limítrofe del sur; 61. Sierras del sur Puebla; 62. Karst Yucatán y Quintana Roo; 63. Karst y lomeríos Campeche, Quintana Roo y Yucatán; 64. Karst del sur de Quintana Roo; 65. Sierras de la costa de Jalisco y Colima; 66. Cordillera costera michoacana del noroeste; 67. Depresión del Río Balsas; 68. Depresión del Tepalcatepec; 69. Sierras y valles guerrerenses; 70. Sierras orientales del norte de Oaxaca; 71.Sierras nororientales Oaxaca; 72. Mixteca alta; 73. Costas meridionales del noroeste Guerrero; 74. Sierras y valles de Oaxaca; 75. Llanura costera del norte Veracruz; 76. Llanuras fluviodeltaicas de Tabasco; 77. Sierra de los Tuxtlas; 78. Sierras del norte de Chiapas; 79. Sierra Lacandona; 80. Sierras bajas del Petén; 81. Altos de Chiapas; 82. Depresión central del Chiapas; 83.Sierras del sur de Chiapas occidental; 84. Llanuras del Istmo; 85. Llanura costera de Chiapas y Guatemala; 86. Volcanes de Centroamérica; 87. Islas Revillagigedo; 88. Llanuras costeras del Golfo norte; 89. Sierras y lomeríos de Baja California norte; 90. Cañones chihuahuenses del norte; 91. Meseta chihuahuense meridional; 92. Cañones chihuahuenses meridionales; 93. Cañones duranguenses del norte; 94. Cañones duranguenses del sur; 95. Meseta duranguense meridional; 96. Sierras Guanajuato y San Luis Potosí; 97. Cordillera costera centro-occidental de Guerrero; 98. Cordillera costera centro-oriental de Guerrero; 99. Cordillera costera del sureste de Guerrero; 100. Cordillera costera occidental de Oaxaca; 101. Cordillera costera oriental de Oaxaca; 102. Sierras y llanuras del norte sonorense; 103. Sierras y llanuras del noreste sonorense; 104. Sierras y llanuras orientales de Sonora; 105. Llanuras y lomeríos del norte; 106. Llanuras costeras y deltaicas de Sonora; 107. Pie de la sierra sonorense; 108. Llanuras y sierras volcánicas del sur; 109. Llanuras de Coahuila y Nuevo León sur; 110. Bolsón Mapimí sur; 111. Sierras y llanuras de Coahuila y Nuevo León; 112. Pie la sierra sinaloense norte; 113. Pie la sierra sinaloense sur; 114. Pie de la sierra nayarita; 115. Mesetas de Jalisco, Nayarit y Zacatecas; 116. Sierras y llanuras suroccidentales; 117. Karst huasteco sur; 118. Lomeríos costeros del Golfo norte; 119. Lomeríos costeros de Jalisco y Colima; 120. Depresión de Toluca; 121. Depresión de México; 122. Volcanes Pico Orizaba y Cofre Perote; 123. Llanura costera de Colima; 124. Sierra costera de Colima; 125. Cordilleracostera del sur de Michoacán; 126. Cordillera costera oriental de Michoacán; 127. Sierras y piedemontes de Veracruz y Puebla; 128. Sierras de Oaxaca, Puebla y Veracruz; 129. Pie de la sierra michoacana; 130. Cordillera costera del sureste de Michoacán; 131. Cordillera costera del noroeste de Guerrero; 132. Sierras de Guerrero, Oaxaca y Puebla; 133. Llanuras y lomeríos costeros de Guerrero; 134. Llanura costera del sur de Veracruz; 135. Llanuras aluviales occidentales de Tabasco; 136. Llanuras aluviales y lagunares de Campeche; 137. Karst y lomeríos de Campeche; 138. Llanuras aluviales de Tabasco y Chiapas; 139. Costas meridionales del sureste de Guerrero; 140. Sierras orientales de Oaxaca; 141. Sierras del sureste de Oaxaca; 142. Costas meridionales de Oaxaca occidental; 143. Cordillera costera del centro de Oaxaca; 144. Costas meridionales de Oaxaca oriental; 145. Sierras del sureste de Chiapas.

completed and validated by expert researchers, has served as a platform for the establishment of environmental policies and to determine areas of priority for the Mexican General Environmental Land Use Management Program (POEGT), founded by the Secretary of Environment and Natural Resources (SEMARNAT) and the Mexican National Institute of Ecology (INE), as conducted during the years 2008 and 2010 and written into decree by the federal government on the 7^{th} of September, 2012 in the Official Journal of the Federation.

5. Conclusions

The application of the geoecological approach for the evaluation of the state of the environment in Mexico represents a broad scope effort to detect and emphasize the geographic differentiation and degrees of deterioration of natural resources and levels of social and economic development. Due to its meaning, fullness, reach, and holistic nature, it was the basic platform for establishing the trends framework of the POEGT.

The obtained results reveal alarming scenarios in the environmental state of the national territory of Mexico, which demand the immediate application of public environmental policies that contribute to preventing, mitigating and correcting the degradation effects on environmental quality, social inequality and unequal economic growth under a territorial planning scope and a better distribution of federal, state and municipal financial resources, addressing national and most marginal sector needs.

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ANNEX

Table 2. State of the Environment. Indicators of natural resources management problems, of anthropic modification and socioeconomic status, assessed in the Biophysical Environmental Units (BEU) of the Biophysical Regionalization of Mexico (López-Blanco, 2007, 2008).
BEU: Biophysical Environmental Units; Name of the BEU (see Figure 1).
A. Soil degradation; B. Vegetation degradation; C. Degradation by desertification; D. Length of roads; E. Extent of urban areas; F. Surface area of water bodies; G. Population density; H. Social marginalization; I. Mean educational index; J. Mean health index; K. Housing Overcrowding; L. Housing consolidation; M. Industrial assets; N. Rate of municipal economic dependency; O. Laborers per remunerated activity per municipality.
$\sum$ Points: Sumatory of points given to indicators (see Table 2).

BEU	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	$\sum$Points	State of the Environment
1	2	2	2	3	2	1	3	1	1	3	2	4	3	2	1	32	Stable
2	1	0	2	2	1	1	1	2	1	2	2	5	5	2	2	29	Stable
3	1	0	2	2	0	1	1	1	1	2	2	5	5	2	2	27	Stable
4	1	2	2	2	1	1	1	1	2	2	2	4	5	2	2	30	Stable
5	1	0	2	2	1	1	2	1	1	2	3	3	5	1	1	26	Stable
6	2	3	0	3	2	1	2	1	1	3	2	5	3	2	1	31	Stable
7	1	0	0	1	0	0	1	1	1	1	2	5	3	2	1	19	Stable
8	4	2	3	3	1	1	1	1	1	3	2	4	4	4	5	39	Moderately stable
9	2	2	3	3	1	1	1	1	3	4	2	5	3	2	2	35	Stable to Moderately stable
10	1	2	2	2	0	1	1	2	2	4	2	5	3	3	2	32	Stable
11	4	3	2	3	1	2	1	2	3	4	2	5	4	4	4	44	Moderately stable to unstable
12	2	3	0	2	1	2	1	3	4	3	3	3	5	3	4	39	Moderately stable
13	4	3	3	2	1	1	1	5	5	3	3	5	3	5	3	47	Moderately stable to unstable
14	3	4	3	4	1	1	1	2	3	3	2	5	4	4	3	43	Moderately stable
15	3	3	0	1	1	0	1	4	4	3	2	5	4	4	4	39	Moderately stable
16	3	4	0	1	1	1	1	5	5	2	4	5	4	4	3	43	Moderately stable
17	4	4	3	3	1	1	2	2	3	3	2	4	5	5	2	44	Moderately stable to unstable
18	3	2	4	3	1	1	1	1	2	5	2	5	3	3	1	37	Stable to Moderately stable
19	3	0	3	2	1	1	2	2	3	4	2	5	3	2	1	34	Stable to Moderately stable
20	2	3	3	3	2	2	3	1	2	4	2	4	3	2	1	37	Stable to Moderately stable
21	3	0	0	2	1	1	1	1	2	3	2	4	3	2	2	27	Stable
22	2	3	3	3	1	1	1	2	2	2	2	5	1	3	2	33	Stable
23	2	2	2	2	1	1	1	2	2	3	2	3	1	3	1	28	Stable
24	2	2	0	1	0	1	1	1	2	3	2	3	1	2	1	22	Stable
25	3	0	0	2	0	1	1	2	2	2	2	4	1	3	2	25	Stable
26	3	2	2	4	1	1	3	2	2	2	3	2	1	2	1	31	Stable
27	2	2	2	4	1	1	2	3	2	3	2	3	1	2	3	33	Stable
28	2	3	2	2	1	1	1	4	3	3	3	4	3	3	4	39	Moderately stable
29	3	3	4	3	1	1	1	4	4	3	3	3	3	4	4	44	Moderately stable a Unstable
30	3	4	2	3	1	1	1	4	4	3	3	3	3	5	4	44	Moderately stable to Unstable
31	4	4	4	4	2	1	1	1	4	4	4	4	3	2	2	44	Moderately stable to Unstable
32	4	5	2	4	3	2	3	1	2	4	4	4	5	3	3	49	Unstable
33	4	4	3	2	3	4	4	2	2	3	3	3	5	3	2	47	Moderately stable to Unstable
34	4	4	0	2	2	5	2	2	2	4	3	3	5	3	2	43	Moderately stable
35	1	3	0	1	0	0	1	2	2	3	3	4	5	2	2	29	Stable
36	5	5	3	5	2	2	3	3	2	4	5	5	5	5	5	59	Critical
37	5	5	5	3	2	3	2	2	2	3	4	4	3	3	3	49	Unstable
38	2	3	2	1	2	0	1	4	4	3	4	4	4	5	5	44	Moderately stable to Unstable
39	2	2	0	1	0	1	1	3	4	4	4	3	3	3	4	35	Stable to Moderately stable
40	2	3	2	2	1	1	1	3	3	3	2	4	4	4	3	38	Stable to Moderately stable

41	3	4	5	2	1	1	1	3	3	4	2	3	3	3	3	41	Moderately stable
42	2	4	3	3	1	1	1	4	4	4	2	4	3	5	4	45	Moderately stable to Unstable
43	4	4	5	3	2	1	3	4	4	4	2	3	5	5	2	51	Unstable
44	4	4	5	4	2	1	3	4	4	4	2	3	4	5	3	52	Unstable
45	4	3	5	1	0	1	1	3	4	5	4	4	5	5	5	50	Unstable
46	4	5	5	1	1	1	3	3	4	4	3	3	4	4	4	49	Unstable
47	4	5	0	2	2	1	3	4	4	4	4	4	5	4	3	49	Unstable
48	4	5	1	4	1	1	2	2	4	5	4	4	4	4	4	49	Unstable
49	4	4	0	2	1	1	1	4	4	4	4	5	4	3	3	44	Moderately stable to Unstable
50	3	4	0	2	5	1	5	1	2	4	3	3	4	1	1	39	Moderately stable
51	2	5	3	3	4	2	4	3	4	5	3	3	4	2	2	49	Unstable
52	4	5	2	5	3	2	4	3	3	4	4	4	3	4	4	54	Unstable to Critical
53	3	5	2	4	2	5	4	2	4	4	2	5	4	3	2	51	Unstable
54	3	5	0	3	3	5	4	3	4	4	2	3	5	5	2	51	Unstable
55	4	4	0	3	1	2	2	4	4	4	4	4	5	4	4	49	Unstable
56	4	5	0	2	1	1	2	4	5	5	4	4	4	4	4	49	Unstable
57	4	5	0	5	3	1	4	4	4	4	3	3	3	3	4	50	Unstable
58	4	4	0	2	2	3	2	3	4	4	4	4	5	5	4	50	Unstable
59	3	5	3	2	3	1	4	1	4	3	4	4	4	4	4	49	Unstable
60	3	4	2	2	2	1	3	4	4	5	3	4	5	3	3	48	Moderately stable to Unstable
61	4	5	2	3	2	1	3	4	4	4	5	5	5	5	5	57	Critical
62	3	5	3	5	2	1	2	4	5	4	4	4	5	3	3	53	Unstable
63	3	5	0	3	1	1	1	4	4	4	4	4	5	5	5	49	Unstable
64	2	3	0	2	1	3	2	3	3	2	3	4	5	3	3	39	Moderately stable
65	3	4	0	2	1	1	2	3	4	4	3	5	4	2	2	40	Moderately stable
66	3	5	0	2	1	1	1	4	5	3	3	5	4	3	2	42	Moderately stable
67	4	4	0	3	1	1	2	4	5	5	5	5	5	5	5	54	Unstable to Critical
68	3	5	2	2	2	1	3	3	4	4	3	4	5	4	4	49	Unstable
69	3	5	0	3	2	1	3	4	4	4	3	4	5	5	3	49	Unstable
70	3	4	2	2	1	0	2	4	5	4	4	5	5	3	5	49	Unstable
71	3	4	2	2	1	0	1	4	5	4	4	4	5	5	5	49	Unstable
72	4	5	0	2	1	1	1	5	5	5	5	5	5	5	5	54	Critical to very Critical
73	5	5	0	2	1	2	2	4	4	4	5	5	5	5	5	54	Unstable to Critical
74	4	5	2	2	2	0	3	4	5	4	5	5	5	4	4	54	Unstable to Critical
75	4	5	0	4	2	1	3	4	4	4	4	5	5	5	5	55	Unstable to Critical
76	3	4	0	2	2	5	2	3	3	4	4	5	4	4	4	49	Unstable
77	4	5	0	2	1	3	2	4	5	4	4	5	3	4	4	50	Unstable
78	4	5	0	2	1	1	2	5	5	4	5	5	5	5	5	54	Unstable to Critical
79	2	4	0	2	1	1	1	5	5	4	4	5	5	5	5	49	Unstable
80	3	4	0	1	0	1	1	4	4	3	4	5	5	5	4	44	Moderately stable to Unstable
81	3	5	2	3	2	1	3	4	5	5	5	5	5	5	5	58	Critical
82	3	5	3	2	1	5	1	4	5	4	4	5	5	5	5	57	Critical
83	4	5	0	2	1	1	2	4	5	5	5	5	5	5	5	54	Critical
84	5	5	2	2	2	1	3	4	4	5	4	4	5	5	5	56	Critical
85	5	5	0	2	2	2	2	4	4	4	5	5	5	5	5	55	Critical
86	4	5	0	2	3	0	4	4	4	4	4	5	5	5	5	54	Critical
87	1	0	0	1	0	0	2	2	4	0	3	5	5	2	2	27	Stable
88	4	5	3	3	2	4	3	3	3	4	3	4	3	5	5	54	Unstable to Critical
89	1	0	0	2	0	1	1	1	1	3	2	4	5	2	1	24	Stable
90	4	2	0	2	1	1	1	5	5	3	3	5	3	5	4	44	Moderately stable to Unstable
91	2	3	0	1	1	1	1	5	5	3	3	5	5	5	4	44	Moderately stable to Unstable
92	2	2	0	1	1	1	1	5	5	3	4	4	5	5	5	44	Moderately stable to Unstable

93	1	2	0	1	0	0	1	5	5	3	3	4	5	5	4	39	Moderately stable
94	2	2	0	1	0	1	1	4	3	3	4	4	4	5	5	39	Moderately stable
95	3	3	2	2	1	0	1	1	2	4	4	3	4	5	4	39	Moderately stable
96	3	3	3	1	1	1	1	4	4	4	3	3	5	4	4	44	Moderately stable to Unstable
97	5	5	0	1	0	1	1	4	5	5	5	5	5	5	5	52	Critical to very Critical
98	3	4	0	2	1	1	2	4	5	4	4	4	5	5	5	49	Unstable
99	4	4	0	1	1	0	1	5	5	5	5	5	5	5	5	51	Unstable to Critical
100	4	5	0	2	1	1	2	4	5	5	5	5	5	5	5	54	Unstable to Critical
101	4	5	0	2	1	1	1	5	5	5	5	5	5	5	5	54	Unstable to Critical
102	3	1	0	2	1	1	1	1	1	5	3	5	5	3	3	35	Stable to Moderately stable
103	4	2	5	2	1	1	1	2	3	4	2	5	5	2	2	41	Moderately stable
104	4	3	3	3	1	1	2	1	1	4	5	4	4	4	4	44	Moderately stable to Unstable
105	2	3	0	2	1	1	1	1	2	5	3	5	4	2	1	33	Stable
106	3	4	2	3	2	1	3	2	2	4	3	3	4	4	4	44	Moderately stable to Unstable
107	4	3	3	2	1	3	1	4	3	3	3	4	5	5	5	49	Unstable
108	3	2	0	2	1	2	1	2	2	4	2	3	1	3	1	29	Stable
109	4	4	3	3	1	2	2	2	2	4	2	3	3	4	4	43	Moderately stable
110	4	3	3	4	1	1	2	2	2	3	2	5	5	3	4	44	Moderately stable to Unstable
111	3	2	3	3	2	1	4	2	1	3	3	3	3	3	3	39	Moderately stable
112	4	3	0	1	1	3	1	3	3	4	3	2	3	5	3	39	Moderately stable
113	4	4	0	1	1	1	1	2	4	4	4	4	5	5	4	44	Moderately stable a Unstable
114	4	5	0	2	2	1	2	3	3	5	5	5	5	5	5	52	Unstable
115	4	3	3	2	1	3	1	4	4	3	4	4	4	5	4	49	Unstable
116	2	3	3	2	1	1	1	4	4	4	3	3	3	5	5	44	Moderately stable a Unstable
117	3	5	0	3	1	1	2	4	5	4	4	4	4	4	5	49	Unstable
118	5	5	0	3	2	1	3	4	3	4	4	5	5	5	5	54	Unstable to Critical
119	3	4	0	2	1	2	2	3	3	5	5	5	5	5	5	50	Unstable
120	3	5	0	3	3	2	4	4	3	4	3	3	4	5	3	49	Unstable
121	4	5	3	5	5	2	5	1	1	4	3	2	4	5	5	54	Unstable to Critical
122	3	5	0	2	2	0	4	4	5	4	3	4	3	5	5	49	Unstable
123	3	5	0	2	3	2	4	2	3	4	3	5	5	4	4	49	Unstable
124	4	5	0	1	2	1	1	5	5	5	5	5	5	5	5	54	Unstable to Critical
125	4	4	0	1	1	0	1	5	5	5	5	5	5	5	5	51	Unstable a Critical
126	4	4	0	1	1	1	1	5	5	5	5	5	5	5	5	52	Unstable to Critical
127	3	5	0	3	4	0	4	4	5	4	3	4	5	5	5	54	Unstable to Critical
128	5	4	2	2	1	5	2	5	5	4	5	5	5	3	5	58	Critical
129	3	5	0	3	1	0	1	5	5	5	5	5	5	5	5	53	Critical
130	3	4	0	2	1	5	1	4	4	5	5	5	5	5	5	54	Unstable to Critical
131	4	5	0	2	1	1	1	5	5	5	5	5	5	5	5	54	Critical
132	5	4	0	2	1	1	1	5	5	5	5	5	5	5	5	54	Critical to very Critical
133	5	5	3	2	3	2	4	3	4	4	4	4	5	5	5	58	Critical
134	5	4	0	3	2	1	2	4	4	4	5	5	5	5	5	54	Unstable a Critical
135	5	5	0	4	1	2	3	3	2	4	3	5	4	4	4	49	Unstable
136	3	4	0	2	1	1	1	3	4	5	5	5	5	5	5	49	Unstable
137	3	4	2	3	1	1	1	4	4	3	4	5	5	4	5	49	Unstable
138	3	5	0	2	1	3	1	3	4	3	5	5	4	5	5	49	Unstable
139	4	5	2	2	3	2	4	4	4	4	4	4	5	5	4	56	Unstable to Critical
140	4	4	0	1	1	0	1	5	5	5	5	5	5	5	5	51	Critical
141	3	3	0	1	1	1	1	5	5	4	5	5	5	5	5	49	Unstable
142	5	5	0	2	1	2	2	4	4	5	5	5	5	5	5	55	Critical
143	4	5	0	1	1	0	1	5	5	5	5	5	5	5	5	52	Critical
144	4	4	2	2	1	1	2	4	5	5	5	5	5	5	5	55	Critical
145	5	5	0	2	1	1	1	4	5	5	5	5	5	5	5	54	Critical