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# Ecological land management in the oil municipalities of Region V North, Chiapas: limits and perspectives of participatory community workshops

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**Abstract**. The present article discusses the importance of community participation in workshops conducted in the oil municipalities of Region V North, Chiapas, as part of the process of drawing up an environmental agenda for the region. The main concerns of the population are analysed, including those relating to changes in land use caused by livestock production and their effects on the environment, as well as those related to the oil industry. The article also discusses the lack of action on the part of the various governmental agencies in resolving the social, economic and environmental problems associated with the municipalities; this lack of action can affect the implementation of an environmental proposal.

**Key words**: Environmental land use management, participatory planning, environmental agenda.

# El ordenamiento ecológico territorial en los municipios petroleros de la Región V Norte de Chiapas: límites y perspectivas de los talleres de participación comunitaria

**Resumen**. En este artículo se discute la importancia de los talleres de participación comunitaria, realizados en los municipios petroleros de la Región V Norte de Chiapas, como parte del proceso para obtener una agenda ambiental de dicha región. Se analizan las principales inquietudes de la población, en las que se incluye lo relacionado al cambio de uso del suelo ocasionado por la ganadería y sus impactos al ambiente, así como los relacionados con la actividad petrolera. Asimismo, se discute la falta de acción por parte de las diferentes instancias gubernamentales para resolver los problemas sociales, económicos y ambientales inherentes a los municipios y que, por ende, puede repercutir en la instrumentación de alguna propuesta ambiental.

**Palabras clave**: Ordenamiento ecológico del territorio, planeación participativa, agenda ambiental.

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## INTRODUCTION

The government of the State of Chiapas, through the Institute of Natural History and Ecology (IHNE), decided to promote a project designated 'Ecological territorial regulation of the oil-producing zone of Region V in northern Chiapas', which was assigned to the Institute of Geography (IG) of the National Autonomous University of Mexico (UNAM). This proposal stemmed from a need identified by the Inter-institutional Commission on the Environmental Problems of the oil zones of the state of Chiapas created under the auspices of the Governor in December 2003. The proposal of Ecological Territorial Regulation (OET) that was drawn up included among its objectives the formulation of a Territorial Agenda in which would be identified areas for priority attention from the environmental point of view; this would contribute elements identified by consensus for the definition of a Model of Ecological Territorial Regulation (MOET).

A basic element in achieving these objectives was the setting up of participatory workshops with the various stakeholders involved in the use, exploitation and management of the land in the study area, as will be explained in more detail below.

### Geographical characteristics of the study area

Region V North of the state of Chiapas comprises 23 municipalities with a total area of 6098.5 km$^2$, equivalent to 8% of the surface area of the state of Chiapas (IHNE, 2005). Within this economic region of the state are five oil-producing municipalities adjacent to the state of Tabasco that are included in the OET, namely Pichucalco, Ostuacán, Reforma, Juárez and Sunuapa (Figure 1). The total area of the land relevant to the OET is 2 456.88 km. The city of Pichucalco is the socio-economic capital of the area studied, with a population of 324 273, representing 8.27% of the population of Chiapas.

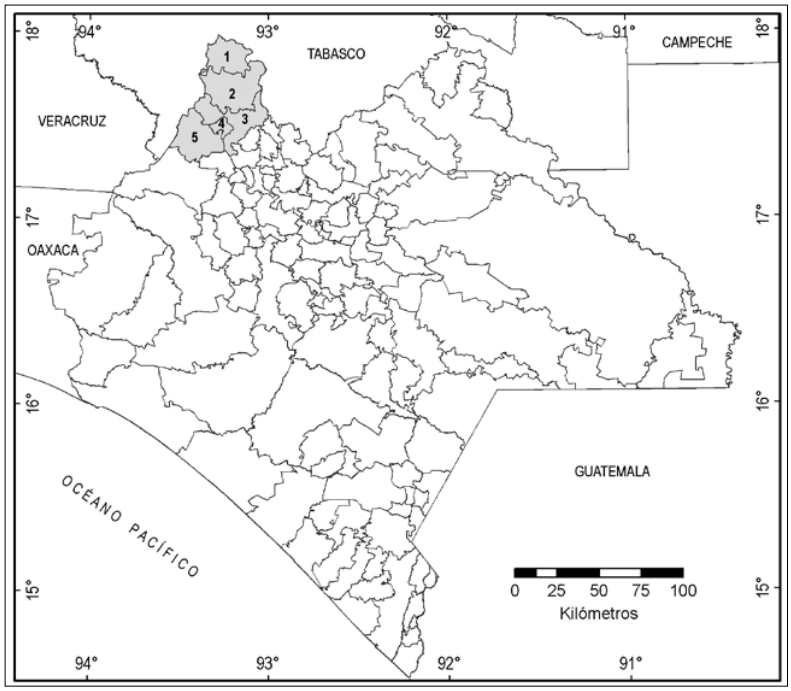


Figure 1. Study area in Region V North of the state of Chiapas. Municipalities involved:1. Reforma, 2. Juárez, 3. Pichucalco, 4. Sunuapa and 5. Ostuacán.

Source: Santana, 2009.

At the municipal level, the capitals of Reforma, Pichucalco, Juárez, Ostuacán and Sunuapa[1] together constitute the urban system of the region; the rest of the localities are rural and are classified as such according to their resources of public services in the areas of education, health, commerce, supplies and public administration. Of these, the municipal capitals of Reforma and Pichucalco, which are the most important urban centres, contrast with the infrastructure and services of the other localities of the region. This urbanization process has given rise to problems such as the pollution of water bodies and soil contamination through the discharge of municipal discharges or sewage and of municipal wastes, as well as by openly exposed rubbish dumps.

The principal economic activity has for decades been agriculture, and this has in the past 20 years begun to undergo considerable change as a result of the expansion of livestock production over crop land, and of the environmental damage produced by oil activities. As an alternative to the issues confronting the crop production sector, livestock production represents the best option for part of the population. However, the expansion of livestock production has incorporated considerable areas at the expense of forested areas and those dedicated to crops, and these areas are not always the most suitable in terms of their physico-geographic characteristics; this has implications in the deterioration and degradation of the natural resources. In cocoa production, yields have fallen during the past 20 years owing to the misuse of agrochemicals, to the ageing of the plantations (50–60 years), to the lack of organization and of competitive commercialization and entrepreneurial vision, and to the spread of *Monilia* disease[2].

The quality of surface and ground waters in the territory was at an 'acceptable' level in the 1980s, with their composition being within the permitted standards. However, the first 'warning lights' have already begun to attract attention, with indications of a fairly severe ecological deterioration through pollution of the water and sedimentation of hydrocarbons, provoked by the functioning and marked development of the oil industry, as demonstrated by results of studies undertaken in Laguna Limón[3] (Leal, 2009) and in the San Miguel lake system (CINVESTAV-IPN, 2002). In the study area at present there are 18 oilfields with plants for the separation and production of petrochemicals, with some 5–25 wells per oilfield for the extraction of crude oil and natural gas (PEMEX, 1998, 2005). The public have no access to information regarding the existence of treatment plants for residual waters in these fields, nor to the chemical analyses of ground waters in the areas occupied by this industry.

**Environmental planning in Mexico**

Environmental politics —in particular, territorial planning— appeared in the Mexican national development systems in the 1970s. At the beginning of that decade, actions directed at dealing in an comprehensive manner with the demands of the populace (civil associations and non-governmental organizations) began to take shape in relation to the deterioration of natural resources and the pollution of air, water and soils, in both urban and rural areas (INE, 2000). In particular, the first actions with respect to territorial planning focused on human settlements, such that in 1976 the General Law of Human Settlement (LGAH) was enacted, and the term 'territorial regulation' appeared for the first time, in a reference to an instrument of territorial regulation applied to the urbano-rural environment (INE, 2006). In 1982 the Law for Environmental Protection arose; this included for the first time the concept of 'ecological planning', related to environmental diagnosis and to the management and conservation of natural resources. The Federal Law for Environmental Protection and the Law of Planning (1983) formed the basis for the creation of the General Law of Ecological Equilibrium and Environmental Protection (LGEEPA) of 1988. This

1 The total population of the municipality of Sunuapa approaches 2800 inhabitants. According to INEGI, a population is considered to be rural when it has fewer than 2500.

2 A fungal disease, caused by *Moniliophthora roreri,* which affects the cocoa plantations.

3 Information obtained from 'Ecological planning in the oil-producing zone of Region V North in Chiapas', Stage II. Integrated diagnosis of the territorial system, economic subsystem.

law represents the central legal basis of national environmental politics, with general powers as regards planning and coordination in environmental matters (Rosete, 2006).

**Social participation in decision making**

LGEEPA establishes in article 157 the obligation of the federal government to promote the active participation of society in the planning, execution, evaluation and monitoring of environmental politics and of natural resources. Article 158 establishes that to comply with the obligation above, the Secretariat of the Environment, Natural Resources and Fisheries (SEMARNAT) is authorized to convene diverse sectors of society. Article 159 anticipated the integration of consultative organs that function in assessment, evaluation and pursuance as regards environmental politics, and which can issue opinions and observations that are considered pertinent.

In Mexico the link between planning bodies and those responsible for the implementation of programmes of regulation has frequently been weak or absent. Hence, these are normally devised as a requirement for justifying investments, receiving budgets, loans, etc., but not as a guide for achieving the fulfilment of these. This is one of the great risks that face the politics of territorial regulation, since, although the plans may be technically well formulated, they are not carried out and, also, they do not have administrative or legal means that sanction this non-fulfilment; in addition, they suffer from democratic processes of planning, and the participation of the society is limited to innocuous consultations, these being demagogic acts (Massiris 2003). For this reason, the OET is a challenge for Mexico and other countries of Latin America (Rodríguez *et al.*, 1996; Medina and Espinosa, 1998).

**Participatory planning**

In contrast to this type of planning, there are examples of successful community participation in planning; here, in the face of governmental policies that have deliberately opposed the paradigm of community forestal development, it is stakeholders who have had to fight against these, in order to impose their vision and their desire to conserve their territory and their living on its natural resources (Bray and Pérez, 2005). To cite some examples, the authors mention the practices accomplished in Oaxaca, Michoacán, Quintana Roo and Puebla, which have demonstrated that this approach is valid for defining internal politics of land use at community level, for segregating areas for production and protection in a consensual manner, and for reaching agreements in order to give viability to the decisions that are taken. The participatory planning of the use of the territory has evolved by a route of its own, focusing basically on developing the social instruments of environmental management that make most democratic and just the form in which decisions are taken with respect to land use (Corbett and Keller, 2006).

Therefore, the objective of a statute will not only be to make 'legitimate' a decree of the same, but also that, as noted by Azuela (2007), the stakeholders who take relevant decisions or who can influence others can formulate their expectations on the basis of those stipulated by OET, or where appropriate some other decree.

**The participatory workshops conducted in the study area**

The procedure that the Institute of Geography at UNAM developed for the formulation of a Model of Ecological and Territorial Regulation (MOET) at the municipal level comprised five consecutive stages: Stage I, Characterization; Stage II, Integrated diagnosis; Stage III, Prospective phase; Stage IV, MOET proposal; and Stage V, Implementation.

The proposed method was in accordance with the regulations established in the 'Términos de Referencia para la elaboración del Programa Municipal de Ordenamiento Ecológico y Territorial (PMOET)' [Terms of reference for elaboration of the municipal programme of ecological and territorial regulation], which was published by SEMARNAT-INE-SEDESOL in May 2005. In the present case it was decided to conduct the participatory workshops between Stages III and IV, since it was necessary to integrate the results of these in the MOET proposal. Eight workshops took place in the five municipalities involved, Reforma, Ostuacán, Sunuapa, Juárez

and Pichucalco, with the installation of 16 work groups (Table 1). The invitation to the workshops was issued by means of the municipal presidents, in conjunction with the Institute of Natural History and Ecology of Chiapas.

The workshops involved SMART (Simple multi-attribute rating technique; Goodwin and Wright, 2000). This technique consists in listing the problems that arise in the zone (the participants define them in work groups), and these are organized according to various criteria (social, environmental, economic and political context). Then the problems are classified according to the frequency with which they are mentioned and each is assigned a weighting according to its importance. The most important problem is given a weight of 100, and the least important a weight of 0. Subsequently, the weights obtained are summed and normalized, and a standardized weight is obtained, which oscillates between 0 and 1, with 1 being the value that indicates that the criterion is the most important, and with the value nearest to 0 indicating the criterion with the least importance. In this way, the problems are first arranged in a hierarchy and then placed in a scale of 0 to 100.

It must be emphasized that the analysis is performed on the basis of the perception of the populace regarding the inherent problems of the municipality in question, and of the productive necessities of the sectors involved. For each municipality the reports and the results of the work groups are reviewed, and the tables of results are drawn up. On the basis of the table of weighting of each work group, the most important problems are selected (social, environmental, economic), independently of the group that has proposed them, and for each municipality are obtained weights and frequencies that reflect its specific situation. The

Table 1. Workshops conducted during the public consultation

| | | | | No. participants | | |
|---|---|---|---|---|---|---|
| Municipality | Sector | Date | Group No. | Workshop | Municipality | Important themes |
| | Cocoa | | | | | Economic |
| | Social | | | | | Social |
| | Social | | | | | Economic |
| | | | | | | Social |
| | Livestock | | | | | Economic |
| | Crops & Livestock | | | | | Economic |
| | Crops & Livestock | | | | | Environmental |
| | | | | | | Environmental |
| | Social | | | | | Environmental |
| | | | | | | Economic |
| | Institutional | | | | | Environmental |
| | | | | | | Social |
| | Crops & Livestock | | | | | Environmental |
| | | | | | | Economic |
| | Crops & Livestock | | | | | Social |
| | | | | | | Environmental |
| | | | | | | |

Source: Rojas *et al.*, 2006.

present article describes the discussion of the most frequent results from the work groups, with the aim of demonstrating the local perception of the general problems of the study zone. It is considered that the analysis of frequencies helps to identify the problems that most preoccupy the inhabitants of the region, without distinguishing the productive sector, community, religion, socio-economic level or any other type.

**Social participatory workshops and the design of the Model of Territorial Occupation (MOET)**

The design stage of the MOET considers the environmental issues of the municipalities at the level of landscapes or unities of environmental management[4], as the point of departure for setting out preventive or corrective proposals during the prescription of the various scenarios of spatial reorganization but, above all, for the formulation and design of the desired viable scenario, as the point of departure for drawing up the proposal of the model of occupation of the territory. Of course, this environmental issue needs to remain based on the present model of use; the main conflicts of the multidirectional interactions between nature and society that have become clear during the discussions in the social participatory workshops, whether these were municipal or sectorial, are recalled as criteria for the execution of this final stage of the process. The perception of the communities concerning the state of the environment not only enriches by its objectivity the detection of the problems and situations of conflict, but also constitutes one of the main requisites of a study for the OET, where the satisfaction of the expectations of the population of the territory studied becomes one of the key objectives of the success of the proposal and application of the model of regulation.

The design of the Model of Territorial Development or Model of Occupation of the Territory that is proposed for the study zone took into account the Methodology Guide for the preparation of State Programmes for Territorial Regulation developed by the Institute of Geography of the Autonomous University of Mexico in 2002, as well as the methodological experiences of the Group of Geo-ecology and Landscape of the Faculty of Geography of the University of Havana (personal communication[5]), which has worked on various Projects for Ecological Regulation and Territorial Regulation in Mexico and other countries of Latin America. One of the analyses employed (in addition to the social participation workshops) for drawing up proposals for use of eco-geographic landscapes was the spatial interpretation of different social and economic indicators of Stages I and II of this project of territorial ecological regulation.

Table 2 presents a comparative overview of those problems identified on the basis of the deliberations during the social participation workshops that do not conflict with those obtained by means of analysis and diagnosis performed during Stages I and II of the MOET. The social, environmental and economic problems are not the same for every municipality, but they do offer a comprehensive overview of the local in the context of the regional generality.

## DISCUSSION

Although it is true that territorial regulation is a function whose impetus, planning and management is appropriate for public administration, it is pertinent to involve in this process the needs identified by the stakeholders themselves whose activities affect the territory; hence, it should be developed in a concerted and participatory manner (Vega 2008:3). However, as noted by Negrete and Bocco (2003:9), this process still requires much effort in order to achieve a participatory planning that integrates all sectors of a population and that considers the great cultural and eco-geographic diversity that characterizes our country. The process of translating these theoretical postulates into

[4] A UGA is the minimum territorial unit for which apply both environmental features and strategies –of territorial politics– combined with schemes for management of natural resources, i.e. criteria or fine features of management of these resources, oriented to the development that progresses to sustainability.

[5] Dr. José Manuel Bollo Manent, UNAM.

Table 2. Correlation between the results obtained in the social participation workshops with inputs for the design of the MOET

| Problem identified in the municipal workshops | Problem identified in the MOET | Solution set out in the MOET |
|---|---|---|
| Deforestation in the zone owing to change in land use; erosion; problems in water quality and contamination of water bodies. | For the identification of the environmental problems in the sectors of the eco-geographic landscape of the territory, the social or economic activities that generate these problems are identified; among the economic activities appear intensive cropping or plantations, such as cocoa production; extensive commercial crops or subsistence crops, drilling of wells and extraction of oil and natural gas, livestock production, forestry extraction; and among the activities of a social character, the process of urbanization was considered in each sector of the eco-geographic landscape. | • Control of the number of head of livestock according to the carrying capacity.<br>• Improvement of pastures.<br>• Arresting the encroachment by pasture. Halting the process of draining wetlands and clear felling of forests with secondary vegetation<br>• Organic improvement to augment soil fertility. Use of compost.<br>• Achieving a 10% forested area in land used for livestock production<br>• Flood control, limitation of cultivation in places susceptible to unseasonal flooding.<br>• Promotion and incentivisation of investigation into environmental subjects, of urbanism and of territorial regulation.<br>• Halting encroachment by agriculture through draining wetlands or clear felling of forests with secondary vegetation.<br>• Regulating the application of fertilizers and pesticides to established limits.<br>• Control of felling for wood.<br>• Reforestation with local timber species on banks of streams and gullies.<br>• Evaluation of lands for conservation. Proposal of the Santa Ana Nature Reserve and possible new areas in the south-west of the study region.<br>• Involvement of the local people in economic and conservation activities for the proposed Nature Reserve. |

Table 2. Continuation

| | | |
|---|---|---|
| Problems in cocoa production owing to moniliasis, to soil degradation and to intermediaries | Natural limiting factors:<br>• Diseases in the crop (*Monilia*).<br><br>Socioeconomic limitations:<br>• Problems of commercialization of the crop and of worthwhile market prices.<br>• Presence of intermediaries.<br>• Lack of infrastructure for primary industrial processing. | • Selective felling of species for wood and timber.<br>• Reforestation with tree species for shade.<br>• Replacement of the plantations by livestock production.<br>• Gradual replacement of agriculture by cocoa and fruit plantations.<br>• Development of technologies and training of personnel for disease eradication in cocoa plantations.<br>• Intensive fight against diseases in cocoa production.<br>• Market opportunities for producers and fewer intermediaries in all economic activities.<br>• Improvement of the business culture. |
| Problems associated with lines of communication and the urban infrastructure; lack of management and disposal of solid waste, problems with the quality of drinking water and the contamination of water bodies. | • Domestic waste thrown directly into surface waters, causing chemical and biological pollution.<br>• Open rubbish tips.<br>• Uncontrolled illegal rubbish tips.<br>• Accumulation of rubbish through lack of a system of urban collection, also causing chemical and biological contamination of surface waters and ground waters. | • Facilities for the construction and improvement of services in housing, in particular those of the lower-income families.<br>• Channelling and treatment of urban waste waters.<br>• Monitoring surface and ground waters for nutrient content (nitrates, nitrites, ammonia, phosphates, sulfates, pesticides, etc.).<br>• Treatment and recycling of surface and ground waters for industry, with possible effects of urban liquid wastes.<br>• Monitoring surface and ground waters possibly affected by solid wastes.<br>• Control of collection and disposal of solid waste and creation of tips that comply with established technical standards.<br>• Prevent the burning of solid waste and control fly tipping. |

Table 2. Continuation

| | | |
|---|---|---|
| Relation of the oil industry with its environmental and social effects | Action:<br>• Exploitation of hydrocarbons by means of drilled wells.<br>• Installations for recycling the extracted fuel.<br>• Processing of hydrocarbons.<br><br>Environmental problems:<br>• Contamination of the soil and of surface and ground waters by hydrocarbons. (Intensity: Medium.)<br>• Escape of toxic gases into the atmosphere. (Intensity: Medium.)<br>• Spillage of hydrocarbons into the environment. (Intensity: Medium.) | • Monitor the quality of surface and ground waters and the soils in relation to possible spillage of hydrocarbons, in particular in the pumping stations and in the pipelines.<br>• Monitor the quality of air in relation to the emission of gases, in wells, pipelines or other installations.<br>• Constant control of compliance with the technical standards established for each installation of the oil industry in the territory.<br>• Control of the process of extraction of dangerous wastes during drilling operations.<br>• Avoid any type of activity on the surface of land under which there are pipes. |
| Problems of insufficient medical services and rights of access to these; unemployment as a limiting factor in the development of the region; lack of education and environmental awareness. | • Medium rate of general morbidity.<br>• Medium rate of access to medical services.<br>• Insufficient provision of household services, from low to medium.<br>• Medium level of overcrowding. | • Increase general public awareness of the environment and of sustainable forms of land use, by means of the media and the education and health systems.<br>• Raise the level of education of the population, decrease illiteracy and encourage pupils to remain at school for longer.<br>• Improve the health services and access to primary care, in particular for pregnant women and the elderly.<br>• Facilities for the construction and improvement of services in the dwellings, in particular for low-income families |

Table 2. Continuation

| | | |
|---|---|---|
| Problems related to the lack of finances for production of livestock and crops; technical consultancy for productive projects; technical training. | Insufficient financial support of social and agricultural projects.<br>Low market prices for livestock products.<br>Low productivity of milk and meat, reflecting the low level of mechanization and investment in most livestock businesses.<br>Low level of investment in the zone.<br>Medium to high levels of marginalization of localities.<br>Problems of prices, intermediaries and markets, lack of business culture and of organization.<br>Low to medium productivity, with a predominance of maize and bananas.<br>Present agricultural development in conditions of low competition.<br>Little diversification of the tertiary sector. | • Search for the greatest efficiency in the application of programmes of support for livestock production, agriculture and aquaculture.<br>• Market facilities for producers with a decrease in intermediaries in all economic activities. Improvement of the business culture.<br>• Development of aquaculture in the long term.<br>• Development of technical support systems for crop and livestock production.<br>• Diversification of the tertiary sector in particular in relation to environmental services.<br>• Stimulation of investment in the territory.<br>• Development of the secondary sector in the industry linked to crop and livestock production. |
| Participation of the organs of government and involvement in comprehensive projects. | | • Improve the planning and coordination existing between the diverse stakeholders and economic sectors that take part in the regulation of the territory and promote the active participation of the society in the actions in this area.<br>• Establish coordinated actions and shared responsibility between the various levels of government for the protection, conservation and rehabilitation of the natural capital and natural resources.<br>• Promote the generation of inter-institutional actions and of the civil society for the preservation of the flora and fauna of the State, both on land and in water. |
| Source: personal derivation from the data from Stages III and IV of the MOET for the oil-producing zone of Region V North (ZPRVN). | | |

spatial reality for each society is not simple, since the process of environmental planning is faced with specific environmental conditions and with diverse political, economic and social interests.

On the basis of our own experience, it is complicated to knit together the points of view of different economic sectors involved in the management of a territory to generate proposals for their use and conservation.

In analysing the results of the workshops, it is pertinent to stress the worrying aspect of requesting more economic support for livestock production, when the practice of this is in itself the cause of many of the impacts with which the region is confronted. Livestock farmers who own large ranches and who operate mainly in the municipalities in the north of the state contaminate the rivers and the wells by their use of agrochemicals and also by the wastes (dung) of the animals themselves. Paradoxically, the greatest economic benefits of livestock production are distributed mainly in the large ranches of the municipalities of Juárez and Reforma, and do not remain in Chiapas but in Tabasco, the State of origin of the ranchers of the region.

This disparity in economic aid contrasts also with the component granted for a small number of head of animals in the municipalities of Ostuacán and Pichucalco, and in Sunuapa, which is also a reflection of the differences in the type of livestock production that is practised in these, i.e. more capitalized and intensive in the municipalities in the north, mainly in Juárez, and more extensive or pastoral in the municipalities in the south of the region.

Also, the natural grasslands have gradually been replaced, above all in the municipalities of the north of the region, by pastures cultivated with species of higher quality, classified as good rangeland, which makes them preferable for the development of livestock. The elimination of the natural plant cover for the seeding of pastures has had major ecological consequences for the region: in the first place, it decreases the collection of water that feeds the aquifers, and with this, the availability of underground water resources; in addition, the gradual reduction in atmospheric humidity changes the regional atmospheric characteristics, and this also produces changes in the dynamics and in the available volume of surface water (running water and standing water bodies). This occurs above all in the municipalities of Juárez and Reforma, where there are already considerable problems of collection of water. Particularly in the municipality of Reforma, the problem of contamination of the lakes is exacerbated by contamination by agrochemicals and by waste waters from the populace. These above-mentioned processes of environmental change, as a result of the many diverse human activities that occur, can threaten the survival of the various species (Dirzo and Raven, 2003).

There is a relationship between public policies and soil degradation, since in politics there is no analysis of the effect that these policies have on the stability of the environment and, hence, on the loss of animal and plant species. Many of the established programmes, such as the spread of livestock production, the practice of monoculture with high consumption of agrochemicals and the intense deforestation, accentuate the problem of soil degradation. As noted by Tarrio *et al*. (1985), an advantage that permits livestock production to be competitive is the practice of extensive production, since it lowers the costs of production and allows profits that correspond more to a rent for the soil than to an investment. Nevertheless, it represents a considerable social cost, since with the incorporation of a very small workforce (one cowhand can look after more than 30 head of cattle), it can achieve an increased productivity per man employed as unskilled cheap labour in these large operations. One of the conclusions of the participatory workshops alluded to this problem in mentioning, as has already been noted above, that many of the owners of extensive lands do not live in Chiapas but in Tabasco; taking advantage of the lack of employment within the region or of the low productivity of the land, they employ the local populace who find themselves obliged to work as cattle hands with low salaries. Some work groups referred to this practice as 'slave labour'.

Tarrio and co-workers noted that the displacement of staple crops by pastures, the replacement of staple crops by forage and oilseed plants, and the

confinement of crop production by livestock production are processes that mutually reinforce each other and contribute in an important manner to the agro-food crisis and to defining the underdevelopment of rural Mexico. On its part, crop production requires the use of herbicides and fertilizers, which has markedly transformed the landscape. In conjunction with livestock production it has eliminated almost all natural forests, so that the biological system has partially lost the capacity to achieve its geo-ecological functions and has lowered productivity. According to Ortiz *et al.* (1994), this process has been defined as 'the lowering or destruction of the biological potential of natural resources caused by the poor use and management of these, which has as a consequence degenerative processes of the physical, economic and social environment of the populations involved within its confines'; according to testimonies of the local inhabitants, monilia disease has clearly intensified because the land does not have 'the ability to fight it'. The area of labour has been reduced relatively, above all by the expansion of the surface area occupied by pastures and the consequent spread of the area of livestock production at the cost of land for both crop production and forestry.

The abandonment of crop production in the Mexican countryside can be explained by the fact that the productive potential of the peasants has historically been underestimated within the agrarian politics of Mexico (Appendini, 1995), owing to the predominating official vision which considers the peasants as inefficient producers and not apt for modernization (Morett, 2003). The changes realized in the political and institutional context include the adoption of free trade, a reduction in subsidies, elimination of price control and reform of the legal framework that regulates the ownership of the land in the farming cooperatives (Fritscher, 2004). The combined effect of the reforms together with the recurrent economic crises has put at risk the productive viability of the peasantry as a whole (Bartra, 1995).

The policies of subsidization and of productive modernization implemented since the second half of the 20th century sidelined crop production by peasants in favour of the private sector (Paz, 1995), nurturing thereby an unbalanced development of Mexican agriculture that leads to a progressive deterioration in the productive conditions of the peasants (Mackinlay 1996).

For example, for cocoa production there are three basic problems that work against family incomes and the standard of living of the producers, these being the current low price of cocoa, the presence of intermediaries in its commercialization, and the lack of a business culture, in addition to deficient organization of production and to the problem of *Monilia* disease; this has led to a change in the use of the soil to favour the elimination of the plantations in order to introduce livestock. A situation that prejudices this sector economically is the absence of an infrastructure encouraging processing, and this favours commercialization of the product in its raw state, without added value.

With respect to oil production, it is remarkable how this has had repercussions within the region, not only through environmental impacts inherent in the drilling and extraction of oil but also through its influence on the dynamics of economic and social activities.

In the environmental sphere, there is an obvious vulnerability to contamination of soils, and in consequence of ground water, by the products derived from the oil industry (by the infiltration of meteoric water, via the soil or by direct injection of the treated water) in the zones near the PEMEX batteries. Particularly noticeable is the general perception of the contamination of the air, which manifests itself in the form of acid rain, and in various lacustrine bodies[6] that can not support any activity for man (provision of drinking water) or beast (watering holes).

In the economic and social sphere, the municipalities have undergone a change in dynamic stemming from the arrival of PEMEX; there has been a markedly unbalanced development with a concentration of the oil industry in the urban centres.

On the basis of the growth pole theory of Perroux (1988), it can be seen principally in the

[6] The highest contamination index is observed in the lakes El Limón, El Santuario and La Estancia Vieja and in the marshy soils of the Santa Teresa region of the first and third sections.

Reforma municipality how the economic activities organize themselves in the geographic space. Perroux argued that, like a force field, 'economic space consists of centres (or poles or foci) from which centrifugal forces emanate and to which centripetal forces are attracted, but with a development it is thrown off balance' (*Ibid.*:11). The focus of growth is defined principally by an industrial complex and dominated by a driving or propelling industry that ends up being the engine of development through its capacity for innovation and stimulation, and for dominating other industries. In the words of Perroux: 'Growth does not occur everywhere at the same time; it appears in nodes or poles of growth of various intensities, it spreads by various ways and with differing effects on the economy as a whole' (Parr, 1999:17).

The municipality of Reforma is characterized by having grown as a consequence of the migrations to the region during the 1970s and 1980s, owing to the existence of the sources of employment generated by the presence of PEMEX. However, since the state-owned company relies on its own permanent workforce, it only offers the local people temporary, low-grade work since it maintains that they do not have adequate qualifications for their employment in the oil industry. The nucleus of development of the zone is centred on Reforma, which is the most dynamic, and which in conjunction with Juárez and Pichucalco, which are in this same area, forms a north–south corridor and represents a development potential for the zone. Ostuacán forms a weak nucleus in the territories in the south of these municipalities and has relations with the more disperse localities. With regard to the density of the population and the level of development, the better equipped territories possess a greater population density, while the municipalities with very low densities are those that have a lower index of social integration.

According to Sánchez and Casado (2006:24), the Reforma municipality is classified as having very high economic development (the highest in the State), a level only achieved elsewhere in Chiapas by the municipalities of Tuxtla Gutiérrez and Tapachula, in that order; within the study zone, Pichucalco and Juárez occupy an intermediate position in terms of incomes, and Ostuacán and Sunuapa, the most rural municipalities of the zone and with a greater proportion of work in the family plot, have the lowest incomes and the highest proportion of their economically active population who are occupied without receiving income.

There is a cultural clash between the local populace and those who come in from the neighbouring states and from the other oil-producing regions of the country (the skilled workforce of the oil industry). The arrival of this population, as well as bringing about an increment in the cost of living in the oil-producing zones of Chiapas and Tabasco on account of the higher wages of the PEMEX workers in relation to the average for the region, has also favoured the proliferation of establishments such as bars, restaurants, cafes, etc., which generate an economic turnover at the local level, to the detriment of other types of services more necessary for the populace (schools of various levels and types, diverse health services, cultural and recreational services for families, etc.).

In the case of the oil-producing zone of Region V North of Chiapas, the social appropriation of OET (Territorial Ecological Regulation) as a political instrument has a long way to go, since there has still not been an initiative on the part of the municipalities involved (Reforma, Sunuapa, Pichucalco, Juarez and Ostuacán) to take up any of the alternatives proposed by the government for 'putting the land in order'. In addition, each of these municipalities has very specific 'priorities' that need to be discussed at the local and then the regional level. This is a considerable barrier encountered by the territory analysed here, since, as mentioned above, its complexity is manifested not only in the diverse uses and priorities of land use, but also in the social and economic disparity existing between one municipality and another, as well as in the participation of the various stakeholders involved in the process of implementing any MOET proposal.

As noted by Azuela (2007), of the instruments of environmental politics that the Mexican legislation plans, it is difficult to think of any other whose institutionalization requires social changes as profound as those for OET.

For the World Bank, participation requires that the interested stakeholders take control over those decisions that are going to affect them (World Bank, 1996); it is also a process of empowerment of the communities that shows transparency in the decision proposal (Xiaojun *et al.*, 2008). However, in practice, nearly all the decisions are inflexible and rapidly reached by high levels of government, without sufficient consideration of the heterogeneity of the rural environment or the effective participation of the local population.

Talking of participation is not exactly an ideological term in the sense that it deals with politics of public relations or of mechanisms for legitimizing a proposal without its necessarily being followed through (Briceño, 1998). In this case, after more than three years of presenting the MOET before the IHNE and the government of the state of Chiapas, it has not yet been implemented. This is probably because of the great economic and social complexity of the zone and the interests of the strongest economic sectors which bring their influence to bear in a decisive way by opposing the measures proposed by the MOET.

## CONCLUSIONS

In general, in the region there is a separation between the distinct levels of government in a vertical sense and among the various entities of each of their dependencies in a horizontal sense. In addition, there is a lack of coordination between the plans and the sources of finance needed to bring about the proposed actions; these are not focused on zones or problems worthy of priority attention, or else the authorities of the various levels of government do not add efforts that allow a synergy in the economic and human resources destined to support and back up the work of the institutions.

The oil industry has left a negative imprint on the territory, whether it be as impacts on the natural resources or on the health of the inhabitants: the dynamics of oil production (phases of extraction of hydrocarbons and processing of natural gas) has not strengthened the traditional regional economy; it has not uniformly consolidated the infrastructure and urban services, nor the diversification and amelioration of the quality of the social and economic services; nor has it resulted in substantial improvement in the levels of wellbeing of the populace.

The solution to these shortcomings is simply the embodiment of the culture of planning and execution of comprehensive projects of territorial regulation drawn up and applied with the participation of all sectors of the society.

The subject of social participation has been dealt with in the scientific literature in a wide variety of disciplines, and the taking of decisions as an outcome of public consultations can be defined as the essential manifestation of the exercise of political power; hence the necessity of including these procedures in the democratic system. The participation of the citizens in the decision-making acquires, for this zone, a special importance in the municipal environment because it is at this level that the process of social reproduction takes place and where decisions are taken that have the greatest effect on the daily life of the citizens.

The participatory workshops that were conducted certainly achieved the objective of designing an Environmental Agenda that will serve as a basis for developing the corresponding MOET proposal. However, there is still a long way to go before the MOET proposal is truly viable, by virtue of the fact that this tool of environmental politics considers social participation as an indispensable element in implementing and making transparent the process of territorial planning.

The SMART technique can be a useful tool for communicating and directing the participation of the people involved in a proposal for development; the organization and the participants are indispensable, since in order for the process to be valid it is essential that the various stakeholders who live in a territory are represented.

The formulation of the theoretical–conceptual platform and of the course via different disciplinary and interdisciplinary methodological proposals developed during the process of characterization (Stage I), of integrated diagnosis (Stage II) and the municipal and sectorial participatory workshops (Stage III), as well as their results, allows the establishment of a scientific base oriented to the de-

velopment of Stage IV; finally, this leads to the formulation of the model of territorial ecological regulation (MOET), the desired scenario that will be viable for a sustainable socio-productive reorganization of the territory of the oil-producing zone of Region V North of the state of Chiapas.

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