ALTERNATIVE FUTURES FOR THE REGION OF LORETO, BAJA CALIFORNIA SUR, MEXICO

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Introduction

This study investigates how economic performance, demographic changes, private and public investments, and public policy choices could influence urban growth and land use change in the region of Loreto of Baja California, Mexico, over the next 20 years. The study assesses how these changes will impact the area's hydrology and ecology, as well as its visual, social, and economic landscape.

A range of scenarios for the region of Loreto is developed in this study. The scenarios are studied using digital models that evaluate the locational attractiveness for the major land use types of the area, and project a range of Alternative Futures through the year 2025. Computer-based models, built on expert knowledge, local interviews, and comparable locations in Mexico, assess the economic, ecological, hydrological, and visual impacts of the Alternative Futures. These models are used to analyze the consequences of the range of policy choices embedded in the scenarios.

Interviews and discussions with relevant individuals and groups informed the study, both to help determine the types and extent of the conservation and development strategies to be studied, and to help define the economic, social, hydrological, visual, and ecological assessment models. The study relies on existing data, scientific research, and professional expertise. One of the results of this effort has been the compilation of a comprehensive digital information database for the Loreto region.

Decision-makers in Loreto will face a number of major challenges over the next years: providing adequate drinking water, ensuring public access to beaches and marine areas, safeguarding the visual quality of the city and surrounding areas, reducing poverty while managing in-migration, maintaining the economic health of the historic core of the city, preserving traditional societal values, enhancing tourism, attracting new ideas and innovation, protecting and improving quality of life for all citizens, managing development for the benefit of both current and future residents, and protecting fragile marine and terrestrial ecosystems.

This study is elaborated at a time when city leaders are considering action on a proposed regional development plan that outlines a legal zoning plan that delineates where future development is permitted. The principal objective of the study is to aid city and regional leaders in evaluating the plan and possible modifications. The hope is that this study will also be useful in formulating planning policy for the future of the region. The introduction of effective regulatory controls is essential if the region is to maintain the economic, hydrological, ecological, societal, and visual base upon which future growth will depend.

Short-term objectives have often taken precedence over longer term planning. Government administrators and policy makers are forced to make land use decisions without proper consideration of the full range of impacts and without adequate consideration of longer-term consequences. This study seeks to contribute to policy formulation and land use planning processes in Loreto and to further economically and environmentally sustainable development.

Figure 1. The Loreto Region

Figure 2. The Proposed Sub-Regional Development Plan

The Loreto Region

Loreto is located on the Sea of Cortez in the southern half of Baja California. The territory of the municipality of Loreto is 4,311 km2 with approximately 270 kilometers of coastline, including the offshore islands. The region of Loreto houses approximately 15,000 people, of which over 80% live in the town of Loreto. The rest of the population lives in 130 small ranching settlements and another 21 fishing and cattle breeding communities (Ivanova and Cota, 2005).

Figure 3. Location of the Study Area in Mexico

Loreto is the oldest colonial settlement in the Californias, built around a mission that was founded in the year 1697. Loreto was the capital and administrative center of Baja California until the capital was moved to La Paz following a devastating hurricane in 1829. Historically, the economy of Loreto has been based on fishing and ranching. The society and economy of the Loreto region underwent fundamental changes in the second half of the 20th century.   The rural-based society transformed into an urban society, while the economy based on primary sectors transformed into a predominantly service-based economy.   The environment has also begun to show signs of degradation due to inappropriate use of natural resources and the lack of adequate conservation efforts (Fuentes, 2003). The region now depends heavily on tourism, focused mainly on sportfishing. Foreign visitors currently number more than 60,000 per year. Most of these visitors are from the western areas of North American and typically come for a few days of fishing.

Loreto is known for its outstanding natural beauty. Dramatic mountains descend steeply to a narrow coastal strip along the Sea of Cortez on the eastern shore of Baja California. The views over the water are notable, accentuated by a number of offshore islands. However, the beaches in the Loreto area are not considered first rate. Moreover, stingrays inhabit the dark sandy bottoms in many of the near-shore areas, further reducing the appeal for the 'sun and sand' tourism market. The region of Loreto is recognized for its emerging potential for nature-based tourism. Kayaking, trips to the islands of the Marine Park, and hiking are popular activities for tourists in the Loreto region. A golf course and tennis facilities in the Nopoló area offer more traditional recreational opportunities. Loreto is known as a three-season destination: the intense heat and humidity of the summer months make Loreto an uncomfortable place to be in the summer.

In the late 1960s, Loreto was identified as one of a select number of areas with the potential to be a major tourism destination by the Fondo Nacional de Fomento al Turismo (FONATUR), the Mexican federal agency charged with tourism development and investment promotion.

Subsequent public investments in infrastructure included the construction of an airport, new roads, water supply, sewage treatment, and a hotel. These investments were carried out at approximately the same time as those in Los Cabos. Whereas tourism took off in Los Cabos, the expected growth of tourism in Loreto did not materialize, except for a failed marina and development at Puerto Escondido.   The rising interest recently among North Americans in real estate in Baja California, and the renewed efforts by government tourism promoters, has revived the hopes for economic growth spurred by foreign visitors and investments.

Development plans for Loreto have also played a central role in the Escalera Nautica project, a regional project being promoted by FONATUR. The Escalera Nautica is designed to increase tourism in Baja California with a series of marines to attract recreational boaters to the Sea of Cortez, mainly from the west coast region of the United States. The Escalera Nautica project has not proceeded as planned and has been subject to criticism that the demand estimates were overly optimistic and that the environmental impacts had not been adequately addressed.

If the economy of Loreto is to experience strong growth in the coming years, this growth will be based on tourism and real estate development. There are no other apparent sources of robust growth. However, tourism in Loreto did not grow as expected over the past two decades despite the public investments in infrastructure.   This suggests that skepticism regarding the potential for strong growth based on traditional tourism markets would be well founded. The development trend has shifted from conventional tourism to the sale of second homes to North Americans. This market does show remarkable potential for growth as exemplified by the surge in real estate transactions in Baja California in recent years. Loreto is now being marketed not only as an ecotourism destination but also as an excellent location for investing in a second home.

In the Nopoló area, the Loreto Bay Company, based in Phoenix, Arizona, is constructing a residential community. This planned community is being sold as a sustainable community based on the principles of New Urbanism. This project plans to build and sell thousands of homes, and promises to dramatically change the economic and social landscape of the Loreto region.

Real estate sales are quietly transforming the structure of landholding throughout the region. Communal property owners have been selling *ejido* land along the coast, most commonly in rectangular plots with 20 meters along the oceanfront. Relatively few of the plots sold have been developed, as water, electricity and roads service very few of these areas. These purchases are perhaps best explained as an attempt 'to get in early' and purchase oceanfront property while it is still affordable.

Loreto is not an affluent area. Per capita income and human development measures place it below average for Baja California Sur, though above average for the country. Nevertheless, surveys suggest that residents are generally content with the quality of life in Loreto. Access to public services, and in particular healthcare, is substandard. The incidence of social problems is on the rise, which adds to the development debate taking place in Loreto. Some attribute this to the recent surge in construction and associated influx of outside workers. Others point to the slow economic growth of the past several decades.

The Study Area

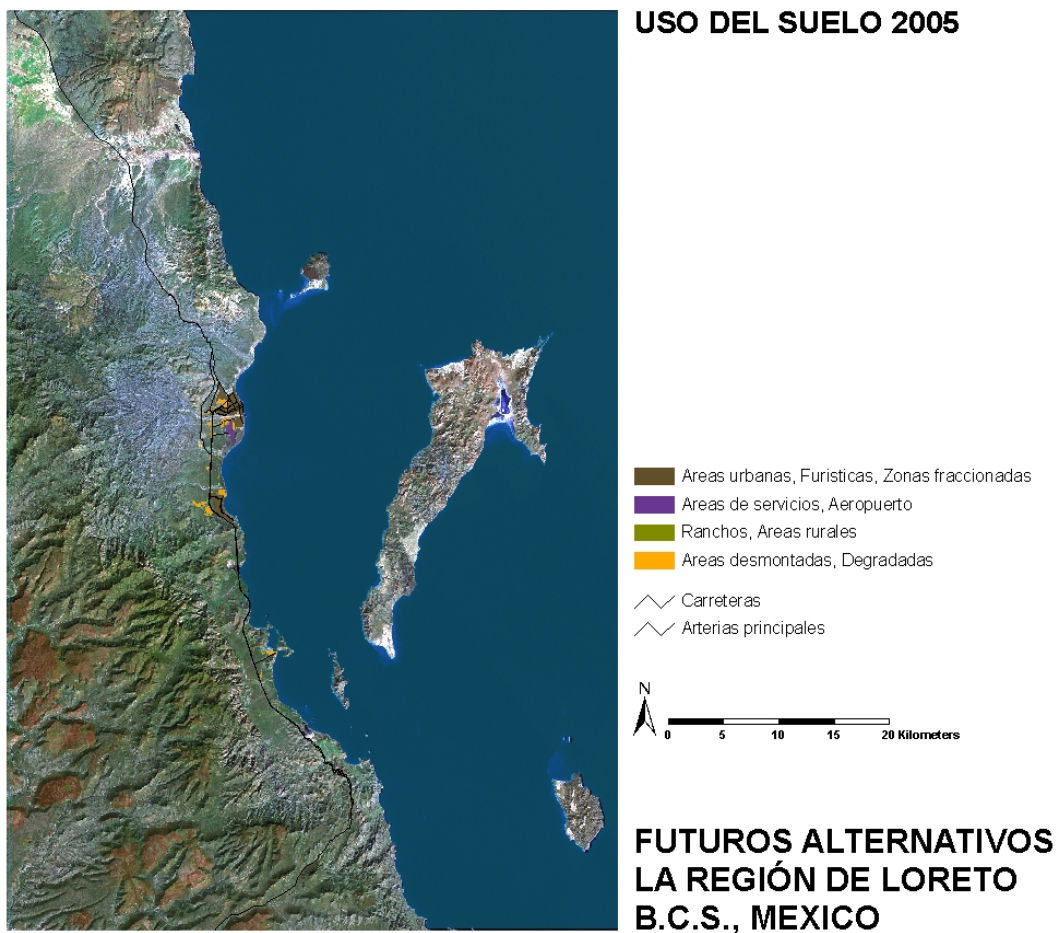The study area covers an area of approximately 4,525 square kilometers within the municipality of Loreto. Of this, 2,625 square kilometers is covered by ocean and islands. The terrestrial areas make an area of approximately 1,900 square kilometers. The landscape is oriented north to south following the coastline. The study area spans a distance of 85 kilometers north to south, as the crow flies.

The coastal strip that might be developed is quite narrow in most areas and is traversed by many small arroyos that carry significant amounts of water during storms. This leaves relatively little land that might be appropriate for development. The town of Loreto lies in the northern half of the study area with the source of drinking, the San Juan Bautista Londó aquifer, 30 kilometers to the northwest. In addition to the area surrounding the town of Loreto, the region is usually divided into four other areas south of Loreto: Nopoló, Notrí, Puerto Escondido, and Ensenada Blanca-Ligüi.

FONATUR owns approximately 30 square kilometers of land in the Loreto region designated for tourism development. Most of this landholding is within two parcels, one in Nopoló and the other in the Puerto Escondido-Ligüi area. The Nopoló area is the site of two major hotels, a golf course, a tennis center, and the Loreto Bay Company development. The FONATUR land in the Puerto Escondido area covers an area of more than 35 square kilometers.

A marine protected area covers most of the ocean included in the study area. The Loreto National Marine Park covers an area of approximately 2,065 square kilometers.

Figure 4. Map of the Loreto region study area

USO DEL SUELO 2005

Areas urbanas, Furisticas, Zonas fraccionadas
Areas de servicios, Aeropuerto
Ranchos, Areas rurales
Areas desmontadas, Degradadas

Carreteras
Arterias principales

N
0   5   10   15   20 Kilometers

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The Study Approach

The analytical framework of this project has been developed by the authors and used in numerous prior studies. This approach is designed to utilize the widest possible range of information, both quantitative and qualitative, and to organize this information to form a structured basis for analysis. It attempts to represent a broad spectrum of opinion and values regarding the future of Loreto.

Figure 5. The Study Approach
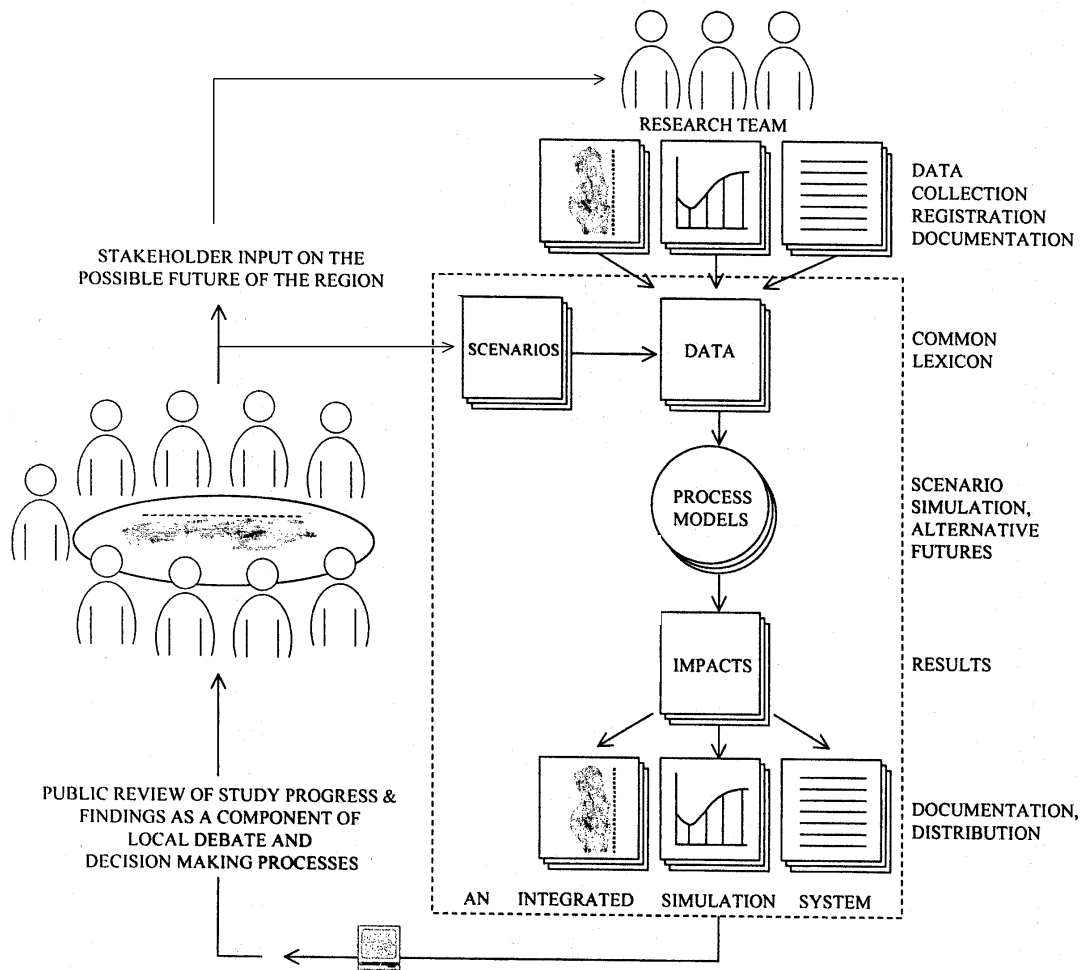
Maintaining neutrality is a critical guiding principle for the research team in carrying out studies such as these. Every effort is made to use diverse local values to guide the development of the study in an unbiased manner.

Rather than producing a single recommendation, this approach produces a set of well-developed Alternative Futures that can help local stakeholders to assess the strengths and weaknesses of each of the policy choices inherent in the scenarios. An advantage of this approach is that it models the consequences of a range of choices that decision-makers face today, rather than creating a single vision for the future of Loreto.

Figure 6. Alternative Futures
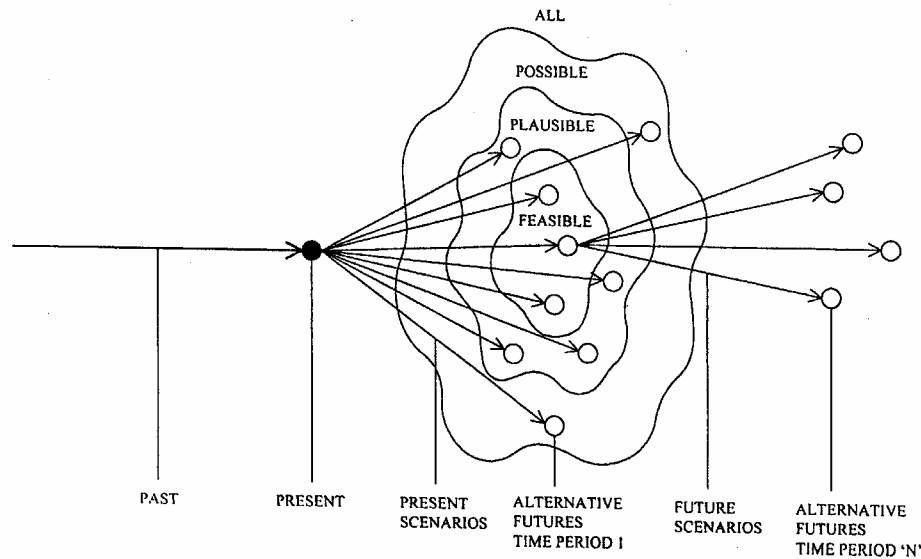
DESIGN AN ALTERNATIVE FUTURE
AND THEN ASK :
VIA WHAT SCENARIO
MIGHT IT BE ACHIEVED?
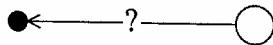
DESIGN AN ALTERNATIVE SCENARIO
AND THEN ASK :
IN WHAT FUTURE
MIGHT IT RESULT?

The Conceptual Framework

The study of the Loreto region is organized according to the framework for Alternative Futures studies developed by Carl Steinitz (1995). The framework consists of six questions (Figure 7). In designing a study of Alternative Futures for an area, the answers – the models and their applications – result from the unique conditions of the study area.

I. How should the state of the landscape be described in content, space, and time?

This question is answered by representation models that describe the study area. The boundary of the study area is defined to allow modeling interactions among hydrological, economic, and ecological processes, and to include the areas most directly affected by policy decisions. A computer-based Geographic Information System (GIS) is used to organize the data spatially, and to model and represent the complex processes at work. The baseline land use and economic conditions are defined for the year 2005. This establishes the reference period against which the impacts of future change are measured.

Figure 7. The Organizational Framework

RECOGNIZE CONTEXT   PERFORM STUDY

TIME-

1. HOW SHOULD THE LANDSCAPE BE DESCRIBED?   REPRESENTATION MODELS

2. HOW DOES THE LANDSCAPE OPERATE?   PROCESS MODELS

DATA

3. IS THE CURRENT LANDSCAPE WORKING WELL?   EVALUATION MODELS

INFORMATION

4. HOW MIGHT THE LANDSCAPE BE ALTERED?   CHANGE MODELS

CULTURAL KNOWLEDGE

5. WHAT PREDICTABLE DIFFERENCES MIGHT THE CHANGES CAUSE?   IMPACT MODELS

6. HOW SHOULD THE LANDSCAPE BE CHANGED?   DECISION MODELS   NO YES   IMPLEMENTATION

TIME+

SPECIFY METHOD   CHANGE SCALE

II. How does the landscape operate? What are the functional and structural relationships among its elements?

This question is answered by process models that provide information for the assessments that form the core of the study. Process models are developed for economics, new land use development, hydrology, terrestrial ecology, marine ecology, visual quality, and recreation. Process models are used to describe and evaluate how the current landscape works, and to assess the potential impacts of each of the scenarios relative to baseline conditions in the year 2005. Just as issues facing the region are interrelated, the computer models are interlinked.

Figure 8. Analytical Models

The economic and demographic models are based on a range of development alternatives and the relationship between the number of rooms in the tourism and high-end housing markets and the rate at which new migrants are drawn to the area in search of economic opportunities. The demographic projections associated with each of the scenarios produce estimates of the demand for new housing and for commercial, industrial, and tourism-related development.

The development model evaluates the attractiveness of the available land for different types of new land use demands. This model directs the computer allocation of new housing and business development to preferred locations in the study area.

The hydrological model assesses both ground and surface water. The groundwater model estimates the estimated annual recharge of groundwater. This serves as a rough measure of the sustainable levels of groundwater extraction that will be available. The groundwater model also predicts the impact of higher pumping rates on the aquifer by estimating the year in which saline intrusion will render the aquifer unusable without employing desalinization. The level of future water demand is linked to the economic and demographic projections. The surface water model identifies areas at risk of flooding in the event of a 50-year storm.

The visual model uses the results of a photographic survey to define the scenic preferences and visual quality of the landscape as evaluated by local residents and tourists. The model applies these preferences to describe the existing scenic quality throughout the study area and forms the

basis for measuring changes in visual quality associated with each of the Alternative Futures. Finally, a land value model assesses the impact of the different policy sets on property values.

The terrestrial ecology model assesses the relative value of the region's vegetation and habitat types. The marine ecological model assesses the potential impact of land use and demographic changes on the adjoining marine areas. An additional model looks at fishing catch and its influence on the risk of overexploitation in the fisheries.

III. Is the current landscape working well?

This question is answered by evaluation models, which evaluate existing conditions in the study area in terms of the parameters inherent in each of process models listed above. The output of each of the evaluation models is a map or chart of the baseline conditions in 2005.

IV. How might the landscape be altered, by what policies and actions, where and when?

This question is answered by the change scenarios that are projected in the research. The scenarios were developed based upon wide ranging discussions with stakeholders and experts, and are intended to represent the broadest spectrum of foreseeable futures.

The Scenarios

Each scenario is defined by a unique combination of economic growth and policy variables. Economic and population growth forecasts are linked to the number of new rooms in planned developments, including tourism resorts. The policy context determines the amount and location of land to be available for development in each of the scenarios. In addition, assumptions regarding the placement of new roads and upgrade of existing roads vary by scenario.

Population Growth Alternatives

The demand for new land uses is reflected in five possible alternatives defined by the number of rooms in tourism-related developments. The number of new rooms accounts for both hotel rooms and rooms in the high-end residential market, including villas, condominiums, and other similar housing development projects. This is appropriate given that much of the growth in Loreto will be the result of housing developments.

The linkage between the expansion of the real estate, tourism markets, and population growth is estimated using a simple ratio of population in respect to tourism-related rooms of 15 to 1. This number is based on the experience of other tourist destinations in Mexico. However, we also recognize the uncertainty in this ratio. The actual ratio will depend on many factors, such as the overall performance of the Mexican economy and the performance of the other tourism locations. The ratio of new migrants to tourism development is also a key determinant in future levels of per capita income for the region. The population to room ratio is largely beyond the control of local leaders. However, leaders are able to limit the number of new tourism-related rooms that are permitted, which will have an impact on the population.

To account for this uncertainty, we look at the implications of lower and higher population-to-room ratios in the largest scenarios, constructing two scenarios built on ratios of 10 to 1 and 20 to 1, respectively.

Table 1. Tourism Development and Population Growth

Total tourism-related rooms	Population/ rooms ratio	Population	Annual Population Growth Rate
2,000	15 to 1	30,000	3.5%
4,000	15 to 1	60,000	7.2%
6,000	15 to 1	90,000	9.4%
12,000	10 to 1	120,000	11.0%
12,000	20 to 1	240,000	14.9%

The existing population of the region is estimated at 15,000. We define 5 levels of possible growth over the next 20 years. The lowest assumes a doubling of population. The highest projects an ultimate population of 240,000 people, based on a total of 12,000 tourism-related rooms and a population to room ratio of 20 to 1. The rate of growth necessary to reach the estimated population levels in the year 2025 varies from 3.5% to almost 15% (see Table 1). As we discuss later, both the ultimate size of the population and the rate of growth represent a critical challenges for planning and policy.

The demand for new land uses is derived from planned resort and housing developments, population levels, and gross development densities for each of the land use categories. We do not assume contiguous development that is of uniform density. Therefore, the new developed areas allocated on the landscape are gross densities, implying that there will be open spaces interspersed with the actual new developments. The polygons should therefore be interpreted as showing the extent of influence of urban development, not the actual footprint of individual buildings and housing plots. The projected densities of new development vary with the demand and supply of new land uses. The demands for new lands uses are shown in Figure 9.

Figure 9. Demand for new land uses
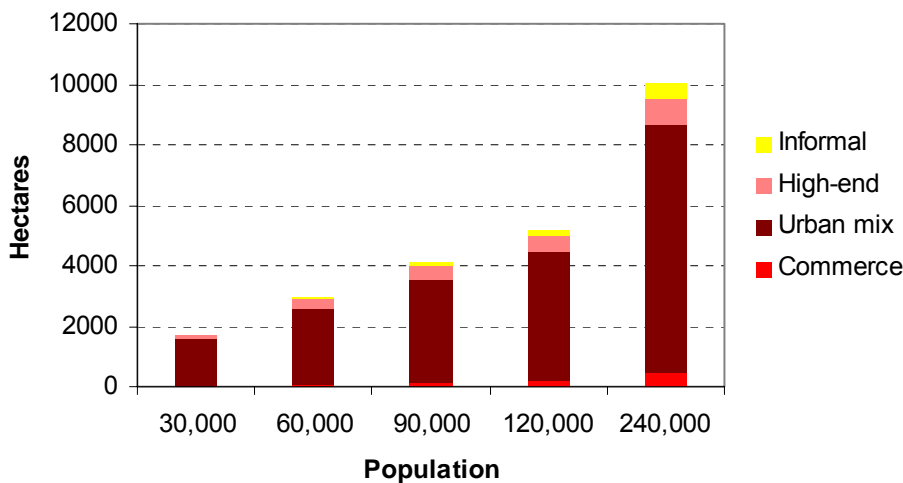
Supply of Developable Land

The supply of developable land is defined by a set of land use policies. The columns in Table 2 correspond to different policy sets that define where future development would be permitted.

Table 2. The Twenty-five Alternative Futures

Total rooms	Population/ rooms ratio	Population	Sin Planeación	Plan Propuesta	Loreto 2025	Proactive Moderado	Proactivo Muy Regulado
2,000	15 to 1	30,000	SP30	PP30	VV30	PM30	PR30
4,000	15 to 1	60,000	SP60	PP60	VV60	PM60	PR60
6,000	15 to 1	90,000	SP90	PP90	VV90	PM90	PR90
12,000	10 to 1	120,000	SP120	PP120	VV120	PM120	PR120
12,000	20 to 1	240,000	SP240	PP240	VV240	PM240	PR240

Five policy options are included in the study:

<u>Sin Planeación</u>

This alternative assumes that all land is available for development. The only areas that are precluded from development in the computer simulations are areas with steep slopes or frequent flooding. These limitations are included to approximate behavioral choices of landowners and developers, not policy choices.

<u>Plan Propuesta</u>

This alternative represents a somewhat simplified version of the plan currently under consideration in Loreto. In the actual plan, the allowable density for development varies by location. Nevertheless, the implied densities of future growth allocated by the computer models are consistent with the limits stated in the plan. Where site-level plans are available, we have tried to replicate the plans for each of the areas.

<u>Loreto 2025</u>

This policy set reflects a spatial plan submitted for study by a local non-governmental organization, Loreto 2025. Much of the future growth in this plan is restricted to the northern areas of the region close to the town of Loreto. Fewer areas in the south are opened for development. We offered to study alternative plans submitted by local groups. This was the only such plan that was submitted to us.

<u>Proactivo Moderado</u>

This policy set includes a number of policies designed to protect key public goods, including hydrological, ecological, visual, recreational, and economic assets. This alternative is a rules-based zoning pattern created by the research team that was later converted into a spatial model by the computer, guided by the spatial rules. Areas of high ecological or visual value are set

aside, as well as areas subject to safety risks. These areas include areas at risk of flooding from hurricanes, arroyos that flood regularly, areas with important biodiversity, steep slopes, and high-quality view corridors.

Proactivo Muy Regulado

This policy set is based on the same criteria as the previous alternative, except that the level of visual protection is much stricter, thereby removing additional land from possible development.

Table 3 summarizes the elements that define the policy sets.

Table 3. Scenario Specifications – Land Excluded from Development by Public Policy

	Sin Planeación	Plan Propuesto	Loreto 2025	Proactivo Moderado	Proactivo Muy Regulado
Streams and frequently flooded areas	X	X	X	X	X
Areas with excessive slope	X	X	X	X	X
Plan Propuesto zoning		X			
Loreto 2025 zoning			X		
50-year flood areas				X	X
Terrestrial areas of ecological importance				X	X
Key recreational areas				X	X
Aquifer recharge areas				X	X
Inner mountain areas – 200m contour line				X	X
Moderate visual protection				X	
Stringent visual protection					X

The constraint areas function differently for each of the land use types. High-end housing, for example, is permitted to build on slopes of up to 20%, while commerce and mixed urban is restricted to land on slopes no greater than 10%. The new land use allocations assume that resorts, high-end housing, commerce, and mixed urban respect the designated spatial plans. The allocation of informal settlements is governed by the assumption that enforcement of property rights is costly, both economically and politically, and will therefore not be consistently implemented. Informal housing therefore does not respect these same spatial restrictions, although they are prevented from building in areas of high development value.
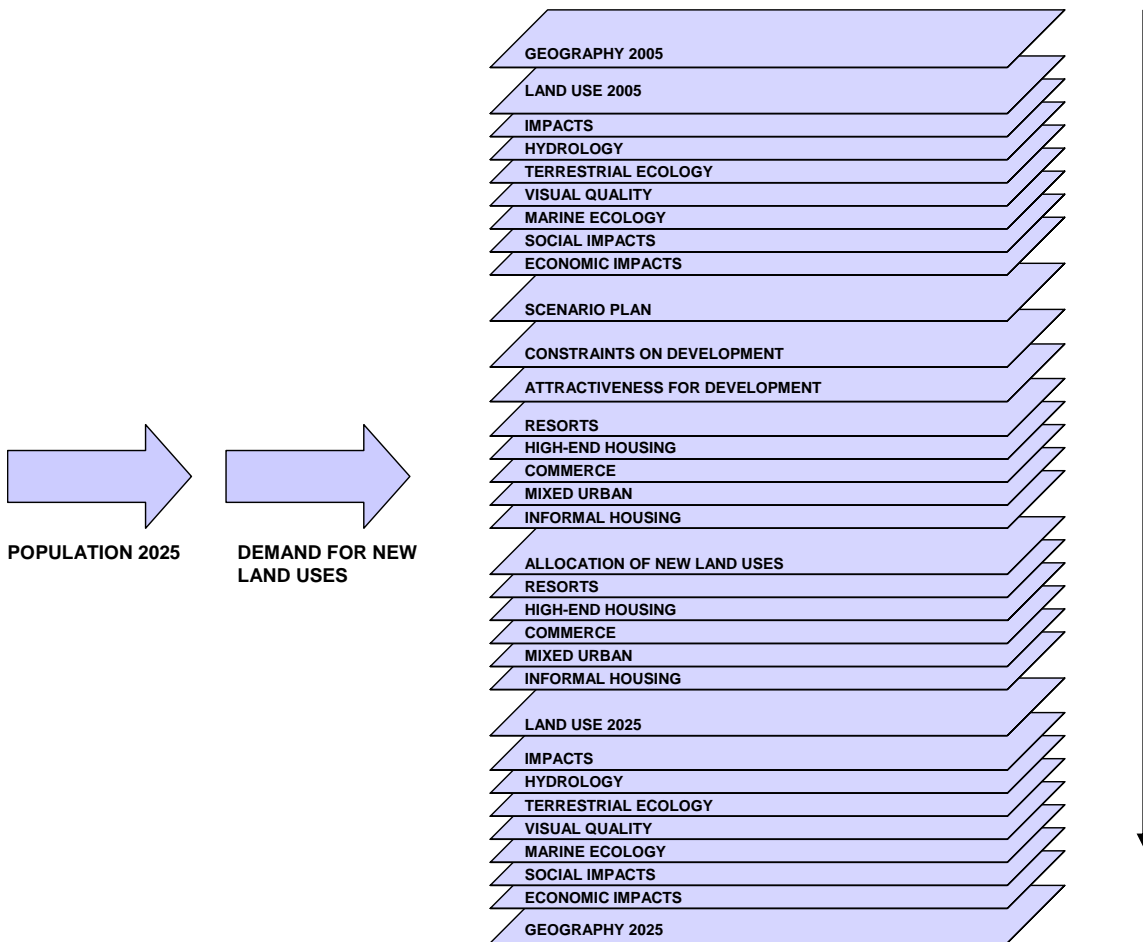
The Process of Allocation

The economic projections from each scenario are converted into demands for new land uses in five categories: hotels and villas, high-end residential, commerce, mixed urban, and informal housing. A computer program then defines the areas that are constrained from development by

the relevant policy set. Subsequently, the development attractiveness model for each development type is implemented based upon infrastructure investments that either attract or repel development. The program allocates the new land uses which are required in the order in which they are assumed to be able to pay: hotels and villas, high-end residential, commerce, mixed urban, and informal.

The computer models are designed to reflect a context in which market forces and individual choices determine the location of future development in all the scenarios. These policy sets also assume that there are normal levels of public resources to meet the demands for new services and infrastructure.
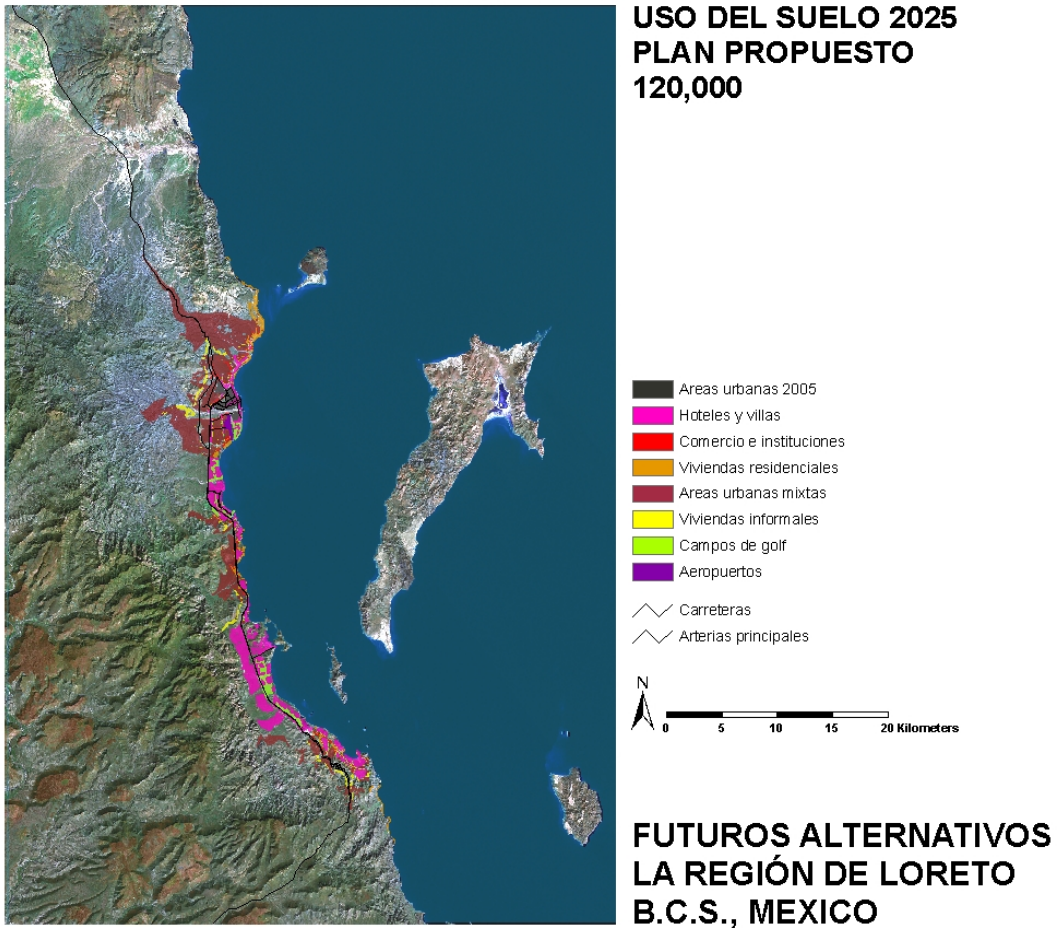
Twenty-five scenarios are developed in order to include a broad selection of policy choices. Each scenario creates an Alternative Future that is evaluated in terms of the over-all level of economic and ecological impacts and the spatial distribution of those impacts, including both water and land. Each of the scenarios is projected over a 20-year time horizon.

Figure 10. Scenario Process

GEOGRAPHY 2005
LAND USE 2005
IMPACTS
HYDROLOGY
TERRESTRIAL ECOLOGY
VISUAL QUALITY
MARINE ECOLOGY
SOCIAL IMPACTS
ECONOMIC IMPACTS
SCENARIO PLAN
CONSTRAINTS ON DEVELOPMENT
ATTRACTIVENESS FOR DEVELOPMENT
RESORTS
HIGH-END HOUSING
COMMERCE
MIXED URBAN
INFORMAL HOUSING
ALLOCATION OF NEW LAND USES
RESORTS
HIGH-END HOUSING
COMMERCE
MIXED URBAN
INFORMAL HOUSING
LAND USE 2025
IMPACTS
HYDROLOGY
TERRESTRIAL ECOLOGY
VISUAL QUALITY
MARINE ECOLOGY
SOCIAL IMPACTS
ECONOMIC IMPACTS
GEOGRAPHY 2025
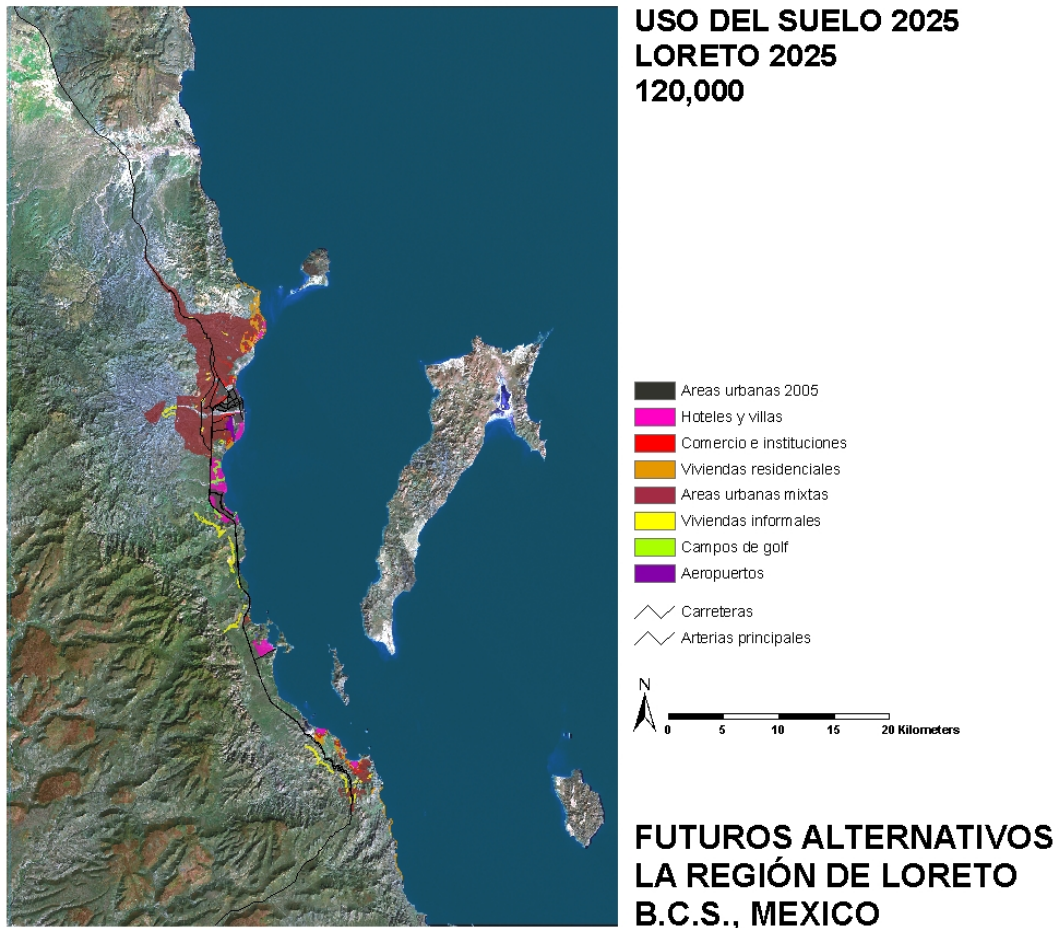
POPULATION 2025   DEMAND FOR NEW LAND USES

The resulting land use patterns vary in terms of the extent, the direction, and the pattern of growth. Figure 11 shows projected land use in the year 2025 for Alternative Future PP120 - the proposed development plan at a population of 120,000. In this alternative, development extends to essentially all of the most attractive locations in the study area.

Figure 11. Land Use in 2025 for Plan Propuesto 120,000

USO DEL SUELO 2025
PLAN PROPUESTO
120,000

Areas urbanas 2005
Hoteles y villas
Comercio e instituciones
Viviendas residenciales
Areas urbanas mixtas
Viviendas informales
Campos de golf
Aeropuertos

Carreteras
Arterias principales

N

0   5   10   15   20 Kilometers

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The projected land use pattern for the plan proposed by the group, Loreto 2025, is shown in Figure 12 at a population of 120,000. This configuration concentrates much more of the development in the areas surrounding the town of Loreto. Development in the southern areas is restricted to relatively small windows where development is permitted.

Figure 12. Land Use in 2025 for Loreto 2025 120,000

USO DEL SUELO 2025
LORETO 2025
120,000

Areas urbanas 2005
Hoteles y villas
Comercio e instituciones
Viviendas residenciales
Areas urbanas mixtas
Viviendas informales
Campos de golf
Aeropuertos

Carreteras
Arterias principales

N
0   5   10   15   20 Kilometers

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V. What difference might the changes cause?

This question is answered by impact models, which are based upon the process models under changed conditions. The economic, social, hydrological, ecological, visual, and marine impacts are estimated for each of the Alternative Futures in the year 2025.

Water Model and Impacts

The groundwater model estimates the impact of changes in water demand and land cover on groundwater storage in the region and forecasts the wells at risk of saltwater intrusion for each of the scenarios. MODFLOW, (McDonald and Harbaugh 1988; 1996) the most widely used and respected groundwater modeling program, was used to develop a preliminary groundwater model for the San Juan Londó aquifer. Currently, the San Juan aquifer is the only major source of potable water supplying the citizens of the City of Loreto and surrounding areas. In constructing a groundwater model, estimates of the water entering the aquifer (recharge), water leaving the system (well pumping), and hydraulic properties (an estimate of how fast the water moves through the system) are entered into the model. MODFLOW then produces a map of groundwater elevations using a set of partial differential equations.

To prevent saline water from entering the San Juan aquifer, and thus contaminating the aquifer, water must flow out of the basin into the Sea of Cortez. If this stops and the elevation of the Sea becomes greater than the elevation of the groundwater, saline water will flow into the system. If pumping then continues, the saline water will reach the wells resulting in the loss of potable water.

In 1986, the Institute of Geophysics at the Universidad Nacional Autónoma de México (UNAM, 1986) used a basic water balance equation and rudimentary flow net analysis to estimate recharge. Given the sparse data available and high level of uncertainty, they estimated a recharge rate of 10 Mm^3 per year, plus or minus an order of magnitude, which translates into a rate of recharge that falls within a range of 1 Mm^3 and 100 Mm^3 per year.

In this study, we update this estimate using a different methodology. To calculate the amount of recharge entering the aquifer, sub-basins were delineated using digital elevation models and the total volume of water that fell within each sub-basin was determined from annual rainfall rates and storm data. In semi-arid areas such as Loreto, only a small portion of this volume becomes recharge; most is lost to run-off and evaporation. In average or dry years - years with average annual rainfall of 11.5 cm or less - rainfall is not sufficient to produce aquifer recharge. Potential recharge in wet years was estimated by including data from larger 2-year, 5-year, 25-year, and 50-year storm events. The 2-year storm event yielded the highest amount of annual recharge: 2 Mm^3/yr. Using improved data analysis tools that were not available at the time of the 1986 study, our estimates of average annual recharge are close to the lower of the earlier estimates. The updated analysis carried out for this study indicates that given the level of rainfall and the aridity of the area, a recharge of 10 Mm^3 per year is not possible.

To ascertain the effects of pumping on the aquifer, the model was applied with the projected water consumption rates for each of the growth scenarios (see Table 4). Both the high and low recharge estimates (10 and 2 Mm^3 per year) were tested in different runs of the models.

Table 4. Projected water use

Population in 2025	Sin Planeacion	Plan Propuesto	Loreto 2025	Proactivo
30,000	**600**	**500**	**500**	**500**
60,000	**540**	**450**	**450**	**450**
90,000	**475**	**400**	**400**	**400**
120,000	**415**	**350**	**350**	**350**
240,000	**350**	**300**	**300**	**300**

Liters per person per day.

In all cases, the pumping resulted in saline intrusion into the aquifer, although the estimated date of saline intrusion varies with different recharge and pumping rates (Figure 13).

Figure 13. Year of saline intrusion into the San Juan Londó aquifer
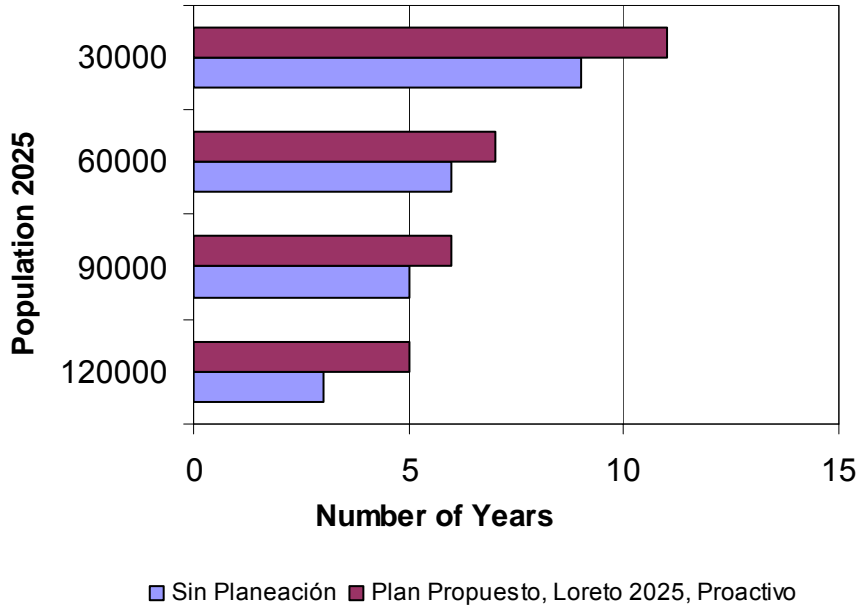
Estimated at a rate of recharge of 2 Mm^3 per year.

More importantly, at current population levels and a recharge rate of 2 Mm^3 per year, the municipal wells will see saline intrusion by the year 2025 (Figure 14). The onset of saline intrusion could be significantly delayed with infrastructure improvements. Even with an optimistic recharge estimate of 10 Mm^3 per year, the maximum amount of pumping above current rates that can be sustained is 0.9 Mm^3 per year. This is approximately equal to the amount of water needed for an additional 4000 residents in the region. In summary, the model results conclude that any future development must find an alternative water source for that development and the associated growth in supporting population.

Figure 14. Estimated San Juan Aquifer groundwater elevations for years 2005 and 2025 projected at present pumping levels
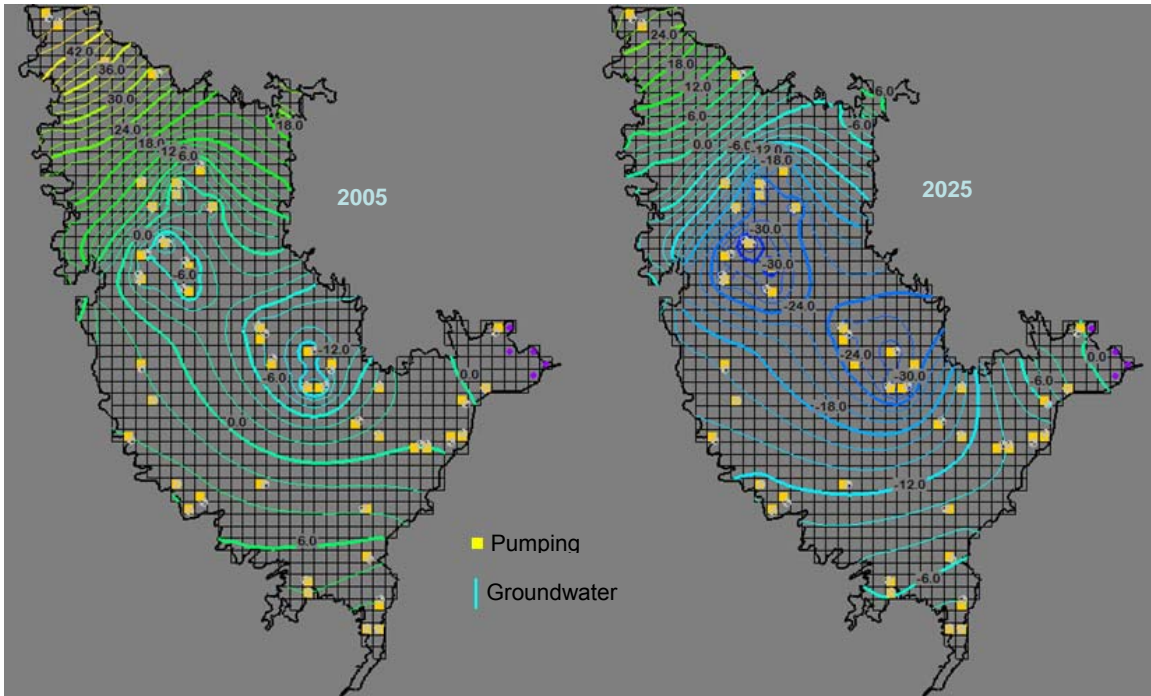
Negative numbers indicate elevations below level of Sea of Cortez.

The surface water component of the model is created using the software package, KINEROS. The model estimates the areas at risk of flooding in major hurricane events. When compared with the land uses in the various Alternative Futures, an estimate can be made of the population at risk of flooding. Figure 15 shows the areas at risk of flooding under the Plan Propuesto and a population of 120,000. A comparative summary of the population at risk in the twenty-five Alternative Futures is shown in Figure 16.

Figure 15. Population at Risk of Flooding, Plan Propuesto 120,000

POBLACIÓN EN RIESGO
POR INUNDACIONES
PLAN PROPUESTO
120,000

■ Riesgo de Inundación
■ Areas urbanas 2005
■ Hoteles y villas
■ Comercio e instituciones
■ Viviendas residenciales
■ Areas urbanas mixtas
■ Viviendas informales
■ Campos de golf
■ Aeropuertos

⋀ Carreteras
⋀ Arterias principales

N

0   5   10   15   20 Kilometers

FUTUROS ALTERNATIVOS
LA REGIÓN DE LORETO
B.C.S., MEXICO
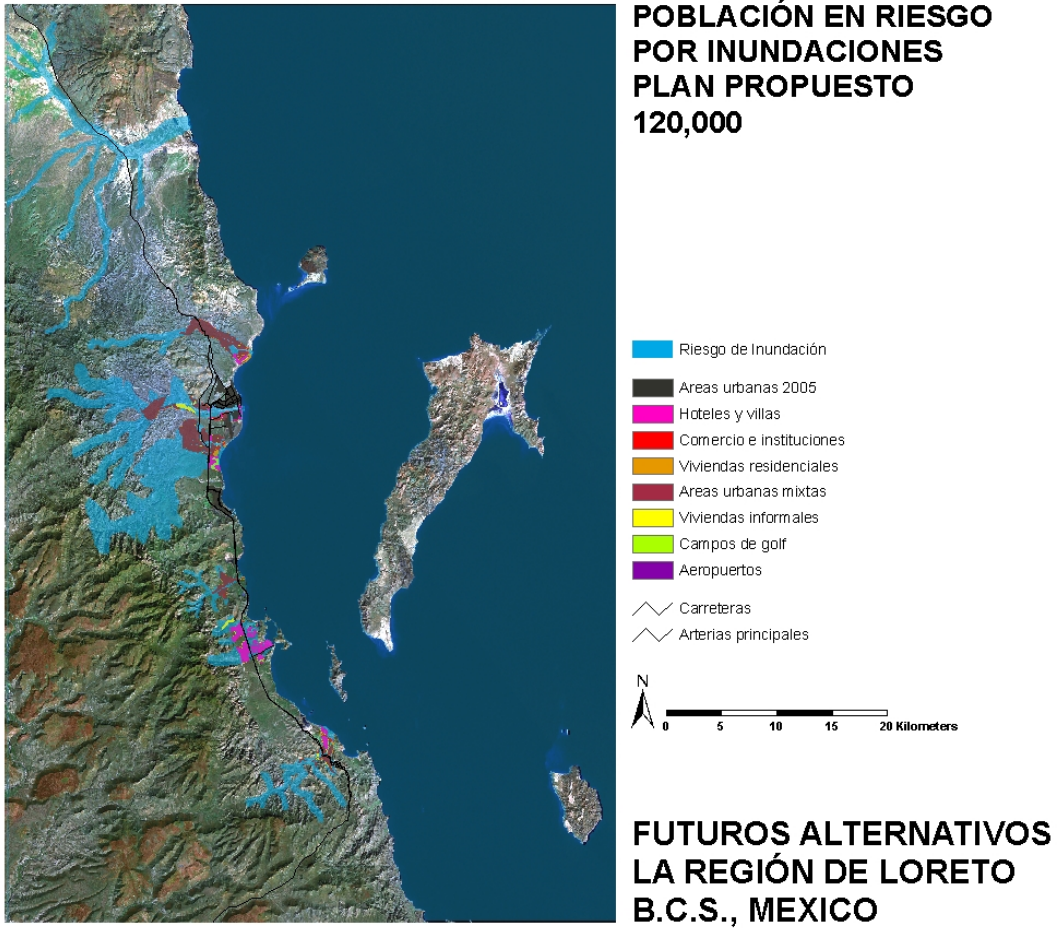
Figure 16. Population at Risk of Flooding
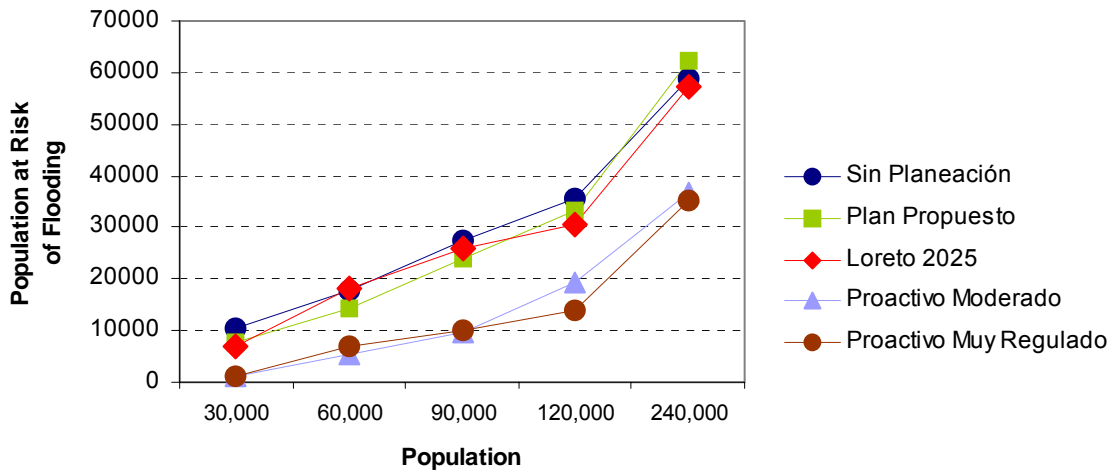
Visual Model and Impacts

The visual model assesses the impact of future development and resulting landscape changes on visual quality. Survey results support the observation that the visual quality of the landscape in the Loreto region is a critical source of economic competitiveness for the area's tourism and real estate markets. The impacts of land use change are measured using the visual preferences of local residents and visitors as recorded in interviews carried out in the photographic survey.
To assess the consequences of future change on the visual landscape, a model of visual quality is estimated using the results of a photographic survey of residents and visitors (Figure 17).

Survey respondents were asked to order sixty photographs that represent the existing landscape of the Loreto region according to their scenic preferences.   Ten of these sixty photographs in the survey were altered to represent possible future developed conditions. The sixty photographs in are shown on the following pages in order of preference, from the highest rated to lowest rated, reading from upper left, across, and down. (Figures 18 and 19).

Figure 17. The Visual Survey
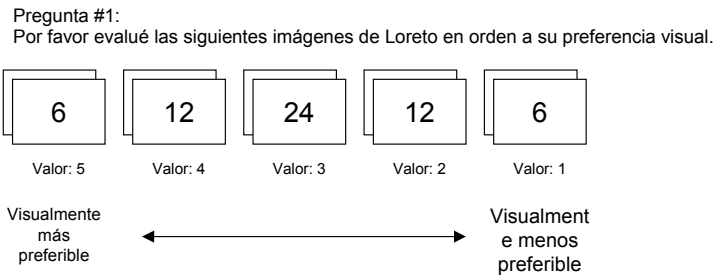
The visual quality assessment is implemented in four stages. First, the quality of the view from each location is recorded by cross-referencing the type of view from each location with the results of the visual survey. Four kinds of views are rated the highest: undeveloped ocean, island, and mountain views, and views in Loreto's historic center. These views are then identified, located, and assessed by a GIS-based model.
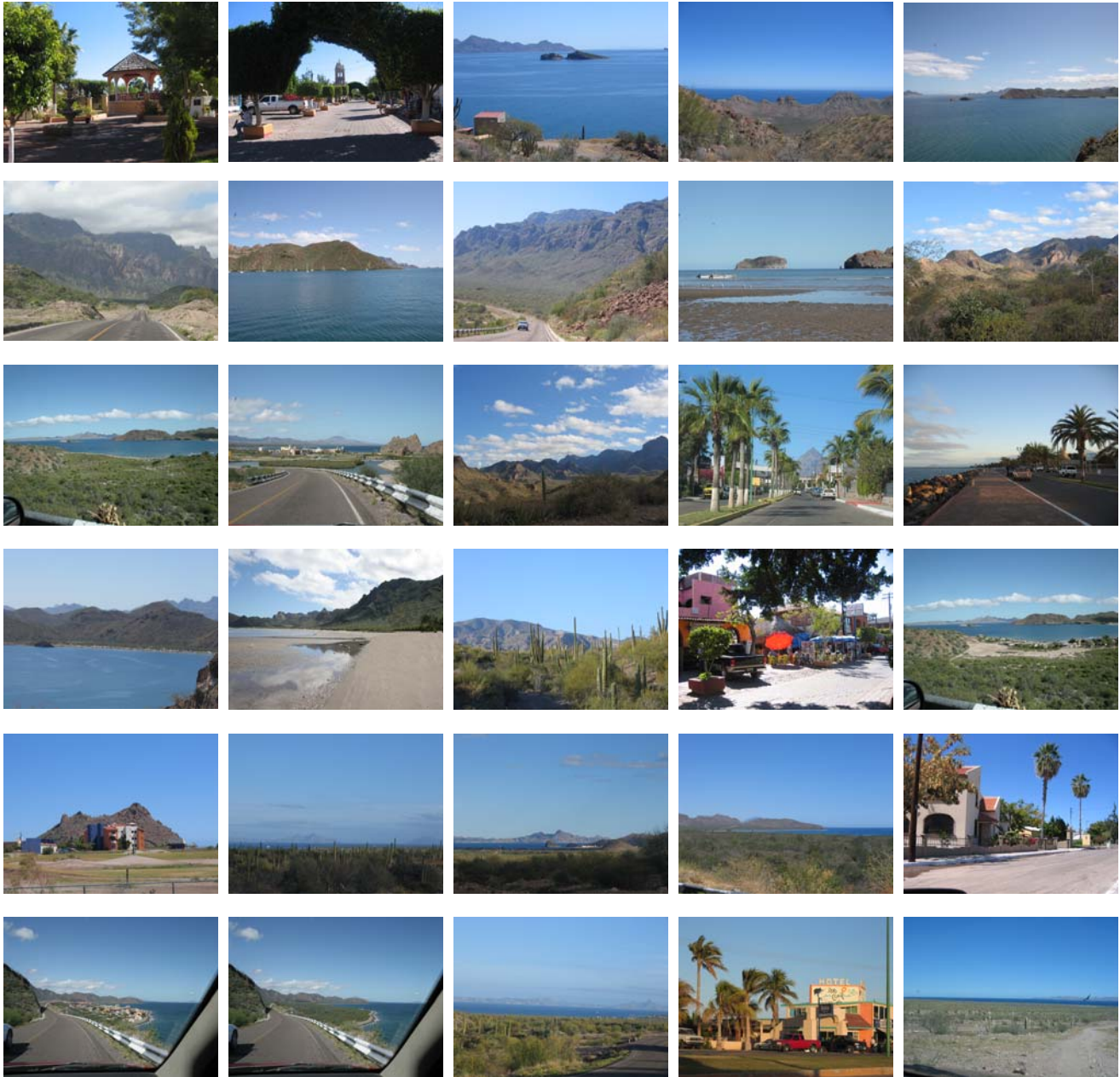
Figure 18. The Thirty Highest Rated Photographs

Figure 19. The Thirty Lowest Rated Photographs
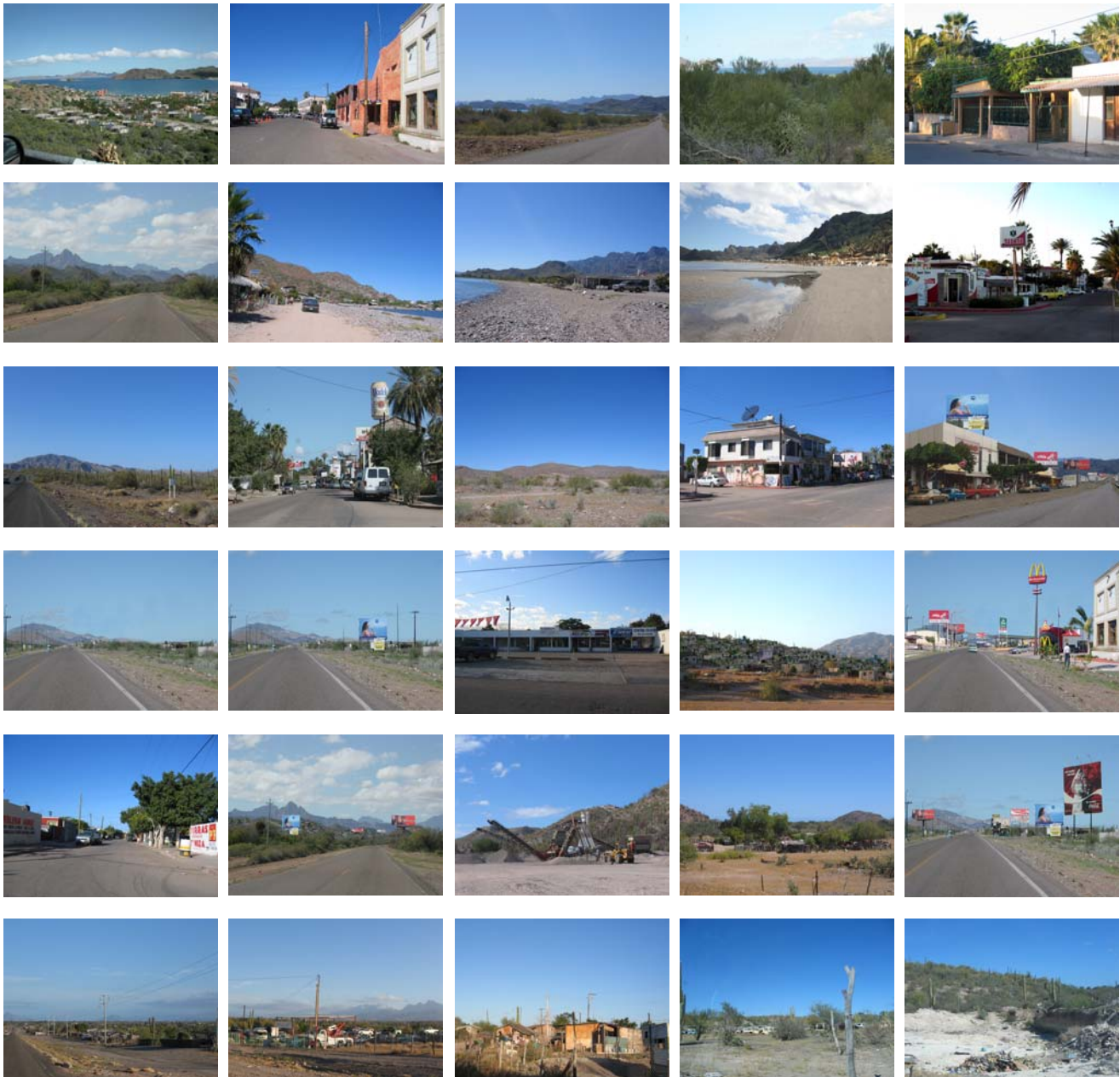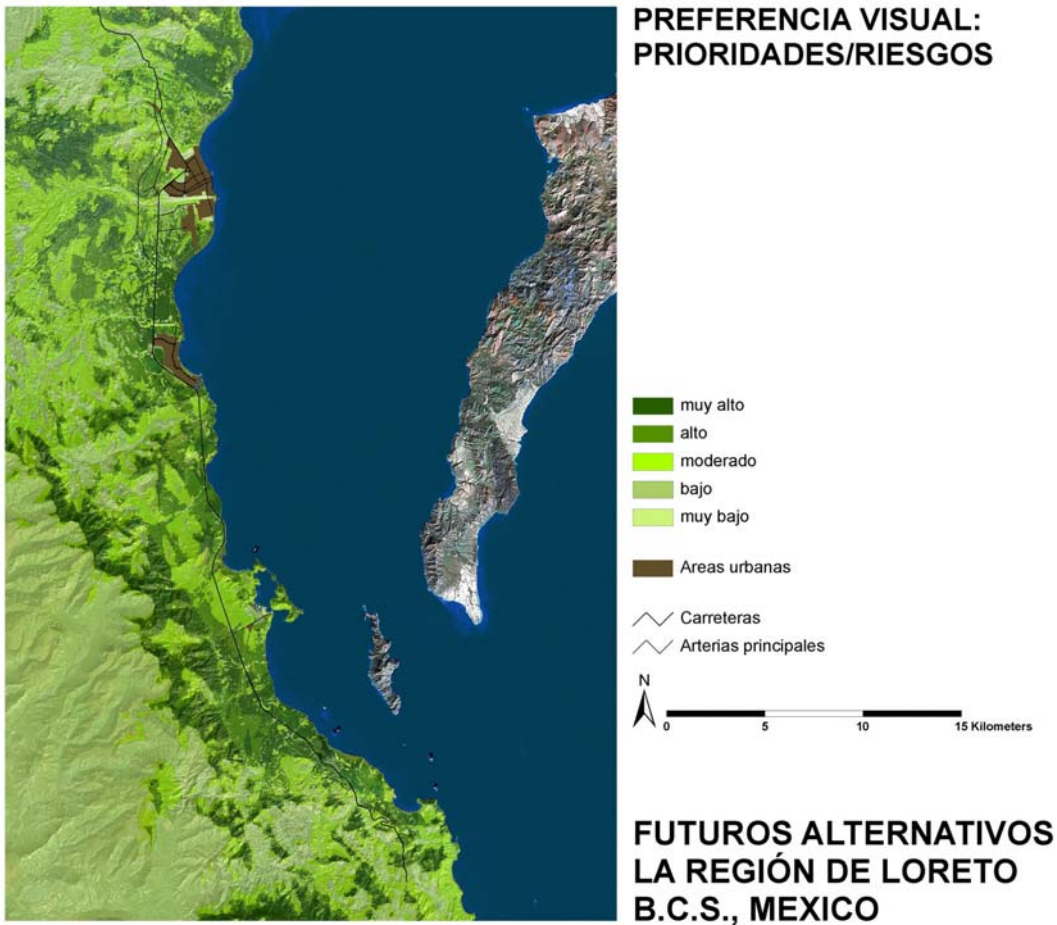
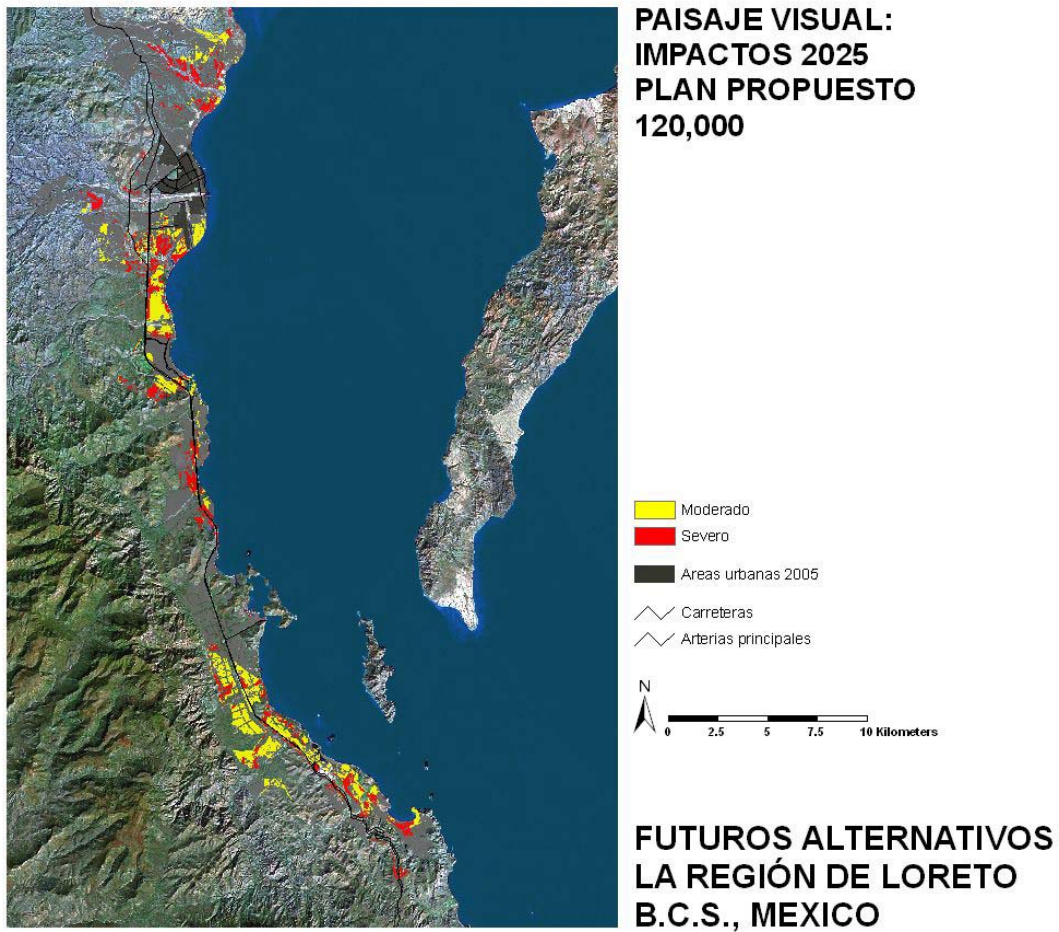**Figure 20. View Preferences**

In the second stage of the visual assessment, the high-quality views are weighted by their predicted exposure to residents and visitors; the most visited and public views, such as those from the main north-south highway, are given greater weight compared to high-quality views that are, in effect, private. The third stage defines the areas that constitute the viewshed for these locations. This delineates the areas that are most deserving of visual protection, and the areas that suffer the highest costs if the view is degraded. This process creates a number of priority viewsheds that tend to fall along the north-south highway as well as in coastal areas with good public access. The final stage in the visual assessment is to assess the damage to the most important viewsheds resulting from different types of future development.

The impacts of visual models are reported by location. The model considers both the degree of change and the visual value of the impacted area. Two levels of impacts are reported, moderate and severe.

Figure 21 displays the extent and locations of visual impact of the Plan Propuesta with a population of 120,000.

Figure 21. Visual Impacts, Plan Propuesto 120,000

PAISAJE VISUAL:
IMPACTOS 2025
PLAN PROPUESTO
120,000

Moderado
Severo
Areas urbanas 2005
Carreteras
Arterias principales

N

0   2.5   5   7.5   10 Kilometers

FUTUROS ALTERNATIVOS
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B.C.S., MEXICO

In order to compare the visual impacts of the different Alternative Futures, the level of impacts is summarized using a simple scoring method that totals the impact scores for each location on the landscape. The results of the visual impact assessment are summarized in Figure 22. (The scores have been normalized; which means that the scores are based on a comparison with the scores of the other scenarios. A lower score indicates a more severe impact.)

Figure 22. Visual Impacts Summary
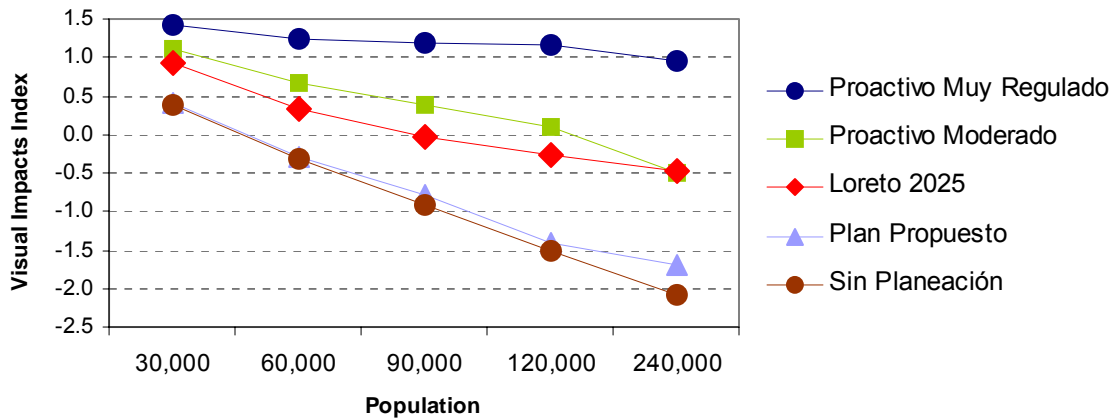
Terrestrial Model and Impacts

The terrestrial ecology model assesses the impacts of the Alternative Futures on different vegetation and habitat categories. New land uses of the Alternative Futures are aggregated into groups based upon their impacts associated with construction, maintenance and use.

The impacts of terrestrial model are assessed by location. The model considers both the degree of change and the underlying ecological value of the impacted area. Three levels of impact are reported for this model:

- Moderate: natural mitigation possible
- Severe: mitigation possible with major engineering
- Terminal: no possible mitigation

Figure 23 shows the impact on terrestrial ecology of Plan Propuesto at a population of 120,000. The results of the terrestrial ecology model for the twenty-five Alternative Futures are summarized by totaling the impact scoring for each pixel on the map and shown in Figure 24.

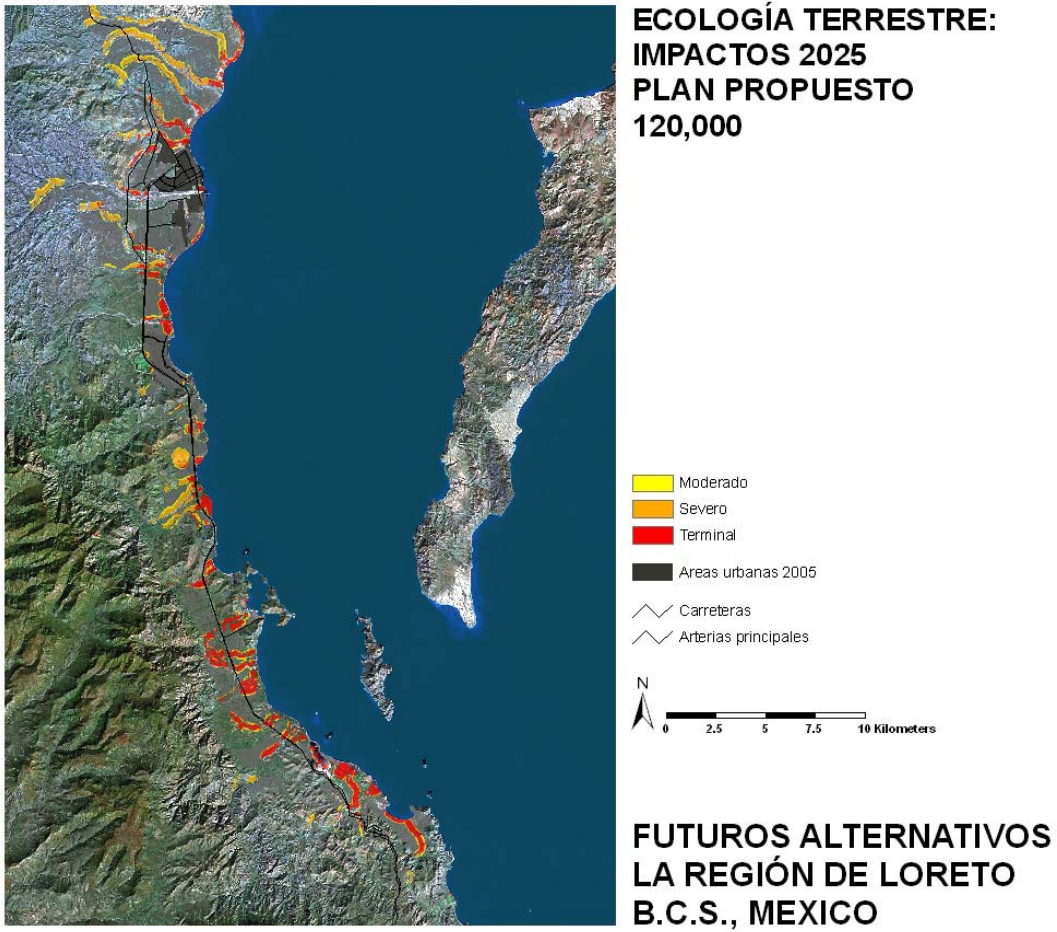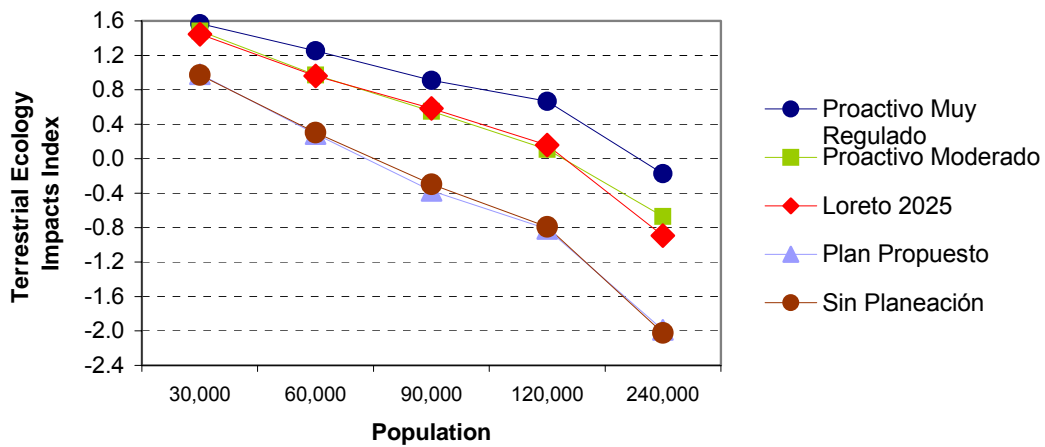**Figure 23. Terrestrial Ecology Impacts of Plan Propuesto 120,000**

ECOLOGÍA TERRESTRE:
IMPACTOS 2025
PLAN PROPUESTO
120,000

Moderado
Severo
Terminal
Areas urbanas 2005
Carreteras
Arterias principales

N

0   2.5   5   7.5   10 Kilometers

FUTUROS ALTERNATIVOS
LA REGIÓN DE LORETO
B.C.S., MEXICO

Figure 24. Terrestrial Ecology Impacts

The impact index scores are normalized around an average score of zero.

Marine Impacts

The flow of sedimentation and other contaminants from building activities and land use change has the potential to cause severe damage to the marine ecosystems of the Loreto region. Sediment loading will damage, in particular, the benthic communities that inhabit the bottom of the ocean floor that are critical to the functioning of the other marine ecosystems. In turn, this will impact the quality and quantity of local fish and shellfish production. The quantity of sediment flows is an important determinant of damage, as is the content of these sediment flows. The presence of toxic waste associated with human activities and untreated sewage will exacerbate the damage on ecosystems that are integral to the economic future of Loreto.

The growth of tourism and resident populations in Loreto will increase the number of fishermen plying the waters of the region. Increased fishing effort will put additional pressure on fishing stocks that are already displaying signs of overexploitation. The fishing model elaborated as a part of this study estimates the impact on fishing stocks of increasing numbers of fishermen. The model employs a fishing search algorithm that estimates the risk of an individual fish being caught that enters the waters of the region. Extrapolating from this model, we can make inferences about the risk of overexploitation of the fishery and losing the viability of resident fish stocks. We consider here that when over 20% of the stock of a species is taken in a season, the sustainability of the population is at risk. As seen in Figure 25, the current level of fishing effort is already putting resident communities of fish in jeopardy. The probability of a major collapse in fish populations rises substantially with an increase in visitors.

Figure 25. The Impact of Increased Fishing Efforts
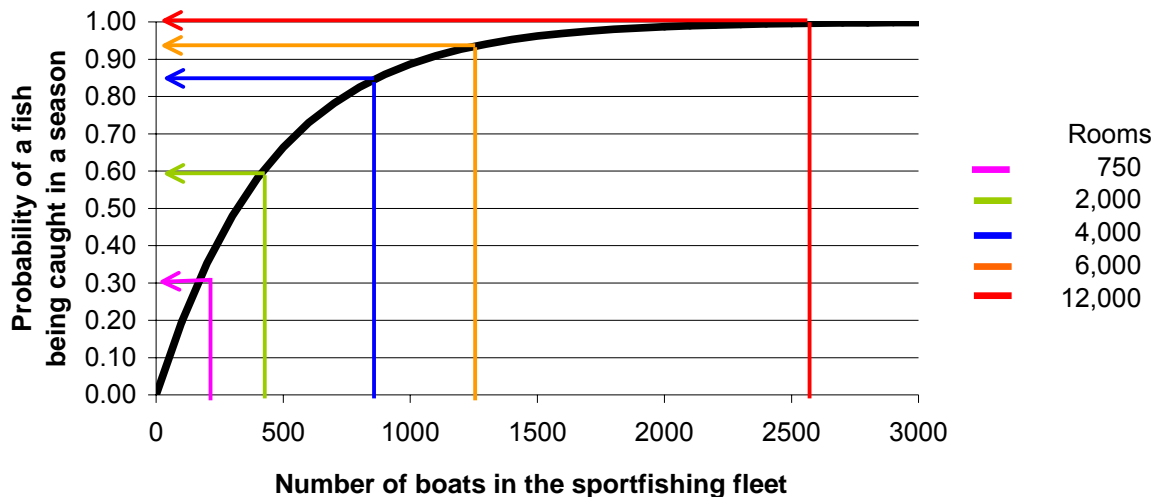
The dynamics of the model operate differently for resident species versus migratory species. For the resident fishing stocks such as grouper or sea bass, the activities of local fishermen represent the main pressures on fishing stocks, and the local fishing sector will also suffer the consequences of a collapse in the fishery. For migratory species, the actions of Loreto's sport fishermen have an impact on the fishery throughout the Gulf of California and are impacted by similar actions in other regions of the gulf. Not only are the fish themselves at risk, but the economic viability of the sportfishing and artisanal fishing sectors are in danger. Increasing numbers of fishermen competing for the same dwindling fishing stocks will destroy Loreto's reputation as an excellent launching point for sportfishing. This is true for both resident and migratory species. Hundreds of fishermen vying to catch each marlin that passes through the waters is much less attractive than a few dozen fishermen on the water at any particular time.

Economic and Social Impacts

Loretanos say that they enjoy a relatively high quality of life. Despite the lack of greater employment opportunities and local services such as a hospital, public transportation, and large retail stores, most people in Loreto report satisfaction with the quality of life in the community (Carrilio and Ganster 2006). *Loretanos* have a sense of their historical past and value it. The strong community feelings are reflected in high rates of political participation. *Loretanos* share many cultural and social values and the community displays significant internal cohesion.

Loreto's population grew at an average annual rate of 3.9% (doubling time of 18 years) during the decade of the 1990s and the community was able to retain its traditional social values. In conversations and interviews, people from the community express concerns that this sense of community and shared culture might be lost in the event of rapid population growth associated with high economic growth in the future. Annual growth rates similar to those experienced by Los Cabos in the 1990s (over 9% per year, doubling time of about 6 years) would bring new perspectives and values to Loreto and would likely overwhelm traditional social cohesiveness and sense of community.

A review of the quantitative indicators shows that Loreto lags behind the state of Baja California Sur and Los Cabos in average life expectancy, infant mortality, per capita income, and education (Gerber 2006; Carrilio and Angeles 2006). However, despite these differences, survey research (Carrilio and Ganster 2006) and informal conversations with Loreto residents reveal that many *Loretanos* contrast Loreto with Los Cabos. Many clearly state that they do not want to become like Los Cabos. They feel satisfied with Loreto as a community, they feel safe, and they have a positive view of the future.

Reconciling future growth and development needs with the strong sense of maintaining the existing community structure is one of the critical challenges for community leaders. In this study, we evaluate these future options with quantitative models, while recognizing that many of the aspects are fundamentally qualitative and must be addressed through the political process.

The economic assessments are based upon the projections for the number of new rooms in tourism and planned communities intended for foreign housing markets, and the rate at which new migrants are drawn to the area in search of economic opportunities stemming from real estate and tourism investments.

For this analysis, we assume that the economic and demographic impact of housing developments aimed at North American buyers is the same as conventional hotel-based tourism. In fact, the impacts that accompany these different types of markets might vary significantly if occupancy rates, average daily expenditures, and wage rates paid to employees differ substantially. This suggests that the actual impact of housing developments might be higher or lower compared to traditional hotel tourism. However, we believe that differences between the two markets will be small when compared to the variation in performance within either one of these markets. This assumption is bolstered by the fact that many of the second homes being sold in Loreto are being sold as 'horizontal hotels,' meaning that the homes are to be centrally managed and rented while the owner is not in residence. The distinction between hotels, time-shares and second homes is increasingly blurred in modern tourism markets. Moreover, the pricing and performance of these different sub-sectors will be closely linked, as are rental and purchase markets in conventional real estate markets.

The growth of the tourism and real estate markets in Loreto will constitute an exogenous boost in investment and spending for the local economy. As such, the performance of the economy will be based primarily on the success of the tourism and real estate sectors. To our knowledge, there are no studies that quantify the factors that explain the relative success or failure of tourism destinations in Mexico. This is understandable given the paucity of data that track income,

growth and tourism performance indicators. The available data (occupancy rates, domestic and foreign participation in tourism markets, per capita income rates) do allow us to make the following observations. Destinations that enjoy high occupancy rates and high participation in foreign markets are correlated with higher per capita incomes. The best examples of this are Cancún and Los Cabos. Of course, this success in tourism and high per capita incomes does not preclude underlying disparities in income distribution and social problems. (Not that one would choose lower per capita income given the choice.) The tourist destinations that have lower per capita income are those that are supported more by domestic tourism. This does not suggest that domestic tourism is necessarily undesirable, only that domestic tourism markets are correlated with lower per visitor expenditures.

The success of tourism destinations is based on providing a top-quality tourism product and in exploiting a destination's competitive niche. Cancún and Los Cabos have done well in the 'sun and sand' markets although occupying somewhat different positions in this market. Two important distinctions must be made when considering the future of the Loreto market. First, Loreto is not well positioned to compete in the 'sun and sand' market due to its poor quality beaches. The failure of the Loreto market to grow over the past two decades compared to Los Cabos is ample evidence to support this assertion. Second, the future of the Loreto market will be more heavily weighted toward the preferences of homeowners as compared to tourists that spend a relatively short time at a destination. Both of these points are related to the same principle: the success of Loreto will be based more on public amenities as compared to many traditional tourism markets.   The Loreto market will be more sensitive to social and landscape issues that are more apparent at a regional scale, whereas many resorts in other locations are able to compete effectively solely on the environment of the specific resort site, without suffering as much from problems in the nearby communities and environment.

The economic model for Loreto used for this study is based on the performance of the factors that will determine the competitiveness of the tourism and real estate markets. These factors are shown in Table 5. Weights are assigned to each of these factors to assess the overall performance of the tourism and real estate markets. This performance is in turn linked to per capita incomes. In order to produce indicative estimates, these outcomes are calibrated to the range of outcomes currently observed in other Mexican tourism destinations.

**Table 5. Determinants of Tourism Market Performance**

Factor	Weight
Density of the area and potential crowding	0.20
Natural beauty and quality of visual landscape	0.17
Character of social environment	0.13
Character of developed areas	0.13
Fishing and marine ecosystem health	0.12
Security	0.12
Accessibility and transportation	0.07
Availability of commerce and services including health care	0.06

The weights for these factors are derived from two surveys carried out for this study. One survey was conducted on the current English-speaking community in Loreto. This community is made up of mostly seasonal residents that originate from North America. A second survey was carried out on possible homebuyers from the San Diego area. This survey was implemented over the

Internet and advertised on the website of the San Diego Union-Tribune newspaper. (We surveyed people of non-Mexican origin, not because their opinions and preferences should carry more weight than that of residents of Mexican origin, but because their preferences are more likely to coincide with the preferences of the housing markets that will drive the economy of Loreto.)

The performance of each of the factors mentioned above is drawn from the results of the other impact models, such as the visual assessment and marine models. Other factors are correlated simply with the population of the region. The performance of many of the factors tends to decline as the size of the community grows. However, some of the economic performance factors, such as accessibility and transportation and the availability of commerce and services, tend to improve as the population and tourism market of the region increase. The projected performance of the tourism market for each of the scenarios is shown in Figure 26. This model also produces a projection of per capita income and gross regional product.

Figure 26. Projected Performance of the Tourism Market
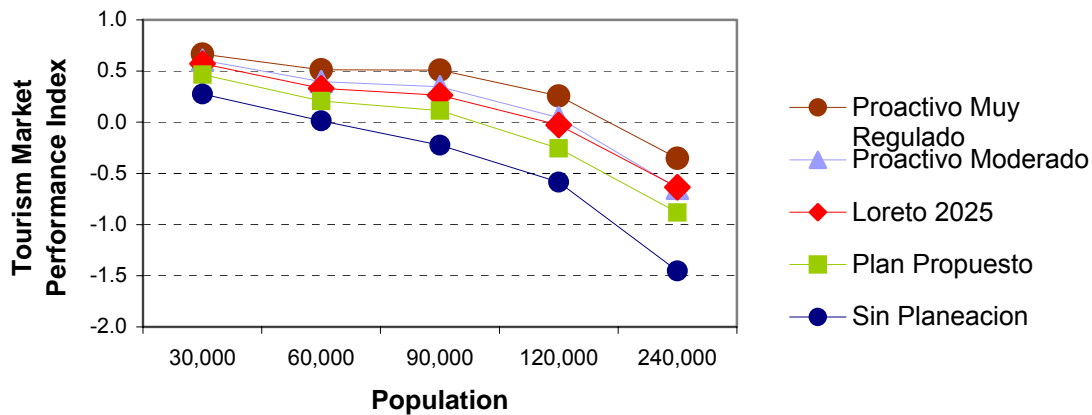
The impact index scores are normalized around an average score of zero.

Gross regional product presents a very different measure compared to per capita income. Gross regional product is driven by both the size of the population and per capita incomes. In this sense, gross regional product is more likely to appeal to national policy makers while per capita income is perhaps a better measure of local economic performance.

The next step in the analysis is to create an overall index of social and economic performance to allow the comparison of the twenty-five different Alternative Futures. This index is comprised of 6 factors: per capita income, gross regional product, number of households in poverty, social cohesion, crime, and access to public services. The estimates for per capita income and gross regional product are drawn from the analysis described above. (Neither one of these measures accounts for income distribution. This would have been another obvious choice for including in the socio-economic performance index. However, there is not adequate data to estimate the impact of different patterns of growth on income distribution.) Social cohesion is projected to decline and crime is projected to increase as population grows. This corresponds to the experiences of urbanization in Mexico.

Access to public services, such as health care and education, is an important aspect not only of human welfare but also of future economic competitiveness. Projecting how public services will vary in the future is speculative at best. For this study, we have created a simple quantitative

model in which access to public services is projected as a function of 5 factors, equally weighted: the number of people in poverty, the annual growth rate, per capita income, gross regional product, and total population. Public services would increase with rising incomes, both per capita and gross regional product. The quality of public services would drop with increasing numbers of people in poverty who would put increasing demands on public resources. All else equal, the availability of public services would improve as the size of the community grows with greater efficiency coming from the economies of scale. Finally, the performance of public services would suffer as population growth rates increase — there is a natural lag in the provision of services as the government attempts to catch up with a rising population and invests in expanding services. A difficult fact of life in Loreto is that the municipal government has little control over the level of spending on public services. Most of this funding comes from outside sources, predominantly state and federal transfers.

Combining the projected values for these factors for each of the alternative futures produces the socioeconomic index measure shown in Figure 27.

Figure 27. Socio-economic Index Scores
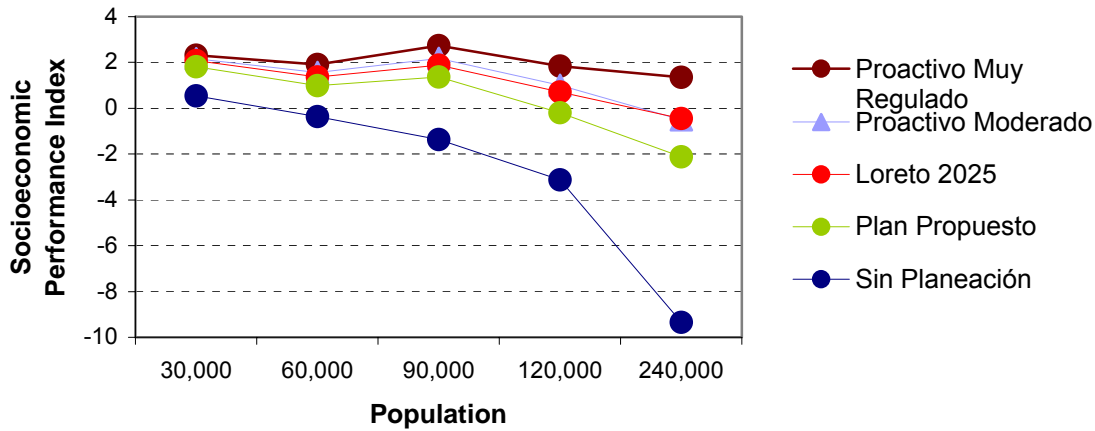
The impact index scores are normalized around an average score of zero.

Impacts on Land Markets

An evaluation is carried out of the impact on land values associated with each of the planning scenarios. This assessment is predicated on a few basic premises. Removing development rights reduces the value of land, and visa versa. Restricting the supply of developable land increases the value of developable land. Areas that are inherently of low value because of the physical limitations of the land are not impacted significantly by the imposition of new zoning plans. Finally, the fall in the value of land is proportionate to the value of land if developable. The attractiveness model is used as a proxy for base land prices.

This analysis is meant only to capture the short to medium term impact of implementing each of the plans, not as a prediction of the long-term changes in property values.
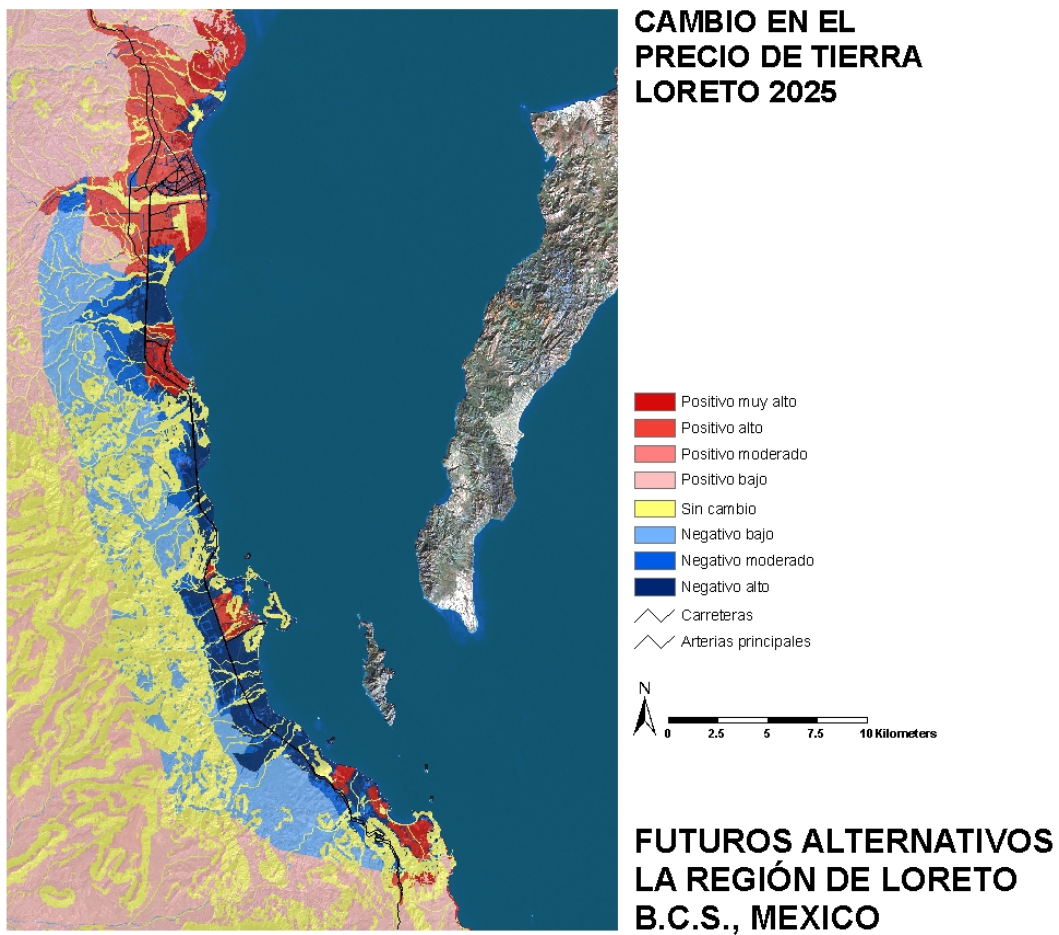
Figure 28 shows the estimated impact on land prices under the proposed plan. The areas where development is not permitted by policy are shown in blue. The yellow areas are not considered developable because of frequent flooding or excessive slope. The areas where development rights are established experience moderate increases in value, shown in red.

Figure 28. Impact on Land Prices of the Proposed Plan
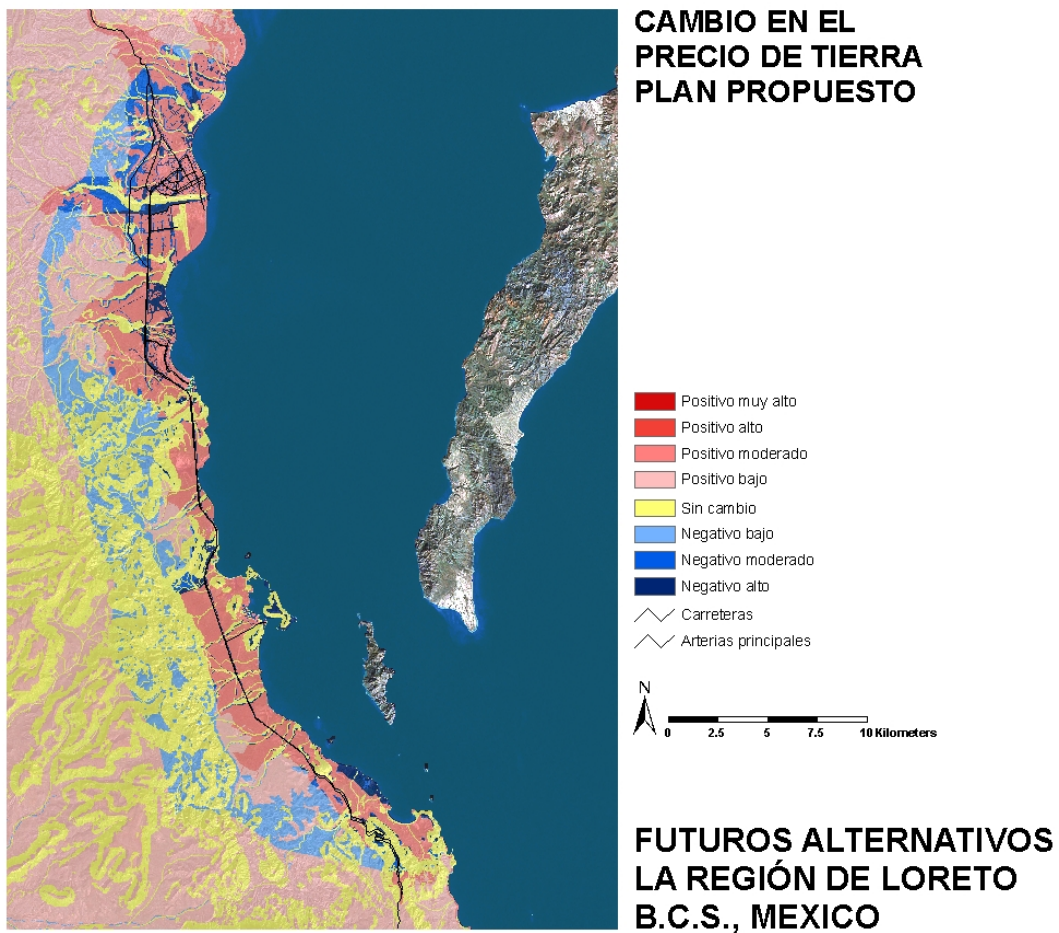
The plan put forward by Loreto 2025 shows a markedly different impact on land prices, as seen in Figure 29. In this alternative, development is permitted on a much smaller proportion of the land in the areas of highest demand. This produces a relatively higher increase in land value for these areas. Accordingly, there are more areas that suffer from a drop in property values as a result of development restrictions. This analysis highlighted the political difficulty decision-makers would face in limiting development.

Figure 29. Impact on Land Prices of the Loreto 2025 Plan

CAMBIO EN EL
PRECIO DE TIERRA
LORETO 2025

- Positivo muy alto
- Positivo alto
- Positivo moderado
- Positivo bajo
- Sin cambio
- Negativo bajo
- Negativo moderado
- Negativo alto
- Carreteras
- Arterias principales

N

0   2.5   5   7.5   10 Kilometers

FUTUROS ALTERNATIVOS
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A separate evaluation of the impact of changing land use patterns on land values is based on the results of the survey of residents in the United States. The survey asked potential homebuyers to choose among different housing choices that differed in price, the views from the house, and characteristics of the region, after survey respondents were introduced to the Loreto region with photographs and text. The evaluation is based on conjoint analysis, where a hypothetic market is created to replicate, to the greatest extent possible, the choices that consumers would make in a real marketplace.

Five attributes where included in the choice sets:

- the view from the house towards the ocean
- the view from the house towards the mountains
- the view of the road between the house and the urban center
- an aerial view of the region
- the price of the house

The statistical analysis of the reported preferences allows us to make inferences about the approximate difference in value among the different attributes. For the views towards the ocean, the unobstructed view (View 1) is worth on average $90,000 more than the partially obstructed view (View 2), and $150,000 more than View 3.

Figure 30. Views Towards the Ocean

View 1   View 2   View 3

The difference in the value of views towards the mountains is not as high. View 1 is worth approximately $70,000 more than View 2, and $90,000 more than View 3.

Figure 31. Views Towards the Mountains

View 1   View 2   View 3
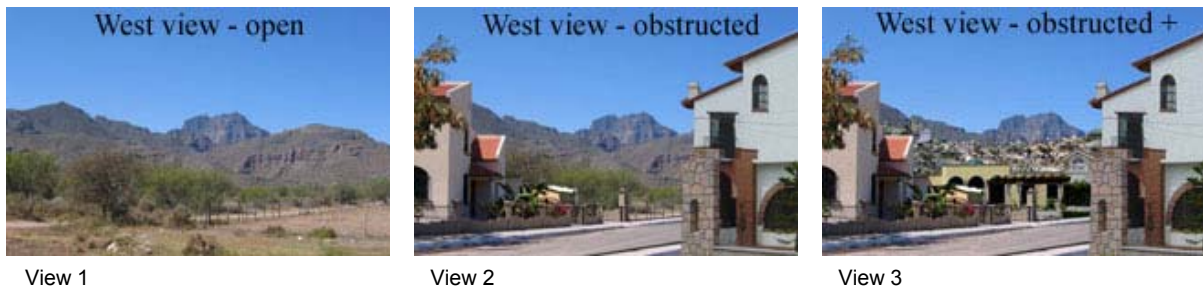
The difference in the views from the road is not statistically significant. Of the five factors, this appears to be the least important.

Figure 32. View of the Road between the House and the Urban Center

View 1   View 2   View 3

The density of the region did have a statistically significant impact on housing preferences. View 1 is valued at approximately $70,000 more than View 2, and $160,000 more than View 3.

Figure 33. Aerial View of the Region

View 1   View 2   View 3
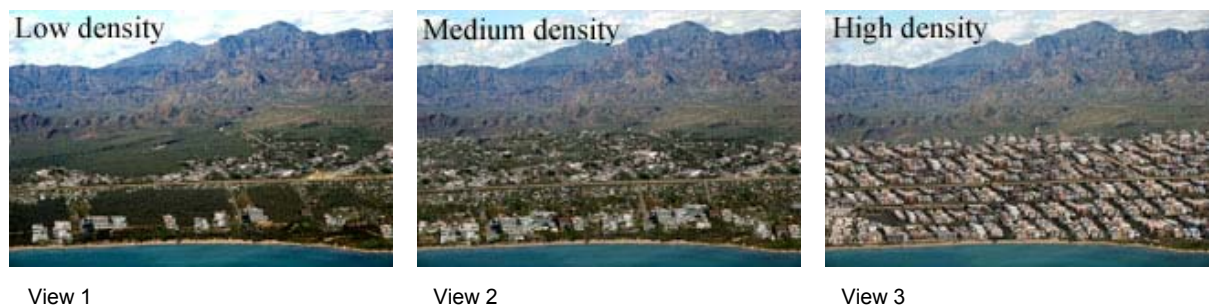
These results indicate that as density increases, the value of existing housing declines. This should not be confused with the movement in prices that result from other factors that influence property values, such as improvements in transportation, job creation, or real estate marketing efforts. In a housing market that experiences rising housing prices, the impact would be a relative decline (comparing real estate values to what would have occurred otherwise) and not an absolute decrease in property value.

Using the results of this study, we have created an indicative model of the relative impact on real estate prices in the high-end market in Loreto as the quantity of housing increases in the area. Again, this does not take into account the myriad of factors that can sway real estate prices in the future. This only looks at the impact of changes in the total number of houses on the landscape as interpreted by the stated preferences of potential homebuyers. This analysis does not include the impact of these changes on the value of the lower and middle segments of the housing market in Loreto.

Assuming an average home price of $350,000 and starting with 200 homes, the estimated decline in the average price of housing is shown in Figure 34. This suggests that existing homeowners will experience a relative decline in property values as additional houses are added to the market. This phenomenon is widely accepted as one of the principal factors that motivate communities to limit growth. In Loreto, where investments by foreigners in real estate are likely to drive future growth, this could be a more fundamental indicator of the health of the economy.

More than reducing the relative value of existing homes, this simple model also exhibits how the aggregate value of this segment of the housing market can decline with increasing numbers of houses.
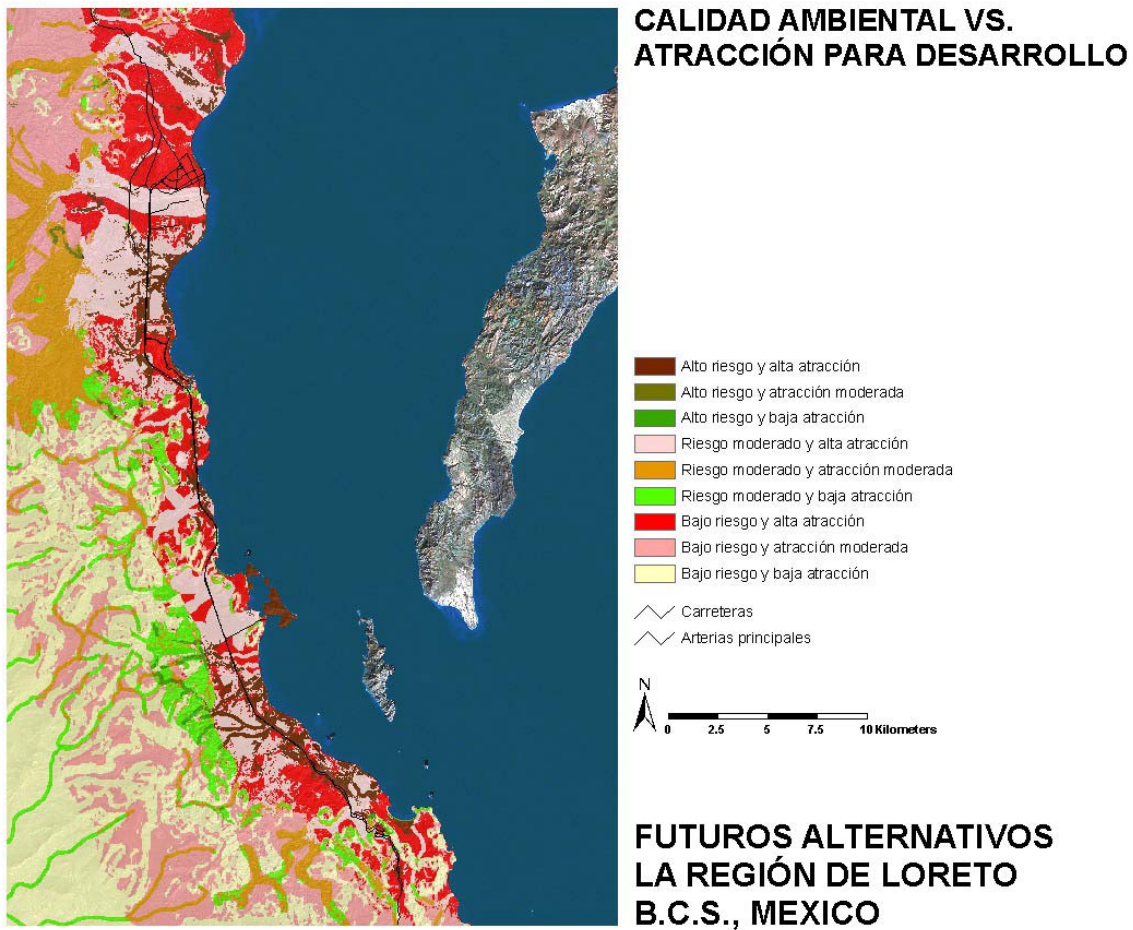
Figure 34. Impact of Increasing Development on Housing Values
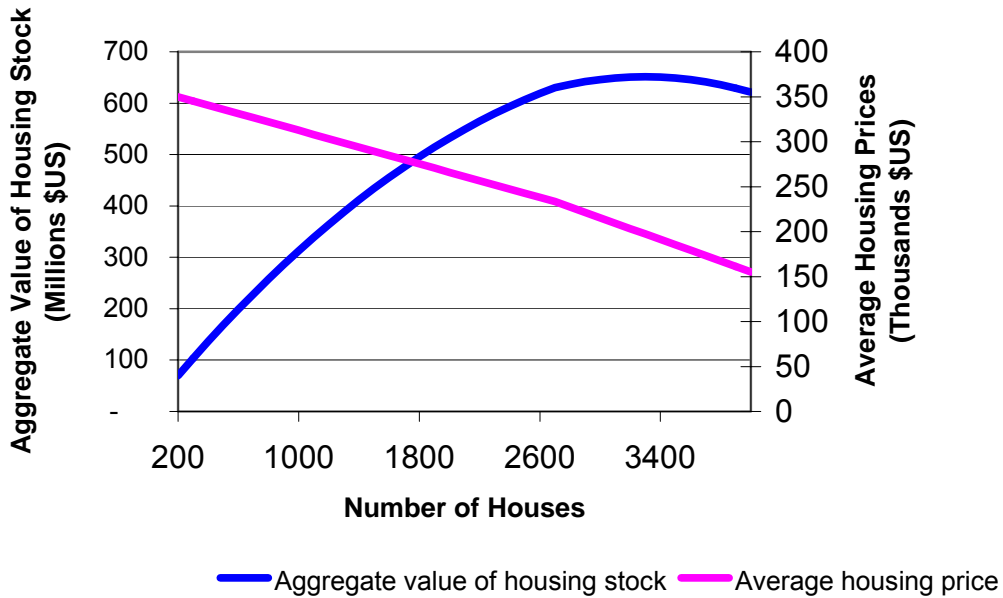
Areas of Conflict

Figure 35 maps the relative attractiveness for development for each location against the ecological and visual value of the landscape. The areas in dark brown indicate areas of conflict: locations of high development pressure and high environmental value. It is these areas where the choices over land use will be both important and contentious. Areas in red could be developed at a low to moderate environmental cost.

Figure 35. Attractiveness for Development and Environmental Quality

CALIDAD AMBIENTAL VS.
ATRACCIÓN PARA DESARROLLO

Alto riesgo y alta atracción
Alto riesgo y atracción moderada
Alto riesgo y baja atracción
Riesgo moderado y alta atracción
Riesgo moderado y atracción moderada
Riesgo moderado y baja atracción
Bajo riesgo y alta atracción
Bajo riesgo y atracción moderada
Bajo riesgo y baja atracción

Carreteras
Arterias principales

N
0   2.5   5   7.5   10 Kilometers

FUTUROS ALTERNATIVOS
LA REGIÓN DE LORETO
B.C.S., MEXICO

Comparing the Scenarios

Figure 36 graphically displays the aggregate performance of each of the Alternative Futures, using summary indices for economic and environmental performance. The socio-economic index is the same as explained earlier. The environmental index is based upon the results of the visual, terrestrial ecology, and marine ecology models. The terrestrial ecology impacts are not as important in Loreto. Therefore the terrestrial ecology indictor is given half the weight of the visual and marine aspects. Moving from the upper left to the lower right implies a trade-off between economic performance and environmental quality. Movements from the lower left to the upper right indicate an improvement in both economic and environmental terms. The distribution of the twenty-five Alternative Futures confirms the strong relationship between environmental and economic outcomes for Loreto. The results also suggest that limiting the amount of growth is essential for Loreto to achieve the best socio-economic and environmental results.

Figure 36. Comparing the Alternative Futures
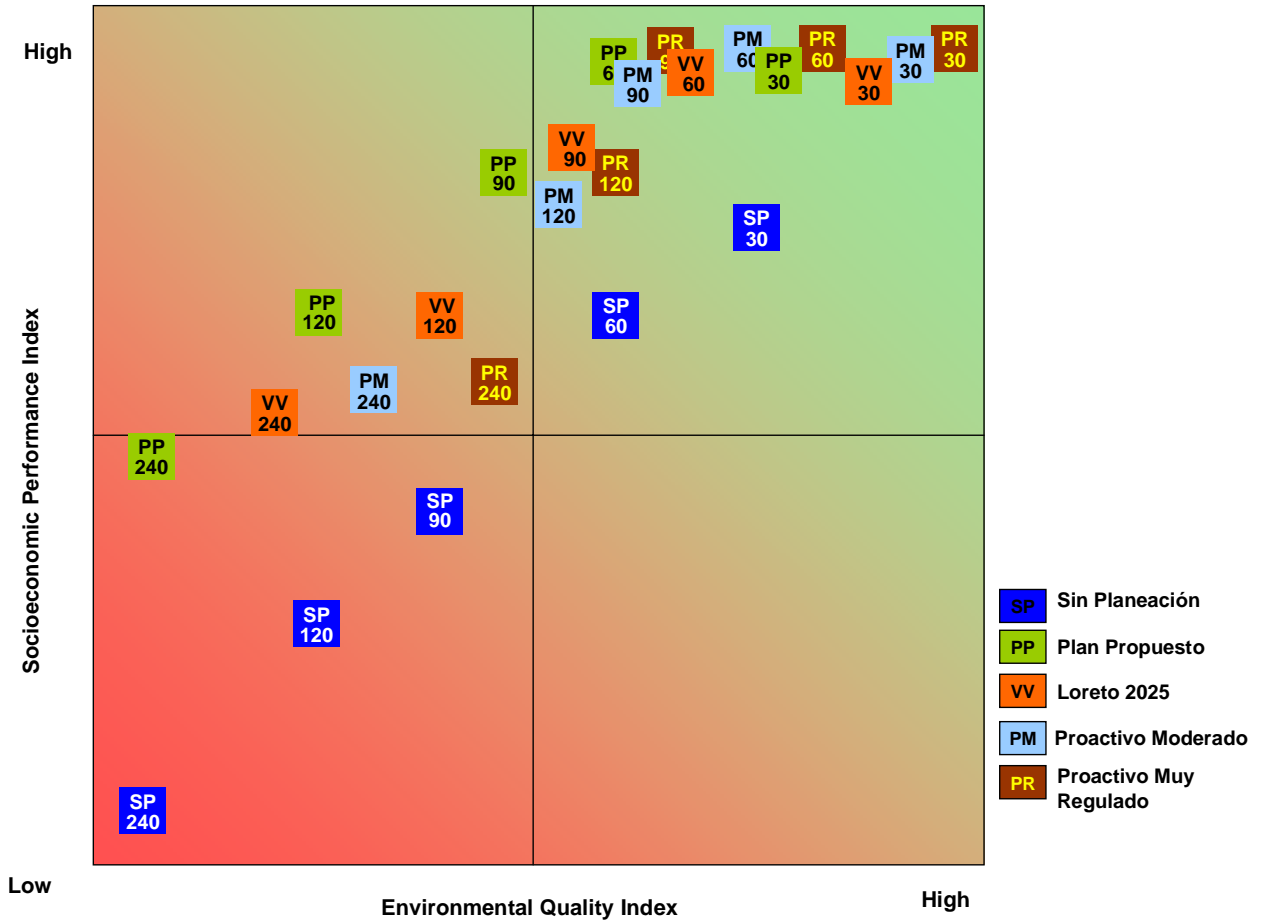
Conclusions

The different spatial plans expressed in the twenty-five Alternative Futures exert a strong influence on the pattern and location of growth. New land use policies and related regulations could have a dramatic influence on the pattern of future land use. The ecological, visual, and marine impacts of the 25 alternatives vary according to the projected new land use pattern. The performance of these factors, in turn, influences the projected economic success for Loreto. This creates a situation in which the environmental and economic outcomes are correlated; if planned for and located properly, economic and environmental outcomes are not in conflict.

A principal conflict in the future of Loreto lies between pursuing actions that entail short-term benefits and the more politically difficult strategy of restricting short-term development in order to maintain more control over medium-term and long-term objectives such as environmental quality and social cohesion. A related conflict will be in defining whether the developable land is opened for private development or set aside in the public interest.

Historically, undeveloped areas surrounding the city of Loreto have supported a high quality of life, a healthy environment, and ample recreational opportunities for the citizens of Loreto. These amenities also attract visitors and support the tourism and real estate sectors of the region. The view of the water, islands, and mountains is one of the public amenities that contribute to the character of Loreto. Permitting private development is essential for economic growth. A key decision for the future of Loreto is to what degree these public amenities may be modified by private development.

Today, Loreto depends on groundwater for its water supply. All the scenarios assessed in this study exhibit the loss of groundwater resources and result in saline intrusion into public wells. In the future, alternative sources of water will need to be developed, with desalinization the only apparent option. The difference in the various scenarios is the point in time in which desalinization will be become necessary for supplying all the fresh water to Loreto. The impacts of desalinization can be considerable, particularly when done without expensive remediation efforts. If steps are not taken to prevent significant damage to marine ecosystems, the provision of water could contribute to an erosion of one the principal attractions and economic assets of the Loreto region: the excellent fishing and marine recreation in the national park.

Degradation of the ecological, visual and recreational landscape may have profound consequences for the future of the tourism and real estate sectors, as well as the quality of life for the residents of Loreto. As the size of Loreto grows, the risk of damaging the economic base for sustaining future growth also increases. The logical response to this situation is to develop the area in carefully controlled stages, rather than opening up the region now to a level of growth that eventually may prove to undermine economic growth and reduce the quality of life in Loreto. This suggests a potentially difficult conflict between the interests of the general public and individual landowners that stand to lose in the short-term if their development rights are curtailed. However, the results of this study also point out the potential losses expected for all – including landowners – if excessive development occurs. This transforms the problem into one of educating the stakeholders on the risks and opportunities, and allocating the development rights in a way that considers both equity and the necessity of incorporating the spatial criteria in deciding land use rights.

The leadership of Loreto is forced to make a decision in the near future in the face of great uncertainty. The responsible course of action in this context is to proceed with a strategy that allows future administrations to adapt the decisions taken today in light of better information. The current administration should not take decisions that are effectively irreversible, and development rights, once granted, cannot easily be rescinded.

VI. How should the landscape be changed?

Loreto must plan and implement an appropriate balance between protecting its valuable ecological, visual, and recreational landscape and promoting growth through private development. Additional land-use related policies must be integrated into the regulatory and planning framework for Loreto.

The most important question, "How should the landscape be changed?", must be answered by the actions of the decision-makers of Loreto. The scenarios used to develop the Alternative Futures are representations of a range of policy decisions that can be made in the near future. Comparison of the Alternative Futures and their impacts allows decision-makers to explore the likely future effects of current policy choices.

As always, political will and public interest will decide the future of Loreto. It is the aim of this study to provide the basis for informed decision-making, in the hope that the future Loreto reflects the values and priorities of its people.

Figure 37. Loreto in 2005

Figure 38. Loreto in 2025 under the Plan Propuesto scenario with a population of 120,000
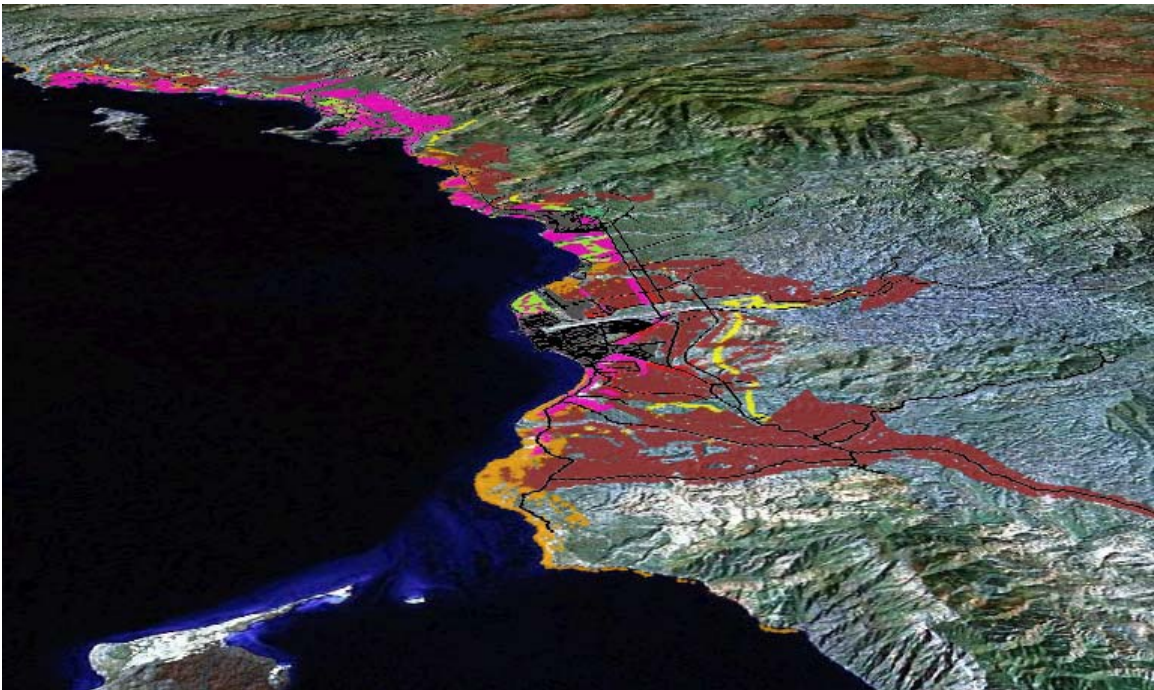
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On-line Resources

Additional materials and a full set of maps will be available at:

www.futurosalternativosloreto.org

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