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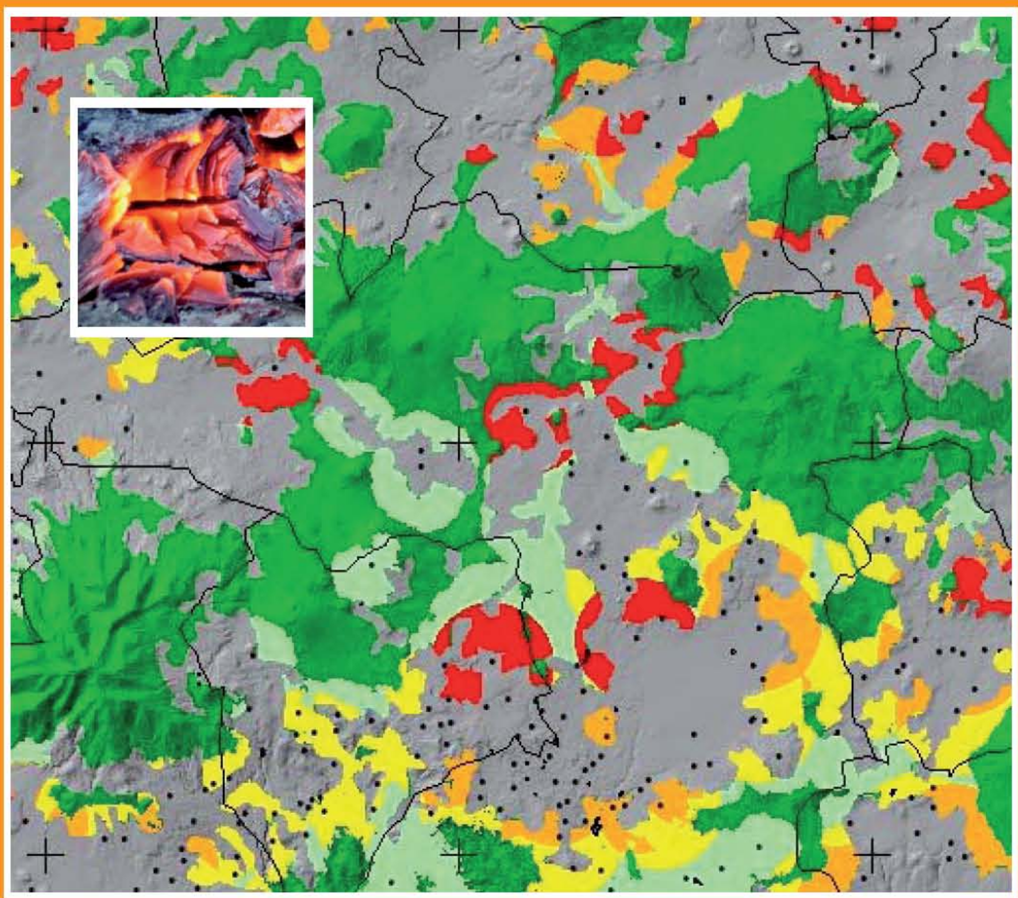
A CASE STUDY USING WISDOM

Woodfuel Integrated Supply-Demand Overview Mapping



FAO Wood Energy Programme

Universidad Nacional Autonoma de Mexico - UNAM
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FUELWOOD "HOT SPOTS" IN MEXICO:

A CASE STUDY USING WISDOM – Woodfuel Integrated Supply-Demand Overview Mapping

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Foreword

A more sustainable use of woodfuels will have a positive impact on the environment and on sustainable forest management and will produce social and economic benefits such as income and employment opportunities to decentralized communities. To this end, the Wood Energy Programme of FAO is broadening and disseminating knowledge and information on wood energy aspects and actively collaborating with member countries in the development and implementation of planning tools supporting wood energy planning and policy formulation.

The most critical limitation in the formulation of wood energy policies commonly pointed out is the lack of reliable information on woodfuel production and consumption, but this is a somewhat misleading perception. The information is poor and contradictory, no doubt, but this is more often the result than the cause of the absence of sectoral policies. In most cases, the problem is not lack of reliable data per se but rather the lack of clear institutional responsibilities and of a comprehensive analytical perspective, which prevents the proper use of the information that exists in the forestry and energy agencies of most countries.

FAO, under the request of the Govermnment of Mexico, funded the project "Wood energy for rural development" (TCP/MEX/4553) which provided a detailed analysis of the wood energy situation in Mexico. As a follow up of this project and in order to promote the adoption of a comprehensive analytical perspective and thus to favor the definition of institutional responsibilities, the Wood Energy Programme of FAO and the Center for Ecosystems Research of the National University of Mexico developed the Woodfuel Integrated Supply / Demand Overview Mapping (WISDOM), a spatially-explicit method for assessing woodfuel sustainability and supporting wood energy planning through the integration and analysis of existing demand- and supply-related information.

In the Mexico study here presented, the analysis was conducted at two different scales: at national scale, in which it allowed the definition of priority areas or fuelwood "hot spots", and at sub-national scale in the "Purhepecha" Region (one of the priority regions), where it allowed the definition of different pressure zones according to accessibility aspects. In this multi-scale analysis WISDOM expressed its potential as national strategic planning tool as well as operational tool for sub-national planning.

The results of the Mexico study - in terms of the identification of priority areas or fuelwood "hot spots"- have been incorporated by the National Forestry Commission, which plans to launch a program of efficient woodburning cookstoves and multi-purpose energy plantations directed to those areas.

In addition to the Mexico case, the WISDOM approach has been so far implemented in Senegal and Slovenia. Confronted with very diverse contexts, WISDOM has proved to be flexible and adaptable, always able to consolidate fragmented knowledge and to produce clear perceptions of woodfuel production/consumption patterns. It is interesting to note that the priorities identified in the three cases are very different. In Mexico the critical aspect is the sustainability and access of fuelwood supply sources in specific users' contexts (fuelwood "hot spots"); in Senegal the main issue is the trend in charcoal consumption in rural villages. Finally, in Slovenia the definition of biomass resources available for energy purposes and the socioeconomic constraints that limit the access to such resources are the most relevant aspects. In each case, the analysis was based on the integration of information already existing in the countries, which shows also the cost-efficiency of the WISDOM approach.

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Summary

Adequately understanding the environmental and socio-economic implications of the current patterns of woodfuels production and use and their resource potentials is a critical task for promoting the sustainability of these energy sources. The inherent site specificity of woodfuel situations challenges conventional energy planning methods based on aggregate information, and require to coherently and efficiently articulate the local heterogeneity into the national or regional level. Multi-scale spatially-explicit approaches have much to offer for achieving this latter task.

This study uses the Woodfuel Integrated Supply/Demand Overview Mapping (WISDOM) methodology to identify woodfuel priority areas or household fuelwood "hot spots" in Mexico. WISDOM is a spatially-explicit method oriented to support strategic planning and policy formulation through the integration and analysis of existing demand and supply related information and indicators. In the present report, Mexican *municipios* (first sub-state administrative unit) are categorized into five priority groups. Further analysis at a higher resolution is conducted using accessibility to forests and fuelwood user's densities, over the Purhepecha Region of Michoacan State to preliminary identify concrete areas for project implementation.

The WISDOM analysis confirmed the high heterogeneity of fuelwood situations within Mexico, allowing the identification of 262 high-priority *municipios*, out of a country total of 2,401. *Municipios* were ranked based on the number of fuelwood users; the percentage of households that use fuelwood; the density and growth of fuelwood users; the resilience of fuelwood consumption, and the magnitude of woodfuel forest resources.

The spatially-explicit accessibility analysis conducted over the Purhepecha Region shows that 40% of the forest area is actually accessible to fuelwood gatherers at one hour distance (round trip) from their homes. This portion rises to 80% when considering a walking round trip of two hours. Approximately 13% of the accessible forests are estimated to suffer the highest pressure from fuelwood harvesting due to their proximity to more populous settlements.

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Acknowledgments

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1. Introduction

The large and widespread utilization of woodfuels is associated to a host of environmental and socioeconomic impacts and benefits. For example, by creating local employment and income, the use of woodfuels supports rural development; also, when harvested sustainably, woodfuels allow the mitigation of greenhouse gas emissions. On the other hand, the indoor air pollution caused by smoky traditional stoves or the degradation of forests from intensive fuelwood harvesting are clear examples of negative impacts. The precise magnitude and likely trends of these impacts has been a controversial issue since the mid 1970`s, when fuelwood became a major item on the developing countries energy agenda. For example, regarding environmental impacts, widely cited studies still argue that woodfuel extraction is a major cause of deforestation and environmental degradation (Goldemberg & Johansson, 1995), while others state that the environmental impacts of fuelwood use are minor and circumscribed to specific locations (Del Amo, 2002).

The research conducted in the last decade, including comprehensive field studies and projects have shown that woodfuels demand and supply patterns are very site specific (Leach & Mearns, 1988; Arnold et al., 2003). Recognizing the site specificity of woodfuel use associated impacts has shifted the early thinking of a general fuelwood crisis to the understanding that critical areas vary from area to area (Arnold et al., 2003; Mahapatra & Mitchell, 1999; RWEDP, 1997 and 2000). Even in regions with an overall negative woodfuel demand/supply balance, not all the places face woodfuel scarcity, and, similarly, regions with overall positive balance may include deficit areas with serious impacts on natural resources (RWEDP, 2000).

However, no clear guidance has been developed so far that helps identifying these critical areas without having to rely on very expensive local fuelwood surveys. The problem is that national-level data are too aggregated to provide the sense of local variance, while local studies are too fragmented and discontinuous to convey the general picture. Also, obtaining exact measures of woodfuel deficits at the national level (i.e., like the studies conducted using the traditional fuelwood gap model (De Montalambert & Clement, 1983; Newcombe, 1984)) presents severe methodological and financial challenges, particularly considering the scarce resources normally allocated to this specific sector (ESMAP, 2001).

There is an urgent need for spatial explicit approaches that help in strategic planning and that follow a hierarchical analysis through multiple spatial scales: first identifying priority areas at the country level, and second, within each priority area, helping identify critical sites for the implementation of projects. In this manner, resources can be used more efficiently and policies can be more effectively directed and tailored to the specific characteristics of the sites.

To face these challenges, the Centre for Ecosystems Research (CIECO) of the National University of Mexico (UNAM), in cooperation with the Food and Agriculture Organization of the United Nations (FAO), has developed the Woodfuel Integrated Supply/Demand Overview Mapping (WISDOM) (Masera *et al.*, 2003), a spatially explicit method for identifying woodfuel priority areas or "hot spots". WISDOM is based on geographic information system (GIS) technology, which offers new possibilities for integrating statistical information about production and consumption of woodfuels. WISDOM attempts to integrate existing information at different geographic scales and reduce the collection of costly new data.

In this article we apply the WISDOM approach to Mexico. Subsequently we explore the possibility of identifying concrete areas for intervention at the project level, based on an accessibility analysis within the Purhepecha Region of Michoacan State.

2. The WISDOM approach [1]

Assessing and strategic planning tool

The Woodfuel Integrated Supply/Demand Overview Mapping (WISDOM) is a spatial-explicit planning tool for highlighting and determining **woodfuel priority areas** or **woodfuel hot spots** (Masera, Drigo and Trossero, 2003). We recognize that woodfuels are connected to a set of interrelated environmental and socio-economic issues, and thus woodfuel hot spots can be defined in terms of its relevance for consumption patterns, production, and potential environmental impacts.

Woodfuel hot spots can be thus established according to a number of criteria set by the users. For example, in identifying areas with potential large social impacts, zoning can be done according to the number and density of woodfuel users and the scarcity of woodfuel resources. Studies looking at potential degradation caused by woodfuels use, will try to identify regions where woodfuel consumption is high, resilient, and increasing, where woodfuel supply is at risk, due to loss or degradation of natural vegetation, and where the demand-supply balance indicates a deficit or is likely to develop such condition in the near future.

WISDOM will not replace a detailed national biomass demand/supply balance analysis for operational planning but rather it is oriented to support a higher level of planning, i.e. strategic planning and policy formulation, through the integration and analysis of existing demand and supply related information and indicators. More than absolute and quantitative data, WISDOM is meant to provide relative/qualitative values such as risk zoning or criticality ranking, highlighting, at the highest possible spatial detail, the areas deserving urgent attention and, if needed, additional data collection. In other words, WISDOM should serve as an ASSESSING and STRATEGIC PLANNING tool to identify priority places for action.

WISDOM is based on:

- **Geo-referenced data bases**. A core feature of the approach is the spatial base on which the data is framed. The analysis and presentation of results for all modules is done with the help of a Geographic Information System (GIS).
- **Minimum spatial unit of analysis at sub-national level**. The spatial resolution is defined at the beginning of the study, on the basis of the wanted level of detail (national study, regional study) and as constrained by the main parameters or proxy variables that will be used to "spatialize" the information. In most cases the existing demographic data, such as census units, and land use/land cover data represent the main reference for the definition of the spatial base, which will be in all circumstances sub-national and preferably below state level.
- **Modular and open structure**. WISDOM consists of three basic modules: a demand module, a supply module, and an integration module. The first two modules require different competencies and data sources. Once the common spatial base of reporting is defined, each module is developed in total autonomy using existing information and analytical tools and is directed to the collection,

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[1] This section presents a short summary of the WISDOM approach; refer to Masera, Drigo and Trossero (2003) for a complete description of the methodology.

harmonization, cross-referencing and geo-referencing of relevant information existing for the area of study.

- **Adaptable framework.** As mentioned before, the information of relevance to wood energy comes from multiple sources and is often fragmented and poorly documented, ranging from census data to local pilot studies or surveys, to projected estimates with unknown sources. Proxy variables may be used to "spatialize" discontinuous values. In synthesis, WISDOM tries to make all existing knowledge at work for a better understanding of woodfuel consumption and supply patterns.

The benefits of the WISDOM approach include:

- It provides a consistent and **holistic vision** of the wood energy sector over the entire country or region and helps to determine **priority areas** for intervention.
- It constitutes an **open framework** and a **flexible tool** meant to adapt to existing information related to woodfuels demand and supply patterns.
- It allows the **definition of critical data gaps** resulting from the thorough review and harmonization of wood energy data.
- It **promotes cooperation and synergies** among stakeholders and institutions (Forestry, Agricultural, Energy, Rural development, etc.). In this, WISDOM will combat the fragmentation (of information, of responsibility) that so heavily limits the development of the sector.
- It allows to concentrate the actions on **circumscribed targets** and thus to optimize the use of available resources (human, institutional, financial, etc.) [2]
- It enhances the **political recognition** of the real inter-sectoral role and priorities of the wood energy by policy makers.

WISDOM steps

The use of WISDOM involves five main steps (See Figure 1):

1. Definition of the minimum administrative spatial unit of analysis
2. Development of the DEMAND module
3. Development of the SUPPLY module
4. Development of the INTEGRATION module
5. Selection of the PRIORITY areas or "woodfuel hot spots"

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[2] One of such actions would likely be the collection of up-to-date local data to confirm the results of national or regional analyses (which are always based on information of lower quality and resolution), and to build-up an information base for operational planning.

A detailed description of the WISDOM approach can be found in Masera, Drigo and Trossero, (2003). Below we give a short description of the different steps of the analysis.

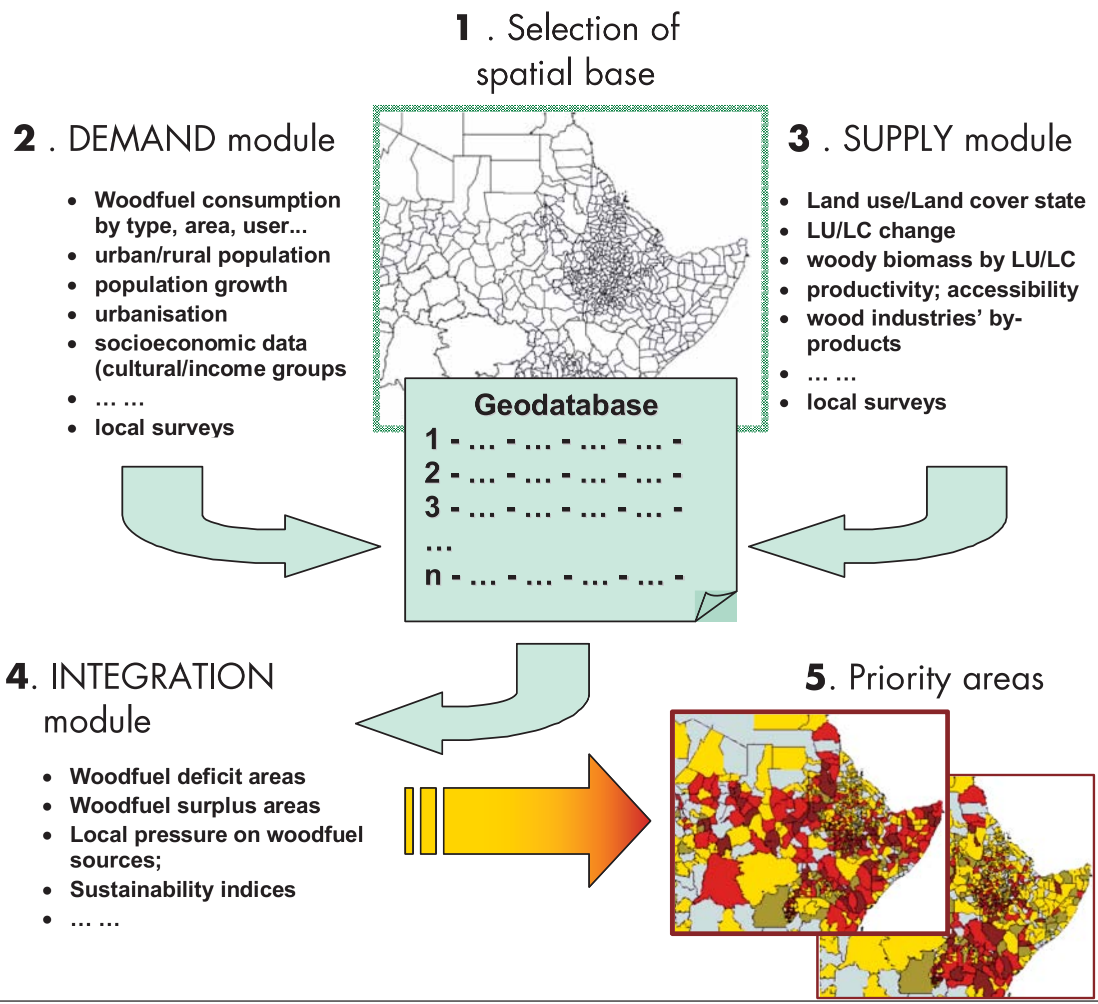


Figure 1. WISDOM Steps

1. Definition of the minimum administrative spatial unit of analysis

The analysis should be carried out at the lowest administrative level for which demographic, social and economic parameters are available. In this step, spatial and statistical data are linked through a "map attribute table", which has a database structure and contains the basic geographic attributes and identifiers of all individual elements of the digital map (identity codes and names, area, perimeter, coordinates, etc.). The table can be expanded as needed by the addition of thematic attributes referring to the same set of map elements.

2. Development of the DEMAND module

The main challenge of this module is to find either direct or proxy variables, available at the minimum sub-national unit selected, that can be used to estimate consumption levels and their spatial distribution. These variables should be disaggregated, if possible, by fuel type (fuelwood, charcoal, others), by sector of users (households, industrial, others) and by area (rural, urban), since each has a particular impact on sources and sustainability of supply, calling for separate lines of analysis.

3. Development of the SUPPLY module

This module provides a spatial representation of all woodfuel sources, their stocking capacity, their change over time, and their productivity. The main, and often the only, sources of information for developing this module are national forest inventories. A weak point of these data sources is that they do not differentiate woodfuels from other types of commercial or usable timber, overestimating the real woodfuel supply. Moreover, inferred data based on detailed surveys might be used regarding non forest land use classes, as forest inventories do not cover these areas. As mentioned earlier, the scope of WISDOM is not operational planning, for which quantitative precision is essential. Thus, with the scope of identifying priority areas where the demand-supply balance reveals a possible deficit, the supply module may concentrate mainly on land use and land use change, and may use indicative biomass productivity indices based on ecological characteristics.

4. Development of the INTEGRATION module

This module is used to integrate the information from the demand and supply modules. The integration is done through the combination of the variables related to woodfuel consumption and supply that have been systematized for each minimum administrative unit of analysis.

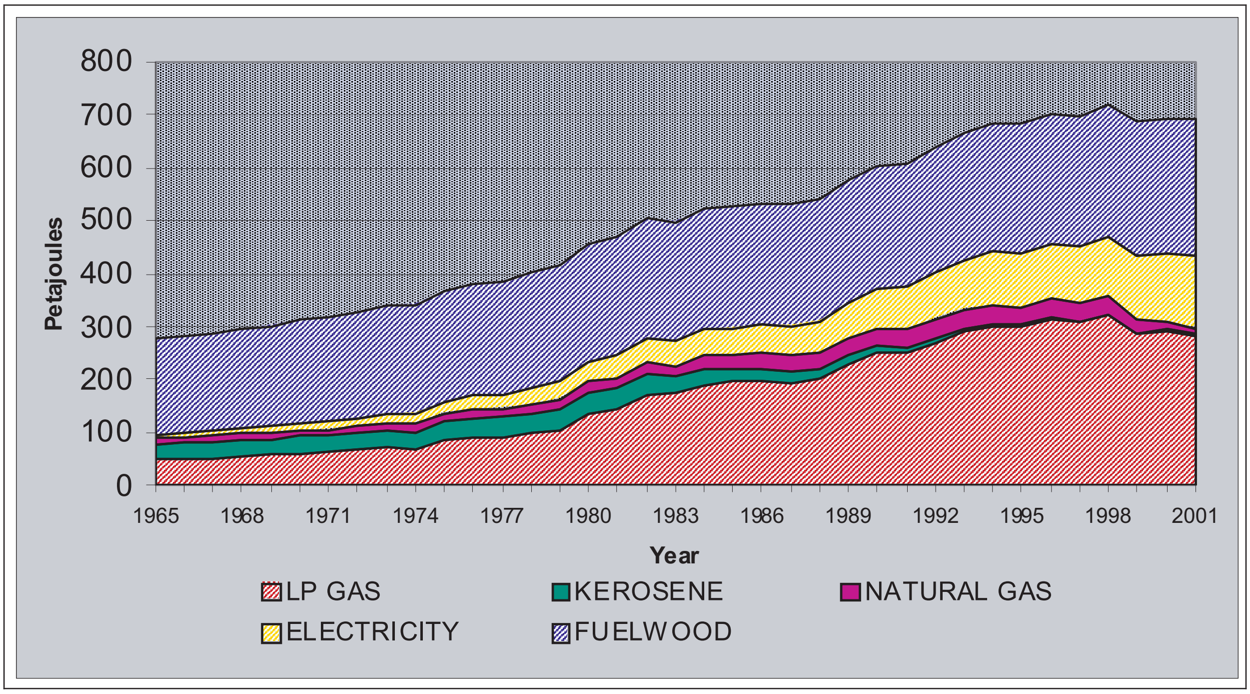
5. Selection of the PRIORITY areas or "woodfuel hot spots"

The last step of the methodology is the identification of those areas where action, or further investigation, is needed. This final objective may be achieved either by multivariate statistical procedures or by grouping some selected variables form the three modules into an overall index (Fuelwood Priority Index) which allows the priorization of each minimum administrative unit in terms of woodfuel demand, supply or both.

3. Identifying fuelwood "hot spots" at the national level

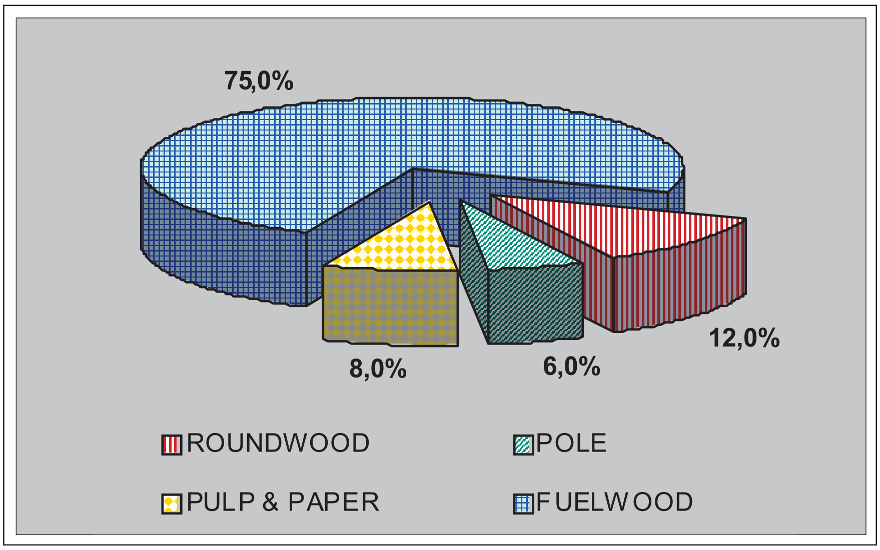
Mexico's current pattern of woodfuel use

Biofuels represent about 9% of total energy demand in Mexico, while fuelwood accounts for 37% of residential energy use (SENER, 2001) (Figure 2), and more than 80% of the energy demand in the rural sector (Masera, 1996b). The three main types of biofuels used in the country are: bagasse, which is used in the sugar cane industry, fuelwood and charcoal. Fuelwood is, by far, the dominant woodfuel, with charcoal being used mostly in food industries and for barbecues. Total fuelwood use accounts for three times the total commercial timber legally harvested in the country (Figure 3) (Masera 1996a).



Source: Secretaría de Energía del Gobierno de Mexico (SENER): National Energy Balance.
http://www.energia.gob.mx/work/secciones/192/imagenes/cons_res_com_pub.xls

Figure 2. Mexico's energy consumption in the residential sector (1965 - 2001)



Source: Masera (1996a)

Figure 3. Share of fuelwood on total wood demand in Mexico

Mexico fuelwood demand is concentrated on rural areas and small towns, and comes mostly from households. Approximately one out of four inhabitants (25 million people) uses fuelwood for cooking (Masera, 1996b). Fuelwood is also used in many small (cottage) industries, like pottery making, "tortilla" making, brick making, and several others; this demand is important within specific regions. Fuelwood is either collected or bought from local markets and comes from commercial and non commercial forest areas (including here all degraded lands and semi-arid forests), little from agricultural areas. Many of the species used are of no commercial value. The use of agricultural residues and dung is not widespread. (Masera, 1996a; Masera *et al*, 1997).

The patterns of fuelwood use are extremely diverse, with a high heterogeneity in terms of saturation and growth of users and potential environmental impacts across the country. Still critically lacking are studies that show the spatial patterns of fuelwood use, availability of woodfuel resources, and the identification of "woodfuel hot spots". The undertaking of WISDOM was thus a needed exercise.

WISDOM analysis for Mexico

The objective for conducting a WISDOM analysis for Mexico was to identify fuelwood priority areas or "hot spots" for the year 2000 at the national level. "Hot spots" are defined as those areas showing a high number of exclusive[3] fuelwood users; a high density and growth of exclusive fuelwood users at the

[3] The INEGI census does not distinguish mixed fuel users (i.e. users of fuelwood and LP gas), although they represent a significant percentage of total fuelwood users (31% in 1990 (Díaz, 2000)). As there is no reliable direct estimate of this group of users, this study accounts for the exclusive fuelwood users alone. Some underestimation of fuelwood demand should then be expected.

household level; a high percentage of houses that exclusively use fuelwood; a high resilience of fuelwood consumption (resistance to change to other fuels in terms of social and cultural aspects); and few or insufficient woodfuel resources from forests. Table 1 shows the main premises for the WISDOM case study in Mexico.

Table 1. Main characteristics of the case study in Mexico

Main features of woodfuel use in Mexico	▶ The demand for woodfuels is concentrated on fuelwood. ▶ Most demand comes from households. ▶ The majority of fuelwood comes from forest areas, relatively little from agricultural areas. ▶ The use of agricultural residues and dung is not widespread.
Objective and scope of the analysis	▶ To determine fuelwood "hot spots" in the country for the year 2000. ▶ The analysis focused on fuelwood, households and fuelwood exclusive users.
Minimum Administrative Spatial Unit of Analysis	▶ The unit chosen was the *Municipio* (county). The country had by the year 2000 a total of 2,436 *municipios* .
Demand Module	The two main sources for the development of the module were: ▶ The National Population Census 1990/2000. ▶ A comprehensive collection of local/regional/national surveys on energy use in the household sector.
Supply Module	▶ The basis of the module is the National Forest Inventory 2000, which was conducted at a 1/250,000 scale over the whole country. The original 69 Land-use land-cover classes were aggregated into seven major classes (Velázquez *et al.*, 2001). Average biomass productivities were assumed for each LU/LC class.
Integration Module and GIS system	▶ A GIS was created using an ArcGIS platform. ▶ The GIS database includes information on fuelwood demand and supply for each of the 2,436 *municipios* in the country. ▶ A new variable called "fuelwood balance" was created integrating supply and demand variables.
Priority zoning	▶ A set of six uncorrelated variables was selected. *Municipios* were grouped into five main categories: high; mid-high; mid; mid-low; and low. (e.g., high consumption, mid-high consumption, and so on), for each variable. ▶ A simple indexing of all the six variables and a further grouping was conducted to rank *municipios* into five categories or classes of priority.

STEP 1: Determining the minimum spatial unit of analysis: the "municipio"

The municipio (county) was selected as the minimum administrative unit of analysis for conducting the WISDOM (Figure 4). A geo-referenced data base that covers the whole country and is articulated into the state and national level is available from the Mexican National Bureau of Statistics (INEGI). A total of 2,436 units were identified and incorporated into a GIS. For each unit, basic information such as: coordinates, area, and perimeter are available. However, there are gaps in relevant data for some municipios due mainly to geostatistical changes at the bureaucratic level: new municipios are created frequently (INAFED, 2002). This usually leads to inconsistencies of the census data with these new municipios. For calculating some variables, (e.g. discrete average annual growth rate of exclusive fuelwood users population (1990-2000) only those municipios that could be tracked all the way during the twenty year period were used.

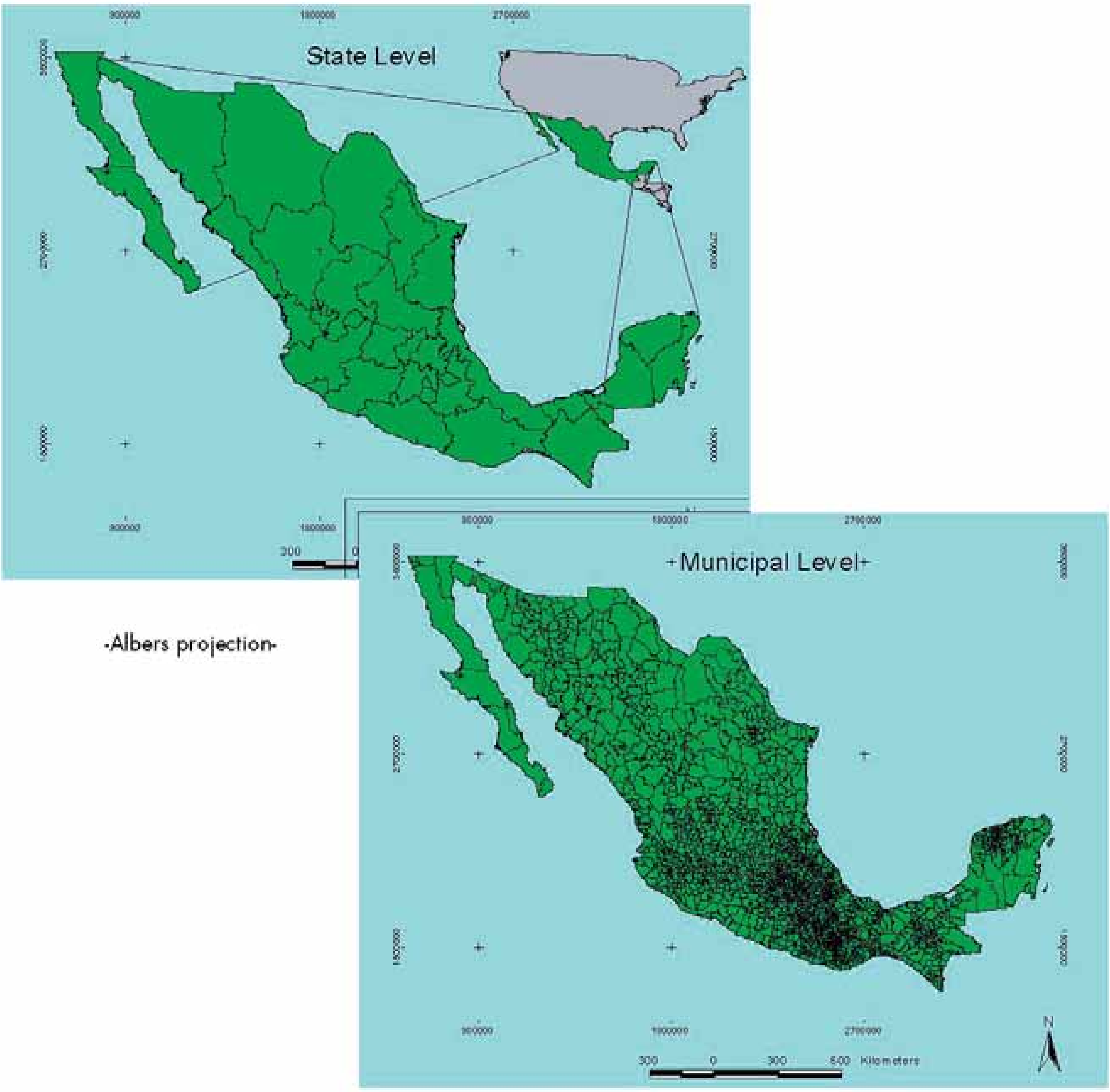


Figure 4. Spatial administrative units within Mexico

STEP 2: Development of the DEMAND module

The INEGI census (currently available electronically at the *municipio* level)[4] was used as the basic source of information for the module. The census includes general socio-demographic variables as well as variables related to the quality of living of the Mexican population. The average per capita fuelwood consumption by major ecological zone was estimated based on local surveys (Díaz, 2000)[5]. Besides these two sources of information new variables were calculated for the completion of the demand module (Table 2).

Table 2. Variables used in the demand module

Original Variables from the Census (1980/1990/2000)	▶ Population (urban, rural, total). ▶ Total number of households. ▶ Number of households that use exclusively fuelwood. ▶ Number of exclusive fuelwood users. ▶ Percentage of population belonging to an ethnic group. ▶ Socioeconomic index.
Original Parameters from Surveys	▶ Average per capita fuelwood consumption by major ecological zone (temperate, tropical dry, tropical humid, semi-arid and wetlands).
New variables calculated	▶ **Density of fuelwood users (A)** (exclusive fuelwood users per km^2, using the total municipality area). ▶ Density of fuelwood users (B) (exclusive fuelwood users per km^2, using the forest municipality area). ▶ Average annual growth rate of exclusive fuelwood users (1990-2000). ▶ **Saturation of fuelwood users** (percentage of exclusive fuelwood household users). ▶ Annual fuelwood consumption (estimated as per capita fuelwood consumption times number of exclusive fuelwood users). ▶ Annual fuelwood consumption coming from forests (estimated as per capita fuelwood consumption coming from forest times number of exclusive fuelwood users).

Note: All these variables are disaggregated at the *municipio* level. In bold are the variables selected for the determination of "woodfuel hot spots".

As appears in Table 2, the amount of fuelwood that is harvested within forest areas (annual fuelwood consumption coming from forest areas) was calculated as the total fuelwood demand minus the proportion of fuelwood coming from non-forest areas. This last factor was obtained from local surveys conducted over the different ecological zones (temperate, tropical humid, tropical dry, semi arid and wetlands). For tropical regions of Mexico for example, about 20% of fuelwood consumption comes from non forest areas, which may include farmland trees, abandoned or regrowth areas due to shifting cultivation practices, and

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[4] Mexican National Bureau of Statistics (INEGI), http://www.inegi.gob.mx

[5] This paper gives a compilation of data from several local surveys conducted within Mexico.

other places. More detailed surveys covering all the ecological zones need to be conducted in order to obtain a more precise estimate of these proportions.

Table 3. Average per capita fuelwood consumption coming from forest areas.

Major Ecological Zone	Per capita biofuel consumption kg/cap/day **(A)**	Per capita fuelwood consumption* kg/cap/day **(B)**	Percentage of fuelwood consumption coming from forest areas **(C)**	Per capita fuelwood consumption coming from forest areas kg/cap/day (B * C)
Temperate	2.0	1.98	82%	1.62
Tropical Dry	2.5	2.47	68%	1.68
Tropical Humid	3.0	2.97	82%	2.44
Semiarid	1.5	1.48	80%	1.12
Wetlands	2.5	2.47	80%	1.98

Source: Own estimates based on a review of existing studies. See Díaz (2000) for a comprehensive review of case studies and surveys in Mexico.
* Non-fuelwood consumption is represented mainly by crop field residues and dung, estimated here as 1% of total biomass fuel consumption (A * 1% = B). All the agro industrial by-products (i.e. residues produced in the processing, like sugar-cane bagasse; coconut shells, etc.) are used as fuel almost exclusively by industries but not by households.

STEP 3: Construction of the SUPPLY module

The supply module was based on the cartography derived from the latest Mexican National Forest Inventory (Palacio *et al.*, 2000). It was conducted over a period of a year and was based upon data from INEGI and Landsat ETM-7 imagery. The procedure followed the interdependent interpretation method (FAO, 1996), which chiefly includes visual up-dating of the classes modified between the reference data base (Serie II) and the current image (Landsat ETM-7 from 2000). The legend is hierarchical with four levels, namely, vegetation formations, vegetation types, vegetation communities and vegetation sub-communities, giving a total of 75 classes (Velázquez *et al.*, 2001). The inventory was subjected to a reliability assessment with the aid of digital aerial photography (scale ±1:15,000) (Mas *et al.*, 2001).

For the purpose of the present work, a simplified legend was derived with the following general LC/LU vegetation classes: 1) agriculture/pasture; 2) urban areas; 3) and 4) temperate forests (primary and secondary); 5) lakes; 6) scrublands; 7) mangroves; 8) other vegetation; 9) and 10) tropical deciduous forests (primary and secondary); 10) and 11) tropical evergreen forests (primary and secondary). Table 4 shows the detailed description of the original LU/LC incorporated into the more general classification used in our analysis and Figure 5 shows the vegetation map for Mexico.

Table 4. Land use and land cover classes used in the Mexican case study

Formation	Vegetation Types	Simplified legend for the present analysis
Temperate forest	Conifers	Temperate Primary Forests
	Conifers & broad-leaved	
	Broad-leaved	
	Mountain cloud forest	
	Conifers (with herbaceous and shrubby secondary vegetation)	Temperate Secondary Forests
	Conifers & broad-leaved (with herbaceous and shrubby secondary vegetation)	
	Broad-leaved (with herbaceous and shrubby secondary vegetation)	
	Mountain cloud forest (with herbaceous and shrubby secondary vegetation)	
Tropical forest	Perennial & sub-perennial rainforest	Tropical Evergreen Primary Forests
	Perennial & sub-perennial rainforest (with herbaceous and shrubby secondary vegetation)	Tropical Evergreen Secondary Forests
	Deciduous & sub-deciduous forests	Tropical Deciduous Primary Forests
	Deciduous & sub-deciduous forests (with herbaceous and shrubby secondary vegetation)	Tropical Deciduous Secondary Forests
Scrubland	"Mezquital"	Scrubland
	Xerophytic scrubland	
Hygrophilous vegetation	Hygrophilous vegetation	Mangroves
Other vegetation types	Other vegetation types	Other vegetation types
Man made grassland	Cultivated grassland	Agriculture/Pasture
	Induced grassland	
Natural open grassland	Alpine grassland and Natural grassland	Other vegetation types
Cropland	Cropland (irrigation & humid)	Agriculture/Pasture
	Cropland (rainfed)	
	Forest cropland	
	Open grassland	
Other coverage types	Human settlements	Urban areas
	Water reservoir	Lakes

Adapted from Velázquez *et al.* (2001).

Figure 5. Simplified vegetation map for Mexico, 2000

To estimate the total woody biomass production from Mexican forests, average biomass productivities (in ton/ha/yr) for each of the major forest types was assumed and incorporated into the supply module (Table 5). Figure 6 shows the distribution of the resulting biomass forest productivities within the country. A more detailed analysis of forest productivities, for example, using climate and soil conditions will be needed for a more accurate estimate of total biomass production at the *municipio* level.

Table 5. Average aboveground biomass production by main forest type

Forest Type	ton/ha/yr
Temperate Primary forests	3.0
Temperate Secondary forests	2.0
Tropical Primary Evergreen forests	5.0
Tropical Secondary Evergreen forests	5.0
Tropical Primary Deciduous rainforests	4.0
Tropical Secondary Deciduous forests	4.0
Mangroves	5.0
Scrublands	1.5
Other vegetation types	1.5

Source: Own estimates based on a comprehensive review of literature.

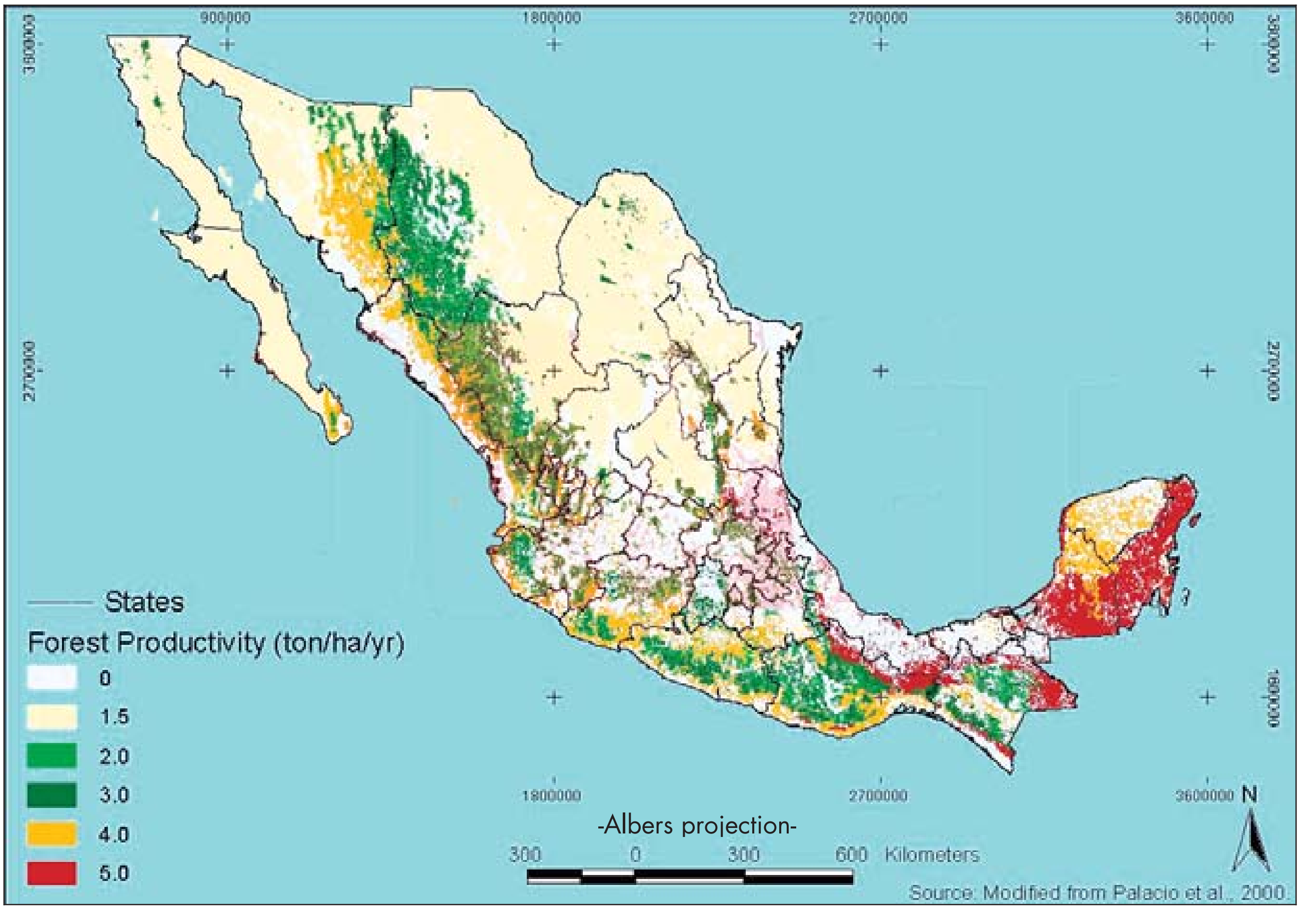

Figure 6. Assumed biomass productivities for Mexican forests, 2000

Table 6 shows the different variables used to construct the woodfuel supply module.

Table 6. Variables used in the supply module

Variables	Description
Original Variables from the National Forest Inventory (2000)	Area by each LU/LC class (ha).
Original Parameters from Surveys	Total aboveground biomass productivity by forest class (ton/ha/yr).
New variables calculated	Total forest area (ha); includes temperate, tropical, scrubs, mangroves and other forests. Aboveground biomass production from forests (ton/yr).

Note: All these variables are disaggregated at the *municipio* level. None of these variables were selected for the determination of "woodfuel hot spots". See the Integration Module.

STEP 4: Integration module

The information gathered in the supply and demand modules was combined to get a series of new variables, or indicators. This procedure was done iteratively during the development of WISDOM, as some demand variables depend on variables from the supply module (e.g., per capita fuelwood use) and vice versa.

Two main integrated variables of interest at the *municipio* level derived were:

- **Fuelwood Balance** (forest biomass productivity - fuelwood demand coming from forests) in ton/yr.
- **Pressure on Forest Resources** (fuelwood demand coming from forests / total forest area) in ton/ha/yr.

Only the Fuelwood Balance was selected for the determination of "woodfuel hot spots".

STEP 5: Identification of Mexican fuelwood "hot spots" at the municipio *level*

The last step of the analysis was the determination of the fuelwood "hot spots". Four main sub-steps were necessary for achieving this task:

1. Selection of a robust set of variables associated to fuelwood consumption and supply by *municipio* to be used in setting priority municipalities.
2. Ranking of *municipios* in 5 groups in terms of each of the individual variables.
3. Construction of an integrated fuelwood priority index by *municipio* (FPI).
4. Ranking of *municipios* in 5 groups according to the FPI.

1) Selection of a final set of variables

A correlation matrix was built with the different potential variables associated to the demand and supply of fuelwood. The matrix and the subsequent analysis allowed the selection of a smaller set of uncorrelated variables for the setting of a priority ranking of municipalities within the country. The objective of the priority ranking was to find municipalities that show high fuelwood demand, high density and growth of fuelwood users, resistance to change to other fuels (due to social and cultural aspects), and few or insufficient woodfuel resources. It was clear from the analysis that several variables were closely correlated. For example, there was a close correlation between fuelwood consumption and fuelwood users and between the income level and the saturation of fuelwood users. Table 7 shows the correlation analysis.

Based on this statistical analysis a final set was chosen with the following six uncorrelated, or loosely correlated, variables:

- Total number of exclusive fuelwood users.
- User density (number of exclusive fuelwood users / total municipality area).
- Discrete annual growth rate of exclusive fuelwood users (1990-2000).
- Saturation of fuelwood users (proportion of households that use exclusively fuelwood).
- Percentage of people belonging to an ethnic group.
- Fuelwood balance (total forest productivity - annual fuelwood consumption coming from forest areas).

2) Grouping of *municipios* for each variable

For each of the variables selected, *municipios* were grouped and ranked into 5 categories, reflecting the acuteness (or priority) of the problem. The ranking was done by dividing each of the six selected variables in five intervals or "natural groups":

Group 1 = low priority

Group 2 = mid-low priority

Group 3 = medium priority

Group 4 = mid-high priority

Group 5 = high priority

The thresholds for defining each group are shown in Table 8. For example, regarding the proportion of fuelwood users, low priority municipalities are those with low saturation and high priority those showing high saturation of users (Table 8 and Figure 10). Each index might be used independently when considering or aiming at highlighting different situations.

Table 7. Correlation coefficients for the full set of fuelwood related variables

Correlation coefficients
Marked correlations are significant at p < .05000
N=2401 (Casewise deletion of missing data)

Variable	Income Level	Number of Exclusive Fuelwood Users	User Density (A)	User Density (B)	Growth Rate of Fuelwood Users	Annual fuelwood Consumption Coming From Forest	Saturation of Fuelwood Users	% Indigenous Population	Fuelwood Balance	Pressure on Forest
Income Level	1	-0.14	-0.22	0.04	-0.24	-0.15	-0.84	-0.50	0.15	0.03
Number of Exclusive Fuelwood Users	-0.14	1	0.17	-0.01	0.25	0.97	0.13	0.07	0.05	-0.01
User Density (A)	-0.22	0.17	1	0.11	0.14	0.18	0.25	0.29	-0.15	0.06
User Density (B)	0.04	-0.01	0.11	1	0.02	-0.02	-0.02	-0.01	-0.02	0.98
Growth Rate of Fuelwood Users	-0.24	0.25	0.14	0.02	1	0.25	0.32	0.21	-0.08	0.02
Annual Fuelwood Consumption Coming From Forest	-0.15	0.97	0.18	-0.02	0.25	1	0.15	0.10	0.04	-0.01
Saturation of Fuelwood Users	-0.84	0.13	0.25	-0.02	0.32	0.15	1	0.64	-0.14	-0.02
% Indigenous Population	-0.50	0.07	0.29	-0.01	0.21	0.10	0.64	1	-0.10	-0.01
Fuelwood Balance	0.15	0.05	-0.15	-0.02	-0.08	0.04	-0.14	-0.10	1	-0.01
Pressure on Forest	0.03	-0.01	0.06	0.98	0.02	-0.01	-0.02	-0.01	-0.01	1

Note: In red are those coefficients that are statistically significant at 95% confidence level.

Table 8. Variables selected and threshold values for the construction of the indexes

Index	Variable associated	**Threshold values** used in the construction of the index
I 1	Number of exclusive fuelwood users.	1. <2,000 2. 2,000 to 4,000 3. 4,000 to 7,000 4. 7,000 to 15,000 5. >15,000
I 2	User density (number of exclusive fuelwood users / total municipality area)	1. < 0.07 2. 0.07 to 0.15 3. 0.15 to 0.3 4. 0.3 to 0.6 5. >0.6
I 3	Annual growth rate of exclusive fuelwood users (1990-2000)	1. <-0.03 2. -0.03 to -0.01 3. -0.01 to 0.005 4. 0.005 to 0.02 5. >0.02
I 4	Saturation of fuelwood users (proportion of households that use exclusively fuelwood over total number of households)	1. <0.2 2. 0.2 to 0.4 3. 0.4 to 0.7 4. 0.7 to 0.9 5. >0.9
I 5	Percentage of people belonging to an ethnic group	1. < 0.5% 2. 0.5% to 1.5% 3. 1.5% to 7% 4. 7% to 40% 5. >40%
I 6	Fuelwood balance (total forest productivity - annual fuelwood consumption coming from forest areas (ton/yr))	1. >120,000 2. 30,000 to 120,000 3. 12,000 to. 30,000 4. 1,000 to 12,000 5. <1,000

3) Construction of an integrated Fuelwood Priority Index (FPI)

The third step of the analysis was the development of an overall "priority index" for each *municipio* that integrates the six variables identified in the final set. In order to perform this analysis, each *municipio* was given a numerical value for each variable, from 1 to 5 according to its degree of priority (low priority = 1; high priority = 5).

Then, an overall fuelwood priority index was obtained as follows:

$$FPI_j = \sum_{1}^{6} I_{ij} * P_i$$

where,

FPI_j = woodfuel priority index for each *municipio* "j"

i_{ij} = index for each variable "i" used in the analysis (6 in total), ranging from 1 to 5.

p_i = weights assigned to each variable, set to 1 in our case.

4) Ranking of *municipios* in 5 groups according to the FPI: defining "hot spots" municipalities

With each *municipio* being assigned a numerical index that integrates the different concerns regarding fuelwood consumption and availability of resources, the final step was a regrouping into the five categories defined in the previous section: from low priority to high priority (Figures 16, 17 and 18)

The analysis of 2,401 (out of 2,436) *municipios* used to calculate the FPI produced the following results:

262 *municipios* → High priority
389 *municipios* → Mid-high priority
461 *municipios* → Medium priority
676 *municipios* → Mid-low priority
613 *municipios* → Low priority

Statistical analysis

A statistical analysis was conducted to corroborate the significance of the previous mentioned groups. An overall ANOVA confirmed that these five groups were statistically different at a 95% confidence level for the six variables used to calculate the FPI (Tables 9 and 10).

Table 9. Values of the FPI by group of priority *municipios*

Group	FPI threshold values	Average FPI	Number of municipios
1. High priority	> 24	25.6 (1.4)	262
2. Mid-high priority	21 - 24	22.0 (0.8)	389
3. Medium priority	18 - 21	19.0 (0.8)	461
4. Mid-low priority	13 - 18	15.1 (1.4)	676
5. Low priority	< 13	9.3 (1.9)	613
Global		16.6 (5.6)	2,401

Note: Differences are significant at $p< 0.05$; Standard deviation values are shown in brackets.

Table 10. Analysis of variance of the six dependent variables of the FPI

Analysis of Variance for the variables in the fuelwood priority index
Marked effects are significant at $p < .05000$

Variable	SS Effect	df Effect	MS Effect	SS Error	df Error	MS Error	F	P
Fuelwood user	447270E5	4	111818E5	239954E6	2397	100106E3	111.6986	0.00000
User density	199	4	50	451	2397	0	264.8270	0.00000
Growth Rate of Fuelwood Users	1	4	0	4	2397	0	165.7476	0.00000
Saturation of fuelwood users	121	4	30	142	2397	0	510.3282	0.00000
Percentage indigenous population	1078830	4	269708	1414990	2397	590	456.8857	0.00000
Fuelwood balance	928128E8	4	232031E8	15684E11	2397	654333E6	35.4608	0.00000

The differences among all groups are statistically significant for most groups and variables, as can be seen from a box-plot analysis showing averages and standard errors for each group graphically (Figure 7).

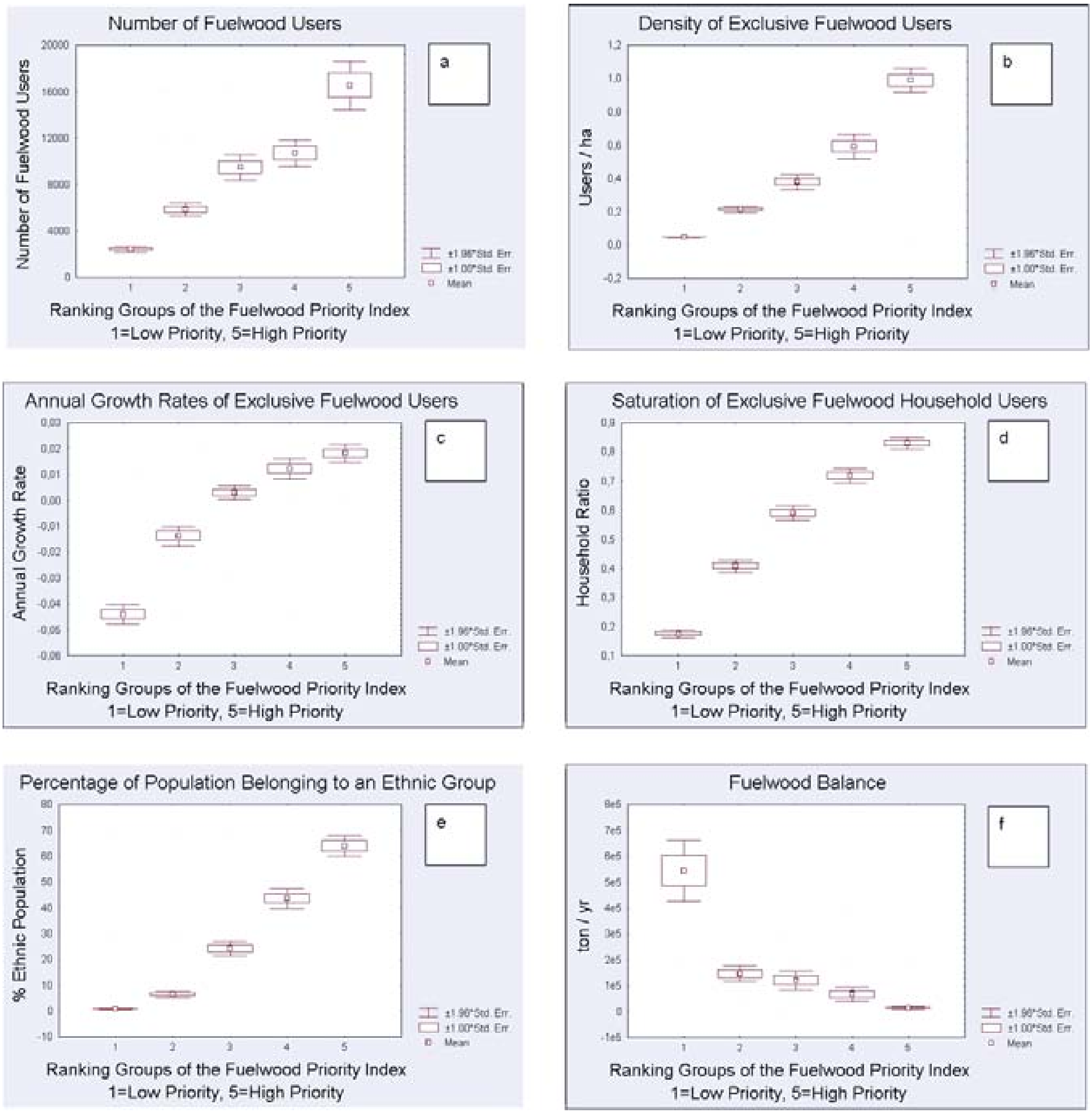

Figure 7. Statistical differences among groups of *municipios* according to selected variables

Overall results

Results for each variable used to construct the FPI

The FPI combines six variables in one ranking or priorization of *municipios*. However, useful results can be obtained by examining each of the variables independently. For example, we might be interested in the geographic distribution of fuelwood users from a health perspective, such as indoor air pollution, while an environmental analysis will focus on those municipalities where fuelwood extraction is not sustainable (i.e. when consumption surpasses fuelwood production). Moreover, a public policy analysis might need to link some fuelwood supply/demand variables with the average income level for each *municipio*. In other words, WISDOM is a flexible tool for focusing actions on different perspectives.

Thematic maps were prepared for each of the six variables used in the construction of the FPI index, illustrating the diverse aspects of fuelwood use patterns in Mexico (Figures 8 to 13). The five colours in all legends correspond to the five groups of priority, from green to red in increasing order of priority. Note the uneven geographical distribution of the different groups of *municipios* regarding the different criteria.

Figure 8 shows the distribution of fuelwood users in Mexico. Red areas correspond to those *municipios* with more than 15,000 exclusive fuelwood users. Note that their distribution is heavily biased towards Central and Southern Mexico. Because of their small size, municipalities from the state of Oaxaca are seldom red (high priority).

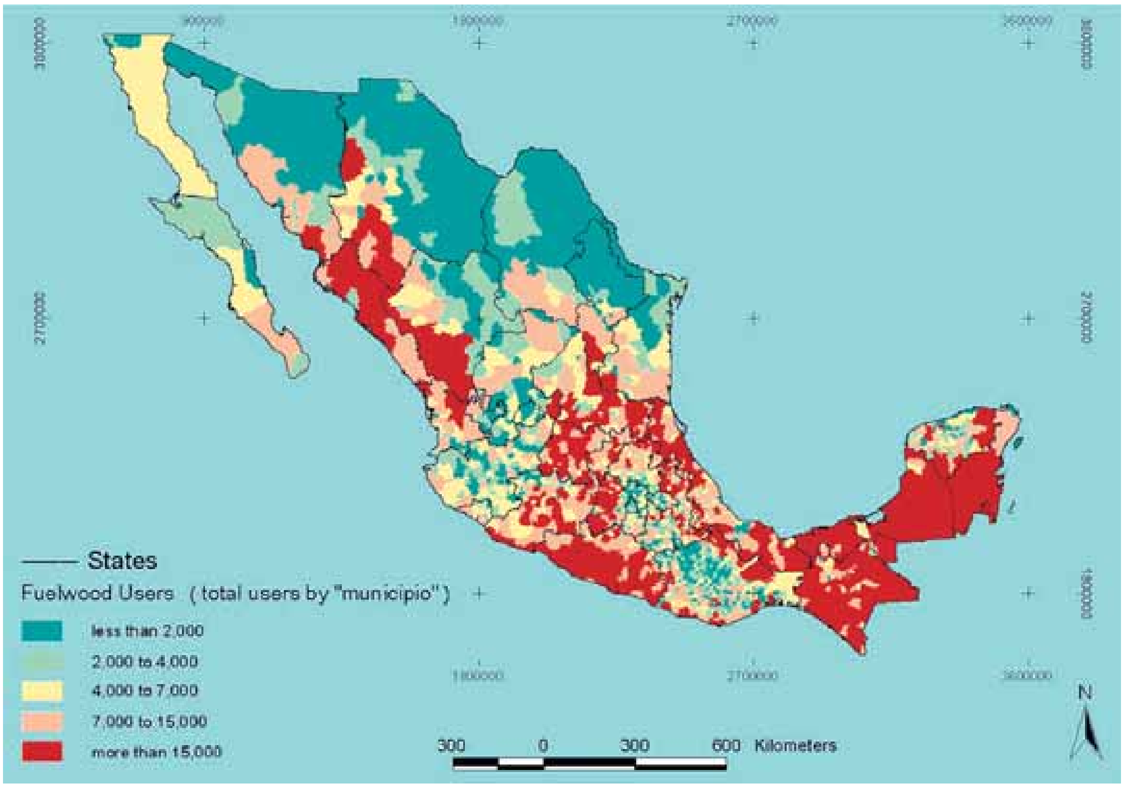

Figure 8. Number of fuelwood users, Mexico 2000

Figure 9 shows the distribution of densities of fuelwood users within Mexico. Red areas, corresponding to *municipios* with over 0.6 users per hectare, are mainly distributed within the states of Estado de Mexico (33.5% of its area); Puebla (27.8%); Veracruz (18.4%); and Hidalgo (17.9%).

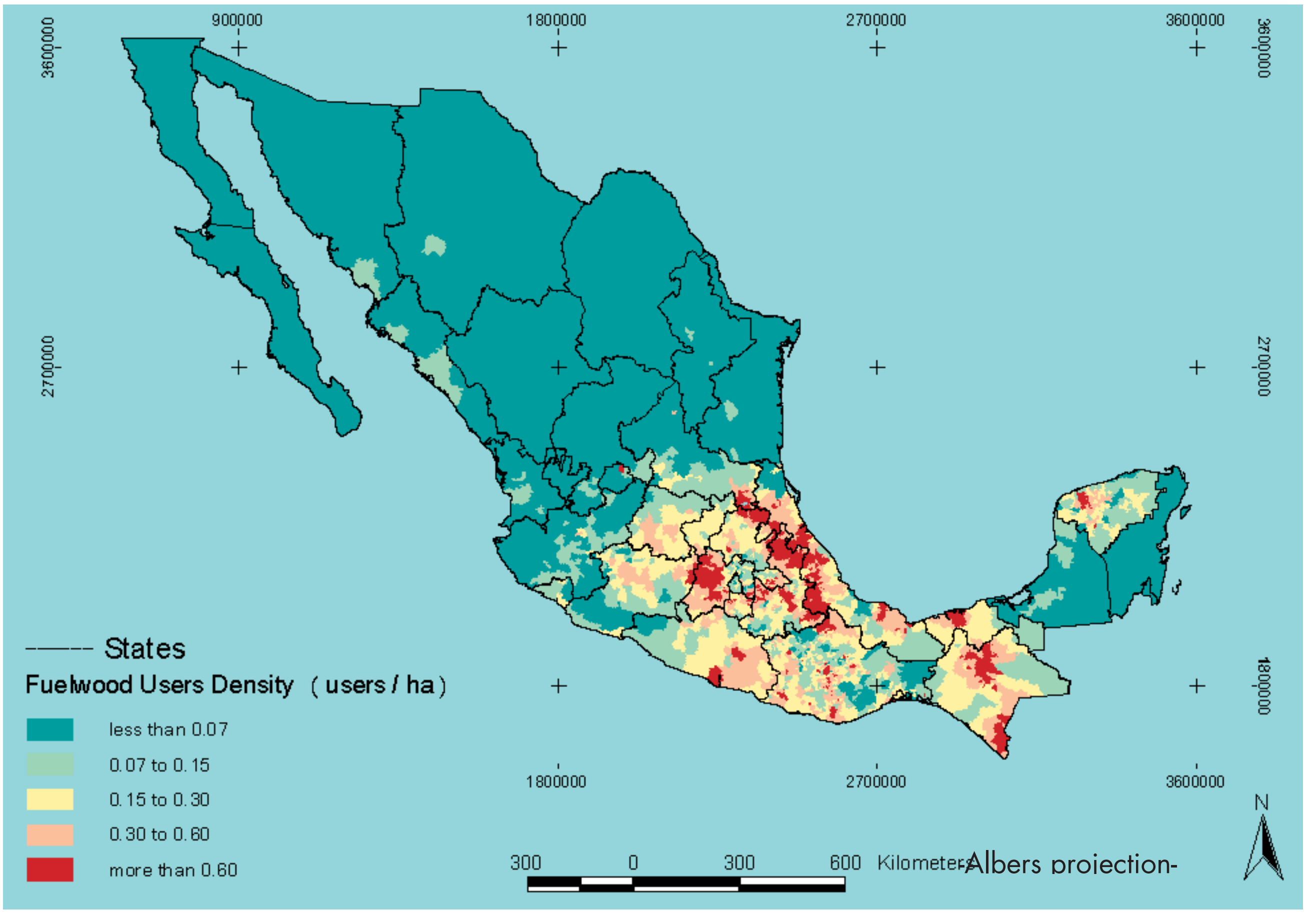

Figure 9. Density of fuelwood users, Mexico 2000

The spatial distribution of the growth rate of fuelwood users in Mexico (Figure 10) shows that a major proportion of *municipios* with high values (red) are distributed in the states of Yucatan, Quintana Roo, Tabasco and the coasts of Guerrero, Michoacan and Nayarit.

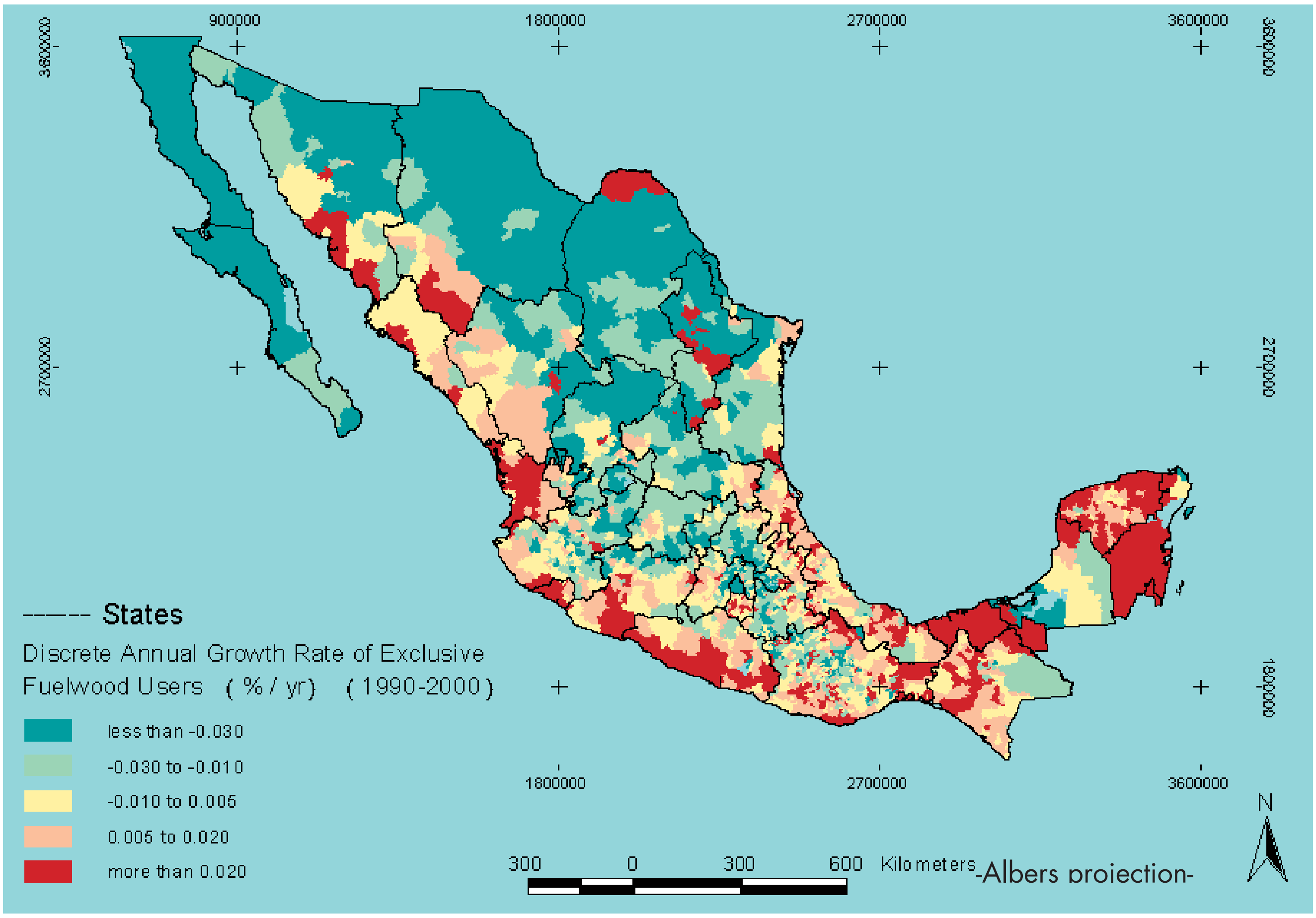

Figure 10. Growth of fuelwood users, Mexico 1990-2000

The percentage of households that use fuelwood for cooking is illustrated in Figure 11. As seen in the map, Oaxaca is the most critical state for this indicator. Approximately 43% of the State land area is covered by *municipios* where the percentage of households that use exclusively fuelwood for their domestic requirements rise to 90% of total population or more (red areas on the map).

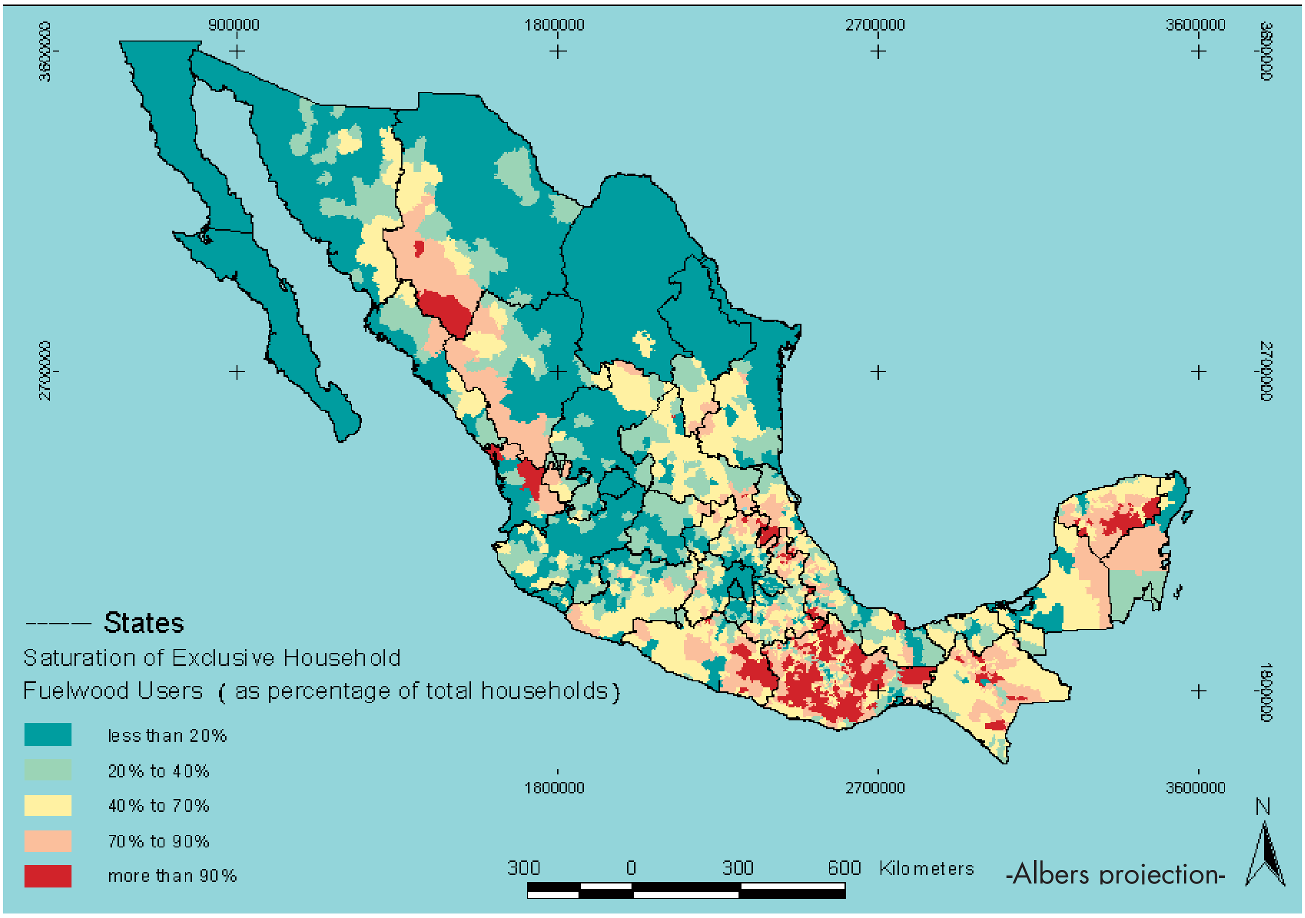

Figure 11. Saturation of fuelwood users, Mexico 2000

The distribution of people belonging to an ethnic group (speakers of native tongues) shown in Figure 12, is consistent with the results published by Toledo *et al.* (2001) and also mostly concentrated in the Southern States of Mexico.

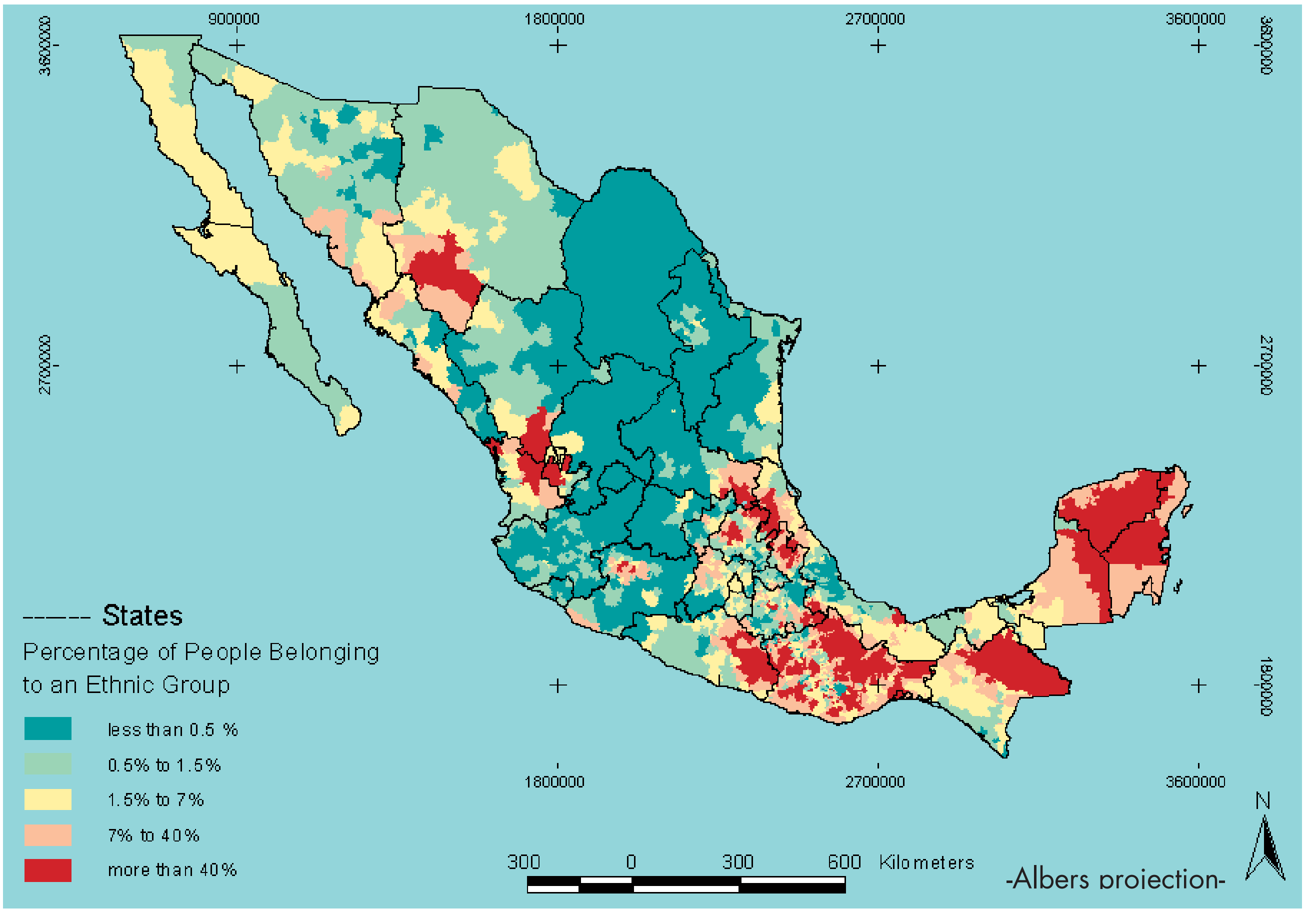

Figure 12. Percentage of indigenous population, Mexico 2000

Figure 13 illustrates the fuelwood balance in Mexico. As in Figure 8 above, the lowest availability of fuelwood is concentrated on the Mexican Gulf coast and central region. The three most critical states are again Veracruz (with 32.6% of its area covered by *municipios* ranked as "very low availability" of fuelwood), Tlaxcala (30.4%) and Estado de Mexico (22.3%). See Figure 7 for comparison.

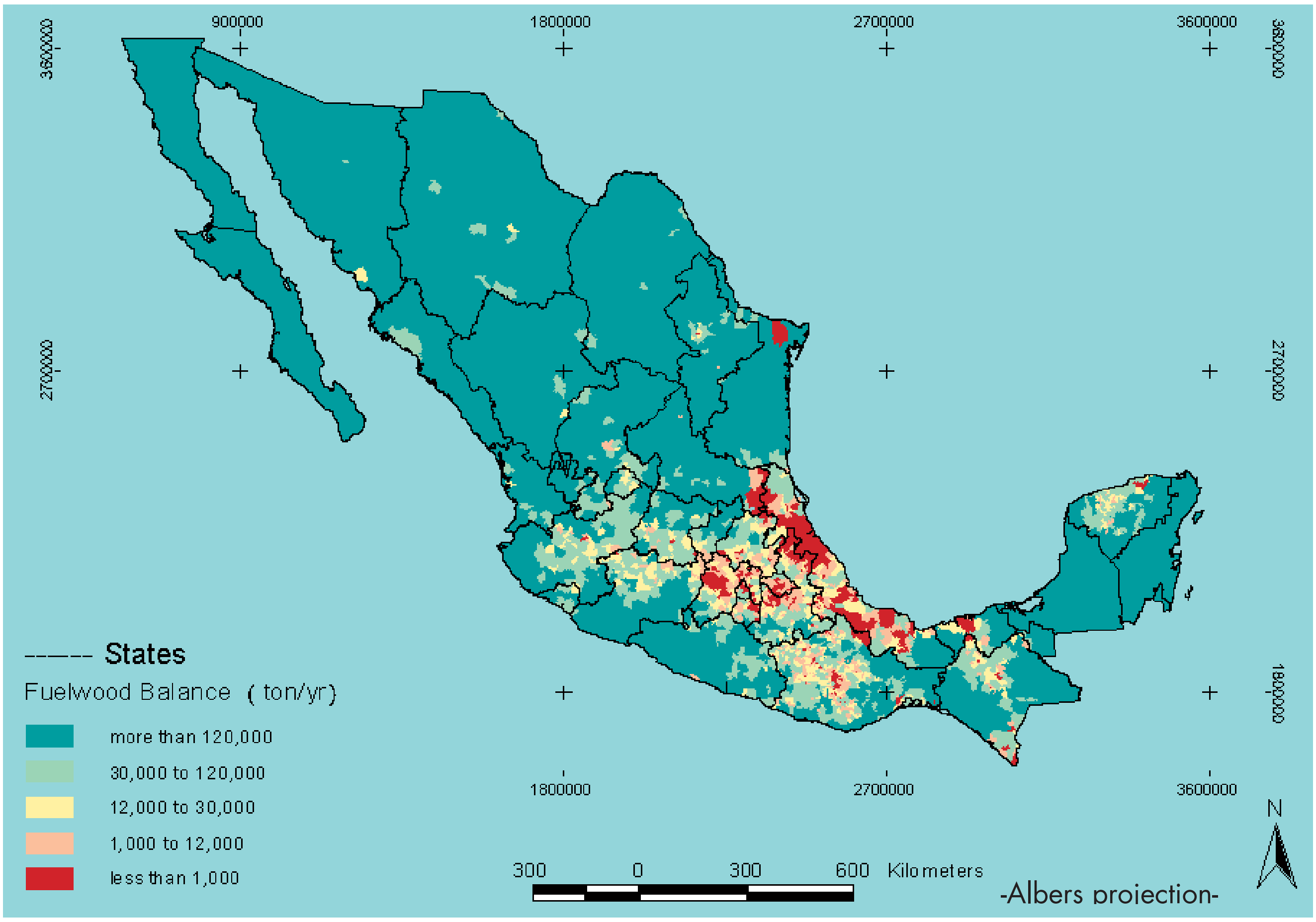

Figure 13. Fuelwood balance, Mexico 2000

Concerning another integrated variable, (not used in the FPI), Figure 14 illustrates the distribution of the potential pressure on forest resources from the use of fuelwood. Red areas are those *municipios* showing the highest pressure from fuelwood harvesting (> 2 ton/ha/yr). The map illustrates that the highest pressure on forest is concentrated on the Mexican Gulf coast and in the Central region. The three most critical states for this indicator are Veracruz (with 38.8% of its area covered by *municipios* ranked as "very high pressure", or more than 2 tons per hectare per year), Tlaxcala (27.1%) and Estado de Mexico (20.1%).

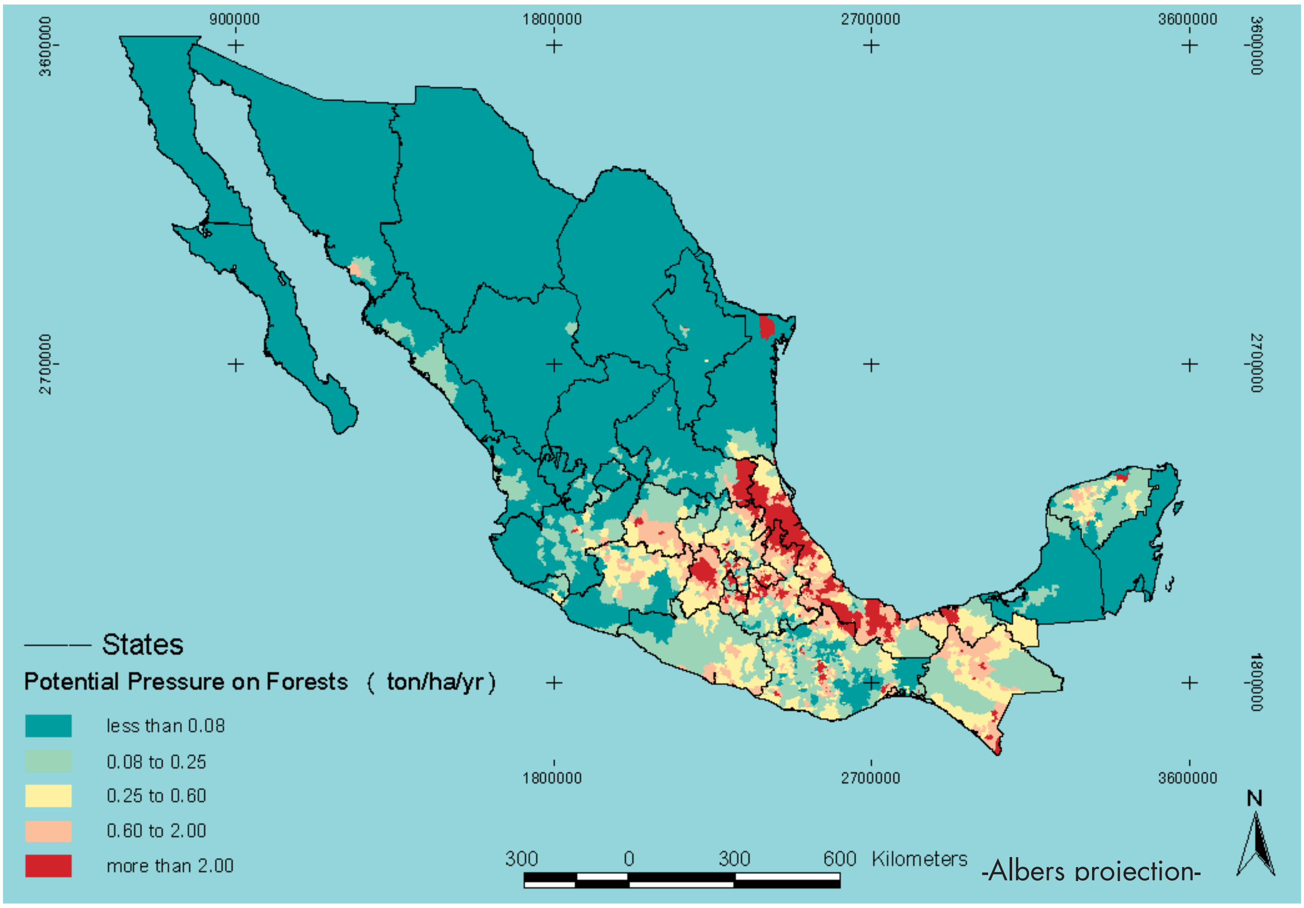

Figure 14. Potential pressure on local forests from the extraction of fuelwood, Mexico 2000

Results from the priorization of *municipios*

Conducting a WISDOM analysis for Mexico allowed the categorization of 2,401 *municipios* (out of 2,436) in five groups according to their level of priority. As stated above, the *municipios* ranked as high priority were those at the top of the Fuelwood Priority Index (FPI) ranking. The variables used in the construction of the FPI were: the number of fuelwood exclusive users; the percentage of houses that exclusively use fuelwood; the density and growth of exclusive fuelwood users at the household level; the resilience of fuelwood consumption (resistance to change to other fuels in terms of social and cultural aspects); and woodfuel resources from forests.

Figures 15 to 18 show *municipios* ranked in five final groups according to their FPI index. The red areas represent the 262 hot spots, or those *municipios* of highest priority in terms of the six variables selected for the construction of the FPI index.

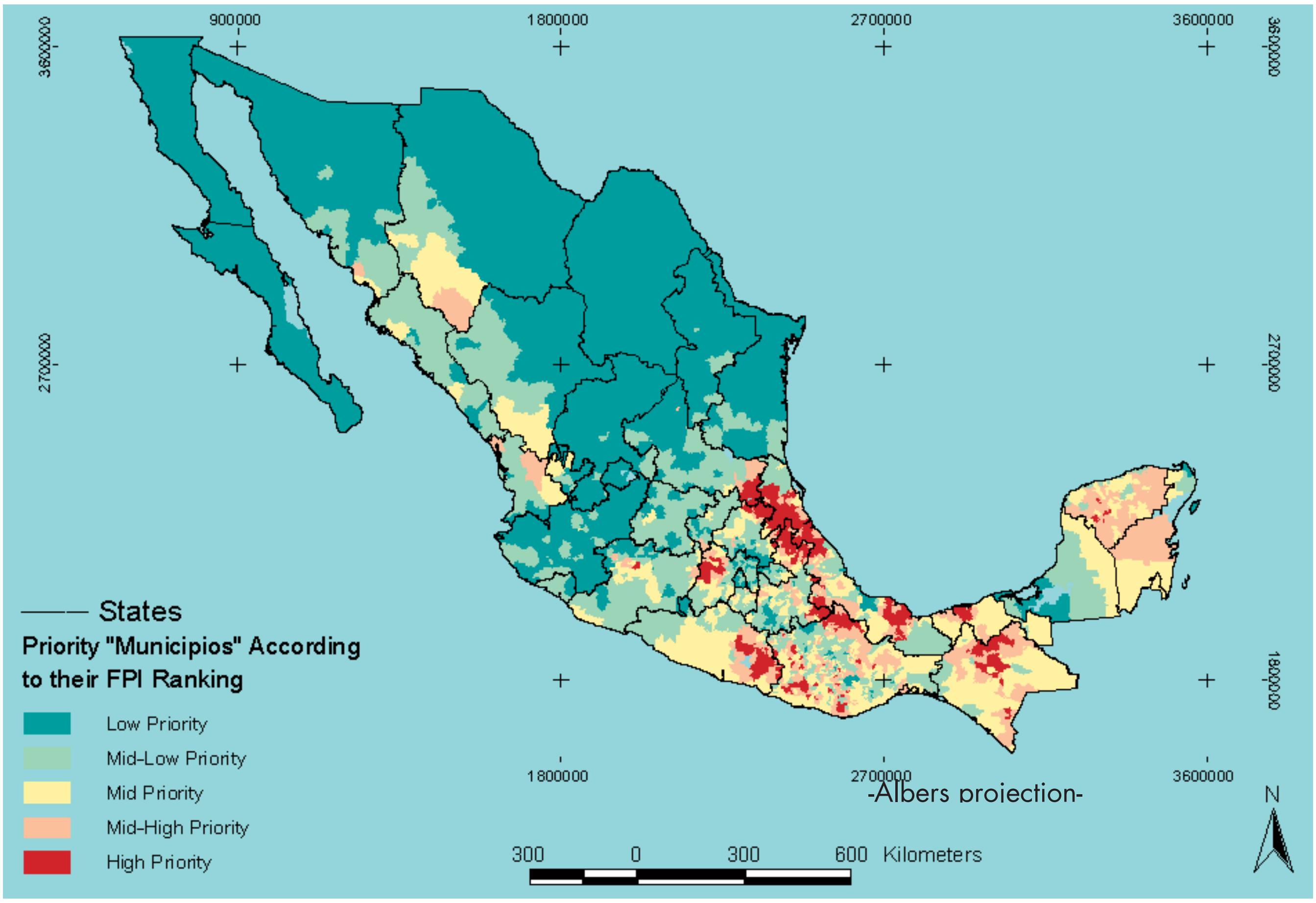

Figure 15. Priority *municipios* in terms of fuelwood use and availability of fuelwood resources, Mexico 2000

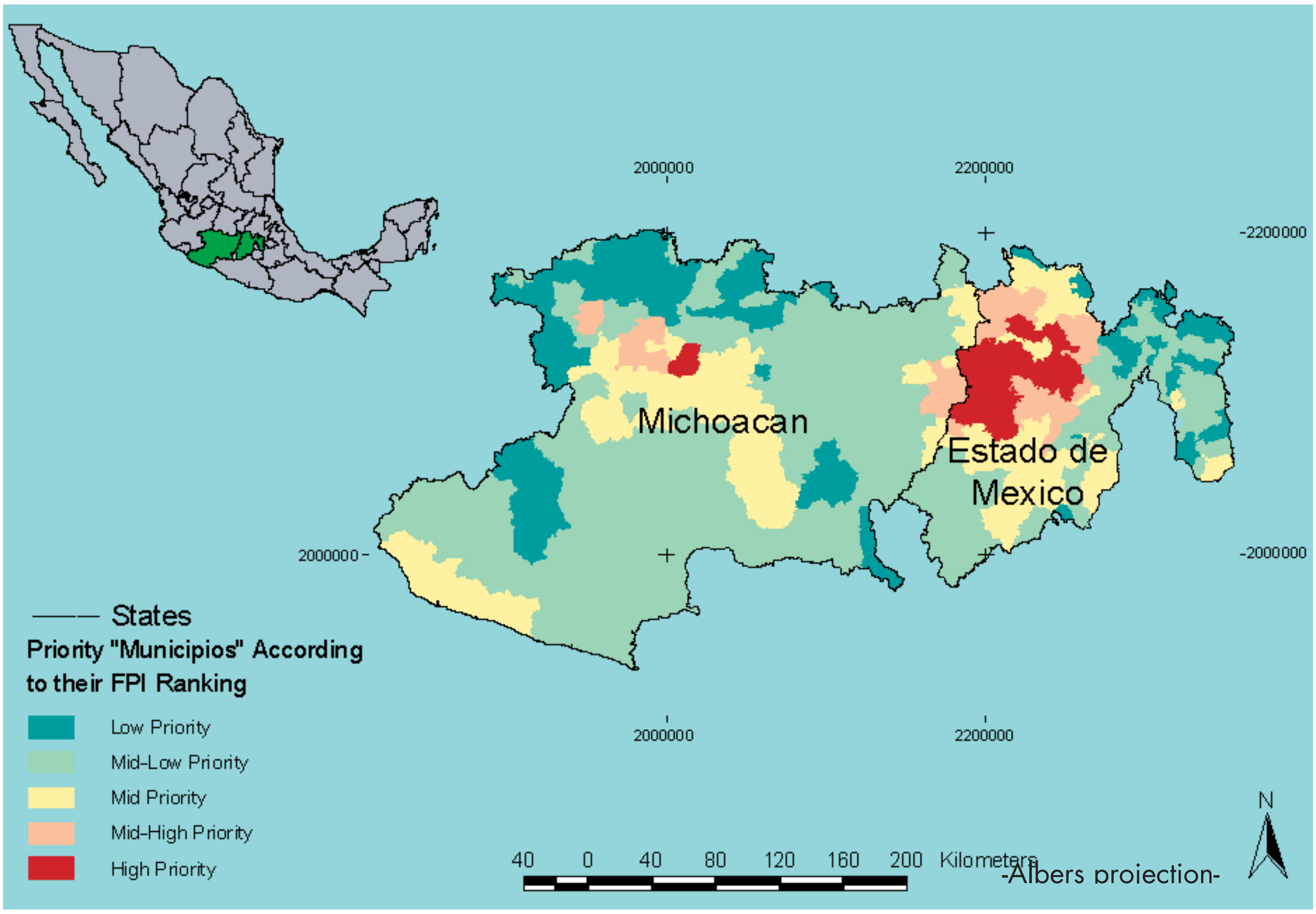

Figure 16. Priority *municipios* in terms of fuelwood use and availability of fuelwood resources, Mexico 2000. Detail for the Central Region

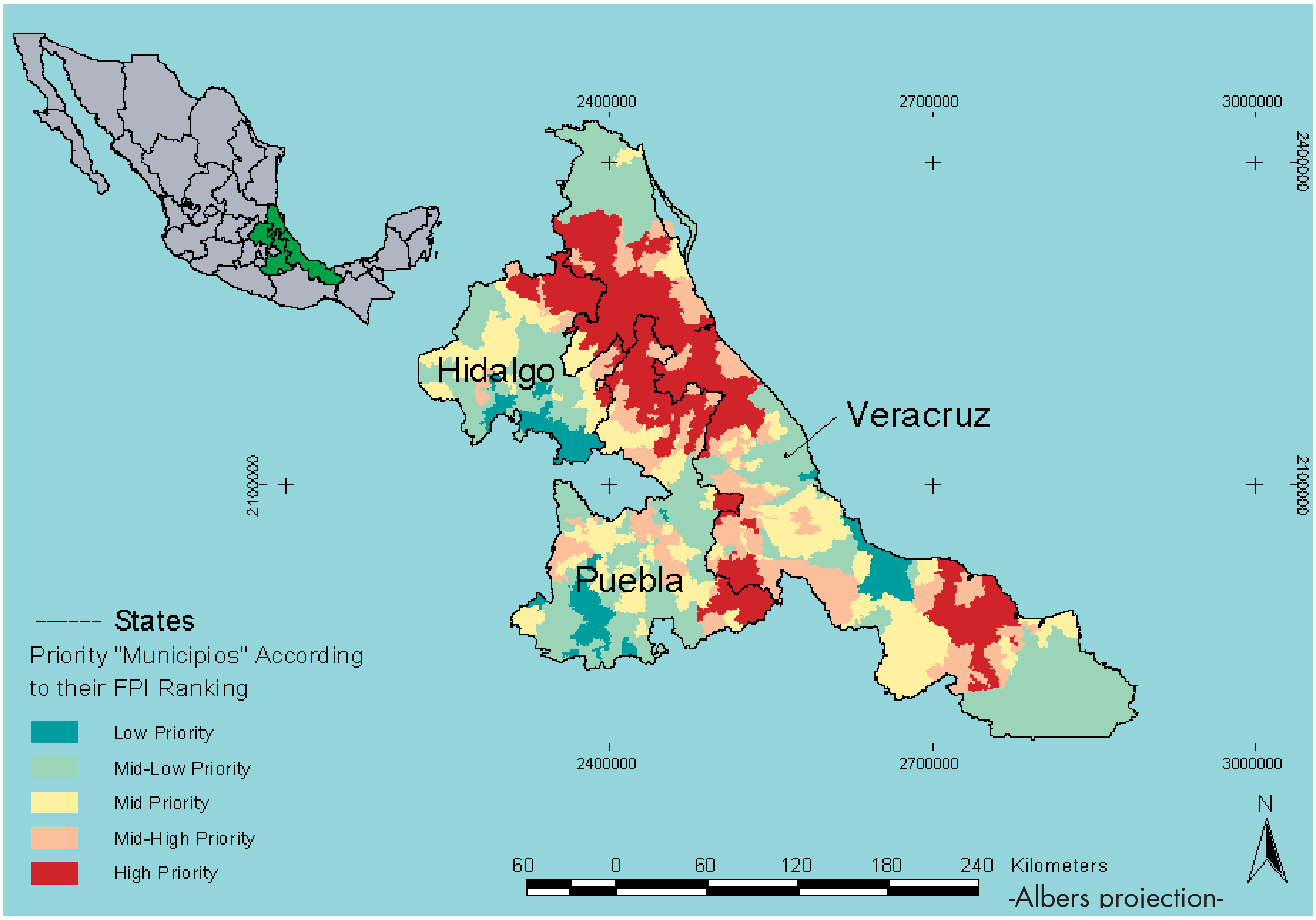

Figure 17. Priority *municipios* in terms of fuelwood use and availability of fuelwood resources, Mexico 2000. Detail for the Central Gulf Region

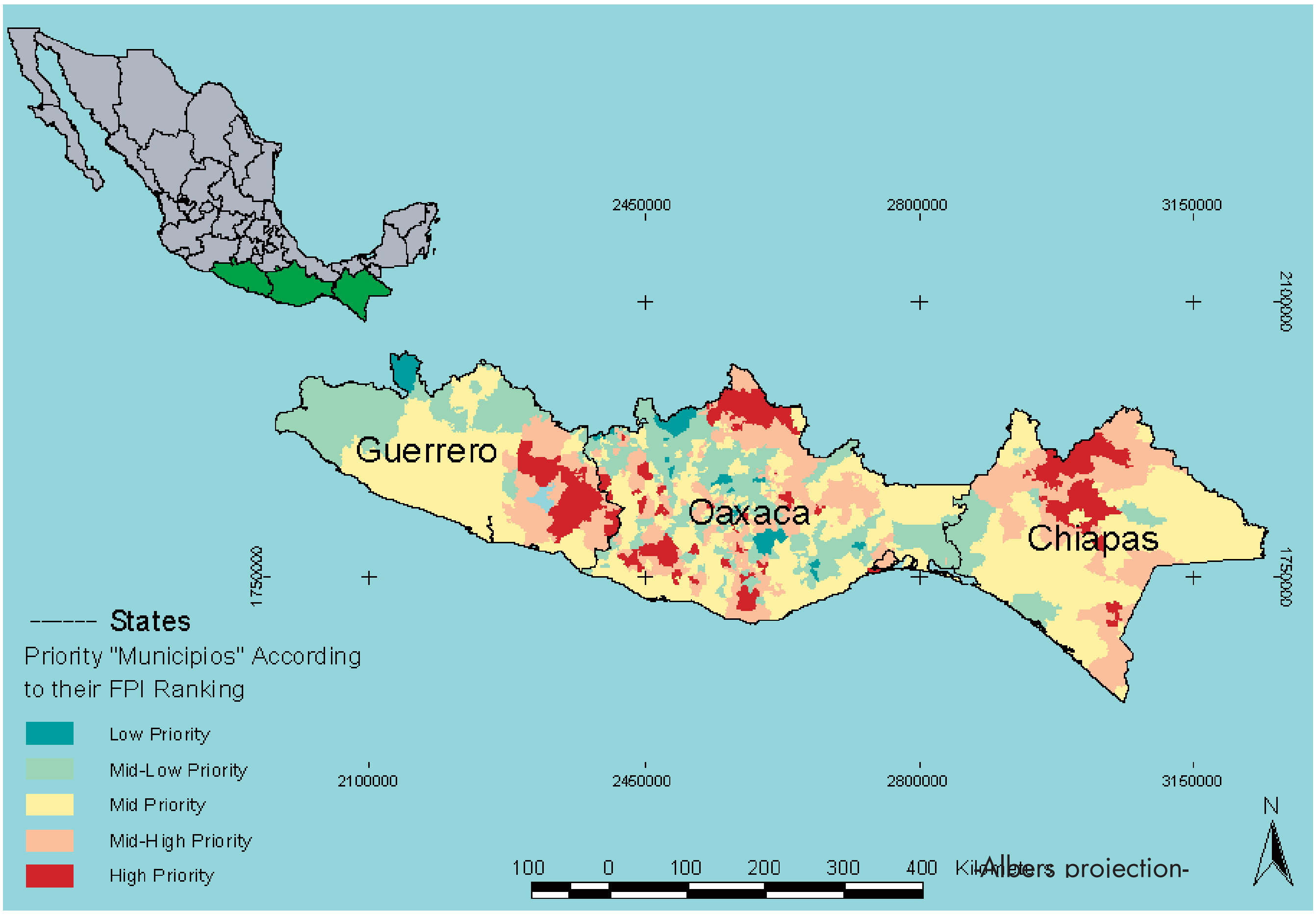

Figure 18. Priority *municipios* in terms of fuelwood use and availability of fuelwood resources, Mexico 2000. Detail for the South Pacific Region

The most critical states according to the percentage of their area covered by high priority (red) *municipios* are Veracruz (60 *municipios*; 26.4% of its area); Puebla (53 *municipios*; 19.1% of its area); Hidalgo (14 *municipios*; 15.3% of its area); and Estado de Mexico (10 *municipios*; 14.9% of its area). The number of *municipios* ranked as "high priority" on the state of Oaxaca rises to 63, but they represent only 9.3% of the total area. It is interesting to note that many priority *municipios* are located within larger clusters.

Tables 11 and 12 show the average and standard error values of selected variables of interest according to the five groups of *municipios* defined by the FPI index.

Table 11. Characteristics of each priority group according to the six variables used in the FPI

FPI Groups	Number of fuelwood exclusive users	Saturation of fuelwood users (%)	Fuelwood users density (A)(users/km2)	Indigenous population (%)	Growth rate of fuelwood users (% / yr)	Fuelwood balance (ton/yr)
High priority	16,539 (1,055)	83.0 (1.0)	0.99 (0.04)	63.9 (2.0)	1.8 (0.2)	13,632 (2,179)
Mid-High priority	10,734 (599)	71.8 (1.3)	0.59 (0.04)	43.7 (1.9)	1.2 (0.2)	67,999 (13,928)
Medium priority	9,451 (569)	58.9 (1.3)	0.38 (0.02)	24.2 (1.4)	0.3 (0.1)	118,911 (18,525)
Mid-Low priority	5,850 (280)	40.9 (1.1)	0.22 (0.01)	6.4 (0.6)	-1.4 (0.2)	145,812 (15,675)
Low priority	2,435 (118)	17,4 (0.7)	0.05 (0.00)	0.82 (0.1)	-4.5 (0.2)	543,633 (60,076)

Note: Standard error values are shown in brackets. Smallest "n" for any variable: 2401.

Table 12. Characteristics of each priority group according to selected variables of importance

FPI Groups	Welfare INEGI code* (1 to 7)	Consumption (ton/yr)	Forest area by municipio (ha)	Forest productivity (ton/yr)
High priority	1.83 (0.06)	11,633 (791)	8,079 (738)	25,265 (2,311)
Mid-High priority	2.67 (0.08)	7,002 (415)	20,749 (4,028)	75,001 (14,086)
Medium priority	3.16 (0.08)	5,846 (372)	35,938 (5,130)	124,757 (18,717)
Mid-Low priority	3.95 (0.07)	3,409 (170)	40,376 (4,131)	149,222 (15,763)
Low priority	5.07 (0.06)	1,296 (67)	132,217 (13,411)	544,929 (60,080)

Note: Standard error values are shown in brackets. Smallest "n" for any variable: 2,401.
*This variable, from the INEGI census, summarizes more than 20 socioeconomic other variables. The lower level of welfare is "1", while the highest is "7".

Net CO_2 emissions from fuelwood non-sustainable use by the residential sector

Non renewable use of fuelwood (i.e., when the amount burned exceeds the growth rate of the living biomass sources)[6] contributes to net CO_2 emissions. On the contrary, when harvested and used sustainably, woodfuels represent a major alternative for greenhouse gas mitigation (ISBSRD, 2003). In any case, quantifying the net CO_2 emissions from fuelwood use at the national level represents a key step towards promoting the sustainable use of this resource.

It is currently accepted that woodfuels are mostly used in a sustainable way (RWEDP, 1997 and 2000), however, there may be still specific sites within countries where it is not. When considering those areas where fuelwood extraction surpasses forest woody productivity, net CO_2 emissions from fuelwood use can be estimated. However, getting this type of information is very difficult (Díaz, 2000). In the Mexican case, estimates of net CO_2 emissions from fuelwood use remain very coarse, and they depend on assumptions about the overall degree of renewability of fuelwood extraction patterns (Díaz, 2000).

Based on our WISDOM results for Mexico, we can now get a relatively more precise estimate of the net CO_2 emissions from fuelwood use at the country level. To do this, we consider those *municipios* with a negative fuelwood balance between consumption and supply values. This analysis assumes that a) all the fuelwood demand from a *municipio* is covered by fuelwood coming from the same *municipio*, b) fuelwood extraction is homogeneously distributed within each *municipio*, and c) that all the forest biomass productivity is used for fuelwood. Criterion a) is mostly true in Mexico, while criteria b) and c) lead to underestimate the impacts of fuelwood use, particularly within large *municipios* or *municipios* with large commercial demand for timber.

Figure 19 and Table 13 show the estimated CO_2 emissions for Mexico in the year 2000 using the precedent assumptions. Considering only the fuelwood used within the residential sector, emissions reached from 1.90 $MtCO_2$/yr (0.52 MtC/yr) to 3.8 $MtCO_2$/yr (1.04 MtC/yr), depending if all forested areas within each *municipio* or only those forests actually accessible (estimated in 40% of the total forest area) are considered, respectively. These estimates are lower than the 4.3 to 10.2 $MtCO_2$/yr of emissions coming from fuelwood use obtained by Díaz (2000), using information aggregated at the state level.

Our estimates represents from 0.43% - 0.85% of total CO_2 emissions for Mexico (444.5 $MtCO_2$/yr (SEMARNAP, 1997)) and from 1.72% - 3.43% of total emissions from land use change and forestry (110.7 $MtCO_2$/yr (Masera *et al.*, 2001)). In other words, fuelwood is a minor contributor to carbon emissions within Mexico.

More detailed analyses are needed that take into account the actual fuelwood supply by *municipio*. As we will show in the next section, accessibility analysis may prove a valuable tool in this direction.

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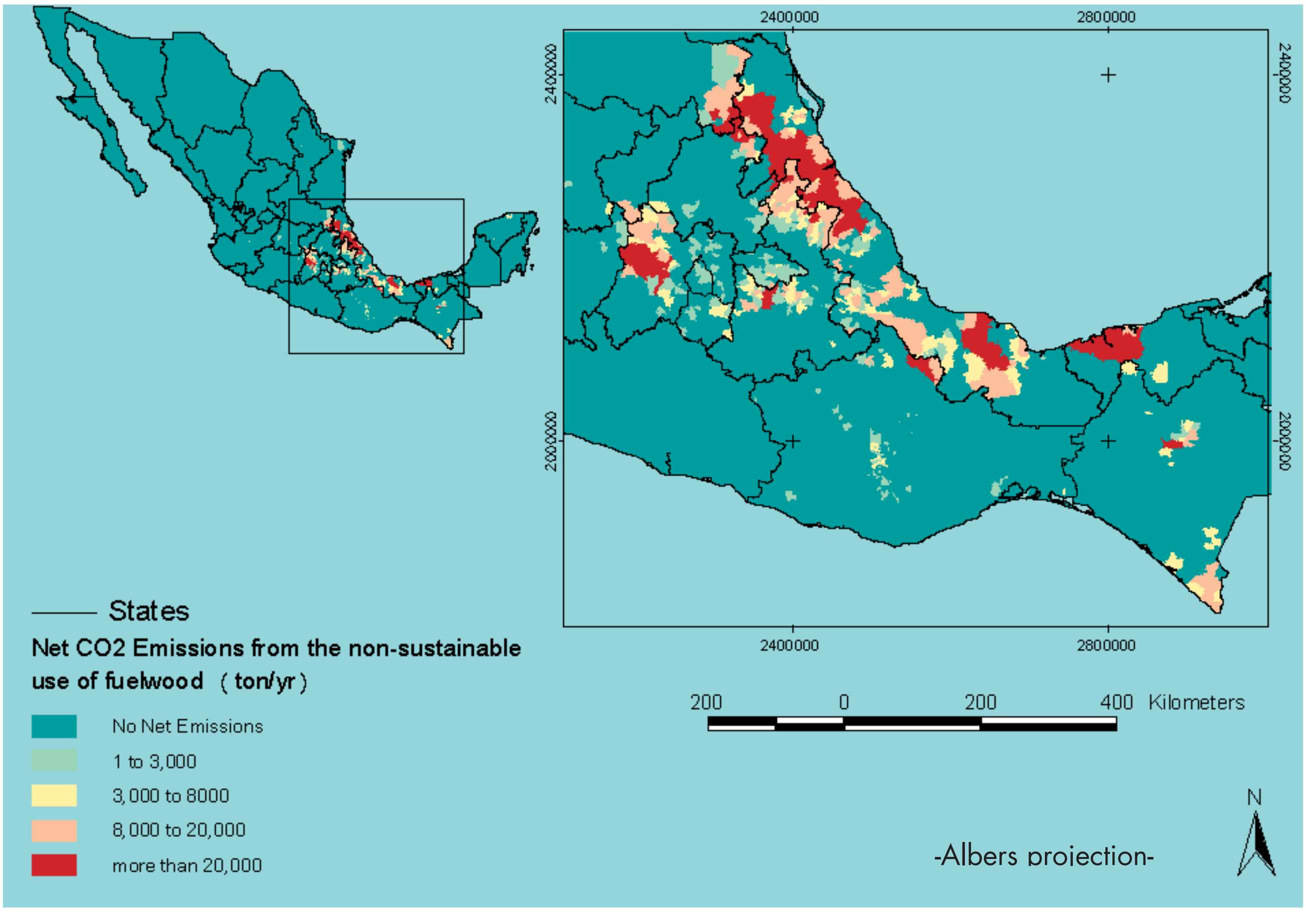
[6] Even when extracted on a renewable basis, fuelwood is not a 100% greenhouse gas emission neutral. This is because fuelwood combustion in traditional cookstoves or open fires is associated to net emissions of methane, non-methanogenic organic compounds (TNMOC), carbon monoxide and other gases. The relative contribution of these gases to total emissions depends largely on the type of technology used, the conditions of the fuel, and other factors. No reliable emission factors of these other greenhouse gases still exist for Mexico to make a reliable national assessment.



Note: Only forests accessible to fuelwood users are considered in the analysis.

Figure 19. Estimated Net Emissions of CO2 from the non-sustainable use of fuelwood, Mexico 2000.

Table 13. Net CO_2 emissions from the non-sustainable use of fuelwood by the residential sector, disaggregated by representative *municipios*:

Region	Net CO_2 emissions ($MtonCO_2$/yr)	As a percentage of total	Net CO_2 emissions from accessible forests only ($MtonCO_2$/yr)	As a percentage of total
Total Mexico	1.90	100%	3.80	100%
Veracruz	0.82	43.4%	1.51	39.7%
Puebla	0.27	14.4%	0.60	15.8%
Estado de Mexico	0.26	13.9%	0.48	12.6%
Oaxaca	0.08	4.4%	0.18	4.7%
Tabasco	0.08	4.1%	0.17	4.5%
Tlaxcala	0.05	2.7%	0.07	1.8%

4. Identification of forests under fuelwood harvesting pressure within priority *municipios*: an accessibility analysis

The WISDOM analysis carried out for Mexico allowed the identification of 262 high priority *municipios*, distributed over several aggregated areas or "clusters of *municipios*". This procedure allows focusing policy action over those areas that require most attention for natural resource management and other social or economic concerns. However, in order to go from strategic planning to actual implementation on the field, more steps are needed. Specifically, from an environmental perspective, it is important to identify those forest areas within each *municipio* or "hot spot" that show more pressure from fuelwood harvesting. Specific actions such as forest restoration, multipurpose energy plantations and others, can be concentrated on these newly identified areas.

Accessibility analyses provide a valuable tool for identifying priority forest areas within the clusters and *municipios* identified by WISDOM. Assessing the accessibility to fuelwood sources due to physical restrictions (i.e. slope, distance) and legal restrictions (i.e. protected areas) may allow helping to recognize those fuelwood supply areas more critical in terms of the pressure exerted by people's demand. By considering the number of fuelwood users that can access limited portions of the whole forest area, accessibility studies may also help quantify the actual pressure on forest resources.

Determining the areas accessible to fuelwood harvesting is not a simple issue. Traveling costs considering the influence of slopes and land cover classes; means of displacement by fuelwood gatherers; legal access to fuelwood sources areas; distance to selected fuelwood sources from settlements and roads; and local surveys concerning site specific parameters (e.g. willingness for gathering fuelwood or gender and age of fuelwood collectors) are things that need to be considered for conducting any accurate accessibility valuation. The information needed to conduct a thorough analysis include elevation maps; road and town maps; land use/land cover maps; ground measurements for travel velocities; maps of protected areas; cadastral data; or local surveys on fuelwood use.

In this section we conduct an accessibility analysis over the Purhepecha Region of the State of Michoacan, using a GIS platform. The example attempts to: 1) estimate the potential forest areas accessible to fuelwood users, and 2) categorize those accessible forest areas, according to the pressure exerted by local people's demand.

The "Purhepecha" Region

Situated within the state of Michoacan, the "Purhepecha" Region has an area of 653,547 ha from which 323,068 ha are forests. Vegetation in the area consists primarily of Pine-Oak forests, and dominant land uses are agriculture and permanent crops. By the year 2000, total population reached 732,480 inhabitants, distributed over 927 villages and 19 *municipios*. The number of exclusive fuelwood users is estimated in 236,510, more than 30% of the total population. "Purhepechas" are the dominant ethnic group in the region, accounting for 14.1 % of the total population. A comprehensive survey about the dynamics of forest resources has been conducted over this area by Masera *et al.* (1998). Although the study is oriented at local industries that use forest products, it highlights the importance of fuelwood for the whole region. Based on this survey and the WISDOM results (Figure 20), we decided to develop an accessibility model over this specific area.

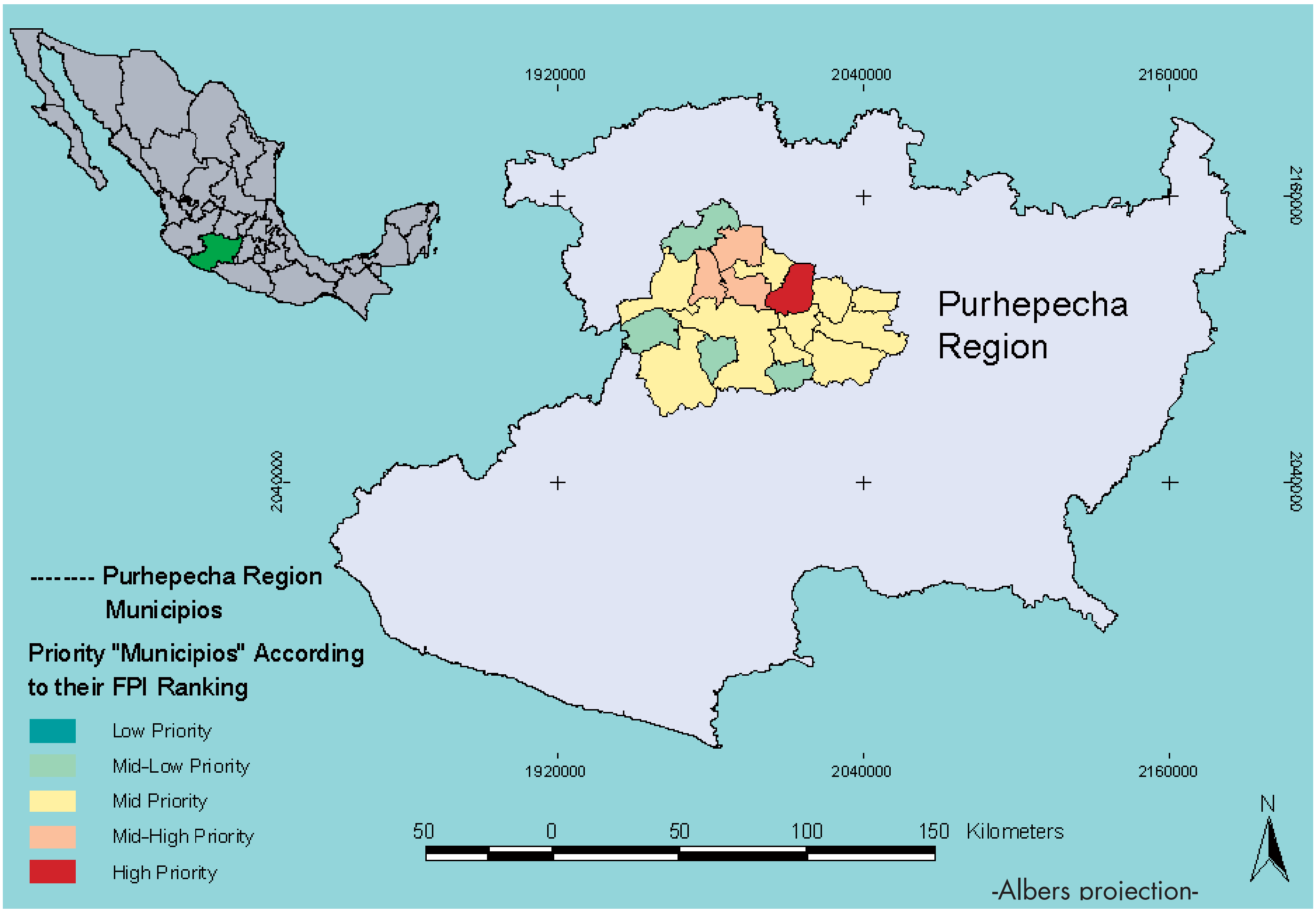


Figure 20. Priority *municipios* for the Purhepecha Region

Methods

The following assumptions were made to conduct the accessibility analysis:

- All human settlements censed by the National Census Bureau (INEGI) for the Purhepecha Region in the year 2000, in which at least one fuelwood user exist, were incorporated as starting points of fuelwood gatherers.
- Displacement velocities through the terrain are a function of the slope and the geographic barriers only.
- Only walking fuelwood gatherers, with or without draft animals, were considered.
- All fuelwood gatherers walk a maximum of 60 minutes, from their starting points and back. It should be noted that the actual gathering or cutting of fuelwood takes an extra time of one to three hours. Therefore, a round trip at a walking distance of 60 minutes actually means an overall trip of two to four hours for fuelwood collection. This is consistent with surveys conducted in the country (Masera, 1993; Del Amo, 2002). A second example of a two hour- walking round trip was also considered.
- The different forest land covers were unified as one target area.

Based on these assumptions, a method was developed, which is fully described on this section.

Estimation of the potential forest areas accessible to fuelwood users of the Purhepecha Region

Human settlements were incorporated into a Geographic Information System (GIS) of the Purhepecha Region, considering not only their cartographic position but also the number of fuelwood users by settlement. This information is used in the model as "starting points", from where fuelwood gatherers must begin their journey to the forest for gathering fuelwood.

As a parallel entry, a "time-distance" map was calculated based on a digital elevation map of the region. Access depends partly on the time needed to reach a certain point. Time is in turn a function not only of distance but of slope, particularly when considering walking people velocities. In this study we used the mean displacement velocities of walking fuelwood gatherers for different slopes to create a "time-distance" map (Table 14 and Figure 21).

Table 14. Mean displacement velocities of fuelwood gatherers according to slope angles

	Slope range				
	0° - 8.5°	8.5° - 16.7°	16.7° - 24.2°	24.2° - 35°	35° - 45°
Displacement velocity (seconds spent per meter walked)	0.8	1.2	2.1	4.5	9

Source: Adapted from a survey by Puentes (2002).

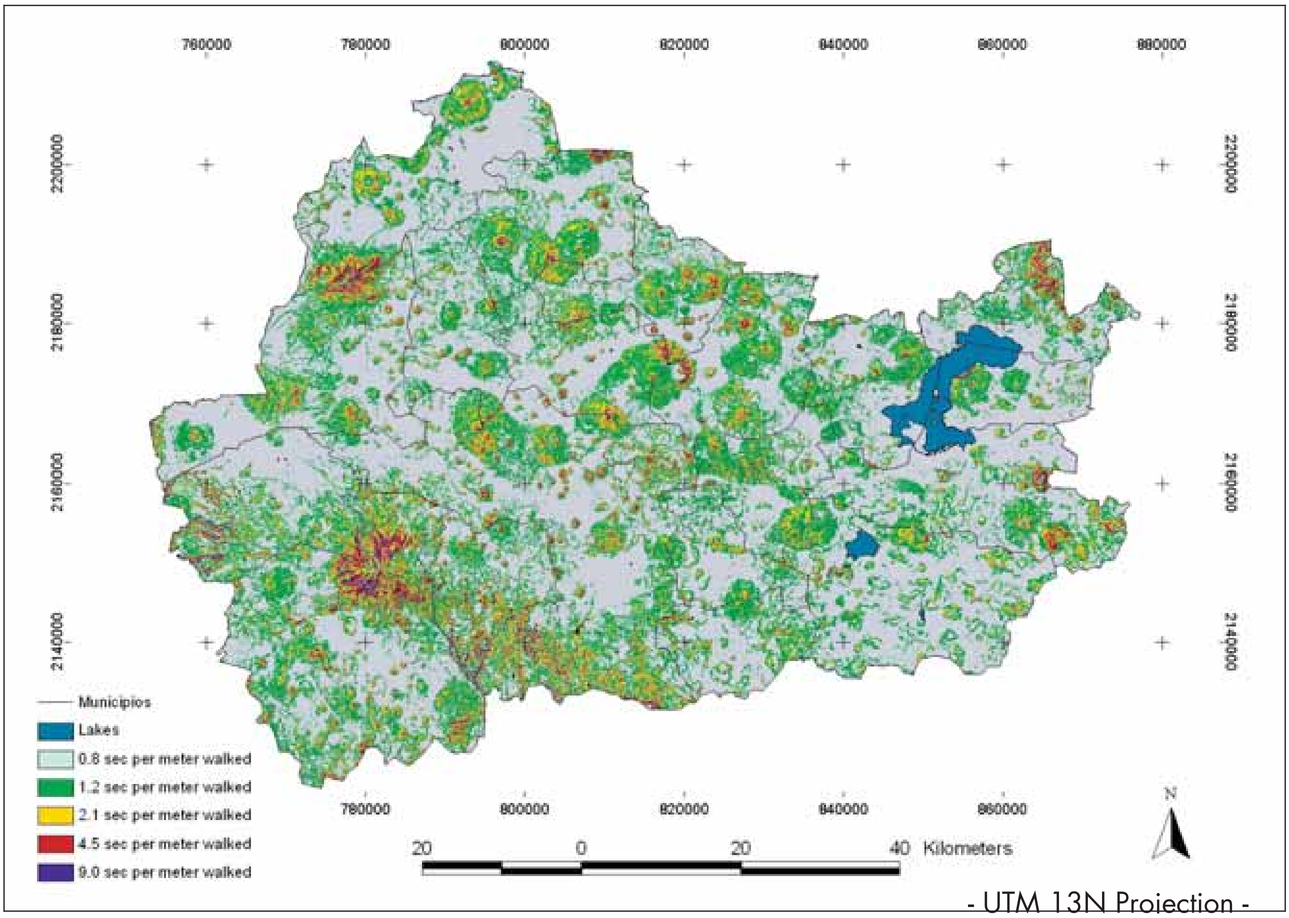


Figure 21. "Time distance" map

Buffers of 30 minutes radius (60 minutes round trip) and 60 minutes radius (120 minutes round trip) around each settlement were calculated by combining the human settlements map with the "time-distance" map. Notice that although buffers represent areas around settlements, the outer perimeters are defined by walking time limits (30 and 60 minutes radius) (Figure 22).

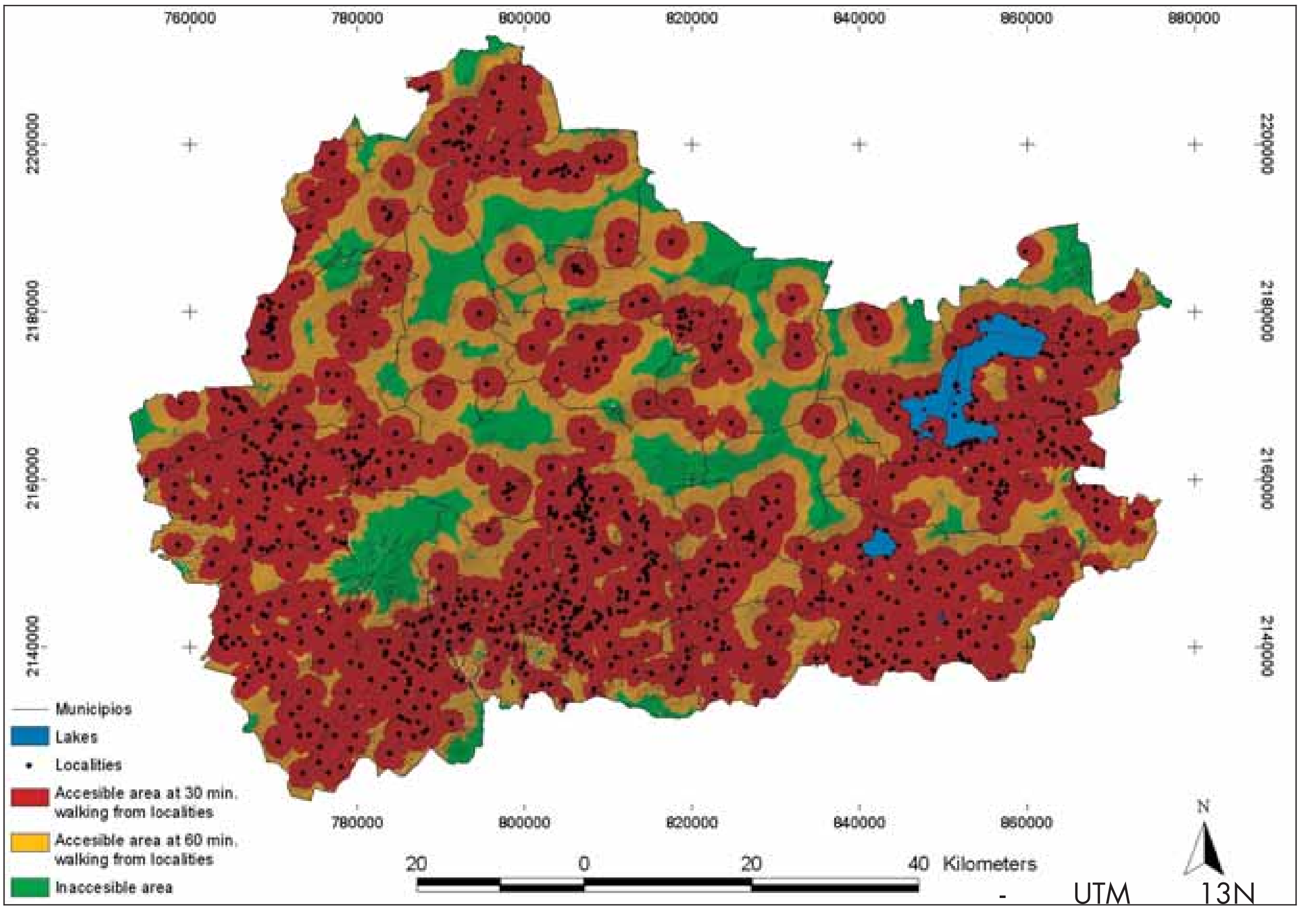


Figure 22. Buffers around settlements based on the "time-distance" map

The third parallel entry in the analysis was the forest map. As stated in the model assumptions, all forest classes were merged into one, so called the "target" area, or fuelwood supply area.

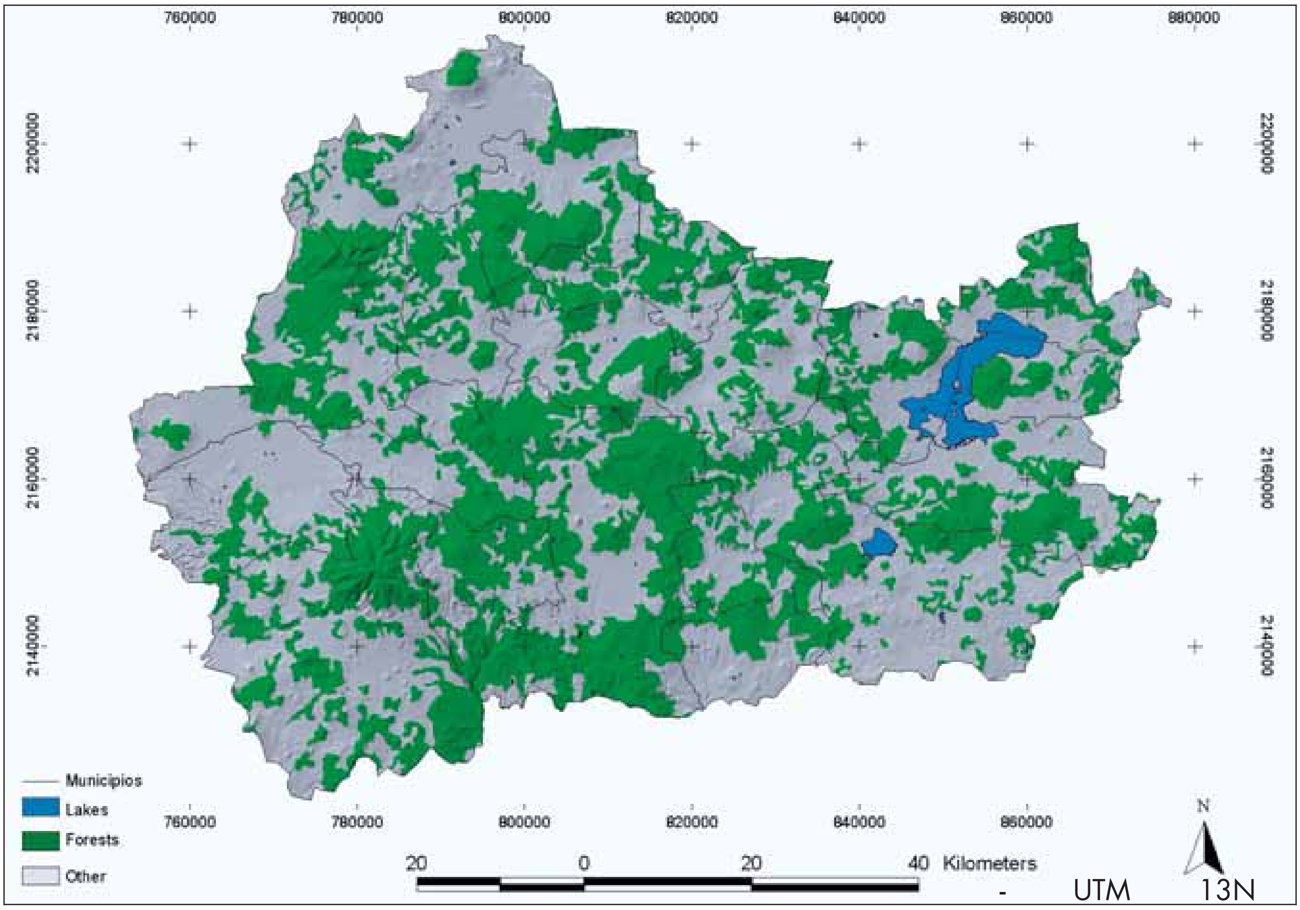


Figure 23. Forests cover of the Purhepecha Region, 2000

Finally, buffers were overlapped to this forest cover map of the Purhepecha Region. The resulting intersections were considered as those areas potentially accessible from settlements by walking fuelwood gatherers (Figure 25, Table 16)

Categorization of accessible forest areas according to the pressure exerted by local people’s demand

As seen in Figure 22, accessible areas at a one-hour walking round trip from settlements, prior to the overlapping to the forest map, cover a major part of the entire Region. However, the population distribution through these localities is highly heterogeneous. As fuelwood demand is concentrated over more populous settlements and their closest forest areas, a new categorization of the already accessible forests, based on population density ranges, was made.

Circle areas of 3 Km radius around each settlement were selected. These areas were then divided by the number of fuelwood users in each corresponding locality so as to calculate their densities. All density circles where then overlapped with each other and the resulting intersections where considered as new density areas. A reclassification into four groups was then made considering this last map (Figure 24). Finally, the density range map was overlapped to the accessible forest area (Figure 25) for the identification of priority areas (Figures 26 and 27, Table 16).

It is important to remark that this type of analysis is aimed at classifying the accessible forests according to the estimated pressure from villages with different number of fuelwood users. Local surveys should be conducted in order to validate the areas at risk from fuelwood shortages identified with the proposed method.

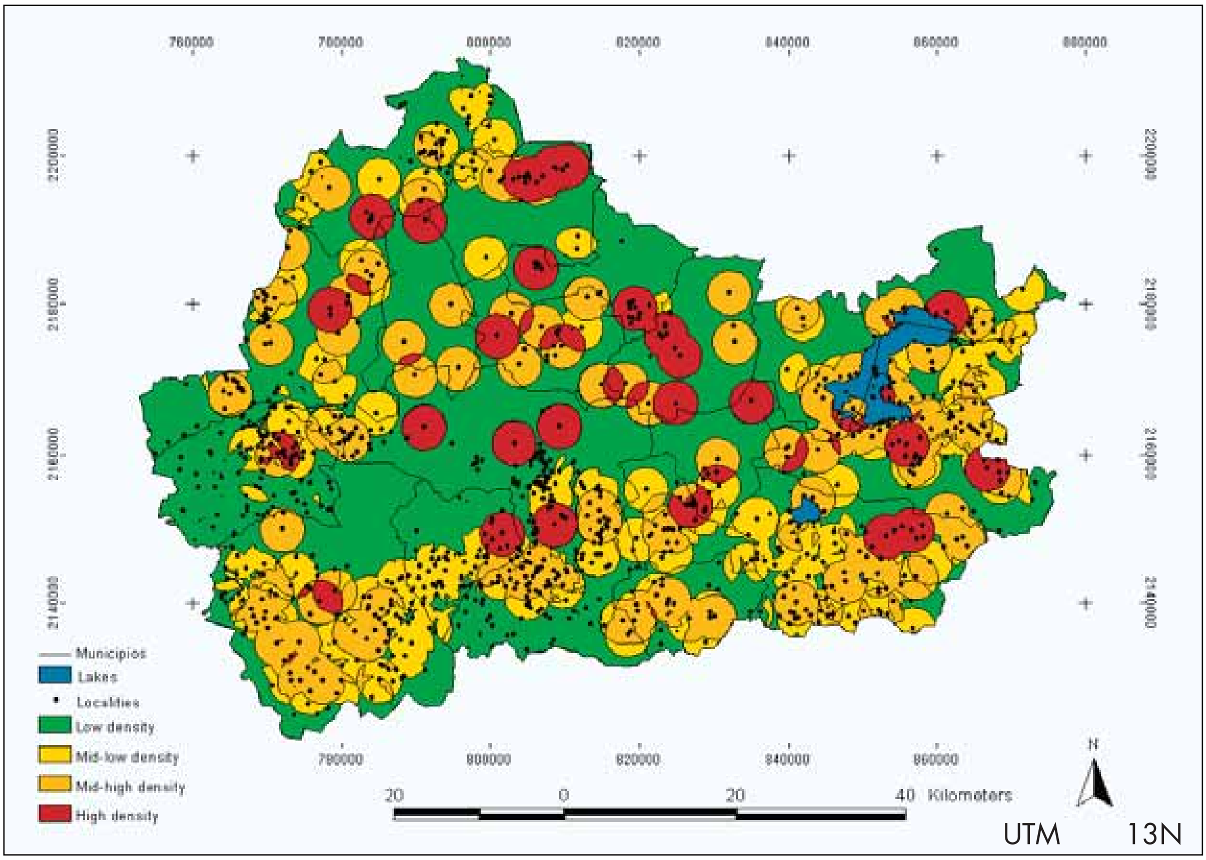
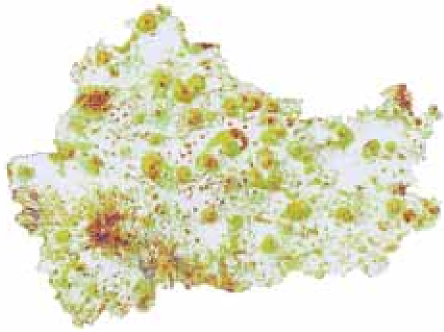
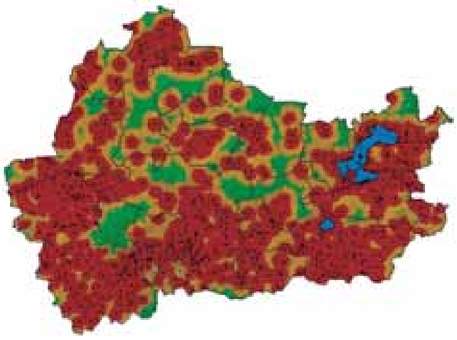
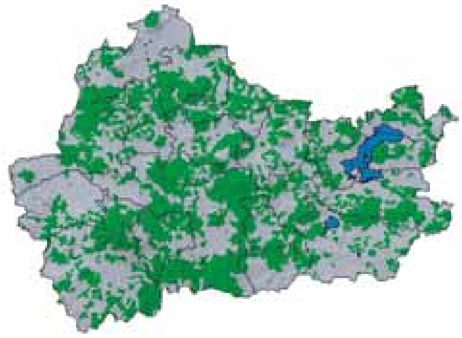
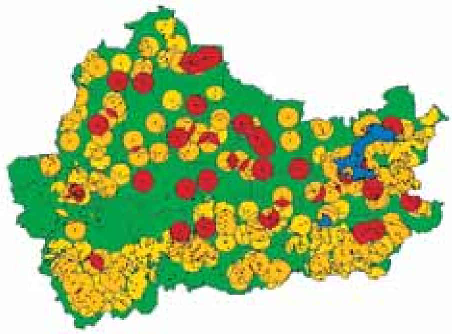


Figure 24. Density population map of the Purhepecha Region considering 3 Km radius circles around settlements

Table 15 gives a summary of the maps and general data needed to conduct the accessibility analysis presented in this report.

Table 15. Information used for conducting the accessibility analysis

Map	Description	Example
Starting points map	Corresponds to the starting points of fuelwood gatherers (e.g, isolated country households, small towns, and villages from the Purhepecha Region).	
Digital elevation model	A digital elevation model needs to be reclassified into those slope ranges that match with the displacement velocities classification. In our case, the elevation map was reclassified into five slope ranges: 0°-8.5°; 8.5°-16.7°; 16.7°-24.2°; 24.2°-35°; 35°-45°. See Table 14.	
Reclassified slope map or "time distance map"	A simple reclassification transforms the slope range map into a map resembling the five velocity displacement ranges. See Table 14.	
Buffers map	The outer perimeters of buffers were set as 30 minutes and 60 minutes walking following the displacement velocities shown on Table 14 and the reclassified time distance map shown on Figure 22. Note that a 30 minute radius buffer corresponds to a 60 minute round trip, without considering neither the time spent in the gathering of fuelwood itself.	

Map	Description	Example
Forest map	Forest cover classes were unified into one forest category namely "target" area or fuelwood supply area. See Figure 23.	
Fuelwood users density map	A density map using 3 km radius circles around each starting point. Further reclassification into few desired groups, considering the resulting intersection of densities is needed. See Figure 24.	

Data	Description
Displacement velocities	Displacement velocities of walking fuelwood gatherers according to few ranges of slope angles. We based our data on a field survey by Puentes (2002).
Fuelwood users density	Number of fuelwood users per locality shown over the starting points map. This information is used to calculate the fuelwood density map. See Figure 24.

Results

Approximately 40% of total forest area (120,867 ha) is accessible at a time-distance of 30 minutes. This value rises to 80% when considering 60 minutes buffers (241,757 ha) Table 16. Figure 25 shows the potential forest areas accessible to fuelwood extraction within the Purhepecha Region considering a 30 minute radius buffer around each settlement (red areas). Out of this range, under the model assumptions, the forest remains inaccessible for walking fuelwood gatherers (green areas).

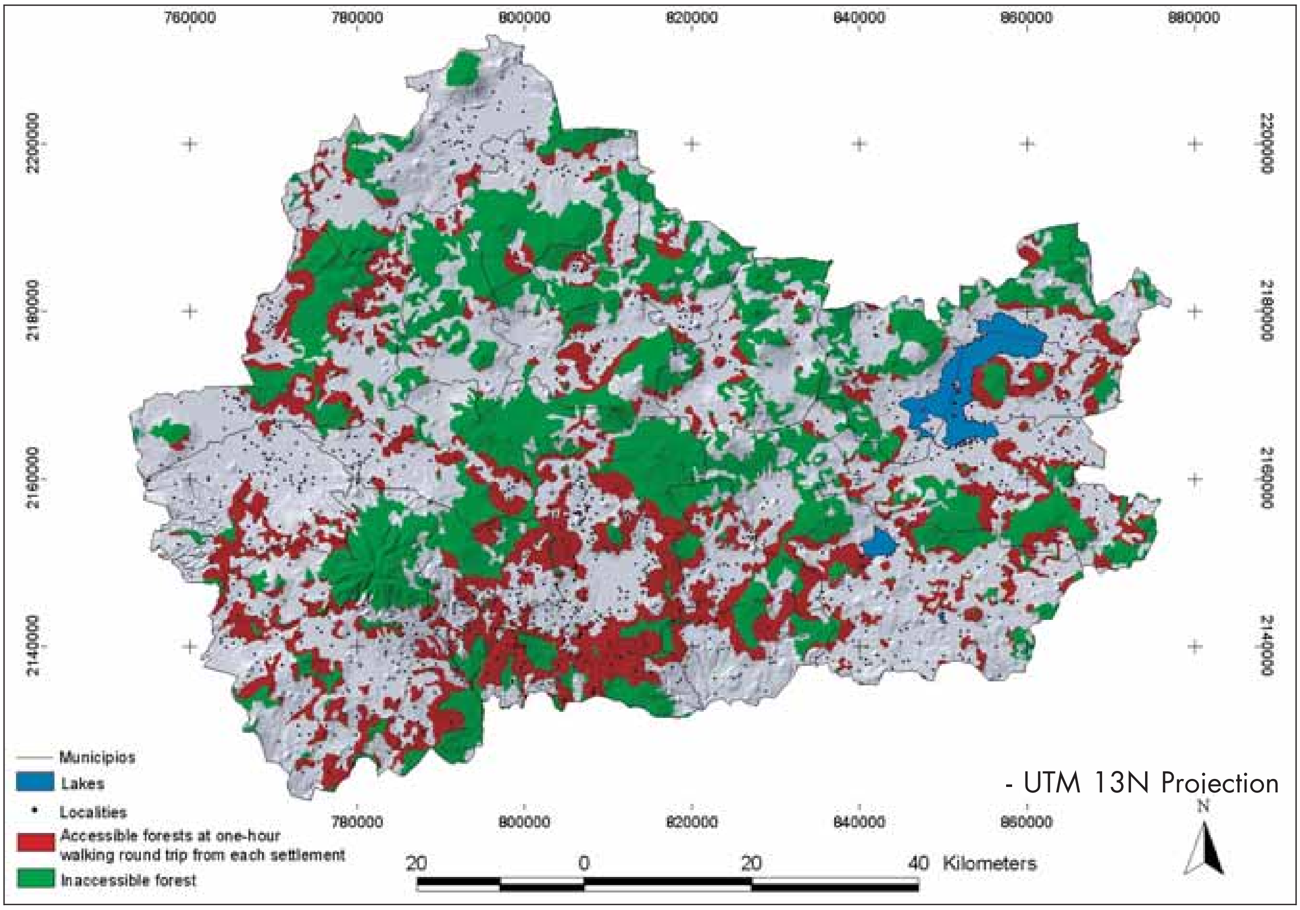


Figure 25. Accessible forest areas of the Purhepecha Region at one-hour walking round trip from each settlement

Table 16. Accessible forest areas of the Purhepecha Region by walking fuelwood gatherers, and further priorization according to four fuelwood users densities

	Area (ha)	Percentage
Total Forest Area of the Purhepecha Region	301,397 ha	100 %
Accessible forest areas at one hour walking round trip from each settlement.	120,867ha	40 %
Low density	38,490 ha	**31.9 %** of 40%
Mid-Low density	34,984 ha	**28.9 %** of 40%
Mid-High density	30,710 ha	25.4 % of 40%
High density	15,984 ha	**13.2 %** of 40%
Accessible forest areas at two hours walking round trip from each settlement.	241,757 ha	80 %

Figures 26 and 27 show the accessible forest areas for each density group. Red areas represent the highest priority sites, considered by the model as prone to degradation because of the pressure exerted by local fuelwood users. Priority sites sum almost 16,000 ha, corresponding to 13% of the region total accessible forest when considering buffers of one-hour. This percentage is reduced to 11% of the accessible forests when considering buffers of two hours. In these sites, specific actions such as forest restoration or multipurpose plantations may be relevant (Table 16).

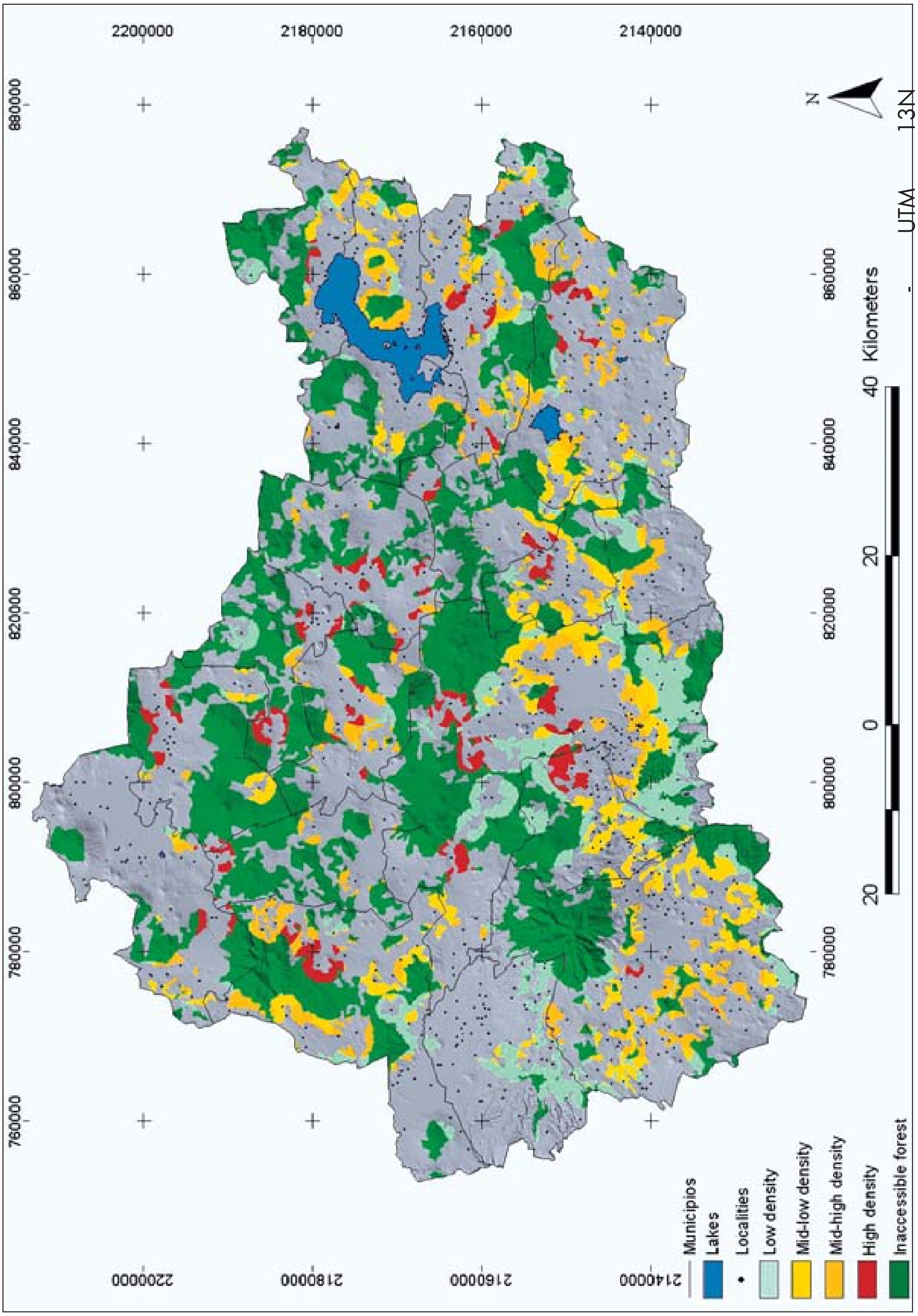


Figure 26. Accessible forest areas of the Purhepecha Region at one-hour walking round trip from each settlement, according to four fuelwood users densities

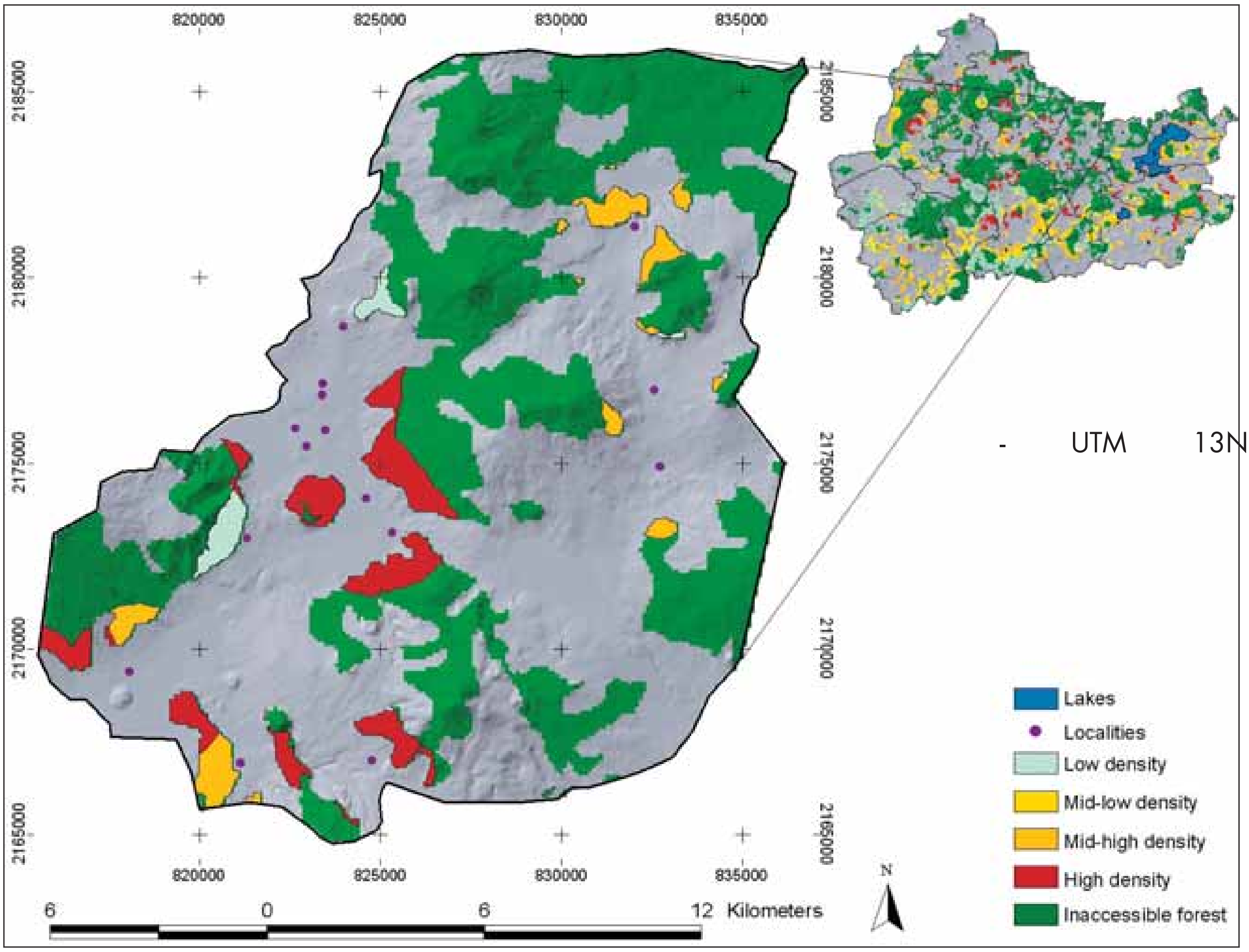


Figure 27. Accessible forest areas of "Nahuatzen", a *municipio* in the Purhepecha Region, at one-hour walking round trip from each settlement, according to four fuelwood users densities

The accessibility analysis presented here is a good first step to further guide strategic planning into actual implementation. It helped to preliminary identifying concrete -spatial-explicit- areas where forest management or restoration activities directed to fuelwood production may be undertaken. Subsequent work is needed with local people in order to validate the analysis and also to select the concrete forest management options suitable to the specific conditions of each village.

Analytically, more sophisticated analyses of accessible forests may include the use of friction functions of velocity displacement according to land cover classes; fuelwood gatherers using motorized vehicles; data from land property and rights; fuelwood market dynamics; competition from small industrial woodfuel demand; and assigning woody biomass productivities by forest type.

5. Conclusions

Most developing countries have scarce financial and human resources for the design and implementation of appropriate policies and measures to promote a sustainable use of woodfuels. As shown by the Mexican example presented in this report, multi-scale assessments of woodfuel priority areas are an attractive option to focus government resources to critical areas -or fuelwood "hot spots"- where action is more needed. Within priority areas, multi-scale assessments further help to preliminary identify in a spatial-explicit fashion, those forest areas under greatest pressure from fuelwood harvesting.

The analysis conducted in Mexico confirmed that the fuelwood situation is very heterogeneous within the country; therefore broad generalizations about the impacts of fuelwood use are wrong. Much more effective policies and more efficient use of resources can be assured by focussing actions to priority areas. In the Mexican example, the analysis using WISDOM allowed the identification of 262 *municipios* out of a total of 2,401, leading to a reduction of target areas of almost 90%.

Following the multi-scale hierarchical framework, an accessibility analysis was conducted over the Purhepecha Region (a region composing a cluster of priority municipios) to further define and spatially explicitly identify areas under pressure from fuelwood harvesting. In the case analyzed, 40% of the forest area is physically accessible for fuelwood gatherers at one-hour walking round trip (equivalent to an overall fuelwood collection trip of two to four hours), and 13% of it is estimated to have the highest pressure from fuelwood gatherers.

Operatively, we established a comprehensive and flexible GIS platform that permits a readily spatial representation of *municipios*, according to a set of predefined criteria concerning environmental, social or economic issues. In addition to identify priority areas, the GIS platform can be used for a variety of applications: for example, to develop future scenarios of the fuelwood situation in the country, to help identify population at risk from indoor air pollution by fuelwood burning within households, or to establish target areas for forest management of restoration efforts oriented to fuelwood production. In our case, we used the WISDOM database to preliminary estimate the CO_2 emissions coming from the non-sustainable use of fuelwood in Mexico. The analysis showed emissions in the order of 1.9 to 3.8 million ton of CO_2 per year when considering total and accessible forests, respectively. This range is lower than previous estimates conducted using more aggregated information.

The following actions are needed to improve the present analysis:

- To validate the results of "priority municipios" and forest areas under fuelwood pressure on the field.
- To expand the demand module in order to include: non exclusive fuelwood users (i.e. households that simultaneously use fuelwood and LPG); other uses of woodfuels (such as the demand for small industries), and demand from timber.
- To expand the supply module, with more detailed estimates of forest biomass productivity according to forest classes, forest status (degraded or not) and geographical location within the country
- To conduct a more detailed accessibility analysis including other physical, and very particularly legal and social constrains.

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7. Annexes

Annex 1. List of municipios *according to their classification into high, mid-high and medium priority groups*

Municipality Name (State)	Fuelwood users	Percentage of fuelwood users over total population	Anual Fuelwood Consumption Coming From Forest Areas (ton/yr)	Saturation of Fuelwood Users (households)	Fuelwood Balance (ton/yr)
HIGH PRIORITY - (262 *municipios*)					
AMATAN (CHS)	17.825	95%	15.397	94,0%	49.766
BELLA VISTA (CHS)	17.362	95%	13.824	94,4%	11.483
CHALCHIHUITAN (CHS)	11.896	97%	7.050	97,0%	34.142
CHAMULA (CHS)	56.793	96%	33.656	96,2%	22.981
CHENALHO (CHS)	22.228	81%	13.173	79,7%	16.815
GRANDEZA, LA (CHS)	5.730	96%	3.396	94,7%	-1.647
HUIXTAN (CHS)	16.986	91%	10.066	90,2%	24.959
HUITIUPAN (CHS)	18.732	93%	14.897	92,2%	54.010
IXHUATAN (CHS)	7.028	79%	5.293	76,2%	20.452
IXTAPA (CHS)	15.329	83%	9.085	80,5%	39.683
JITOTOL (CHS)	11.372	87%	6.813	84,8%	39.396
MITONTIC (CHS)	7.324	96%	4.340	96,2%	-4.172
OCOTEPEC (CHS)	8.801	95%	5.322	95,0%	10.448
OXCHUC (CHS)	35.467	94%	21.018	93,3%	45.201
PANTELHO (CHS)	13.256	82%	7.856	79,5%	2.088
PANTEPEC (CHS)	7.767	91%	4.730	89,2%	14.003
PORVENIR, EL (CHS)	11.221	96%	6.663	95,0%	818
PUEBLO NUEVO SOLISTAHUACAN (CHS)	21.112	87%	13.136	84,9%	26.674
RAYON (CHS)	4.905	71%	2.907	69,3%	4.627
ROSAS, LAS (CHS)	16.127	76%	9.584	73,0%	18.617
SABANILLA (CHS)	18.774	89%	15.842	87,8%	38.596
SALTO DE AGUA (CHS)	43.287	88%	38.479	85,6%	106.300
SOYALO (CHS)	6.306	81%	3.756	78,4%	10.552
TAPILULA (CHS)	5.958	58%	3.558	53,2%	-1.277
TENEJAPA (CHS)	29.816	90%	17.669	88,3%	148
TEOPISCA (CHS)	22.086	82%	13.088	78,7%	33.038
TILA (CHS)	50.778	87%	43.517	86,3%	113.619
SAN LUCAS (CHS)	5.228	92%	3.116	91,4%	10.249
ZINACANTAN (CHS)	27.662	93%	16.393	93,5%	17.945
SAN JUAN CANCUC (CHS)	18.349	89%	10.874	89,1%	2.933
ATLAMAJALCINGO DEL MONTE (GRO)	4.698	92%	2.784	93,9%	13.916
ATLIXTAC (GRO)	20.335	95%	12.088	95,2%	97.154
COPANATOYAC (GRO)	14.804	94%	8.783	93,2%	30.639
CHILAPA DE ALVAREZ (GRO)	78.241	76%	46.609	75,4%	84.883

Municipality Name (State)	Fuelwood users	Percentage of fuelwood users over total population	Anual Fuelwood Consumption Coming From Forest Areas (ton/yr)	Saturation of Fuelwood Users (households)	Fuelwood Balance (ton/yr)
HIGH PRIORITY					
MALINALTEPEC (GRO)	33.855	97%	20.063	96,6%	162.070
METLATONOC (GRO)	29.322	98%	17.400	97,3%	248.437
SAN LUIS ACATLAN (GRO)	33.719	92%	19.999	89,7%	292.227
XALPATLAHUAC (GRO)	10.912	93%	6.527	92,8%	34.968
XOCHISTLAHUACA (GRO)	21.174	93%	12.689	92,1%	139.495
ZITLALA (GRO)	16.020	92%	9.466	91,8%	70.988
ACAXOCHITLAN (HGO)	27.940	76%	16.558	72,1%	3.022
ATLAPEXCO (HGO)	16.226	90%	14.242	89,3%	5.244
CALNALI (HGO)	14.081	86%	9.413	84,8%	11.060
CHAPULHUACAN (HGO)	15.790	78%	11.861	75,6%	28.734
HUAUTLA (HGO)	20.534	88%	17.622	87,5%	32.384
HUAZALINGO (HGO)	10.527	95%	8.190	93,8%	-1.427
HUEHUETLA (HGO)	22.464	90%	18.582	88,8%	-468
HUEJUTLA DE REYES (HGO)	74.197	69%	64.386	63,9%	-48.260
JALTOCAN (HGO)	8.684	86%	7.719	82,8%	-6.224
SAN FELIPE ORIZATLAN (HGO)	32.585	86%	28.965	84,0%	-12.151
TEPEHUACAN DE GUERRERO (HGO)	24.332	94%	19.061	93,1%	33.240
TLANCHINOL (HGO)	28.021	87%	18.811	85,4%	37.426
XOCHIATIPAN (HGO)	16.356	96%	14.539	95,8%	15.776
YAHUALICA (HGO)	19.894	96%	17.575	95,4%	9.919
AMANALCO (MEX)	17.151	81%	10.164	78,6%	22.130
ATLACOMULCO (MEX)	19.732	26%	11.693	23,8%	-2.290
DONATO GUERRA (MEX)	21.947	78%	13.006	75,2%	19.726
IXTLAHUACA (MEX)	44.748	39%	26.518	36,4%	-25.367
JIQUIPILCO (MEX)	30.003	53%	17.780	51,4%	867
MORELOS (MEX)	17.121	63%	10.146	61,3%	5.842
SAN FELIPE DEL PROGRESO (MEX)	133.204	75%	78.939	72,4%	-32.828
TEMOAYA (MEX)	37.849	55%	22.430	51,3%	-16.027
VILLA DE ALLENDE (MEX)	33.507	83%	19.857	81,0%	9.380
VILLA VICTORIA (MEX)	54.785	74%	32.466	69,8%	-21.064
NAHUATZEN (MIC)	18.167	78%	10.766	75,2%	23.285
CANDELARIA LOXICHA (OAX)	8.557	89%	6.192	87,2%	48.815
COATECAS ALTAS (OAX)	5.512	95%	3.266	93,8%	1.648
COICOYAN DE LAS FLORES (OAX)	5.537	97%	3.281	94,7%	21.499
CHALCATONGO DE HIDALGO (OAX)	6.364	81%	3.771	81,4%	15.886
TAMAZULAPAM DEL ESPIRITU SANTO (OAX)	5.923	88%	3.510	88,0%	8.175
HUAUTLA DE JIMENEZ (OAX)	24.304	78%	14.755	79,5%	6.261
MAGDALENA OCOTLAN (OAX)	881	86%	382	84,8%	-381
MAGDALENA PE¥ASCO (OAX)	3.401	98%	2.015	97,9%	4.195

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HIGH PRIORITY					
MAGDALENA TEITIPAC (OAX)	3.376	94%	2.001	94,0%	3.949
MAZATLAN VILLA DE FLORES (OAX)	13.481	97%	8.117	95,8%	18.364
PINOTEPA DE DON LUIS (OAX)	5.370	86%	3.299	82,7%	2.345
SAN AGUSTIN LOXICHA (OAX)	21.836	97%	15.542	96,7%	73.384
SAN ANDRES PAXTLAN (OAX)	3.642	98%	2.158	98,0%	10.334
SAN ANDRES TEOTILALPAM (OAX)	4.250	99%	3.375	98,7%	27.456
SAN ANTONINO MONTE VERDE (OAX)	6.008	97%	3.560	96,5%	8.703
SAN BARTOLOME AYAUTLA (OAX)	3.730	97%	2.790	97,6%	11.223
SAN BLAS ATEMPA (OAX)	11.663	73%	7.165	70,6%	27.670
SAN CRISTOBAL AMATLAN (OAX)	4.062	96%	2.422	96,1%	21.673
SAN FELIPE JALAPA DE DIAZ (OAX)	20.760	89%	18.023	88,0%	17.925
SAN JOSE INDEPENDENCIA (OAX)	4.327	95%	3.846	94,6%	4.652
SAN JOSE TENANGO (OAX)	19.213	96%	15.384	96,0%	65.748
SAN JUAN BAUTISTA TUXTEPEC (OAX)	34.395	26%	30.574	23,0%	-3.938
SAN JUAN COLORADO (OAX)	8.285	96%	5.880	94,3%	15.242
SAN JUAN ¶UMI (OAX)	6.508	96%	3.857	95,8%	23.856
SAN LORENZO (OAX)	5.280	98%	3.243	97,8%	14.655
SAN LORENZO CUAUNECUILTITLA (OAX)	727	99%	431	98,5%	732
SAN LORENZO TEXMELUCAN (OAX)	5.612	99%	3.326	98,4%	14.570
SAN LUCAS CAMOTLAN (OAX)	3.084	98%	1.828	98,4%	22.156
SAN LUCAS OJITLAN (OAX)	18.617	93%	16.549	91,4%	101.106
SAN LUCAS ZOQUIAPAM (OAX)	7.116	98%	4.217	97,8%	5.627
SAN MARTIN ITUNYOSO (OAX)	2.510	96%	1.487	97,5%	11.218
SAN MARTIN PERAS (OAX)	8.668	98%	5.137	97,0%	35.835
SAN MATEO DEL MAR (OAX)	9.817	92%	4.744	91,1%	7.346
SAN MATEO YOLOXOCHITLAN (OAX)	2.520	87%	1.093	86,0%	-1.091
SAN MIGUEL PANIXTLAHUACA (OAX)	6.490	97%	4.024	96,2%	40.266
NUEVO SOYALTEPEC (OAX)	30.236	84%	26.877	82,4%	60.145
SAN PEDRO EL ALTO (OAX)	4.642	98%	2.751	97,3%	11.717
SAN PEDRO IXCATLAN (OAX)	9.853	91%	8.759	89,7%	4.863
SAN PEDRO JICAYAN (OAX)	9.240	95%	5.676	93,8%	27.160
SAN PEDRO MARTIR (OAX)	1.726	91%	748	91,0%	-747
SAN PEDRO OCOPETATILLO (OAX)	849	97%	503	97,5%	-20
SAN SIMON ZAHUATLAN (OAX)	2.192	99%	1.299	97,9%	5.678
SANTA CATARINA MECHOACAN (OAX)	4.033	95%	2.369	94,6%	10.662

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HIGH PRIORITY					
SANTA CRUZ ACATEPEC (OAX)	1.241	98%	735	97,9%	-345
SANTA CRUZ ZENZONTEPEC (OAX)	14.748	98%	8.807	97,8%	106.014
SANTA LUCIA MIAHUATLAN (OAX)	2.739	98%	1.623	97,5%	9.932
SANTA LUCIA OCOTLAN (OAX)	3.113	90%	1.350	90,5%	-1.348
SANTA MARIA LA ASUNCION (OAX)	3.250	98%	1.926	97,7%	-725
SANTA MARIA CHILCHOTLA (OAX)	20.240	94%	15.604	94,6%	39.559
SANTA MARIA TEMAXCALAPA (OAX)	923	96%	547	95,3%	296
SANTA MARIA TEMAXCALTEPEC (OAX)	2.193	99%	1.441	98,8%	3.442
SANTA MARIA TEOPOXCO (OAX)	4.773	99%	2.829	97,9%	338
SANTA MARIA TLAHUITOLTEPEC (OAX)	7.745	92%	4.593	92,6%	17.388
SANTA MARIA YUCUHITI (OAX)	6.283	96%	3.702	93,2%	10.308
SANTIAGO AMOLTEPEC (OAX)	9.371	98%	5.592	98,0%	36.339
SANTIAGO APOSTOL (OAX)	3.635	78%	1.576	78,0%	-1.575
SANTIAGO IXTAYUTLA (OAX)	10.347	97%	6.166	96,2%	72.313
SANTIAGO TEXCALCINGO (OAX)	2.640	97%	1.565	97,5%	183
SANTIAGO TLAZOYALTEPEC (OAX)	4.290	99%	2.542	98,7%	8.437
SANTIAGO YAITEPEC (OAX)	2.991	96%	1.773	94,0%	9.207
SANTO DOMINGO DE MORELOS (OAX)	8.198	94%	5.418	92,0%	37.003
SANTO TOMAS OCOTEPEC (OAX)	4.011	97%	2.377	96,2%	7.870
SAN VICENTE COATLAN (OAX)	4.076	98%	2.416	97,2%	12.893
AHUACATLAN (PUE)	11.938	91%	7.075	89,9%	1.786
AJALPAN (PUE)	33.599	69%	20.076	66,6%	71.993
ALTEPEXI (PUE)	6.148	39%	2.666	36,9%	-435
AMIXTLAN (PUE)	4.099	87%	2.429	87,1%	34
ATEMPAN (PUE)	12.990	70%	7.698	66,0%	-4.365
AYOTOXCO DE GUERRERO (PUE)	6.187	80%	5.500	76,4%	-4.426
CAMOCUAUTLA (PUE)	2.053	95%	1.217	95,1%	742
CAXHUACAN (PUE)	3.278	83%	1.421	81,3%	-1.420
COYOMEAPAN (PUE)	11.937	94%	7.126	93,8%	34.463
CUAUTEMPAN (PUE)	7.792	87%	4.618	86,0%	4.284
CUETZALAN DEL PROGRESO (PUE)	37.192	83%	23.749	78,8%	-12.510
CHICONCUAUTLA (PUE)	12.125	94%	7.185	93,8%	1.744
CHICHIQUILA (PUE)	19.185	95%	11.383	94,0%	1.859
CHIGNAUTLA (PUE)	11.761	55%	6.970	50,6%	8.210
CHILCHOTLA (PUE)	16.156	91%	9.574	87,7%	12.123
ELOXOCHITLAN (PUE)	10.420	96%	7.130	96,4%	19.639
FRANCISCO Z. MENA (PUE)	13.445	82%	10.526	79,3%	-1.035

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		HIGH PRIORITY			
HERMENEGILDO GALEANA (PUE)	7.413	90%	4.393	88,9%	-610
HUEHUETLA (PUE)	14.858	92%	13.207	90,9%	-11.137
HUEYAPAN (PUE)	8.329	82%	4.936	78,9%	6.856
HUEYTAMALCO (PUE)	20.579	73%	14.608	70,3%	-1.080
HUEYTLALPAN (PUE)	5.223	96%	3.095	94,9%	-3.031
HUITZILAN DE SERDAN (PUE)	10.719	92%	6.352	90,4%	2.048
IGNACIO ALLENDE (PUE)	2.565	93%	1.112	93,0%	-1.111
IXTEPEC (PUE)	6.097	93%	2.644	91,9%	-2.642
JALPAN (PUE)	11.678	88%	10.381	86,2%	-4.028
JONOTLA (PUE)	4.299	87%	2.953	83,9%	-1.558
JOPALA (PUE)	11.516	85%	6.825	84,9%	-5.301
NAUPAN (PUE)	7.620	79%	5.220	79,5%	-1.369
OLINTLA (PUE)	11.946	95%	8.727	93,7%	-2.308
PAHUATLAN (PUE)	14.180	77%	8.717	76,4%	-620
PANTEPEC (PUE)	17.007	88%	15.118	86,9%	-13.169
QUIMIXTLAN (PUE)	17.927	93%	10.648	91,7%	17.112
SAN FELIPE TEPATLAN (PUE)	4.130	93%	2.447	93,1%	977
SAN GABRIEL CHILAC (PUE)	7.196	53%	3.249	52,5%	26.400
SAN SEBASTIAN TLACOTEPEC (PUE)	12.794	97%	9.854	96,4%	49.973
TEPANGO DE RODRIGUEZ (PUE)	3.573	89%	2.117	88,3%	2.389
TEPETZINTLA (PUE)	8.876	94%	5.260	92,8%	4.142
TEZIUTLAN (PUE)	14.685	18%	8.703	13,7%	315
TLACUILOTEPEC (PUE)	16.743	94%	12.084	93,2%	-1.730
TLAOLA (PUE)	15.791	87%	9.358	85,6%	675
TLAPACOYA (PUE)	5.979	92%	3.543	91,0%	915
TUZAMAPAN DE GALEANA (PUE)	5.435	88%	3.268	87,5%	-2.493
VICENTE GUERRERO (PUE)	19.714	93%	11.683	91,8%	20.630
XICOTEPEC (PUE)	25.876	37%	16.438	33,8%	668
XOCHITLAN DE VICENTE SUAREZ (PUE)	9.811	83%	5.814	82,0%	364
ZACAPOAXTLA (PUE)	32.347	66%	19.169	61,9%	9.143
ZAPOTITLAN DE MENDEZ (PUE)	4.142	79%	2.455	74,6%	-1.074
ZAUTLA (PUE)	15.838	81%	9.353	79,4%	31.914
ZIHUATEUTLA (PUE)	10.379	77%	8.343	82,0%	3.671
ZINACATEPEC (PUE)	8.179	60%	4.024	58,5%	6.809
ZOQUIAPAN (PUE)	2.496	85%	1.770	84,1%	260
ZOQUITLAN (PUE)	18.556	94%	11.703	92,9%	35.995
TANCANHUITZ DE SANTOS (SLP)	16.078	81%	14.292	77,5%	-2.690
COXCATLAN (SLP)	15.373	89%	13.665	87,2%	-5.527
HUEHUETLAN (SLP)	11.662	82%	10.367	78,6%	1.823
SAN ANTONIO (SLP)	8.899	95%	7.911	94,1%	-1.471

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HIGH PRIORITY					
SAN MARTIN CHALCHICUAUTLA (SLP)	19.790	88%	17.592	86,3%	-7.393
SAN VICENTE TANCUAYALAB (SLP)	10.466	74%	6.541	70,2%	-3.712
TAMAZUNCHALE (SLP)	62.969	71%	55.945	66,1%	-14.877
TAMPACAN (SLP)	14.343	90%	11.633	88,5%	-6.141
TAMPAMOLON CORONA (SLP)	11.981	87%	10.650	85,2%	-1.312
TANLAJAS (SLP)	16.594	91%	14.751	89,7%	-3.689
TANQUIAN DE ESCOBEDO (SLP)	8.010	60%	7.120	54,5%	-6.848
AXTLA DE TERRAZAS (SLP)	24.935	79%	22.165	76,5%	-15.507
XILITLA (SLP)	42.036	85%	31.206	82,0%	44.307
COMALCALCO (TAB)	83.064	50%	41.501	45,6%	-19.036
CUNDUACAN (TAB)	55.641	53%	24.127	49,5%	-18.063
JALPA DE MENDEZ (TAB)	34.488	50%	16.998	46,4%	-5.536
ACAYUCAN (VER)	30.511	39%	19.752	35,5%	-12.961
ASTACINGA (VER)	5.060	94%	2.999	94,0%	1.061
ATLAHUILCO (VER)	7.777	97%	4.609	95,8%	5.391
ATZALAN (VER)	40.128	83%	30.679	80,7%	-9.958
BENITO JUAREZ (VER)	15.390	95%	13.680	93,6%	22.823
CALCAHUALCO (VER)	10.406	94%	5.949	92,8%	23.083
CAZONES DE HERRERA (VER)	17.755	74%	12.832	71,6%	-12.697
CITLALTEPETL (VER)	9.101	81%	7.814	77,5%	-117
COAHUITLAN (VER)	6.615	96%	5.880	95,5%	-4.811
COETZALA (VER)	1.676	91%	1.490	90,0%	-789
COXQUIHUI (VER)	13.441	93%	11.948	92,0%	-11.282
COYUTLA (VER)	18.630	88%	16.561	86,8%	-10.682
CHALMA (VER)	10.383	80%	9.230	78,1%	-1.620
CHICONAMEL (VER)	6.249	94%	5.555	93,4%	-3.085
CHICONTEPEC (VER)	51.400	88%	45.691	85,6%	-129
CHINAMPA DE GOROSTIZA (VER)	8.473	60%	7.532	57,3%	71
CHUMATLAN (VER)	3.355	98%	2.982	97,2%	-1.894
ESPINAL (VER)	20.257	85%	18.007	82,3%	-16.849
FILOMENO MATA (VER)	10.209	94%	9.075	93,8%	-8.728
HUEYAPAN DE OCAMPO (VER)	25.397	64%	21.009	59,0%	3.674
ILAMATLAN (VER)	12.418	96%	9.370	95,6%	10.967
IXHUATLAN DEL CAFE (VER)	15.981	80%	10.601	77,9%	6.352
IXHUATLAN DE MADERO (VER)	46.749	95%	41.556	93,9%	17.210
JALACINGO (VER)	23.268	70%	13.789	67,3%	-1.025
MAGDALENA (VER)	2.140	92%	1.312	93,5%	1.331
MARTINEZ DE LA TORRE (VER)	28.212	24%	20.448	21,5%	-16.734
MECATLAN (VER)	9.878	95%	8.781	94,9%	-8.424
MECAYAPAN (VER)	14.125	93%	11.234	91,3%	9.671

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HIGH PRIORITY					
MISANTLA (VER)	31.781	52%	20.585	48,3%	-4.816
MIXTLA DE ALTAMIRANO (VER)	8.201	98%	5.052	98,0%	4.486
NARANJAL (VER)	3.058	76%	2.718	73,2%	-2.580
OTEAPAN (VER)	6.999	58%	3.035	55,8%	-3.033
PAJAPAN (VER)	13.164	94%	8.516	93,0%	-5.075
PAPANTLA (VER)	93.541	55%	83.151	50,7%	-66.194
RAFAEL DELGADO (VER)	7.503	51%	5.276	45,4%	432
REYES, LOS (VER)	4.068	97%	2.411	96,7%	3.608
SAN ANDRES TUXTLA (VER)	82.668	58%	71.664	53,9%	-14.774
SAYULA DE ALEMAN (VER)	17.155	61%	11.743	58,4%	-5.608
SOCONUSCO (VER)	5.955	52%	5.153	49,5%	-4.411
SOLEDAD ATZOMPA (VER)	15.938	97%	9.445	96,8%	15.736
SOTEAPAN (VER)	25.908	94%	22.414	94,1%	39.380
TANTIMA (VER)	11.137	83%	9.500	79,9%	4.722
TANTOYUCA (VER)	69.880	74%	60.341	71,5%	10.858
CASTILLO DE TEAYO (VER)	15.893	81%	14.128	77,3%	-12.061
TEHUIPANGO (VER)	16.903	96%	10.017	94,8%	353
TEMAPACHE (VER)	67.328	65%	59.849	60,9%	-29.710
TEMPOAL (VER)	22.182	61%	18.942	57,0%	-12.802
TEPETZINTLA (VER)	10.486	76%	9.060	73,6%	2.422
TEQUILA (VER)	10.892	91%	6.911	90,6%	13.379
TEXCATEPEC (VER)	8.885	98%	6.482	97,9%	16.342
TEXHUACAN (VER)	4.410	95%	2.613	93,9%	4.130
TIHUATLAN (VER)	39.659	49%	35.254	45,5%	-29.922
TLACHICHILCO (VER)	10.556	95%	8.218	94,8%	16.784
TLAPACOYAN (VER)	18.422	36%	7.988	31,7%	-7.987
TLAQUILPAN (VER)	6.027	96%	3.572	96,0%	3.527
XOXOCOTLA (VER)	4.037	92%	2.392	92,0%	2.127
ZARAGOZA (VER)	6.740	75%	5.991	72,2%	-4.253
ZONGOLICA (VER)	33.720	85%	27.669	84,1%	46.863
ZONTECOMATLAN (VER)	11.908	97%	10.148	96,2%	41.365
ZOZOCOLCO DE HIDALGO (VER)	11.974	95%	5.192	94,1%	-5.191
ACANCEH (YUC)	9.474	72%	5.820	69,8%	18.701
AKIL (YUC)	7.965	85%	4.893	82,5%	2.189
CHUMAYEL (YUC)	2.554	89%	1.569	87,5%	6.752
MAYAPAN (YUC)	2.360	95%	1.450	95,3%	2.888
TICUL (YUC)	17.990	55%	11.051	50,3%	104.831

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MID-HIGH PRIORITY - (389 *municipios*)					
CALKINI (CAM)	29.080	62%	18894	59,1%	681.052
ACALA (CHS)	15.330	62%	9241	58,1%	57.657
AMATENANGO DE LA FRONTERA (CHS)	22.486	86%	13461	83,6%	33.896
AMATENANGO DEL VALLE (CHS)	5.198	79%	3080	79,6%	25.314
BEJUCAL DE OCAMPO (CHS)	6.514	98%	3878	96,4%	1.302
BOCHIL (CHS)	14.694	65%	8764	61,2%	86.260
BOSQUE, EL (CHS)	10.688	71%	6334	68,9%	18.764
CACAHOATAN (CHS)	21.927	56%	17060	51,8%	43.360
CATAZAJA (CHS)	10.689	68%	5173	65,4%	20.668
COAPILLA (CHS)	6.457	89%	3841	87,3%	26.783
COPAINALA (CHS)	13.247	69%	8314	65,0%	50.873
CHAPULTENANGO (CHS)	5.899	85%	4729	83,3%	35.051
CHIAPA DE CORZO (CHS)	26.531	44%	15832	41,5%	124.719
CHIAPILLA (CHS)	3.451	66%	2120	63,9%	-1.658
CHILON (CHS)	58.241	75%	42219	71,9%	340.539
FRANCISCO LEON (CHS)	5.077	97%	4224	96,1%	36.193
FRONTERA HIDALGO (CHS)	7.167	66%	3108	63,7%	-3.106
HUEHUETAN (CHS)	19.214	61%	14411	57,6%	-196
INDEPENDENCIA, LA (CHS)	30.400	94%	19425	93,5%	37.976
IXTACOMITAN (CHS)	5.791	63%	5148	56,5%	13.278
IXTAPANGAJOYA (CHS)	4.277	91%	3802	88,8%	8.377
LARRAINZAR (CHS)	12.173	74%	7214	72,8%	23.141
MAZATAN (CHS)	15.385	64%	8483	61,3%	7.865
METAPA (CHS)	2.516	52%	2237	48,0%	-2.207
MOTOZINTLA (CHS)	40.198	67%	27918	62,0%	100.059
NICOLAS RUIZ (CHS)	2.811	86%	1727	85,8%	7.602
OCOZOCOAUTLA DE ESPINOSA (CHS)	38.352	58%	28758	53,8%	505.405
PALENQUE (CHS)	51.605	60%	44955	55,2%	310.911
SILTEPEC (CHS)	30.356	94%	18093	92,0%	151.281
SIMOJOVEL (CHS)	20.033	63%	13018	59,0%	42.286
SOCOLTENANGO (CHS)	11.269	74%	6919	69,7%	54.588
SOLOSUCHIAPA (CHS)	6.294	81%	5437	78,0%	23.316
TAPACHULA (CHS)	74.166	27%	60689	23,4%	76.059
TAPALAPA (CHS)	3.258	90%	2051	88,6%	12.281
TECPATAN (CHS)	28.006	73%	24220	68,7%	115.515
TOTOLAPA (CHS)	4.960	90%	2955	88,9%	13.108
TRINITARIA, LA (CHS)	53.439	90%	33699	88,4%	185.018
TUMBALA (CHS)	22.396	83%	18303	81,7%	40.886
TUXTLA CHICO (CHS)	23.452	70%	20847	67,5%	6.228

Municipality Name (State)	Fuelwood users	Percentage of fuelwood users over total population	Anual Fuelwood Consumption Coming From Forest Areas (ton/yr)	Saturation of Fuelwood Users (households)	Fuelwood Balance (ton/yr)
MID-HIGH PRIORITY					
UNION JUAREZ (CHS)	9.183	66%	7811	61,9%	13.301
YAJALON (CHS)	14.534	56%	9668	51,6%	23.092
GUADALUPE Y CALVO (CHI)	45.215	94%	26821	93,1%	2.125.501
AHUACUOTZINGO (GRO)	17.978	93%	10840	92,4%	246.627
ALCOZAUCA DE GUERRERO (GRO)	14.568	92%	8673	90,9%	100.238
AYUTLA DE LOS LIBRES (GRO)	47.636	86%	28553	84,2%	235.186
COPALILLO (GRO)	11.610	91%	7042	88,9%	259.040
CUAUTEPEC (GRO)	14.285	94%	8773	92,8%	101.098
FLORENCIO VILLARREAL (GRO)	13.709	72%	8288	68,9%	20.572
IGUALAPA (GRO)	9.267	91%	5661	89,5%	68.012
OLINALA (GRO)	17.983	79%	10832	75,2%	173.739
OMETEPEC (GRO)	35.976	71%	22100	67,7%	187.005
QUECHULTENANGO (GRO)	29.008	89%	17536	86,8%	227.040
TECOANAPA (GRO)	38.839	90%	23226	88,2%	130.508
TIXTLA DE GUERRERO (GRO)	16.413	49%	9848	46,7%	63.585
TLACOACHISTLAHUACA (GRO)	14.797	94%	8819	93,6%	221.178
TLACOAPA (GRO)	8.652	94%	5127	95,0%	47.774
TLAPA DE COMONFORT (GRO)	31.485	55%	18886	52,6%	134.533
ZAPOTITLAN TABLAS (GRO)	9.682	94%	5738	95,9%	33.008
CHILCUAUTLA (HGO)	7.468	50%	3778	48,3%	28.696
LOLOTLA (HGO)	8.140	82%	5485	80,7%	17.538
PISAFLORES (HGO)	14.876	90%	11907	87,6%	19.964
SAN BARTOLO TUTOTEPEC (HGO)	15.997	86%	11143	85,9%	31.193
TENANGO DE DORIA (HGO)	12.779	74%	7573	72,9%	12.081
TEZONTEPEC DE ALDAMA (HGO)	10.416	27%	5178	25,8%	5.783
TIANGUISTENGO (HGO)	11.159	82%	7264	81,0%	15.406
ACAMBAY (MEX)	28.819	49%	17079	47,6%	13.974
ALMOLOYA DE JUAREZ (MEX)	43.235	39%	25622	37,6%	-20.345
CHAPA DE MOTA (MEX)	12.136	53%	7192	51,4%	23.595
IXTAPAN DEL ORO (MEX)	4.858	76%	2889	71,1%	13.768
ORO, EL (MEX)	12.867	42%	7625	39,2%	3.325
OTZOLOTEPEC (MEX)	12.791	22%	7580	20,3%	5.968
TEMASCALCINGO (MEX)	25.565	41%	15150	38,4%	7.015
TOLUCA (MEX)	54.425	8%	29869	6,7%	-16.052
VILLA DEL CARBON (MEX)	20.226	53%	11986	48,9%	23.999
CHARAPAN (MIC)	8.514	78%	5046	77,5%	23.975
CHILCHOTA (MIC)	18.213	59%	10793	54,5%	34.225
OCAMPO (MIC)	15.340	82%	9091	79,1%	13.960
PARACHO (MIC)	14.523	47%	8607	42,1%	18.378
TANGAMANDAPIO (MIC)	13.633	52%	8212	45,1%	39.395

Municipality Name (State)	Fuelwood users	Percentage of fuelwood users over total population	Annual Fuelwood Consumption Coming From Forest Areas (ton/yr)	Saturation of Fuelwood Users (households)	Fuelwood Balance (ton/yr)
MID-HIGH PRIORITY					
ZITACUARO (MIC)	47.841	35%	28470	31,7%	44.727
OCUITUCO (MOR)	7.634	51%	4528	48,6%	-2.263
TEMIXCO (MOR)	6.945	7%	4266	7,0%	4.775
TETELA DEL VOLCAN (MOR)	10.512	64%	6196	60,6%	5.384
TOTOLAPAN (MOR)	3.104	36%	1839	32,6%	-187
NAYAR, EL (NAY)	24.945	94%	14946	92,3%	1.495.335
ACATLAN DE PEREZ FIGUEROA (OAX)	25.130	56%	22339	53,5%	81.276
ASUNCION OCOTLAN (OAX)	3.118	85%	1352	86,7%	-1.351
AYOTZINTEPEC (OAX)	4.798	85%	4265	82,6%	37.044
CONCEPCION PAPALO (OAX)	2.899	94%	1737	94,4%	32.835
COSOLAPA (OAX)	5.559	38%	4942	36,1%	14.953
CUILAPAM DE GUERRERO (OAX)	4.920	38%	2916	37,0%	-2.037
CHAHUITES (OAX)	4.177	43%	2242	39,6%	-2.118
SAN JUAN CHIQUIHUITLAN (OAX)	2.404	96%	1581	95,0%	6.614
EJUTLA DE CRESPO (OAX)	11.044	63%	6572	63,4%	14.163
ELOXOCHITLAN DE FLORES MAGON (OAX)	3.942	95%	2336	94,4%	1.476
GUEVEA DE HUMBOLDT (OAX)	5.288	94%	3146	92,5%	74.621
HUAUTEPEC (OAX)	6.402	97%	3906	97,4%	2.272
JUCHITAN DE ZARAGOZA (OAX)	17.232	22%	10114	19,7%	37.923
MAGDALENA MIXTEPEC (OAX)	940	99%	557	98,8%	7.057
MIAHUATLAN DE PORFIRIO DIAZ (OAX)	18.049	55%	10765	54,3%	30.517
MIXISTLAN DE LA REFORMA (OAX)	2.633	99%	1560	97,8%	6.427
PE, LA (OAX)	1.973	97%	856	95,6%	-854
SAN JOSE DEL PROGRESO (OAX)	4.759	84%	2820	81,3%	7.471
SAN AGUSTIN CHAYUCO (OAX)	4.325	94%	2657	92,8%	56.413
SAN ANDRES HUAXPALTEPEC (OAX)	4.307	76%	2646	72,7%	2.084
SAN ANDRES NUXI¥O (OAX)	2.024	98%	1199	97,7%	5.808
SAN ANDRES SOLAGA (OAX)	1.613	96%	956	96,1%	2.626
SAN ANDRES ZABACHE (OAX)	817	89%	484	85,9%	-401
SAN ANTONIO DE LA CAL (OAX)	3.212	21%	1903	16,8%	-497
SAN ANTONIO HUITEPEC (OAX)	4.177	97%	2475	96,3%	28.337
SAN ANTONIO SINICAHUA (OAX)	1.265	93%	750	95,5%	4.974
SAN ANTONIO TEPETLAPA (OAX)	3.719	97%	2267	96,7%	25.497
SAN BARTOLOME LOXICHA (OAX)	2.445	97%	1667	97,4%	51.607
SAN CRISTOBAL AMOLTEPEC (OAX)	1.152	98%	683	98,0%	2.690
SAN CRISTOBAL LACHIRIOAG (OAX)	1.131	90%	670	90,8%	1.218
SAN DIONISIO OCOTEPEC (OAX)	7.687	79%	4603	76,6%	69.944
SAN ESTEBAN ATATLAHUCA (OAX)	3.325	98%	1970	97,2%	19.703
SAN FELIPE TEJALAPAM (OAX)	4.997	81%	2961	78,2%	8.128

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MID-HIGH PRIORITY					
SAN FELIPE USILA (OAX)	11.266	96%	9101	95,7%	147.574
SAN FRANCISCO HUEHUETLAN (OAX)	1.275	92%	756	91,3%	505
SAN FRANCISCO LOGUECHE (OAX)	1.841	99%	1103	98,0%	5.451
SAN FRANCISCO OZOLOTEPEC (OAX)	1.968	99%	1166	97,9%	4.347
SAN FRANCISCO TLAPANCINGO (OAX)	1.945	94%	1161	89,2%	20.147
SAN JACINTO TLACOTEPEC (OAX)	2.298	98%	1364	97,6%	9.584
SAN JERONIMO TAVICHE (OAX)	1.460	95%	867	92,8%	7.815
SAN JERONIMO TECOATL (OAX)	1.526	90%	904	88,3%	-620
SAN JORGE NUCHITA (OAX)	2.549	76%	1546	72,5%	11.905
SAN JOSE CHILTEPEC (OAX)	7.089	72%	6302	68,5%	23.836
SAN JOSE DEL PE¥ASCO (OAX)	1.856	98%	1100	97,2%	1.375
SAN JOSE LACHIGUIRI (OAX)	2.989	95%	1801	94,7%	1.495
SAN JUAN BAUTISTA TLACOATZINTEPEC (OAX)	2.202	98%	1872	97,9%	15.113
SAN JUAN COATZOSPAM (OAX)	2.371	96%	1562	95,5%	16.780
SAN JUAN COMALTEPEC (OAX)	2.269	97%	1345	97,2%	24.521
SAN JUAN DIUXI (OAX)	1.408	96%	825	95,4%	2.835
SAN JUAN GUICHICOVI (OAX)	23.469	86%	19603	84,2%	154.228
SAN JUAN JUQUILA VIJANOS (OAX)	1.789	98%	1060	98,0%	2.284
SAN JUAN LACHAO (OAX)	4.071	95%	2413	93,4%	51.553
SAN JUAN LALANA (OAX)	15.855	95%	12405	93,3%	138.486
SAN JUAN MAZATLAN (OAX)	15.773	92%	11835	90,9%	480.550
SAN JUAN MIXTEPEC -DISTR. 08- (OAX)	8.686	91%	5147	90,5%	49.182
SAN JUAN QUIAHIJE (OAX)	3.657	94%	2169	91,7%	52.453
SAN JUAN TABAA (OAX)	1.108	96%	657	96,3%	1.631
SAN JUAN YAE (OAX)	1.562	97%	1235	96,6%	6.198
SAN JUAN YATZONA (OAX)	489	99%	290	99,2%	3.733
SAN MARCIAL OZOLOTEPEC (OAX)	1.704	98%	1010	97,9%	11.670
SAN MARTIN DE LOS CANSECOS (OAX)	694	92%	411	91,9%	-123
SAN MARTIN TOXPALAN (OAX)	2.497	77%	1510	73,8%	10.759
SAN MATEO CAJONOS (OAX)	551	86%	327	80,1%	907
SAN MATEO PE¥ASCO (OAX)	1.715	93%	1016	93,2%	2.688
SAN MELCHOR BETAZA (OAX)	1.090	97%	646	97,2%	3.797
SAN MIGUEL AHUEHUETITLAN (OAX)	2.147	95%	1228	94,4%	23.511
SAN MIGUEL AMATITLAN (OAX)	5.661	92%	3401	89,4%	29.667
SAN MIGUEL COATLAN (OAX)	3.067	98%	1818	97,1%	23.132
SAN MIGUEL CHICAHUA (OAX)	2.198	97%	1303	95,8%	5.820
SAN MIGUEL EJUTLA (OAX)	613	69%	363	71,3%	-274
SAN MIGUEL MIXTEPEC (OAX)	2.059	98%	1220	98,0%	12.609

Municipality Name (State)	Fuelwood users	Percentage of fuelwood users over total population	Anual Fuelwood Consumption Coming From Forest Areas (ton/yr)	Saturation of Fuelwood Users (households)	Fuelwood Balance (ton/yr)
MID-HIGH PRIORITY					
SAN MIGUEL QUETZALTEPEC (OAX)	5.265	99%	3120	98,5%	51.179
SAN MIGUEL SANTA FLOR (OAX)	855	98%	500	94,1%	4.232
SAN MIGUEL SUCHIXTEPEC (OAX)	2.515	96%	1490	95,2%	10.959
SAN MIGUEL TILQUIAPAM (OAX)	3.055	97%	1810	96,4%	3.234
SAN MIGUEL TLACOTEPEC (OAX)	2.734	78%	1623	76,1%	2.684
SAN MIGUEL YOTAO (OAX)	593	99%	351	95,9%	7.586
SAN PABLO TIJALTEPEC (OAX)	2.438	98%	1450	96,4%	19.263
SAN PEDRO AMUZGOS (OAX)	4.458	84%	2397	80,8%	35.041
SAN PEDRO ATOYAC (OAX)	3.581	95%	2399	94,1%	27.438
SAN PEDRO IXTLAHUACA (OAX)	2.164	60%	938	57,7%	-937
SAN PEDRO MOLINOS (OAX)	593	91%	351	92,0%	3.640
SAN PEDRO OCOTEPEC (OAX)	1.716	96%	1017	96,5%	9.627
SAN PEDRO POCHUTLA (OAX)	22.828	62%	14631	58,1%	154.766
SAN PEDRO QUIATONI (OAX)	8.975	94%	5406	93,1%	191.142
SAN PEDRO SOCHIAPAM (OAX)	4.457	98%	3494	98,0%	58.040
SAN PEDRO TEUTILA (OAX)	4.046	97%	3203	95,7%	41.481
SAN PEDRO YANERI (OAX)	968	98%	574	97,2%	3.177
SAN PEDRO Y SAN PABLO AYUTLA (OAX)	4.608	84%	2733	86,2%	20.084
SAN SEBASTIAN RIO HONDO (OAX)	3.218	98%	1907	97,6%	11.481
SAN SEBASTIAN TUTLA (OAX)	639	4%	379	4,7%	-221
SANTA ANA ATEIXTLAHUACA (OAX)	524	100%	311	100,0%	2.607
SANTA ANA CUAUHTEMOC (OAX)	853	99%	518	98,4%	7.763
SANTA ANA ZEGACHE (OAX)	2.807	82%	1663	81,6%	-1.599
SANTA CATARINA LOXICHA (OAX)	4.268	96%	2583	95,3%	45.640
SANTA CATARINA TICUA (OAX)	719	84%	426	85,3%	797
SANTA CATARINA YOSONOTU (OAX)	1.821	99%	1079	98,3%	2.759
SANTA CRUZ ITUNDUJIA (OAX)	10.383	97%	6163	95,9%	113.473
SANTA CRUZ MIXTEPEC (OAX)	2.485	75%	1473	74,0%	5.117
SANTA CRUZ NUNDACO (OAX)	2.586	97%	1532	96,5%	7.571
SANTA CRUZ PAPALUTLA (OAX)	1.239	68%	537	67,0%	-309
SANTA CRUZ TACAHUA (OAX)	1.118	97%	669	94,7%	9.545
SANTA CRUZ XITLA (OAX)	3.240	80%	1920	79,6%	1.970
SANTA INES DEL MONTE (OAX)	2.177	98%	1290	97,6%	5.887
SANTA INES YATZECHE (OAX)	1.148	98%	498	97,7%	-496
SANTA LUCIA MONTEVERDE (OAX)	6.436	97%	3801	96,2%	26.680
SANTA MARIA ALOTEPEC (OAX)	2.440	92%	1446	91,7%	22.722
SANTA MARIA APAZCO (OAX)	2.460	97%	1462	95,4%	9.186
SANTA MARIA ATZOMPA (OAX)	3.666	23%	1590	22,0%	-1.588
SANTA MARIA JACATEPEC (OAX)	8.726	89%	7757	87,3%	94.829

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MID-HIGH PRIORITY					
SANTA MARIA LACHIXIO (OAX)	1.059	99%	628	97,8%	13.592
SANTA MARIA OZOLOTEPEC (OAX)	4.096	99%	2427	98,1%	22.214
SANTA MARIA PAPALO (OAX)	2.022	97%	1256	97,3%	20.070
SANTA MARIA PE¥OLES (OAX)	6.845	99%	4056	98,2%	40.779
SANTA MARIA PETAPA (OAX)	7.363	54%	5313	52,5%	32.769
SANTA MARIA TEPANTLALI (OAX)	2.625	95%	1557	97,0%	18.639
SANTA MARIA TEXCATITLAN (OAX)	1.164	97%	714	96,9%	10.825
SANTA MARIA TLALIXTAC (OAX)	1.529	98%	950	96,9%	3.668
SANTA MARIA TONAMECA (OAX)	17.719	88%	11348	84,3%	139.106
SANTA MARIA XADANI (OAX)	3.610	63%	1850	62,2%	15.231
SANTA MARIA YOSOYUA (OAX)	1.201	98%	712	97,3%	4.673
SANTIAGO ATITLAN (OAX)	2.712	98%	1607	98,4%	13.619
SANTIAGO CHOAPAM (OAX)	4.714	97%	2934	96,7%	75.309
SANTIAGO JOCOTEPEC (OAX)	12.121	96%	10612	96,1%	181.839
SANTIAGO LALOPA (OAX)	505	97%	299	96,6%	2.849
SANTIAGO MATATLAN (OAX)	5.679	65%	3373	62,3%	9.986
SANTIAGO NUYOO (OAX)	2.708	94%	1588	91,4%	12.093
SANTIAGO TETEPEC (OAX)	4.764	95%	2739	93,8%	82.864
SANTIAGO XANICA (OAX)	3.207	98%	2084	97,5%	29.671
SANTIAGO ZACATEPEC (OAX)	4.751	96%	2816	95,2%	34.799
SANTIAGO ZOOCHILA (OAX)	393	85%	233	85,1%	1.585
SANTO DOMINGO IXCATLAN (OAX)	853	97%	505	97,3%	965
SANTO DOMINGO NUXAA (OAX)	3.391	99%	2010	97,8%	18.681
SANTO DOMINGO OZOLOTEPEC (OAX)	1.122	100%	665	99,5%	10.113
SANTO DOMINGO TEPUXTEPEC (OAX)	3.922	98%	2325	97,6%	16.323
SANTO DOMINGO XAGACIA (OAX)	982	94%	582	94,3%	10.947
SANTOS REYES NOPALA (OAX)	12.287	87%	8113	85,5%	41.367
SANTOS REYES PAPALO (OAX)	2.497	97%	1499	97,1%	12.611
SANTOS REYES YUCUNA (OAX)	1.426	98%	850	96,7%	13.213
SANTO TOMAS JALIEZA (OAX)	2.396	77%	1420	72,4%	5.105
SAN VICENTE LACHIXIO (OAX)	3.313	98%	1963	97,4%	19.776
TANETZE DE ZARAGOZA (OAX)	1.692	91%	1003	90,9%	1.305
TATALTEPEC DE VALDES (OAX)	5.021	95%	3074	92,9%	53.826
TEZOATLAN DE SEGURA Y LUNA (OAX)	9.439	76%	5614	73,8%	86.377
TOTONTEPEC VILLA DE MORELOS (OAX)	5.427	96%	3216	96,8%	58.910
SAN JUAN BAUTISTA VALLE NACIONAL (OAX)	17.956	78%	15607	74,9%	213.772
YAXE (OAX)	2.176	96%	1290	95,2%	6.882
YUTANDUCHI DE GUERRERO (OAX)	1.216	97%	627	95,7%	6.672

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MID-HIGH PRIORITY					
VILLA DE ZAACHILA (OAX)	5.857	30%	3471	29,4%	-926
SANTA INES DE ZARAGOZA (OAX)	1.863	95%	1104	94,4%	768
ACAJETE (PUE)	14.719	30%	8665	28,0%	-4.283
ACATENO (PUE)	6.830	74%	6071	69,6%	-3.540
ACATZINGO (PUE)	12.940	32%	7668	29,0%	-5.287
ACTEOPAN (PUE)	2.733	89%	1679	87,2%	13.208
ATLIXCO (PUE)	20.927	18%	12281	15,0%	-4.659
ATZITZIHUACAN (PUE)	8.191	69%	4939	66,8%	1.380
CALPAN (PUE)	6.372	47%	3776	45,5%	-1.133
COATEPEC (PUE)	800	90%	474	90,8%	193
COHUECAN (PUE)	3.837	83%	2357	82,1%	2.632
CORONANGO (PUE)	8.706	32%	3775	30,0%	-3.774
CHILA HONEY (PUE)	6.008	83%	3560	81,1%	2.185
DOMINGO ARENAS (PUE)	3.259	58%	1931	57,8%	-1.582
HUAUCHINANGO (PUE)	28.205	34%	17340	30,8%	14.246
IXTACAMAXTITLAN (PUE)	24.125	85%	13813	83,1%	54.155
JUAN GALINDO (PUE)	1.521	16%	901	14,8%	655
NAUZONTLA (PUE)	2.879	80%	1706	78,8%	-1.303
NOPALUCAN (PUE)	8.651	45%	4836	42,2%	2.357
QUECHOLAC (PUE)	17.597	46%	8092	42,9%	9.572
SAN ANTONIO CA¶ADA (PUE)	3.768	84%	2186	82,8%	19.696
SAN JERONIMO TECUANIPAN (PUE)	2.419	46%	1434	43,0%	-1.245
SAN JOSE MIAHUATLAN (PUE)	8.445	72%	4019	70,5%	108.339
TECAMACHALCO (PUE)	15.728	27%	6820	23,7%	5.968
TENAMPULCO (PUE)	5.957	84%	4031	82,7%	-2.806
TEPEACA (PUE)	15.015	24%	8269	21,7%	5.304
TEPEXCO (PUE)	4.722	74%	2901	70,8%	27.737
TLACOTEPEC DE BENITO JUAREZ (PUE)	24.747	59%	10878	55,4%	67.357
TLATLAUQUITEPEC (PUE)	29.558	63%	17516	59,4%	17.165
TLAXCO (PUE)	5.204	83%	3084	82,3%	-2.417
TOCHIMILCO (PUE)	12.823	75%	7365	72,3%	20.434
VENUSTIANO CARRANZA (PUE)	12.804	51%	10704	49,3%	-4.601
XIUTETELCO (PUE)	16.838	55%	9978	51,5%	-7.016
XOCHIAPULCO (PUE)	3.476	81%	2060	78,8%	9.524
YAONAHUAC (PUE)	4.017	60%	2381	58,6%	3.277
YEHUALTEPEC (PUE)	7.909	41%	3430	38,5%	8.052
ZACATLAN (PUE)	34.951	50%	20712	47,1%	27.967
ZONGOZOTLA (PUE)	2.346	53%	1390	53,8%	7.485
AMEALCO DE BONFIL (QRO)	30.338	56%	17979	51,0%	11.077
FELIPE CARRILLO PUERTO (QTR)	45.186	75%	37141	70,5%	4.111.176

Municipality Name (State)	Fuelwood users	Percentage of fuelwood users over total population	Anual Fuelwood Consumption Coming From Forest Areas (ton/yr)	Saturation of Fuelwood Users (households)	Fuelwood Balance (ton/yr)
MID-HIGH PRIORITY					
JOSE MARIA MORELOS (QTR)	26.297	85%	20552	82,5%	1.742.416
AQUISMON (SLP)	38.225	89%	33335	87,9%	138.423
EBANO (SLP)	12.046	30%	6534	25,4%	-2.253
TAMUIN (SLP)	15.008	43%	8991	38,7%	9.488
ETCHOJOA (SON)	18.213	32%	8174	29,3%	17.814
CARDENAS (TAB)	77.166	36%	43549	31,0%	26.556
JALAPA (TAB)	14.974	46%	7116	42,6%	1.927
NACAJUCA (TAB)	23.984	30%	10854	26,7%	17.360
PARAISO (TAB)	24.833	35%	15334	31,6%	3.853
TACOTALPA (TAB)	27.387	66%	24059	61,7%	56.753
CONTLA DE JUAN CUAMATZI (TLA)	8.391	29%	4973	28,5%	-4.719
SAN PABLO DEL MONTE (TLA)	12.401	23%	7349	21,6%	-5.510
ACULTZINGO (VER)	10.172	57%	6028	55,9%	14.335
ALPATLAHUAC (VER)	7.318	85%	4337	83,8%	6.283
ALTOTONGA (VER)	34.713	65%	21924	59,8%	17.135
AMATLAN TUXPAN (VER)	6.526	25%	5736	21,7%	774
AMATLAN DE LOS REYES (VER)	10.634	29%	9453	27,8%	10.255
AQUILA (VER)	1.654	93%	980	93,2%	1.428
ATZACAN (VER)	8.143	48%	4877	47,3%	-2.241
TLALTETELA (VER)	10.112	76%	7214	72,9%	49.313
AYAHUALULCO (VER)	17.551	87%	10261	84,0%	4.210
CAMERINO Z. MENDOZA (VER)	6.238	16%	3742	12,5%	-336
CATEMACO (VER)	22.133	49%	19550	44,9%	31.705
CERRO AZUL (VER)	4.544	18%	4039	16,7%	-2.316
COATZINTLA (VER)	12.121	31%	10775	27,4%	-6.849
CORDOBA (VER)	16.138	9%	11769	7,9%	5.601
COSAUTLAN DE CARVAJAL (VER)	11.724	77%	7184	73,4%	23.278
COSCOMATEPEC (VER)	26.203	62%	15528	59,3%	-3.584
COSOLEACAQUE (VER)	16.512	17%	8460	15,0%	13.633
CHICONQUIACO (VER)	10.779	83%	6388	82,0%	5.107
CHINAMECA (VER)	5.800	41%	4311	39,5%	-3.173
CHOCAMAN (VER)	7.083	47%	4197	45,6%	-901
CHONTLA (VER)	12.887	86%	11351	82,8%	18.787
GUTIERREZ ZAMORA (VER)	10.841	41%	6503	38,1%	-5.675
HUATUSCO (VER)	20.625	44%	16139	38,5%	23.905
IXCATEPEC (VER)	11.510	89%	10231	88,7%	30.579
IXHUACAN DE LOS REYES (VER)	8.324	87%	4962	84,8%	20.716
IXHUATLANCILLO (VER)	4.199	35%	2710	33,4%	6.109
IXTACZOQUITLAN (VER)	15.093	27%	12948	24,5%	12.243
XICO (VER)	14.354	50%	8566	45,6%	18.105

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MID-HIGH PRIORITY					
MARIANO ESCOBEDO (VER)	9.920	35%	5885	30,3%	508
OLUTA (VER)	4.472	34%	3975	31,9%	-3.975
OMEALCA (VER)	12.673	57%	11265	53,8%	-9.078
PERLA, LA (VER)	14.051	78%	7827	76,7%	13.331
PLATON SANCHEZ (VER)	11.369	65%	10106	61,2%	-6.936
POZA RICA DE HIDALGO (VER)	5.035	3%	2183	3,2%	-2.182
VIGAS DE RAMIREZ, LAS (VER)	9.120	64%	5405	60,5%	7.410
SAN ANDRES TENEJAPAN (VER)	1.844	83%	1093	83,2%	3.945
SAN JUAN EVANGELISTA (VER)	21.620	66%	16459	61,2%	12.706
SANTIAGO TUXTLA (VER)	33.911	62%	30144	58,8%	-22.805
SOCHIAPA (VER)	2.549	82%	2266	81,4%	1.519
SOLEDAD DE DOBLADO (VER)	15.229	56%	9355	53,2%	-2.254
TAMALIN (VER)	7.495	65%	5560	62,4%	9.587
TANCOCO (VER)	4.645	74%	3933	71,8%	16.791
TECOLUTLA (VER)	13.715	53%	8162	48,8%	736
TENAMPA (VER)	5.156	87%	4038	85,4%	11.981
TEPATLAXCO (VER)	6.579	84%	5205	80,9%	7.416
TEXISTEPEC (VER)	12.678	66%	10607	63,3%	11.814
TEZONAPA (VER)	38.637	76%	34226	72,6%	83.946
TIERRA BLANCA (VER)	29.641	33%	12853	30,5%	-5.882
TLACOLULAN (VER)	7.503	84%	4446	81,1%	11.463
TLALNELHUAYOCAN (VER)	6.016	52%	3597	46,0%	-1.114
TLILAPAN (VER)	2.245	57%	1629	54,4%	2.214
TONAYAN (VER)	4.324	89%	2562	88,1%	3.693
TOTUTLA (VER)	11.016	74%	9714	71,2%	25.193
TUXPAM (VER)	27.056	21%	16250	19,0%	-1.228
VILLA ALDAMA (VER)	4.635	58%	2747	54,2%	-1.187
YECUATLAN (VER)	8.253	66%	4945	63,4%	8.692
TRES VALLES (VER)	11.533	26%	5001	24,0%	-4.920
ABALA (YUC)	4.649	89%	2856	87,6%	54.177
CACALCHEN (YUC)	4.495	72%	2761	68,9%	13.033
CUZAMA (YUC)	3.992	91%	2452	88,8%	20.441
CHACSINKIN (YUC)	2.304	97%	1415	96,5%	23.915
CHEMAX (YUC)	23.315	93%	19436	92,4%	416.116
CHICXULUB PUEBLO (YUC)	2.232	64%	1358	60,8%	12.222
CHIKINDZONOT (YUC)	3.429	98%	2105	97,7%	68.909
DZAN (YUC)	3.671	85%	2255	83,9%	14.206
ESPITA (YUC)	11.371	90%	6985	85,9%	193.392
HALACHO (YUC)	14.037	83%	9488	80,6%	199.484
HOCABA (YUC)	4.712	89%	2895	87,5%	24.244

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MID-HIGH PRIORITY					
HOCTUN (YUC)	3.632	66%	2231	62,7%	26.562
HOMUN (YUC)	5.071	83%	3115	80,5%	47.622
IZAMAL (YUC)	14.693	64%	9026	60,1%	87.509
KANASIN (YUC)	12.460	32%	7654	25,8%	12.423
KANTUNIL (YUC)	4.044	79%	2484	78,2%	49.865
KAUA (YUC)	2.060	92%	1265	90,2%	39.082
MAMA (YUC)	2.474	91%	1520	89,0%	18.853
MANI (YUC)	3.962	85%	2434	82,7%	26.086
MAXCANU (YUC)	14.759	78%	9161	75,4%	258.710
MERIDA (YUC)	54.316	8%	33325	6,5%	140.264
MOTUL (YUC)	16.599	56%	10212	53,2%	54.309
MUNA (YUC)	7.267	63%	4464	60,5%	109.226
MUXUPIP (YUC)	2.198	87%	1350	85,0%	12.305
OPICHEN (YUC)	4.874	92%	2994	91,7%	75.530
OXKUTZCAB (YUC)	16.621	65%	10210	59,9%	224.074
PANABA (YUC)	5.447	70%	3346	65,3%	428
PETO (YUC)	16.056	75%	9911	71,9%	264.280
SACALUM (YUC)	3.127	80%	1921	78,8%	64.029
SANAHCAT (YUC)	1.260	87%	774	86,9%	1.240
SEYE (YUC)	5.830	70%	3581	70,3%	33.304
TAHDZIU (YUC)	3.147	99%	1933	97,8%	53.207
TEABO (YUC)	4.328	89%	2659	86,8%	38.206
TECOH (YUC)	11.659	81%	7162	78,8%	73.067
TEKANTO (YUC)	2.821	73%	1733	70,6%	11.750
TEKAX (YUC)	25.974	75%	16094	71,0%	1.047.311
TEKIT (YUC)	6.825	81%	4193	78,9%	73.872
TEMOZON (YUC)	11.229	91%	6898	89,8%	122.653
TIMUCUY (YUC)	5.245	89%	3222	87,9%	34.599
TINUM (YUC)	7.110	75%	4368	71,9%	134.192
TIXMEHUAC (YUC)	3.812	95%	2352	94,1%	36.634
TIXPEHUAL (YUC)	2.812	58%	1727	57,5%	10.364
TIZIMIN (YUC)	42.268	66%	27048	62,1%	653.527
UAYMA (YUC)	2.772	93%	1703	92,8%	51.279
UMAN (YUC)	16.218	33%	9963	29,0%	86.537
VALLADOLID (YUC)	30.573	54%	19322	48,9%	199.220
YAXCABA (YUC)	12.326	93%	7572	91,7%	351.890

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MEDIUM PRIORITY - (461 *municipios*)					
HECELCHAKAN (CAM)	14.475	58%	9239	55,7%	445.906
HOPELCHEN (CAM)	22.688	73%	17215	71,0%	4.895.361
ACACOYAGUA (CHS)	10.356	73%	7825	68,8%	49.229
ACAPETAHUA (CHS)	14.750	59%	10121	55,8%	9.300
ANGEL ALBINO CORZO (CHS)	15.970	73%	9464	68,8%	134.580
BERRIOZABAL (CHS)	11.523	40%	9374	39,0%	92.019
COMITAN DE DOMINGUEZ (CHS)	42.034	40%	24961	37,6%	129.395
CONCORDIA, LA (CHS)	30.558	77%	18149	72,3%	471.127
CHANAL (CHS)	6.605	87%	3914	85,6%	77.262
CHICOMUSELO (CHS)	21.351	85%	12785	82,7%	141.124
ESCUINTLA (CHS)	18.196	65%	12508	57,9%	60.576
FRONTERA COMALAPA (CHS)	33.088	63%	19789	60,5%	50.872
HUIXTLA (CHS)	17.726	37%	11929	32,6%	49.420
JIQUIPILAS (CHS)	20.356	58%	12110	54,8%	223.927
JUAREZ (CHS)	10.928	55%	8388	51,0%	21.792
LIBERTAD, LA (CHS)	3.899	74%	2932	71,5%	9.357
MAPASTEPEC (CHS)	20.950	54%	15798	48,6%	147.182
MARGARITAS, LAS (CHS)	69.605	81%	50729	76,3%	679.090
MAZAPA DE MADERO (CHS)	5.756	80%	3487	77,2%	20.357
OCOSINGO (CHS)	84.934	58%	69444	53,0%	3.067.032
OSTUACAN (CHS)	13.559	80%	11556	75,4%	49.367
PICHUCALCO (CHS)	15.022	51%	13124	46,6%	33.214
VILLA COMALTITLAN (CHS)	18.712	70%	12281	66,0%	30.142
REFORMA (CHS)	8.197	24%	3554	20,6%	-422
SAN CRISTOBAL DE LAS CASAS (CHS)	28.479	22%	16877	19,7%	46.849
SAN FERNANDO (CHS)	14.602	55%	11101	52,2%	89.933
SITALA (CHS)	4.277	54%	2535	50,4%	2.754
SUCHIAPA (CHS)	8.935	56%	5441	52,3%	69.974
SUCHIATE (CHS)	12.301	41%	7532	39,2%	-2.119
TONALA (CHS)	29.508	38%	20254	34,7%	247.528
TUXTLA GUTIERREZ (CHS)	18.418	4%	11316	3,9%	46.134
TUZANTAN (CHS)	15.812	68%	14056	64,5%	43.154
TZIMOL (CHS)	9.547	80%	5707	78,7%	55.895
VENUSTIANO CARRANZA (CHS)	31.715	60%	19375	56,5%	220.316
VILLA CORZO (CHS)	44.102	64%	26548	60,6%	543.804
VILLAFLORES (CHS)	40.768	47%	24371	44,4%	349.206
BALLEZA (CHI)	12.855	77%	7434	72,3%	1.043.467
BATOPILAS (CHI)	10.723	85%	6438	87,0%	696.679
BOCOYNA (CHI)	20.707	74%	12271	73,5%	541.488

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MEDIUM PRIORITY					
GUACHOCHI (CHI)	33.672	83%	19958	81,6%	1.528.023
MORELOS (CHI)	8.759	92%	5219	91,3%	751.418
URIQUE (CHI)	15.300	87%	9141	85,3%	891.008
URUACHI (CHI)	7.436	90%	4462	89,6%	818.575
MEZQUITAL (DGO)	23.067	84%	13587	81,9%	2.164.214
PUEBLO NUEVO (DGO)	38.008	84%	22606	82,0%	1.758.599
CORONEO (GTO)	4.328	42%	2565	40,3%	-1.430
ROMITA (GTO)	16.153	31%	7316	29,3%	8.352
SILAO (GTO)	20.564	15%	10794	13,9%	28.829
ACAPULCO DE JUAREZ (GRO)	117.571	16%	70207	14,2%	404.038
AJUCHITLAN DEL PROGRESO (GRO)	29.077	70%	17370	67,8%	402.903
ATOYAC DE ALVAREZ (GRO)	34.561	56%	20757	51,5%	355.354
AZOYU (GRO)	25.397	78%	15416	76,1%	217.854
BENITO JUAREZ (GRO)	5.326	34%	2499	31,6%	5.052
COPALA (GRO)	9.154	70%	5480	66,9%	60.131
COYUCA DE BENITEZ (GRO)	42.716	62%	25629	57,3%	457.572
CUAJINICUILAPA (GRO)	17.194	67%	10410	63,1%	48.776
CUALAC (GRO)	5.760	88%	3466	85,0%	54.794
CUETZALA DEL PROGRESO (GRO)	7.898	80%	4803	77,2%	80.980
CHILPANCINGO DE LOS BRAVO (GRO)	41.692	22%	24454	18,3%	540.436
GENERAL HELIODORO CASTILLO (GRO)	31.943	90%	19216	87,2%	427.885
HUAMUXTITLAN (GRO)	7.598	53%	4612	49,8%	93.305
JUAN R. ESCUDERO (GRO)	14.369	65%	8706	61,7%	109.525
LEONARDO BRAVO (GRO)	18.561	81%	11022	76,5%	165.439
MARTIR DE CUILAPAN (GRO)	11.879	86%	7128	84,4%	208.026
PEDRO ASCENCIO ALQUISIRAS (GRO)	7.280	93%	4396	90,7%	29.906
PETATLAN (GRO)	21.515	46%	13005	41,5%	407.587
SAN MARCOS (GRO)	38.813	80%	23501	76,4%	240.121
SAN MIGUEL TOTOLAPAN (GRO)	26.044	90%	15637	87,2%	644.733
TAXCO DE ALARCON (GRO)	27.753	28%	16671	24,8%	102.114
TECPAN DE GALEANA (GRO)	27.456	46%	16328	40,6%	546.518
TELOLOAPAN (GRO)	32.301	60%	19669	56,8%	167.694
TETIPAC (GRO)	10.327	78%	6144	74,0%	30.694
TLALIXTAQUILLA DE MALDONADO (GRO)	5.318	79%	3237	75,3%	33.920
TLAPEHUALA (GRO)	9.937	44%	6092	42,3%	49.521
EDUARDO NERI (GRO)	21.269	53%	12836	49,7%	418.423
AGUA BLANCA DE ITURBIDE (HGO)	6.933	81%	4091	80,7%	8.300
ALFAJAYUCAN (HGO)	9.956	59%	5192	57,2%	42.984

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MEDIUM PRIORITY					
CARDONAL (HGO)	10.575	62%	5624	61,9%	78.968
CUAUTEPEC DE HINOJOSA (HGO)	13.004	29%	7666	26,5%	10.799
IXMIQUILPAN (HGO)	19.504	26%	9634	23,7%	56.775
JUAREZ HIDALGO (HGO)	2.790	87%	1653	85,4%	16.292
METEPEC (HGO)	4.730	46%	2756	44,4%	1.717
MISION, LA (HGO)	9.512	86%	5745	83,4%	24.451
MOLANGO DE ESCAMILLA (HGO)	7.301	68%	4332	67,0%	20.460
NICOLAS FLORES (HGO)	5.833	85%	3457	84,7%	32.708
NOPALA DE VILLAGRAN (HGO)	6.070	41%	3514	40,2%	864
OMITLAN DE JUAREZ (HGO)	4.143	52%	2455	49,0%	7.208
SAN SALVADOR (HGO)	8.317	29%	4109	27,3%	16.846
TASQUILLO (HGO)	8.627	52%	4007	49,5%	40.279
TECOZAUTLA (HGO)	14.169	46%	6331	42,9%	111.592
TLAHUILTEPA (HGO)	9.335	90%	5200	88,2%	110.495
TULANCINGO DE BRAVO (HGO)	7.031	6%	3971	4,9%	10.179
XOCHICOATLAN (HGO)	5.707	76%	3398	75,8%	18.949
MEZQUITIC (JAL)	11.048	76%	6540	71,3%	931.515
TLAQUEPAQUE (JAL)	5.062	1%	2195	1,0%	-2.193
ACULCO (MEX)	14.402	37%	8513	34,6%	6.261
ALMOLOYA DE ALQUISIRAS (MEX)	7.971	51%	4724	48,0%	16.905
ATLAUTLA (MEX)	9.571	37%	5249	34,7%	13.138
COATEPEC HARINAS (MEX)	17.775	51%	10534	46,8%	24.091
CHIMALHUACAN (MEX)	2.400	0%	1041	0,5%	-176
ECATZINGO (MEX)	5.059	64%	2832	60,6%	9.674
IXTAPAN DE LA SAL (MEX)	7.388	24%	4408	22,5%	5.517
JILOTEPEC (MEX)	22.173	32%	13140	30,6%	4.653
JOCOTITLAN (MEX)	12.505	24%	7411	23,4%	1.837
MALINALCO (MEX)	9.845	45%	5899	41,4%	24.949
OCUILAN (MEX)	14.169	55%	8397	50,5%	47.067
PAZ, LA (MEX)	1.119	1%	663	0,6%	-238
SANTO TOMAS (MEX)	3.779	44%	2268	40,9%	11.689
SULTEPEC (MEX)	21.454	78%	12780	74,7%	83.328
TEMASCALTEPEC (MEX)	22.647	73%	13421	69,6%	71.645
TENANGO DEL VALLE (MEX)	12.871	20%	7626	18,1%	6.041
TEXCALTITLAN (MEX)	11.332	69%	6716	66,0%	17.440
TIANGUISTENCO (MEX)	10.903	19%	6448	17,0%	7.437
TIMILPAN (MEX)	5.700	39%	3378	37,0%	7.378
VALLE DE BRAVO (MEX)	13.898	24%	8236	21,4%	66.370
VILLA GUERRERO (MEX)	16.608	33%	9861	29,8%	23.938
XONACATLAN (MEX)	6.251	15%	3704	14,9%	2.209

Municipality Name (State)	Fuelwood users	Percentage of fuelwood users over total population	Anual Fuelwood Consumption Coming From Forest Areas (ton/yr)	Saturation of Fuelwood Users (households)	Fuelwood Balance (ton/yr)
MEDIUM PRIORITY					
ZINACANTEPEC (MEX)	21.234	17%	12465	15,4%	17.842
ANGANGUEO (MIC)	5.660	55%	3354	51,4%	8.876
AQUILA (MIC)	16.659	75%	10179	73,5%	803.062
CONTEPEC (MIC)	12.933	43%	7671	40,6%	8.506
CHERAN (MIC)	11.079	68%	6566	65,1%	32.286
ERONGARICUARO (MIC)	7.114	54%	4189	50,4%	30.537
PATZCUARO (MIC)	21.642	28%	12678	25,3%	41.221
QUIROGA (MIC)	7.083	30%	4184	28,7%	24.925
REYES, LOS (MIC)	14.373	25%	8531	22,2%	62.261
SALVADOR ESCALANTE (MIC)	23.140	60%	13713	56,5%	29.147
SUSUPUATO (MIC)	7.336	81%	4388	78,0%	34.689
TACAMBARO (MIC)	25.513	43%	15227	39,4%	96.140
TANCITARO (MIC)	16.852	66%	9884	63,0%	90.694
TINGAMBATO (MIC)	6.508	55%	3857	52,9%	22.497
TLALPUJAHUA (MIC)	14.810	58%	8777	55,6%	11.137
TURICATO (MIC)	23.427	65%	14265	60,2%	352.550
TUXPAN (MIC)	8.103	34%	4816	30,8%	26.404
TZINTZUNTZAN (MIC)	5.685	46%	3351	43,2%	12.297
URUAPAN (MIC)	35.449	13%	20703	11,6%	134.956
ZIRACUARETIRO (MIC)	5.565	43%	3298	38,7%	22.832
AMACUZAC (MOR)	4.654	28%	2812	25,5%	4.130
AYALA (MOR)	10.637	15%	6534	13,6%	46.185
CUAUTLA (MOR)	4.683	3%	2877	2,7%	-1.079
EMILIANO ZAPATA (MOR)	2.958	5%	1817	4,7%	8.565
JIUTEPEC (MOR)	3.552	2%	2182	1,9%	2.829
MIACATLAN (MOR)	8.722	36%	5321	33,4%	25.513
PUENTE DE IXTLA (MOR)	14.982	28%	9079	23,7%	30.445
TLALNEPANTLA (MOR)	3.401	60%	2015	57,2%	13.618
TLAYACAPAN (MOR)	2.526	18%	1527	17,3%	1.526
XOCHITEPEC (MOR)	5.079	11%	3120	10,3%	3.231
YECAPIXTLA (MOR)	6.371	17%	3889	16,0%	699
ZACUALPAN (MOR)	2.592	33%	1589	30,6%	-109
ZTEMOAC (MOR)	4.854	40%	2105	38,8%	-2.103
YESCA, LA (NAY)	9.474	73%	5672	70,3%	825.532
ABEJONES (OAX)	1.441	94%	859	93,7%	36.084
ASUNCION CACALOTEPEC (OAX)	2.487	97%	1474	97,2%	16.174
ASUNCION IXTALTEPEC (OAX)	4.640	33%	3166	29,1%	155.926
ASUNCION NOCHIXTLAN (OAX)	5.603	41%	2991	38,6%	60.409
CIUDAD IXTEPEC (OAX)	4.657	21%	2874	19,5%	57.964
COMPA¥IA, LA (OAX)	3.826	96%	2267	95,0%	10.080

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MEDIUM PRIORITY					
CONSTANCIA DEL ROSARIO (OAX)	2.766	84%	1639	78,1%	17.080
CUYAMECALCO VILLA DE ZARAGOZA (OAX)	4.133	96%	2488	94,6%	13.636
MESONES HIDALGO (OAX)	3.803	91%	2044	88,4%	40.688
VILLA HIDALGO (OAX)	1.596	75%	949	78,2%	8.225
HUAJUAPAM DE LEON (OAX)	8.814	17%	5113	15,9%	33.084
LOMA BONITA (OAX)	11.401	28%	10135	25,3%	-4.501
MAGDALENA JALTEPEC (OAX)	2.950	79%	1472	76,9%	12.824
MATIAS ROMERO (OAX)	18.133	45%	15798	39,1%	205.644
MONJAS (OAX)	1.981	83%	1174	82,6%	-1.032
NATIVIDAD (OAX)	211	36%	125	35,8%	34
OAXACA DE JUAREZ (OAX)	8.031	3%	4770	2,8%	3.696
OCOTLAN DE MORELOS (OAX)	6.805	37%	4044	38,0%	-2.521
PUTLA VILLA DE GUERRERO (OAX)	17.738	67%	10056	65,0%	55.949
SANTA CATARINA QUIOQUITANI (OAX)	421	99%	249	99,0%	7.847
SALINA CRUZ (OAX)	5.252	7%	3159	6,1%	24.337
SAN AGUSTIN TLACOTEPEC (OAX)	520	69%	308	71,3%	4.443
SAN AGUSTIN YATARENI (OAX)	950	28%	412	28,0%	-410
SAN ANDRES TEPETLAPA (OAX)	530	97%	237	92,3%	37
SAN ANDRES YAA (OAX)	492	92%	292	93,3%	8.267
SAN ANTONINO EL ALTO (OAX)	1.784	92%	1057	89,5%	19.813
SAN ANTONIO ACUTLA (OAX)	333	98%	175	97,8%	-5
SAN BALTAZAR CHICHICAPAM (OAX)	2.514	87%	1495	86,7%	9.940
SAN BALTAZAR LOXICHA (OAX)	2.801	97%	1699	96,7%	39.144
SAN BALTAZAR YATZACHI EL BAJO (OAX)	668	85%	396	86,7%	3.076
SAN BARTOLOME QUIALANA (OAX)	1.913	70%	1134	69,2%	1.191
SAN BARTOLOME ZOOGOCHO (OAX)	337	53%	200	81,7%	916
SAN BERNARDO MIXTEPEC (OAX)	2.351	86%	1393	84,1%	15.970
SAN CARLOS YAUTEPEC (OAX)	10.419	96%	6239	95,4%	704.660
SAN DIONISIO DEL MAR (OAX)	3.750	76%	2135	73,9%	51.478
SAN FRANCISCO CHAPULAPA (OAX)	1.878	98%	1097	97,7%	11.619
SAN FRANCISCO CHINDUA (OAX)	683	87%	296	87,2%	1.532
SAN FRANCISCO DEL MAR (OAX)	4.186	72%	2477	71,2%	84.375
SAN FRANCISCO IXHUATAN (OAX)	4.993	54%	2917	50,1%	17.873
SAN FRANCISCO JALTEPETONGO (OAX)	1.016	86%	441	87,0%	1.850
SAN GABRIEL MIXTEPEC (OAX)	3.451	87%	2378	85,0%	65.122
SAN ILDEFONSO AMATLAN (OAX)	1.880	97%	1116	97,3%	13.002
SAN ILDEFONSO SOLA (OAX)	820	97%	490	94,2%	6.317

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MEDIUM PRIORITY					
SAN ILDEFONSO VILLA ALTA (OAX)	2.527	77%	1498	74,5%	17.525
SAN JACINTO AMILPAS (OAX)	457	5%	198	5,3%	-197
SAN JERONIMO COATLAN (OAX)	5.043	96%	3015	96,1%	154.113
SAN JOSE AYUQUILA (OAX)	999	79%	596	76,0%	325
SAN JUAN ATEPEC (OAX)	1.481	94%	876	92,7%	10.668
SAN JUAN BAUTISTA TLACHICHILCO (OAX)	1.423	94%	868	93,5%	23.581
SAN JUAN COTZOCON (OAX)	16.579	76%	11809	73,6%	228.863
SAN JUAN EVANGELISTA ANALCO (OAX)	338	80%	203	81,7%	2.146
SAN JUAN GUELAVIA (OAX)	1.891	65%	859	62,5%	1.650
SAN JUAN JUQUILA MIXES (OAX)	3.439	96%	2064	95,8%	90.720
SAN JUAN LACHIGALLA (OAX)	3.082	96%	1826	94,3%	7.979
SAN JUAN MIXTEPEC - DISTR. 26 - (OAX)	894	96%	530	95,1%	16.674
SAN JUAN OZOLOTEPEC (OAX)	3.052	98%	1809	97,6%	67.075
SAN JUAN PETLAPA (OAX)	2.534	99%	1955	99,2%	69.464
SAN JUAN TAMAZOLA (OAX)	3.402	98%	1908	97,8%	49.305
SAN JUAN TEITIPAC (OAX)	1.972	70%	1169	68,6%	2.860
SAN JUAN TEPEUXILA (OAX)	2.913	98%	1744	97,3%	64.733
SAN LORENZO CACAOTEPEC (OAX)	2.009	20%	871	19,0%	-870
SAN LUCAS QUIAVINI (OAX)	1.575	81%	933	79,7%	4.521
SAN MARTIN LACHILA (OAX)	955	80%	566	79,6%	-209
SAN MATEO ETLATONGO (OAX)	916	83%	397	80,8%	1.307
SAN MATEO PI¥AS (OAX)	3.914	94%	2670	92,4%	33.193
SAN MATEO SINDIHUI (OAX)	1.879	97%	1105	92,1%	23.178
SAN MIGUEL ALOAPAM (OAX)	2.398	91%	1422	91,2%	31.837
SAN MIGUEL DEL PUERTO (OAX)	8.055	94%	5108	92,0%	197.234
SAN MIGUEL EL GRANDE (OAX)	3.294	91%	1952	89,6%	14.907
SAN MIGUEL HUAUTLA (OAX)	1.646	97%	976	95,8%	8.362
SAN MIGUEL PERAS (OAX)	3.106	97%	1841	96,0%	15.992
VILLA SOLA DE VEGA (OAX)	11.583	91%	6879	90,2%	226.061
SAN MIGUEL TALEA DE CASTRO (OAX)	2.016	75%	1195	75,4%	9.787
SAN MIGUEL TECOMATLAN (OAX)	209	78%	91	78,2%	6.082
SAN MIGUEL TLACAMAMA (OAX)	2.475	79%	1520	75,3%	52.727
SAN NICOLAS (OAX)	1.069	95%	634	94,1%	345
SAN PABLO COATLAN (OAX)	3.906	96%	2322	94,1%	47.975
SAN PABLO HUIXTEPEC (OAX)	3.060	36%	1813	35,3%	-1.795
SAN PABLO YAGANIZA (OAX)	892	83%	530	84,9%	9.021
SAN PEDRO APOSTOL (OAX)	968	66%	420	63,6%	-418
SAN PEDRO CAJONOS (OAX)	733	61%	434	62,4%	-60

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MEDIUM PRIORITY					
SAN PEDRO HUAMELULA (OAX)	8.400	85%	5165	83,1%	327.236
SAN PEDRO HUILOTEPEC (OAX)	1.905	74%	1078	70,8%	9.947
SAN PEDRO JALTEPETONGO (OAX)	663	98%	406	96,0%	23.135
SAN PEDRO JOCOTIPAC (OAX)	993	98%	599	98,5%	19.619
SAN PEDRO MARTIR YUCUXACO (OAX)	1.466	94%	869	94,4%	10.929
SAN PEDRO MIXTEPEC DISTR. 22 (OAX)	11.415	35%	6946	29,9%	64.424
SAN PEDRO MIXTEPEC - DISTR. 26 - (OAX)	1.219	98%	722	97,4%	42.288
SAN PEDRO TIDAA (OAX)	801	94%	465	93,7%	8.541
SAN PEDRO TUTUTEPEC (OAX)	27.700	65%	19595	61,1%	248.404
SAN PEDRO YOLOX (OAX)	2.334	92%	1571	90,8%	37.808
SAN RAYMUNDO JALPAN (OAX)	1.003	63%	435	60,8%	-433
SAN SEBASTIAN IXCAPA (OAX)	3.095	83%	1901	80,0%	36.020
SAN SEBASTIAN NICANANDUTA (OAX)	1.307	80%	775	81,4%	6.314
SAN SEBASTIAN TECOMAXTLAHUACA (OAX)	6.840	79%	4055	75,8%	34.760
SANTA ANA DEL VALLE (OAX)	1.395	65%	827	62,9%	1.518
SANTA ANA YARENI (OAX)	969	84%	579	88,2%	7.878
SANTA CATALINA QUIERI (OAX)	955	98%	566	98,0%	16.904
SANTA CATARINA CUIXTLA (OAX)	1.145	74%	679	76,0%	2.847
SANTA CATARINA JUQUILA (OAX)	10.729	76%	7432	74,7%	182.577
SANTA CATARINA TAYATA (OAX)	633	87%	375	85,9%	5.165
SANTA CRUZ AMILPAS (OAX)	258	4%	153	3,8%	-150
SANTA CRUZ TAYATA (OAX)	549	97%	325	97,0%	1.675
SANTA CRUZ XOXOCOTLAN (OAX)	4.129	8%	1790	7,6%	-1.789
HEROICA CIUDAD DE TLAXIACO (OAX)	13.714	47%	8127	44,8%	47.459
AYOQUEZCO DE ALDAMA (OAX)	3.190	57%	1890	56,9%	15.826
SANTA MARIA COLOTEPEC (OAX)	10.587	58%	6397	53,4%	124.599
SANTA MARIA CORTIJO (OAX)	831	82%	510	77,1%	6.432
SANTA MARIA CHIMALAPA (OAX)	6.791	96%	5744	94,3%	1.559.803
SANTA MARIA GUELACE (OAX)	297	39%	129	35,7%	-127
SANTA MARIA GUIENAGATI (OAX)	2.854	94%	1744	94,0%	138.491
SANTA MARIA HUATULCO (OAX)	10.570	37%	6825	30,5%	210.902
SANTA MARIA HUAZOLOTITLAN (OAX)	7.335	72%	4472	68,7%	49.922
SANTA MARIA IPALAPA (OAX)	4.398	90%	2549	88,0%	52.484
SANTA MARIA NATIVITAS (OAX)	703	91%	417	91,0%	2.583
SANTA MARIA QUIEGOLANI (OAX)	1.395	93%	829	91,3%	37.723
SANTA MARIA SOLA (OAX)	1.518	91%	900	90,7%	6.177

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MEDIUM PRIORITY					
SANTA MARIA TOTOLAPILLA (OAX)	983	97%	600	95,1%	50.488
SANTA MARIA YOLOTEPEC (OAX)	454	97%	271	93,6%	11.443
SANTA MARIA ZACATEPEC (OAX)	13.474	87%	7415	85,5%	132.257
SANTA MARIA ZANIZA (OAX)	1.602	98%	950	97,9%	35.254
SANTIAGO APOALA (OAX)	1.328	97%	789	95,2%	10.554
SANTIAGO ASTATA (OAX)	2.056	80%	1246	78,8%	34.021
SANTIAGO CACALOXTEPEC (OAX)	712	53%	428	51,2%	1.461
SANTIAGO CAMOTLAN (OAX)	3.023	99%	2175	98,6%	96.115
SANTIAGO IXCUINTEPEC (OAX)	1.143	95%	677	94,8%	31.031
SANTIAGO JAMILTEPEC (OAX)	12.676	71%	7735	68,2%	191.349
SANTIAGO JUXTLAHUACA (OAX)	20.749	74%	12296	72,8%	140.022
SANTIAGO LACHIGUIRI (OAX)	6.086	96%	3652	95,2%	184.358
SANTIAGO LAXOPA (OAX)	1.402	98%	831	97,2%	29.201
SANTIAGO NUNDICHE (OAX)	1.014	99%	601	98,8%	13.063
SANTIAGO PINOTEPA NACIONAL (OAX)	23.960	54%	14483	50,8%	188.601
SANTIAGO SUCHILQUITONGO (OAX)	3.580	45%	2122	42,9%	11.534
SANTIAGO TAMAZOLA (OAX)	3.646	82%	2171	77,0%	22.744
SANTIAGO TEXTITLAN (OAX)	3.226	97%	1912	98,0%	63.024
SANTIAGO TILANTONGO (OAX)	3.712	95%	1961	95,1%	25.376
SANTIAGO YOSONDUA (OAX)	7.126	94%	4249	94,5%	37.021
SANTIAGO YUCUYACHI (OAX)	919	78%	553	75,8%	7.204
SANTO DOMINGO ALBARRADAS (OAX)	685	91%	409	91,1%	21.879
SANTO DOMINGO ARMENTA (OAX)	2.930	88%	1692	84,9%	21.326
SANTO DOMINGO PETAPA (OAX)	5.903	80%	3857	78,8%	109.143
SANTO DOMINGO ROAYAGA (OAX)	921	97%	546	96,8%	15.588
SANTO DOMINGO TEHUANTEPEC (OAX)	21.333	40%	13042	37,5%	428.338
SANTO DOMINGO TEOJOMULCO (OAX)	4.204	97%	2491	95,9%	36.306
SANTO DOMINGO TOMALTEPEC (OAX)	1.321	47%	792	45,7%	7.581
SANTO DOMINGO TONALTEPEC (OAX)	318	97%	188	95,8%	1.331
SANTOS REYES TEPEJILLO (OAX)	1.024	70%	617	71,0%	10.935
SANTO TOMAS MAZALTEPEC (OAX)	1.431	74%	848	70,5%	8.956
SITIO DE XITLAPEHUA (OAX)	572	90%	351	88,8%	-56
TANICHE (OAX)	797	91%	346	89,7%	-344
SAN JERONIMO TLACOCHAHUAYA (OAX)	1.989	42%	1081	40,5%	3.428
TLALIXTAC DE CABRERA (OAX)	3.455	51%	2064	45,6%	16.520
TRINIDAD ZAACHILA (OAX)	2.024	72%	878	73,0%	-876
UNION HIDALGO (OAX)	2.424	20%	1489	18,4%	19.123

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MEDIUM PRIORITY					
ZAPOTITLAN PALMAS (OAX)	1.316	84%	656	82,4%	5.352
AHUATLAN (PUE)	3.369	89%	2065	86,1%	40.999
AHUAZOTEPEC (PUE)	4.399	48%	2607	46,2%	1.014
AQUIXTLA (PUE)	5.986	78%	3547	76,1%	23.159
ATOYATEMPAN (PUE)	1.763	30%	1083	29,5%	-606
COXCATLAN (PUE)	8.893	48%	4910	43,4%	67.065
CUAUTINCHAN (PUE)	3.899	55%	2311	51,8%	2.634
CUYOACO (PUE)	6.988	48%	4065	45,2%	8.920
CHIGMECATITLAN (PUE)	668	51%	410	55,0%	3.416
CHIGNAHUAPAN (PUE)	27.885	57%	16525	52,8%	49.544
GENERAL FELIPE ANGELES (PUE)	7.053	47%	4050	45,3%	1.329
HUAQUECHULA (PUE)	12.456	43%	7269	42,2%	21.946
HUATLATLAUCA (PUE)	5.303	66%	3258	64,6%	14.207
JOLALPAN (PUE)	10.513	84%	6226	80,0%	151.950
JUAN C. BONILLA (PUE)	3.387	23%	1469	21,8%	-1.467
LAFRAGUA (PUE)	6.800	74%	3895	71,1%	16.856
LIBRES (PUE)	9.226	36%	5160	33,6%	20.956
MAGDALENA TLATLAUQUITEPEC, LA (PUE)	605	84%	372	81,1%	1.399
MOLCAXAC (PUE)	3.678	59%	1937	57,1%	37.768
NEALTICAN (PUE)	3.477	33%	2061	31,5%	-1.785
NOCOTEPEC (PUE)	2.190	44%	1236	42,3%	8.168
OCOYUCAN (PUE)	6.682	28%	3960	27,9%	4.076
PALMAR DE BRAVO (PUE)	17.534	49%	7888	46,1%	45.527
PUEBLA (PUE)	30.670	2%	18157	1,8%	-3.279
REYES DE JUAREZ, LOS (PUE)	4.535	22%	1966	20,7%	-1.965
SAN ANDRES CHOLULA (PUE)	4.904	9%	2126	7,5%	-2.125
SAN GREGORIO ATZOMPA (PUE)	690	10%	299	8,4%	-298
SAN JERONIMO XAYACATLAN (PUE)	3.103	72%	1857	71,6%	15.955
SAN PEDRO CHOLULA (PUE)	10.611	11%	6288	8,3%	-5.922
SANTA CATARINA TLALTEMPAN (PUE)	533	60%	327	66,4%	6.098
SANTA INES AHUATEMPAN (PUE)	4.470	73%	2394	71,0%	73.560
SANTA ISABEL CHOLULA (PUE)	2.962	34%	1755	31,9%	-1.332
SANTIAGO MIAHUATLAN (PUE)	4.809	34%	2088	31,6%	22.094
TEHUACAN (PUE)	20.742	9%	9177	7,6%	161.621
TEOPANTLAN (PUE)	3.950	82%	2395	81,3%	62.198
TEPANCO DE LOPEZ (PUE)	7.688	46%	3334	43,3%	50.853
TEPEMAXALCO (PUE)	1.154	91%	709	89,8%	6.128
TEPEXI DE RODRIGUEZ (PUE)	9.274	51%	4823	50,4%	72.159
TETELA DE OCAMPO (PUE)	18.677	72%	11068	69,8%	43.089

Municipality Name (State)	Fuelwood users	Percentage of fuelwood users over total population	Anual Fuelwood Consumption Coming From Forest Areas (ton/yr)	Saturation of Fuelwood Users (households)	Fuelwood Balance (ton/yr)
MEDIUM PRIORITY					
TETELES DE AVILA CASTILLO (PUE)	1.351	24%	801	24,3%	-715
TIANGUISMANALCO (PUE)	4.452	46%	2638	45,0%	11.919
TLANEPANTLA (PUE)	1.273	30%	552	29,9%	-41
TOCHTEPEC (PUE)	4.986	29%	2162	26,4%	8.924
ZARAGOZA (PUE)	3.257	24%	1930	22,7%	-784
TOLIMAN (QRO)	12.182	57%	5662	54,6%	215.503
OTHON P. BLANCO (QTR)	64.184	31%	53981	27,4%	4.409.717
LAZARO CARDENAS (QTR)	14.565	71%	12233	67,6%	1.063.552
SANTA CATARINA (SLP)	9.109	84%	6131	82,7%	208.212
ELOTA (SIN)	15.182	31%	9200	29,3%	315.695
GUASAVE (SIN)	21.779	8%	11169	7,4%	80.249
HUATABAMPO (SON)	15.718	21%	6902	18,1%	339.856
BALANCAN (TAB)	30.729	57%	20483	52,2%	128.950
CENTLA (TAB)	49.500	56%	23883	51,2%	255.087
CENTRO (TAB)	46.602	9%	23699	7,4%	64.659
HUIMANGUILLO (TAB)	83.336	53%	53321	47,9%	266.610
JONUTA (TAB)	19.196	69%	9598	65,8%	132.140
MACUSPANA (TAB)	55.017	41%	26954	36,9%	130.689
TEAPA (TAB)	12.372	27%	8867	24,2%	19.499
TENOSIQUE (TAB)	23.411	42%	18549	38,8%	133.856
APETATITLAN DE ANTONIO CARVAJAL (TLA)	809	7%	479	6,4%	-214
ALTZAYANCA (TLA)	6.092	46%	2845	44,4%	10.642
CUAPIAXTLA (TLA)	3.138	29%	1675	26,0%	106
CHIAUTEMPAN (TLA)	4.639	8%	2749	7,3%	-1.497
HUAMANTLA (TLA)	14.510	22%	8093	19,5%	8.855
IXTENCO (TLA)	1.470	25%	871	25,5%	-651
MAZATECOCHCO DE JOSE MARIA MORELOS (TLA)	2.606	31%	1544	30,3%	-1.480
TENANCINGO (TLA)	1.846	18%	1094	18,9%	-394
ZITLALTEPEC DE TRINIDAD SANCHEZ S. (TLA)	4.065	51%	2409	49,1%	2.168
XALOZTOC (TLA)	3.363	20%	1993	18,6%	-1.563
ACAJETE (VER)	4.864	65%	2882	58,8%	12.958
CAMARON DE TEJEDA (VER)	3.944	70%	2423	67,4%	-770
ANGEL R. CABADA (VER)	11.056	34%	8114	31,6%	-4.809
APAZAPAN (VER)	2.764	77%	1683	73,7%	6.532
CARRILLO PUERTO (VER)	11.593	79%	7122	77,1%	34.187
COACOATZINTLA (VER)	3.940	54%	2335	50,6%	1.646
COATZACOALCOS (VER)	7.777	3%	5102	2,6%	14.300
COLIPA (VER)	4.304	69%	3702	64,4%	5.441

Municipality Name (State)	Fuelwood users	Percentage of fuelwood users over total population	Anual Fuelwood Consumption Coming From Forest Areas (ton/yr)	Saturation of Fuelwood Users (households)	Fuelwood Balance (ton/yr)
MEDIUM PRIORITY					
COMAPA (VER)	14.873	87%	10940	85,7%	25.981
COSAMALOAPAN (VER)	7.345	14%	4004	11,9%	-1.386
COTAXTLA (VER)	11.621	61%	7139	57,2%	22.148
CUICHAPA (VER)	3.963	37%	3523	35,9%	-1.057
FORTIN (VER)	6.120	13%	5440	11,8%	-5.323
HUAYACOCOTLA (VER)	14.585	81%	8577	78,3%	60.706
IGNACIO DE LA LLAVE (VER)	10.254	58%	5132	54,2%	12.964
ISLA (VER)	11.330	29%	9962	26,4%	34.933
IXHUATLAN DEL SURESTE (VER)	3.626	27%	2532	25,9%	19.171
XALAPA (VER)	10.436	3%	6366	2,4%	5.401
JALCOMULCO (VER)	3.328	75%	1996	73,0%	6.222
JALTIPAN (VER)	11.455	30%	8824	28,5%	40.601
JAMAPA (VER)	4.543	46%	2791	44,4%	4.914
JUAN RODRIGUEZ CLARA (VER)	13.946	42%	11882	38,9%	10.227
JUCHIQUE DE FERRER (VER)	12.122	64%	10023	60,1%	3.928
MALTRATA (VER)	6.915	47%	4098	45,9%	9.897
MANLIO FABIO ALTAMIRANO (VER)	10.179	49%	4414	47,7%	-4.412
MEDELLIN (VER)	7.409	21%	3764	20,2%	285
MIAHUATLAN (VER)	2.423	64%	1436	60,0%	957
MINAS, LAS (VER)	2.229	86%	1321	86,3%	7.733
NOGALES (VER)	5.738	19%	3415	15,6%	5.389
PASO DEL MACHO (VER)	11.180	42%	8215	38,8%	-3.553
PASO DE OVEJAS (VER)	10.987	36%	6749	34,0%	-2.025
PLAYA VICENTE (VER)	33.634	68%	29270	64,5%	76.477
PUEBLO VIEJO (VER)	5.148	10%	2819	10,1%	29.170
TAMIAHUA (VER)	16.625	63%	12494	58,6%	34.928
TATATILA (VER)	4.283	88%	2538	87,2%	12.369
TENOCHTITLAN (VER)	4.575	82%	2711	80,6%	8.527
TEOCELO (VER)	6.313	42%	3864	40,1%	14.409
JOSE AZUETA (VER)	9.217	38%	7866	34,4%	2.949
TLACOTEPEC DE MEJIA (VER)	2.892	80%	2040	77,3%	18.399
TOMATLAN (VER)	2.566	42%	1113	40,0%	-1.111
VERACRUZ (VER)	9.632	2%	4910	2,1%	7.992
ZACUALPAN (VER)	6.396	91%	3790	90,6%	21.311
ZENTLA (VER)	8.640	70%	7608	66,7%	16.435
AGUA DULCE (VER)	6.950	16%	5111	13,7%	10.309
NANCHITAL DE LAZARO CARDENAS DEL R. (VER)	898	3%	765	2,6%	888
BACA (YUC)	2.847	56%	1749	52,9%	13.743
BOKOBA (YUC)	1.322	67%	812	65,0%	23.172

Municipality Name (State)	Fuelwood users	Percentage of fuelwood users over total population	Anual Fuelwood Consumption Coming From Forest Areas (ton/yr)	Saturation of Fuelwood Users (households)	Fuelwood Balance (ton/yr)
MEDIUM PRIORITY					
BUCTZOTZ (YUC)	5.585	70%	3431	66,9%	37.301
CALOTMUL (YUC)	3.436	88%	2111	85,1%	81.180
CANSAHCAB (YUC)	3.248	68%	1995	65,3%	26.819
CANTAMAYEC (YUC)	2.007	96%	1233	95,7%	126.079
CONKAL (YUC)	2.588	34%	1590	33,1%	12.741
CUNCUNUL (YUC)	1.159	88%	712	89,7%	47.100
CHANKOM (YUC)	3.893	97%	2391	96,3%	140.086
CHAPAB (YUC)	2.535	91%	1557	90,9%	49.339
CHICHIMILA (YUC)	6.043	92%	3770	91,3%	174.214
DZIDZANTUN (YUC)	3.456	44%	2094	41,0%	36.392
DZILAM GONZALEZ (YUC)	4.053	69%	2491	67,1%	64.726
DZITAS (YUC)	3.075	90%	1889	87,7%	74.625
DZONCAUICH (YUC)	2.247	83%	1380	79,6%	16.716
HUHI (YUC)	3.254	77%	1999	74,8%	46.891
HUNUCMA (YUC)	14.012	54%	9170	49,1%	208.064
IXIL (YUC)	2.149	67%	1324	63,7%	34.172
KINCHIL (YUC)	4.506	81%	2764	79,1%	136.812
MOCOCHA (YUC)	1.225	46%	753	45,0%	7.055
QUINTANA ROO (YUC)	922	93%	566	92,1%	28.361
SAMAHIL (YUC)	3.771	87%	2317	85,1%	41.565
SANTA ELENA (YUC)	3.209	92%	1971	90,3%	220.381
SINANCHE (YUC)	1.756	58%	1094	56,1%	28.576
SOTUTA (YUC)	6.611	87%	4061	84,1%	145.871
SUCILA (YUC)	2.781	72%	1708	70,0%	20.319
SUDZAL (YUC)	1.374	90%	844	87,7%	65.763
SUMA (YUC)	1.363	74%	837	70,6%	12.651
TAHMEK (YUC)	2.420	69%	1487	67,9%	28.658
TEKAL DE VENEGAS (YUC)	1.997	86%	1227	84,5%	46.406
TEKOM (YUC)	2.488	94%	1528	93,1%	81.186
TELCHAC PUEBLO (YUC)	1.713	52%	1052	49,4%	6.713
TEMAX (YUC)	4.936	77%	3032	74,9%	72.368
TEPAKAN (YUC)	1.743	82%	1071	82,0%	25.831
TETIZ (YUC)	3.413	81%	2174	78,5%	123.808
TEYA (YUC)	1.587	82%	975	81,3%	11.207
TIXCACALCUPUL (YUC)	4.988	94%	3064	94,1%	141.854
TIXKOKOB (YUC)	6.667	44%	4096	41,4%	45.128
TZUCACAB (YUC)	10.580	84%	6750	81,0%	235.086
UCU (YUC)	2.030	70%	1247	64,8%	44.615
XOCCHEL (YUC)	2.365	84%	1453	81,9%	34.178
YAXKUKUL (YUC)	1.425	60%	875	58,2%	5.988

Annex 2. Accessible forest areas of *municipios* of the Purhepecha Region disaggregated by density groups

Density groups by *municipio*	Accesible forest area by density group (ha)	Percentage of TOTAL forest (%)	Total accessible forest area by muncipio (ha)	Total forest area by municipio (ha)
Charapan				
Low density	39,938	0,34	1064,46	11233,54
Mid-high density	683,625	6,04		
High density	340,893	3,04		
Cheran				
Low density	951,559	7,16	2459,26	12786,25
Mid-low density	2,471	0,03		
Mid-high density	278,936	2,06		
High density	1226,290	9,44		
Chilchota				
Low density	232,119	1,49	2701,192	16478,48
Mid-low density	1223,461	7,56		
Mid-high density	151,365	1,02		
High density	1094,247	6,85		
Erongaricuaro				
Low density	288,709	3,96	1506,745	9388,96
Mid-low density	730,884	7,56		
Mid-high density	483,92	4,94		
High density	3,232	0,03		
Nahuatzen				
Low density	244,872	2,86	2031,25	12065,58
Mid-high density	602,378	5,18		
High density	1183,996	10,60		
Nvo Parangaricutiro				
Low density	2963,091	22,37	6980,79	13081,14
Mid-low density	2826,336	21,92		
Mid-high density	71,063	0,63		
High density	1120,302	8,55		
Paracho				
Low density	372,290	3,63	3135,39	10444,77
Mid-low density	156,230	1,56		
Mid-high density	2008,682	19,63		
High density	598,192	5,90		
Patzcuaro				
Low density	1972,542	9,22	8212,05	18466,63
Mid-low density	1510,498	8,15		
Mid-high density	3478,582	19,69		
High density	1250,428	7,10		

Density groups by *municipio*	Accesible forest area by density group (ha)	Percentage of TOTAL forest (%)	Total accessible forest area by muncipio (ha)	Total forest area by municipio (ha)
Periban				
Low density	4632,341	75,89	5088,78	6088,99
Mid-low density	323,345	5,53		
Mid-high density	133,096	2,17		
Quiroga				
Low density	811,768	9,02	2291,52	9428,6
Mid-low density	728,741	7,63		
Mid-high density	487,089	5,33		
High density	263,922	4,26		
Reyes Los				
Low density	2362,109	9,91	10582,8	23659,3
Mid-low density	2855,703	12,00		
Mid-high density	3844,901	16,97		
High density	1520,089	6,40		
Salvador Escalante				
Low density	954,195	6,61	7883,36	13712,66
Mid-low density	2876,223	23,00		
Mid-high density	3025,730	22,97		
High density	1027,212	7,81		
Tancitaro				
Low density	3695,387	10,06	16003,05	34135,6
Mid-low density	6913,578	20,18		
Mid-high density	5225,854	15,23		
High density	168,229	0,49		
Tangacicuaro				
Low density	288,991	3,52	1842,66	8427,93
Mid-low density	531,839	6,34		
Mid-high density	629,280	7,69		
High density	392,550	5,31		
Taretan				
Low density	2147,956	28,33	4443,81	7647,1
Mid-low density	929,996	12,24		
Mid-high density	1365,858	17,79		
Tingambato				
Low density	204,567	2,15	1425,87	8746,45
Mid-low density	538,838	5,69		
Mid-high density	135,356	2,13		
High density	547,104	6,49		

Density groups by *municipio*	Accesible forest area by density group (ha)	Percentage of TOTAL forest (%)	Total accessible forest area by muncipio (ha)	Total forest area by municipio (ha)
Tzintzuntzan				
Low density	531,262	8,46	4120,87	6146,61
Mid-low density	1930,189	31,60		
Mid-high density	1644,812	27,03		
High density	14,609	0,23		
Uruapan				
Low density	14160,725	25,62	26955,54	54995,11
Mid-low density	6045,522	11,02		
Mid-high density	3441,163	6,44		
High density	3308,131	6,15		
Ziracuaretiro				
Low density	730,590	8,27	4845,62	8982,27
Mid-low density	2993,322	33,43		
Mid-high density	673,730	8,08		
High density	447,973	5,46		