Vol. III, Number 5, June 2014 • ISSN: 2007-6703

# ESPACIO

## INNOVACIÓN MÁS DESARROLLO

General translation Michael J. Greces

Digital Journal of the Universidad Autónoma de Chiapas
Indexed in the directory and catalog Latindex

**ESPACIO I+D,** *Innovación más Desarrollo*

Vol. III, No. 5, June 2014 — ***English Version***

Indexed in the Directory and Catalog Latindex

It is a digital magazine of scientific and cultural dissemination of multidisciplinary nature of the Universidad Autónoma de Chiapas (UNACH). Has a quarterly basis and record:

**ISSN 2007-6703**



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# AN INTERCULTURAL APPROACH TO TRAINING HUMAN RESOURCES

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ABSTRAC

While considering the argument that multiculturalism should be the central axis in promoting education in the XXI century as fair and necessary to assist in the development of towns and marginalized communities it is necessary to recognize the diversity of cultures that coexist, interact and influence each other in everyday life in all of Mexico. It is also imperative that the Higher Education Institutions (HEIs) in our country recognize and assume that an integral human development must respond to the complaint of the poor and marginalized peoples of Chiapas. Therefore, it is vital that a transverse axis in the curricula should be interculturalism which encourages young people from the most vulnerable sector to study, overcome their situation, and assist their communities to overcome their problems. The dialogue of knowledge is undoubtedly the primary tool to different ways of being, of living and to the underlying knowledge that the different cultural expressions of our people and communities can engage and interact in mutual benefit. This is the great challenge of education today, and it is the purpose of this article that basically seeks to motivate the interest of students and academics in this issue of the training of human resources with an intercultural approach.

***Keywords:*** *interculturalism, dialogue about knowledge, education, human resources, institutions of higher education.*

Education is one of the most deeply felt universal rights of humanity and is, without doubt, the main legal and human foundation that recognizes the existence of cultural diversity. For these reasons, the practice of Interculturalism should correspond to public universities which must focus and concentrate the best of themselves to give to mainly marginalized humans in Mexico a real choice of for personal growth, laying the foundations for personal and community wellness, seeking in the words of the declaration of UNEP (2007), "the transformation of values, attitudes, aspirations, decisions and practices, capacity and knowledge building, and fomenting the interconnections of the environment and development, which ultimately leads to the progress of nations".

In this context, higher education institutions (HEIs) are an essential part in this process in the attention to the neediest in society, which involves academic cooperation at all levels, particularly international knowledge networks. These networks should contribute to build new models of teaching and learning that consider learner-centeredness and interculturalism as fundamental elements of social welfare, sustainable development, equity, relevance and equal opportunities in the context of lifelong learning (UNESCO, 1999).

HEIs in this regard must assume their historic responsibility to build their educational programs, taking into account the diversity of cultural groups that share common elements or traits that identify them and usually differ from other cultural groups, including, of course, the *mestizo culture*. The distinction between cultural elements that identify a group and make it different from another is what makes multiculturalism possible, considering that the word 'inter' implies dynamically interaction and so therefore opens to relationships, exchanges and processes.

## INTERCULTURAL EDUCATION AND XXI CENTURY

It is important to consider that culture is not static: this means that the elements associated with a culture can change, like all living things. These cultures and identities, to the extent that they remain alive, are in a process of continuous change, whether by internal processes or

increasingly for exchange with other cultures and experiences within its environment.

What are the common cultural elements shared by ever larger groups of people, that come from many backgrounds and cultural belongings?

The educational paradigm of the twenty-first century must have Interculturalism as one of the cornerstones in university educational models that are practiced in different educational programs that can focus on the learning and building of knowledge and skills. In this process, the student is the central character, since it is he who builds his own learning and the teacher is the one who serves as guide.

The introduction of interculturalism to educational models allows for the incorporation of the training of human resources together with a set of strategies that recognizes not only the construction of meaningful, autonomous and situated learning, but also integrates knowledge which is immersed in the towns, in their cultural expressions and in their integration into a new content of schemes of knowledge about reality, including prior knowledge-as Piaget termed it- as well as Carl Jung's knowledge archetypes. Learning is autonomous in that it is exercising, according to ANUIES (1999), the "power to take decisions to regulate one's own learning in order to bring it closer to a specific goal, within specific conditions that form the context of learning" and its entire application is not reduced only to the school context.

## RESEARCH AND KNOWLEDGE DIALOGUE

The basic premise for the construction of a system of teaching and learning from the intercultural perspective is participatory research as an essential training tool which is made up of a congruent orientation to the development of critical thinking. It generates repeated opportunities on one hand for to support and maintain its own positions and on the other hand, evaluate the ideas of others in the context of collaborative teamwork , helping to enrich the professional training with a genuine commitment to the problems facing society.

However, when reference is made to research and knowledge and its relationship to multiculturalism, there is an implicit fundamental element that you cannot forget, which is a dialogue about knowledge. This concept essentially proposes the recognition that besides scientific knowledge exists other knowledge and skills that come from men and women who do not study nor practice any form of science.

The conduction of research projects as a learning strategy not only contributes to the understanding of natural or social phenomena but also about learning processes occur in science and how to apply them to teaching. This allows students to take ownership of the methods used by the sciences, arts, and humanities-in short, all disciplines-- to approximate interpretations of reality underlying the laws of science. In this sense, curriculum planning and research should address the problems that communities and society face, because it is here where professional training intervenes , offering collaborative alternative solutions to the objectives that are posed (Nozenko and Fornari, 1995).

So, then the system of knowledge generation and teaching-learning processes considered in curriculum design should be viewed from a broad perspective and not as the result of the simple arithmetic sum of knowledge, attitudes and skills. It is an inclusive concept, where it is not enough to consider one or more of the elements separately, but the articulation of them taking into account the connection of theory and practice from a scientific perspective and knowledge and practice of people and cultures of the communities.

## DIVERSITY OF KNOWLEDGE AND LOCAL KNOWLEDGE

Its necessary to consider that when we look at the communities we do not find isolated knowledge rooted in people, but a system of knowledge, such as is the case of human health or the current production systems in rural communities which have a profound connection between the inhabitants of a community and between people of different communities. Consequently, it would be foolish to ignore or underestimate this knowledge.

However, the story is somewhat different from that premise. For centuries, from the arrival of the Spaniards to our country a system of European knowledge and belief prevailed and it was led to believe that the system of knowledge and knowledge of indigenous peoples are nothing more than quackery, superstition and paganism. That is, the imposition of European culture to the Mesoamerican culture brought contempt and the liquidation of these knowledge systems.

After the collision of two cultures, of two civilizations, even though it dwindled the vast ancient knowledge was unable to be liquidated. It remained in our communities in the form of what we call "traditional knowledge" imbricated to knowledge imposed by Europeans. It is our duty to study, understand, respect and incorporate Western scientific knowledge through the medium of dialogue of knowledge, which is another important foundation of the concept known as multiculturalism.

## CONCLUSION

In conclusion, when we talk about multiculturalism we mean first that this concept involves a relationship with nature ( one of materials and economics, production, food, shelter); Secondly, the social relations between individuals and groups (family, community, politics); and third, to the imaginary or symbolic that gives meaning to the whole (language, religion, art, law and legal system).

Therefore, multiculturalism involves not only shared common traits that identify a group of people and make it different from others, but also the opening to relations and exchanges between different groups or between different knowledge systems such as health or productivity. This relationship based on respect, responsibility and equality is perhaps the greatest challenge of this dialogue of knowledge.

Today we have a great opportunity to build a new system of learning that recognizes and includes INTERCULTURALITY as an essential element in the training of human resources necessary for the full, inclusive, progressive development of society that we intend to build, not to mention the recognition of cultural diversity involves recognizing the existence of other knowledge, skills, attitudes and values that underlie the *pueblos* and communities of our country.

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# MULTIDIMENSIONAL MEASUREMENT OF THE CONCENTRATION OF POPULATION

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## ABSTRAC

The current way of measuring the concentration of population is mainly based on estimating the ratio between people and territory at a given point in time. It is easy to understand that the way of measuring concentration is subject to sudden changes in migration flows. This paper proposes a new way of measuring the levels of concentration of population in a territory, using a great quantity of information on the characteristics of population as well as housing, infrastructure and services in the region. A new measure of concentration is proposed capable of capturing multiple elements that gives density to a space and in turn allows us to understand the populations as an integral part of system that also gives shape, structure and complexity to the territory. Thus this designed method considers different stages of measurement. During the first stage tangible elements such as the population and the physical elements that fill spaces are quantified using the statistical method known as DP2. This makes it possible to assign a hierarchy level of each of the studied localities, which we understand as a group of one or more occupied dwellings.

In the second stage the relationships between sets of locations are identified. In other words, systems of mapped locations identified as networks are built. It is through the identification of relationships that makes it possible to establish towns as new elements in the system of locations. It is understood that relationships are also elements that increase density in the space, and that the position of a locality within the system changes its degree of centrality and therefore should effectively increase the level of concentration.

Finally, a formula for calculating the concentration index using the hierarchy of the location, the density measurements of the locality systems and surface locationsas inputs, as well as the locality and what occupies the whole system, is proposed.

***Keywords:*** *housing, adobe, reinforcement, structure, safety, earthquake-resistant*.

The spatial distribution of the population, within the territory, gives rise to the problem of measuring the levels of concentration or dispersion, because the distribution is generally heterogeneous. The way the population is distributed in the territory is closely linked to historical, economic, social, political, environmental and culturalfactors. However, the concentration of population in large urban centers is due to a greater availability of resources, infrastructure and services, which in turn determine the living conditions of the population and their standard of living.

The development of a measure of concentration of population depends first on the number of people living in the territory. However, the technical difficulties of quantifying aresident population in a given space and time, as well as the ephemeral nature of measurement, make the development of new techniquesnecessary. This forces us to analyze the relationship between population and territory (the greater the population implies a greater concentration), and supplement this with less dynamic elements that allows for the construction of a more robust estimation.

Not only does the number of people present in a territory make it more dense, but other elements associated with their demographic composition, structure by age and sex, educational level and production capacityshould be considered.In addition, economic elements such as the amount and quality of facilities, housing, and infrastructure in terms other than their number but alsotheir importance and relevance, need to be considered as well.

Therefore a region is dense for its population, but also for all that its presence implies. Numerous population centers involve a higher concentration of housing, basic services and facilities such as potable water, electricity, roads, schools and hospitals, as well as production and communications infrastructure such as factories, shops, banks, shopping centers, ports and airports. In other words, in order to design a new way of measuring the concentration of a population which is robust and stable over time, should consider in addition to the population various elements that comprehensively account the density in land use and the speed with which it can change which involves the measurement of migration, student, and laborflows, among others.

The main problem lies in that the population does not remain static, resulting in two basic difficulties: 1- The measuring of population flows is often very complex the smaller the area 2. -The measurements soon become outdated due to the same dynamics of migration and labor or commuter flows. Therefore it is necessary to analyze the relationship between population and territory and supplement it with less dynamic elements to build a more robust measure of the level of concentration.

The ultimate goal is to build an indicator capable of quantifying the concentration levels grouped in different layers of administrative and / or geographic aggregations, using conceptual bases that are based on theoretical paradigms such as polycentric theory, general systems theory,graphics theory, network analysis [7] and various multivariate statistical methods as tools to reduce the number of variables and data necessary for measuring [4].

The methodology for calculating the index of population concentration has been divided into stages. A brief description of each will be given based on the objectives and tasks required, but also considering the limitations on the availability and quality of data and official information available in the case of Mexico.

The first phase of the methodology is to identify and analyze a set of variables that characterize the towns of Mexico. They are available online (on the official page of the INEGI) and come from the last general census of population and housing as well as information from the economic and agricultural censuses generated by the National Institute of Statistics and Geography (INEGI).

## THE PROBLEM OF POPULATION CONCENTRATION IN THE CASE OF MEXICO

Mexico was made up of 192.245 inhabited localities in 2010, although in reality the inventory of locations exceeds 280 thousand. The difference includes inhabited localities. Of all the inhabited localities there are 139,000 sites with less than 100 inhabitants and with only 2.2 percent

of the national population (2 million 383 thousand inhabitants), which gives us an idea of the enormous dispersion of the population. Moreover, there are 36 locations with over 500,000 inhabitants. They account for 27.8 percent of the national population (just over 31 million inhabitants), which gives us an idea of the enormous concentration of population. Thus, it is possible to identify a small number of locations with large concentrations of population, but also easy to identify a large number of localities with very small populations. This is a very general overview of the distribution of the population nationwide.

Another factor that is important to analyze is the number and the speed with which localitiesappear or disappear. From the census 2000 and 2010, 45,896localities disappeared and 38,759 locations emerged. It's important to note that of the towns that disappeared, 44,581 had less than 100 inhabitants and a great many of these only changed their name, but it was not possible to distinguish between them.

In this regard, it is important to note that the size of the community is keyfactor to explain the permanence and stability in the survival time of localities. 97 percent of those that disappeared were less than 100 inhabitants. It is also necessary to analyze the characteristics of the localities that did not disappear and even more important to know what are the characteristics of localities which also significantly increased in size. What was the economic, demographic and social dynamics that followed to ensure its permanence over time? Were there physical elements or infrastructure that may explain its evolution? In the next section we will build indicators that will explain the elements associated with the main characteristics present in all localities in the country.

The rest of the paper details a new methodology that provides a measure of concentration of population for localities in Mexico through the calculation of an indicator whose objective is to quantify the population density considering a great quantity of information that refers to housing , facilities, infrastructure and services, and their characteristics in terms of quality and level of accessibility.

## ALGORITHM FOR MEASURING CONCENTRATION LEVELS OF POPULATION

The methodology for the development of a concentration-dispersion model revolves around the concept of polycentricity, framed within the general systems theory, and evaluated through mathematical functions developed in order to quantify the concepts of centrality and dispersion from a systemic perspective. In this manner a system will not be seen abstractly or qualitatively, but rather will give a mathematical approach to the traditional methods.

The algorithm used to measure the levels of concentration of population in Mexico will develop in the following phases:

1. Assign a hierarchal level to each locality of the country.

2. Identify centers as abnormally dense areas, with a hierarchy level above two standard deviations from the mean of the analysis area.

3. Define continuous central locations, such as those areas where the continuous space of buildings exceeds the limit of the town, in order to identify rural centers, urban centers and metropolitan centers, among others.

4. Establish an area of influence for each center, through the identification of flows between localities.

5. Characterizenetworks formed by localities made up of centers, sub-centers and localities, at different levels of aggregation. They will refer to metropolitan, urban, rural and dispersed systems.

6. Assign a hierarchy to each system.

7. Calculate the measure of population concentration.

## HIERARCHY OF LOCALITIES

The locality hierarchy is an indicator of the importance of a location relative to the locations in their environment, which allows for the comparison of the level of primacy of a town of 800 inhabitants with respect to another with the same number of people, but with different demographic, social and economiccomposition. In other words, the indicator allowsdiscrimination between two or more locations from a very large set of variables grouped into at least four basic dimensions:

1. Population size
    - Total Population
    - Education level
    - Access to health services
    - Average age of the population
    - Demographic dependency
    - Migration

2. Structure and composition of households
    - Total households
    - Average size of households
    - Proportion of female-headed households
    - Proportion of single-person households
    - verage number of children per household

3. Dimension of Housing (number and quality of goods in the households)
    - Total housing
    - Quality of dwellings (ceilings, floors, ...)
    - Services (water, electricity, ...)
    - Goods within the house (refrigerator, ...)

4.Locality services
    - Access to highways
    - Public Transport
    - Access to potable water
    - Access to sewage system
    - Garbage collection
    - Public lighting

- Paved streets
- Public square or garden
- Public registrar's office
- Municipal Agency

5. Economic infrastructure of the locality
    - Services infrastructure (number of hospitals, schools...)
    - Communications Infrastructure (dedicated to communications)
    - Productive infrastructure (primary, secondary, tertiaryindustries)

The development of the hierarchy of locationsindicator requires the support of multivariate statistical analysis techniques, which are intended to summarize large amounts of variables, which are often mathematically and conceptuallycorrelated. Statistical techniques are able to reduce and capture most of the observed complexity and generate new concepts known as latent variables. The design leads to the generation of simple and robust indicators.

Regarding the development of indicators, statistical techniques best suited to the type of requirements listed are: principal component analysis (PCA) and analysis of distances (DP2). To design the hierarchy of locations indicator we have chosen to use the analysis of distances technique, DP2, which main characteristic is to identify and discard non-significant relationships.

The DP2 technique aims to develop syntheticindicators based on the concept of distance, where the partial correlation coefficient, between the ith and the jthcomponent is a measure that reflects the absolute value of the difference between the ideal set of indicators (in other words, a standard measure, which are not necessarily found in reality) relative to a set of simple or observed indicators, standardized by the inverse of the standard deviation of the observed indicator. The redundant information is discarded by including the partial correlation coefficient.

Since the variables that make up each locality hierarchyindicator have different units of measurement and scale, the DistanceAnalysis (DP2) is used in order to reduce the effect of the magnitude of the different scales or metrics. However, the implementation of the DP2

demands compliance with a number of assumptions in order to ensure the consistency of the results based on the proper selection and quality of the data, along with the monitoring of the levels of correlation between the variables involved. The assumptions that need to be considered are completeness and objectivity, which implies that the data that are used should be an objective representation of the modeled variable, free from value judgments or subjective predictions.

The DP2 technique transforms all of the components into comparable units, being sure not alter the order of the indicator of the following formula:

$$DP_2 = \sum_{i=1}^{n} \left\{ \left( \frac{d_i}{\sigma_i} \right) \left( 1 - R^2_{i,i-1,i-2,\ldots,2} \right) \right\}$$

It should be understood that the use of the DP2 technique aims to estimate the value of a hierarchy index that summarizes thedimensions of the indicators and all associated variables, according to a conceptual model that, for the case of the concentration measurement, is understood in terms of linear combinations of the variables set forth above, that is:

$$jq_{loc}=DP_2$$

The calculation of the locality hierarchy requires the measurement and evaluation of data at the level of thelocality. The information for its estimation can be obtained from the micro dataof the General Census of Population and Housing, Population Counts, as well as the data added at the AGEB level, which come from the Economic and Agricultural Censuses-information provided by the National Institute of Statistics and Geography (INEGI).

## IDENTIFICATION OF CENTERS AND SUB CENTERS

The traditional way to identify urban centers and sub-centers is given by the methodology established by Roca and Marmolejo [12], which

performs an analysis of the spatial distribution of the density of land use. Four methods emerge from this analysis:

1. Analysis of layer densities and detection of local disruptions with the use of GIS;

2. Use of a set of massand densitythresholds;

3. Identificationfrom an econometric perspective of areas of possible sub-centers with significantly positive residuals in a regression where the dependent variable is the density of employment and the independent distance to the central business district (CBD), and

4. Nonparametric estimation models using local or geographically weighted regression, in order to detect peaks of density after the layer has been adjusted locally, according to two dimensions and considering the effect of the nearby areas.

A second aspect of a functionalist order explains that the centers or sub-centers are not only unusually dense areas, but are nodes from which the functional relationship between nodes, the CBD and the rest of the system is structured.

The functionalist criteria allowthe characterizing of the centers once the hierarchical, complementarity and synergistic relationships are detected. In this manner the identification of the centers and sub-centers will be the most delicate work in terms of the capacity to quantify the measures of centrality and flow of each of the centers, using the value of the relationships established in terms of their complementarity and synergy from all available information to determine the type, frequency, intensity and direction of the relationships.

There are some other definitions of centers of both functional and economic orderswhich can be seen in [29, 32]:

1. Zone withan employment density significantly higher than its region.
2. An area that has a significant effect on density.

3. Representation of the backbone of an urban subsystem within the metropolitan structure.

The way in which we will identify potential centers shall be based on the idea that a center is an area of abnormally dense space, which is able to build relations with neighboring localities. To achieve the objective identification of potential centers we employ a spatial autocorrelation analysis, the same that will allow the identification of areas of high concentration (high hierarchy) starting from the relationship that the hierarchy reserves for each locality with itself and the space.

The spatial autocorrelation analysis is able to identify the extent to which the locations of geographical units are similar to other locations in nearby geographical units. That is, it is able to identify hot spots or hot areas surrounded by hot areas, and vice versa, cold areas surrounded by cold areas. This feature is essential to identify localities with high hierarchy surrounded by localities with high hierarchies, which of course will be identified as centers or sub-centers.

The centrality of a locality is detected through spatial autocorrelation, measured through the Moran index as well as in a global manner:

$$I = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}\,(z_i - \bar{z})\,(z_i - \bar{z})}{S_z^2 \sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}}$$

Locally:

$$I_i = \frac{\sum_{j=1}^{n} w_{ij}\,(z_i - \bar{z})\,(z_i - \bar{z})}{S_z^2 \sum_{j=1}^{n} w_{ij}}$$

Where $W_{ij}$ is the weighing factor indicating the relationship of contiguity between spatial units i and j, which can be an indicator of proximity or an assigned measurement.

The local unit will be defined by a concentration, in place of the global space, with particularly high values of the locality hierarchy in comparison with its average value.

The mere observationof the distributionof a variable on a map in space allows one to intuitively grasp the existence of patterns of spatial behavior. This information will always be subjective and highly dependent on the number of established intervals that represent this variable on the map. Therefore, it is essential to have a combination of statistical measures or instruments capable of detecting the presence of significant (global and / or local) spatial autocorrelation.

The design of centrality measures of localities in a systemic structure is made through traditional measures of centrality. In general, the way of measuring the concentration of a system is by measurements where the centrality is an attribute of the nodes (localities), assigned in function of their structural position. In other words, there is not an intrinsic attribute (such as income) but rather it is directly dependent on the shape of the system. For example, in a star shaped system, the central node has a maximumcentrality value whereas the nodes of the tips have lower centrality values. In other words the centrality depends on, in addition to the spatial autocorrelation measure, on the position the center occupies with respect to the sub-centers and the other localities.

## DEFINITION OF CONTINUOUS LOCALITIES

During the phase of the identification of continuous localities new analytical units are built based upon the group of contiguous localities. These new units are groupings of localities that share at least one common physical border, where the continuum of buildings is not broken or where the number of infrastructures linking the towns make it possible to think that these form a continuum (due to the amount

and intensity of flows ) and it is also possible to find evidence of similar levels of spatial autocorrelation between localities of the continuum. At this point a new type of sets of localities is proposed that go beyond the simple separation of urban and rural.

Continuous localities are established through an identification algorithm that takes into account:

- The spatial contiguity
- The hierarchical level of the town
- The observed levels of spatial autocorrelation
- The presence of infrastructures
- Geographic ruptures

The continuous identification algorithm is certainly determined by what is meant by spatial contiguity and the definition of neighborhood that uses polygons that make up the territorial units of analysis. At this point, it should be noted that there are a lot of rural localities, especially dispersed localities, whose limits have not yet been made so there is not a polygon defined for them.

The local spatial autocorrelation tests detect clusters of variables that are spatially referenced. These allow for the testing for the presence of areas of spatial dependence within a general or local area through the Local Indicators of Spatial Association, or LISA for short.

Local Indicators of Spatial Association generate a significance indicator for each point of the group. The sum of significances of all of the points in the study area is proportional to the overall indicator for spatial association of that area. That is, the overallautocorrelation rate decomposes and verifies the contribution of each spatial unit to the formation of the overall value, allowing simultaneous capture of the degree of spatial association and the resulting heterogeneity of the contribution of each spatial unit.

The spatial autocorrelation test seeks to test the null hypothesis of non-local autocorrelation ($H_0$), for which the alternative hypothesis assumes that the test variable has a random distribution.

$$I = \frac{\sum_{i=1}^{n} w_i I_i}{\sum_{i=1}^{n} w_i}$$

Wherewi is, as before, the weighting factor for proximity or distances.

The use of the LISA test is proposed because some global statistical spatial lag can mask patterns of spatial autocorrelation, while LISA is capable of detecting them and also showing their location. It can also break down overall results into local results and discover local hidden patterns of data contained on overall patterns.

Once identified, the continuums areassigned a hierarchy level such as the sum of the hierarchies of the localities that they make up, plus an adjustment factor due to the integration of the relationships which is defined in the stage of identifying networks of localities as systems.

## TYPE OF LOCALITIES

Rural locations are defined as those with less than 2500 inhabitants. This measurement of rural and urban fails to recognize the heterogeneity that characterizes the structure of these populations. The problem is analogous to wanting to define a rainbow as the combination of black and white.

The locality hierarchy is a multidimensional index that captures the heterogeneity in the different stages of the development of localities. However, the question to answer is-What is the minimum threshold in terms of infrastructure at which a village can be considered urban? Beyond trying to resolve such questions, I will focus on proposing a new localitytypology which seeks to capture different stages of development.

Proposed typology of localities:

1. Dispersed locality without blocks (A set of inhabited houses without services or access roads).

2. Hamlet without blocks (This is a group of houses with access to some services and to a dirtroad or some other path).

3. Locality with blocks and scattered hamlets (it is a town with a core of identifiable housing, plus scattered dwellings).

4. Micro regional center (This is a fully blocked town whose built area covers at least 75 percent of the town).

5. Mesoregional center (Thisis a town that has exceeded its limits and is in a phase of conurbation with other localities).

6. Macro regional center (This is a consolidated center in terms of equipment, infrastructure and services covering at least two urbanlocations).

7. Metropolis (consolidated city).

8. Megalopolis (the conurbation of several consolidated cities).

## ESTABLISHMENT OF THE AREA OF INFLUENCE

Once the center and sub-centers areidentified either as a single locality or as a continuum of locations, the next step is the definition of its area of influence which will depend of course on their level of hierarchy and the number and importance of the towns with which it shares the same geographical area.

The definition of the area of influence should be estimated for all of the centers and sub-centers that are identified, i.e., those that reach a minimum level of hierarchy in order to choose the category of center or sub-center. However, it is necessary to specify that the hierarchy level is always relative to the environment.

At this point it is necessary to define an algorithm that permits the identification of an area of influence for localities identified as central on a local level terms of elements such as:

1. Location of the center (coordinates)
2. Center hierarchy level
3. The distance between the center and localities
4. Attraction/appeal of the center
5. Position of center within the network
6. Centers geographical region
7. Political boundaries
8. Geographical features
9. Hierarchy of neighboring towns

In general, the area of influence of a center or sub-center as an attraction zone based on the gravitational type agglomeration/ desagglomeration model proposed by Roca C, Josep and Marmolejo, C. (2010)is such that :

$$AT_i = \frac{\int_j A \cdot M_i^{k_1} \cdot M_j^{k_2}}{d_{ij}^{r_1}} - \frac{\int_j B \cdot M_i^{k_1} \cdot M_j^{k_2}}{d_{ij}^{r_2}}$$

Where:

A and B = locality hierarchy (intensity of the attraction )
M = nearby center or sub center localities
i = local attractiveness
j = localityattractor (center or subcenter )
$k_1$ and $k_2$ = model adjustment constants
$d_{ij}$= distance between two localities
$r_2$ and $r_1$= the speed at which the attraction of the center distance is diluted with distance

The aim is to identify areas of influence in metropolitan areas, large cities and urban areas but also in smaller centers located in rural and dispersed areas. Furthermore, the validation of the existence of

so called zones of influence is sought through the identification of all types of relationships.

A general definition of polycentricity is associated with the idea that within an urban metropolitan area a multinuclear structure is generated from the emergence of peripheral urban areas. That is, a city usually has an identifiable center while other urban sub-centers coexist, with a series of complementary or competitiverelationships. Thus the relationship between the polycentric theory and development of the systems theoryis clear. In this manner the measurement model maps the polycentric model characteristics (centers, sub-centers and flows) to a measurable systemic structure based on the definition of a system composed of subsystems (sets of localities) and the relations between them [3] . Furthermore, each of the various subsystems must be translated into a graph that models the system through a network which will provide the basis for constructing the functions of concentration and flow, as well as allow thevisual identification of systems.

## CHARACTERIZINGLOCALITY NETWORKS AS SYSTEMS

At this point the systems that make up each center or sub-center will be identified, as well as their complexity and level of concentration,therefore it is essential to know the level of integration, structure and hierarchy. The aim is to define the different systems observed at the national and state level. Each of the systems consists of a center and a set of locations that interact with the center, or a center, a set of sub-centers and a set of locations within its area of influence.

The importance and hierarchy level of each of the systems depend on the preponderance of the center, the number of towns that make up the system and the amount of relationships and flows that are present.

A network is a graphical representation of a system and can be defined as a set of objects together with a set of connections. A set of hierarchical relationships or one formed by non-hierarchical relationships form a network, and what marks the difference is the

direction of flows. The first deals with vertical relationships and dominance, and in the second horizontal or equality relations.

Overall the analysis of a network is based on recognition and evaluation of relationships between nodes(a node is a town, a center, or a sub-center). The characterization of flows allows for the identification of a network as well as its scope according to the opportunities and constraints which are a product of the featuresof the same structure of relationships. The morphology of a network may be identified from the following:

1. Anchor or location: initial starting or reference point for the network , which determines the structure of the opportunity, and determines the ease of access to the resources of other localities;

2. Accessibility: force with which the behavior of a locality is influenced by their relationship with others. It's possible to calculate two types of accessibility: By proximity, which refers to the smallest relative distance with localities; or by intermediation which indicates the localities that are found at the shortest distance.

3. Density: which is a function of the number of connections, and

4. Range: in all systems some localities have direct access to others. A range of first order is given by the number of locations in direct contact with the city on which the network is located.

The identification and characterization of flows in the network (locality systems) will be made based on the following elements:

- Content: refers to the content of the communication flow through the network;
- Direction: there are cases in which the links are reciprocal. However, there are relationships where the flow moves with greater intensity towards a meaning of the relationship or are relations of only one direction;

- Duration: networks have a certain period of life;
- Intensity: this can be understood as the degree of involvement of actors linked to each other and
- Frequency: a relative repetition of the contacts between the actors is necessary in order for such connection to persist.

Flow indicators are estimated in direct and indirect terms with informationabout the locations andhighway flows, bus schedules, the flow of goods and services and the flow of people. Other elements are considered such as:

- Distance, time and transportation costs
- Integration of productive chains

The tangible elements detected within each network are nodes which are defined as localities, centers or sub-centers. They are quantified as:

$$N = \sum nodos$$

Once the nodes and their relationships are known, it is possible to calculate the size of the network, such as

$$S_k = \sum_{i=1}^{N} \sum_{j=1}^{N} f_{ij} \qquad \forall\ i \neq j$$

Where fij represents the flow between the i, e, and j nodes, where i indicates the source node and j indicates the destination node.

The density of a network is defined as the number of effective relationships (network size) divided by the number of possible relationships, excluding the main diagonal of the matrix of relationships (i.e., relationships of a node with itself areexcluded ). The density is

thus an index ranging between 0 and 1 where 0 represents the null-density network and 1 represents a fully connected network.

$$D_s = \frac{\sum_{i=1}^{N}\sum_{j=1}^{N} f_{ij}}{N^2 - N} \qquad \forall\, i \neq j$$

Once the basic elements and network measurements are identified, it is possible to define general types:

1. Depending on the nature of theexternality of anetwork, it is possible to identify complementary and synergetic networks.

    a. Complementary networks exist between specialized and complementary centers, interconnected through market interdependencies, so that the division of functions between these nodes ensures a large enough area for each center market and enables that scaleand agglomeration economies are achieved.
    b. Synergy Networks: exist between schools with a similar productive orientation, that cooperate between themselves in a unplanned manner. In these centers the key concept is that synergy is obtained through cooperation, and thus the externalities are provided by the same network.

2. Depending on the type of union one can speak of hierarchical, polycentric and equipotentialnetworks.

    a. Hierarchical or hierarchy networks arise from the idea or model of central place. Relationships between network nodes are asymmetrical, and the system consists of polygons, i.e., it is possible to identify patterns of spatial contiguity between nodes and therefore possible spatial relationships can be predicted between neighboring nodes.
    b. Polycentric or stable local specializednetworks. Exchange relationships between nodes can be based on complementarity

or synergy, but may be strongly asymmetric, even dominance-dependence. In this case, the urban functions are divided among multiple nodes, in combinations of various types and dimensions. However, their distribution is not casual, but the nodes are organized seeking to obtain economies of agglomeration.

c. Equipotential networks arise when relationships between nodes are symmetric or nearly symmetric and do not follow a pattern. Urban functions are distributed by chance among the network nodes. The activity does not follow a clear pattern of localization, i.e. activities are distributed randomly between nodes, but on the basis of complementarity, without a center defined in the network.

In practice, the way to detect the type of a network is done through gravity models, while the estimations in the search for complementarities are made using methodologies focused on determining the existence of networks.

Gravity models use data flow networks to identify synergies, whereas complementarities models use estimates based on the search for stock data or the detection of complementary networks.

In general, the detection of synergy networks from a gravity model is done with data on labor mobility and distancemeasures such as travel times between each node. The gravity model relates the masses with the distances (the number of work sites in the town) and are fundamentally considered hierarchical relationships.

The methods for detecting synergy or complementary networks are estimated using:

- Data on disaggregated flows by sectors or activities in order to determine the pairs of localities between those that have strong synergistic and complementary exchanges.
- Identify the network structure and overlapping specializations of localities, so that complementarity or synergetic relationshipsmay be established (between each pair of cities

connected by a network relationship), based on specialization. This procedure utilizes data and stock flow.

If localities have a network connection with the same specialization, it is considered that the network connection is synergistic, and if each have a different specialization the relationship is considered complementary.

## ASSIGNING A HIERARCHICAL LEVEL TO EACH SYSTEM

Systems theory provides the basic mathematical tools for working with networks. The instrument is based on matrix calculation and the development of indicators that reveal the characteristics of the network and the nodes that comprise it.

The basic matrices of network theory are the adjacency matrix, the matrix of accessibility and the distance matrix.

The adjacency matrix indicates when a direct connection between two network nodes in a network exists. It is a square, binary matrix where a value of 0 indicates no relationships between two nodes, and a value of 1 indicates that two nodes are directly connected.

The accessibility matrix indicates if a network node is connected to another, either directly or indirectly. The matrix can also be balanced (not binary) when it displays the total number of connections between pairs of nodes.

The distance matrix determines the shortest route through the minimum number of lines to move between the two nodes.

From these matrices can be calculated, as already stated at point eight, statistics such as the size and density of the network. From the size and density of the network can be assigned a hierarchy level for each,  detected as the sum of each of the nodes that make up the hierarchy times the density of the network systems.

## CONCENTRATION MEASUREMENT

Finally, to calculate the concentration index (CI) of the elements defined within systems of cities or the towns themselves, a means was designed in the form of a model of non-parametric density which includes each of the elements in the above.

The IC of a locality is estimated directly as the ratio of the hierarchy of the locality, multiplied by the number and intensity of the relationships that the locality has with the reference system localities, divided by the area it occupies. That is:

$$IC_{loc} = \frac{jq_{loc}/superficie}{\sum_{i=1}^{N} \Psi\,(loc)\;\; jq_{loc}/superficie\ total} * \frac{D_s}{D_N}$$

*(area, total area)*

Where the function Ψ is defined as:

$$\Psi\,(loc) = \begin{cases} 1 \quad si \;\; loc \in S \\ \\ 0 \; si \; loc \notin S \end{cases}$$

Moreover, the IC can be estimated for a system S (a system of dispersed locations, or a system of cities),such as:

$$IC_S = \frac{\sum_{i=1}^{n_S} \Psi\,(loc_i)\;\; jq_{loc_i}/superficie}{\sum_{j=1}^{N} \Psi\,(loc_j)\;\; jq_{loc_j}/superficie\ total} * \frac{D_s}{D_N}$$

(area, total area)

In addition, the IC can be estimated in a specific geographical area such as a state or a municipality, or any other area, from the following expression:

$$IC_a = \frac{\sum_{i=1}^{n_a} \Phi\left(loc_i\right)\ jq_{loc_i}/superficie}{\sum_{j=1}^{N} \Phi\left(loc_j\right)\ jq_{loc_j}/superficie\ total} * \frac{D_a}{D_N}$$

Where the function Φ is defined as:

$$\Phi\left(loc_k\right) = \begin{cases} 1 \quad si \quad loc_k \in Área \\ \\ 0\ si\ loc_k \notin Área \end{cases}$$

Overall, it was decided to use this form of measurement because the nonparametric procedures can be applied to any type of distributions, without any assumptions about the shape of the underlying density. Furthermore, this type of measurement has the capability to accommodate cases where the distribution is multimodal.

## CONCLUSIONS

It is important to change the dichotomous conception of population centers. As was previously mentioned, defining the population as rural and urban clusters is equivalent to trying to explain a rainbow in terms of black and white. Itimplies ignoring the reality of a large number of population cores whose developmental stage places it in any of the proposed typologies in the relevant section. Moreover, it is also important to note that a population core is more than just the conglomeration of people, so its definition must include the physical infrastructure and places where there is a tangible and intangible flow of a large accumulation of goods and services that streamline and increase the density of the geographic area that they inhabit. Therefore,

the definition and measurement of the concentration of population that is proposed involves a great number of dimensions, and each seeks to capture a different densification of a distinct space.

Finally, the proposed methodology assigns a degree of hierarchy or importance to each population center. This is an intermediate measurement of the concentration, which practical usefulness goes beyond the scope of this investigation. The ultimate goal is to generate a measure of concentration which is achieved by relativizing the specific weight of each locality, with respect to the geographical area in which it is found.

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# RURAL AND URBAN POVERTY IN MEXICO
# 1995-2013
# A STOCHASTIC ANALYSIS

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ABSTRAC

This article seeks to model the new theories of multidimensional poverty measurement. The proposed model considers the poverty of capabilities and poverty of needs as complementary and not as substitutes (Discussed extensively in the literature on the subject) consistent with new currents that support a multifactorial definition. Through a stochastic model the breaking of the traditional paradigm of measuring poverty indicators is sought with Static and deterministic models, at the same time providing a dynamic picture of the evolution of poverty, which has a historical memory in its formation. This model is applied to the various dimensions of poverty through income in Mexico discriminating between rural and urban areas.

***Keywords:*** *Evolution of poverty, social mobility, social heterogeneity, Transition probability, Markov Chains, multidimensional poverty in Mexico.*

In order to study the evolution of the structure of poverty and examine the characteristics of the process of social mobility between the different dimensions of income poverty in Mexico, this article has considered the following: the evolution of poverty is a dynamic process of mobility between different dimensions of income that affect humans, food poverty, capacity and capital. It is assumed that people are constantly looking to improve their income and change their living conditions. Also, mobility takes place in a space open to opportunities through the creation and discovery of new strategies for the formation of human capital, their entry into the market and their sustainability in the long term. It is understood that there is heterogeneity in access and utilization of social programs, due to:

a. The space of poverty is complex and multidimensional;

b. That society is experiencing social and economic change;

c. That the poor population is heterogeneous in its needs and wants;

d. That different social conditions coexist that lead to differing degrees of success and failure in the formation of human capital, poverty alleviation and development.

The relative success or failure of social policies in the process of evolution of poverty can be measured in terms of the transition probability of overcoming a dimension or to move to a dimension of higher income.

De esto trata el presente texto: del uso de las estrategias usadas por los candidatos en las elecciones referidas, haciendo énfasis en aquellas que recurrieron a la estimulación de las emociones, a través del miedo y la comedia.

1 It is assumed that the State or NGOs continue strategic routines through actions and programs to increase social capital and human development of the population, and the review of these strategies is directly linked to their success.

## THE PROBABILITIES OF POVERTY

Each transition probability is the probability that a person in poverty i at time t is exceeded and goes on to the next dimension j poverty in which their deficiencies decrease at time t + 1. If i = j then the transition probability becomes an indicator of the inability of people to overcome their poverty from one period to another. If i ≠ j then the transition probability can be interpreted as the relative mobility of poverty dimensional j in the attraction of dimension i. A stochastic Markov process of first order is assumed.

The probability distribution for mobility from one dimension to another population is conditioned to its previous size. Therefore, each transition probability is conditional on the size of the population in the previous period, so you can make the following transition probability matrix:

$$1. \quad \begin{bmatrix} P_{11} & P_{21} & P_{31} & \cdot & \cdot & \cdot & P_{n1} \\ P_{12} & P_{22} & \cdots & \cdot & \cdot & \cdot & P_{n2} \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ P_{1n} & P_{2n} & \cdots & \cdot & \cdot & \cdot & P_{nn} \end{bmatrix}$$

If there is a fragmentation of mobility, or lack of social mobility between the dimensions of poverty, it will be reflected in the matrix of transition probabilities. The matrix also shows whether the mobility process is more intense.

The transition probabilities are described as the proportion of the population who are in any of the dimensions of income poverty and changing to another dimension over time. Consequently, they become the parameter of the equations of motion of the social structure.

## STOCHASTIC MODELS TO EXPLAIN THE EVOLUTION OF POVERTY

Poverty, either for its causes (psychological, social, economic, political ...) is a complex and multifactorial phenomenon that when combined,

results in states other than the social condition of the individual (food poverty, capabilities, non-vulnerable assets) . This presents stochastic elements and makes known the limitations of deterministic models to explain measure and compare culturally heterogeneous groups over time. People perform different actions and strategies (for example, modify their consumption, expand their job skills, training, etc.) and divergent behaviors in different social groups has been observed within different economic scenarios (recession, stability or growth) thereby the result of thier social status given their actions and strategies should be modeled as a stochastic outcome, given the complexity required a multifactorial model is proposed and the inability to model the heterogeneity that is posed by various social groups.

Stochastic models have been commonly used in the analysis of social statistics to model the evolution of populations[4]. The obligatory stochastic reference models are Gibrat's Law of Proportionate growth[5]. He uses a stochastic approach to model the evolution of the distribution of the population in a sector with a number of control groups where:

a. Growth rates of each population group are stochastic, with a probability distribution that can be specified (usually normality is assumed).
b. The probability distribution for growth rates of population groups are independent of the size of the community.
c. and that the probability distribution is independent of the past history of population growth.

This very simple stochastic model is able to describe (and perhaps explain) the behavior of the concentration in many populations[6].

4 For example Rothblum and Winter (1985), Ijiri and Simon (1977) and the pioneering work of Hart and Prais (1956). Scherer and Ross (1990), pp 141-146, contains a good introduction to the literature on stochastic growth model.

5 Gibrat (1931).

6 See Seherer and Rose (1990), pp 141-146.

## MODELS BASED ON THE BEHAVIOR OF STOCHASTIC POPULATION MODELS

Some authors argue [7] that there is some stochastic element in the nature of human beings and in particular their behavior when making a decision. Consequently, stochastic models of population behavior are very popular in the research of consumer behavior in economic literature.

This section explains the underlying model, under the assumption of the heterogeneity of poverty, assuming that:

a. There are options that a person can have different states of poverty (food, capacities, assets, and non-vulnerable) among different groups of the population.
b. The position of being poor at birth of a person is defined stochastically in terms of a vector of probabilities of θ (t) = [Ø_ (1) (t), Ø_2 (t), ... Ø_ (n) (t )], where Ø_ (i) (t) refers to the probability that a person is in a degree of poverty at time t.[8]
c. The probability distribution vector is independent of the previous actions of the person (zero-order model).

The probability distribution of Ø (t) indicates that the person has a stochastic behavior, but the specific distribution of Ø (t) is determined by two factors: the initial conditions of individuals at birth and secondly, the cultural, social and economic conditions of their society.

The initial condition defines absolute poverty, in terms of the attributes of the individual's family and the person is determined as poor in relative terms with the options available in their community[9]. The second states that this behavior plays an important role in determining

7 See Bass (1974), Bass and Pilon (1980), Lipstein (1965), Massy (1970), and Lilien (1992), Red (1993).

8 The model assumes that each individual will suffer to the same extent from the lack or deficiency that is measured in terms of income.

9 See Lancaster (1996).

their future poverty status thus modifying its multidimensional space.[10] A person is considered successful if i can improve their conditions (income, health, education, heritage, etc.) so that ∅_ (i) (t) is greater than anywhere ∅_ (j) (t).

If individuals are heterogeneous in their conditions, and it is possible to define m different groups and each group consists of members q, the probability distribution for the condition of poverty is different between groups. Mathematically, the vector ^ q ∅ (t ) is a specific group, the new specification is ∅ ^ q (t) = [∅_1 ^ q (t), ..., ^ ∅_n q (t)]; , And q = 1, ..., m; where ∅_i ^ q (t) is the probability that a person in a condition of type q poverty will go on to type i poverty group at time t.

Then, you can define the conditional probabilities $P_{ij}$, which indicate the average probability for a person in poverty dimension j at time t. The transition probability is given as follows:

2. $$P_{ij} = \frac{\sum_{q=1}^{m} \emptyset_{jt}^{q} \emptyset_{i(t-1)}^{q} k_q}{\sum_{q=1}^{m} \emptyset_{i(t-1)}^{q} k_q}$$

$$\text{Donde } i,j = 1,2,\ldots n$$

Where i, j = 1,2, ... n

Taking into account the n conditions of poverty of the individual, in (nxn) the matrix of transition probabilities is defined.

Taking into account the transition probabilities $P_{ij}$ and supposing that they are stationary and the number of people that are found in the state of poverty known at the moment t, then it is possible to calculate the expected number of the people in state of poverty in the period t+ 1.

Where S(t) is the total number of people in society at moment t, and if S_i(t)

10 See Capozza and Van Order (1978), Schmalensee (1978), Moorthy (1988), Hauser (1988), and Shaked and Sutton (1982). The pioneer in localization models (1929). Ver Lilien (1992), Chapter 5.

Is the total number of people in the state of poverty I at moment t:

$$S_{\square}(t) = \sum_{q=1}^{m} K_q^{\square}(t)$$

3. $$S_i(t) = \sum_{q=1}^{m} \emptyset_i^q(t) K_q^{\square}$$

Where the vector describing the distribution of individuals among the different dimensions of poverty at time t which can be defined: [S_1 (t), S_2 (t), ..., S_in (t)]. The expected number of people in poverty dimension j at time t + 1 is given by the following formula, which describes a stochastic Markov process of first order for the group of people in society:

4. $$S_j(t) = \sum_{j=1}^{n} P_{ij} S_i(t)$$

Therefore, if the behavior of the family is characterized by a stochastic process of a zero order and if there is heterogeneity in the characteristics of poverty, the first Markov stochastic order process reflects the evolution of the aggregate of individuals (number of poor in dimension j) describing the behavior of the switched dimension of its origin.

In general, it is assumed that there is no entry of new people. In this case S_i (t) = S_ (t-1), and the process described in equation (4) can be expressed in terms of the total proportion of the population of society if we divide both sides of the equation by S_ (t). Thus, a first order process describes the evolution of the different dimensions of poverty.

a. People born into poverty have the behavior from their family and social group initially specified, described by equation (4).

b. The different dimensions of poverty attract new people at the same rate as those new people who are born into it. Therefore, let N (t) as the total number of new poor in period and N_j (t) is the total number of new people born in dimension j at time t. Therefore, this assumption implies:

$$5. \quad S_i(t)\frac{N_j(t)}{N(t)} = \sum_{j=1}^{n} P_{ij}\frac{S_i(t-1)}{S(t-1)}$$

The course leads to the equation (5) which simplifies the analysis and is justified because it seems reasonable to assume that births and immigration to the dimension of poverty must be correlated with the ability of that dimension for retaining people, Therefore, the dimension size (number of people in food poverty, skills or equity) is described by the following equation:

$$6. \quad S_j(t) = S_j^{Ali}(t) + N_j(t)$$

If we manipulate the equation (6) it leads to the following process describing the evolution of the size of the dimension of poverty:

$$7. \quad \frac{S_j(t)}{S(t)} = \sum_{j=1}^{n} P_{ij}\frac{S_i(t-1)}{S(t-1)}$$

This implies the following stochastic process underlying the first order which characterizes the evolution of the proportions of each dimension of poverty when people are heterogeneous and behave

according to a stochastic process of zero order, and / or new births and immigration of people which is represented by the equation:

$$8. \quad m_j(t) = \sum_{j=1}^{n} P_{ij} m_i(t-1)$$

## MARKOV STOCHASTIC PROCESSIN THE EVOLUTION OF POVERTY IN MEXICO

The use of a first order stochastic Markov process is used to explain the evolution of poverty in Mexico, and implies that the actions and efforts made in the past stochastically influence on social mobility and the present development of families, based on families that take action (search for government and private support) to improve their human capital and will succeed if the proportion of people who are in the dimension j of poverty is reduced.

Ø_j = (t): expresses the probability that a person who is located in the dimension j at time t, and $P_{ij}$: expresses the probability that the person transits from one dimension of poverty to another or exceeds the period t-1 at time t.

The following system of n equations relates the probability Ø_j over time:

$$9. \quad \emptyset_j(t) = \sum_{i=1}^{n} P_{ij} \emptyset_i(t-1)$$

$$J=1,\ldots,n$$

$$i=1,\ldots,n$$

It is possible to express this system of equations in the metrical form as

10. $$\begin{bmatrix} \emptyset_1(t) \\ \vdots \\ \emptyset_n(t) \end{bmatrix} = \begin{bmatrix} P_{11} & P_{21} & P_{31} & \cdot & \cdot & \cdot & P_{n1} \\ P_{12} & P_{22} & \ldots\ldots & \cdot & \cdot & \cdot & P_{n2} \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ P_{1n} & P_{2n} & \ldots\ldots & \cdot & \cdot & \cdot & P_{nn} \end{bmatrix} \begin{bmatrix} \emptyset_1(t-1) \\ \vdots \\ \emptyset_n(t-1) \end{bmatrix}$$

In matrix notation, the equation becomes:

11. $$\emptyset(t) = P'\emptyset(t-1)$$

Where ∅ (t) is an n-dimensional vector of state probabilities, and P is a matrix n by n of the transition probabilities P_ij. Where each dimension of poverty is mutually exclusive and gated, the following two equations hold for each period:

12. $$\sum_{j=1}^{n} \emptyset_j(t) = 1 \quad y$$

13. $$\sum_{j=1}^{n} P_{ij}(t) = 1$$
$$i=1,\ldots,n$$

The following paragraphs explain how the transition probabilities of a first order Markov process can be estimated using aggregate data showing the proportion of people in each of the different dimensions of income poverty in each period time. For a fuller explanation, see MacRae (1977), Lee (1970) and Rojas (1993).

A particular specification for the transition probabilities should be done since it is necessary to meet the following restrictions:

14. $$\sum_{j=1}^{n} P_{ij} = 1$$
$$j=1,\ldots,n$$

15. $$1 \geq P_{ij} \geq 0\,, \quad \forall$$

MacRae proposes the use of a multinomial logic formulation as suggested by Thai (1969). This formulation expresses the probability ratio as a function of an exogenous parameter[11]. Using the transition probabilities compared to the last column of the matrix P as the denominator, and since there are n columns in P, then the following relationships are formed (n-1 times):

$$16. \quad Ln\left(P_{ij}/P_{in}\right) = \beta_{ij} \qquad \begin{matrix} j=1,\ldots, n \\ i=1,\ldots, n \end{matrix}$$

The equation implies:

$$17. \quad P_{in} * exp\,\beta_{ij} = P_{ij} \qquad \forall\ 1,j \qquad j=1,\ldots, n\text{-}1$$

Adding through j = 1, ..., n

$$18. \quad P_{in} * \sum_{j=1}^{n-1} \exp(\beta_{ij}) = \sum_{j=1}^{n-1} P_{ij} \qquad i=1,\ldots, n$$

From equation (22) the following specification of the transition probabilities of the last elements of each column is obtained:

$$19. \quad P_{in} = 1/\left[1 + \sum_{j=1}^{n-1} exp(\beta_{ij})\right] \qquad i=1,\ldots, n$$

11 In this dissertation, the state assumes stationary transition probabilities. MacRae (1977) and others have suggested the use of a variation in considering non-stationary states of the transition probability. In this case the transition probabilities are assumed as dependent on a set of explanatory variables.

Finally, equation (23) and (20) gives the following specifications for the other transition probabilities:

$$20. \quad P_{in} = {exp(\beta_{ij})} \Big/ \left[1 + \sum_{j=1}^{n-1} exp(\beta_{ij})\right]$$

$$i=1,\ldots, n$$

This specification of the transition probabilities implies that the system of equations in which the process of the first order Markov stochastic can be described as:

$$21. \quad \emptyset_j(t) = \sum_{j=1}^{n} \frac{exp(\beta_{ij})}{1+\sum_{j=1}^{n-1} exp(\beta_{ij})} * \emptyset_i(t-1)$$

$$i=1,\ldots, n$$

$$j=1,\ldots, n\text{-}1$$

The equations (21) are very useful for estimation purposes. The transition probabilities are estimated indirectly, through direct parameter estimation β_ij. The specification of transition probabilities ensures its estimation so that this probability is not negative and the sum of the rows is equal to the unit. The equation system becomes a system of nonlinear equations.

## SOCIAL MOBILITY BETWEEN URBAN AND RURAL AREAS IN MEXICO

In order to study social mobility among families of Mexican urban and rural areas, two matrices of transition probabilities were estimated. The estimation uses monthly data from 1995 to 2013, which includes the four dimensions of social mobility of lower income populations in Mexico.

It is useful to discriminate the poverty analysis spatially, dividing the population living in an urban (more than 25 thousand inhabitants) and rural (less than 25,000 inhabitants) zones in order to observe the structural change that occurs in the social sector of the country.

The study was restricted to four dimensions of income poverty; it is observed that most of the elements of the diagonal are relatively

high. With values above 70 per cent and in the case of asset poverty, the likelihood of retention is higher. This information supports the claim that social mobility is very low and that the structure of poverty is not in balance.

The structure follows a path toward a stationary or immovable point (steady state condition), which is not stable and will probably never be achieved due to the forces of structural modification of both cyclical factors such as poverty. Therefore, the dimensions of poverty (tautological) are structures that are in a state of constant imbalance moving towards a long term dynamic equilibrium.

Table 1. Probability matrix of the transition of urban poverty in Mexico January 1995-December 2013

| | Alimentary | Capacity | Assets | Non vulnerable |
|---|---|---|---|---|
| Alimentary | 74.57% | 3.23% | 4.30% | 17.90% |
| Capacity | 9.54% | 76.37% | 3.50% | 10.59% |
| Assets | 6.44% | 1.78% | 90.53% | 1.25% |
| Non vulnerable | 5.61% | 1.12% | 0.26% | 93.01% |

***Source:*** Own estimation with data from CONEVAL 2013.

Table 2. Probability matrix of the transition of rural poverty in Mexico January 1995-December 2013

| | Alimentary | Capacity | Assets | Non vulnerable |
|---|---|---|---|---|
| Alimentary | 83.41% | 2.96% | 2.54% | 11.09% |
| Capacity | 6.56% | 74.37% | 6.41% | 12.66% |
| Assets | 5.53% | 6.28% | 85.99% | 2.21% |
| Non vulnerable | 8.64% | 4.45% | 0.79% | 86.13% |

***Source:*** Own estimation with data from CONEVAL 2013.

Tables 1 and 2 show that some transition probabilities outside the diagonal are close to zero, which shows a fragmentation of social mobility climbing with income and that the dimensions with higher population mass attracts more strongly the dimensions of lower mass. Poverty is higher in rural areas than in urban areas and food poverty has a high value for both matrices. However this condition has a relatively high rate of conversion that must be overcome by the official government programs.

The odds decrease, if the person is located in an urban area, but both parents have significantly higher elements on the main diagonal which indicates low social mobility.

Table 3. Indicators of poverty dynamics
Urban and rural Mexico 1995-2013

| | **Urban** | **Rural** | **% change** |
|---|---|---|---|
| **SOCIAL INDICATORS** | | | |
| Social mobility index | 10.58% | 16% | -32.2% |
| Poverty index | 54.19% | 69% | -21.6% |
| **SOCIAL DYNAMICS** | | | |
| Social centrifugal force | 19.58% | 19% | 3.3% |
| Social centripetal force | 10.58% | 16% | -32.2% |
| **POLARIZATION FACTOR** | 85% | 21% | 298.1% |
| **POVERTY DYNAMICS** | | | |
| Population entering poverty | 4.30% | 6% | -26.3% |
| Population leaving poverty | 15% | 10% | 53.0% |
| **POVERTY CONCENTRATION FACTOR** | -71% | -40% | 77.4% |

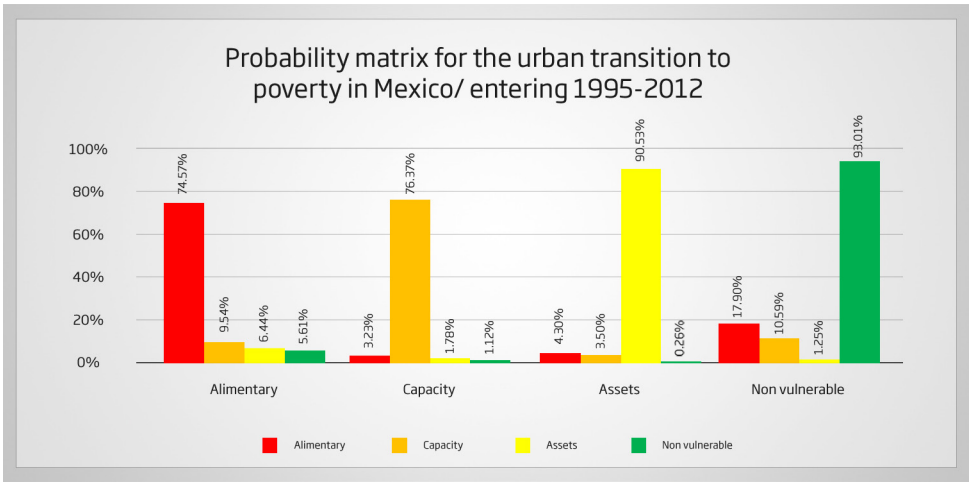
***Source:*** Own estimation with data from CONEVAL 2013.

Mobility was 32% higher in rural areas than in urban areas and income poverty was 21% more likely in rural areas. The expulsion of rural areas is 32% more likely than urban areas. There is a 26% chance of falling into poverty if you live in a rural area and 53% percent chance of overcoming income poverty if you live in an urban area.

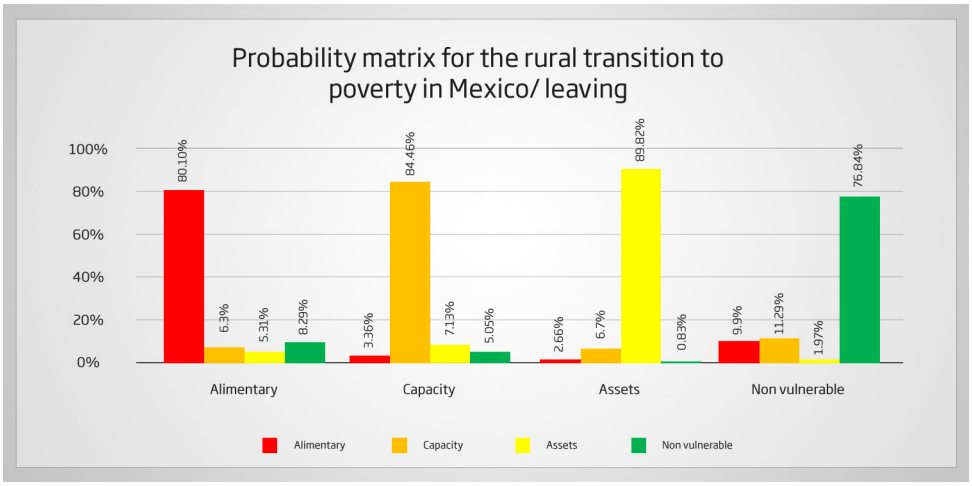
In analyzing the dynamics of poverty, we can see that there was a strong trend towards urbanization of the population where people sought more developed urban communities or locations with urban conditions, the population concentrated with a 85% chance in an urban area and during the period a family living in an urban area had a 75% chance of overcoming poverty and only a 40% chance if they lived in a rural area.

As we can see in Figure 1, social mobility is reduced and becomes stable to the extent that families migrate to urban areas, and the hypothesis that the retention capacity depends on the population mass that accounts for the size is met. The asset poverty was the dimension that attracted more families and expelled least within this period, so we can demonstrate that economic instability impacts more on income generating greater gateway to the entrance of poverty.

**Graph 1**. Probability matrix Urban and rural 1995-2012




***Source:*** Own estimation with data from CONEVAL 2013.




***Source:*** Own estimation with data from CONEVAL 2013.

## MATRIX OF LONG TERM SOCIAL TRANSITION BETWEEN URBAN ZONES

**Table 4.** Stable state of long term probability of urban poverty in Mexico 1995-2012

| State Name | State Probability | Recurrence Time |
|---|---|---|
| State 1 | 0.19 | 5.20 |
| State 2 | 0.07 | 15.34 |
| State 3 | 0.13 | 7.80 |
| State 4 | 0.61 | 1.63 |
| Expected | Cost/Return= | 0 |

***Source:*** Own estimation with data from CONEVAL 2013.

The probabilities (Table 4) long-term studies show that the chances of being vulnerable are the highest in the dimensions of social mobility with 61% and the poverty of capabilities is the one with the lowest, probability according to the recurrence over time shows that it is easier to overcome poverty and harder to stay in capability poverty because once the dimension is exceeded, the possibility of return is almost 15

months, the size of non-vulnerable shows lower recurrence where only takes 2 months to return to the dimension.

Living in an urban area has high potential for overcoming poverty in the long-term health conditions and education are covered more effectively in the area, the food poverty would be the condition which affects most to urban areas this would affect 20% of the population.

Matrix of social transition between rural long term.

**Table 4.** Stable state of long term probability of urban poverty in Mexico 1995-2012

| State Name | State Probability | Recurrence Time |
|---|---|---|
| State 1 | 0.19 | 5.20 |
| State 2 | 0.07 | 15.34 |
| State 3 | 0.13 | 7.80 |
| State 4 | 0.61 | 1.63 |
| Expected | Cost/Return= | 0 |

***Source:*** Own estimation with data from CONEVAL 2013.

The long-term probabilities show that the chances of being vulnerable are reduced for inhabitants of rural areas and the probabilities are distributed homogenously between capacity poverty and asset poverty with 14% having the greatest vulnerability, as well as a dramatic reduction of food poverty.

We can say that urban conditions are an important factor in overcoming poverty but food poverty is a common denominator that it found in both areas, which requires actions and programs that can overcome this deficiency in the long term.

## CONCLUSION

- The transition probabilities show the complexity of the social mobility of people in poverty.

- The probabilities fit the definition and design of multidimensional poverty, through a limited rationality and the incorporation of uncertain elements affecting poverty.

- The probabilities are adjusted to the complexity of the heterogeneity of the needs of the population with a stochastic and non-deterministic behavior.

- The probabilities capture the unsystematic risks of social development and changes in the macroeconomic and political environment.

- The high values of the main diagonal of the matrix of transition probabilities demonstrate the difficulty of the population in poverty, which is associated with involution of social capital, the disparity in economic growth of social groups, macroeconomic deterioration, inefficient and / or ineffective policies and actions of social actors (government, society and business).

- The near-zero off-diagonal values showed a scale pattern of social mobility, where the transition probability is reduced to the extent that it is further from its size. In other words, it is more likely to go from food poverty to capacity poverty than food poverty to not be vulnerable.

- The dimensions with the highest population mass attract more strongly than the dimensions of lower-mass population.

- One can see that the odds of being poor decreases if the person is located in an urban area, but both matrices presented low social mobility for Mexico in the period of 1995-2013.

- Social mobility was 32% higher in rural areas than in urban areas in the same period.

- Income poverty is 21% more likely in rural areas, and mobility in rural areas is 32% more likely than in an urban area.

- The population is concentrated with an 85% probability in an urban area, where a family living in an urban area had a 75% chance of overcoming poverty compared to 40% of the population living in a rural area.

- We can say that the conditions of civility represent an important factor in overcoming poverty, but food poverty is a common denominator that occurs in both areas, which requires actions and programs that can overcome this deficiency in the long term.

- The odds of falling into poverty are higher than those to overcome it, so we can conclude that the door to poverty is wider than its exit during this period.

# REVIEW OF TECHNOLOGIES FOR WASTEWATER TREATMENT WHICH CONTAIN FARMACEUTICAL CONTAMINANTS

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ABSTRAC

In the past twenty years, residues of commonly used pharmaceutical products have been found in bodies of water and have become harmful for a variety of ecosystems. These contaminating pharmaceuticals have not been considered an environmental hazard and therefore no legislation has been enacted to control them. Since wastewater treatment plants (WWTP) have not been designed to treat this class of contaminants their efficacy is low. This study focuses on the technical and economic aspects of the most appropriate existing technologies to treat pharmaceutical contaminants. A series of wastewater treatment procedures Including physical-chemical, biological, and combined advanced technologies have been analyzed. The combined wastewater treatment procedure is the most efficient but also the most expensive. The use of subsurface flow wetland turned out to be an attractive technology offering high removal percentages and being 77% more economical than the conventional wastewater treatment process.

***Keywords:*** *Pharmaceutical contaminants, wetlands, advanced, conventional and combined processes, wastewater treatment.*

Anthropogenic activities have increased in recent decades, and consequently so has the range of contaminants in wastewater such as personal care products, among others. These pollutants have been named Emerging Contaminants (EC) and Pharmaceutical and Personal Hygiene products or PPCPs. The compounds are characterized by complex chemical structures.

Within the EC are pharmaceutical residues. Although their concentrations in water bodies are relatively low, recent studies show that their presence and contact with aquatic species can cause toxicity (Table 1).

| Substance | Extremely toxic CE50 <0.1mg/l | Very toxic CE50 0.1-1 mg/l | Toxic CE50 1-10mg/l | Damaging CE50 10-100> mg/l | Nontoxic CE50>100 mg/l |
|---|---|---|---|---|---|
| Analgesics | | | D | D,E | |
| Antibiotics | A | B | | | |
| Anti-depressants | | D | | | |
| Anti-epileptics | | | C | | D,E |
| Cardiovas-cular | | D | | | |
| Cytostatics | | A | | D,E | |

***Where:*** A- microrganism; B-algae; C- cnidarians ;
D.-crustaceans; E- fish (Valdés, 2009).

Pharmaceuticals, once ingested by individuals, are metabolized and then excreted as waste to be dumped into sewers that reachwastewater treatment plants or other receiving bodies of water directly or indirectly. Santos states (2006) that this is due to the wide discharge ofwaste. Wastewater Treatment Plants (WWTP), are the main source of supply of these pollutants to the environment.

Another source is the improper disposal of medications that were prescribed and were not finished by the patient. In Mexico about 10% of drug residues are thrown into the environment.Acetaminophen is one of the drugs present in wastewater (Ayala and Fernández: 2010).

The pharmaceutical products and sub products (metabolites), such as EC, found in wastewater are not regulated by any standards, and the general effects on the environment (biota and human beings) are not yet sufficiently known since the study of their presence began in the 90´s (Henríquez: 2012).

EC´s are not persistent compounds, but the constant use and discharges to water bodieshave reached conventional WWTP´s which are not designed to remove them and make their concentration rise in the ecosystem (Henríquez: 2012). There are fewer studies regarding drinking water but nevertheless there is the possibility of the presence of EC´s.

Therefore, the presence of pharmaceutically active compounds has been an issue of growing concern (for the possible bioaccumulation in biota) and attention during the past 20 years (since they were discovered in soil, sewage, surface and drinking water). While nature has a capacity of biodegradability, it also should be considered that the increase of these discharges of EC makes this natural process more difficult.

## ECOLOGICAL IMPACTS PHARMACEUTICAL CONTAMINANTS

Adverse drug effects of pollutants on aquatic and human life have been reported in several investigations. It was found that the veterinary use (applied to livestock) of diclofenac has led to a significant decline (95%) in the vulture population in certain areas of the Indian subcontinent. It has also been seen as a potential risk to other scavengers (Oaks and Meteyer: 2012). The mechanism of death is probably renal failure, a known side effect of diclofenac. Vultures the remains of domestic pets treated by a veterinarian with diclofenac, and are poisoned due to the

accumulated chemical compound (Meteyer, et al .: 2005). Another effect of diclofenac is that it affects the tissues of gills and kidneys of freshwater fish, causing a potential risk to these populations (Hoeger et al .: 2005).

There is evidence that these pollutants have impacts such as mortality, errors in molting, hatching, anatomical deformities, sub lethal changes in plant growth, changes in the sex ratio of higher organisms, changes in biogeochemical cycle, the transmission of antibiotic resistant genes, microbial communities damaged by disinfectants, variation in life cycles, trophic relationships by anesthetics, reduced fertility, change in sexual condition and the hormone-reproductive toxic effects of cytostatic drugs (Stuart et al .: 2012).

Table 2 shows the physicochemical properties of diclofenac. We can see that there are reports that indicate the risk of bioaccumulation and toxicity (Tables 2 and 3).

**Table 2** Physicochemical properties of diclofenac

| **PROPERTIES** | |
|---|---|
| Henry constant | 4.73x10-12 (atm·m3/mol) |
| Water solubility | 2.43 (g/L) |
| Vapor pressure | 6.14x10-8 (mmHg) |
| Log coefficient of the absorption of organic carbon | 830 (-) |
| Log coefficient of the octane-water partition | 4.51 (-) |
| Acid disassociation constant | 4.15 (-) |
| Persistence, bioaccumulation, and toxicity | 7 (-) |
| Bio concentration factor | 3 (-) |

***Source:*** Lobo et al., (2012);

Table 3 lists the species of organisms that have shown reactions of acute and chronic toxicity. You can see the damage depending on the species, which may occur in minutes, hours or days.

**Table 3** Concentrations of diclofenac at which acute and chronic toxicity occurs

| Organism | Parameter | Concentration of diclofenac (µg/L) |
|---|---|---|
| **Acute toxicity** | | |
| **V. fisheri 30 min** | EC50 | 11.454 |
| D. magna 48 h | EC50 | 224.30 |
| C. dubia 48 h | EC50 | 22.704 |
| **Chronic toxicity** | | |
| P. subcapitata 96 h | ACWE | 10 |
| | MCOE | 20000 |
| B. calyciflorus 48 h | ACWE | 25 |
| | MCOE | 12500 |
| C. cubia 7 d | ACWE | 1000 |
| | MCOE | 2000 |
| D. rerio (ELS) 10 d | ACWE | 4000 |
| | | 8000 |

ACWE: Anticipated Concentrations without effect,
MCOE: Minimum concentration with observed effect,
EC50Concentration that causes 50% of the effect.
Source: Ferrari et al., (2003).

The toxicity values reported indicate that a small dose produces adverse effects on living organisms, therefore it is important that water discharges made into the environment have a control on the concentration of diclofenac.

## TECHNOLOGIES FOR THE REMOVAL OF PHARMACEUTICAL CONTAMINANTS

WWTP treatments for the removal of pollutants in general can be classified into physical, chemical, biological, and advanced and

combinedtechnologies. The following is a summary of the different technologies that are currently operating.

It should be noted that to date that there are no WWTP´s that remove specific CE

## Physicochemical technologies

The physiochemical technologies include activated carbon adsorption, oxidation processes (ozone and hydrogen peroxide), coagulation/ flotation, and chlorination. The processes by means of activated carbon and membranes have proven to be more efficient.

In a study conducted at the laboratory level using diverse treatments (coagulation / flotation, lime softening, ozonation, chlorination and granular activated carbon adsorption) the removal of thirty different pharmaceutical compounds were analyzed, without obtaining a significant removal (<20%) with the processes of coagulation/ flotationnor lime softening, but with a good result with granular activated carbon and ozone oxidation and chlorination (> 90%) (Westerhoff et al., 2005). These results are consistent with Adams et al. (2002), where pharmaceutical compounds (carbadox, **sulfadimethoxine**, trimethoprim) were not removed using coagulants such as aluminum sulfate and ferric sulfate. Similarly in other studies, coagulation was not effective for removing diclofenac, carbamazepine, ibuprofen and ketoprofen (Petrovic et al, 2003;.Vieno et al, 2006.).

A Photo-Fenton and Sono-Fenton heterogeneous system was used for removing a set of eight drugs of various kinds which commonly appear in the effluent treatment plant. These techniques involve the combined application of UV-visible radiation or ultrasound with H2O2 and a heterogeneous iron catalyst supported on a mesoporous silica, type SBA-15. The use of heterogeneous catalysts involves a number of advantages, most notably its easy recovery by filtration and reduced contamination of the reaction medium by the dissolution of iron. The tests were carried out on two different aqueous matrices, dissolving therein a certain concentration of the selected drug (10 mg / L), being

able to assess the influence of the matrix on its degradation. A set of experiments were made on a matrix of Milli-Q ultrapure water to evaluate the influence of different modes of reaction (H2O2, catalyst and light or ultrasound) on degradation, as well as other assays with increasing concentrations of hydrogen peroxide to assess the degree of degradation experienced by the pharmaceuticalsthat were being studied according to the amount of the oxidizing agent.

As for the results obtained from the experiments, it was observed how both advanced oxidation techniques have a high efficiency to degrade the pollutants that were studied. The Sono-Fenton system showed a low utilization of hydrogen peroxide at high concentrations and low effectiveness of degradation when the initial concentration of oxidant is reduced, while the Photo-Fenton system demonstrated a high efficiency for any initial concentration of oxidant, as well as a majority consumption of the same substance. For this reason, this technique seems to be more favorable for this type of testing.

The optimum concentration of $H_2O_2$ is considered to be 450 mg/L when applied with Photo-Fenton and 100 mg / L when applied with Sono-Fenton, thereby the Photo-Fenton system remains the most effective in the degradation of pharmaceuticals. The results showed a relationship between matrix effect and degradation in photo-Fenton systems, while in Sono-Fenton systems there does not seem to exist a matrix effect to be considered. Furthermore, it has been found that simple oxidation systems (such as ultrasound sonication without a catalyst or H2O2) provide a very significant degradation of thetreated pollutants compared to the Sono-Fenton system, whereas the Photo-Fenton system the efficiency of the degradation is much greater if this technique is applied and not simpler systems, such as the exclusive application of UV-visible radiation or combinations of UV radiation, UV radiation or catalyst and hydrogen peroxide (Manzano 2008).

## Biological technologies

Conventional treatments such as activated sludge systems or biological trickling filters can quickly convert various organic compounds

into biomass that can then be separated by means of clarifiers. In a wastewater treatment plant in Switzerland, compounds such as diclofenac, naproxen and carbamazepine werefound, with a removal efficiency of 69%, 45% and 7% respectively (Tixier et al., 2003).

Another biological technology is wetlands. The aquatic plantTyphaangustifoliahas been used to remove pharmaceutical compounds: carbamazepine (from 26.7 to 28.4%, it turns out to be the more recalcitrant drug), ibuprofen (80%), naproxen (91%), fenopren (25%) and cyclophosphamide (82.2%) with a residence time of 2 to 4 days. An important role of this plant is that the oxidation occurs in the rhizosphere and aeration (Qing et al .: 2011).

Wetlands can promote the elimination of pharmaceuticals through several mechanisms including: photolysis, absorption by plants, microbial degradation and soil adsorption. There are few studies on the rate of removal / disposal of drugs by wetlands. This has generated the need for research to document the extent to which various pharmaceutical compounds are eliminated in large-scale treatment (White et al .: 2006).

## Advanced technologies

In recent years, technologies have been studied as reverse osmosis, ultrafiltration, Nano filtration and advanced oxidation processes; such systems are considered as the most suitable to remove traceconcentrationsof pharmaceutical contaminants.

On the other hand, Advanced Oxidation Processes (AOP) and hydrogen peroxide ozone ($O_3$ / $H_2O_2$) have been used for treating ibuprofen and diclofenac, where the removal of 90% of these compounds was achieved (Zwiener et al .: 2000) .

The Advanced Oxidation Processes (AOPs) are technologies that are based on the in situ generation of highly reactive transient species($H_2O_2$, •OH, $O_2$•-, $O_3$) for he mineralization of refractory organic compounds and the elimination of pathogens (Chong et al.,

2010). The AOP´s have been widely studied, being heterogeneous photo catalysis with semiconductors such as TiO2 and the Fenton reaction (transition metal plus hydrogen peroxide), the two techniques with the greatest environmental applications reported in the last two decades. Using a laboratory scale reactor, the efficiency of a treatment with ozone degradation of nonylphenol ($NPE_0s$) metabolites was evaluated, where acetic acid nonylphenol ($NPE_1C$) was completely mineralized, nonylphenol (NP) at 80% and 50% of lipophilic ethoxylated nonylphenol (NP1EO) in 6 minutes of treatment in all of the cases (Ike et al .: 2003).

Employing technology using a membrane bio reactor (MBR), the removal of various drugs were evaluated including a wide range of pharmaceutical compounds, psychiatric drugs, antibiotics, macrolides, anti-inflammatories, etc.

MBR technology combines the biological degradation of contaminants in a physical separation of the treated water by a filtration membrane incorporated in the bioreactor. If the MBR system is coupled to a subsequent filtration system by reverse osmosis (RO) a greater filtration of the effluent is achieved by the smaller pore size of the RO.

Combining MBR and RO treatment has permitted the removal of more than 99% of pharmaceuticals (Liberti: 1999). This elevated contaminant removal contrasts with conventional purification technologies used in a more widespread way to treat urban wastewater, such as the secondary or biological treatment using activated sludge system in which the elimination of drugs is incomplete..

The conventional sol-gel process is based on the formation of oxo-bridges (molecular arranged) by hydrolysis and the poly condensation of the molecular precursor (usually silicon or metal alkoxides) has been successful in the preparation and understanding of oxide and mixed oxide catalytic materials. An important advantage of the sol-gel process is its versatility, which enables control of the composition, morphology, texture, and structure of the final materials by adjusting

the relative rates of hydrolysis and condensation reactions (Debecker .: et al 2013).

## Combined technologies

Several investigations have been reported that include the combination of oxidation processes with biological processes, highlighting their great potential to the problem of treating contaminated water with PPCPs or EC. These can be difficult to remove by conventional processes. They may be physical-chemical / biological, and with the advantage of reusing this water and contributing to caring for the environment. (Gogate and Pandit, 2004; Mantzavinos and Psillakis, 2004).

For the treatment of penicillin, ozonation and perozonation($O_3$ + $H_2O_2$)has been implemented at different concentrations, before submitting the effluent with a biological activated sludge treatment. The result of this investigation was the removal of 83% of the non-biodegradable chemical oxygen demand (COD) (Arslan et al .: 2004). Similarly, a satisfactory treatment of estrogenic substances was achieved in a combined process of ozonation and moving bed reactor after being subjected to a conventional activated sludge treatment (Gunnarsson et al .: 2009). For treatment of common precursor pharmaceutical such as α-methylphenylglycine, a photo-Fenton process was used with H2O2 added as a pre-treatment in an immobilized biomass reactor (IBR), achieving the removal of up to 95% of total organic carbon (TOC ) of which 33% corresponded to the advanced oxidation system and 62% for biological treatment. In this combined system the removal of nalidixic acid (belonging to the group of quinolones) was also studied, succeeding in removing it in only 190 minutes (Sirtori et al .: 2009).

Finally, constructed wetlands and vegetative plants are noted since they are the foundation of the process since they degrade, absorb and assimilate contaminants in their tissues. They also provide a large surface area which favors bacterial growth and retain solids in suspension (Estrada: 2010). A combination of methods of treatment is recommended for wastewater containing pharmaceuticals.

## Costs of different technologies for removing pharmaceutical contaminants

The costs for wastewater treatment are presented in Table 4. It is important to note that the costs presented correspond to the cost of treatment and are averages obtained from the application of each technology, its value is only an approximation at current prices, as many of these costs depend on the manufacturer, the location and characteristics water to be treated.

Table 4 Approximate costs and average pharmaceutical contaminant removal for different technologies.

| Type of technology | Cost (USD/m3) | Cost (MXN/m3) | Average cost (USD/m3) |
|---|---|---|---|
| **Physiochemical treatments** | | | |
| Ozone | 0.04400 | 0.5663 | 0.04020 |
| Peroxide | 0.04500 | 0.5792 | |
| Chlorination | 0.04120 | 0.5302 | |
| Absorption with activated carbon | 0.05300 | 0.6821 | |
| Ultraviolet light/ ozone | 0.04300 | 0.5534 | |
| **Biological treatments** | | | |
| Activated sludge or biological filters | 0.03700 | 0.4762 | 0.03667 |
| Wetlands | 0.03200 | 0.4118 | |
| Biological filters | 0.04100 | 0.5277 | |
| **Advanced treatments** | | | |

| | | | |
|---|---|---|---|
| Reverse osmosis | 0.15000 | 1.93050 | 0.26100 |
| Ultrafiltration | 0.42000 | 5.40540 | |
| Nano filtration | 0.45000 | 5.79150 | |
| Advanced oxidation | 0.14000 | 1.80180 | |
| Membrane bioreactor | 0.14500 | 1.86615 | |
| **Combined technologies** | | | |
| Physiochemical/ biological | 0.16 | 2.0592 | 0.1600 |

***Source:*** IEPS, 2007. ***Source:*** Liberti and Notanicola, (1999) Thecurrentvalue of the U.S. DollarwithrespecttotheMexican Peso is 12.932 ( as of 10/27/13)

Moreover, the Environmental Protection Agency, EPA, reported that:

> The main items included in the investment costs of the SF wetlands are similar to many of the systems required for lagoons. These include the cost of land, site assessment, site clearing, earthwork, coating, medium gravel, plants, intake and discharge structures, fences, miscellaneous piping, engineering, legal costs, contingencies, overhead and profits of the contractor, (EPA, 2000).

Costs are summarized in Table 5:

**Table 5.** Comparison of costs of a subsurface flow wetland system and a conventional wastewater treatment

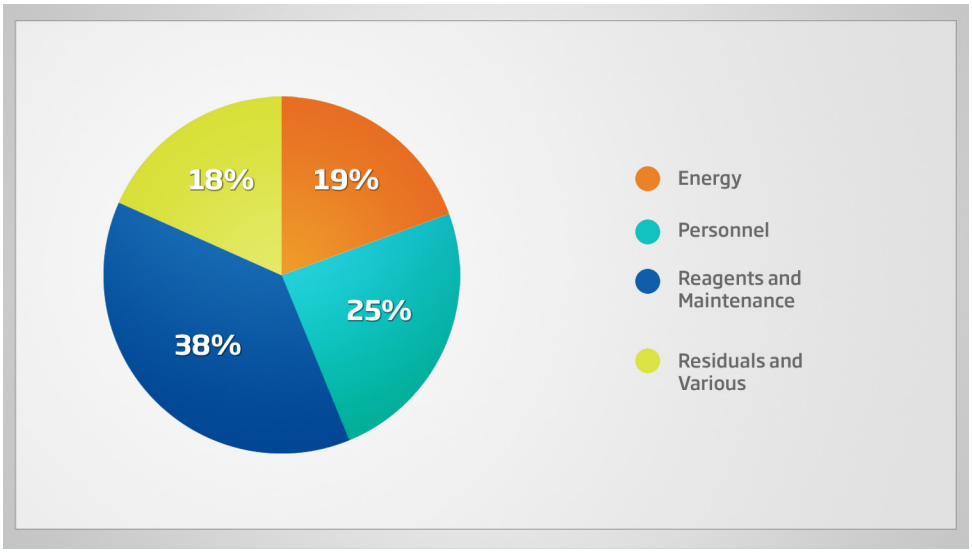
| **Cost element** | **Wetland process** | **Conventional process: reactor sequenced by batches, SBR** | **% more economical, wetland** |
|---|---|---|---|
| | **(value of the cost in dollars)** | | |
| Investment cost | $ 6,278.05 | $ 14,857.74 | 58 |
| O/M cost | $ 80,712.00 | $ 1,433,983.20 | 77 |

| | | | |
|---|---|---|---|
| Total cost to PV | $ 7,133,595.60 | $ 30,043,696.80 | 77 |
| Cost of 378,000L of treated water | $ 9.82 | $ 41.17 | 77 |

*The PV factor (Present value) is 10.594 with a base of a period of 20 years and 7 percent interest ( costs from June 1999 with an ENR construction index = 6039)
** The daily intake for 365 days per year for 20 years, divided by 1000 gallons.
Source: EPA 832-F-00-023
Environmental Protection Agency Washington, D.C. September 2000

**Figure 1** refers to the costs reported for different treatments, which have been grouped into four categories: energy, personnel, reagents-maintenance and residuals-various. The weighted average was obtained from 43 plants under study in order to obtain an economic feasibility study in this area.

**Figure 1.** Distribution of the major costs in technologies for wastewater treatment




Figures 2, 3 and 4 were made from the data in Table 3, considering an average in terms of cost according to the method to be carried out.

The mixture of pharmaceuticals prevents that a single technology in treatment is sufficient to eliminate all of the compounds. The same figures represent the values in terms of costs for treatment, making comparison between different alternatives of the same method.

**Figure 2.** Comparison ofwater treatment costs with physiochemical technologies.

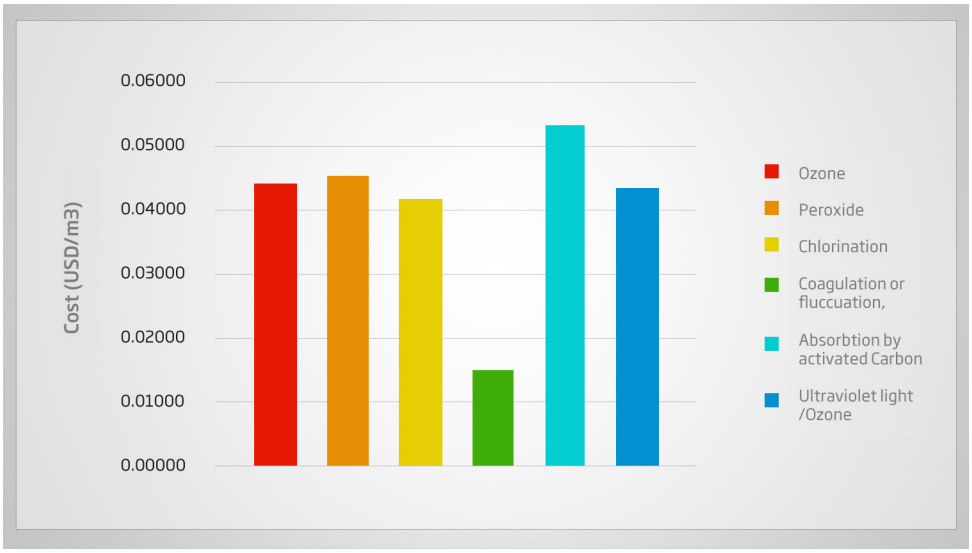



**Figure 3.** Comparisonof water treatment costs with biological technologies

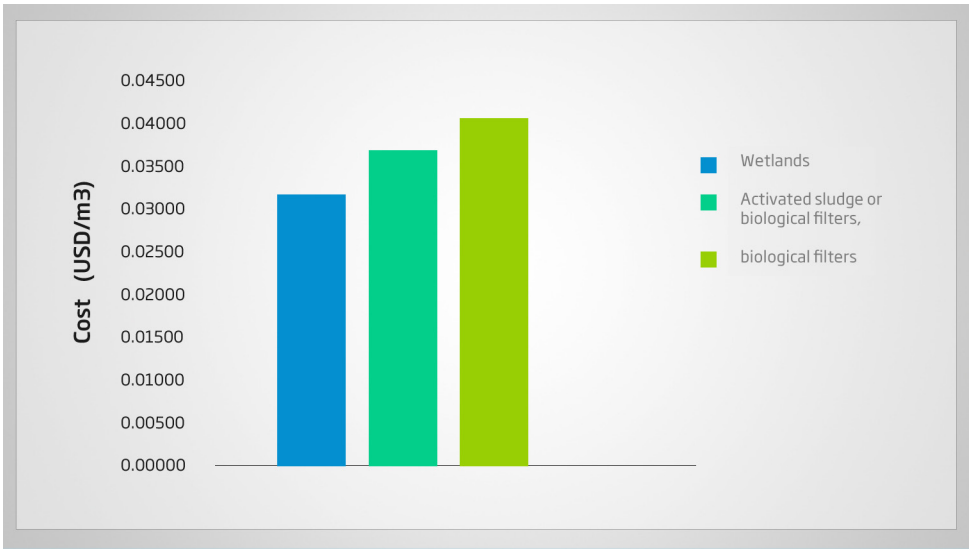
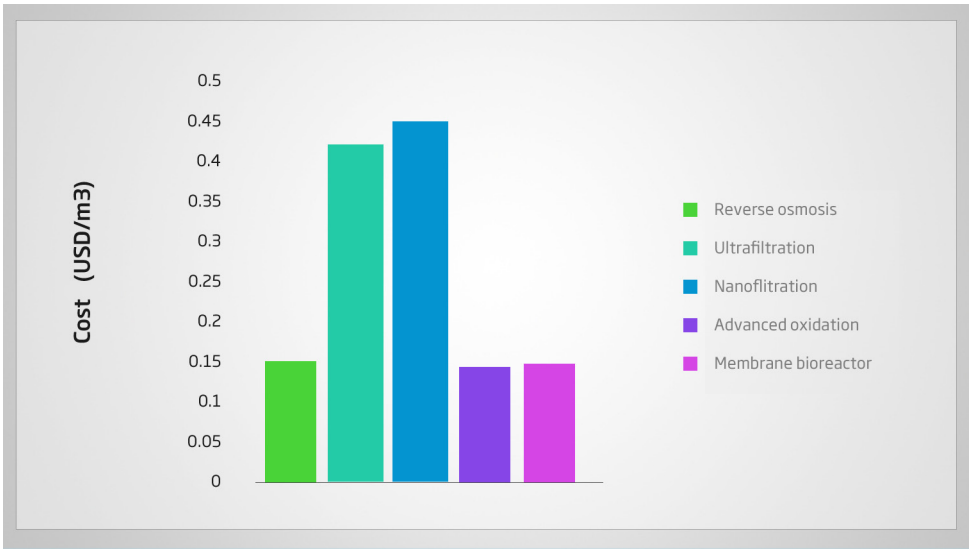


**Figure 4.** Comparison of water treatment costs with advanced technologies




At present, pharmaceutical contaminants that are found in residual water have diversified.In order to be eliminated it is necessary to apply chemical, physical-chemical, and biological methods. In most cases only one type of technology is not sufficient, rather a treatment including various methods and combined technologies is required. It is recommended to consider that the best strategy of combined methods, "natural methods". A comparison of treatment costs of different technologies is shown in **Figure 5.**

**Figure 5.** Comparison of treatment costs with distinct types of technologies.

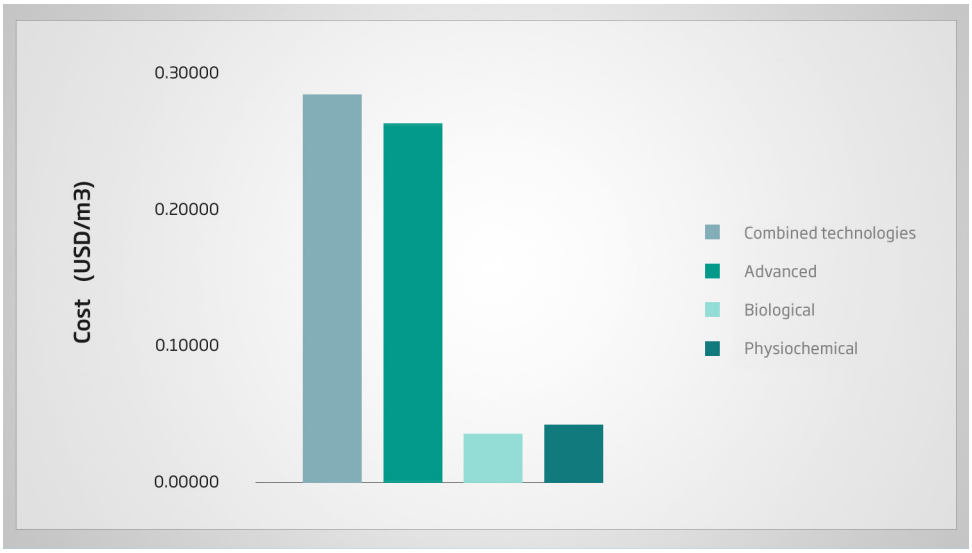


Table 6 presents information related to investment costs, operation and maintenance of plants.This information was supplemented by budgetary costs of final design, so the values shown are approximations of what might occur today. To obtain the information related to investment costs for building plants, several regressions were performed to establish the curve to estimate the investment based on the design capacity of the plant where wastewater flows of 600 -800 l/swere considered.

**Table 6.** Costs and approximate average investment of various technologies for removing pharmaceutical contaminants

| Type of technology | Aprox. costs (USD/m3) | Aprox. costs (MXN/m3) | Average costs (USD/m3) |
|---|---|---|---|
| Physiochemical treatments | | | |
| Ozone | $420,000.00 | $5,405,400.00 | $373,333.33 |
| Peroxide | $420,000.00 | $5,405,400.00 | |
| Chlorination | $350,000.00 | $4,504,500.00 | |
| Coagulation or flocculation | $300,000.00 | $3,861,000.00 | |
| Absorption by activated carbon | $350,000.00 | $4,504,500.00 | |
| Ultraviolet light/ ozone | $400,000.00 | $5,148,000.00 | |
| Biological treatments | | | |
| Activated sludge or biological filters | $170,000.00 | $2,187,900.00 | $90,000.00 |
| Wetlands | $60,000.00 | $772,200.00 | |
| Biological filters | $40,000.00 | $514,800.00 | |
| Advanced treatments | | | |

| | | | |
|---|---|---|---|
| Inverse Osmosis | $100,000.00 | $1,287,000.00 | $230,000.00 |
| Ultrafiltration | $250,000.00 | $3,217,500.00 | |
| Nano filtration | $200,000.00 | $2,574,000.00 | |
| Advanced oxidation | $350,000.00 | $4,504,500.00 | |
| Membrane bioreactor | $250,000.00 | $3,217,500.00 | |
| Combined treatments | | | |
| Physiochemical/ biological | $500,000.00 | $6,435,000.00 | $500,000.00 |

***Source:*** IPES, 2008. The current value of the American Dollar with respect to the Mexican Peso( as of 10/28/13)

## CONCLUSIONS

The physicochemical processes of chlorination, oxidation by ozone and granular activated carbon have removed over 90% of thirty different pharmaceutical contaminants while with technologies such as coagulation / flotation and lime softening, removal is much lower.

The Photo-Fenton and Sono-Fenton heterogeneoussystemspresent high efficiency to degrade the pollutants that were studied, however the Photo-Fenton process is the most effective in the degradation of pharmaceuticals.

The biological treatment through wetlands was a good alternative for the treatment of pharmaceuticals like carbamazepine, ibuprofen, naproxen, and cyclophosphamide, with fenopren removal percentages of 28.4%, 80%, 91, 25% and 82.2% respectively.

As far as advanced technologies, the POA with ozone and hydrogen peroxide was able to eliminate 90% of ibuprofen and Diclofenac, while the POA with only O3 managed to mineralize nonylphenol acetic acid-nonylphenol by 80% and 50% in lipophilic ethoxylated nonylphenol, all within 6 minutes of treatment.

The combination of the MBR and RO allowed for the treatment of up to 99% of a broad spectra of pharmaceuticals.

The use of combined technologies demonstrated a 83% removal of non-biodegradable COD penicillin. Implementing ozonation and perozonation, there was a 95% TOC removal to treat α-methylphenylglycine with a Photo-Fentonsystem adding $H_2O_2$ as a pretreatment to an immobilized biomass reactor, and the same process resulted in the total removal of nalidixic acid.

Comparing the costs of a subsurface flow wetland system and a conventional wastewater treatment facility, the wetland resulted being 77% more economical technology than the conventional system.

In summarizing the different types of technologies that were addressed for wastewater treatment that includes pharmaceutical contaminants, it was found that the physicochemical process by coagulation or flocculation, biological treatment with wetlands and the advanced technology of advanced oxidation are the most economic processes. However, it is recommended to evaluate the use of new, more efficient and inexpensive technologies

The combined treatment processes are the most efficient for the removal of pharmaceutical contaminants, but these have higher treatment costs.

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# THE UNIVERSITY PROFESSOR AND HER ROLE AS A TEACHER

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ABSTRAC

The work of professors is key to developing a new model of education. The professor is responsible for initiating the educational function that introduces and shapes the student in the technical discipline that they are studying, as well as in their training to function prepare the student to properly develop as a professional and as a person. Thus professor orientation should enhance student learning, conduct close monitoring of the evolution of their skills and knowledge and correct, if necessary, any deviations. Training plans must be developed to go deeper into the treatment of skills, in the students assessment, in techniques and systems that promote lifelong learning , and to among students the ability to work in teams and, synthetically , to offer training programs whose main purpose is not to convey a repertoire of knowledge but find the system for tutoring the learning experiences of students.

***Keywords:*** *University professor, EHEA, teaching role.*

The university professor is a professional whose job is to achieve the goals set by the university in order to meet the demands of society that are given to it. A professor must be a reflective, critical, and competent professional in the field of their discipline, trained for teaching and for research (Benedito, 1992). While historically the teacher's role has been to act as custodian and transmitter of knowledge, today we can say that role has changed. The mission today is to provide the student access to knowledge and helping at the same time to develop their capacity for understanding and reflection and encouraging them the skills and abilities which will together provide them a position in the labor market.

## ROLES OF A UNIVERSITY PROFESSOR

### Traditional functions: teaching, research and administration

The main functions of a university professor include (Benedito, 1992: 80):

a. Study and research
b. Teaching and organization and the improvement of both
c. Communication on their research
d. Innovation and communication of educational innovations
e. Mentoring and student assessment
f. The responsible participation in the selection of other teachers
g. Evaluation of teaching and research
h. Participation in academic administration
i. The establishment of exterior relations regarding, culture, etc.
j. Promoting interdepartmental and inter-university relations and exchange.

All of these functions can be grouped into three functions that have traditionally been attributed to the university professor, which are teaching, research and administration. Thus, according to Marcelo (1992: 6):

> First, the university teacher is a person who is professionally engaged in teaching (...) Secondly, he is a specialist at the highest level of science,

> which involves the ability and habits that enable researchers to approach and enlarge the frontiers of their branch of knowledge. Thirdly, he is a member of an academic community, which means accepting and shaping behavior to a specific set of norms, values and attitudes (...).

However, the weight and importance of each assumption is not equal because, depending on the collective role one would have greater importance than the other. For students the university teacher is a mere transmitter of knowledge, ignoring the other two functions. For teaching staff, the research mission and the teacher are inseparable and interdependent and therefore are given the most effort and time.

Administration must be added to these two important tasks. Active participation in the various university organizations is part of the basic work to do in order to adequately fulfill their functions as a professor. All professors to greater or lesser extent are involved in the operation of their center, department, area of knowledge or other part of the University, assisting in fulfilling the respective objectives. The need for teachers to take on these tasks is clear and its impact on the work of teaching and research is also apparent. However, administrative tasks are understood in many cases to be a burden on the teacher, and there is less time for the development of the aforementioned functions , forgetting the importance of these administrative tasks have for the positive functioning of the university.

## QUALITIES, SKILLS AND CHARACTERISTICS REQUIRED OF A UNIVERSITY PROFESSOR FOR THE PERFORMANCE OF THEIR DUTIES

According to De la Cruz (1994) in order to perform their functions, the professor must possess the following qualities:

- *Appropriate training*. They must have the necessary and sufficient knowledge to address the teaching of the discipline with guarantees and responsibility.
- *Creativity*. Teaching is a creative act of answers and motivation for the student. That is why the teacher must be able to

generate interest in the discipline, have a desire to learn and have a personal, independent critical consciousness.

- *Certain personality traits* (patience, tolerance, flexibility, sense of humor, availability, flexibility, authority, fairness) and certain personal skills (interpersonal skills, ease of communication, stress management).
- *Pedagogical Aptitude*, such as proper planning to impart knowledge, simplicity, enthusiasm for the subject and encouragement of student learning, organizational capacity and management of situations and learning resources, stimulation of the students interest,. ..
- *Awareness of social responsibility*. People engaged in educational tasks cannot escape questions about the means and ends of their work, giving their activity a sense of ethics. They must be aware that they are guides and that the course of their work transmits, perhaps unconsciously, a set of values, attitudes and behaviors.
- *A vocation for teaching*.

Gairín (2003) identifies five types of knowledge that must be mastered by college professors to successfully perform their duties:

a. Specialized scientific knowledge, linked with the corresponding field or area.
b. Cultural knowledge, related to the given topic and in general with the world of culture.
c. Psychopedagogic knowledge linked to the processes of teaching and learning, curriculum development (programming and evaluation, among others), and institutional organization.
d. Knowledge about teaching related to the teaching experience, professional socialization, communication skills, methodological resources, and tools for reflection on practice.
e. Personal knowledge about himself.

Regarding the characteristics of the university professor, the teacher's attitude and aptitude are key to the formation process in order to reach targeted objectives. Therefore, knowledge of the subject by the teacher is a necessary but insufficient condition. The attitude of the

teacher in relation to their role towards students and their teaching skills will affect final results. A positive attitude towards students is characterized by knowing their profile and interests, to value them and to be convinced of the influence that is exerted on them. Pedagogical skills are other critical elements: the teacher must master both movements such as their voice, as well as teaching means and methods.(Pedraja: 2001).

Additionally, there are a number of characteristics that affect whether the teacher's task is more or less excellent. As indicated by Lang (1986) the characteristics that determine success in teaching and are extensible to any university professor are:

a. Enthusiasm and conviction for the practice of teaching.
b. Mastery of the subject to be taught.
c. Use of teaching methods appropriate to the type of students and specific subject matter.
d. Highly-skilled in the use of oral and written communication.
e. Wide and positive relationship with students which in any case is useful to maintain effective control over their progress and behavior.
f. Maintain ongoing professional development through study, participation in research projects, membership in professional associations, etc.

It is difficult to say which of the analyzed characteristics play a more important role, and surely it is crucial to achieve proper consistency between all of them. Lumsden (1974) obtained the features of professors which are most relevant to students: the clarity of their presentation, and enthusiasm and respect for student opinion. Meanwhile, Carmona and Carrasco (1998) obtained as most appreciated by the students qualities such as clarity of expositions, the ability to combine theory and practice, dedication, knowledge and amenity. Finally, Meshing and Perez (1995) obtained as most the valued aspects of a university professor: the daily planning of their classes, methodology, clear and precise expression, student motivation with the subject matter, and general knowledge of the teacher's especially practical knowledge.

Among the least appreciated aspects appeared personal characteristics and the professional status of the teacher.

## THE NEW ROLE OF THE UNIVERSITY PROFESSOR

The functions that the teacher performs are dynamic and must adapt to changes in the system. Today, society is demanding a new role for teachers (Luzon et al., 2009). In the words of Arbizu (1994, p. 96), "one can speak of an assigned role (assumed by tradition) and a respondent role (the new role that is asked of a professional). The college professor has a role which traditionally has been assigned, but today society demands a number of new roles that will shape the new role of teacher."

The teacher, in the words of García-Valcárcel (2001) thus ceases to be the sole or primary source of information to become:

a. A specialist in the diagnosis and prescription of learning.
b. A specialist in learning resources.
c. Facilitator of learning in the community.
d. A specialist in the interdisciplinary convergence of knowledge.
e. A classifier of values.
f. A promoter of human relationships.
g. A professional counselor

Therefore, the change of current legislation and adaptation to the European Higher Education Area (EHEA) suggests that the tendency of the work that is done by a university professor should focus on encouraging students to "learn to learn" (Arias Gundín et al, 2008;.Díez et al, 2010;.Díez et al, 2009).. To achieve this goal, a previous acquisition of certain skills by the teacher which can be improved through teacher training is required. In fact, most if not all universities already have university staff training programs. For example, there is the case of of the University of Valencia which has a beginner course for university teaching and other techniques such as voice, classroom teaching, etc. There is also specific training offered for teaching groups of innovative teachers and courses focusing on

the aspects related to the EHEA. All of these are given through the Servei de Formació Permanent.

It is interesting to consider the following proposed initiatives with regard to teacher training made by the Ministry of Education and Science (MEC: 2006):

- Conventional training programs.
- Online courses on teaching.
- Mentoring programs for novices.
- Training on specific methodologies.
- Visits to leading centers.
- Visits by professors from other relevant universities.
- Research on teaching methodologies.

It is also interesting that the teacher adopts an orientation to the market. In this manner, previous investigations (Flavian and Lozano: 2002) apply the concept of market orientation to teachers of Spanish Public Universities and it is observed as to how there is a greater willingness of teachers to understand the needs of students, to collaborate with other teachers in the same or in other colleges, and have interest in alternative training and research which implies greater market orientation activities with the collection and dissemination of information on the needs of students and the designing of effective responses based on those needs. Fenollar et al. (2008) concludes that one can identify positive effects on academic performance of the direction of learning and self-efficacy that is perceived by students and suggests the need for the teacher to enhance the direction of student learning. To do so, he advises teachers to undertake close monitoring of the evolution of the skills and knowledge of their students, correcting if necessary possible deviations and encourage students in their ability to confront subjects in the area.

However, it is important to note that despite the importance of the implementation of the new educational model, there are several causes that hinder the change of teaching methodologies. Among them include:

- The low recognition of teaching versus research.
- The concentration of the efforts of teachers in the transmission of content.
- The low pedagogic and didactic teacher preparation derived from the absence of a strong system of initial and ongoing training of university teachers.
- Teacher resistance to change of methodology.
- Lack of information and awareness of teachers about the change of educational culture which involves the EHEA.
- Lack of tradition of cooperation in education.
- The need to manage new teaching planning techniques.
- The lack of universally accepted models for assessing generic skills.
- The size of the groups, which is still excessive in some degrees.
- The difficulty of engaging students in their own learning processes.
- The inadequacy of administrative processes in moving towards a diversified model, which greatly increases the work of academic planning and management.

## Characteristics of university professors from the student's perspective

Some authors have analyzed the opinion of students and have found that the teacher's performance is regarded as a fundamental aspect that explains their degree of satisfaction with the education they received at the University (Rodríguez et al .: 1995).

Table 1 shows some of the most relevant findings of the major studies that analyze the characteristics of university teaching from the perspective of students.

**Table 1.** Characteristics of university professors according to students

Wotruba and Wright (1975)  Marsch (1987)

| **Wotruba y Wright (1975)** | **Marsch (1987)** |
|---|---|
| • Favorable attitudes toward students<br>• Mastery of subject matter<br>• Communication skills<br>• Encourages students to think for themselves<br>• Impartiality in exams and grades<br>• Enthusiasm for their subject<br>• Good organization of the program and course<br>• Good speaking skills<br>• Enjoyment of experimentation, flexibility | • Interest and relevance of content<br>• Teaching load and appropriate learning<br>• Organization of content<br>• Clear explanation<br>• Enthusiasm<br>• Openness<br>• Empathy<br>• Appropriate course demands |
| **Castonguay-Leblanch and Couturier-Leblanc (1989)** | **Belando (1999)** |
| • Knowledge of the subject<br>• Availability<br>• Fair evaluation<br>• Union between theory and practice<br>• A like for teaching<br>• Methodical and structured<br>• Respectful of students<br>• Clarity of presentations<br>• Promotes intellectual development of students<br>• Interesting presentation of the subject<br>• At ease with speaking<br>• Skilled in human relations<br>• Personal and original thinking<br>• A sense of humor | • Emotional stability and self-confidence<br>• Ability to adapt to different situations<br>• Creative thinking<br>• Commitment that students learn how to learn<br>• Sufficient pedagogical and scientific training in their specialty<br>• Good knowledge of methodology, resources and techniques necessary for optimal job performance<br>• Ability to diagnose and provide critical appraisal<br>• Capacity for dialogue and teamwork |

***Source:*** Garrido (2003).

In the field of business studies, Meshing and Perez (1995) conducted an investigation in order to know what the ideal teacher was from the point of view of their students. Table 2 shows the main results.

**Table 2.** Features of the ideal teacher from the business studies students perspective

| ASPECT THAT WAS ANALYZED | MOST VALUED ELEMENTS FOR STUDENTS |
|---|---|
| Knowledge | • A greater value given to the practical knowledge on the subject than on the theoretical.<br>• A poor assessment of knowledge of other subjects and about the supplementary readings. |
| Classroom teaching | • Daily worry about the class<br>• Continued attendance to the class<br>• Ability to make up class<br>• A greater emphasis on the consistency of creativity |
| Dedication to tutorials | • Generally not highly valued<br>• Total availability of the professor<br>• Little interest in the organization of activities outside of the classroom period |
| Relationship with students | • Order of the exposition and the value placed on the subject in the real business world.<br>• Lack of interest in the use of less traditional resources. |
| Methodology | • Clear and precise expression<br>• Motivation of the student on the subject matter |

| | |
|---|---|
| Planning | • A greater value given to daily programming of classes that encompass the program. |
| General aspects | • A greater importance given to intangible qualities |
| Professional category | • Teaching ability is not associated with professional category |

***Source:*** Martín (2007).

## CONCLUSIONS

The teaching profession is no easy task, and it is complicated in many cases even more as a result of overcrowding in our university programs. The appearance of a professor with greater pedagogic preparation should be promoted in such a way that the development of the teacher is not only the consequence of her experience or interaction with fellow professors, but rather through her reflection about the results of her actions while seeking means and materials that allow for an improvement of her professional practice.

In conclusion and in seeking consensus of opinion among experts and the aspects that student's value, a university professor must above all:

» Be a specialist in their area of expertise. This specialization must be linked to research on the content of their subject that they are teaching.
» Must be professionally trained in each of the tasks needed to perform: teaching, research and administration.
» Must be motivated to research and teach of their subject with enthusiasm, interest and dedication.
» Must possess certain personality traits that teaching and investigating requires, such as patience, tolerance, empathy,

fairness, openness, flexibility, availability, concern for others, creativity, etc.

» Must have some basic personal skills: facility for interpersonal relationships, communication skills, tolerance for frustration, control of stress, ...
» Must have specific teaching skills: organization and structuring of knowledge to impart and plan on the short-and long-term, and promote independent and critical thinking, etc.
» Must possess a critical and reflective attitude about their own performance as a teacher.
» Must be innovative and open to change in their professional performance.

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# ATTITUDES, KNOWLEDGE AND PRACTICES OF TEACHERS FROM THE CITY OF ESMERALDAS REGARDING INCLUSIVE EDUCATION: AN EXPLORATORY STUDY

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ABSTRAC

This article presents part of the study of a doctoral thesis developed in Esmeraldas, in collaboration with the Pontificia Universidad Católica del Ecuador (Esmeraldas Campus) and the University of Valencia. The objective of the analysis is to understand the attitudes, knowledge and practices of teachers to inclusive education in the province of Esmeraldas to explore the position in which they find themselves in their educational work. The main findings of this investigation relate to positive attitudes and practices towards inclusionthat teachers claim to possess and the self-assessment of their ownknowledge as well as deficiencies.

***Keywords:*** *Educational inclusion, attitude, knowledge and teaching practice.*

The purpose of this exploratory analysis focuses on the collection of information on the attitudes, knowledge and practices of teachers in the city of Esmeraldas to inclusive education. For this purpose a self-developed questionnaire was applied which allowed for the collection of relevant information.

The question of investigating this issue was induced after confirming the lack of studies on inclusive education in the province of Esmeraldas, focusing on the evaluation of teachers as key players, which means that no previous work is evident with the characteristics of this investigation. It is considered that professionals are the cornerstone in the inclusive movement -those doing the daily work in the classroom, planning the process of teaching & learning. Teachers are the fundamental protagonists and should be the first to report of the situation in which they find themselves before inclusive education.

A first approach to the understanding of inclusive education, which study focuses on the attitudes, knowledge and practices of teachers, offers new lines of investigation, creating new hypotheses and questions in the study of the formation of such professionals in the field of inclusion in the indicated context. It may be noted that this is an initial approach to this specific and little studied field in Esmeraldas. For this reason, it is advantageous to work on an issue like this -the ability to investigate an emerging field which aims to describe new perspectives and concepts. Therefore, this research is, first, an exploratory matrix of its realization since it is considered that it first precedes the descriptive or explanatory studies, and can be used to identify trends and areas.

Given thatit is the professionals who build their work daily and who know the reality of the classroom, the overall goal is to know what are the attitudes, knowledge and practices about educational inclusion of teachers. Therefore it is considered appropriate and convenient to investigate it through a questionnaire. It was seen fit to build a specifically designed questionnaire to collect information that would allow a large number of people and allow, in turn, the estimating conclusions from the representative sample of teachers in the city of Esmeraldas. While developing the questionnaire, particular relevance

to the content of the items is given, taking care not to apply great efforts and demands for attention from the respondents at the time of its completion, thus ensuring the response of those involved in the study.

This questionnaire is to take the first step to encourage new lines of study that will help the growth and exchange of materials to help promote inclusive education by teachers in schools in the city of Esmeraldas.

Its design followed the steps mentioned by Fernández, Pérez and Rojas (1998) adapted to our interest. The questionnaire is divided into: A) Demographics: The population data that refer to sex, age, address, facility where they teach classes, grade, years of teaching, college where they graduated for both undergraduate, graduate and specialization, and an b) Analysis of Scales: the 79 items of the questionnaire, divided into attitudes, knowledge, practices.

The scaled questions are in all 3 dimensions from "nothing", "little", "quite" and "very much" (Likert scale). The items were constructed trying so they had a simple formulation according to Ecuadorian vocabulary and terminology and a similar extension.

Prior to execution, an analysis of the metric properties and the validation by expert judges was made with a group of five experts in Research Methods and Diagnosis in Education (MEAS) and Dr. Magaly Robalino Campos, responsible for educational programs of UNESCO in Ecuador.

Subsequently, through a statistical program for Social Sciences -SPSS- data were collected from the questionnaire. These data were entered into the system chosen for analysis that allowed a quick, simple and visual way to obtain statistical resultswhich were considered in the development of an assessment of the attitudes and practices of teachers before inclusion.

In order to facilitate the collection of information a previously authorized invitation by the Ministry of Education and its representative in Esmeraldas, Iliana Chiriboga, on part of the University for all schools-considering 4 Teachers and one director for each center. The

day was December 13, 2012 during the hours of 11 am to 12:30 pm for the afternoon session schools, and from 13:30 to 15:00 for the day session schools, with the aim of reflecting on existing training needs in the theme of educational inclusion and completion of the questionnaire.

Following this, the Chief of the Division of Educational Supervision of the Ministry, Ms. Noemi Rubio Pita, attached a letter signed by herself from the district address number 3 of intercultural education ofEsmeraldasin order to get as much assistance from teachers as possible. Finally, invitations to the 166 elementary schools in the city were sent personally and by telephone. On December 13, 2012, there were 321 teachers who attended the University who made up our study sample.

Regarding the control of the application, special care was given so that the respondents understood the questionnaire welland it was specifically attended to by encouraging teachers to consult me with queries. Once the collection stage was finished–with questionnaires from 321 teachers- the responses were analyzed and a methodological process was used and significance was given.

The first dimension of attitudes contains 19 items which refer to the qualities of teachers to the inclusion, analyzing what position they have in their daily activities with questions about the importance of working with inclusion in the classroom, equality among all students, inclusive training materials, etc.

On one hand, the word attitude is conceived asthe positive/ inclusive individual predisposition that teachers have to treat children with special educational needs and minority groups. In other words, the attitudes of teachers represent the will, way of being or particular posture in order to manifest positively or negatively the inclusive movement. There have been several studies (Fennel, Fernandez and Aznar, 2002, Cervantes, Capello and Castro, 2009 and Ocampo and Cid, 2012) that deal with the attitudes of professionals in various fields, highlighting the importance of developing positive attitudes. In our case, it is the teacher'sattitudes towards special needs education and

inclusive education in existing schools and in Esmeraldasociety which are ways to encourage commitment to quality education.

The second dimension refers toknowledge, and they are 19 items that deal with the strategies, skills and expertise to address inclusivity in the classroom and which cases of children with special educational needs have had the opportunity to work. Knowledge is understood as scientific and common preparedness for inclusive education and its management / treatment. If knowledge is not adequate, the care for such children will not be adequate. Bothscientific and common knowledge do not cancel each other nor are independent, because each has a meaning and a function. It is essential to know both types of knowledge as one focuses on the theoretical / scientific and daily life which is one that purifies the educational experience, develop lesson plans, make decisions or develop alternative action strategies. The questionnaire refers to both types.

The third dimension concerns practices. It has 15 items that question the inclusive practices that teachers build in their classrooms with questions about the development of specific plans, the promotion of equality in the classroom, and the support given to students who demand special treatment among others. Practices are seen as tasks, assignments and exercises used by teachers in their inclusive educational actions, i.e. they reflect the activities and actions that promote educational equity, taking into account the special educational needs of each student in the classroom. Practices relate to those skills that give coverage to the fundamental right to a quality education.

It is important to question and reflect on these practices to provide quality attention to the diversity of students, and adapting to the pace of development of each student. The social and relational skills are those that derive an effective inclusive treatment. It is necessary to promote practices, strategies and teaching skills that reflect inclusive educational attention designed for diversity. Based upon this, you may say that changes at the educational and cultural level, are needed in the education system in the province.

This research stems from the link between attitudinal, cognitive and practical teaching training of staff about educational inclusion. Inclusive education is conceived as an educational movement that is increasingly permeating in educational systems all over the world. For several years it has been trying to improve the situation to include student diversity in classrooms through quality and welcoming education. Inclusive education should be understood from a holistic perspective that is intended to improve educational institutions, seeking todiminish the level of social segregation.

Many authors define, and defend, the sense of inclusive education in its global sense, such as Ainscow or Arnaiz, among others. From all of the readings on this interesting subject, it is thought of as a kind of education that guarantees the right to quality education for everyone seeking equal opportunities, possibilities and results, including all of social actors in their entirety – neighborhoods, families , school, mass media.

In the legal context of education in Ecuador and from some socio-political initiatives,action is suggested to achieve equal opportunities in education and real inclusion for all. Another aspect that is currently being developed by the Government and Ministries is to train quality teachers. In this case, this refers to those who are trained to deal specifically with cases of children with special needs in schools.

## PRESENTATION AND JUSTIFICATION OF THE STUDY

Latin America, characterized as being the most ethnically diversepart of the world, is immersed in this educational change. Diversity is very evident in educational systems where there is a large range of ethnicity-creoles, African descent, indigenous, gypsies, etc.  among children and young people in schools. As the Social Forum of the Americas states “diversity is one of the principles of the present and future and in all of its expressions.”Therefore, in the context of Latin America, inclusion has the potential to act in support of the transformation of

school systems as themost effective mechanism for equal treatment for everyone.

Many countries pick up what is collected as a determining factor in the development of societies and equitable education systems. Many reforms are germinating a result of this movement, which is expected to play not only an important, but a crucial role. From a political view, the governments of this region and other national and international institutions agree on the fact of developing inclusive education in order to combat discrimination and social and school exclusion, primarily contributing to all Latin American educational policies. It should be noted that it is the governments that must match the development of their policies for inclusion, innovation and progress.

Education is the link to growth, equity and justice in society. Meanwhile, the UN is its document "Progress in Latin America and the Caribbean towards the Millennium Development Goals. Challenges to achieve equality "(2013, pp.19-20) , regarding education, states:

> "Latin America and the Caribbean have made significant progress in expanding coverage and access to education. In relation to the second Millennium Development Goal, the region began in the early 1990s and has virtually achieved universal access to primary education. By 2007 and 2008, a large majority of countries exhibited net rates near or above 90% and enrollments in practically each with regards to gender equality had been achieved. Despite this achievement, progression and completion of primary education was far from optimal. Two decades later the region scored tremendous achievements in this area, but it does not seem to be capable of achieving universal completion of primary education, although some countries are likely to succeed. Indeed, the simple average of 18 Latin American countries indicates that 89.6% of young people aged 15 to 19 had completed their primary education, a figure that rises to 93.1% when considering the weighted average mainly due to the high completion rates that occur in Brazil and Mexico. Although in 5 of these 18 countries between 12% and 38% of children does not end the primary cycle, the regional situation regarding primary education is good although the rate of progress towards universality between 1990 and 2007-2008 was

> 83%, lower than expected for the region to achieve the goal of universal primary education."

Although great progress has been achieved, the results are insufficient to meet the minimum educational level. Additional challenges have been added, as cited by the UN (2013, p.12) :

> "The low coverage of preschool education, low pay and little recognition of the teaching profession, the gaps in the introduction and use of information technology and communications (ICT), and in a large part as a consequence of the above-the lack of linking secondary and postsecondary education and the labor market- is reinforced by the slow growth in the supply of productive good quality jobs."

The Ecuadorian education system has been improving in recent years. Many of the developments include: the expansion of coverage up to 6 years, the evaluation of educational services, assessment for students and teachers, higher salaries and educational investment. The majority of students will finish primary their education. On the other hand, a solid foundation is being created in assessment in order to identify and correct problems and to solve them quickly and efficiently, enhancing the quality of teachers through training and education along with an improvement in wages which will result in improved student achievement. However, these advances are not enough. Ecuador is initiating reforms and changes in the education system but there are still significant challenges, such as access to education both at the primary and secondary levels, and a balance the economic inequalities among children in rural and urban areas-education for all. In the Constitution of the Republic of Ecuador, Article 27 which is effective to todayprovides "access to education for all citizens without discrimination."

It is important to explain how and what progress there has been in special education in the country. Special education in Ecuador began in the 40´s through partnerships between parents and mothers and private organizations. Between 1990 and 1997, the development of special education in the country was promoted through a series of ministerial agreements that facilitated the processes in this subsystem, with an

apparently coherent legal framework. The Ministry of Education and Culture of Ecuador (2005) indicated that the greatest progress has been made in this area from 2002 to 2009. Since the first Regulations on Special Education was published in the Official Journal No. 496, a model was developed with attention to Special Education and the first guidelines for inclusion in secondary and vocational education were established. In these years the process of training for teachersbegan in regular education, as well as special education. Advances of inclusion in Ecuador are very recent, which is why more support from government institutions and organizations is required in order to continue making progress towards an inclusive society for all.

Education remains uneven in terms of access and even more so in results. Several factors affect this situation: poor children, rural areas, political instability, poverty, low education, little recognition of teachers, weaknesses in their training, traditional approaches to education, marginalization of what is different, etc. A changeand social cohesionis needed with the support and joint participation of civil society and local organizations.

In Esmeraldas, social inequality and poverty levels directly affect the implementation of inclusive education in terms of social justice. Students cannot take advantage of the educational opportunities when they do not enjoy a minimum level of human development and quality in their lives. It is necessary to promote systematic experiences of interaction with “others” which permits the revelation of their world through dialogue and social construction, and in this manner reinvent school based education. Education in Esmeraldas, in terms of teacher training, is in flux, which is why there continues to be better training.

In order to achieve quality education, it is essential to have greater involvement of the actors at the national and provincial levels of the education system. The authorities should implement policies according to the reality of the province.

## POPULATION AND STUDY SAMPLE

The reference population and the study sample are teachers inpre-university education from Esmeralda. The inclusion criterions that were thought appropriate for this research were:

- Teachers from the pre university schools from the city-General Basic Education, the most suitable school stage for the detection of special education needs.
- Teachers in urban schools.

According to the Master Archive of Educational Institutions (AMIE, 2012), the total number of teachers in all of the schools in Esmeraldas is 1027 in total.Information was collected via questionnaire from 321 respondents.

From the sample population, some representative data are: almost 80% are women, compared to 20% men. The average age of the reference population is 49.94 years. The 70.6% of the respondents are graduates in Education Science. 140 subjects said they graduated from the University Luis Vargas Torres, 26 from the University of Guayaquil and 17 from the PUCESE. It is notable that 80% -257 subjects- of respondents did not answer whether they possess postgraduate qualification for teaching. 64 said they have a graduate degree.

## RESULTS AND DISCUSSION

After explaining the above, it can be noted that the basic requirements to be met by any data collection instrument are reliability and validity.

According to Hernández, Fernández and Baptista (2006, p. 200) reliability is referred to as “the degree to which an instrument produces consistent results.” Meanwhile Kerlinger (1981, p. 132) says it means “stability, ability to be predicted, that can be confided in, that which is consistent, that which is consequent”. As for validity, the first authors note that “the degree to which an instrument actually measures the variable that is to be measured” (2006, p. 201) , or

Kerlinger (1981, p. 138) that defines validity by raising the question "are you measuring what you think you are measuring?". Finally, according to Hernández, Fernández and Baptista (., 2006, p 207), we find a specific feature: objectivity. These authors define this as "the extent to which the instrument is permeable to the influence of bias and trends of the researchers who administer it, interpret it, and qualify it." However, this feature refers to the validity of the instrument and, in short, is evidence of the same concept (Jornet and Suarez, 1990).

Following the above reasoning, it can be indicated that this exploratory study meets both requirements, and specifically regarding objectivity (in terms of Hernández, Fernández and Baptista, 2006). On one hand, the validity of our questionnaire is true because it has been approved by outside judges or "qualified voices" (2006, p. 204) as a means of collecting appropriate data, which aims to explore and become familiar with the object of study in order to obtain the information it seeks to explore. On the other hand, objectivity is also true because the measuring instrument that was developed is transparent to the predispositions of any investigator who uses it.

In any case, it is not always possible to require these features of goodwill in a questionnaire, since they are brought together in the same format the collection of data is nominal or categoricalwith others on the scale.We can estimate reliabilitywith only those on the scale, and it is that aspect which has been attempted in this study to control. Therefore, the questionnaire focuses on the analysis of the same feature, only referring to the clusters that can be considered scalar dimensions of assessment. This is why only specific reliable information regarding those areas of the questionnaire is provided.

In first place, in order to demonstrate the quality of the instrument that was used, the information from the analysis of the metric properties of the same that refers to the studied scalesare collected: attitudes, knowledge and practices with the objective of observing its own reliability, and the functioning of the elements. An analysis is performed for each of the three scales included in the

questionnaire, taking into account the value of Cronbach's alpha and the homogeneity index of each of the items.

On the one hand, for the analysis we focus on theCronbach Alpha reliability coefficient being:

> "A model of internal consistency, based on the average of the correlations between items. Among the advantages of this measure is the possibility of evaluating how much better (or worse) the reliability of the test is if a particular item is excluded. (Garcia, Gonzalez and Jornet, 2013).

Regarding the metric properties of the "Attitudes" scale, the Cronbach alpha coefficient is 0.824, which is a good level of overall reliability. Generally, all of the reviews on this scale are similar- the question presented and is based on the average, with the lower middle average of 14 with 2.08 and it those with the higher average ratingis the item 8 with 3.56. As shown below, each of the items contribute significantly to the reliability of the scale. Although there is a slight difference, we must realize that there are three faulty items and a low coefficient of homogeneity. These are: Item 10 "I believe that indigenous children require special treatment in the classroom because of their problems of marginalization, they are slow learners and other" has a value of Cronbach's alpha of 0.827 with a coefficient of uniformity of 0.247 . Item 18-"I think refugees children require special treatment in the classroom because of their problems of marginalization, slow learning or other" gets a Cronbach's alpha value of 0.826 with a coefficient of uniformity of 0.236, and item 77 "I think the issue of violence in the classroom is important to work on in the school" has a value of 0.825 Cronbach's alpha coefficient with a level of homogeneity of 0.247. In all three cases the increase is very small but instrument reliability remains and so their removal would increase the scale reliability.

Regarding the metric properties of the "Skills" scale, the Cronbach Alpha coefficient is 0.783, which is a good level of overall reliability. Generally all of the average scores are rather dispersed, wherein the lowest average isitem 30 with 1.13 ,and that which has a higher average rating is item 20 at 3.10. As will be seen, each of the

items contributes significantly to the reliability scale. Although there is little difference, one must realize that there are three faulty items and a low coefficient of homogeneity: Item 19 "Inclusive education is only for working with children with sensory or physical hardships and psychological limitations" has a Cronbachalpha value of 0.786 with a coefficient of uniformity of 0.234. Item 20 "Inclusive education means rethinking the attitudes and actions in society" gets aCronbach's alpha coefficient value of 0.786 and a homogeneity coefficient of 0.171.Item 21 -"Students with and without special educational needs should have the same curriculum in the classroom "has a Cronbach's alpha value of 0.784 with a level of uniformity coefficient of 0.247. We can observe that in the three cases the increase is reduced but the instrument reliability is subtracted.

Regarding the metric properties of the "practice" scale, we found a Cronbach alpha coefficient of 0.868,again constituting a good level of overall reliability. Generally all the average ratings that are displayed here are similar and rather high, with Item 38 having a lower level with a mean value of 2.04, and item 49 having a greater value with a mean of 3.65. Each of the items contributes significantly to the reliability scale. On this scale, there are no defective items that do not provide reliability.

In the three scales the Cronbach's alpha coefficient represents a good level of overall reliability of the construct, which was found above 0.7 (Gonzalez and Jornet, 2013). The scale of "practice" had the highest level of reliability, followed by "attitudes" and, finally, the scale of "knowledge."

Some results of our study are presented in the following.

## 1.ANALYSIS: DESCRIPTIVE SCALES

The procedure is designed only for descriptive quantitative scale variables. It contains some descriptive statistics, central tendencies, dispersion and distribution shape ,which also includes the frequency method but adds an option: the possibility of obtaining valuations of

variability through standard deviations or any other indicator, such as the variance.

In this analysis the focus is on the average, since the responses of teachers are positioned through it in addition to information on the standard deviation, minimum and maximum. The items which comprise the questionnaire were analyzed globally through its 3 main dimensions.In the following the scale of attitudes is presented through Table 1, reflecting the number of cases that responded to the item, as well as the averages.

1.1 Attitudes

**Tabla Ia. Description of attitudes**.

| | N | Media |
|---|---|---|
| 1. I consider that it is important that educational inclusion is done transversally in all of the subjects. | 312 | 3,37 |
| 2. I am willing to reflect on my educational practice in order to work in favor of inclusion. | 318 | 3,49 |
| 3. I am in favor of inclusion for any student with special needs in my classroom. | 312 | 3,26 |
| 4. I intend to treat all of the students in my class according to their needs and characteristics. | 319 | 3,45 |
| 5. I am willing to go to training courses on inclusion methodologies outside of my normal work schedule. | 304 | 3,06 |
| 6. I consider that it is possible to adequately attend to students in my class with special educational needs. | 306 | 2,82 |
| 7. I believe that all children with some sort of special needs have the right to be in school, always when possible in the state center, integrated with the rest of the students.4 | 307 | 3,35 |
| 8. I would like to receive specific information on how to approach the theme of special needs students. | 311 | 3,54 |
| 9. I am willing to train myself in what I should do as a teacher in the classroom in order to attend to cases of special needs students. | 311 | 3,47 |
| 10. I consider that indigenous children require special treatment in the classroom due to their problems of marginalization, slower learning rate, among others. | 305 | 2,93 |

| | | |
|---|---|---|
| 11.I believe that it is positive for everyone ( students and teachers) that the student body with special educational needs attend the same classes as those that do not have difficulties. | 303 | 3,01 |
| 12.I believe that the fact that there are students with special educational needs in the classroom can improve the development of values for the rest of the students. | 306 | 3,22 |
| 13.In my daily classroom work, I believe that it is necessary to work the same way with every student. | 300 | 2,91 |
| 14.I consider myself sufficiently trained to work in classrooms that have children with difficulties together with others with special needs. | 307 | 2,03 |
| 15.My function as a teacher is to guide my students about the special cases that exist in the classroom so that they are made aware of the topic. | 306 | 3,39 |
| 16.In order to be a good, quality teacher I have to know how to adapt the work methods to the characteristics and needs of my students. | 284 | 3,50 |
| 17.I support the manner of being of those children with a different sexual orientation that that which is expected for their sex. | 298 | 2,88 |
| 18.I think that refugee children require a special treatment in the classroom due to their problems of marginalization, slower learning, among others. | 307 | 2,97 |
| 77. I consider that the theme of violence in the classroom is important to work on at the school. | 313 | 3,30 |
| Valid N (according to the list) | 222 | |

Si observamos las medias, los docentes de la ciudad de Esmeraldas dicen tener actitud inclusiva ante los niños/as con necesidades educativas especiales en sus aulas, ya que muestran una atención positiva en la respuesta a las demandas de aquellos que lo necesitan. Es resaltable, la diferencia existente entre aquellas preguntas formuladas generalmente – por ejemplo la 1,2, 3 07- y aquellas que apelan a lo específico -13 o 14-, habiendo una diferenciación de porcentajes entre ambas. Las preguntas generales obtienen valoraciones altas frente a las específicas donde las puntuaciones son más bajas. Esto hace vislumbrar, que los docentes dicen mostrar una actitud positiva en asuntos generales acerca de la inclusión mientras que, es "menos inclusiva" cuando se hace referencia al propio trabajo de los/as mismos/as.

Los encuestados dicen no considerarse suficientemente capacitados para trabajar con niños con Necesidades Educativas Especiales (NEE) demostrando, a su vez, una falta de habilidades en el trabajo con todo tipo de estudiantes

En este plano sería interesante trabajar las fortalezas que los docentes dicen tener en su forma actitudinal, y las debilidades trabajarlas, ya que hacen referencia a la actitud específica "dentro del aula".

Seguidamente se expone la tabla 1b referente a la escala de conocimientos.

1.2 Knowledge

**Tabla Ib. Description of knowledge**.

| | N | Media |
|---|---|---|
| 19. Inclusive education is only of working with children with sensory difficulties and physical and psychological limitations | 286 | 2,62 |
| 20. Inclusive education means rethinking the attitudes and actions in society | 282 | 3,10 |
| 21. Students with and without special educational needs should have the same curriculum in the classroom | 297 | 2,61 |
| 22. I have the inclusive strategies and skills to work in a classroom | 316 | 2,22 |
| 23. I have clearly detected those students who need a supplementary aid in the teaching / learning process | 316 | 2,92 |
| 24. I have the ability to identify what factors are affecting the learningdifficulties of each of my students. | 315 | 2,57 |
| 25. I know the legislative framework for inclusive education in Ecuador | 313 | 2,08 |
| 26. Throughout my professional experience I have had the opportunity to work with children with Down Syndrome | 316 | 1,25 |
| 27. Throughout my professional experience I have had the opportunity to work with children with Autism | 314 | 1,35 |
| 28. Throughout my professional experience I have had the opportunity to work with children with learning difficulties (dyslexia, dyscalculia and dysgraphia). | 316 | 2,44 |
| 29. Throughout my professional experience I have had the opportunity to work with children with behavioral disorders. | 312 | 2,84 |

| | | |
|---|---|---|
| 30. Throughout my professional experience I have had the opportunity to work with children with cerebral palsy | 314 | 1,13 |
| 31. I have specific skills to work with children in school with Down Syndrome | 313 | 1,19 |
| 32. I have specific skills to work with children in school with Autism | 316 | 1,25 |
| 33. I havethe expertise to work in schools with children with learning difficulties (dyslexia, dyscalculia, dysgraphia) | 317 | 1,86 |
| 34. I have the expertise to work in schools with children with behavioral disorders | 315 | 2,13 |
| 35. I have the expertise to work in schools with children with cerebral palsy | 312 | 1,16 |
| 36. I have experience to address the special educational needs of indigenouschildren | 312 | 1,64 |
| 76. I have worked with issues of violence in the classroom | 304 | 2,48 |
| Valid N (according to the list) | 213 | |

The knowledge of teachers in the city is basic because they say they do not know how to attend to the different special needs described in the questionnaire. There is a lack of training and specific knowledge about these topics.

Some qualitative data about training in Ecuador / Esmeraldas suggest that there are two reasons for this cause. First, there does not exist within the Bachelor of Science in Education in Esmeraldas a specialty of Special Education and Inclusive Schooling, which would produce professionals with specific training in the understanding and treatment of different cases of special educational needs that can be found in classrooms. Second, the almost exclusive-treatment these children receive is derived from special schools - for a total of 12,662 peoplewith disabilities (CONADIS, 2013), not including special educational needs not associated with a disability such as indigenous children, refugees, victims of abuse, those with learning difficulties, behavioral or socio-affective behavior, among others. Unfortunately, this group does not have medical, therapeutic and educational treatment.

Most responses and considering the average value, which shows the lack of knowledge –scientific and colloquial- on part of the teachers. An ambivalent perception of themselves regarding their own knowledge about inclusive education is highlighted. On the one hand, they know that inclusive education is not just about addressing sensory, physical and psychological difficulties. 2.62 on average do not have inclusive work and classroom strategies, 2,22 are not familiar with the factors that affect learning difficulties of students, 2,57 do not know the legislative framework for inclusive education in Ecuador, 2,08. Considering the low average, teachers say they have not had the opportunity to work with most groups of students with special educational needs that were specified – DownSyndrome, autism, Cerebral palsy, or with indigenous minority groups, refugees or homosexuals.

Specific expertise in addressing these students is equally deficient. They have more knowledge about learning difficulties and to a lesser extent knowledge about violent behavior in the classroom.

On the other hand, they do know that inclusive education means rethinking the attitudes and actions of society. 3.10 detect those students who need help, 2.92 have also worked with children with learning difficulties or violence in the classroom and have specific knowledge to address these issues.

The area of knowledge should be a key in order to focus efforts and enhance the understanding of the reality of diversity and inclusiveness in the classroom.

Finally, Table 1c shows the Practice scale.

1.2 Practices

**Tabla Ic. Description of practices**.

| | N | Media |
|---|---|---|
| 37. I intend to build equity in the classroom regardless of student characteristics | 308 | 2,62 |

| | | |
|---|---|---|
| 38. I prepare specific schedules for students with special educational needs | 305 | 3,10 |
| 39. I as a teacher adapt learning content of the students | 306 | 2,61 |
| 40. In my classroom I have in mind the different rates of student learning | 311 | 2,22 |
| 41. I coordinate with other teachers in solving problems together when a student is concerned | 312 | 2,92 |
| 42. I foment activities that promote the development of empathy among students. | 307 | 2,57 |
| 43. We perform custom reports reflecting the progress of all students, adapted to their needs | 301 | 2,08 |
| 44. My educational practice focuses on equality and inclusion | 305 | 1,25 |
| 45. I develop materials for those children who need adjustments to their teaching / learning | 307 | 1,35 |
| 46. I consider that I offer sufficient support for students with some kind of need | 309 | 2,44 |
| 47. I look for information when I need it to work when a special educational need in the classroom | 307 | 2,84 |
| 48. I work in coordination with the families of the students | 299 | 1,13 |
| 49. I demonstrate respect for all students without distinction of any kind | 310 | 1,19 |
| 50. I attend to the needs presented by refugeechildren in the classroom | 295 | 1,25 |
| 78. I am able to work positively to eliminate violence in the classroom | 311 | 1,86 |
| Valid N (according to the list) | 234 | |

Based on these average measures, positive scores for most of the items discussed in this section are highlighted. Teachers state that they possess and display a series of inclusive practices in classrooms, such as: building equality and inclusion regardless of the characteristics of the students, making custom reports for each student while respecting their differences in the classroom, creating adapted materials, jointly coordinate with the various stakeholders in the teaching / learning of the students, promote the development of empathy, and offer to support students who require it.

This analysis may indicate that, generally, the attitudes of teachers are tied to their practices, for example a high number of subjects say they possess a positive attitude, and in turn, that they have inclusive practices in the classroom. There are small discrepancies between what they say and what they do, but there is a link between attitude and practice.

Just like with attitudes, it is recommended to follow the line to reinforce the strengths in terms of inclusive practices that teachers say they have, and focus on overcoming the weaknesses that are hindering their work in the classroom.

## BY WAY OF CONCLUSION

This study has permitted the test of the quality of the instrument that was used. The analyzed results, suggest an adequate internal consistency of the instrument that was used. The analysis of the psychometric properties and the quality of the questionnaire was done through the analysis of Cronbach's alpha coefficient and Classical Test Theory.

Finally, the analysis allows us to say that all of the scales have a medium-high level of reliabilityand the analysis of the psychometric properties of the instrument as a unit shows a medium-high coefficient being greater than 0.7 Alfa, considered satisfactory and sufficient. Thus, the overall quality of the instrument is confirmed, with the scale of "practices" which has the highest reliability factor of 0.868. The lowest coefficient was "knowledge", with a 0.783 coefficient.

Regarding the three scales that were studied, and remembering that the final analysis is in process, we can glimpse some findings that concern the two major features that teachers have in Esmeraldas: attitudes and practices. There is a divergence in responses between what they say and do, but generally the data found that they have a positive attitude toward inclusion, as well as conducting practices that made this process positive. Both scales would relate since most percentage of teachers who have an inclusive predispositionpractice inclusion in the classroom. The recommendation is to pay attention to

the attitudinal and practical deficits with the aim that teachers have the greatest number of strategies, tools and willingness necessary to achieve an inclusive quality education.

Knowledge, however, is a formativeweakness that teachers from Esmeraldas have. This lack of knowledge prevents inclusivity for all students. Again, there is a divergence between their knowledge. A future proposal would be to perform specific skills that relate to working from the diversity in the classroom, such as thinking about educational diversity within and focusing on the different special abilities that can be presented in schools.

It is necessary for teachers on one hand to strengthen inclusive attitudes and practices that they claim to possess in order to achieve that educational inclusion is present in institutions and in Esmeralda's classrooms; and on the other hand develop training / instruction in order teach specific knowledge about treatment for all types of students with SEN, associated or not with a disability, minority groups, etc., attendingto schools from an educational perspective of quality and warmth.

This study reinforces and supports the development of ateacher training diagnosticin Esmeraldas. It is considered essential to begin with an investigation of this nature as a starting point for future interventions in education. It is necessary to enhance the strengths thatEsmeralda's teachers have, and this is a big step towards generating changes in both schools and society. In turn, it becomes apparent that there is a demand for specific training in this area, as seen through investigation, that teachers do not have quality colloquial and scientific knowledge in order to attend to all of the diversity of the students.

There is a clear need for academic and day to day training for teachers from Esmeralda, as well as progress and improvement of both the school and the social context in which they live and give sense to their educational experience regarding the context structure of the institutions and the subculture of teachers (González Sanmamed, Fuentes, Raposo, 2006, p. 279) in a study of this nature.

It is worthwhile to mention that the majority of respondents expressed attitudes and inclusive practices as being very important features in the attention of plurality which requires further promotion and strengthening. Attitudes are not considered immutable and fixed, but are dynamic and can change or be modified in such a manner that they can be identified in order to reconstruct them in this case of less inclusive attitudes and practices in the classroom.

Salinas, Beltrán, San Martin et at (1996, p.26) indicate that there is no doubt that the inclusion of students with no obvious differences in unspecific classrooms must assume that teachers rearrange its ordinary patterns of life management of their classrooms, as well as their teaching assumptions on which they base their teaching.

Therefore, it is necessary to continue work on thisyet unknown field in this context, delving deeper intoteacher's pedagogical and contextual deficits to include inclusive education and to have more studies done on this subject. Finally, we must emphasize the importance of corroborating that Esmeralda teachers are professionals with a predisposition of inclusiveness but a contextual reality that actually hinders them to fully develop inclusion in their classrooms.

After the theoretical review and analysis, it is considered that the most critical points regarding inclusive and educational material is to optimize and improve in Ecuador and more specifically in Esmeraldas the following points:

- Low pedagogical training of teachers.
- Weak educational programs and teacher training.
- Little national research on teacher training.
- Lack of adequate training on inclusive education and content to cater to disadvantaged and marginalized groups of society (children with special needs, those in poverty or extreme poverty, rural populations, etc.)

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# ACADEMIC

## PAPERS

# POSTCARDS

## REVIEW

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The title and under the heading, comes to mean a great deal regarding the appreciation of a book. As the themes developed, they reveal a sentimental, free education- a situation of the literature. Borges reflected that: "If it were possible to read any current page-this one, for example- as if you'll read it in 2000, I know how the literature of the year 2000 will be like". [1] Among the qualities of the writer Adriana Azucena Rodriguez, is putting of a title to a book. One of the most successful, although I really like *The truth about my imaginary friends*, is the volume that appeared recently[2]. This is about a group of stories collected under this designation: Postcards, which makes the character of its pages look good, since the postcard with its brevity makes you travel back in time, especially if you think of those colors, some of which were hand painted. You may refer to a less remote past, when one travelled and would buy them, writing and sending postcards to friends and relatives. Those cards illustrated with various motifs were almost always photographs- they could not have the depth of a letter, which was worded in a more calm and calculated manner. In meeting places everywhere, like hotels and museums, there was a rotating device full of colored cards,. You could pick the less strident color then right away put writing on the back of it, followed by the impression of seals and stamps and then throw it with its fate in a mailbox.

This book by Adriana Azucena Rodríguez is another example of her talent, with this one even more remarkable, which is to tell great stories in spaces as small as a quarter of a letter, which is the traditional format of postcards. In such a restricted site barely fits a tight message, even more now that the patience of yesteryear is broken with handwriting, forgotten is the dedication of calligraphy in mild discrete sheets impregnated with perfume.

1Quoted by Gérard Genette in "Structuralism and Literary Criticism" in Texts on theory and Criticism (formalism to postcolonial studies). Selection by Nora Araujo and Teresa Bravo. Mexico. UAM-Iztapalapa / University of Havana, pp. 235-255.

2Adiana Azucena Rodríguez; Postcards. Mini-Hiper-Fictions.Editorial Phosphorus / SEP / CONACULTA / INBA.Narrative Collection.Mexico, 2013.

This book is made with an intellectual prose, with language of a short story. There appears analogies between dissimilar objects, associations that are visible but only the writer's eyes know how to relate them. Among my favorites is the one that describes a class of absorbent paper that disappears as the words of the writer fall upon it, such as when *In time of all*, referring to Góngora, Quevedo writes that the poet reads a manuscript so dark that the hand is not visible holding it and owls and bats flock to hear it.

I also like the story "*Defining the TIME MACHINE. Dictionary of Literary Terms* (ed. 2080) ", p. 58-59. Here it said that once it was possible to travel through time, "mechanisms and habits of the literary field have changed. Those who had the best links with researchers and academic scientists capable of sustaining the missions, those who enjoyed the best physical condition to withstand the journey, were the scholars who reached the best budgets."

Emphasizing the mocking tone of the book, I think it is very significant because one can laugh at ease. In "*Ars reader*", p. 60, views are scorned, dialogs and self observations that one made in the past are stated: "When I get a book that had already been marked, it is as if I was listening to another conversation, which details and background I did not know even if you know the speakers , and after a futile effort, I conclude that this conversation is stupid."

There is also a Bestiary, p. 63-75, with a dragon, a werewolf; cats, mermaids, pets, stuffed animals and a bull. It includes a literary Axolotl and a Panther from Iztapalapa, "black like her mother, Devil yellow eyes and beautiful as death."

The Borgiean turtle isn't missing in these postcards who said after finishing the race in first place: "I owe everything to my manager and Zenon from Elea." The last word is just an errand or a farewell note: "Godot,we were waiting for you."

# POVERTY AND WELL-BEING FOR THE ZOQUE AND TZOTZIL PEOPLE OF CHIAPAS

## A research experience of the Centre for Municipal Studies and Public Policy Development (CEDES) of the UNACH

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The aim of the investigation is to understand the perception of the Zoque and Tzotzilpeople in Chiapas regarding the concepts of poverty and welfare. This is done through the identification on part of the social actors of some of the representations built regarding the two concepts.

## POVERTY

When speaking of poverty, there comes to mind a number of concepts and definitions such as the shortage or lack of income and material assets: food, clothing, land, tools, money, etc. (Ravallion: 1993; Brandt: Garza 2000: 2002) insecurity, lack of voice and power (Deepa: Moguel 1999: 2000); much gender inequality, such as age and ethnicity, associated in particular the rural and traditional life (World Bank 1982; Kabeer: 1998 and Deepa: 1999), lack of opportunities (Kabeer, 2003 and Sensor, 2003); the time and space since the interpretation varies with the historical epoch and culture, customs and characteristics of the place.

There are also classifications such as absolute poverty, extreme poverty or homelessness, which measures income below the poverty line related to the provision of food and its nutritional and energy value; and the relative or moderatepoverty, concerning households relative to others in the same community, in another country or another equally determined by the lack of material resources to meet basic needs for the healthy survival of the individual, his meager income which result in inadequate and unsatisfactory nutrition (Ravallion 1993, Brandt 2000, Sen 2000 Garza, 2002, Hernández Laos 1990).

We have designed different types of indexes and indicators for measurement such as the Human Development Index (HDI) and the Marginalization Index, among others. The conceptualization is usually done with the aim of defining and measuring poverty, but these obey the criteria of those who do not live and suffer poverty. With the clarity that a study on poverty is beyond the academic interest and joins in the discussion for the design of public policies, the definition of poverty was discarded resuming academic studies or development programs, with the intention of defining poverty from the perspective of people, the poor, those who live and suffer its effects. The aim was to define

poverty from the social representations of Zoques and Tsotziles in Chiapas (Jiménez, 2012).

As a starting point, the aforementionedconcepts are considered, and with them four municipalities qualified as having a high level of poverty and low Human Development Index: Zinacantán and Santiago El Pinar inTsotzil territory, and Ocotepec and Francisco Leon inZoque territory.

## SOCIAL REPRESENTATIONS

Social facts are interpreted differently in each group based on their beliefs, customs, habits and characteristics. These represent a more or less complex shape from the images and symbols that shape reference systems which allow interpretation of events or phenomena, which will give it significance, categorize it and classify it(Moscovici, 1979), (Tinocco, 2006). Meanwhile, social representations are a form of spontaneous knowledge which arise from interpreting everyday reality collectively. Culture and formal and informal education, are crucial to the way it is built psychosocially and is how this knowledge and interpretation is symbolically concretized.

Among the factors involved in the construction of social representations are living together, experience, and thought patterns (traditional, formal, and social communication). It builds on dialogues, words, gestures, and images to represent something invisible or intangible. It is a creative and autonomous process where the interaction between subject and object (Jodelet and Guerrero, 2000) occurs.

Thus, social representations are built around three main components, which are the attitude of the subject toward the object, information about that object and a field of representation where a number of hierarchically organized content is structured.

## STUDY METHODOLOGY

The methodological strategy was designed with a social construction of the concept with the "poor". In a first series of workshops, starting from the question -What do you mean by the word "poverty"? The result showed about 200 different ideas about what poverty is and why someone thinks they are poor. These were grouped into 13 categories of analysis.

It was felt that this set of ideas about poverty were only a hypothesis that would need to be tested through a series of investigative techniques, such as sending out 520 questionnaires. A second cycle of participatory workshops with self-diagnosis with watershed maps and mind maps were organized in a mode offieldworker theater. Walking and car tours were done for the territory and the creation of an ethnographic video were performed to retrieve images of the rural landscape of the places where the inhabitants identified poverty (with an exposure methodology and dissemination among people of oral tradition). With this reflection and discussion among stakeholders was generated in order to further facilitate communication, understanding and interpretation by researchers.

## RESULTS

In the first approach with stakeholders, we discovered that the term "poverty" does not correspond to the Tzotzil and Zoque languages, but is part of the institutional and academic language to describe social needs. So it was identified that the best way to define the concept of the term is from be-well or well-being.

The results of the first participatory assessment exercise were insufficient to clarify the social representation of poverty[1]. Only

1. This was part of the discussion on the open debate for the publication on the subject in the book by: Tinoco, Rolando and LilianaBellato (Coords.), 2006, Representacionessociales de la pobreza en Chiapas, Ecosur-Sedeso, Chiapas, México, 162 pp.

one workshop had been in each county seat, which provided a first approach to the concept of poverty. Very different interpretations, such as those that defined poor as those that no longer speak the native language, in the opposite direction of those that defined poor as those who only spoke their native language.

One of the key concepts that allowed carrying out the research strategy in the field, was to define the territory. A map was prepared by the municipality with geographical precision limits and main sites and infrastructure, such as the municipal seat and the main localities, roads and rivers, allowing attendees to the first series of workshops to locate where there was "poverty" and "no poverty". The result showed the following features. A third and final series of workshops was organized to present the preliminary results of the investigation with the help of a documentary video, in order to validate the information and improve the scope of interpretation.

## AN APPROACH TO "POVERTY" AND "NON POVERTY" TERRITORY

Here we briefly present how social actors see and identify, "poverty" or "non-poverty" in their territory by municipality. Walking and car tours served to physically identify the different situations of poverty or it's opposite, well-being:

**Francisco León** is a Zoquemunicipality composed of four *ejidos*. This town was hit by the eruption of theChichonal volcano in 1982. For more than 15 years it was not included in the list of municipalities of Chiapas. The eruption survivors displaced by the disaster returned to re-occupy their ancestral territory,and this poorly planned process generated a scenario of agricultural and political disputes within the ejidos. Two Zoqueejido leaders from San Miguel La Sardina, members of the Emiliano Zapata Campesino Organization (OCEZ), in an interview allowed us to approach the social representation of the land and the agrarian struggle in its territory and its political participation.

The territory of the four ejidos have enough resources to produce various foods: basic grains (corn, beans, squash, mainly), vegetables (tomato, onion, chili ...), fruits (orange, lemon, watermelon, coffee, avocado, pepper ), timber (cedar, mahogany, pine, oak, cinnamon), herbal medicine, cows, small backyard livestock (pigs, sheep, goats, poultry), beasts of burden (horses, donkeys, mules) and even fish in the many rivers and lakes. The paradox of the peasants of Francisco Leon is that they live in food poverty despite the wealth of the environment in which they live.

Agricultural production is for self-consumption, and producers have little or no marketing experience. They simply sell their surplus to middlemen who pay very low prices. The situation is even more serious in the most remote towns from the county seat due to the poor road infrastructure.

In **Ocotepec**,which is also a Zoque municipality, present similar territorial conditions to Francisco Leon.

In **Santiago El Pinar**, micro-watersheds are deforested by extensive cattle grazing and firewood collection, and it is far from having a forest management program that coordinates harvesting activities and protects reforestation areas.There are programs like rural cities that represent a change in land use from rural to urban, but the population has no population growth to warrant the construction of a city. Traditional homes have backyards with vegetables, trees or livestock with a Temazcal somewhere or land with a farmhouse.

In **Zinacantán** there are different experiences. The ornamental flower growers use many agrochemicals, irrigation infrastructure and emissions, and with the economic gains buy corn for consumption. They have ceased to sow corn for other than self-consumption.

There are different water access problems according to the availability of the resource in each watershed. In the county seat, the Zinacantánriver is highly deteriorated, with no aquatic life and little current. At the edges of rivers one can observe sheep grazing the vegetation cover, women washing for lack of running water in their

homes, drainage discharges from households, and agrochemical containers from the greenhouses of flowers or vegetables.

In the community ofPastéin the municipality ofZinacantán, access to water has another problem due to the type of watershed. The weather is dry and water sources are underground and there are not enough wells for the entire population, which in previous years was a subject of a dispute between rival political groups (PRI-PRD-EZLN) and was resolved through the intervention of the Community authorities who appointedcouncilmen in charge of piped water and vigilance that the liquid was distributed to include all residents, regardless of political affiliation or religious belief, which significantly reduced the socio-environmental conflicts by water stress.

In Navenchauc, in the municipality Zinacantan, the water is so abundant that the pond is overflowing due to the trash that has accumulated in the natural drain of the lake. People define poverty as a problem arising from floods that every year worsenliving conditions.

So we can see that in one town there are at least three micro-watersheds, each with different types of water conflicts: garbage pollution and overgrazing of cattle in the county seat of Zinacantan; Water scarcity in a watershed without surface rivers in Pastéand conflicts between rival political groups to intervene in a well-managed system of community charges; and the overflow of the lagoon in Navenchauc for the mishandling of waste derived from the chemicals used in flowers greenhouses.

## THE "WELL-BEING" FOR TSOTZILES AND ZOQUES

As noted in the workshops, ideas and concepts about what is and isn't poverty were identified, and as a result were grouped and defined by property type, which are described below:

*Material goods:* Are those which are commonly known as public service infrastructure and housing, but are also considered as the materials

with which the house is made, domestic and work equipment, and also includes machinery parts.

**Table 1.** Material resources

| Means of living | Categories | Indicators |
|---|---|---|
| IV. Material resources | 4.1 Infrastructure | Communication and access |
| Resources available for health | Number, type and equipment of nearby clinics | |
| Resources available for education | Number, type and quality of education services | |
| Housing characteristics | Housing materials and intra- domiciliary services | |
| 4.2 Machinery, tools, and useful objects | Availability and use | Production, transportation, commerce, offices, homes, clothing |

A gender difference derived from the sexual division of labor can be perceived. Men relate physical capital with the means of production, infrastructure and communications, while women mostly state that goods and materials for housing and services, primarily water, the provision of food and its preparation, clothing, health and medications.

Vulnerability of dwellings or including community vulnerability for environmental contingencies are observed.

*Social goods.* The tradition of unpaid collective work linked to local celebrations has diminished. Other measures of solidarity with family or community problems still arise among the poor, but in larger populations they are becoming blurred.

**Table 2.** Social resources

| Means of living | Categories | Indicators |
|---|---|---|
| II. Social resources | 2.1 Organizations | Productive, religious, political |
| 2.2 Legal systems | Community authorities | Type of local authorities |
| 2.3 Institutions | Federal, state, private ( businesses), mixed (NGOs), municipal | Type of institutions |

In this area the lack of organization for production and development is perceived, which is a representation of poverty, corruption, cronyism and the interests of the leaders have damaged organizations. Religious and political conflicts have helped the deterioration. The need to solve urgent problems is forcing the organization and internal negotiations, so that the magnitude of some problems requires state intervention, butthere is no political interest in participating.

Stakeholders that were interviewed believe that government programs and interventions give few results and it seems that there are setbacks. Among the causes that were identified are the social and political divisions that have emerged within communities due to disputes over municipal power (political parties), by corrupt leaders and officials who favor to friends, relatives and people from his party excluding other people. There is a loss of community cohesion and trust by the ineffectiveness of many government programs and a "law that does not punish those who do harm to the community."

In all cases we found low social participation in productive projects, few if any rural enterprises, not even peasant cooperatives with a product system such as organic coffee. In general, commercialization is in the hands of local or external agents known as coyotes, who buy agricultural products at very low prices.

The leaders that are most politicized are those who are active in leftist peasant organizations, and have a very clear idea that in order to improve the living conditions, social organization is necessary,

particularly to defend the territory, natural resources, customs and to give support to community life-specifically to organize production and marketing processes, for among the scarce resources it has is land, water, agricultural culture and native seeds. However many have been corrupted and patronize schemes with the government or political parties.

Neighbors organize voluntarily to solve local problems such as access to clean water, transportation to cities, the organization of municipal markets, the organization of traditional festivals, construction and repair of roads, bridges, schools and spaces such as public squares or sports fields.

*Human goods.* Are those related to the individual and are generated from the culture, "knowledge" from formal education, skills, abilities, skills and health condition.

**Table 3.** Human resources

| Means of living | Category | Indicators | Variables |
|---|---|---|---|
| I. Human resources | 1.1 Culture | Identity | Age, gender |
| | | Mother tongue | Name of the indigenous language by at least one family member |
| | | Beliefs and attitudes about poverty | Divine punishment, destiny, lack of resources, bad governing, why don't we organize ourselves |
| | 1.2 Health | Food-nutrition | Type of food products/type of food purchased |
| | | Sickness | Type of sicknesses in the family |

| | | | |
|---|---|---|---|
| | | Handicaps | Types of handicaps in the family |
| | | Local health systems | Types of medical attention: 1st, 2nd or 3rd level / Family or traditional medicine |
| | 1.3 Education | Training | Types of training |
| | | Schooling | Level of schooling |

For the Tzotzil and Zoque, the stronger identity is derived from human goods as well as the use of the mother tongue and beliefs and attitudes to poverty. It is noted that some feel that being poor is the result of divine grace,while others feel that their family is not poor.

A lowlevel of education is perceived and there is little technical and management training. The association of health and poverty was common with problems such as malnutrition, diarrhea and acute respiratory diseases, cough, fatigue, body aches and headache, blotchy skin, teeth in poor condition are part of their social representation. The lack of medication as well as emotional aspects related to the lack of rest and physical exertion determine the well-being of the individual. It is also clear that ignorance, lack of technical knowledge to work and conducttrade  to address the rest of the world and seize opportunities or solve problems.

For women, poverty is seen in the emotional state of the feelings that are generated such as sadness, anxiety, and fear.Stress is experienced and people suffer from frequent headaches and backaches, which eventually affects mental health. There is also discrimination by gender, age or culture and loneliness among the elderly.

Another factor is alcohol, which is for men a right to rest and leisure, and for women is a risk of domestic violence and impoverishment. The choices they have found is to change religious groups or sects that prohibit alcohol.

*Economic goods.* They are those related to labor and employment, income, forms of financing, and ways to save. Also, they have a connection with production and trade.

**Table 4.** Economic resources

| Means of living | Category | Indicators | Variables |
|---|---|---|---|
| V. Economic resources | 5.1 Income | Employment | Type of employment |
| | | | Type of employment |
| | | Migration | Type of payment for employment |
| | 1.2 Health | | Period and frequency of migration |
| | | Production | Type and amount of payment for migration ( money sent to home country) |
| | | Commercialization | Type and quality of agricultural production |

| | | | |
|---|---|---|---|
| | | Economic activity | Type of agricultural commercialization |
| | 5.2 Other income | Government subsidies | Type of activity, job or profession |
| | | Schooling | Income for subsidies or programs |

In these regions there is a clear lack of permanent jobs and production processes in rural areas. Incomes are low and people need to be made jointly responsible for their progress- that the stimuli are for those who work well because government subsidies create an attitude of dependency.

Life choices are: subsistence farming if they have land; work as day laborers, peons or servants; marry, have children, and get access to social programs; move to another region, state or country to study or work.

Family incomes are not put into production nor are invested. In many cases they are wasted without benefit to families. With regard to poverty in Francisco León one respondent states:

> (...) the Zoques, have always been financially poor, but we were rich in culture, but now I think ... I'll hand it both ways: economically and culturally we are falling, we are impoverished by government policy. (Ranch hand)

A representation of the local complexity to solve some aspects observed in Ocotepec, wherethere is no municipal market despite having the infrastructure.The people and the authorities have failed to determine the tenants, and there are no agreements or rules to operate.

More complex still is the case of population dispersion, understood by the institutions as a cause of poverty, for social actors population dispersion is not a problem in itself, however,it is part of the strategies

agricultural land occupation and utilization of resources such as land, water and forests. Dispersion represents an opportunity to access land even if they have no access to basic services like water, electricity, sewage, schools, clinics, and land is a secure job as it depends on one's own strength and human capacity and is a resource renewable. The land also gives them a sense of belonging:

> Those who live in the county seat, even if they have services but do not have land, they are the poorest of the poor, because if you do not have money you do not eat. He who has land even without service is not starving, you just have to work hard at what we already know. (Older adult interviewed in Ocotepec)

The most ingenious farmers experiment with agricultural production systems particularly in corn, do trial and error tests in their plots with organic manure and chemical fertilizers, and compare the results, because often they receive materials without training or counseling.

*Environmental goods.* Land is a valuable asset and identity, so its lack represents the largest local poverty indicator. The climate, flora and fauna of these four municipalities is rich and generous, but has a high degree of degradation and risk to people. No conservation strategies and sustainable programs have been identified, only some individual strategies were identified.

**Table 5.** Environmental resources

| Means of living | Categories | Indicators | Variables |
|---|---|---|---|
| III Environmental resources | 3.1 Water | Use of water | Domestic, agriculture, nature, industry, tourism |
| | 3.2 Land | Type of deed | Ejidal, communal, private |
| | 3.3 Forest | Land use | Agriculture, grazing, forest, urban, conservation |

The problems of water pollution, garbage and lack of hygiene and management of water in homes are social representations linked to poverty. Conservation as a life strategy could transform the future of the people and their future generations. This is an area of opportunity for institutions and people, mainly young people who can be involved to generate different forms of use and care of the environment and its resources.

In Ocotepec, a comment was made to the city officials regarding advanced deforestation manifested by the people on a map of hydrographic basins and confirmed during tours of forests, roads and steep ravines. The municipal authorities, with much pain and resignation responded: "In less time the forest will end, this is difficult to change and we don't have a way to change that."

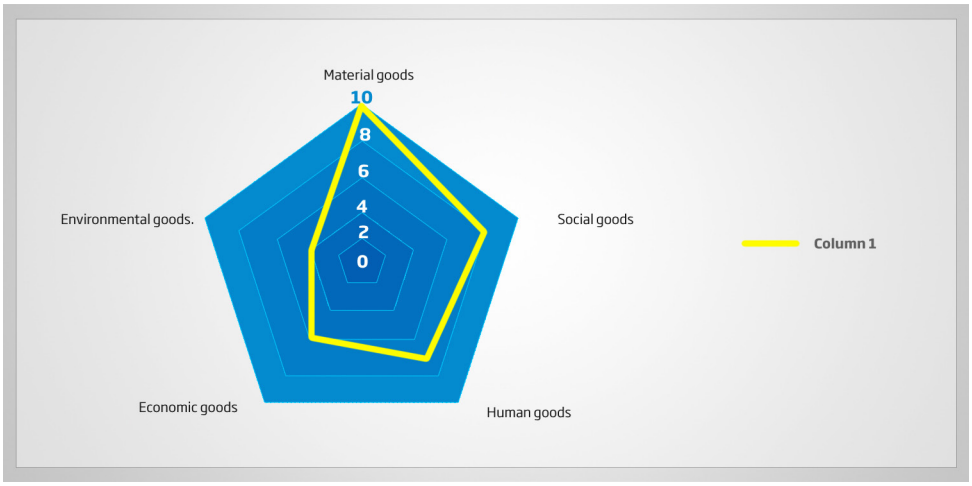
## TECHNICAL TRAINING AND MANAGEMENT FOR THE PRODUCTION, USE OF RESOURCES, ORGANIZATION AND COMMERCIALIZATION.

In Santiago El Pinar, the mayor said that a dream of all of the people was to recover the forests that had been cleared in the last 20 years as a result of extensive cattle ranching. But far from following the social perception of the problems and their solutions, the state government built a Rural City.

There are few cases of organization for the management of forests, which represents a very high risk of deforestation and is present in all of the communities to the extent that there are places like the ejido Vicente Gurrero in the municipality of Francisco Leon where the only trees visible are those that are planted in contour for plots of corn or pastureland.

The outcome of the evaluation of the final perception of property in the importance of reduction of poverty resulted in the following graph:

**Illustration 1.** The importance of property from the perspective of the social participants




Material things that were considered such as housing and labor, occupied the highest level of priority in terms of importance to achieve well-being, quickly followed by social goods, governance of the organization, collaboration and cooperation of groups and communities; in third come the human assets as noted that correspond to the inherent aspects of a person but can determine their way of dealing with life and problems; economic goods were then considered, despite the view of the economic model that identified them as elements from that can reduce poverty, for social actors they are not a priority are necessary; finally there are the natural goods that seems to be on hand and part of daily life, but are considered minor in changing their condition of poverty, although there was awareness of its deterioration and damage.

## CONCLUSIONS

Poverty represents different realities depending on age, gender and the social process of each community, town, ejido, micro-region, and watershed. For women, being poor is having trouble feeding their children, have interfamily conflict and violence,and have the marketing channels of agricultural products and textile craftsclosed. For men,

being poor is not having access to agricultural resources such as land, seeds, fertilizers, technical assistance, and financial credits.

For young people, being poor is a reality that may be overcome by emigration, so that they venture to leave their land and when they return, if they return, they rarely bring money with them and if they bring it, they spend it to invest in the construction of their homes. Information and communication technologies are present and are part of "progress", but should be good orientation in order to take advantage of its benefits that now appear to be more of a distraction and waste of time.

Older people have a different perception that that of youth, usually explained that previously there were no problems of poverty. There was an abundance of natural resources (land, forests, water, seeds) and no money was needed for commercial transactions.

In this study, the subjects are indigenous Tzotziles and Zoques people. The object is poverty and its multiple dimensions, and the field of representation are social systems that give structure to poverty in the villages of the study with emphasis on the sustainable management of territory.

Poverty creates an increased level of vulnerability and violence in all forms, and limits options. Children, women and the elderly are particularly vulnerable to exploitation, insecurity and violence, although men are vulnerable by their origin to the exploitation bosses and landowners, officials,and merchants which reducethe chance to escape the circle.

Analyzing the discourse, it was noted that in all municipalities poverty is considered as something immanent, without a solution,and is considered a situation in which one is born into and that can hardly be surpassed, a social condition that defines them as a people, and that they are waiting for that "someone", whether it is a government or a redemptive leader, to resolve the problem. Social participants do not come forward as change agents or actors in development processes in general. A couple of cases were identified with a very different entrepreneurial mindset, but they are seen as outsiders.

Prevailing paternalism and exploitation of the people can be seen in the representation of a culture of patronage with subsidiary programs fromgovernmental and non-governmentalagencies, hoping to get something, anything: latrines, stoves, poultry, livestock animals, tin roofs, agricultural tools, sacks of cement, fruit trees, even money. They accept to deposit their electoral votes for to craftycandidates.

There are factors that are driving changes and differences between the municipalities that were studied, which make the processes of cohesion and building of knowledge and solutions to face the future more complex.

There is a religious change in many communities, leaving the Catholic belief to adopt new expressions of Christian belief, such as Evangelicals, Jehovah's Witnesses, Pentecostal, Light of the World, Seventh Day Adventist and Bible reading groups. This is for some their only source of information, but also leads to separation and division even among families.

On the other hand, it is generating a process of change in the phenomenon of migration, very palpable in Ocotepec especially of a temporary manner, where men (mostly), return with new customs, ideas, tastes and vices which are products of modernity which are becoming visible aspects such as food, clothing and manner of speaking.

The study generated elements that contribute to the discussion of the paradigms of Social Representations and Livelihoods. Microregionalization, using the approach of Micro watersheds from the social perspective of the territory, allowing further deeper investigation.

It is concluded that the social representations of poverty can contribute to the creation and promotion of public policies for local development more suitable to people who live and suffer poverty and to generate proposals to generate alternative methodologies for action from the extension office of the university.

A very high need for training was observed in production techniques, organization, gathering, food quality control, accounting,

credit unions, commercialization and marketing. This is a secure job market for university graduates with degrees in social sciences and applied sciences such as engineering sciences and management. In this regard, it is considered a success to run social service programs and for the university to engage with the community in their development process, resource management for productive projects, and technical training extension.

The people with better living conditions are those with more than one economic activity. In Zinacantán, for example, there are drivers of public transport from the county seat to the nearest city who maintain their productive maize plot. Also noteworthy are the Zinacanteco women who are organizing to buy yarn for their traditional textiles and over time have received training in traditional medicine and midwifery, use of backyard resouces and women's rights to a life without violence. Having an income derived from the textile market has allowed them to be recognized within their families and in their communities as subjects with rights. When they were starting to organize women had to ask permission from their husbands.Now that they are involved in the family income they have no obstacles from their partners to attend training, even if they are in other cities or in other states of the Republic.

In summary, it is noted that poverty is seen differently depending on the social conditions of gender, cultural identity, territory and access to resources, even within the same municipality. Rural development programs should be targeted according to social participants and to address specific problems such as access to water, housing conditions, training in productive projects, reforestation and watershed management, community organization and the realization of economic, social, cultural, and environmentalrights.

The study suggested that public policy strategies with poverty indicators should be developed by the town and even by the community, and that they arepartial to better understand the problems and possible solutions. It is relevant to design development processes based upon farming families where there is also taken into account a diversity of gender and age.

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# CULTURAL

## BRIEFS

# ADDRESS BY DR. BELISARIO DOMÍNGUEZ, SENATOR FOR THE STATE OF CHIAPAS, PUBLISHED ON SEPTEMBER 23, 1913.

Mr. President of the Senate:

Being a most urgent matter for the health of the Homeland, I am forced to do without the usual formulas and beg you to start to serve this session, taking cognizance of this document and giving it to quickly to the gentlemen senators to know about. I insist, Mr. Chairman, that this matter should be known by the Senate right now, because in a few hours the people will know and I urge the Senate to know before anyone else.

Senators:

All of you have read with great interest the report by Don Victoriano Huerta to the Congress of the Union on the 16th of this month. Undoubtedly, Senators, that you as do I, have been filled with indignation by the amount of falsehoods contained in this document. Who is he trying to fool, gentlemen? The Congress of the Union? No, gentlemen, all its members are learned men who engage in politics, who are aware of the events of the country and not to be deceived on this point. It is intended to deceive the Mexican nation, to this country that relys on our honesty and our courage, and has put in our hands their dearest interests.

What should the national representation do in this case? Correspond to the confidence with which the country has honored us, to tell the truth and not let it fall into the abyss that opens up at its feet. The truth is this: during the government of Don Victoriano Huerta, not only was nothing was done for the sake of peace in the country, but the current situation of the Republic is infinitely worse than before: the revolution has spread in almost all of the states; many nations, before who were good friends to Mexico, refuse to recognize his illegal government, the depreciation of our currency is echoed abroad; our credit is in agony; the press of the Republic is gagged , or cowardly sold to the government and systematically concealing the truth; our fields are abandoned; many villages are razed and finally, hunger and misery in all its forms, threaten to spread quickly across the surface of our unfortunate country. To what is owed this sad situation ? First,

and before all, that the Mexican people cannot bring themselves to have the President of the Republic Don Victoriano Huerta, the soldier who seized power through treachery and whose first act to climb to the presidency was cowardly murder of a legally anointed president and vice president by popular vote; having been the first of these, who heaped promotions, honors and distinctions to Don Victoriano Huerta and being him, also, to whom Don Victoriano Huerta publicly swore unswerving loyalty and fidelity. And second, this sad situation is due to the means that Victoriano Huerta has proposed to employ to achieve peace. This means , you know what they were: only death and destruction to all men, families and people who do not sympathize with his government.

"Peace will happen whatever the costs," said Don Victoriano Huerta. Have you taken in, Senators, what those words mean in the selfish and ferocious approach of Don Victoriano Huerta? These words mean that Don Victoriano Huerta is ready to pour all of the Mexican blood, corpses to cover the entire national territory, to become an immense ruin the whole extent of our country, as long as he does not leave the presidency, or spill a drop of his own blood. In his mad desire to retain the presidency, Don Victoriano Huerta is committing another infamy; he is provoking with the people of the United States of America an international conflict in which, if it were to be resolved by force, they would stoically give and find death to all of the Mexican survivors of the threats of Don Victoriano Huerta, all but Don Victoriano Huerta, nor Don Aureliano Blanquet, because those bastards are tainted with the stigma of betrayal, and the people and the army repudiate them, if necessary.

That is, in short, the sad reality. For the weak spirits it seems that our ruin is inevitable because Don Victoriano Huerta has taken over so much power, to ensure the success of his candidacy for the Presidency of the Republic, in parody announced for the 26th of October elections, and has not hesitated to violate the sovereignty of most states, removing constitutional governors and imposing military governors who will be responsible to outwit the people through ridiculous and criminal farces. However, gentlemen, a supreme effort can save everything. Do your duty of national representation and the country is saved and

will bloom bigger, more united and more beautiful than ever. National representation should depose of the President of the Republic Don Victoriano Huerta for being him against whom they protest rightly all our brothers in arms and consequently, because he who can least make an effect on pacification, the supreme desire of all Mexicans. You will tell me, gentlemen that the attempt is dangerous because Don Victoriano Huerta is a bloodthirsty and ferocious soldier who kills without hesitation or scruple anyone who serves as a barrier. No matter, gentlemen! The country will require you to fulfill your duty, even with the danger and safety of even losing one's existence. If in our anxiety to return to the kingdom of peace in the Republic we have been mistaken, If we believed in the false words of a man that offered peace to the nation in two months and you have appointed him president, now that you see clearly that this man is an inept and wicked impostor, who leads the nation with full speed towards ruin, would you for fear of death tallow him to continue in power? Look within yourselves, gentlemen, and resolve this question: Would the crew of a large ship in the most violent storm and stormy sea, appoint a butcher as pilot who, without any nautical knowledge, sail for the first time and with no other recommendation than having betrayed and murdered the captain of the ship?

Your duty is imperative, gentlemen, and the country expects you to comply will full knowledge. Fulfilling the first duty, it will be easy to comply with national representation with the others that come from it, being requested at once all the revolutionary leaders to cease all hostilities and appoint delegates so that by common agreement, kill the president that should call presidential elections and take care that they have been effected quite legally.

The world is watching you, members of the Mexican Congress, and the country expects you will be honorable before the world, avoiding the embarrassment of having a traitor and murderer for president.

Sen. Dr. Belisario Domínguez Chiapas

# THE INFLUENCE OF THE LIFE AND WORK OF BELISARIO DOMINGUEZ

Silvia E. Álvarez Arana

Universidad Autónoma de Chiapas

Belisario Domínguez Palencia is one of those exceptional characters unfortunately known for only one of their actions, which of course is worth a thousand of any other well-meaning politician who tries to keep adequate moral conduct in our times, and this was to face the murderer and usurper of power, Victoriano Huerta, through his brave speeches in the Senate which he paid for with his own life.

However, the wake of a character like this cannot be summarized in a precarious manner. On the contrary, it is necessary to clarify some of the aspects of the life that defined this patriot, history showing that the attitude of Belisario Dominguez at the time urged the country to regain its dignity and honor. It was not simply an isolated, close to madness or desperate act, but rather the symbol of congruency in meeting such high values and principleswhich took precedence over his actions.

Why is it that such an important man for our identity as Chiapanssoes not have greater relevance in the cultural world, except for when the time comes to deliver the medal in the Senate of the Republic that bears his name? Why are his actions so poorly remembered among the young minds of a country so urgently in need of good examples?

Despite all the limitations, the image of Belisario Dominguez is still remembered as the only man who raised his voice publicly to encourage critical thinking, an example of what should never die in man, at the risk of one's dignity and subjugation of ones will as happened with most of the senators of the republic in that fateful year of 1913. The cowardly perpetrators of the tragedy gathered who stained with shame a country that had the need to rise from the ashes of the old regime left by inheritance.

Those traitors who wanted to recognize with highest honors an act that clearly was a stab in the back of the basic guarantees established in the Constitution, seeking recognition of the parties with the appointment as generals- Manuel Mondragón, Félix Díaz

and M. Velázquez- nothing more and nothing less than the men who materialized the military coup which culminated in the vile assassination of President Madero and Vice President Pino Suarez. It was SenatorBelisariowho was in the tribunal who refused to grant the military servicewho longed to reward their services. He considered that it was not a single real credit that was worth giving them for being generals of the republic and he challenged the opinion that the relevant committee had prepared.

But it all started from another trench, one that made him profess that man was free only when he could express what he thought without fear of being punished or intimidated. His fight for freedom of expression started very young as a consolidated effort in his newspaper El Vate- the proof that one man can indeed make a difference, especially when the purity of his ideals speaks for itself, which reflects his actions.

He constantly urged that was the duty of those who enjoyed intellectual preparation to establish newspapers to provoke the minds of citizens that ideas should undergo profound reflection, such as the note that he dedicated to the then governor of the state c. Rafael Pimentel who in good faith gave reason for his findings regarding the political situation facing the state, where he said, “What do you want us to play? Get to work *Chiapanecos*: to work. Establish in every city a newspaper to disseminate to the world the beauty of our state. “

He always took responsibility for his actions, promoting the idea that anyone could speak freely since the beginning of individual rights would be found by forcing the maximum freedom that humansmust act, coupled with the responsibility to maintain an order that allows for the building of the future of a nation that seeks to go in pursuit of progress. His philosophy became a habit, from which he exercised his reason and the persistent criticism that was exhibited in his newspapers.

However, we might ask, What is Philosophy? What is it good for? Can we live without it? These common questions we ask ourselves when we think about whether you need to create a way of thinking that helps us discern the everyday aspects of life, as Belisario had done. Thinking of the set of values and principles that define us as

individuals can make us wonder if it's really necessary to have such things, and it would be the same with ourattitude ifwe demonstrate that it is essential to study the principles of knowledge, systematizing the issues in the light of reason to propose a change.

And that is what he did when in the same letter he indicateserrors of good faith in which he felt that the governor incurred when the state changes to manage the resources contained in the coffers of public hospitals, a situation which prevented a reconstruction of the hospital that civil society had undertaken in Comitan and had reached the limit of being an intolerable mockery, "What remedy is there for such serious evil? Completely change your behavior, Mr. Governor; leave in your place the funds of the hospital and do everything you can in benefit of your state. "

If the republic is formed by a community of interests that sublime human association, it should be that the moral of our leaders that fosters the ongoing development of society. The values and principles that idyllically reign in our Constitution are structured to create a solid basis for a fraternal coexistence, directing the common growth.

However, as polls show consistently in modernity, confidence in the political leadership is narrowing. It is very clear that personal interests take precedence over the basic needs of a people who cannot even aspire to have knowledge of their rights.

Domínguez Palencia shows us that the matter has remained without changing significantly. He dared to encourage critical thinking:

> "Chiapaneco: the first measure that takes each of our Governors when arriving toChiapas is to believe that he is a favorite of Don Porfirio Diaz and that he carries absolute powers to manage and operate the State at will, and are you so innocent to believe him? Will you do some due diligence to correct it? Time is lost[...] Keep close watch over all public acts of your government leaders; praise them when they do right. Criticize them when they do wrong "(2013: 29).

Here the thought of a being with beliefs, which reports that we have rights as free men and which we must demand at all times, and the responsibilities and obligations as part of a society, and that we have an obligation to fulfill.

Belisario Domínguez was clear that rule was synonymous to serve, so he tells his countrymen "his only desire should be the welfare of the country." And if the petty rulers sin while striving to satisfy their interests, one from one's own position also falters by not taking the responsibility that we have, what we always have sought to encourage with phrases like "Chiapas must be very large, very rich and very happy. And it will be if each of your children knows to enforce their rights and fulfill their obligations. "

We can see that the legacy of Belisario Dominguez is larger than that series of speeches in 1913, one of them printed clandestinely and distributed secretly in the capital of the Republic through the intervention of a young 14-year-old daughter of an editor, whose name was María Hernández Zarco-an example of civic courage and how famous liberal ideas could be impregnated into the young minds of a burning desire for justice. That's how the publication and distribution of the copies was achieved of this important speech in the nation's history which notes the illegality and complicity of the political class, most of which had turned over for fear or affinity to support the traitor.

His humanist attitude, freely given medical advice, the distribution of free medicine to the needy from his pharmacy "The Fraternity," his simplicity and honesty, are all example of the attitude that human beings should aspire to meet fully to achieve the ideal of being a free thinker, straight and decent Human Being in every sense of the word.

Here is how the principles of a hero such as Belisario Dominguez came into popular consciousness of an oppressed class, the same that is reflected in the character of a nation that although it has not yet fully matured in its social transformation , is on track and has the potential to achieve the pathway towards improvement not only in material terms but also of ideas, which ultimately is what determines the level of maturity of a society despite the political implications that it carries.

Being a man of principles and moral values is a matter which should begin from childhood. His uncle, Pantaleon Dominguez, attended the site of the Battle of Puebla with a battalion of four hundred Chiapanecosto defend the homeland. His father, Don Cleophas Dominguez, would have a loss during a revolt with conservatives who wanted at all costs to maintain a centralized system contrary to federalism that they professed. In this environment, Belisario´s consciousness developed among men of conviction who knew no half measures in their political views. It was the future, equity and progress, or it was retreat to a way of life that no one could wish for.

Starting from a simple crib, work was part of his training. From a young age he sought education to the height of his intellect. When he attended the early grades of primary school, he showed a skill that had to be cultivated carefully. This is the reason that his father, at great sacrifice, sent his son to France to study with the best scientists of his generation.

There he had to cross the difficulties of a language that was foreign. His studies were not revalidated, so he began again in the Springer school. Willing to learn, he rallied in a few years what for others was a formal education and was finally able to pursue his school studies in theChavelerinstitution. The deprivation of the most distinguished pleasures helped save the lost time and he was finally able to attend the long-awaited medical career. With the recognition of his peers and teachers, he was able to graduate at age 26 as one of the most prominent students.

The responsible attitude of a young man who had nothing to lose in a remote and inhospitable land, it is remarkable because the will that was imprinted in him and his hunger for knowledge was reflected in the formation of an outstanding scientist, who was also aware of the responsibility that involved the efforts of his parents and the hope that was placed in him to fulfill the desire to have someone educated in the village, with whom to entrust your health.

While in France he witnessed the celebration of the French Revolution. He was a regular reader of liberal thinkers such as

Rousseau, Diderot, Voltaire and of course Balzac and Flaubert. But for those times when the third republic suffered, the fight of royalists against republicans , it was one of the moments in which he assimilated more political stances in favor of people's rights to choose the best way that suited their interests.

His return toComitan came after he allowed himself to learn about the great temples of virtue and science in Europe, which served to meet the organizational forms and customs of other cities and towns. His return to the land where he was received with a humble reception of family,which also predictedhis behavior in the same manner. His treatment was the same between the rich and the destitute, those who needed constant care and those who had a stomachache. Aware that they were human lives, he always knew to see them equal in brotherhood in all of its essence, and maintain a brotherly love that allowed him to be sensitive to the degree of feeling firsthand the injustices of the world.

It was logical that his attitude was recognized by his countrymen, who in 1911 taxed the physician with their unanimous vote for who directs the destinies of the town hall. A year earlier it would have exploded the powder keg of revolution, which would allow inertia to participate and win elections overwhelmingly, a sign that the new ideas were aired in the local population. Considering that it was the position from which he could influence a real change in the conditions of his people, his constant activity made him proposals for improving public administration, hygiene and sanitation, and even geometric plans for the realignment of the cemetery.

But it would be infighting between liberals and conservatives that would separate him from office. Being appointed political chief of Comitan, he had to quit the council. So history would place him in front of one of the most impressive historic moments of his life. In September 14, 1911 an armed revolution came to San Cristóbal that sought to ignore the government formed in the state. The military commander, chief of the rebel forces, Juan Espinosa Torres, addressed a letter to Belisario Domínguez in which, according to the sixth point

of the plan of rebellion, he was invited to join him and ignore Governor Manuel Rovelo Argüello.

In response to the request, BelisarioDomínguez would answer with a letter addressed to the mayor of Tuxtla Gutierrez, strongly requesting enough copies of the text to be distributed among the residents of the city. In that answer he not only refused to participate in such infamy, but further suggests that the head of the rebel movement arrange things in particular manner:

> "You're committing a crime that will make many others have made, and you will be responsible before God and the homeland for all of the blood of our brothers that will spill in the struggle. In order to resolve what city should remain the powers, I propose a duel between you and me. [...] Two pistols, one loaded and the other not. Each of us apply his gun in front of the other. Inevitably one of the two should drop dead, the powers remain in Tuxtla if you become alive and San Cristobal if I do "(2013: 35-36).

It wasn't the ingenious nobleman who launched into death in order to avoid unnecessary bloodshed. It was in the same way that was required two years after the resignation of Huerta- the unorthodox way of demanding ethical behavior which wouldl become a feature of the radicalism of Belisario.

In 1913 he was elected as an alternate representative to the Senate chamber by Chiapas. On March 3 of that year, the life of the Don Leopoldo Gout, incumbent senator was interrupted, which opened the doors of the chamber to Belisario. Given the recognition that it was necessary to occupy the space that was left open, Domínguez considered his duty to take his place by popular election that he had designated.

A few days before the inauguration, BelisarioDomínguezwas closely following the events of the Tragic Ten. There were the still very recent killings of aBasó and Gustavo Madero, the president and vice president, and the cameras were frightened and the occasion demanded a principled person who would not seek to satisfy their interests with political office.

From the beginning, Dominguez was noted for his ideas and quickly became part of the small group of disgruntled senators that somehow remained loyal to the revolution that had brought Díaz from power. These were the days when they were building the republic, and many things were at stake including popular sovereignty, democracy, institutions and the public peace.

Men who had fought to defeat the regime were either dead or forgotten. Very few could believe that any decent future was in store for Mexico under the political situation that had been strained by the influence of many actors, such as the General AurelianoBlanquet and the nefarious ambassador Henry Lane Wilson, who jumped at the opportunity to grow his arrogance of assuming that Huerta had his support and other generals were supposedly loyal to Huerta.

Senator Belisario Dominguez knew the need for real change in the political direction the country was taking. Moral principles at those moments were absent from politics and had to recover the only way they could, with the blood of a martyr who was willing to give his life for a decent future.

Another of the major lessons that Domínguez Palencia bequeathed to his countrymen was to sublimate common interests-Equality in the implementation of rights and obligations, freedom of thought, action and expression, brotherhood of human beings. He always saw that the political leader who had a responsibility to govern, had to govern himself before starting to govern ; To obey in order to lead; The sensitivity and simplicity of character.

Belisario was neither the expert speaker nor the fallacious rhetoric. He was the man of principle that acted because it is the way to indicate his consciousness, and he spoke belligerently highlighting what should be done the right way for the common good.Responsibility lay with national representation. In his State of the Union, Victoriano Huerta sought to institutionalize the most degrading and perverse farce that our historyrecords, and to top it he read his report while intoxicated, representing a mockery and disrespect for role that he pretended to have.

Rectitude, courage, wisdom and philanthropy was displayed by the pound in his speeches which are values that enshrine the effort, motivated by loyalty to the homeland, justice and righteousness. It was this manner that he showed when he responded to the senators on the State of the Union that Huerta gave to the Senate chamber. The speech reads as follows:

> Undoubtedly, Senators, that that same that has filled me with indignation is the culmination of the falsehoods contained therein. Who is he trying to fool, gentlemen? The Congress of the Union? No sir, all of its members are learned men who deal with politics, who are aware of the events of the country and are not to be deceived on this point. It is intended to deceive the Mexican nation, that this noble country, relying on our honesty and our courage, put our hands in their dearest interests (2013: 39).

And he asked the rest of the camera- What should theNational Representation do in this case? No more than correspond to the confidence with which the country has honored us, with what our fellow citizens have invested in usto tell the truth and not let them fall into the abyss opened at their feet. He expressed what he considered a truth, that during the government of Victoriano Huerta, not only had he not done anything for the sake of peace in the country, but rather the situation of the Republic is on the brink of a second revolution, and was infinitely worse than before.

The Revolution had spread to almost every state in the republic. Nations which were formerly friends of Mexico refused to recognize Huerta's government for being illegal. This caused the currency to depreciate abroad. Credits were in agony, because no one trusted the country. The entire press of the Republic, gagged or cowardly sold to the government, began to systematically hide the truth which was that the fields were abandoned, many towns that were considered his enemies were razed, and finally, hunger and misery in all of its forms threatened to continue spreading rapidly across the surface of the unfortunate country.

It was during these times that Venustiano Carranza began his political movements, protectedin the public ignorance of the illegal regime of Victoriano Huerta. The Congress of Coahuila did not recognize the Huerta government and on May26, 1913 appointed Venustiano Carranza as First Chief of the Constitutionalist Army known as Plan de Guadalupe.

Protests of all kinds would be made in Mexico City. On May 14th, Congress opposed the appointment of General Robles Juvencio as provisional governor of Morelos, the same that had been issued by Victoriano Huerta. It was this act of rebellion that would have the image of Belisario Dominguez shine again as a fervent opponent of irregularities that Huertaaimed to leave with impunity.

The reasons for this unfortunate situation was that the Mexican people could not bring themselves to have Don Victoriano Huerta as the President of the Republic to " keep guard over the power he seized through treachery, and whose first act to climb to the presidency wascowardly murdering the President and Vice President who were legally anointed by popular vote. " It should be noted thatit was Madero who in recognition of what he considered fair, filled promotions, honors and awards to Victoriano Huerta and it was this same Huerta who publicly swore unswerving loyalty and fidelity.

In addition and in according to his principles, the second point of this speech signaled before the media that Victoriano Huertablatantly lied. It was proposed to use any means to achieve peace and he had only managed to deepen the differences with other factions, such as the Zapatistas in the south who rose again against the usurper, waving their agrarian struggle. The only means that Huerta knew to employ were death and destruction to all men, families and people who did not like his government -"Because those bastards are tainted by the stigma of treason and the people and the army repudiate, if necessary" .

What should happen in the organization of the country so that, those who are considered of weak minds, should see an inevitable ruin coming even worse than what was prompted by the departure of Don Porfirio Diaz. It was Victoriano Huerta took over much of the power,

on the edge of an absolutism which provided for the elimination of his enemies in order to insure the success of his candidacy for the Presidency of the Republic, as Belisario saw as "a parody of elections announced for the next October 26th." In this speech he emphasized that the usurper did not hesitate to violate the sovereignty of most states, removing constitutional governors and imposing military governors who would be responsible to outwit the people through ridiculous and criminal phrases. These were the words he used, betting that they could reach the consciousness of his fellow senators and rescue the country:

> However, gentlemen, a supreme effort can save everything. Do your duty so that the National and Homeland Representationis saved and will bloom bigger, more united and more beautiful than ever. The National Representation must depose of the President of the Republic, Don Victoriano Huerta, because he is the one that was protesting against with good reason all of our brothers in arms and consequently, because he is the one who can least effect pacification, the supreme longing for all Mexicans (2014: 67).

And knowing the fear that his words aroused among the weak of character who preferred to keep their privileges to reset the balance inherent to the minimum guarantees of legality, these consciences snappedto do their civic duty and compensating the error to support Huerta :

> You will tell me, gentlemen, that the attempt is dangerous, because Don Victoriano Huerta is a bloodthirsty and ferocious soldier who kills without hesitation or scruple to anyone that serves as an obstacle. No matter gentlemen! The country will require you to fulfill your duty even with danger and the safety evenof losingone's existence. If in our anxiety you believed the false words of a man that that offered peace to the nation in two months, and you named him president of the Republic, now you see clearly this man is an impostor- inept and evil-leading the country with all speed to ruin-will you let him for fear of death, that he may continue in power? (2014: 67)

Finally he launched the provocation that earned him the wrath of Victoriano Huerta, when he concluded his speech by saying that "The

world is watching you, members of the Mexican National Congress and the country, and it expects that you will honor before the world, avoiding the embarrassment of having as a president a traitor and murderer" These words were repeated widely by national and international media a week after his disappearance had been confirmed.

On the night of October 7, 1913 he was taken from his room in the hotel where he was staying and where he also conducted regular meetings with other senators and representatives, not to conspire against the government, but rather to discuss the injustices that were committed and the most prudent way they could provide a decent solution to the political situation that existed. It was also where he introduced his companions the speech that he thought to pronounce and publish, and where he received warnings that this speech could well cost him his life.

He was taken by the special police to Xoco Cemetery in Coyoacan, where he was martyred and cruellymurdered. His executioners, Gilberto Márquez, Alberto Quiroz, José Hernández Ramírez and Gabriel Huerta, buried the corpse and paid the gravedigger with the money he had with him, erasing the traces of their crime by undressing and burning their clothes. Dr. AurelianoUrrutia, a declared enemy of Belisario Dominguez and loyalist to the regime, was the one who cut the Senators tongue out of his corpse and sent it as a "trophy" to his friend Victoriano Huerta.

After several inquiries from the senators, relatives and friends of the doctor, the true facts were discovered. The political faction composed of Chiapas representation, demanded that the Attorney General investigate the whereabouts of Senator Dominguez since several days had gone by.

Surprisingly, at the request of the Chamber of Deputies and at the insistent request of the delegation from Chiapas, an investigationwas ordered to First Judge of Instruction, Alberto Rodríguez Arréchiga, to perform the corresponding procedures.

After an extensive research, he managed to solve the crime, ordering the apprehension of the perpetrators, an exhumation and autopsy of the cadaver which revealed the atrocities that were committed against the senator. The truth was known and outraged a large fraction of the political class. Coupled with the increasing mobilization of the revolutionaries, this provoked the acceptationof the resignation of the usurper, who was exiled in Europe and was later arrested in the United States and died in prison in Texas.

His murder was a decisive factor in the fall of the Victoriano Huerta regime, who a few days afterwards dissolved Congress and jailed 90 of its members who had stated that they would move the powers to a place that  the constitution guaranteed, and were truly respected.

Today the legacy of Belisario Dominguez encompasses much more than a heroic attitude. The need for people to moderate and be the ones that determine their own destiny were part of the philosophy that constantly drove him. For the *Chiapaneco*, social transformation through an intellectual revolution was the privilege that held thought before action.

The analysis of society through the use of mass media, served to reframe and reclaim popular causes. His call to action corresponds to the capacity for indignation, the same that leads to reflection on the optimization of the effort and the accuracy of the observation.

The life of Belisario Dominguez does understand that it is first necessary to transform in order to educate humans. To think is to achieve this transformation and reach higher levels of achievement. The fusion of science and virtue in his conscience led him to rise far above the political class, transforming it into a champion of rights and justice.

What impact did Belisario´s values bequeath to modern society? Certainly education is part of the problem that shows the ignorance about the figure of this man of action. His complete consciousness that actions are the result of a meditated response to a need that

transformsthe social landscape, simplifying social relations and solving needs, then the lines of scientific thinkingcontinueto involves accepting a philosophy of thought.

The search for the reasons that ledBelisario to his own immolation, based on the facts and the answer to the question that arises when one asks- what is the way I conduct myself in life? There is no other answer, the path is one way for humanity and represents one of the preferred ways to achieve progress and dignity in life, because as Marcos Enrique Becerra would say-"Nothing gives more strength to man, than the certainty of the reason." In the case of being able to respond from the depths of consciousness, this will lead us to renew the social compact that requires us to have an ethical and moral behavior, for the simple fact of being right.

If we ask, for the aggravating situation that our nation is kept, for if his example alone is enough to motivate a change, it is necessary, first of all, to remind society of the value of their actions. The first world societies tend to participate collectively in the education of children and youth under progressive thinking- the pursuit of knowledge that helps develop the necessary improvements in society, rejecting the formulation of dogmas that only disrupt the free search for the best conditions.

If little by little the gradual revelation of the life and work of Belisario continues, we will notice how his impact will be with the new generations, as young minds are responsible for creating alternatives to the big problems we face, such as hunger, overpopulation, rapid climate change, the systematic destruction of nature and the environment and corruption. A good example is worth more than thousand words.

While our education system is focused on the formation of automats and technocrats, is the obligation of parents to strengthen their children with a quality education, allowing the stories that permit them to feel the possibility that they themselves can make their own observations and analysis, to enable and reach conclusions that will give them a philosophy aimed at developing one's own thought- allowing them to assume duties as the voting responsibility, participate

in collective decisions, be part of a movement that encourages social interaction and not conversely ,dehumanization. They must learn that it is possible to contribute to the transformation of society and its ideas. That is isn't an effort that can be considered useless.

Currently the education of Mexicans focuses on the formation of automatons who know perfectly how to perform technical work, but ignore the way in which to solve problems that arise spontaneously in a work environment. If we follow the example of the attitude of Don Belisario Dominguez, an orderly and responsible society would focus on finding better ways of living. Instead, we are educatedto follow orders without taking into account that we also have the ability, like any human being, to be entrepreneurs, to offer alternatives and to change things. All we need in order to discover that this awareness lies within us is an example.

Resignation is a constant product of this system, which is observable in everyday action of society that is more concerned with its survival than in its formation. Belisario fervently fought this resignation, and it was his initiative that led to the acceleration of change in the nation.

He also showed us that we must include the arts and culture as keys to the creation of critical and creative thinking. The motivation to reach solutions to problems affecting society comes from a rational exercise that brings into play more than square structures of thought. Belisario bequeathed the example of the fusion of skills and abilities can be achieved in the training of men.

Humans need to know our environment and recognize it the thought of Belisario Domínguez should encourage Chiapanecos to stimulate the growth of society. His legacy consists of the pursuit of knowledge and is and will be the guiding principle of human needs to understand his surroundings, including oneself. This self-knowledge is the key to acquire the values and virtues that men need to assimilate to truly influence the social entity.

There is no lacking of those who denounce ideas and who qualify them as utopian.However in reality it is the truth of a man that shows us to be able to build in itself and influence those nearby, with the finality to bring about change.

Perhaps it is enough to help the sick or the needy in order to re dignify society? It has always been wondered what if anything could prevent the weak and needy if they saw the mocking by the wealthy classes and the higher authorities? Today we could ask the same question, knowing the answer takes us away from his teachings.

Therefore, we can only be free, by free speech. For while there are those who suffer injustice firsthand, they will be few laws that enunciate rights. However we can begin to express what we think and what we see as wrong andcompensate for it. With the help of Ernesto Mandujano, Herlinda, sister of Dr. Dominguez, permission from the Central Departmentwas obtained to exhume the remains ofBelisario Dominguez and move them toComitan, where they were interred in May 1938.

Finally, by decree of the president, Adolfo Ruiz Cortines, in January of 1953 the Belisario Domínguez Medal was created, for the conduct of those deemed by the Mexican Congress of the Union of those that deserve public admiration. It is also noteworthy to mention that the first medal was placed on the bronze bust of Dr. Belisario Domínguez Palencia.

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