

DUAL VULNERABILITY AMONG FEMALE HOUSEHOLD HEADS¹

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Abstract

This article investigates the impact of women's double vulnerability, the social and environmental vulnerability that makes them household heads, and the processes that enable them to overcome vulnerability and empower themselves at the local level. An empirical study conducted in the Yautepec river basin in the state of Morelos in Mexico explores the impacts of climate change and socio-environmental migration on this rural population. The study combined quantitative and qualitative methods. In the context of the concept of dual vulnerability, environmental and social, the research analysed the relationship between environmental degradation and adverse social conditions, and an Index of Social Vulnerability was developed. The research results showed that when families are faced with a survival dilemma, men migrate, leaving women overburdened with a workload which leads to illness and malaise. At the same time, having assumed the role of household head with all its productive, caring and educational activities, women become empowered. They become involved in local public activities and are able to break up existing corrupt male chiefdoms. In conclusion, the study found that the feminization of agriculture and local public services had allowed women to recover eroded land thanks to organic farming, and to improve public services in their communities.

Key words: Climate change, social and environmental vulnerability, environmental perception, female household heads, migration, malaise, illness, empowerment.

LA DOBLE VULNERABILIDAD ENTRE MUJERES JEFAS DE HOGAR

Resumen

Este artículo investiga el impacto que ha tenido la doble vulnerabilidad, la ambiental y la social, en las mujeres transformadas en jefas de hogar, cuando sus parejas han emigrado y los procesos que les han permitido superar su malestar y empoderarse a nivel local. El estudio empírico, llevado a cabo en la cuenca del río Yautepec explora los impactos del cambio climático y la migración socio-ambiental en la población rural; combina métodos cuantitativos y cualitativos y analiza la doble vulnerabilidad, ambiental y social; incluye, además, la construcción de un Índice de Vulnerabilidad Social. Los resultados arrojaron que ante un dilema de supervivencia, el jefe de hogar emigra frecuentemente, dejando una sobrecarga de trabajo, lo que provoca malestar a su esposa. No obstante, al asumir la jefatura del hogar, varias mujeres se han empoderado y han incursionado además en cargos públicos locales, donde han tenido que romper cacicazgos que se encontraban en manos de hombres corruptos. Como conclusión, se encontró que la feminización de la agricultura y los servicios públicos locales han permitido a las jefas de hogar recuperar suelos erosionados, gracias a la agricultura orgánica; a la vez, varias mujeres han mejorado los servicios públicos en sus comunidades.

Palabras clave: Cambio climático, vulnerabilidad social y ambiental, riesgos ambientales, jefas de hogar, migración, malestar, empoderamiento.

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A DUPLA VULNERABILIDADE ENTRE MULHERES CHEFES DE FAMÍLIA

Resumo

Este artigo investiga o impacto que vem tendo a dupla vulnerabilidade, ambiental e social, nas mulheres transformadas em chefe de família, quando seus companheiros emigraram e os processos que lhes permitiram superar seu mal-estar e empoderar-se a nível local. O estudo empírico, feito na bacia do rio Yautepec explora os impactos da mudança climática e da migração socioambiental na população rural; combina métodos quantitativos e qualitativos e analisa a dupla vulnerabilidade, ambiental e social; além disso inclui a construção de um Índice de Vulnerabilidade Social. Os resultados mostraram que diante de um dilema de SOBREVIVÊNCIA, o chefe de família emigra frequentemente, deixando uma sobrecarga de trabalho, o que provoca mal-estar na sua esposa. Não obstante, ao assumir a chefia do lar, várias mulheres se empoderaram e além disso começaram a ocupar cargos públicos locais que, encontravam-se nas mãos de homens corruptos. Como conclusão, encontrou-se que a feminização da agricultura e dos serviços públicos locais permitiram aos chefes de família recuperar solos erodidos graças à agricultura orgânica; e ao mesmo tempo, várias mulheres melhoraram os serviços públicos das suas comunidades.

Palavras chave: Mudança climática, vulnerabilidade social e ambiental, riscos ambientais, chefes de família, imigração, mal-estar, empoderamento.

INTRODUCTION

This article analyses dual vulnerability among women heads of household who are solely responsible for their families either because of abandonment by their partners or because of migration. The deterioration of natural conditions related to global environmental change (GEC) has affected soil fertility, water availability, air quality and climate, with an important loss of ecosystem services and biodiversity. This environmental vulnerability reinforces social conditions of high marginalization, where the lack of social and human capital is triggered by the absence of public services, poor education, gender discrimination and government neglect.

When a family faces a survival dilemma (Brauch 2008), many men and adult children decide to migrate, leaving a heavy workload to the women left behind. Socio-environmental, economic and social pressures, the management of agricultural production, the raising of school-age children, the care of their parents and sometimes parents-in-law all create discomfort (Burin et al., 2000) among these women heads of household. They combat their malaise with anti-depressive or anti-anxiety drugs. Dealing with the new roles within the family and the production process, however, presents these women with the opportunity for intense social learning and the possibility of empowering themselves. They have not only learned to manage their home and agricultural production, but have also become involved in local public activities through, for example, becoming president of the Water Committee, or of the Committees for the Primary or Secondary School or the Public Transportation System in their village.

The central focus of this article is an analysis of how this dual environmental and social vulnerability impacts

on their role as head of household and of which processes enable these women to overcome their discomfort and empower themselves at the local level.

Faced with these contradictory processes of discomfort and empowerment, this paper makes an empirical study of environmental vulnerability in the transect of the Yautepec River Basin (YRB) within a framework of global environmental change (GEC; Brauch et al., 2008, 2009, 2011). It focuses on the rural areas of the basin and provides a representative study of a population of 298,054 inhabitants, located in the central part of Mexico (figure 1). The entire basin covers an area of 1,249 km² and has a difference in altitude of 4,592 m, making it prone to disasters and erosion. There are two main ecosystems: in the Altos (highlands) the pine-oak forest, and in the lowlands the tropical deciduous forest (Oswald and Jaramillo, 2012). After a steep mountain area with a high level of erosion, the transect joins the floodplain of the central valley with chaotic urban development and irrigated agriculture where mostly vegetables and sugar cane are produced. The study area finally reaches the Sierra Madre del Sur, with a deciduous forest ecosystem with wide loss of plant cover (Duran, 2010; Arias et al., 2002) and therefore loss of natural fertility of the soil and desertification.

The research area of the YRB covers four municipalities in the state of Mexico (Juchitepec, Atlautla, Ozumba, Tepetitla), nine in Morelos (Totolapan, Tlalnepantla, Tepoztlán, Tlayacapan, Atlatlahucan, Yautepec, Tlatizapan, Tlaquiltenango, Jojutla), and a small part of the mountain area of Milpa Alta in Mexico City. In hydrological terms, the YRB begins at the glacier of the volcano Popocatepetl (5,452 m) in the state of Mexico and receives dozens of tributaries and springs from the neovolcanic axis. The volcanoes of Popocatepetl limit the basin of the Metropolitan

Valley of Mexico City in the east and the Chichinautzin (3,476 m) in the west. A third group of tributaries rises in the Tepozteco National Park. Along with dozens of small intermittent tributaries, these three sub-basins converge in the Yautepec floodplain. All these rivers also recharge the aquifer of Yautepec-Cuautla, and supply the metropolitan region of Cuautla, the second largest economic region in the state of Morelos, with groundwater.



Figure 1. Location of the study area (Field research, CRIM-UNAM, 2010-2012).

This region with its complex environmental conditions has also been affected by various socio-economic crises related to the neo-liberal model developed following the economic meltdown of 1976. With the coming into force of the North American Free Trade Agreement (NAFTA) in 1994, subsidies for small farmers were reduced and Mexico imported massive amounts of cereal grain from the United States, making it impossible for Mexican peasants to compete with international subsidized prices. In 2012, Mexico became the major importer of corn (maize) in the world, with 10.8 million tonnes. Turrent Fernández et al. (2012) proposed reviving corn production among rain-fed farmers through government support, extensionism and small irrigation projects in the south and south-east so that Mexico could regain its self-sufficiency in maize.

Because of these conditions for agricultural production, rural poverty in the region is very high. Only 13.6 per cent of people are not poor, usually immigrants from Mexico City who have transformed their weekend houses into permanent homes in the YRB. A further 44.7 per cent live in conditions of very high or high marginality, and 41.7 per cent in conditions of medium marginality. These difficult living conditions have transformed the migration dynamic. While in 1990 49.7 per cent of the population migrated internally into towns, in 2010 this rural-urban migration fell to 36.5 per cent due to the difficult socio-economic and security conditions in the cities. On the other hand, international migration, mainly to the US, has increased

over the same period from 0.96 per cent to 12.4 per cent, so that in the entire basin 49,000 inhabitants are working in the US, mostly illegally. There are communities in the Sierra Madre Sur where most families have at least one migrant in the US. These data clearly demonstrate the dual environmental and social vulnerability of people exposed to the impacts of global environmental change (GEC) and regressive globalization processes.

Conceptualization of dual vulnerability in the context of global environmental change (GEC)

Conceptualization of dual vulnerability interrelates environmental and social factors in a scenario of GEC and regressive globalization (Held and McGrew, 2007; figure 2). Pollution, climate variability, loss of natural soil fertility, and the destruction of the biodiversity which has sustained ecosystem services have aggravated disasters locally and regionally, but have also generated conflicts over access to natural resources. Difficult natural conditions deteriorated further through chaotic urbanization, the opening up of international imports of agricultural products without protecting farmers, and periodic economic crises (1976, 1982, 1988, 1994, and 2007–8). Lack of money and of local job opportunities has produced a survival dilemma in many homes. In the region, the lack of local opportunities has forced many families to send one or more members to work in the cities or to migrate to the US. Women have thus been left behind as heads of household and have become responsible for economic and educational activities and agricultural production, besides taking care of the extended family.

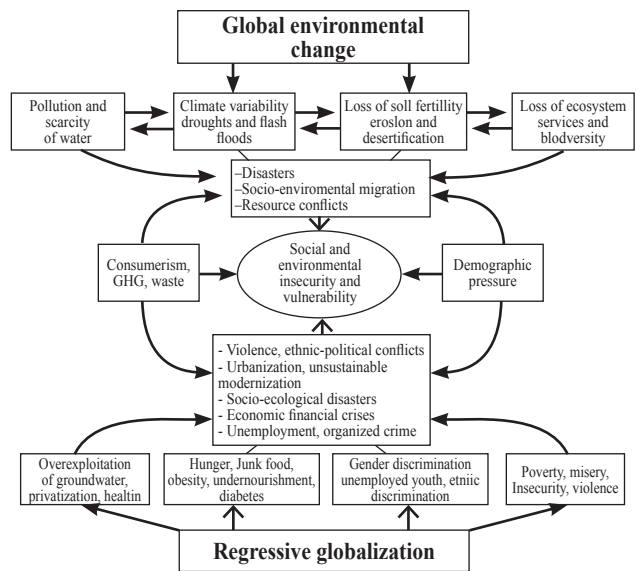


Figure 2. Dual vulnerability (Transformed by the author from Böhle, 2002)

Regarding the concept of dual vulnerability, environmental deterioration is linked to the atmosphere (physico-chemical changes, climate change), the hydrosphere (rivers, lakes, seas, groundwater and wetlands), the lithosphere (soil, geological plates, minerals, sea floor and mountains) and the biosphere (vegetation, wildlife and ecosystems). Moreover, the negative socio-environmental and productive effects on natural resources and human beings in the Anthroposphere² are caused by humankind. The process, recognized and scientifically evaluated, is related to climate change (CC). According to the Intergovernmental Panel on Climate Change (IPCC, 2007, 2012, 2013), the direct effects of CC include increases and greater variability in temperature (heat and extreme cold). Less rain and more heat accelerate the desertification process, resulting in a loss of natural soil fertility and biota. The loss of ice in the polar regions and the glaciers produces a rise in sea level which exacerbates coastal erosion and causes seawater intrusion into the aquifers. Warmer seas and sea level rise increase the amount of moisture in the atmosphere and generate more and stronger cyclones and droughts. Both phenomena are becoming more extreme (IPCC, 2012, 2013), and in Mexico and Central America extreme events have also occurred more frequently.

METHOD

Methods and instruments of research

The empirical study was carried out between 2009 and 2012. Quantitative methods were combined with qualitative studies. After initial field visits, the background studies were systematically assessed, government statistics were analysed, and the study area was mapped with the help of cartographers. Between March 2010 and April 2011, a quantitative survey using random sampling (table 1) was undertaken in the YRB. Based on these quantitative data, we constructed a Social Vulnerability Index (SVI) and an Environmental Perception Index (EPI; Cruz & Oswald, 2013). These data were supplemented with qualitative data from interviews, focus group discussions, participant observation and analysis of social movements (Oswald, 2013).

Table 1

Representative survey in the YRB.

Phases of survey	Persons	Families	Percentage of women
First phase	1,440	385	49%
Second phase	2,515	634	51%
Total	3,955	1,019	50%

Note: Field research, CRIM-UNAM, 2010–2012.

Later, in-depth interviews with local leaders, politicians and key people in the communities and in the state of Morelos were undertaken and the results from both quantitative and qualitative data were discussed with the communities. During the fieldwork, participant observation from anthropology was systematized, five focus group discussions were conducted, and different participatory rural studies on special themes such as desertification, garbage management, water scarcity, migration, and governmental support were undertaken. We also explored local social movements and developed comparative regional studies of the processes of adaptation and resilience that women heads of household had developed when, in the absence of their partners, they were confronted with floods, droughts and soil desertification.

Additional studies were carried out in four communities where specific migration processes were represented. In these localities the survey was applied to the entire community and not just to a random sample. The first community, called Nicolás Zapata, is located in the Highlands (on the slopes of Popocatepetl). It is a community of peasants who were deprived of their land by the local municipal government of Tototlapan following the revolution. Now this locality is struggling at least for recognition as a community, which would allow it to receive basic public services, even though the peasants may have lost their farmland and forests. Because of the lack of jobs and the extreme poverty, many of these residents work as migrants commuting to the metropolitan area of Mexico City. But they return every night so that they are aware of the governmental procedures for the legalization process of their village. Existing violence is the other reason for return. In the same municipality, La Cañada is an indigenous community established before the arrival of the Spaniards, where pre-Hispanic traditions are combined with modern agricultural practices. There is strong social integration and communal support for obtaining basic services, roads and government support. In the existing adverse environmental conditions farmers have changed from basic crops (maize and beans) to the production of tomatoes and recently, due to the lack of water, to cactus (nopal). The third community, El Pañuelo, is located in the irrigation area of the central valley. It is an indigenous community of immigrants from the state of Guerrero, established twenty-five years ago. These indigenous people have escaped the extreme poverty and violence in the region of the Mountains of Guerrero. The inhabitants of El Pañuelo work as agricultural day labourers and low

² The concept of the Anthroposphere was coined by Paul Crutzen (2002). It relates to the environmental changes produced predominantly by human intervention in the earth system since the industrial revolution, but especially the previous five decades due to the intensive use of fossil energy and the rapid increase of greenhouse gas emissions into the atmosphere, and the pollution and warming of the seas.

wages force many men to migrate to northern Sinaloa where they collect vegetables; a few migrate to the US. Finally, the *ejido*³ Lorenzo Vázquez is located in the Sierra Madre del Sur. Soils are largely eroded and desertified and there is little water and no employment in the locality. The adverse environmental and social conditions have forced many families to send at least one member to the United States. These four communities represent four different migration processes: pendulum, no migration, internal migration twenty-five years ago with temporary internal migration, and illegal international migration into the US.

Participants

The composition of the research group was multidisciplinary, involving anthropologists, psychologists, demographers, sociologists, political scientists, medical doctors, ecologists, hydrologists, agronomists and educators. The survey was carried out by high school students from the local cities and communities. Each questionnaire was carefully reviewed and supplemented if errors or missing data were found. The survey was supervised by the members of the project. Similarly, comparative regional studies were conducted on the processes of adaptation and resilience that women heads of household had developed, in the absence of their partners, when they were confronted with floods, droughts and soil desertification. Local workshops organized by project members successfully supplemented missing or unclear information. At the same time, we studied the feminization of agricultural production, changes in the migration processes, the transformation of the local and regional economy, and changes in crops, as well as strategies for mitigating the lack of water and the empowerment of women as heads of household.

Procedures

The research was divided into three phases. During the first year, the research team collected the regional and thematic studies and examined the available government statistics on demography, health, economy and agricultural production. Special attention was paid to the economic crisis since 2007 which had resulted in a reduction of remittances and the expulsion of illegal migrants from the US, as well as to the impacts of extreme hydrometeorological events. These data were translated into maps and were supplemented by aerial photographs and satellite images, in order to enable us to understand the changes in ecosystems and land use in the YRB. A permanent seminar with all the participants permitted the integration of data from different disciplines

and scientific methods. During the second year the survey was conducted with closed and semi-open questions, complemented with in-depth interviews with the water authorities, civil protection, schoolteachers and religious authorities. We also investigated the life stories of migrant families and families who had been forced to return from the US. In this phase we studied environmental vulnerability (water, soil, erosion, sedimentation, biodiversity loss, land use change and ecological reserves) and private investment and public policy on land planning and environmental issues. A comparison using different maps provided an understanding of land use changes and ecosystem deterioration. In the third year the various data were integrated and special studies of physical deterioration of the soil and government agricultural projects were made, and the SVI and EPI were developed; we also studied the social practices of local movements. Furthermore, an epidemiological profile was established and we examined the changes over the last three decades in morbidity and mortality in the region, where the increase of dengue fever was the most important change. Through focus groups, we also explored the impacts and options for subsistence farmers.

Different participants took part in local workshops where we taught them how to compost organic waste and recover eroded soils, water purification processes, traditional medicine, the use of local herbal medicine, the reuse of grey water in gardens and the how to protect themselves from extreme hydrometeorological events. In conjunction with the Peasant University of the South (Unicam-Sur), a diploma course on "Safety for All" was attended by several key informants and this was able to consolidate their knowledge of GEC. With the support of the local authorities, of business people and of people affected by disasters, we developed a thematic map that visualizes environmental and social vulnerability in the basin, and we put forward policies and activities that could protect the local population, in particular women and girls, from the existing adverse socio-environmental conditions.

RESULTS

The high population density of 364 persons/km² in the state of Morelos, in second place only below Mexico City and the state of Mexico, is the result of favourable climate and environmental conditions. For over a thousand years Xochimilcas and Tlahuicas had developed an irrigation system in the Valley of Yautepec, where they produced corn, cotton, chillies, beans, tomatoes and other fruits and vegetables

³ Ejido is the land that was given to the peasants after they took part in the revolution and later struggled for their land rights.

(Maldonado, 1984; Mentz, 2008). The long-standing human impact on fragile environmental conditions in an area of steep slopes, a long dry season, a monsoon from June to October which supplies rain-fed agriculture with water and recharges the aquifers, meltwater from the high volcanoes, and more recently climate variability and change has led to a severe deterioration in natural environmental conditions. Half of the territory of the YRB is occupied by agricultural fields, livestock and urban development. Some 89 per cent of the natural cover has been deforested, so that only 11 per cent of original forest remains undisturbed (table 2).

Table 2

Land use changes in the YRB.

Land use	Area (km ²)	Percentage
Agriculture	634.6	50.7
Grassland/livestock	68.3	5.5
Secondary vegetation	372.2	29.7
Forest	112.1	9.0
Dry tropical forest	24.6	2.0
Urban	22.7	1.8
Without vegetation	9.1	0.7
Bodies of water	4.4	0.4
Desert scrub	1.5	0.1

Note: Field research, CRIM-UNAM, 2010–2012.

Deforestation, erosion, extraction of timber and soil, and land and water pollution by agrochemicals and human or animal waste have increased environmental vulnerability in the basin (Oswald & Jaramillo, 2012). In addition the region is highly impacted by climate change and increased variability in rainfall patterns, so that rain-fed agriculture has been reduced from 10,000 ha in 2009 to less than 9,000 ha in 2012. Lack of water and irregular rain have forced subsistence farmers from their lands, both in the highlands and in the Sierra Madre del Sur. The pressures caused by floods, drought and more irregular midsummer (inter-aestival) drought have severely affected the crop cycle and crop yields. When the harvest has failed for several years so that the seeds for the next cycle are lost, members of some families will take the decision to emigrate in order to mitigate conditions of extreme poverty (Oswald et al., 2013). Irrigated areas in the central valleys have not been affected by these climatic variations, and 43,000 ha have still been planted every year during the last decade. Irrigation therefore represents an effective adaptation strategy in a region with less predictable rainfall.

Besides the changes from forest to agricultural and urban land use, flash floods have increased in the basin, and

both these problems have been aggravated by the erosion of tributaries through excessive logging in the Highlands. These processes have limited infiltration of rainfall and increased extreme floods. While in 1985 floods causing several deaths were still considered by the elderly to be an event that only occurred once every hundred years, in 1998 (a severe Niño year) Yautepec was flooded to a depth of 2.4 m, and in 2003 to 1.8 m. Since 2010, the town and communities in the plain have been flooded every year, and twice in 2010, when at the entrance to Yautepec the river rose 21 m in less than half an hour and flooded the municipality and the communities downstream. The city and the fields were flooded three times during 2013, but disaster was prevented through an efficient early warning system, dredging of the river and reinforcement of the river banks. Thirteen per cent of people complained of an excess of water, whereas fifteen per cent complained of a shortage of water. Other issues complained about were longer periods of drought (30 per cent) and irregular rains (42 per cent), in a region where warm temperatures and extreme cold in the Altos attest the impacts of climate change (INECC, 2013).

When it comes to risk perception, 62 per cent of inhabitants feared a lack of water, 26 per cent floods and 12 per cent crop losses. Regionally, there were differences in risk perception: in the mountains, all the inhabitants feared lack of water, while on the plain over half were afraid of flash floods, and in the whole basin 12 per cent mentioned the loss of crops.

When asked about the conservation of natural resources in the basin, 45 per cent reported that no resources were conserved, 22 per cent referred to good quality of air, 20 per cent to water and 13 per cent to forests and rivers. These perceptions were altered when people in the valleys, where natural resources are different, were interviewed. In the Altos there is better environmental conservation, especially in the protected national parks. Among the most serious environmental problems mentioned in the YRB were waste (33 per cent), lack of water (28 per cent, Altos), air pollution (15 per cent, especially around the sugar cane factory in Zacatepec); 20 per cent mentioned other environmental problems such as the invasion of natural areas, hunting and clandestine logging, and the degradation of ecosystem services. This environmental vulnerability directly triggers social problems. With no clean water and when there are crop failures a family loses its income and cannot be fed. In addition, the absence of income from agriculture increases poverty and increases social vulnerability.

The dual vulnerability—environmental and social—affects the study area through the loss of biodiversity, which is related to the deforestation of pine-oak forests

and especially of the deciduous forest (Maldonado et al., 2004; Arias et al., 2002; Rzedowski, 1973) and which also limits access to ecosystem services. Because of this environmental deterioration, the rural population has lost a major support from natural resources, and this is creating additional pressures on social aspects of life, especially with the decline in hunting and gathering of plants, fruits and roots. The loss of corn crops and pasture for livestock, together with extreme hydrometeorological events related to climate change and variability (floods in low-lying fields and recurrent droughts) (INECC, 2013), means that people have gradually lost the physical support that allowed them to live a productive existence, however precariously. Environmental vulnerability has also exacerbated local conflicts over the control of water and access to irrigated land and wells, in a situation where traditional relationships have facilitated corruption and allowed local chiefdoms to grab these resources. Finally, the still relatively high fertility rate in rural populations has forced young people to seek livelihoods in cities and outside the country, increasing the social vulnerability of those left behind. For example, in Lorenzo Vázquez (Sierra Madre del Sur), two-thirds of the families have at least one immigrant in the US.

This has increased the social vulnerability of the disadvantaged, an increase exacerbated by the country's global socio-economic situation.

Furthermore, Coneval (2013) indicates that nationwide 53.4 million (45.5 per cent) of the population are living in poverty, 7.2 million without income, and 11.7 million in extreme poverty.⁴ Half of the population lacks access to health services, 28 million are hungry, 23.2 million are educationally backward, and 17.1 million lack a home of decent quality. Hence only 23.2 million people (19.8 per cent) do not suffer any disadvantages (Coneval, 2013). The situation of children and adolescents is a particular concern, with 53.8 per cent (21.4 million) in poverty, of whom 5.1 million are living in extreme poverty, 9 million with social deprivation and 2.9 million with no income (Coneval, 2013). Of the 20.2 million young people in 2013,

7.34 million (OECD, 2013) are also considered as “Ninis” (neither study nor work). Youth unemployment stands at 44.7 per cent (ILO, 2013). Those between 20 and 24 years old form the most vulnerable group; 1.31 million young people were without jobs in December 2012 (INEGI-ENOE, 2013). This group of young people is highly exposed to involvement in organized crime. The situation among college graduates is particularly difficult: only 70 per cent have found jobs, and of these only four out of ten have a job related to their studies.

There is no doubt that environmental and social vulnerability have increased especially among social groups that depend on natural resources for their survival (rain-fed peasantry affected by climate change). The concept of social vulnerability (SV) refers to the possibility of exposure to natural and social events with little capacity or resilience to prevent, recover from or adapt to deterioration of socio-environmental conditions, extreme meteorological events, or socio-economic crises (Oswald 2011). SV is triggered by the fragility of communities and by environments that are exposed to disasters, either through their risky location (by river beds or on steep and deforested slopes) or through their limited physical and social resistance. SV includes socio-economic fragility, high levels of marginalization, worsened environmental conditions (logged forests), and little socio-economic cohesion or political organization.

Villagrán (2006: 12) distinguishes between *socio-environmental perspectives* related to the lack or inadequate management of the natural environment; *theories of empowerment*, where SV prevents people with low education from optimizing existing resources, demanding their rights and improving their living conditions (see El Pañuelo); and *political-economic phenomena* related to inequality, class structure, mechanisms of exploitation and discrimination and violence rooted in the patriarchal system and including exclusion and exploitation, as well as conflicts between social groups and the government (see Nicolás Zapata).

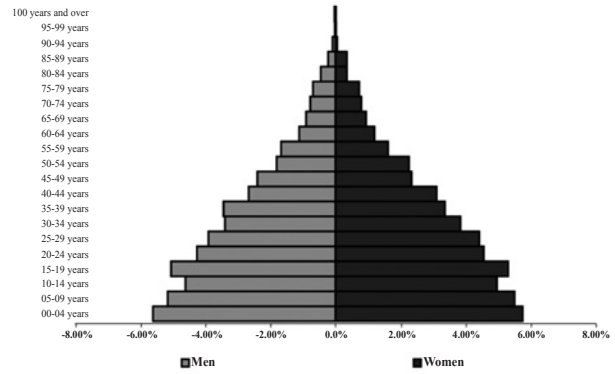
From the point of view of the lack of social capital,⁵ Bourdieu (1983) emphasizes the lack of capacity to

⁴ According to the method used by the National Council for the Evaluation of Social Development Policy (Coneval), poverty is measured by taking into account the number of people who have more than one social deprivation and an income below the welfare line, amounting to twice the average cost of the food basket—in urban areas \$ 177.04 Mexican pesos in June 2013, in rural areas \$ 832.17, amounting to twice the average cost of the food basket—in urban areas \$ 1177.04 Mexican pesos in the same period. According to Boltvinik (2013) and based on the INEGI-ENIGH 2012 study, 83.1 per cent of the poor are evaluated using the integrated measurement method of poverty (IMMP), 32 per cent are indigent, 76.8 per cent have social deprivation, 74.2 per cent have low incomes and 54.2 per cent have time poverty, so that only 16.9 per cent did not demonstrate any lack.

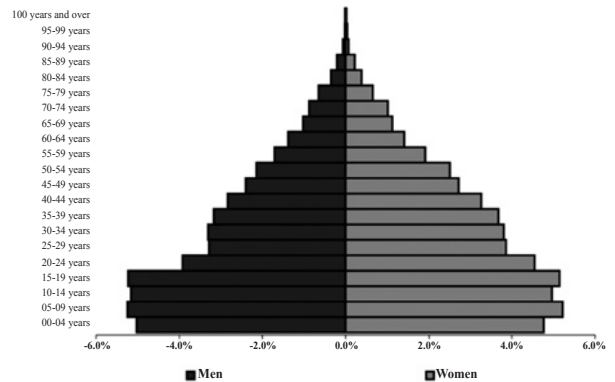
⁵ Bourdieu (1983:21) defines social capital as “the aggregate of the actual or potential resources which are linked to the possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition—or in other words, to membership to a group which provides each of its members with the support of collectively-owned capital, a “credential” which entitles them to credit, in the various senses of the word”.

overcome the type of obstacles discussed in theories of action (Land and Hannafin, 1996). Existing models of capital (Sen, 1995) and theories of crises and the resolution of conflicts (Reychler & Pfaffenholz, 2001; Lederach, 1983) concur with Perona & Rocchi (2008: 1), who define SV as a “status of risk, of difficulty, which disables and overrides, now or in the future, the capacity of affected groups to meet their welfare requirements—subsistence and quality of life—in specific socio-historical and cultural contexts”. SV is thus related to marginal social groups living in unfavourable contexts that make them more likely to face adverse circumstances: “[...] the exercise of behaviours that involve greater exposure to damaging events, or the presence of a common basic attribute (age, gender, ethnicity) that confers risk or common problems ...” (ECLAC, 2002: 3).

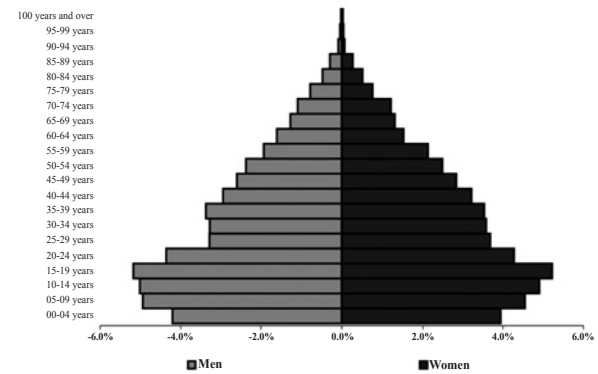
The study indicates differences in this SV: Totolapan is a municipality in the highlands with high marginality, low population density and relatively high fertility, and with a low number of female heads of household (figure 3). Ayala, located in the floodplain, is the municipality with the largest irrigated area in Morelos. It produces the greatest amount of green beans nationwide, besides sugar cane and other vegetables and commercial cash crops using technology packages. It employs agricultural labourers who have immigrated from the mountains of Guerrero, Oaxaca and Puebla, and are usually poor and indigenous. It is an urbanized municipality, with services, but where day labourers live in conditions of high marginalization and extreme poverty because of their precarious education. Tlaquiltenango, located mostly in the Sierra Madre del Sur, suffers from severe socio-environmental deterioration. Its population lives in poverty, with large numbers of migrants in the cities and especially in the US.



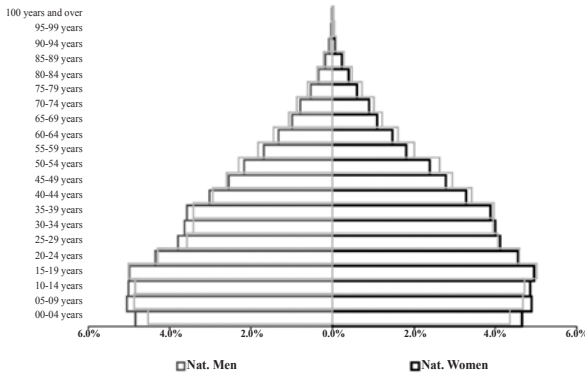
Totolapan



Ayala



Tlaquiltenango



Mexico national and Morelos state

Figure 3. Population pyramid at national, state and municipal level (elaborated by the author based on INEC, 2010).

In the first column, the household vulnerability indicator is highest for El Pañuelo, since 82 per cent of the population speaks an indigenous language (table 3), 64 per cent have no primary education and 27 per cent are illiterate, especially women. In the column indicating vulnerability related to housing, Nicolás Zapata demonstrates the most precarious conditions because this community is not officially recognized

by the municipality of Totolapan. Fifty-five per cent of the houses have roofs of asbestos or cardboard, 60 per cent of the families live in overcrowded rooms, 89 per cent have no water supply and have to obtain their water from standpipes, 86 per cent have no water reservoir, nobody has drainage, 20 per cent burn their garbage, including plastic, and 57 per cent use firewood for cooking. Although El Pañuelo demonstrates also high marginality, government support and their indigenous community organization have allowed them to buy a plot of land and to obtain basic items for their houses, as well as water, sewage and schools services and a road. The migration sub-index emphasizes El Pañuelo's situation as a community of immigration. The low salaries of agricultural day labourers oblige 8 per cent to migrate temporarily to Sinaloa, 11 per cent of households migrate internally and 24 per cent internationally. In three-quarters, it is the head of household who migrates, so that the daily tasks in the field are transferred to women. Not all migrants send remittances, and this increases SVI in their place of origin. Since it is a small community, the migration factor impacts heavily on their social conditions. In Lorenzo Vázquez, nearly two-thirds of households also have at least one member in the US, although remittances and phone calls have allowed this community to improve their living conditions, despite having suffered the most through environmental degradation.

Table 3

Index of social vulnerability (SVI) and index of environmental perception (EPI).

Community	hHousehold Vulnerab.	Housing Vulnerab.	Migration Vulnerab.	SVI	EPI
Nicolás Zapata	55.65	137.14	19.33	212.10	234.87
La Cañada	49.96	97.97	19.60	164.50	182.19
El Pañuelo	83.99	102.37	32.40	218.80	235.63
Lorenzo Vázquez	57.06	119.71	27.60	204.30	224.58

Note: Field Research, CRIM-UNAM, 2010-2012.

When the three sub-indices are combined in the SVI, El Pañuelo has the worst conditions of marginality and precariousness, both historically and in the present. However, the difference with Nicolás Zapata is minimal, as the existence of that community is not regularized and its inhabitants are constantly harassed by the municipality of Totolapan that has taken away most of their land. Lorenzo Vázquez also demonstrates a high SVI, since migration cannot always improve local conditions and many women have indicated that after two years in the US, men general seek another partner and then stop sending remittances, a phenomenon that was also noticed in El Pañuelo.

When educational and health behaviours in the four communities were compared, substantial changes were found despite the communities being poor rural villages. The consolidation of a community takes decades. For this reason, La Cañada, which has existed for centuries, scores the lowest values for SVI. Both Nicolás Zapata and El Pañuelo are communities that are growing in strength. Their priorities are safe water and land regularization, and this has taken away most of their social energy, especially from women who have fought for recognition and basic services. Education and health have been sidelined, while in Lorenzo Vázquez access to secondary and higher education goes some way towards mitigating the loss of the natural conditions for agricultural production. In La Cañada there are alternatives available through education, although the shift towards the production of nopal, with its high requirement for family labour, has forced young people to leave school.

Looking at the environmental perception index (EPI) for these four communities, we may note that there is an acute environmental deterioration in El Pañuelo because of the growing of irrigated crops and deforestation of the deciduous rainforest, closely followed by Nicolás Zapata and Lorenzo Vázquez. Nicolás Zapata faces a particularly difficult challenge; decades of tenacious struggle by women are pressuring the state and the municipal authorities to regularize their community. This will enable people to build a future that is less random and municipal leaders will no longer be able to deny access to land that was granted to the people after the revolution a century ago. This community lacks all municipal services such as a drinking water supply and drainage, and an increasing number of gastrointestinal diseases are caused because women and children are forced to fetch water contaminated by agrochemicals in canyons or to buy water pipes. In addition, extreme weather in the Altos, precarious soils and lack of government support have impeded sustainable rural development.

The soil of Lorenzo Vázquez was already eroded twenty-five years ago and since about fifteen years ago the desertification process has limited livestock production because of poor pastureland management, deforestation, and indiscriminate use of agrochemicals on shallow and stony soils. Renting land near the River Cuautla has allowed some families to plant jicama and so receive some income, although flash floods have destroyed the harvest in several years; the socio-environmental conditions illustrate high environmental vulnerability.

La Cañada, despite suffering from irregular rainfall and lack of irrigation, has found a productive alternative with the planting of nopal and thus employment and income for the family, although the direct handling of manure in the plantation has generated an invasion of flies that has caused

health problems. In short, the SVI and the EPI demonstrate the double vulnerability in both ecosystems: Los Altos and the Sierra Madre del Sur, but since we studied agricultural workers on the irrigated land, it can be seen that they are also exposed to this dual vulnerability.

DISCUSSION

With regard to the initial question as to how this dual environmental and social vulnerability impacts on women in their role as heads of household, and what the processes were that enabled these women to overcome their disadvantages and empower themselves at the local level, we can conclude that both SV and EV coincide, but have had different impacts on each community. Women were faced with this dual vulnerability and were exposed to the migration of their husbands that made them heads of household. First of all, when confronted by new pressures, they became depressed (Burin et al., 2000). Pressures from their families and the need to survive forced these women to first ensure that their children were fed and that they obtained a basic income. Because of the number of new activities they were involved in, and the unknown threats they faced, they took anxiolytic and antidepressant drugs to ease their workload and stress.

The social imaginary⁶ of these heads of household began to restructure itself through social representations where the vehicle of communication was the language through which ideas, beliefs, perceptions, meanings, ideologies and attitudes were confronted. These social representations allow people to understand the processes and mechanisms through which this changing and threatening female reality is understood.

Without doubt, the environmental impact, climate variability, desertification of soils and extreme events have greatly reduced the income from agricultural activities. However, attachment to the land, to subsistence, the taste of the tortilla baked with firewood, the family orchard and the small-scale flock of poultry are elements of identity for small farmers and families. Even so, remittances are often invested in the payment of debts, the rent of land, agricultural inputs or crop failures. Every family who owns land or has money continues to plant the land. In the collective imagination they continue to be a rural community struggling for survival in always precarious conditions. Their production logic is not oriented towards capitalism and profit maximization, but towards their livelihoods (Garcia,

2012) towards achieving as far as possible their own food sovereignty (Oswald, 2009).

In a peasant family where the male has migrated, complex dynamics develop in marital relationships, including the redefinition of relationships with the family, the remote control exercised by the migrant and the family, independence and autonomy in relation to decision-making within the household, the administration of resources, the confrontation when the husband finds another partner in the US, and eventually the migrant's forced return (due to expulsion) to a home destroyed or transformed—all these processes are intertwined in many migrant peasant families. According to theories of identity, the individual's knowledge of belonging to a certain social groups and knowing the emotional value and importance attached to membership of these groups (Tajfel, 1972: 31) is crucial in community and family life. Transnational migration involves putting aside these primary reference groups and entering into a completely new context, very often involving discrimination and stigma, especially if the migrant is illegal. Such migrants have disrupted norms and values established by the group, but they also have expectations and exercise a certain level of influence within the group (Serrano, 2013).

In the female focus groups we perceived the fear of being abandoned as heads of household, as a wife and without remittances, if the husband finds another partner in the US. So when these women feel that their household unity is threatened, their mode of speech changes and with it their social representation. It is no longer the dominant culture that has historically condemned women "to bear their cross", justified by Mary: "from childhood on, they always told me that I am a woman, who is worthless". Now, alone and before the family, a gradual repositioning occurs, with a questioning of the role of 'being-for-others' as the central focus of their daily work. Some women are perceived as more competent and start to get involved in local politics. A woman fought to be the president of the committee of drinking water supply, another of the school committee; a third managed to obtain a public transport service for the community. Their local leadership allowed them greater visibility, especially when these charges had involved struggles against despotic political forces in the hands of men, who had prevented the development or improvement of such services due to their personal interests and corruption. When women take care of these charges they open the field for new policies, which often also involve struggles for local power. But even in these cases, where

⁶ Imaginary is understood as "the incessant creation of figures, shapes, images" that allows human beings to answer fundamental questions about humankind in society to build their own identity: who we are as a community, what we are to each other, what we want, what we need (Castoriadis, 1975, p. 205).

consciousness of them as women with rights is raised in the public arena, their social representation remains subsumed to being a good mother and a good wife in the private sphere (Serrano, 2010).

Gradually, the classification process involved cognition of the organization of its content—generalization or particularization or both—which also impacts at the relational level. This process may lead to inclusion or in extreme cases to rejection, but always through the mechanism of discrimination and prejudice. The world is historically organized by patriarchal gender relations, in which the male gender (the stronger sex) dominates the female gender (the weaker sex). The exercise of power is also reflected in the symbolic distribution of public space to man and private to woman. In the female condition the dominant vision is of being-for-others, and so a woman does not give because of generosity but because she is accustomed to give all and expecting nothing in return. Within this double feature: must-be as assigned identity and being-for-others as self-identity and self-assumed socialization, women's subjectivity is constituted in a gender pedagogy, as being in charge of the lives of others (Lagarde, 1990).

In particular, the history of migration is a process where the two rigid gender divisions between public and private are blurred, making it possible for both genders to acquire new social representations, practices and identity elements. Given that migration and environmental crises involve questions and disruption of the representational universe, migration is also a factor able to energize changes in society. In this process of familiarization with the strange and symbolically overcoming the new, crises facilitate the anchoring of the associative function of other symbols that allow actions that enable accustomization to new rules and *communicative processes and power relations among genders*. In the rural area studied, conflicts emerged between normative social facts, related to typical representations of hegemonic social structures, where the abandoned women dared to face disruptions and crises in the representational and relational universe.

In the end, the resolution of conflicts has relied on multiple strategies: through imposition and violence [‘hard power’], through expert-bureaucratic alienated procedures [in courts, commissions, laws and in projects uprooted from their community], or through open dialogue in the public arena with consultation and especially the dialogue with society and its groups [soft power].

From the deep insight gained, it can be understood that in the face of such profound challenges as GEC and CC, mechanisms of adaptation and resilience are generated at the local level, forcing the affected to mobilize all their social, cultural, political, economic, environmental and existing

relational capital. These transformation processes are the seeds of a more equitable and sustainable femininity and masculinity, able to overcome dual vulnerability and reduce the risks posed by CC. They also open up the field to the political struggle and to a deep transformation of ancestral dominant patriarchal relations.

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