Biodiversity as a common in three Latin American countries: Science, politics and community-based management

Yolanda Massieu

Introduction

Biodiversity includes all living creatures, together with humans and ecosystems, where they exist within complex relations. It is a fragile wealth and can be easily destroyed without any possibility of restoration. Since the seventies the number of species has continuously decreased[1] and, together with other ecological problems, it is part of an environmental world crisis that does not seem to be solved. Nevertheless, there are some experiences in different parts of the world where human communities achieve to manage in a sustainable way their natural resources (biodiversity included). In Latin America these kind of experiences frequently are driven by indigenous people, who in this way practice antique knowledge, being this continent the most megadiverse in the world[2]. State is a main actor about how to manage biodiversity and natural resources in a country through economic and environmental policies. In this essay I compare three different Latin American countries, all of them megadiverse, with different kind of economic and environmental policies: Costa Rica, Ecuador and Mexico. I analyze their regulations and laws towards biodiversity and consider how their science contributes to sustainability and conservation (mainly in Costa Rica), and local experiences of community-based management, now facing threats to their biodiversity, natural resources and territories from mining, hydroelectricity and oil projects in Ecuador and Mexico.

1. Sustainability and biodiversity: some brief considerations

Since 1992, United Nations Conference on Environment and Development (UNCED, the Rio Summit) in Rio de Janeiro, Brazil, ecological crisis has been at the

[1] Present extinction is alarming: from 1970 to 2014, 58% of mammals, reptiles, amphibians, birds and fish have disappeared (WWF, 2016)

[2] According to United Nations Environment Program, there are 17 megadiverse countries (8 in Latin America): Bolivia, Brasil, China, Colombia, Costa Rica, Ecuador, Filipinas, India, Indonesia, Kenia, Madagascar, Malasia, México, Perú, República Democrática del Congo, Sudáfrica and Venezuela (Infobae, 2014).

forefront of many international agencies and forums, and a concern for many civil organizations and NGOs (Non-governmental organizations). A few years prior to that, *Our Common Future* document (1987), had sounded the alarm about the manner in which economic growth and development during the 20th Century had caused large scale ecological degradation, posing threats to the survival of future generations. The need for a new type of development was accepted, and "sustainable" development was first mentioned as a strategy for human survival that would not cause the destruction of our planet. Although these global efforts led to "official" international concerns of ecological risks, the debate was not new: from the beginning of colonization, indigenous communities in Latin America and other regions had experienced the deprivation of their territories and natural resources. This long historical process initiated destruction of native people's territories due to capitalist expansion through industrial development, which has reached its limits today. In the nineties, an intense academic and political discussion on development took place (Escobar, 1995) and it was recognized that in spite all sacrifices that peripheral countries had made to achieve development as had occurred in the Western world, goals like poverty´s decrease and stopping environmental degradation were far from being achieved. It is within this context that environmental concerns have become more important.

Present world crisis has been accompanied by more questions about our ways of development, because poverty and environment degradation have increased, despite international efforts to eliminate them. The main question concerns changing present economic and market rationality as a way of solving this crisis. This is not an easy goal, although some efforts in Latin America are underway to seek a new approach, which includes respect for the environment and nature. These post-neoliberal efforts have been considered good examples of community-based projects in which indigenous and local people have a significant role. Research made in Ecuador and Mexico shows some evidence about this kind of efforts.

The global ecological crisis is very closely related to the asymmetric power relations among countries. Colonization was a first step in depriving peripheral countries of their territories and natural resources. Environmental degradation

commenced with the advent of a capitalistic industrial mode of production and consumption in the 18th Century. Natural resources have always been objects of dispute, and economic rationality has led to the unmeasured exploitation of both people and these resources. These two factors are identified as “conditions for accumulation” by O’Connor (2001), and their destruction comprises the second contradiction of capitalism, following the tendency for profit rates to fall. Now we know that this kind of development has driven us to a limit at which life on our planet could be destroyed. Climate change (CC) is the most recent and visible consequence, but not the only one. Ecological destruction has worsened and includes new mining, oil and hydroelectric projects, and the expansion of energy-intensive industrial and agricultural projects in biologically rich territories, with no concern for both social and environmental damage. This process has been characterized as “accumulation by dispossession” (Harvey, 2004), and expresses the new way of capital growth. It is a process that entails the destruction of nature and the degradation of ecosystems. As stated by Lefebvre (1976), capitalism survives through the production of space. This implies that all natural places where resources are found are dominated, and people living there subjugated and employed for the accumulation of capital.

According to Harvey, accumulation by dispossession is manifested in a variety of forms. These include “the commodification and privatization of land and forceful expulsion of peasant populations; conversion of various forms of property rights –common, collective, state, etc.– into exclusive private property rights; suppression of rights to the common; commodification of labor power and the suppression of alternative, indigenous forms of production and consumption; colonial, neo-colonial and imperial processes of appropriation of assets, including natural resources; monetization of exchange and taxation, particularly of land; slave trade and usury, the national debt, and ultimately, the credit system” (Harvey, 2004, p. 113). Dispossession means the exploitation and destruction of natural resources and territories, and the profits obtained this way do not remain in the place nor do they benefit local inhabitants. Novel and additional environmental predatory forms of mining and oil and gas exploitation are the faces of accumulation by dispossession,

especially in the rural areas of marginalized countries.

A new environmental rationality is required (Leff, 2004), together with a new way of development with respect to nature, and not through the promotion of ecological destruction. In order to achieve this objective, we can turn to ancestral knowledge that has survived in many indigenous and local groups. In Latin America, there are a myriad of experiences in this respect. However, we must be careful not to conceive of indigenous and local people and their knowledge as frozen in the past, only able to bring to our present times their ancient wisdom. To the contrary, these individuals have survived through centuries and are now as modern as those of any other culture, although in many cases, they certainly have acquired more knowledge about how to live from nature without destroying it. In Mexico, the majority of conserved natural ecosystems are property of indigenous people, despite the difficulties they have encountered to survive (Boege, 2008). There is an interesting debate concerning local or traditional knowledge, mistakenly referred to as “traditional”, and its relationship with natural resources and the use of biodiversity. This knowledge has frequently been despised by science despite it considers a vast collection of plants and living creatures assembled by international corporations. Concerning natural resources and biodiversity, they have been community based managed for many centuries.

2. Biodiversity: international, national and local situation

Main international agreement about biodiversity protection is Convention of Biological Diversity (CBD) of the United Nations (UN), signed at the Earth Summit in Rio de Janeiro in 1992 (CBD, 1992). It was made because of the increasing interest and international debate about biological diversity, its profitable uses and access regulation in the nineties and it focuses on the preservation of plants and living organisms on the planet. One of the most important consequences of this new assessment of biodiversity is that its care, access and exploitation are internationally legislated under the tutelage of national States, even in neoliberal times. This means that obstacles to biodiversity’s marketing have been removed, as previously to CDB it was considered human kind heritage (Rodríguez, 2012). Setting up natural

protected areas (NPA) has become the main protection policy and this has encouraged the emergence of new markets (ecotourism, bioprospecting, carbon credits). In 1962 there were thousands of NPAs worldwide, covering 3 percent of the Earth's surface; by 2003, the number increased to 102 thousand NPA, with 11.5 per cent of the Earth's surface (Reyez, 2016).

Other recent international agreements concerning biodiversity are Paris and Cancun Agreements, and Aichi Targets, all under United Nations (UN). The first one was made at the Climate Change Summit of Paris, or Conference of the Parts 21 (COP 21) of the United Nations Framework Convention on Climate Change (UNFCCC). It took place in Paris the last days of November and first of December of 2015 within a fear environment, because of November 16th terrorist attacks, which left a balance of more than 100 dead people in the French capital. An agreement with representation of 195 countries was achieved. The document confirms the objective of stopping the rise of temperature average in 2 ° C, and rather reach 1.5°C for 2020. About the problematic issue of funding, it raises the amount promised by industrialized countries of $ 100 billion per year, to support the peripheral nations to finance their policies against CC. This amount would be a "floor for 2020" (UNEP, 2015) and seeks to reach another quantity in 2025. Agreement was signed in September by 187 countries, but the document does not define how to reach funding and reduction of emissions goals, and there are not mechanisms for industrialized countries to achieve their commitments. There is a risk that this document is a compendium of good intentions, without possibilities to put it into practice. Besides, already enough greenhouse effect gases have been poured in the atmosphere to provoke a 1.5°C warming (Brix, 2015).

The most recent international agreement concerning biodiversity’s conservation is Cancún Declaration of the Conference of the parties 13 (COP 13), held in Cancún, Mexico in December 2016, with the participation of 7,000 people and 4,000 delegates from 170 countries and 400 organizations (UNEP-CBD, 2016). The document recognizes concern about negative impacts in biodiversity caused by the degradation and fragmentation of ecosystems, no sustainable changes in land use, overexploitation of natural resources, logging, captures and illegal species trade,

invasive exotic species introduction, air, soil, continental water and oceans pollution, CC and desertification (Ibid: 2). It is based in UN 2030 Agenda for Sustainable Development and Paris Agreement, as well as effective practice of CDB, Strategic Plan for Biological Diversity 2011-2030 and Aichi Targets. The latest emphasize NPA creation, even more, it seems that the most important policy to protect biodiversity, both in this document and in press newsletter of COP 13 of Cancun (UN, 2016), is to achieve goal 11, which consist in reaching 17% of earth surface as NPAs and 10% of the sea surface by 2020 (Aichi Biodiversity Targets, n.d.). The problem is that it seems that in the rest of the world surface outside NPAs, biodiversity's destruction and environmental degradation will remain. Both documents frame the Decree of Mexican President in COP 13 to increase NPAs as a decision that itself maintains and cares for biodiversity. As Mexican case of Cuetzalan demonstrates, PNA decree is not necessary in all regions to preserve biodiversity. Nevertheless, Costa Rica shows the importance of a decided policy of NPAs to preserve biodiversity.

3. Biodiversity in three LatinAmerican countries

3.1. Costa Rica

Costa Rica is located in tropical American area, where there exists the greater biodiversity. It is a small country, with 51,100 km2 area (0.03% of the world) and 589.000 km2 of territorial waters. Nevertheless, it is one of the 17 megadiverse, due to its geographical position, with two coasts and a mountain system, which provide numerous microclimates. It is inhabited by more than 500,000 species (approximately 300,000 are insects, about 4% of world total) (InBio, n.d.). This biological wealth is managed by the Ministry of Environment and Energy (Minae), specifically to National System of Protected Areas (SINAC), responsible for the conservation and sustainable development of the country's biodiversity. SINAC has 11 areas of conservation across the country and a technical support area. Vaughan (1993:6) mentions others institutions related with biodiversity conservation and management in the nineties: General Office of Wildlife, National Parks Service, Biodiversity Institute (InBio), Regional Mesoamerica and the Caribbean Wildlife

Management Program (PRMVS), Tropical Studies Organization (OTS), UCR (University of Costa Rica) Biology School, Biological Sciences School of the UNA (National University of Costa Rica) and the Agriculture Development Institute. In recent times there have been regional efforts to systematize the information on biodiversity, promoted by the Central American Commission of Environment and Development (CCAD). This has developed regional projects such as the Mesoamerican Biological Corridor, which also includes Mexico and other Central American countries (Ovando and Herrera, 2010:35).

A controversial issue related to biodiversity is bioprospection. There was optimism about great business with collecting living creatures in order to obtain profitable products by multinational corporations in the nineties and Costa Rica was one of the first peripheral countries signing contracts to exchange debt-for Nature. In fact. InBio was founded in 1989 as a private institution which will make bioprospecting contracts in order to get funds for biodiversity's protection. It is now clear that resources did not flowed to the InBio as it was expected, and now the Institute is asking the government to take care of it. There is an especially sensitive issue concerning bioprospection: permissions limits between scientific and commercial objectives, as sometimes the first ones can lead to profitable products. In Costa Rica there is also another problem: most of the permissions given by InBio are for private protected areas, and this limits even more the possibility of exercising sovereignty over extracted resources.

For this research I made13 semi-structured interviews to scientists from UCR and UNA from biological and social sciences related to biodiversity. In almost all interviews scientists expressed that the percentage of protected areas is an achievement, and some of them mentioned some facts that strengthen conservation, as the moratorium to oil and mining projects. In two cases, social scientists talked about some kind of hypocrisy of conservation policy, for example, government publicizes a recovery of forest coverage in the North Park, but does not say that this area was deforested because government promotes livestock exports to the United States, which ended with the dry tropical dry in the area.

Concerning the main threats to Costa Rica's biodiversity, scientists gave different kinds of answers: a common one was that humans were the greatest threat, others emphasized CC as a problem to agro-biodiversity, with irregular cycles and temperatures. In an especially interesting case, as a result of an experience of a genetically modified rice in UCR, which did not reach the market, researchers discovered a landrace of rice in a wetland. This led them to face difficulties to expand protected areas to this wetland, because in its borders there were of pineapple plantations polluting with agrochemicals and a drainage made in the side of Nicaragua. In interviews scientists highlighted biodiverse ecosystems' fragility, as well as wild varieties' potentiality and the need for research about them. In this specific case, scientists have requested the protection of the wetland to Conagebio (Costa Rica's Comission for Biodiversity Management) and SINAP (National Protected Areas System). A risk to biodiversity mentioned in several interviews is export crops expansion, such as pineapple, with a high use of agrochemicals and have been promoted with intensity since the signature of the Free Trade Agreement with República Dominicana and USA in 2008. This pineapple monoculture is in the hands of transnational companies, frequently surrounding protected areas, promoting deforestation (Llaguno, interview: 2015). Costa Rica is world first in agrochemicals´ use *percapita*, "what a shame", says Víctor Jimenez, a national science price interviewed; he considers that conversion to agroecology's efforts have not been enough.

This monoculture model and the possibility of widespreading GM crops (to date, the country produces only cotton and soybeans seeds exports, commercial planting is not authorized), are perceived as a threat to biodiversity in some interviews, but specifically in the case of GM crops, opinions are divided. The feature of enclave of monoculture model, in the sense that profits do not stay in the country, was emphasized by a social researcher (Granados, 2015: interview). In another interview it appeared that transnational monoculture frequently advances with violence, "is common that hunters arrive first and cause fire, with consequent deforestation, and afterwards there comes rice and pineapple produced by transnational companies" (Llaguno, 2015: interview).

3.2. Ecuador

The case of Ecuador is important for this research because to the date it is the only country that has been bold enough to establish Rights of Nature in its Constitution of Montecristi of 2008. Is a megadiverse country, immersed in a socio-political process that led to a left Government (now finishing its second period), supported in a local coalition of different kind of social organizations: peasant, indigenous, environmental, workers and feminist. I had the opportunity to do a field trip with students in 2013 and observe some processes taking place there. We visited Íntag region and I found interesting to compare it with Costa Rica and Cuetzalan, Mexico. Unfortunately I could not return to do more field work, but this visit gave me some empirical evidence concerning biodiversity and community-based management. In spite of Rights of Nature, economic policy of Correa's government is driven by extractivism of natural resources, such as oil and minerals, and agriculture exports, mainly banana and cocoa, with one of the highest land concentration rates in Latin America (Acosta, 2013).

Some examples of environment degradation due to extractivism: deforestation caused by logging companies in forest Esmeraldas is impressive: there were 1.5 million of hectares of forest in 1970, and in 2005 there were 270,000 (Martínez, 2014:139). Flower production has generated health problems in workers and water pollution because of high agro-chemicals use and greenhouses plastic waste (Ibid, 144). All these situations are still present, even though the country has a legal framework of advanced social and environmental content, as the organic law for food sovereignty in the 2008 Constitution (article 281), pointing to an equitable agricultural development model and at the same time a series of policies to encourage agribusiness in rural areas. This has generated a contradiction difficult of solve, especially because to the date there is not a significant agrarian reform. Land policy raised expectations among indigenous and poor peasants who aspired to get a piece of land as a basis for a rural development program.

Together with "Rights of Nature" there comes "good living" as an alternative to development concept and policy. It looks for harmony between humans, collectivity and Nature, and a new way of conceiving life in the planet, grounded in

native Latin American people's knowledge. It is called sumac *kawsay* in Quichua language and it is also written in Monte Cristi Constitution. Together with similar *sumak qamaña* in Aymara language[3] in Bolivian Constitution, it is a significant effort to overcome capitalism environmental destruction and social inequality, although in present world these ideas are difficult to practice. In Ecuatorian Rights of Nature it is the first time that Nature itself is subject of rights, without economic value considerations.

Ecuador is a privileged country in terms of biodiversity. Its territory includes deserts, perennial snow peaks, moors, lakes, high and low forests, mangroves and oceans. This is so because the country is located in a tropical position, with a more or less similar climate all year, the presence of Andes and other mountains, and ocean currents. This generates 40 different ecosystems, with one-fifth of the world bird species and one-tenth of plants, as well as many endemic species. Íntag region is one of the most biodiverse places in the country and 19% of the territory are NPA, including 11 national parks, 5 biological reserves, 9 ecologic reserves, 1 geobotanic reserve, 10 wildlife refuges, 4 marine reserves and 6 recreation areas (Bravo, 2013: 41).

Intersection of two eco-regions of high biodiversity, Chocó and tropical Andes, gives Íntag region its high biodiversity, characterized as one of the most important hot spots of the planet due to its high endemism and abundance of species in extinction danger, such as the spectacled bear, jaguar and Andean Toucan, among others. Because of this in 1979 NPA Cotacachi-Cayapas (RECCS) was created, in the high mountain zone of Toisan, in the Valley of the Intag. In 2006 Intag was considered en important bird area by Birdlife International (Ibid, 20). The area has suffered an accelerated transformation, as it is a colonization area from the beginning of XX century. In spite of this, there are approximately 60,000 hectares of primary forests, feeding 20 microwatersheds and hundreds of water courses. (Espínola and Ordoñez, 2009). Such remaining forests are protected by community

[3] Quichua and Aymara are the main indigenous groups in Ecuador and Bolivia, concerning inhabitants number

conservation systems, or have been declared protected forest areas by Environment Ministry.

There is a participatory democratic process in the region since the nineties. Cotacachi municipality has practiced a local governance model since 1996, based in participatory democracy. This has been determinant for promote and consolidate organizational process in subtropical area in Íntag and anti-mining struggle started in this area, together with political local system democratization, which has developed a management oriented to changes in the quality of life that local actors social considered desirable. Within this process assemblies, councils and committees have been promoted, as suitable mechanisms to citizenship exercise. Women and young have been included as part of the process, together with an increasing presence of no government organizations (NGOs) and there has been international funding in Íntag canton. The latest has strengthened mining critical organizations. That is how DECOIN (Defense and Ecological Conservation of Íntag Association) emerged, around which mining resistance to mining articulated in 1995. With the expulsion of it Bishimetals Japanese firm in 1997, following violent actions that arrived to the company's camps burning. This firm's concession was cancelled until 2002-2004 period, when entrepreneur Roque Bustamante bought it and subsequently Canadian company Ascendant Copper started operations. This latest stays in the area only 18 months, because inhabitants burned its offices in 2005. For Smilowitz (2014) Ascendant Copper "established a realm of terror. Íntag inhabitants fought against paramilitary forces and local opposition leaders were beaten, threatened and illegally arrested. Conflict between mining company and local communities local is exposed in the documentary "Low the land rich", an effort to wake awareness about mining damage for those living in the region.

In the visit to the region in 2013 local leader Silvia Quilumbango gave us a conference about mining resistance. Local organizations were waiting for presidential mining exploitation permit for CODELCO and ENAMI[4] in Junín, after the story of resistance described. At the conference she spoke of the 40,000 hectares

[4] CODELCO-National Copper Corporation from Chile, world's largest copper company; ENAMI-Mining Company from Ecuador, government owned

of forest conservation in Íntag and 25 rivers in the Cotacachi Cayapas reserve, fueling one of the most polluted rivers: the Guayllabamba; she also considered great biodiversity and high endemism of Íntag, refuge of species in extinction danger, such as spider monkey and jaguar. Quilumbango offered a living story about struggle against mining in Intag: Japanese exploration in1990-1997, DECOIN creation in 1995, diffusion of environmental impact study of the Japanese agreement (mentioned as JICA by Latorre *et al*), as well as Bishimetals and Ascendant Copper expulsion of the region. DECOIN had to press to obtain environmental impact study, as Mitsubishi and JICA didn't deliver it, and managed to get a 26 pages document about the exploitation phase. She emphasized about mining large amounts of water requires, and how mining companies tell DECOIN that they can treat waters and return them to the River as they were (which is extremely doubtful because of the known problem of acid drains acids described by Latorre *et al*). She told us about government and Japanese company's invitation to organized communities in 1997 to dialogue, which they rejected and then came the eviction of the mining company. They have expelled two multinationals and cancelled 23 mining concessions. The leader informed that in 2002 Declaration of Cotacachi as ecological canton was formalized through an official registry (Coordinadora zonal de Intag, 2013). Unfortunately this history has not recent good news: in 2014 President approved a decree to authorize mining project in Junín, after reforming mining law (Quilumbango, 2013; Acosta and Hurtado, 2016). From the Quilumbango Conference in 2013 to this date when project is underway, decision has been imposed with violence, and Junin local elected president, Javier Ramírez, was imprisoned for 10 months in 2015 due to his ENAMI complaint and participation in mining resistance (Torres, 2015). Optimism about Montecristi Constitution and its mining mandate (which limits industrial mining concessions), as well as hope contained in Rights of nature, have given way to a kind of social disappointment.

3.3. Mexico

Concerning biodiversity, Mexico stands out because of the great number of species, its high endemism and genetic variability of many taxonomic groups, due

to evolution and cultural diversification of the country. Mesoamerican original populations domesticated a great quantity of species and used many more, both wild as cultivated, with therapeutic purposes, and different uses, such as food, textiles, religious, ornamental and construction. Proportionally, the number of species in the country concerning world total (10-12%) is quite higher concerning percentage of world total surface (1.4%) (Sarukhán *et al*, 2009: 23). Mexico is one of the nations with the largest number of native species of mammals, around 525, only under Indonesia or Brazil, who have 560 and 540 respectively. There are 2,184 of described fish species, figure only surpassed by Indonesia, Philippines, Australia and part of Papua New Guinea. Best known groups are terrestrial vertebrates, Mexico is in third place with 535 species, after Brazil and Colombia (667 and 578 species respectively). Regarding endemic species, in terms of plants the country has about 15,000 (between 50 and 60% of the known so far). Of other vertebrates, reptiles and amphibians are which have higher degree of endemism, with 57 and 65% exclusive in the country. Mammals and sweet water fish have a 32% of endemism in both cases (Ibid: 25).

This high biodiversity is particularly evident in the case of cultivated species and cultural diversity, as it has 291 live indigenous languages. In areas of greater biodiversity there is also a significant presence of indigenous groups, who own 14.3% of total country territory, where almost total of Mexican vegetation is present. This has been called biocultural patrimony to characterize complex historical relationships between indigenous groups and their biologic resources (Boege, 2008). Almost 14% of total territory is occupied by NPAs. Toledo and Ortiz-Espejel (2014) have described human groups' resistance based to defend its biological resources and specific kind of relationship with nature from predatory megaprojects.

In 13th Parties Conference of Biological Diversity Convention, held in Cancun, Mexico, in December 2016, President Pena Nieto signed the Decree of 4 new NPAs, added to the existing ones this areas reach 91 million hectares, almost 14% of the total area of the country (Vargas, 2016). Regarding this great biodiversity's use and access regulation, Sarukhán et al express similar opinions as Costa Rican scientists interviewed in 2015 concerning collecting, as they pose that it is necessary to

improve regulation, since there are regulation and definition absences, overlaps and inconsistencies. It also stands out that there does not exist adequate legal certainty for peasant and indigenous communities, as well as private owners of biodiverse territories. They emphasize that areas like biotechnology prospecting have not have appropriate legal regulation, and this makes it difficult to Mexican institutions to perform research and keeps to the country to the margin of important advances in biotechnology (Ibid: 43).

Case study is located in Cuetzalan, a municipality of high poverty conditions of Puebla State; the greater part of its inhabitants are indigenous: 38 926 of a total of 47 333 (CDI, 2010). The most predominant group is the nahua (72% of total population), followed by totonaca people. Cuetzalan is a biodiverse territory, not only because of to the large number of plants and animals, and the wealth of natural resources such as water, but also because it has been populated by totonaca people from the 4th century and later by the nahuas in the 15th century. Mixed people and Spanish arrived after the conquest. Is a redoubt of biodiversity with combination of several ecosystems: forest mesophyll of mountain, of pine and oak, low mountain jungle, all mixed in a high diversity of altitudes, from 1600 to 159 meters above sea level. It is one of the places where it rains more in the country, with a precipitation of 4,200 mm and a geological system formed by limestone or limestone rock mountain systems, "that produces a peculiar behavior of water and the presence of ecosystems on caves" (Meza, 2013:173).

Nahua and totonaca people "have sustained a mode of production in the field and of use of flora and fauna respectful to nature, starting from a worldview that establishes that nature does not belong to human being but by the contrary, the human must integrate to it, to which belongs" (Ibidem). In 2014 interview, Ms. Rufina Villa, leader of the movement of territorial defense, said us that animals have more right to live than humans, because "they do not threaten nature" (Villa, 2014). Certainly Cuetzalan is a privileged example of how biodiversity and other natural resources as water can be used by humans and simultaneously preserved. For this reason, Nahua and Totonaca people apply their knowledge and live their culture, which are far from being a stronghold of the past, but that they are created and

recreated in resistance and defense of the territory processes through several centuries.

From middle XIX Century collective property is dismantled by Reforma laws and is replaced with private property. It is in these times when present ecosystem is produced, as indigenous people achieved to adapt their way of life to radical transformation of land privatization, in a rapid demographic increase period. This meant the establishment of private individual plots with traditional indigenous coffee plantation that, in contrast with intensive coffee plantation, is not a monoculture ecologically destructive, but a polyculture tree adapted to the tropical mountain environment of the region. Territory occupation mainly by nahuas and totonaca groups since 750 years ago has generated bio-cultural processes that have transformed nature, expressed in the cornfield (milaj), *monte* or intervened forest (kuojta), *monte* where we produce (kuojtakiloyan), ixtautat (*potrero*), or shade coffee (caffenta), within a landscape of biological and cultural diversity (Fernández Lomelín, 2013: 102).

Attempts to take over this territory in the contemporary period began with a tourism project promoted by Commission for the Development of Indigenous Peoples (CDI), which consisted in a group of national and foreign investors, along with Anahuac University, to create tourist companies occupying strategic areas of local ecosystems, specifically the outcrops of water supply to the population of the municipality. The project implied displacement of indigenous providers of tourist services, like Taselotzin (Massieu and Saavedra, 2016) and Tosepankali, supported previously by the CDI, with the argument of that it would create sources of employment in the construction and operation of the new hotels (Meza, 2013:174). Voice of alarm was given by local water management committee, as in September 2008 service of water drinking from a community reported mud and pollutants presence, as the project grabbed springs that provide water for 18,000 people (Fernandez Lomelí, 2013:177).

Social response was wide, citizen and indigenous organizations, social tourism companies, academics and advisers met to reject the project and report that local communities had not been consulted. This way arose Cordesi Development

with Identity Regional Coordinator) in 2008, integrated by 8 organizations, 10 social companies, two directions of tourism and culture and a municipal Tourism Council. Cordesi organized in July a Regional Sustainable Tourism Forum that exceeded expectations, with more than 300 attendees and 50 civil organizations together with social tourist companies, specialists, municipal Government, service providers and tourism consultants. It was agreed to develop a Regional Tourism Plan, with the aim of promoting equitable development and identity, which will generate a collective benefit to the inhabitants of the area and content massive tourism project's voracity.

Then Cuetzalan organizations proposed to create a Territorial Ordering Plan to municipal Government, which could allow inhabitants to manage territory's uses. The document was prepared in community based manner, with the support of the University Center for Disasters Prevention (Cupreder) of Puebla State public university: Benemérita Universidad Autónoma of Puebla (BUAP). A diagnosis was made from 2009 to 2010, with 1,300 participants. Concerning environment and biodiversity issues, a huge concern of lacking water risk was evident, that rivers could dry and consequent decrease of water sources could happen because of inadequate practices, as well as their springs' privatization. Also it was stressed deforestation problem and absence of sanctions and concealment about it; other issues concerned constant and historical soil's use changes (towards cane, coffee, livestock); loss of species in the rivers because of fishing with dynamite and polluting with people's waste; pollution of drinking water in the peaks; trash in canyons, streets and peaks, intensification of fertilizers and herbicides' use, which erode and cause loss of species (Meza, 2013:178).

From this diagnosis a Territorial Ordering Proposal was voted and approved in 2010, after 14 working months, and municipality was organized in Environment Management Units, which put in practice soil use policies, with ecological criterion, together with government agencies such as Environment Ministry and State officers related to ecology, education, agriculture and commerce, and municipal President. This way tourist attractions privatization claims were rejected and to date the mentioned system is an invaluable tool for territory's defense against threats that have not ceased. In 2012 Tliyat Tlali Council emerged as response to a mega-

project, led by Puebla State Government with Federal Government participation. It consists in the authorization of 27 mining concessions, construction of 5 hydroelectric dams and 50 rural towns. The response has been wide and goes beyond the municipality of Cuetzalan, the Council Tliyat Tlali (Tiyat-land in totonaca language and Tlali-land in nahuatl) is a group of several regional organizations[5]. Whole region is threatened by predatory projects:

> Projects are closely interrelated: mining requires large volumes of water and excessive electricity use would be supplied by dams; in rural cities would be relocated families living on the land affected by dams and mines, who would no longer be producers to become consumers of supermarket stores (Albores, 2014).

In Cuetzalan, in November 2014, with the pressure of civil society organizations, a point of agreement was achieved, and by decision of Cordesi, municipality of Cuetzalan assumes the defense of environment and natural resources of the municipality towards possible installation of mining or oil exploitation, within the framework and legal scope of the municipality (Barillas, 2014). In April 2014 PEMEX[6] acknowledges Territorial Ecological Ordering program (part of the Integral Territorial ordering) of Cuetzalan that does not authorize oil exploration in the municipality, as it permits only activities of small and micro-industry (Hernández, 2014). Territorial Ordering is also fundamental to control the impacts of tourism, which has grown considerably in recent years.

The problem is that threat is regional, the entire ecosystem and the 600,000 inhabitants of the mountains can be affected. Even so, the resistance expanding in the area, as it illustrates that Tetela of Ocampo's celebrated in November of 2014, with a thanking ritual in a spring, 3 years of resistance to one of the mining projects miners authorized (OCMAL, 2014). In April of 2016: more than two thousand representatives of populations of 27 municipalities' populations of Puebla and

[5] Unidad Indígena Náhuatl Totonaca (Indigenous Nahua Totonaca Union), Pastoral Social Indígena (Social Indigenous Pastoral), Coordinadora Regional de Desarrollo con Identidad (Cordesi), Agencia Timomachtikan (Timomachtikan Agency), Unión de Cooperativas Tosepan (Tosepan Cooperatives Union), Maseual Siuamej Mosenyolchicaunai (Artisans women organization), Universidad de la Tierra en Puebla (Earth University in Puebla), Instituto Mexicano para el Desarrollo Comunitario (Imdec) (Mexican Institute for Community Development), Centros de Estudios Ecuménicos (CEE) (Ecumenical Studies Center), Centro Operacional de Vivienda y Poblamiento (Copevi) (Housing and Population Operative Center) (Consejo Tiyat Tlali, s/f).

[6] PEMEX-Mexican Government Oil Company

Veracruz, gathered in the13th. They rejected mining, hydroelectric and oil projects of hydraulic fracturing that threaten rivers, forests and mountains of North Mountains of Puebla and Totonacapan region in Veracruz. There are 5 municipalities that have declared themselves free from this kind of projects (Administrador Regeneración, 2016). At the time of writing this chapter, threat remains latent, and Cuetzalan municipality's inhabitants and others of the Puebla's Northern mountains, continue attentive, working and mobilizing to defend, once more, their territory, their water, their biodiversity, their culture, their right to exist and live as they decide. They continue to carry out assemblies every two months of 5,000 people.

Conclusions

Evidence about biodiversity's community based management, science and politics in the three countries considered in this research shows how the possibility of sustainability is determined by national politics and its notion of conservation, development and consideration of biodiverse territories´ people proposals. In Costa Rica is very interesting that a government which has made of conservation one of its international image basis has managed to have a good opinion of scientists about their country's environmental policies. Nevertheless, there are contradictions between these politics and the possibility to develop scientific knowledge concerning biodiversity's sustainable uses.

Ecuador shows difficulties about putting in practice an innovative law proposal as Rights of Nature, in a country who needs to exploit its natural resources and sell raw materials in world's market. At the same time, resistance and local organization as found in Íntag territory can remember this kind of government its commitment towards respecting Nature and local communities´ proposals towards sustainability. Mexican case shows how neoliberal predatory megaprojects threaten directly both Nature and local-indigenous communities' way of living. These communities in Cuetzalan case have achieved to find legal measures, such as Territorial Ordering Plan, to defend themselves, their Nature and culture against these threats. From the exposed examples, it remains as an open debate whether it is possible to arrive to

sustainability and biodiversity's conservation through community-based management in Latin America, one of the most biodiverse regions in the world.

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