Understanding urban risks as encompassing socio-ecological phenomena.

Julien Rebotier

Understanding urban risks as encompassing socio-ecological phenomena.
Territorializing landslides in Caracas and Quito.

Julien Rebotier – julien.rebotier@univ-pau.fr - CNRS / SET (UMR 5603). Pau (FRANCE)

A large scope of different approaches to risks and the environment exist, from orthodox Realism to more constructivist views. Social science approaches have put the stress on the production of risks and the environment (its identification, explanation and management) at least since the 1970s on, in different epistemic communities. English-speaking authors have highlighted the political economy of risks (Wisner 1976; Blaikie and Brookfield 1987; Peet and Thrift 1989; Watts and Bohle 1993), the Latin-American community has insisted on the social construction of risks, its representation and justice issues or implications (Maskrey 1993; Garcia Acosta 2005), and in the French context, following the assessment of vulnerability in the 1980s (Fabiani and Theys 1987), some authors have also put forward the strong social and political contingency of environmental issues in both its assessment and management (Pigeon 2005; Coanus and Pérouse 2006).

Across all these social science approaches of risks and the environment, it is worth underlying that two transversal characteristics are closely related with the necessity of setting a context. On the one hand, these approaches view risk as a social production. They address the ontology of risk. They question the neutrality of risk situations as well as its causal mechanisms and the conditions of their production. They look at what is supposed to be natural or necessary in a critical way. But these approaches also make room, though in different ways, to the epistemology of risks, to the importance of representation, discourses and narratives in framing risks and its implications. Vulnerability encompasses the ontology and the epistemology of risks at the same time. It has been defined as the many conditions that make groups or individuals more or less likely to suffer damages in the face of hazards. And among these "many conditions", some authors put the stress on culture, discourses and representations as critical drivers that cannot be despised (Bankoff 2001; Demeritt 2001; Hoffman and Oliver-Smith 2002; Biersack and Greenberg 2006). On the other hand, constructivist approaches have put forward the necessary articulation of causal mechanisms to a broader context (a historical, geographical and social context). The importance of spatial scales, timeframes or cultural frameworks have been accounted for through different proposals for conceptualizing vulnerability or risk production (Hewitt and Burton 1971; Watts 1983; Mitchell, Devine et al. 1989; Watts and Bohle 1993; Wisner, Blaikie et al. 2004 [1994]; Cutter, Barnes et al. 2008).

Without entering into the debate between realism and constructivism in environmental studies (Demeritt 2002; Forsyth 2003), we would like to propose an encompassing, dynamic and place-based framework that allows accounting for the different drivers of risk construction (both material and intangible, as well as context-sensitive). We do not look for a systematic and exhaustive grid for reading environmental situations. The main objective is not to address the entire and complex set of causal factors that shape risks. It rather consists in setting an approach broad enough in order to bear in mind the very different factors that influence environmental issues as critical environmental challenges in our present world. Such encompassing framework starts from the importance given to contexts and politics. It aims to articulate integrative approaches that have been proposed previously (Thouret and D'Ercole 1996; Wisner, Blaikie et al.

2004 [1994]; D'Ercole and Metzger 2009), putting the stress on structural framings (time-, space- and society- sensitivity), as well as on the epistemology of risks and the environment (representation, discourses and narratives) as they shape risk situations and its implications on people and places.

In that perspective, in order to highlight contexts and political dimensions in assessing risks, the core proposal relies on the idea of territory as it is defined in French social geography (Di Méo 1991; Jean and Calenge 2002; Di Méo and Buléon 2005). Territory is defined as a socio-spatial construction, both material and intangible, and historically identified and appropriated through practices and representations. It is a never-end process of interactions among societies, and that links societies to places. This way, it is pretty much different from Sachs's acceptation of territory and territoriality (Sack 1986). It rather gives room to the work of articulation and situation that is critical at the time to assess (even part of) risk situations in a given place, time, and social context. Putting forward the social and political dimensions of contexts and articulating scales through the notion of places, territories or "terroirs" acknowledges connections between epistemic communities in social science perspectives (for instance it is obvious in western Africa: Bassett, Blanc-Pamard et al. 2007). The territorialization of risks seems to be an accurate notion to address risks as a component of the social production of space, and a contribution from one of the epistemic communities to the challenging social science approach of risk assessment.

The following presentation is based on two PhD fieldworks where landslides, its identification, management and instrumentalization, have been studied. The first one concerns Caracas and is part of a broader research on urban risks (Rebotier 2008), the other one relates with Quito's ravines and the politics of risk management (Sierra 2000). In these cases, the application of the territorialization of urban landslides puts the stress on the epistemology of risks and on the importance of their conceptualization by different actors in shaping the way they are handled. The first part sheds light on the ontology of risks and its political economic drivers. It shows how political and economic reasons did matter in producing landslides, mainly in Caracas. On the basis of such structural framework, the second part puts forward the importance of the epistemology of risks. The ways risks are conceptualized are critical in framing priorities of intervention and management. In addition, as risks are not only a result of humanizing the environment, but also part of the process of human – environment interaction, risks have critical implications that are accounted for in the third part. Finally, a model is proposed in order to articulate epistemology, narratives and discourses to other critical drivers that produce risk situations and vulnerability. The objective of the model is to acknowledge the recognition and assessment of the multiple factors involved in the territorialization of risk, and to take their respective importance into account. Such framework is consistent with a politically-, socially- and culturally-contingent approach of risks. It underlines also the close relationship between epistemology and ontology by integrating social and human systems into human – environment interactions as the core research object for risk assessment. This way, the territorialization of risk as an encompassing approach of risks is part of a broader proposal for improving a situated and politicized assessment of current environmental challenges from a social science point of view.

1. The political economy of landslides in Caracas

In Caracas, it is hard to discriminate the distribution of landslides according to social stratification. The distribution rather depends on biophysical mechanisms, and above all, on the kind of land occupancy. Actually, residential settlements on landslides-prone areas do not concern only poor people (Figure 1). Landslides also affect wealthy urban sectors. The following assessment is focused on them.

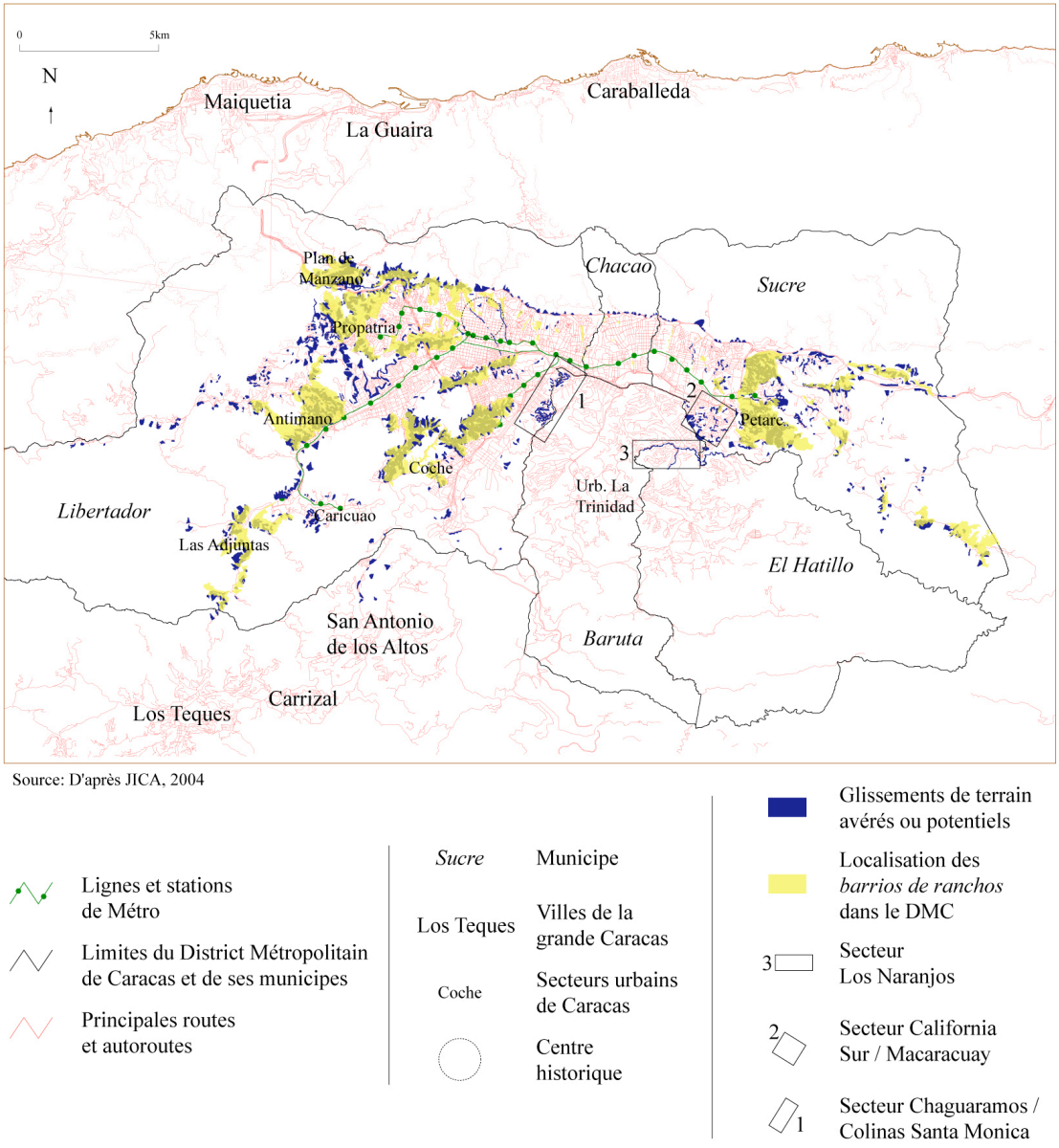

Figure 1: Distribution of landslides (in blue) and *barrios* – invasions (in yellow) in Caracas agglomeration. Wealthy sectors (examples in squares 1, 2 and 3) are also affected by landslides (Source: Rebotier according to JICA 2004).

Landslides are far to be a marker of poverty or even of "social weakness". The drivers of vulnerability to landslides in wealthy sectors are embodied in political, economic and institutional dimensions of Caracas urbanization, which is a form of territorialization (*i.e.* it is a particular way for society to interact with the environment in a place). Let us figure out three characteristics of the urbanization that have been influencing risks of landslides up to present days.

The construction of Santa Monica residential area (sector 1 on figure 1, picture 1) has been allowed in the early 1970s through special urban ordinances. Regarding urban planning in Caracas, the use of "special ordinances" is the normal way for public authorities to regulate the urbanization since the 1960s. In spite of the unstable slopes geoscientists worried about, local urban planning services were used to deliver special permits for urbanizing such or such risky areas, for political or economic reasons. Intents of coordination of the urbanization definitely fail at the end of the 1990, when the OMPU – *Oficina Metropolitana de Planificación Urbana* (Metropolitan Office for Urban Planning) disappears. Santa Monica is not an invasion. It is rather a formal middle-class sector, but a residential sector that is actually barely legal.

Picture 1: Santa Monica residential area at the bottom of Bello Monte sector, on unstable slopes (Source: *Noticias 24*).

Landslides are also the results of market rules in the construction sector. Because of the hills, the site of Caracas needs excavations. The few flat lands are completely occupied during the 1970. By law, the material excavated ought to be evacuated out of the construction site. But most of the time, urban developers only push the material away, on the edge of the tops of the hills that have been flattened. In the case of Santa Inés, a middle-class residential sector, landslides are due to the material excavated and tipped on the surrounding slopes (Picture 2). Such practices mean more meter squares to sell for promoters in a context of land shortage. But some embankments of friable material are so thick that they cannot even be anchored in the bedrock. The pillars cannot be longer than 30 meters, because of technical restrictions due to the iron inside (Picture

3). Some embankments are thicker than this, causing problems for houses at the top and at the bottom of the slope.

Picture 2: Landslide threatening Santa Inés residential sector, at the bottom of the slope (Source: Picture of the author, November 2008).

Picture 3: Intent of stabilization of a sliding slope surrounding the sector of Santa Inés. Pillars reinforced with iron are anchored in the bedrock (Source: Picture of the author, November 2008).

In addition, it is worth mentioning that still because of economic constraints, even wealthy sectors are exposed to bad quality constructions. In many cases, the sewage disposal of individual houses leaks, putting more weight on the friable slopes and worsening their susceptibility to slide down.

Finally, during the period of urbanization of the Caracas valley, biophysical mechanisms have been neglected, following economic, political or ideological logics. Human – environment interactions have not been accounted for (Rebotier 2008). Indeed, in the mid-1980, the huge interventions on urban landscape from the 1950s on, through excavation and embankments, represented more than 20 times the volume of material involved in pre-Hispanic landslides and debris-flows in the valley of Caracas (Singer 1983). In that perspective, the underlying conception of risks and the environment appears to be critical with regards to the kind of urbanization at stake and to the manufacturing of vulnerability.

2. The framings of landslides, its identification and management

The framing of risks, its representation and management refer to principals and assumptions underlying social order, political debates and action (Forsyth 2003). Assessing the different ways to manage landslides allows alternative rationalities among different actors to be put forward. These differences appear to have concrete implications on the regulation of urbanization, on socio-spatial order, or even on the urban landscape. The framing of risks and environment are part of humanizing the environment. The following examples that show such importance come from different urban scales, and concern diverse actors in Caracas and Quito.

The metropolitan district of Caracas (DMC) is made of 5 municipalities that have autonomy in terms of urbanism. Each municipality relies on its own Civil Defense and risk management services. Within the DMC, different ways of managing landslides are working – or not working – side-by-side. Coordination between municipal scales of risk management remains really hard to achieve. Chacao and Baruta municipalities have the most advanced systems of risk monitoring and assessment, but they work differently (Figure 2), and the other municipalities, like Libertador, are barely equipped with services of crisis management (Rebotier 2008).

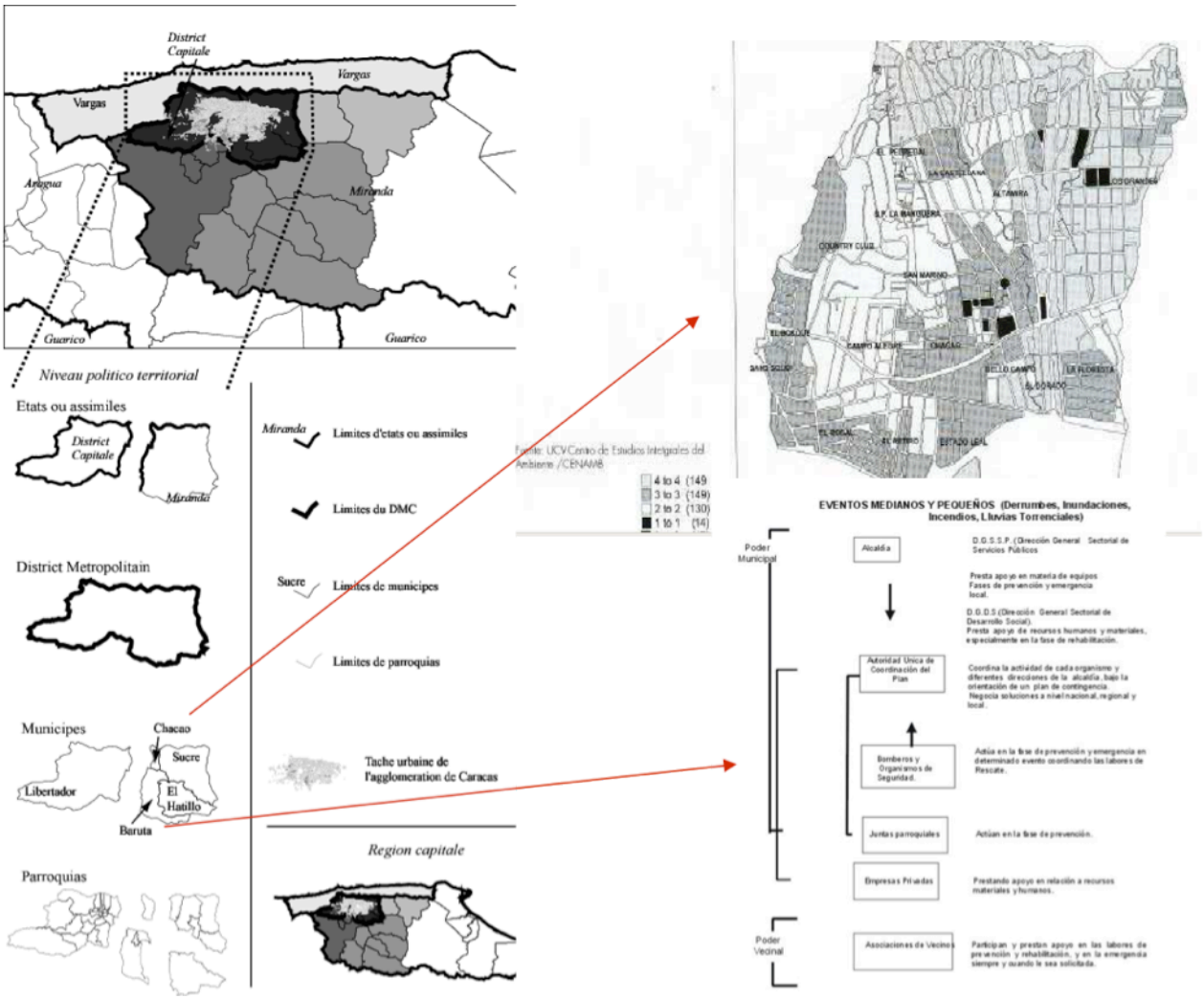

Figure 2: Risk assessment follows municipal boundaries in Caracas agglomeration (Source: Rebotier 2008, and web pages of municipal risk management services of Baruta and Chacao)

At the scale of the metropolitan district, the Japanese Cooperation (JICA) has been charged by public authorities to assess urban landslides in Caracas, but only in the northern part of the agglomeration, because of political constraints and arrangements (Figure 3). Obviously, the boundaries of the research area are politically dependent. In addition, the Japanese cooperation has focused on the biophysical diagnostic, sub-contracting local NGOs to assess the social vulnerability of landslides in so far as JICA has no particular skills in these society-related aspects of risks.

Finally, it is worth highlighting that the coordination between public institutions at different scales can be highly controversial because of critical discrepancies in viewing risks. Indeed, in 2006, the ministry of housing has built collective housing units as part of a social program in *Plan de Manzano*, western Caracas. But the sector had been classified as high-risk area by metropolitan Civil Defense only weeks before. Risk- and environment- related priorities and conceptions are far to be equally shared among state institutions, giving rise to an important weakness at the time to regulate urbanization (and contribute to make it safer).

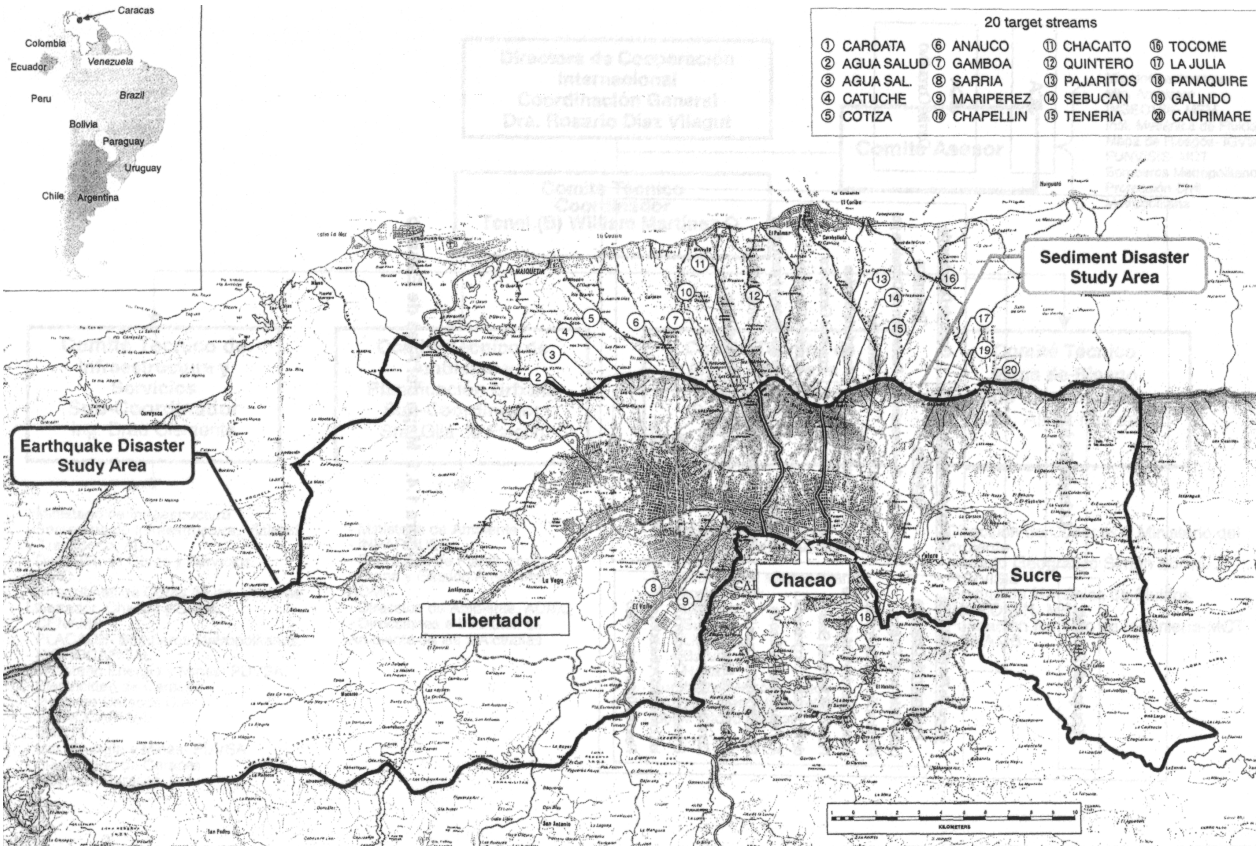

Figure 3: Caracas urban area assessed by the Japanese cooperation (Source: JICA 2004)

The city of Quito – Ecuador, is also located in an Andean valley, at around 2800 meters high, at the bottom of important volcanoes. Like in Caracas, the slopes of the gullies (ravines) are landslides-prone areas, but they have different meanings according to

viewpoints, periods and actors at stake. As for traditional belief, the gullies are bewitched, and people traditionally avoided them (Sierra 2000). But in modern thoughts that go together with the intensive urbanization of the valley, the gullies are seen first as a problem with regards to hygienist statements, in the 19th century. Latter on, during the 20th century, they are supposed to bring flood risk for the city, obstacles to transportation, and problems related with delinquency (Metzger and Peltre 1996). For all these reasons the ravines have been filled in over the past century (Figure 5). The wealthy northwestern parts of the city are particularly concerned by the transformation of the landscape in spite of the worried geoscientists (Rode and Sierra 2008).

It is really significant to see how different actors identify and manage risk and the environment unevenly over time, according to different logics that cannot be reduced to supposedly neutral biophysical mechanisms. In these cases, one of the root causes of vulnerability is epistemological. Indeed, the ways to consider risks are not only markers of a context, different actors, periods or social order. They have also concrete implications for risk situations as they contribute to shape territories, and thus the distribution of vulnerability and its production.

3. Viewing urban landslides as drivers of urbanization

Particularly in times of crisis, risks can be used as a hegemonic category that shapes urbanization, enforces political choices, public policies, or leads to defend particular interests. Different conceptions of landslides do not only highlight social groupings and discrepancies giving rise to diverse risk framings. They are also performative and they contribute to shape the urbanization in Caracas and Quito, making risk and its management critical drivers and consequential processes, not only outcomes.

In Caracas, multiple landslides caused several deaths in December 2010. The crisis has been the opportunity for President Chavez to strengthen the new orientations of the government's housing policy (Figure 4). As for President Chavez, poor people stricken by landslides should find shelters, and then permanent housing solutions among the many vacant houses and apartments in the city, particularly in wealthy sectors. In a period of environmental crisis, landslides were a way to enforce the coming law on vacant lands and buildings. Indeed, since the adoption of an organic law of emergency for lands and housing at the end of January 2011, public authorities can take over private housing units under specific circumstances, buy them, and reassign them according to the priorities of the moment. The state of emergency due to "natural hazards" is one of these circumstances. But landslides do not always strike poor people, rich people are not always safe, and managing a landslide crisis cannot be reduced to addressing housing issues. The problems remain the same and the landslide crisis is instrumentalized.

Figure 4: Screenshot of the online version of *El Universal* (among the main national newspapers) after important landslides and debris-flows in eastern Caracas: « Chavez: we are going to take over abandoned buildings » (Source : *El Universal* web page - http://www.eluniversal.com/2010/12/05/pol_video_chavez:-vamos-a-toma_05A4818413.shtml).

In Quito, the powerful local company of water supply and sewage plays a critical role in the urbanization of the capital city. The gullies are a suited place to install sewer pipes, causing nevertheless many troubles in terms of floods and water drainage. As a consequence of recurrent floods in Quito in the late 1990s, public authorities have chosen the wealthy northwestern part of the city as a priority area of intervention in spite of similar risk conditions elsewhere in the city (Sierra 2000), reinforcing this way a selective representation of risks. Indeed, during a yellow alert before a potential volcanic eruption in 1998, the most cited urban sectors in the media regarding risky situations are clearly concerning the wealthy northwestern part of the city (Figure 6). By framing this way problems of urban floods and landslides, hegemonic discourses also shed light on a hypothetical responsibility of the invasions of the slopes on top of wealthy northwestern sectors. Actually, it is well known that the combination of intensive rains, high slopes, and friable material are the main criteria that cause such environmental accidents (Rode and Sierra 2008). But a link is made between the invasion of slopes by marginal people on the one hand, and triggering-off mechanisms of floods and debris-flows on the other hand. At the end, selective risk identification is closely linked with selective risk management. Both of them are socially contingent, strongly sensitive to the unequal urban order, and they both shape Quito's urbanization.

Figure 5: Historical stages of urbanization and filling of the ravines in Quito – From North to South. The darker are the sectors and the ravines, the earlier they have been occupied or filled in (Source: Metzger and Peltre 1996).

Figure 6: Sectors « at risk » according to the number of citations in national press in Ecuador during the period of yellow alert of Pichincha eruption in 1998. The darker is the color, the more cited is the sector (Source: Rode and Sierra 2008).

In addition, such discriminated risk-oriented interventions in Quito are in line with an environmental conservation program of the slopes of the Pichincha volcano, with view to prevent deforestation. Above a line that limits the altitude of the urbanization in the neighborhood of the wealthy sectors, it is forbidden to build anything inside a national park that has been created following "green belt" ideas in the mid-1970s (Sierra 2000). Previous environmental arguments of the 1970s have been substituted today by risk- (and climate-?) related priorities in enabling dominant discourses as levers for concrete – and selective – interventions or regulations.

Across the instrumentalization of the environment- and risk- related discourses in Quito, three points that have already been mentioned allows putting the stress on the contingency of the current rationality in managing risks of landslides or debris-flows, and its potential intentionality: 1- nothing is said about the way the sewage company handles the intervention on ravines nor about the relation between the gullies and the water disposal, in spite of the crucial implication of sewage equipment in triggering off or lessening floods; 2- in the 1970s the reasons to keep "green" the slopes of the Pichincha above the wealthy sectors were ecology and environment, not risk of landslides and debris-flows. At last, the problem framing is different, but the target remains the same: keeping invaders and poor people away from wealthy sectors; and 3- nothing much is done elsewhere in the city, where vulnerability to landslides is critical,

though mostly misrecognized. From the 1960s on, urbanization is heading south, and the ravines are also filled in, causing similar troubles in a more popular part of the city (Figure 5).

Most of the time, what is at stake in identifying and managing risks cannot be reduced to supposedly neutral biophysical mechanisms. It is highly political and context-sensitive. Epistemological framings are one of the many drivers that contribute to the production of the humanized environment by allocating blames and priorities within society, and by performing discriminated social relations. Territorializing risks, as a framework for risk assessment, allows considering the different – and sometimes contested – ways of viewing risks and the environment, as well as its implications.

4. Territorializing landslides and viewing risks as encompassing socio-ecological phenomena

In a constructivist view, the assessment of vulnerability to environment-related risks focuses on the complex set of causal-factors. Biophysical mechanisms are only one of the many drivers that contribute to shape concrete situations identified as risks. But risks are social productions and need to be politicized. Thus it is worth analyzing the epistemology of risks in addition with its ontology. The epistemology of risk corresponds to the ways of viewing it, its framing, its conceptual boundaries, the language, metaphors or dominant explanations that are used to qualify it, or even the recognition of discriminated responsibilities. Considering the epistemology of risks leads to considering them as place-, time- and society-contingent. They are part of the process of humanizing the environment, as an outcome, but also as a driver. They contribute to shape landscape, spatiality, land uses, or mobility. And the way to view risks and to conceptualize them is critical in the process of territorialization, *i.e.* in producing and making sense of situated human – environment interactions.

Territorializing risks accounts for both ontological and epistemological production of the humanized environment. Such process is rooted in a socio-spatial context. Time, space and society frame the many interactions and mechanisms at stake. It articulates social and natural systems. In the case of landslides, biophysical mechanisms do matter, but political economic drivers leading to the production of risks (Part 1), or even the ways they are identified by different actors (Part 2) are critical to understand the causes of landslides as socio-environmental problems in unequal urban contexts, as well as its role in humanizing the environment (in that case, in shaping urbanization – Part 3).

The model of territorializing risks allows articulating different kinds of explanations and causal mechanisms that shape the humanized environment (Figure 7). The main objective of such model is not to systematically identify the many drivers of environmental situations (it would be a never-ending crossway!). It is rather to recognize the contingencies of environment- and risk-related issues, to acknowledge their interactions (social framing of environmental problems does influence their assessment), and to put the stress on different entry point (according to the situation at stake, to the information available or to the skills of the researcher) without despising the other causal factors involved in the production of the humanized environment.

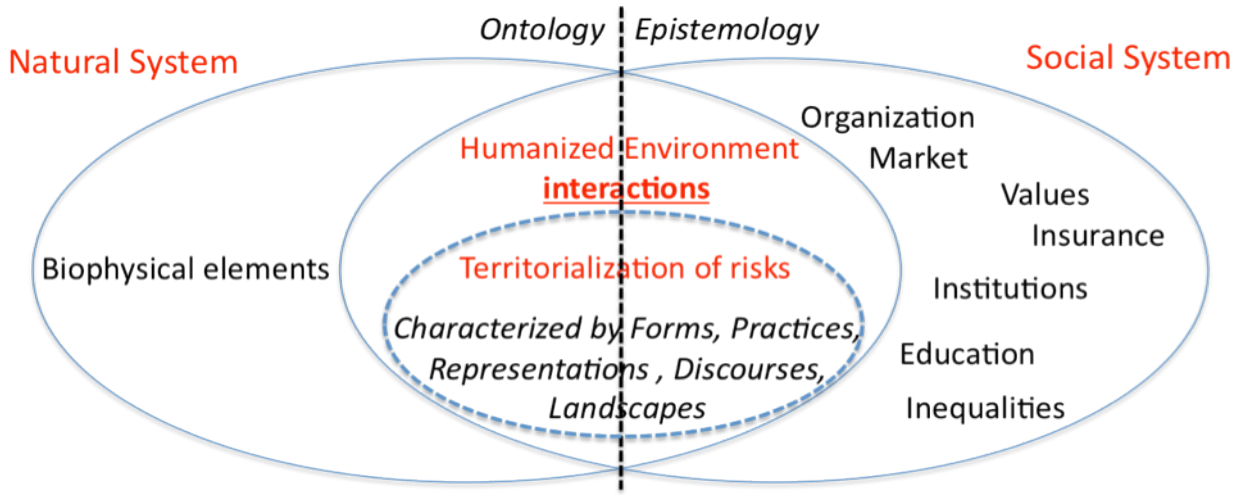

Figure 7: A model of territorialization of risk putting human – environment interactions at the center of the assessment.

5. Discussion of the territorialization of risks as an encompassing approach

Territorializing risk offers a framework for considering the large scope of risk drivers that are involved in human – environment interactions. These interactions are deeply rooted in time, in a place and in society (for instance, Modern paradigms that define the relation to Nature are strongly framing the humanized environment in specific places today). The "humanized environment", with its context, its ontological as well as its epistemological aspects, constitutes the core research object in assessing risk and the environment in terms of political ecology. The territorialization offers a politicized and encompassing framework to account for risk as a co-production (co-evolving with political or economic logics and interests) and its implication in a broader production of space. The discriminated ways of viewing risks and conceptualizing them are only one of the many drivers involved in the production of the humanized environment. Indeed, even if the social framing of landslides as urban environmental issues has concrete implications, biophysical mechanisms must not be neglected as they also contribute critically in shaping urban risks of landslides.

Obviously, other entry points – than epistemology, problem framings and instrumentalization – can be chosen in risk and vulnerability assessment to address environmental issues. Still, the framework of the territorialization of risks remains a way to bear the complex set of drivers in mind without necessarily addressing all of them. Indeed, whether the researcher is more sensitive to the cultural school of landscape, to political economic analysis, to analysis of discourses, biophysical or ecological mechanisms or to the construction of knowledge, different entry points will be chosen at the time to assess risk. Whatever the entry point can be, it is important to bear in mind that risk is part of the human – environment interactions as an outcome and as a determinant. Many different risk drivers do matter, though unevenly. The difficulty consists in prioritizing and putting weight on these different causal factors.

Finally, as parts of a broader production of humanized environment, risks are also a window of opportunities (Pelling 2011). The framework of the territorialization allows envisioning risks as a lever for social transformation putting the stress on socially rooted logics though without neglecting biophysical mechanisms. A further step would

consist in improving the recognition of risks and vulnerabilities as larger levers involved in social relationships for decision-making processes or the implementation of public policies. Shedding light on such hidden mechanisms and implications of human – environment interactions would be an opportunity to democratize even more the debate on and decision-making processes of present environmental issues.

Bibliography

Bankoff, G. (2001). "Rendering the world unsafe: 'vulnerability' as western discourse." Disasters **25**(10): 19-35.

Bassett, T. J., C. Blanc-Pamard, et al. (2007). "Constructing locality: The terroir approach in West Africa." Africa **77**(1): 104-129.

Biersack, A. and J. Greenberg, Eds. (2006). Reimagining political ecology, Duke University Press.

Blaikie, P. and H. Brookfield (1987). Land degradation and society. London, Methuen.

Coanus, T. and J.-F. Pérouse (2006). Villes et risques, regards croisés sur quelques cités en danger. Paris, Anthropos.

Cutter, S. L., L. Barnes, et al. (2008). "A place-based model for understanding community resilience to natural disasters." Global Environmental Change **18**(4): 598-606.

D'Ercole, R. and P. Metzger (2009). "La vulnérabilité territoriale: une nouvelle approche des risques en milieu urbain." Cybergeo.

Demeritt, D. (2001). "The construction of global warming and the politics of science." Annals of the Association of American Geographers **91**(2): 307-337.

Demeritt, D. (2002). "What is the 'social construction of nature'? A typology and sympathetic critique." Progress in Human Geography **26**(6): 767-790.

Di Méo, G. (1991). L'Homme, la Société, l'Espace. Paris, Anthropos.

Di Méo, G. and P. Buléon (2005). L'espace social. Paris, Armand Colin.

Fabiani, J.-L. and J.-M. Theys (1987). La société vulnérable. Evaluer et maîtriser les risques. Paris, Presses de l'ENS.

Forsyth, T. (2003). Critical political ecology. The politics of environmental science. London - New York, Routledge.

Garcia Acosta, V. (2005). "El riesgo como construccion social y la construccion social de riesgos." Desacatos **19**: 11-24.

Hewitt, K. and I. Burton (1971). The Hazardousness of a Place: a regional ecology of damaging events. Toronto, University of Toronto Press.

Hoffman, S. M. and A. Oliver-Smith, Eds. (2002). Catastrophe and Culture. Anthropology and Disaster. Oxford, Santa Fe, School of American Research Press.

Jean, Y. and C. Calenge (2002). Lire les territoires. Tours, MSH.

JICA (2004). Estudio sobre el plan básico de prevención de desastres en el distrito metropolitano de Caracas en la República Bolivariana de Venezuela – Informe final (borrador), resumen, Agencia de Cooperación Internacional de Japón, Pacific Consultants Internacional – Oyo International Cooperation.

Maskrey, A., Ed. (1993). Los desastres no son naturales, La Red.

Metzger, P. and P. Peltre (1996). "Gestion de l'environnement urbain et risques "naturels". La problématique des *quebradas* à Quito." Bulletin de l'Institut Français d'Etudes Andines **25**(3): 531-552.

Mitchell, J. K., N. Devine, et al. (1989). "A contextual model of natural hazard." Geographical Review **89**(4): 391-409.

Peet, R. and N. Thrift (1989). New models in geography: the political economy approach, Unwin Hyman.

Pelling, M. (2011). Adaptation to climate change. From resilience to transformation. London and New York, Routledge.

Pigeon, P. (2005). Géographie critique des risques. Paris, Anthropos.

Rebotier, J. (2008). Les territorialités du risque urbain à Caracas. Les implications d'un construit socio-spatial dans une métropole d'Amérique latine. Institut des Hautes Etudes d'Amérique Latine. Paris, Paris 3 - Sorbonne Nouvelle. **Doctorat:** 429.

Rode, S. and A. Sierra (2008). "Marges urbaines à Tours et à Quito. Essai de comparaison Nord - Sud." Autrepart **45**(1): 137-155.

Sack, R. D. (1986). Human territoriality: its theory and history. New York, Cambridge University Press.

Sierra, A. (2000). Gestion et enjeux des espaces urbains à risques d'origine naturelle. Les versants et les quebradas de Quito, Equateur. Institut Français de Géopolitique. Paris, Université Paris 8. **Docteur:** 331.

Singer, A. (1983). "Geomorfología, arqueología y aspectos de geología reciente." Boletín Informativo Asociación Venezolana de Arqueología **2**(2): 6-44.

Thouret, J.-C. and R. D'Ercole (1996). "Vulnérabilité aux risques naturels en milieu urbain : effets, facteurs et réponses sociales." Cahiers des Sciences Humaines **96**(2): 407-422.

Watts, M. (1983). On the poverty of theory: natural hazards research in context. Interpretations of calamity. K. Hewitt. London, Allen Unwin**:** 231-262.

Watts, M. and H.-G. Bohle (1993). "The space of vulnerability: the causal structure of hunger and famine." Progress in human Geography **17**(1): 43-68.

Wisner, B. (1976). Man-Made Famine in Eastern Kenya: The interrelationship of Environment and Development. Brighton, England, Institute of Development Studies at the University of Sussex.

Wisner, B., P. Blaikie, et al., Eds. (2004 [1994]). At Risk, natural hazards, people's vulnerability and disasters. London, Routledge.