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To upgrade or to relocate

Government's decision on implementing upgrading or relocation practices on informal settlements concerning their vulnerability to floods due to climate change and variability. The case of Montevideo, Uruguay

Valentina Vincent Bertiz, BSc

Being a dissertation submitted to the faculty of The Built Environment as part of the requirements for the award of the MSc Sustainable Urbanism at University College London: I declare that this dissertation is entirely my own work and that ideas, data and images, as well as direct quotations, drawn from elsewhere are identified and referenced.

Signature

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CC	Climate change
DINAMA	Dirección Nacional de Medioambiente *National Environment Authority*
DINAGUA	Dirección Nacional de Aguas *National Water Authority*
DFDR	Development-forced displacement and resettlement
IDB	Inter-American Development Bank
INE	Instituto Nacional de Estadística *National Institute of Statistics*
IPCC	Intergovernmental Panel on Climate Change
LAC	Latin America and the Caribbean
MVOTMA	Ministerio de Vivienda, Ordenamiento Territorial y Medio Ambiente *Ministry of Housing, Planning and Environment*
PMB	Programa de Mejoramiento de Barrios *Neighbourhood Improvement Program*
PNR	Plan Nacional de Relocalizaciones *National Relocations Plan*
PNRCC	Plan Nacional en respuesta al cambio climático *National Plan in Response to Climate Change*
PMCC	Plan Metropolitano de Cambio Climático *Metropolitan Plan for Climate Change*
OPP	Oficina de Planeamiento y Presupuesto *Office of Planning and Budget*
SNRCC	Sistema Nacional de Respuesta al Cambio Climático *National System in Response to Climate Change*
UNFCCC	United Nations Framework Convention on Climate Change
YRP	Years return period

01 ABSTRACT

Currently millions of people live in informal settlements in Latin America. They are the most vulnerable to climate change, because generally they occupy the most hazardous locations (e.g. floodplains) and lack adaptive capacity due to their low social and economical means. For several decades, governments in Latin America have implemented different policies towards informal settlements, such as in situ upgrading and relocations.

This dissertation studies how governments decide between the implementation of upgrading or relocation practices considering the impacts of floods due to climate change and variability on informal settlements. It is based on the case of Uruguay and its capital city Montevideo. Research consisted on the analysis of government plans concerning informal settlements and climate change, and interviews to both local and national government representatives. The study will show how in Uruguay the decision is based on technical and economic factors, and that national government plays a major role in the decision making processes, while local governments mainly focus on implementation stages. It will also been shown that communities generally do not have a voice in this decision.

02 Introduction

At the time when climate change (CC) is considered the most persistent global threat in the coming century (Adger *et al.,* 2003), there is a large amount of urban population living in overcrowded, poor quality and illegal settlements lacking the provision of basic needs (Satterthwaite, 2011). They usually live in the most hazardous physical environments, exposed to events such as floods and landslides, and are excessively more vulnerable to CC (Dodman and Satterthwaite, 2008). According to the United Nations Human Settlements Programme (UN-Habitat), 863 million people lived in slums in 2013 (UN-Habitat, 2013) and this number is expected to reach 2 billion by 2030 (UN-Habitat, 2003).

Latin America and the Caribbean (LAC) is one of the most urbanized developing regions in the world (IM, 2012). The percentage of urban population doubled in the second half of the Twentieth Century, and it is expected to increase up to 89% by 2050. At the same time, most cities suffer from high inequality and informality (IM, 2012). In 2012, 24% of urban population in LAC was classified as living in informal settlements (UN-Habitat, 2013).

Governments have applied different strategies in the attempt to address the informal settlement phenomena. They have done so through two opposed urban policies: upgrading and relocation. While literature has demonstrated that previous involuntary resettlement practices have had great failures (Cernea, 2000), new research has shown that communities' displacement might become more frequent because of CC (Wilmsen and Webber, 2014). Research has concentrated on how planned relocations due to CC should be implemented, but there has not been focus on why would governments choose this line of action instead of other mechanisms, such as upgrading. With the aim to better understand this decision, the dissertation proposes the following research question:

How do governments decide between the implementation of upgrading or relocation practices on informal settlements concerning communities' vulnerability to floods due to climate change and variability?

The study will be through the case of Uruguay and its capital city (Montevideo), and will pursue these four objectives:

- Understand which are the factors that the government considers in making the decision of implementing upgrading or relocation over a specific informal settlement;

- Determine which actors are involved in the decision making process;
- Study how climate change is considered within the design of these policies; and
- Have an understanding of what aspects of an informal settlement's vulnerability to flood due to climate change and variability are addressed through these practices.

This dissertation contributes in the understanding of urban policies as adaptation measures concerning vulnerability to floods due to CC. Within literature, both upgrading and relocation practices have been thoroughly studied, but most generally independently. This research proposes to extend the comprehension of these practices not as single standing solutions, but as a possible set of measures that governments can implement in order to reduce communities' vulnerability to CC. Also, the dissertation contributes in research referring to planned relocation due to CC, focusing on why it is implemented over other potential adaptation mechanisms.

The dissertation will begin with a review of literature concerning government's responses towards informal settlements and the effects of CC on communities' displacement, and the development of a framework relating to informal settlement's vulnerability to CC. Then, the methodology will be detailed and the findings of the research will be presented according to the four objectives. After this, the findings will be discussed. Lastly, the dissertation will conclude with recommendations for policy making and thoughts on possible further research.

03 Informal settlements and climate change

Informal settlements

Informal settlements respond to universal human needs of community, shelter and home making (Huchzermeyer, 2009), and are a physical and spatial manifestation of urban poverty and intra-city inequality (UN-Habitat, 2003). The complexity of the informal settlements phenomena has made it difficult to come to an agreed terminology to define them (UN-Habitat, 2003). In this dissertation I will use the definition given by Huchzermeyer, which is '*settlements of the urban poor that result from unauthorised occupation of land, usually with non-adherence to land use and building regulations*' (2009: 59).

UN-Habitat (2003) states several usual attributes of informal settlements: *lack of basic services* (e.g., sanitation and water facilities, electricity supply, rainwater drainage); *substandard housing or illegal and inadequate building structures* (e.g., use of non permanent materials and/or violating housing standards); *overcrowding and high density* (e.g., cohabitation of several families); *unhealthy living conditions and hazardous locations* (e.g., open sewers, uncontrolled dumping of waste, polluted environments, housing built on floodplains); *insecure tenure and informality* (e.g., lack of formal documents entitling the occupancy of the land, non-compliance with land use plans), *poverty and social exclusion* (considered as a cause and a consequence of informal settlements' conditions).

Governments' responses to informal settlements

The debate on how to address informal settlements has evolved throughout the years. Hardoy and Satterthwaite (1989) explain that in the 1950s and 1960s, governments of developing countries saw the growth of illegal settlements as a transitory phenomenon which would disappear with the country's economic growth. When this failed to happen, eradication and relocation strategies started. This exacerbated the problem, further increasing the growth of informality and overcrowding in other settlements. Thus, governments became more tolerant and allowed cities to grow in an unplanned manner, which led to social and spatial segregation of the urban poor and the construction of housing on hazardous sites. In the 1970s, governments started to develop new social housing programs (Abbot, 2001). These also were an inappropriate solution, usually resulting in high unit costs, benefiting only the middle and upper income groups. According to Hardoy and

Satterthwaite (1989) the designs and locations of the new social housing were not ideal for the poor's needs, and they had little or no control over what was provided. The authors state that this failure has been partly because of very weak and inadequate institutional structures of local governments.

Abbot (2001) explains that a strong critique towards public housing from the academy combined with the new participation of the World Bank in low-income housing created a shift towards an alternative approaches, such as *in situ upgrading*. Abbot states that *informal settlement upgrading* could be defined as '*any sector-based intervention in the settlement that results in a quantifiable improvement in the quality of life of the residents affected*' (2001: 307), thus it can involve many different approaches. Huchzermeyer (1999, quoted in Abbot, 2001) states that the most successful upgrading practices are those which have a strong commitment to community-driven development and the aim not to provide for the poor but to increase their options, allowing the community to take all decisions involving the implementation of the program.

Even though upgrading programs have become popular in the last decades within developing nations, relocation of urban poor settlements are still practiced (Huchzermeyer and Karam, 2006). The topic of *relocation* or *resettlement* has been approached from different fields of research, such as development-forced displacement and resettlement (DFDR) literature (see Ferris, 2014). Also, the World Bank and the Inter-American Development Bank (IDB) have developed guidelines for involuntary resettlement. Some of the basic principles are that involuntary resettlement should be avoided where feasible and that the displaced population should be assisted to improve their livelihoods at least to the levels they enjoyed before the displacement (World Bank, 2001; IDB, 1998).

Wilmsen and Webber (2014) have shown that DFDR praxis has had major failures such as limited regard for the displaced population and a simplistic understanding of communities' livelihoods and dynamics (see also Chardon, 2007). Also, a considerable amount of literature has worked on proving how low-income communities' involuntary resettlement has lead to deeper impoverishment (Wilmsen and Webber, 2014; McDowell, 2013; de Sherbinin *et al.*, 2011; Cernea, 2000; Hardoy and Satterthwaite, 1989). The process of impoverishment is related to assets loss (including land and shelter), increased distance from source of work (and possible loss of income), economic marginalization, and loss of community ties and support networks leading to negative cultural and psychological impacts. Displacement resulting from both conflict and natural disasters carries a

similar dynamic of impoverishment (Ferris, 2011). Mejía (1999) states that in LAC, practices of urban population resettlement have been implemented due to various factors, such as disorderly growth and consequent reordering and specific poverty alleviation strategies. In the case of informal settlements, relocations have also occurred in the actual process of upgrading, where displacement of some families is often carried out to provide services to the community (Mejía, 1999).

It could be said that, independently of what strategy governments choose to address informal settlements, urban policies should go beyond traditional approaches that concentrate on the physical environment and instead address the fundamental issues of poverty in an attempt to improve livelihoods in a holistic manner (UN-Habitat, 2003; Chardon, 2007). Solutions must be formulated locally, on the basis of local experience and information, with a long-term collaboration approach between governments and communities (Hardoy and Satterthwaite, 1989).

Climate change, vulnerability and adaptation

Yet CC might add a new layer of complexity to the debate on how governments tackle informal settlements. Before discussing this, it is first necessary to clarify the definitions of *climate change, vulnerability* and *adaptation to CC*. In the past few years there has been an increasing amount of literature in which many interpretations of these terms can be found (O'Brien *et al*., 2007; Olmos, 2001). The United Nations Framework Convention on Climate Change (UNFCCC) defines **climate change** as a '*change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable periods*' (UNFCCC, 1992: 7). This is the definition I will consider in this dissertation, thus making a distinction between climate *variability* (resulting by natural causes) and climate *change* (result of human activity). This reflects the terms used in the Uruguayan government plans (see SNRCC, 2010; PMCC, 2012).

Hardoy and Pandiella (2009) state that some of the effects of CC that the urban poor in LAC might suffer are heat waves, drought, storms, landslides and flooding. In this dissertation I will focus on impacts produced by floods on informal settlements, because it is the main effect perceived in the south-eastern region of South America (IPCC, 2014b) where the case study (Uruguay) is located.

Regarding **vulnerability,** I will focus on the definition given by the Intergovernmental Panel on Climate Change (IPCC), which is '*the degree to which a system is susceptible to, and unable to cope*

with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is ***exposed****, the* ***sensitivity*** *and* ***adaptive capacity*** *of that system*' (2007: 6).

Exposure is defined by the IPCC as '*the presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected*'(2014a: 5).

Sensitivity is defined by the IPCC as '*the degree to which a system is affected, either adversely or beneficially, by climate-related stimuli*' (2001: 6). According to Adger *et al.* (2003), all societies and activities are in some way sensitive to climate, because their livelihoods are influenced by it, but they differ in the degree to which they are affected.

The third component is ***adaptive capacity***, which is defined as '*the ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences*' (IPCC, 2001: 6). Bicknell *et al.* (2009) state that a society's adaptive capacity depends on its inherent capacity to undertake actions that can help to avoid loss and can speed recovery from any impact of CC.

The following diagram summarizes this definition (fig. 01).

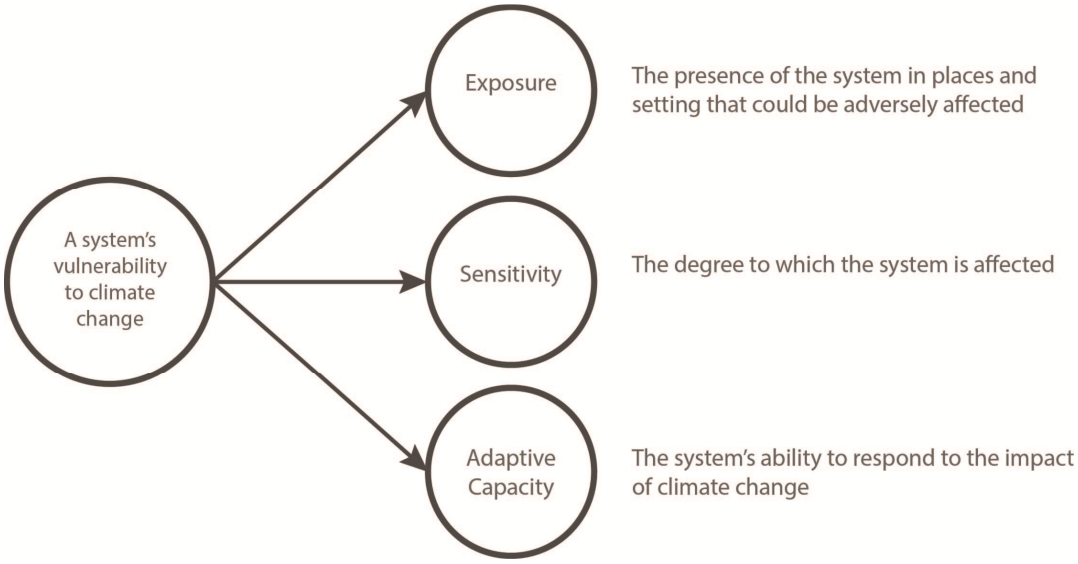

Fig.01. IPCC's definition of a system's vulnerability to climate change (IPCC, 2007).

Clearly, the communities that are most exposed (e.g., live in floodplains), have a high sensitivity (e.g., live in precarious housing), and lack adaptive capacity (e.g., are poor), are the ones most vulnerable to CC. Hardoy and Lankao (2011) state that the millions living in informal settlements in LAC are disproportionately more vulnerable to CC due to the fact that generally they are settled on the most hazardous sites, live in insecure conditions due to the lack of no formal tenure, and have the least protective infrastructure.

We can reinterpret the definition of a system's vulnerability to CC, and adapt it to informal settlements' vulnerability to flood due to CC and variability. Thus, we could say that vulnerability will depend on the climate stresses on the settlement's site (exposure); its physical characteristics that will determine how much the settlement is affected by CC and variability (sensitivity); and the economic, institutional, cultural and social means of the informal settlement's residents that will determine how much they are able to adapt (adaptive capacity) (see fig. 02).

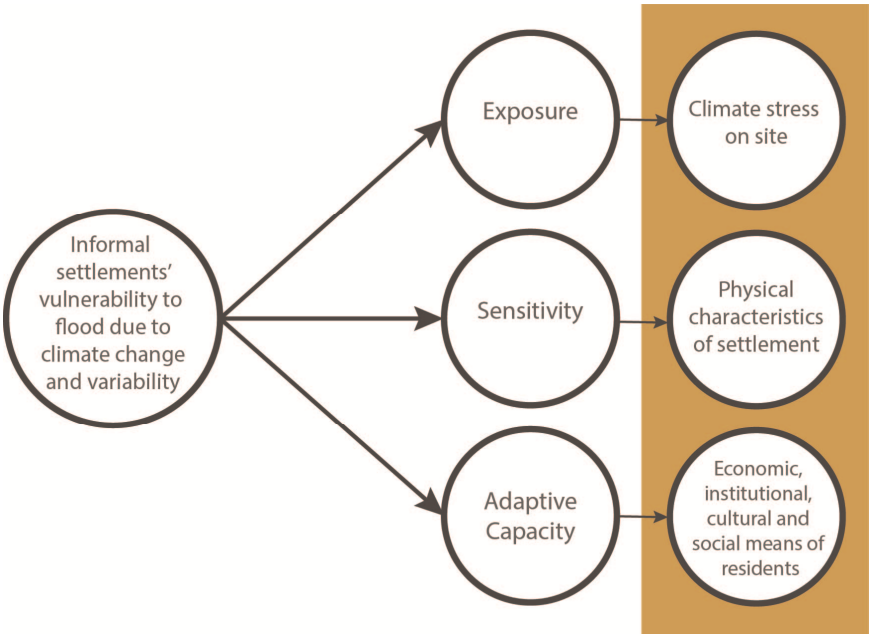

Fig.02. Author's adaptation of IPCC's definition of vulnerability (adapted from IPCC, 2007).

Bicknell *et al.* define **adaptation** to CC as '*actions to reduce the vulnerability of a system, population group or an individual or household to the adverse impacts of anticipated climate change due to the emission of greenhouse gases. Adaptation to climate variability consists of actions to reduce vulnerability to short-term climate shocks (with or without climate change)*' (2009: 9). The authors state that adaptation to CC cannot be considered independent to the often large deficits of basic

infrastructure and vulnerability to current climate variability. As Adger *et al.* (2003) explain, adaptation can take many forms, such as avoiding building on high-risk locations or strengthening existing structures so that they are less likely to be damaged.

Hardoy and Lankao state that '*the best opportunities to adapt to climate change are linked with actions that address underlying causes of vulnerability and respond to more than one problem at a time*' (2011: 158). Then, to adapt an informal settlement to the impacts of CC and variability it is necessary to reduce its vulnerability, impacting on all three aspects that compose it.

If we combine the concept of informal settlements' vulnerability to flood due to CC and variability with the main attributes of an informal settlement defined by UN-Habitat (as stated earlier), we can have the following diagram (fig. 03). In order to adapt to CC, the characteristics of informal settlements should be addressed, which then in turn would tackle at some degree the three components of vulnerability, thus creating a more adapted settlement and reducing its vulnerability.

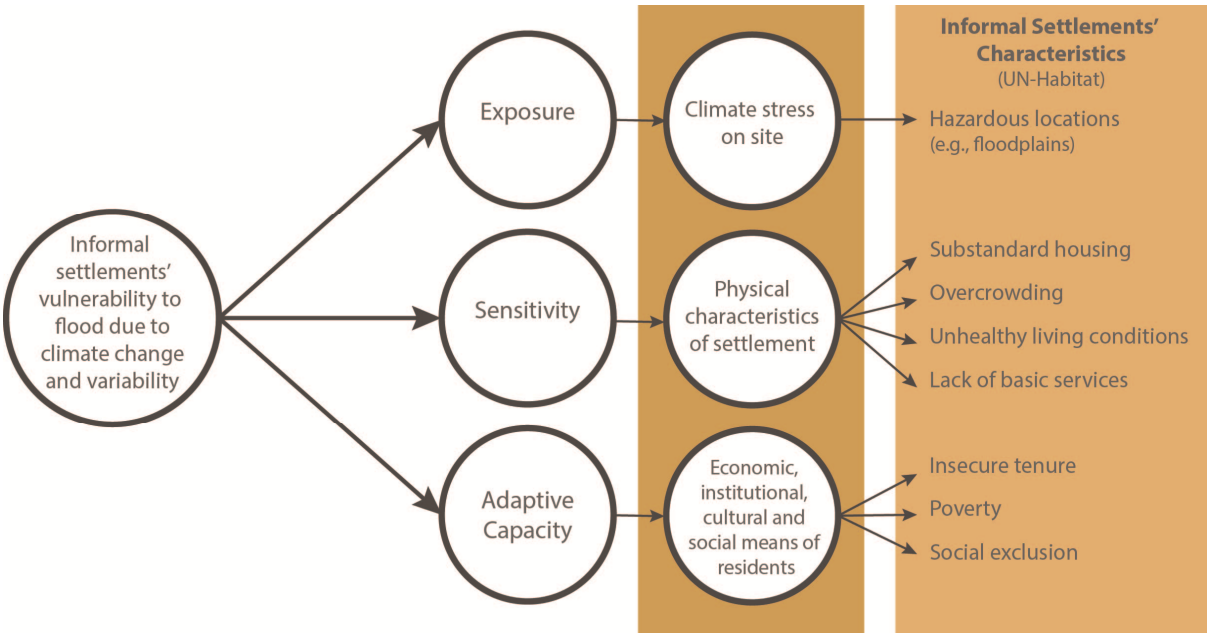

Fig.03. Author's definition of informal settlement's vulnerability (adapted from IPCC, 2007) and characteristics (adapted from UN-Habitat, 2003).

Relocation and upgrading considering climate change

Due to the potentially increased exposure of the urban poor to floods as a result of CC and variability, practices of informal settlements upgrading and relocation might be used as adaptation techniques. The framework developed in the previous section shows the relation between informal settlement's characteristics and their vulnerability to floods due to CC and variability, and thus provides a tool to understand how urban policies such as upgrading and relocation can address vulnerability.

A considerable amount of literature has argued that CC will lead to increased migration and displacement of population (IPCC, 2007; de Sherbinin *et al.*, 2011; Wilmsen and Webber, 2014; Johnson, 2012). Wilmsen and Webber (2014) state that CC will reduce communities' ability to make a living, and this will cause displacements (forced or not). Ferris (2011) states that some of the factors that will produce CC induced displacement (referred as *planned relocations*) are the increasing severity and frequency of natural disasters, areas prone to natural disasters (e.g. floodplains) and threatened livelihoods. Both Ferris (2011) and Wilmsen and Webber (2014) have focused on how previous experiences on other forms of displacement (especially DFDR) can be used to implement successful planned relocations.

Although the literature contributes to show that displacement will become more common because of CC, and a preliminary understanding on *how* planned relocations could be implemented, other questions on the matter are still left unanswered. Ferris (2011, 2014) frames this as a question of *when*. She questions whether governments and communities will recognize in advance the point at which areas become uninhabitable. I consider this not only a matter of *when*, but more importantly a matter of *why*. As Ferris (2011) mentions, different experts might have contrasting opinions in considering if a particular piece of land is fit or unfit for human habitation and on top of this, communities might be willing to migrate or stay on the site regardless of expert's opinions (see Sofaniadi *et al.*, 2015). It is not clear then why some communities might be relocated by their governments while others might not, and how governments would make this decision. The aim of this dissertation is to provide insights on this gap.

According to McDowell (2013), planned relocations will be managed within the existing national and international policies for resettlement practices. The general guidelines for resettlement of the IDB, as explained earlier, state that resettlement should be avoided. The question here is, in a scenario of

planned relocation due to CC, why would the resettlement be unavoidable? Who decides and how it is decided that it is unavoidable? Can there be other practices applied on site that would make the location still habitable? These questions are the basis for the formulation of the main research question of this dissertation, which is how governments decide on implementing either upgrading or relocation practices on informal settlements concerning communities' vulnerability to floods due to CC and variability, and the four objectives previously stated.

04 Methodology

Selection of case study

Uruguay was selected as case study on *a priori determination* of case sample (Flick, 2002) for several reasons. Firstly, within LAC the greatest flooding levels in the region are found in *Río de La Plata* area, where Uruguay is located (IPCC, 2014b) (further discussed in following section).

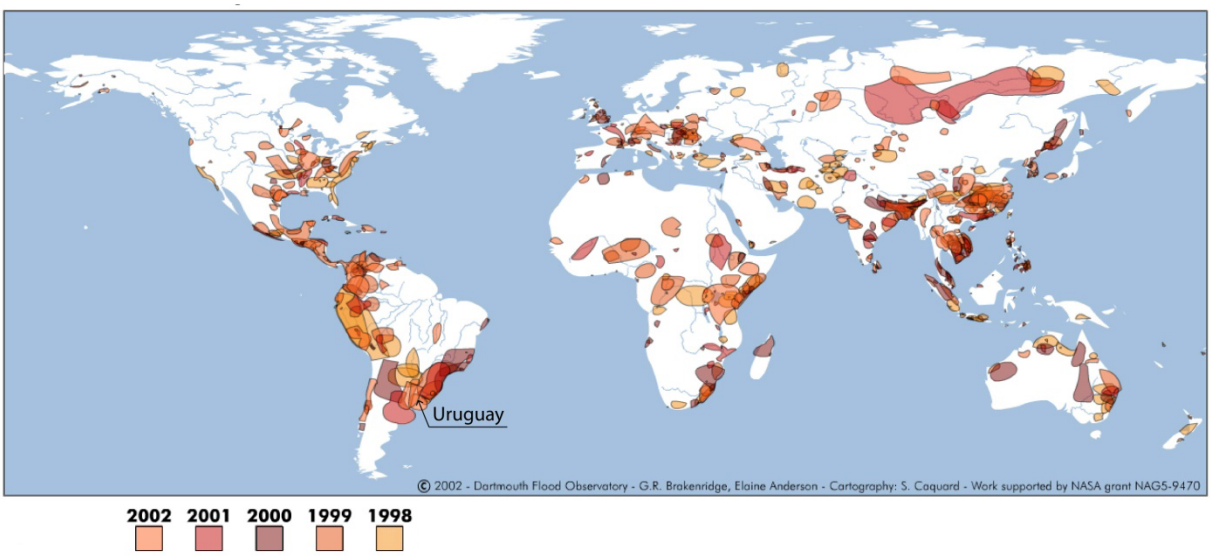

Fig.04. Map of global floods from 1998 to 2002. The map shows how Uruguay has been frequently exposed to floods (DFO, 2015).

Also, Uruguay has ratified the UNFCCC in 1994 and the Kyoto Protocol in 2000 showing the country's commitment to both mitigation and adaptation to CC (SNRCC, 2010). Finally, as my home country, I wish to contribute in further understanding issues relating to informal settlements phenomena, which has been on the country's agenda for decades, and to the new agenda of CC. Further, the dissertation will focus on Uruguay's capital city (Montevideo) because it concentrates the largest number of informal settlements in the country, most of them exposed to floods (further discussed in following sections). Having lived in the city allows me to have an understanding of urban conditions which can complement in a fuller comprehension of the findings.

Data collection and analysis

The data for the research was collected through two major sources. First, two government plans related to CC (National Plan in Response to CC, PNRCC; and Metropolitan Plan for CC, PMCC) and

two informal settlement programs (Neighbourhood Improvement Program, PMB; and National Relocations Plan, PNR) were identified and analysed (see Appendix 1; further discussed in following sections). Second, eight *semi structured interviews* (Flick, 2002) were carried out. Both plans and interviewees were selected according to their expected level of insights (Flick, 2002). Interviews included three government representatives within Montevideo's Municipality and five within different sectors of national government related to either CC or informal settlement policies (see Table 01). Interviews began with *open questions* and then *hypotheses-directed questions* (Flick, 2002) related specifically to the theoretical framework (see Appendix 2). All information gathered was analysed according to the concepts detailed in the literature review and regarding the different dimensions relevant to answer the objectives of the dissertation. A *summarizing content analysis* was carried out (Mayring, 1983 quoted in Flick, 2002). First, the parts of the material that were relevant to answer the research question were defined. Then, the material was paraphrased and summarized to obtain the main concepts to be included in the findings.

Code	Government level	Government Body	Office	Position
NG1	National	OPP	Area of Territorial Development	Senior policy officer
NG2	National	MVOTMA	PMB	Senior consultant
NG3	National	OPP	Area of Territorial Development	Senior consultant
NG4	National	MVOTMA	PNR	Senior policy officer
NG5	National	MVOTMA	National Environmental Observatory (DINAMA) / National system in response to CC	Senior consultant
LG1	Local	Montevideo Municipality University of the Republic of Uruguay	CC working group	Consultant. Senior researcher.
LG2	Local	Montevideo Municipality	Land and Habitat Department	Director
LG3	Local	Montevideo Municipality	Urban Planning, Public Spaces and Edifications Division	Senior officer

Table 01. List of interviewees.

The main limitation of the research is the amount of interviews conducted. However, the participants presented very valuable information and showed true knowledge of the issues proposed, being all of them directly linked with urban policies or CC in Uruguay. The research also presents the limitations of a single case study approach, such as the difficulty of generalizing the findings (Lodola, 2009). However, one case-study approaches can be valuable for the construction of new knowledge and theoretical questions, and are ideal for the in depth study of complex phenomena (Lodola, 2009), such as the one presented in this research.

The research did not involve any particular risk (see Appendix 4). Before carrying out the interviews, participants were asked to give consent by writing. Also, they were informed that their involvement would be anonymous to guarantee confidentiality, and that results of the dissertation would be shared with all involved.

05 The case of Uruguay

Uruguay and Montevideo

Uruguay sits in the south-eastern region of South America (fig. 05), and has 3.3 million inhabitants and 175,216 square km. It is divided in 19 provinces or *Departamentos*, each governed by a Municipality. The capital city is Montevideo (located in the *Departamento* also called Montevideo) and has a population of 1.305.082 (INE, 2011), which represents 99% of the population in the *Departamento* (see fig. 06 and 07).

Fig.05. South America and Uruguay (UTexas, 2015).

Fig.06. Departamentos in Uruguay. Departamento of Montevideo (where city of Montevideo is located) is highlighted (UTexas, 2015).

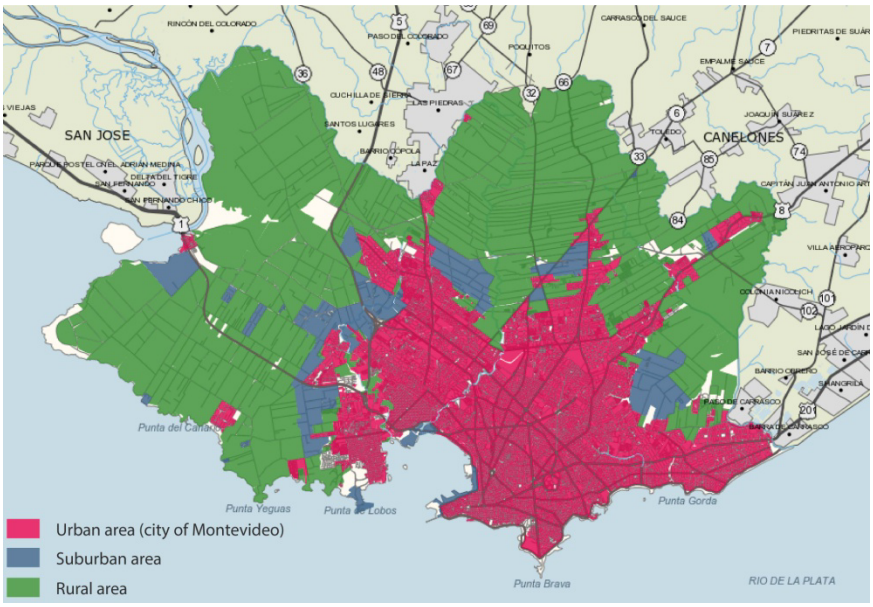

Fig.07. Departamento of Montevideo, composed by urban area (the city of Montevideo itself), suburban and rural areas (IM, 2015).

Informal settlements in Montevideo

Montevideo represents 40% of the country's population (INE, 2011) and has the largest number of informal settlements. The country has a total of 589 informal settlements (165,271 people), of which 423 (72%) are located within Montevideo and Canelones (PMB, 2012).

Research by Cruz (2005) has shown that informal settlements appeared in Montevideo mostly as a result of the deregulation of rents in 1974, after which a large amount of urban population was unable to pay their rents and had to settle in informal conditions in the margins of the city. Piperno *et al.* (2006) state that due to the fact that floodplains were generally the cheapest land this is where the majority of the urban poor managed to settle.

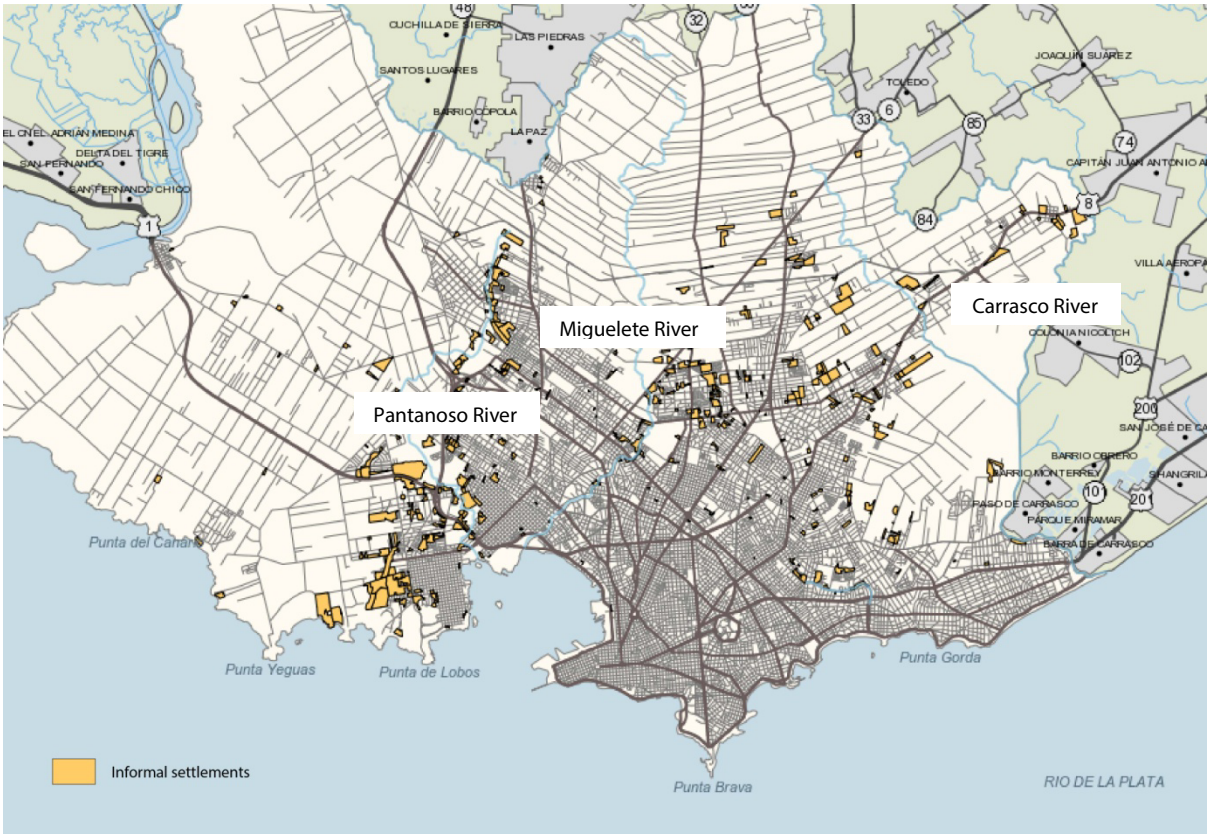

Fig.08. Informal settlements in Montevideo. The largest concentration is surrounding Pantanoso River (IM, 2015).

From the early Twentieth Century, urban policies concerning informal settlements in Uruguay have been varied. Cruz (2005) divides them into *reaction* and *anticipatory* strategies. Within the *reaction* strategies, and similar to international trends explained earlier, the government implemented eradication solutions, usually relocating the population in large housing complexes in the 1960s and 1970s, and later on smaller low density housing, which usually resulted on negative experiences

conforming urban ghettos. After the perceived failure of the previous strategies, in the late 1990s the policies shifted to an *integration* perspective. This was reflected on the Informal Settlement Integration Program (*Programa de Integración de Asentamientos Irregulares, PIAI*, later called Neighbourhood Improvement Program, *Programa de Mejoramiento de Barrios*, PMB). On the *anticipatory* strategies, Montevideo's Municipality has had plans like *Plots and Services* provision and *Land and Housing Portfolios*, but because of budget restrictions and lack of political determination these strategies where never properly implemented (Cruz, 2005).

In 2010, the government established the National Relocation Plan (*Plan Nacional de Relocalizaciones*, PNR), which was specifically targeted to those communities living on floodplains or contaminated sites. Its objective is to improve the health and quality of life of population settled on floodplains through relocation and social integration (MVOTMA, 2010) (see Appendix 3 for detail on PMB and PNR).

Climate change and variability in Uruguay

Even though Uruguay does not contribute greatly to the global GHG emissions, it is still very vulnerable to CC impacts (SNRCC, 2010). Uruguay is frequently impacted by extreme events such as storms and floods, which affect its population, infrastructure, biodiversity, coastal areas and agricultural sector (SNRCC, 2010). Some of the changes that have been observed in the last century in the region are the increase of days with precipitation and frequency of heavy rain falls (IPCC, 2014b).

Figure 09 shows how the region of Uruguay suffers impacts of urban areas and infrastructure affected by flooding, and an increase in extreme coastal flooding. Piperno *et al.* (2006) have shown that urban floods in Uruguay could be considered as natural disasters because of the impact they have on the local economy and development. The number of evacuees due to floods in Uruguay from 2000 to 2010 was over 67000 (DINAGUA, 2010). Figure 10 shows that in all basins of the country there have been flood events, with a preponderance of *Río de la Plata* Basin (where Montevideo is located).

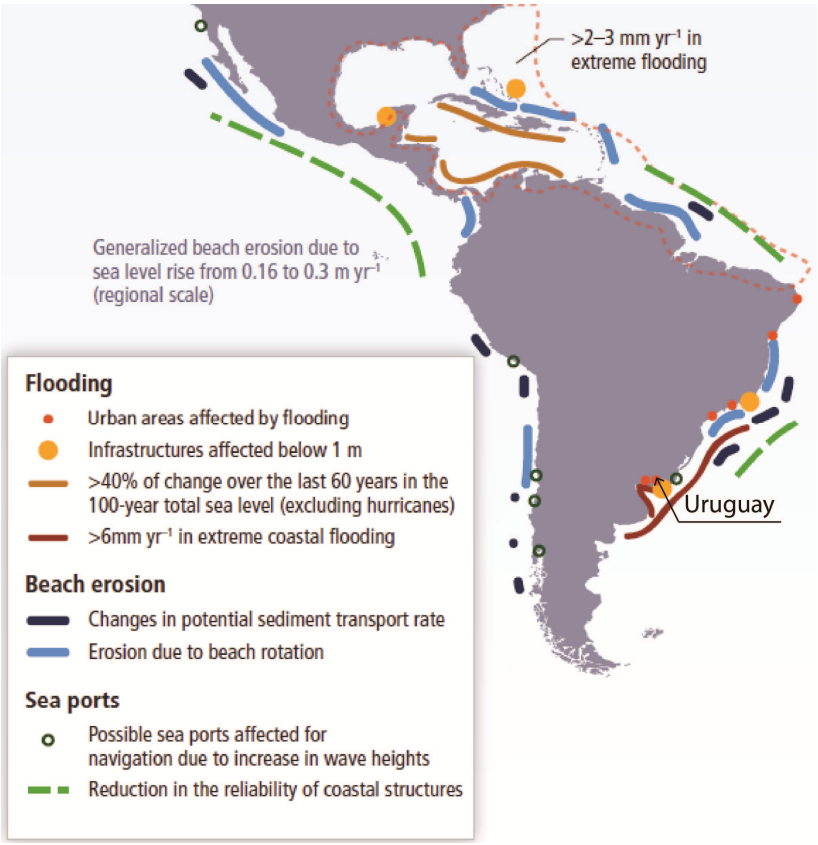

Fig.9. Potential coastal impacts in LAC based on trends observed and projections (IPCC, 2014b).

Fig.10. Main cities affected by floods between 1998-2005 in Uruguay (Piperno et al., 2006).

Scenarios developed by the IPCC for the end of the XXI Century project an increase in the variability, frequency and intensity of extreme events; 10% to 20% increase in the annual precipitations, and a significant increase in the intensity of precipitations in the region (IPCC, 2007). Some of the expected impacts are a greater variability in riverbeds, an increase in the rate of coastal retreat, and loss and damage of urban infrastructures (SNRCC, 2010).

For the last five years, CC has been on the national agenda. In 2009, the government established the National System in Response to Climate Change and Variability (*Sistema Nacional de Respuesta al Cambio Climático y Variabilidad,* SNRCC), which aims to work as a coordinator of all institutions that currently work on CC or are affected by it (SNRCC, 2010). The SNRCC developed in 2010 the National Plan in response to Climate Change (*Plan Nacional de respuesta al cambio climático*, PNRCC), in which the government establishes the main impacts that the country is expected to have because of CC and variability, the main vulnerable sectors, and the main lines of action in order to tackle it.

In 2012, the Montevideo's Municipality published the Metropolitan Plan for Climate Change (*Plan Metropolitano de Cambio Climático*, PMCC), following the line of the PNRCC. The PMCC aims at contributing with the provision of information concerning CC, awareness of its potential impacts in the city, and the identification of risks related to CC and variability (PMCC, 2012) (see Appendix 3 for details on PNRCC and PMCC).

06 Findings

Factors

The first objective of this dissertation is to understand the factors that the government considers in making the decision of whether implementing upgrading or relocation. Through the analysis of documents and interviews, two major factors were detected: technical and economic.

Technical factors

The two major policies that address informal settlements in Uruguay (PMB and PNR) operate independently. If local governments choose to implement either of them, informal settlements need to comply with several requisites. In the case of PMB, settlements (among other things) cannot be located on floodplains or be under litigation (PMB, 2013). It is estimated that in Montevideo only 15% of informal settlements could enter the program because of these restrictions (Cruz, 2005). Contrarily, PNR was specifically developed for those settlements on floodplains or contaminated soil. Municipalities have to prove the settlements' applicability by demonstrating that they are settled on floodplains as defined by the National Water Authority (*Dirección Nacional de Aguas*, DINAGUA). DINAGUA defines floodplains as the 100 year-return period (YRP) areas (DINAGUA, 2011), and these are illustrated on flood maps that the Authority is currently developing. PNR states that if these maps are not available, Municipalities have to demonstrate that the settlement is located under the latest known rise (MVOTMA, 2010). This data is taken as the *objective* input in which to determine which households should be relocated. Interviewee NG5 stated that DINAGUA has recently developed flood maps of 17 cities, including Montevideo. However, interviewee LG3 stated that these maps are not widespread information at local level, and still Montevideo's Municipality studies each case independently and sometimes use information provided by neighbours on specific locations. This shows that there is lack of rigour in the data produced and lack of coordination between national and local agencies.

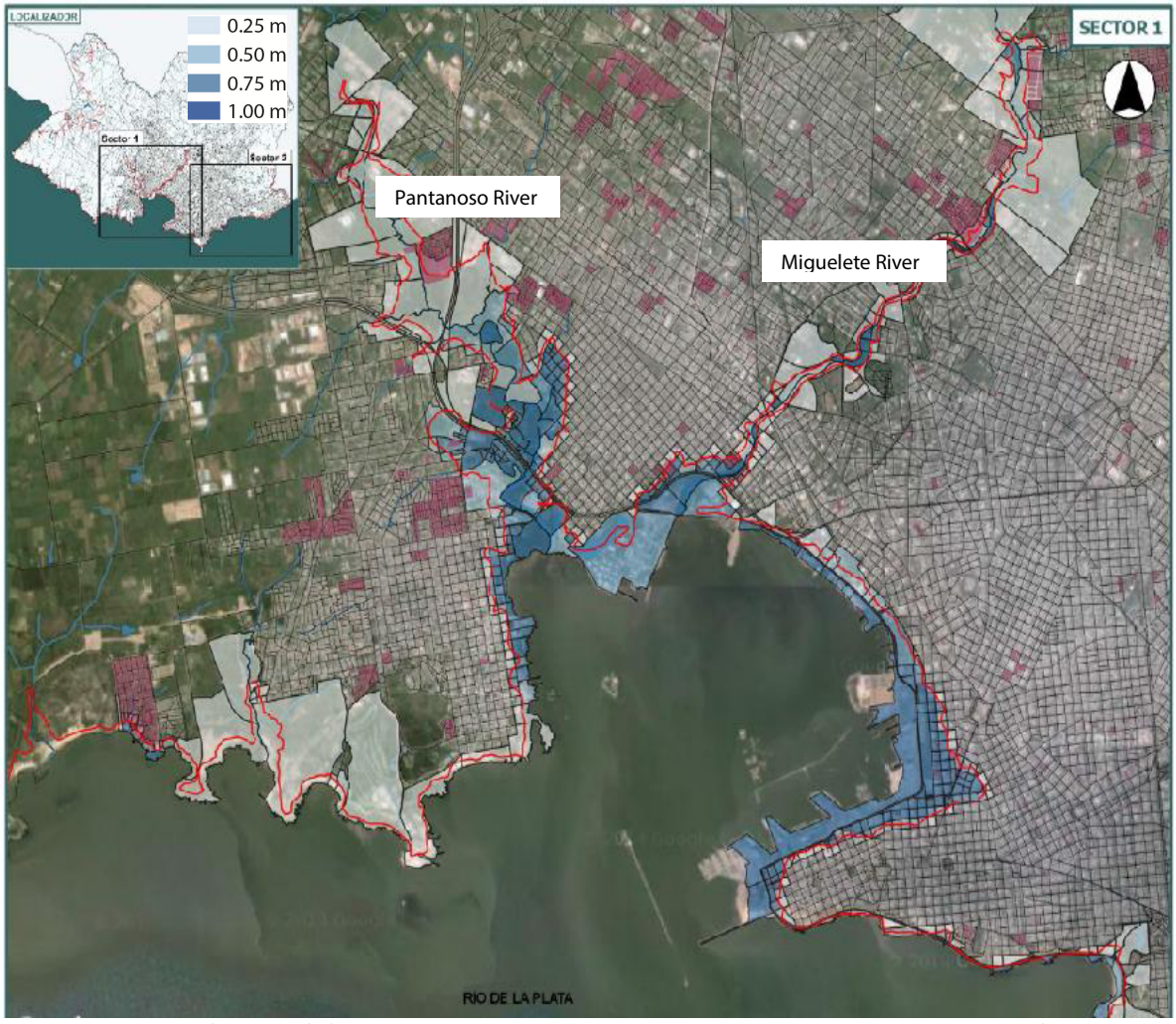

Fig.11. A section of map of floodplains in Montevideo. The population currently living on floodplains in Montevideo is 1.46% (19,366 people) (Interviewee NG5). The largest floodplain is located surrounding Pantanoso River. As seen in figure 8, this is precisely where most of informal settlements are located.

As Mejía (1999) explained, relocations can also be the result of upgrading strategies. Even though PMB is an upgrading program, relocation is considered for certain plots because of the reordering of the street network, to create public spaces, or because the plot is either contaminated or on a floodplain (PMB, 2013). The relocations are done following the IDB policy (previously mentioned in section 03). Following this policy, PMB states that relocations should be avoided or minimized (the program establishes a maximum of 10% of households to be relocated within the settlement); ensure the community's participation in the process; compensate the economical losses; and create labour opportunities for those displaced. However, it also says that the relocation should aim at improving the lives of those relocated, or at least, "*leave them, within a reasonable period of time, at the same level they were before*" (PMB, 2013: 46).

Municipalities can either adhere to these national policies or develop their own interventions within their local plans. However, from the interviews to local authorities in Montevideo and the PMCC, it can be seen that Montevideo's Municipality is aligned with this technical approach.

As interviewee LG2 explains,

'The upgrading or relocation [of an informal settlement] should be decided on technical criteria. If there is a community living on contaminated soil, by the edge of a stream with the constant risk of overflows or floods, or with living conditions that create environmental pollution, there has to be a relocation of that community in pursuit of their own safeguard and that of the City'.

The PMCC also shows this by suggesting actions such as '*relocation of population and landscaping of coastal flood areas*' (PMCC, 2012: 51) for the Coasts Sector. Also, the plan proposes a Sustainable Management of the urban hydrological cycle, which involves relocations and the reversion of growth of urban land in those areas that represent major risks.

Economic factor

The second factor highlighted by interviewees was the costs of implementation. Interviewee NG1 states,

'*I believe the reasons for choosing one option or the other are not related with climate change, but with resource availability. (…) Community's will [to be relocated] should be addressed when land is not habitable or when the costs of avoiding the risks of flooding are too high (large infrastructure works)*'.

Relocations are not only made when the land is considered not habitable, but also when the costs of minimizing the risks of flood on site are too high. The costs are not only associated with the infrastructure work, but also with the availability of land for relocation purposes. This is in fact another factor that determines the applicability of a settlement for PNR: that the local government has an appropriate (not contaminated or flooded) land for the relocation (MVOTMA, 2010). Interviewee LG1 states that because Municipalities usually have a shortage of land and economical resources, this frequently implies purchasing 'cheap land' in the margins of the city, thus extending even more the city sprawl.

Also relating to economical costs, interviewee NG2 states

'The cost of both choices should be evaluated considering a large number of facts, such as the costs that the population will have for moving to a distant site, the extension of the city's infrastructure because of the densification of new urban areas, the need to establish new social services which already exist in other areas of the city, the valorisation of private land in the periphery of the city and its impact on the value of the land in the city as a whole, among other things'.

And adds,

'Relocations should be applied without displacing the whole informal settlement to a different site, because we have enough cases where this has led to negative effects, where the inclusion of the families to the new neighbourhood networks is hardly achieved. The option of relocating families individually or in very small groups would be better, but this means extra costs, because there would be a higher need of experts per family. Both options require a strong follow up effort, which is frequently not implemented, both in relocated families as in the vacated plots'.

When asked about the importance of contemplating residents' willingness to stay or be relocated, all interviewees answered that this is the least factor to be considered by the government. Only three of the interviewees (NG3, NG2, LG1) stated that there should be a higher consideration towards this factor.

Actors

The second objective of this dissertation is to determine which actors are involved in the decision of implementing relocation or upgrading. Both documents analyzed and interviews provided insights to this issue. Within their framework, PMB and PNR establish the actors involved in the programs and their roles (see fig. 12 and 13).

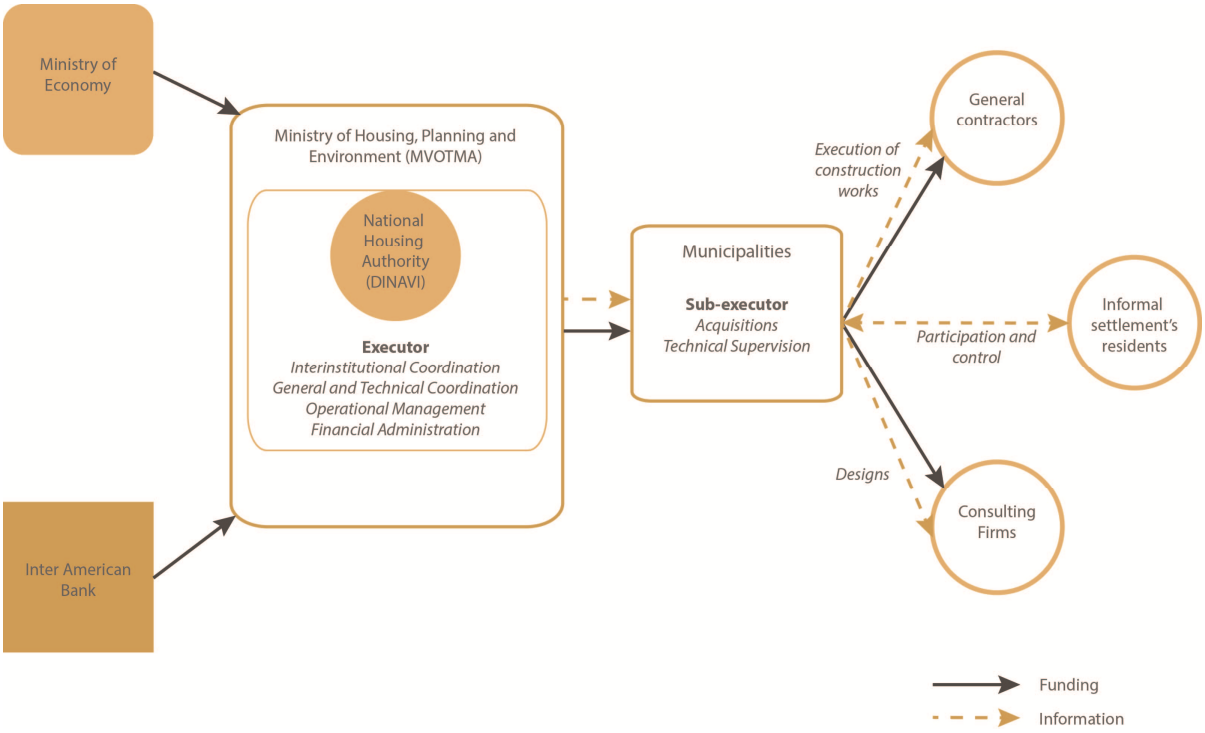

Fig.12. Author's adaptation of PMB diagram of actors (adapted from PMB, 2012).

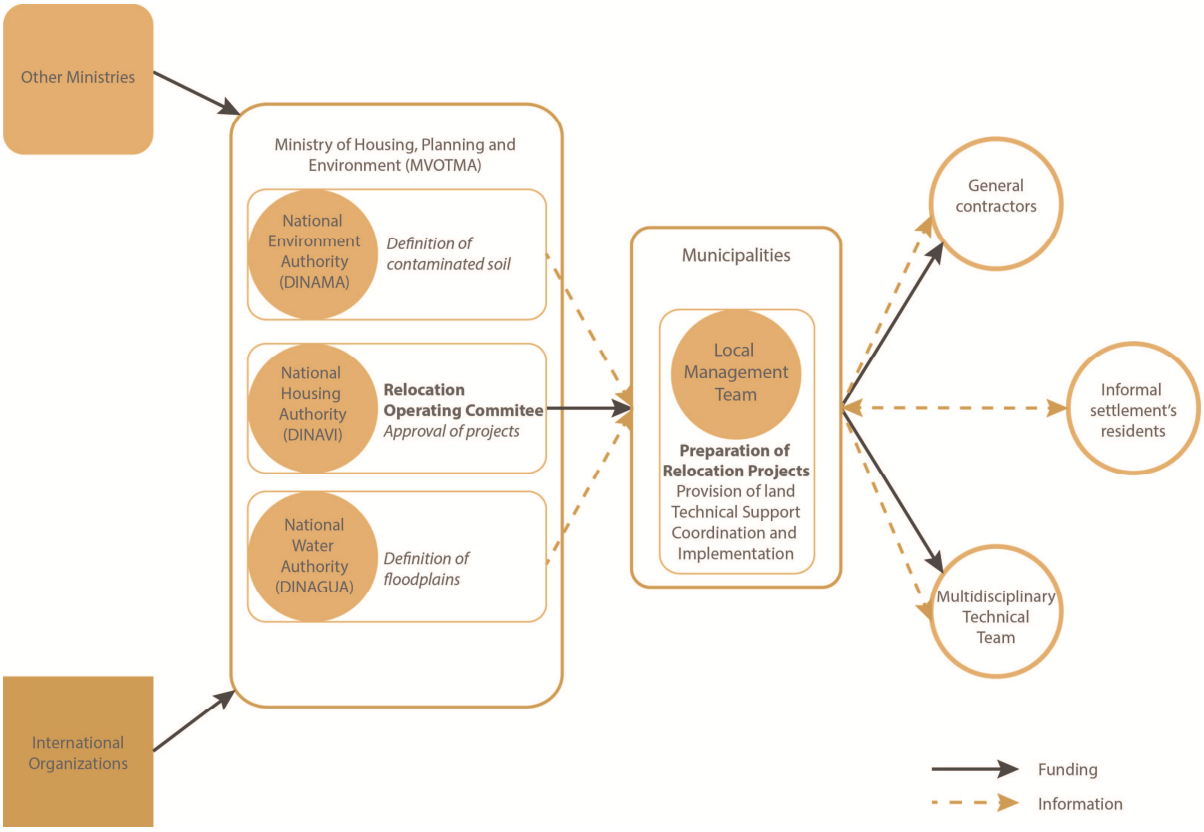

Fig.13. Author's elaboration of actors involved in the PNR process (based on MVOTMA, 2010).

The diagrams show that the national government has a major role not only in the funding but also in the final approval of both PMB and PNR projects. Municipalities mainly propose the settlements to the national government and implement the projects. From the interviews it has been noted that local governments usually lack technical capacity that undermines their possibilities to be key actors. As interviewee NG2 states,

'*I believe that Municipalities should be guiding the territory under their jurisdiction (…) but they do not have the capacity (economical resources, knowledge and influence) to make technical criteria prevalence over political interests. Thus, the consolidation of inappropriate land is decided, often semirural and with very low density designs'*.

In the case of PNRCC, one of its guiding principles is the promotion of local development and the strengthening of local capacities to assume their responsibilities regarding the impacts of CC (SNRCC, 2010). The PMCC follows these same concepts, stating that '*local and regional governments are the key actors in the implementation of national policies, and they also have their own regulatory and planning functions in promoting resilience to impacts of climate change'* (PMCC, 2012: 26).

Regarding the communities' participation, PMB and PNR consider some kind of involvement of the population. In PNR, households to be relocated have to sign a record of commitment to the project, which might include observations and recommendations. They can also participate through self-build housing (MVOTMA, 2010). One of the guiding principles of the plan is that '*projects will be carried out with solid arguments concerning the causes for the relocation, which will be informed to the beneficiaries (…) Agreements will be held in order to guarantee effective participation of all households involved'* (MVOTMA, 2010: 6). Within the PMB, the program finances '*actions of social development within the implementation of the project coordinated by the Multidisciplinary Technical Team to guarantee the effective participation of the informal settlement's residents and their organizations in the process'* (PMB, 2012: 23).

Climate change and informal settlements in Uruguay

This section addresses the third objective which is to study how CC is considered within the design of the relocation and upgrading policies in Uruguay. Neither PMB nor PNR tackle the issue of CC

directly. PNR has been recognised by the UNFCCC *Momentum for Change* program as one of the twelve 'inspiring' projects of Climate Action in 2014 (UNFCCC, 2014), even though the plan itself does not mention CC or its impacts specifically.

In contrast, both PNRCC and PMCC concentrate on CC impacts at national and metropolitan level respectively, but do not address informal settlements directly. PNRCC recognises the importance of addressing underlying problems of communities' vulnerability such as poverty and education. Specifically for floodplains which are urbanized, the PNRCC suggests that these should be subject of socio-economical analyses that would allow to 'readjust' them (SNRCC, 2010). The PMCC acknowledges that there is a high percentage of population living in informal settlements in the region, which are usually located in areas that are flooded. One of the plan's aims is to study vulnerability to CC, for which the potential impacts of CC were mapped (see fig. 14).

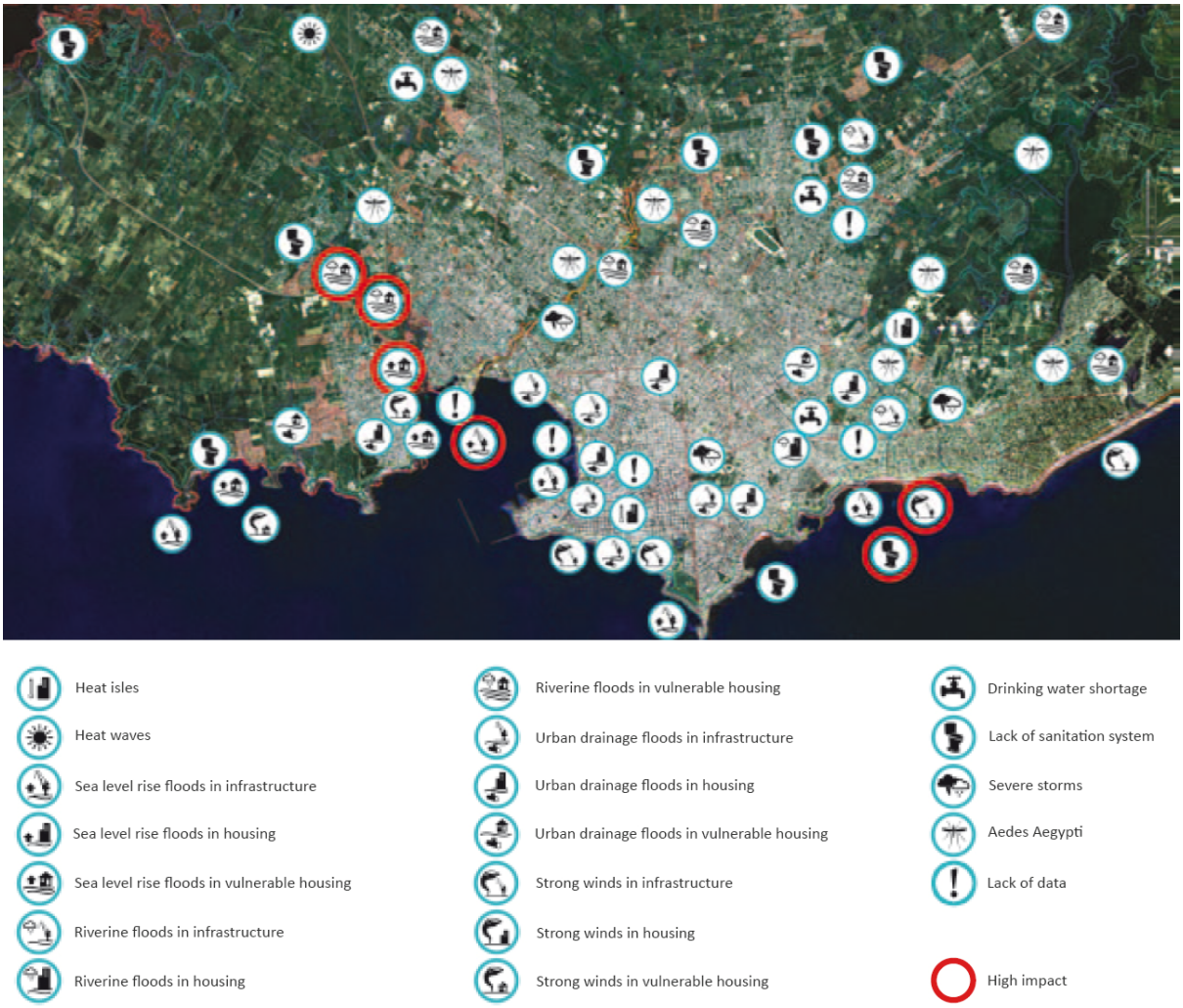

Fig.14. Map of impacts related to CC in Montevideo (PMCC, 2012).

When asked about the inclusion of CC factors in the current design of policies addressing informal settlements in Uruguay, interviewees gave varied answers. Interviewees NG1 and NG4 stated that it is considered, because of the fact that flood maps are used as a tool to determine which intervention should be carried out. However, interviewee NG1 adds that this has more to do with climate variability than actual CC. Interviewees LG1, NG3 and NG2 state that it is not considered. Interviewees NG5 and LG2 are not conclusive.

Relocation, upgrading and vulnerability

Finally, this dissertation has the objective to understand what aspects of an informal settlement's vulnerability to flood due to CC and variability are addressed through relocation and upgrading practices. As stated in the previous section, the plans do not address the problematic of CC directly. However, by analyzing the programs it can be seen that both plans tackle some of the attributes that define informal settlements according to the UN-Habitat (discussed in section 03), and thus help to address the three aspects of vulnerability (exposure, sensitivity, adaptive capacity). PMB might diminish the communities' sensitivity through the general infrastructure, housing and public spaces upgrading, and increase their adaptive capacity through tenure legalization and the implementation of post-upgrading activities promoting social cohesion and education (PMB, 2012). In the case of PNR, the program addresses communities' exposure by providing new land (in theory) free from floods; their sensitivity by providing standard housing, infrastructure and services; and their adaptive capacity by building up skills and promoting grassroots organizations (MVOTMA, 2010).

Still, the view of interviewees provides a different light on this. The framework developed in section 03 was presented to interviewees and they were asked to valuate whether the practices of relocation and upgrading currently being implemented in Uruguay help to tackle the characteristics that define informal settlements, considering a valuation from 1 to 5 (being 1 'no impact' and 5 'high impact'). The answers are summarized in the following diagrams (see fig. 15 and 16).

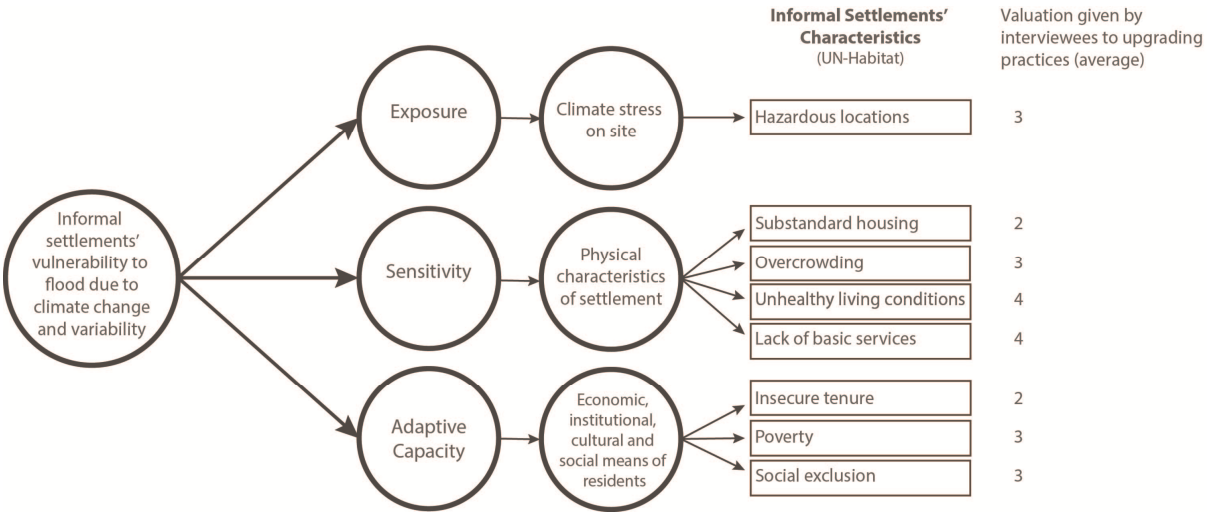

Fig.15. Valuation given by interviewees to the impact of upgrading practices on informal settlements' characteristics (average of valuation given by interviewees).

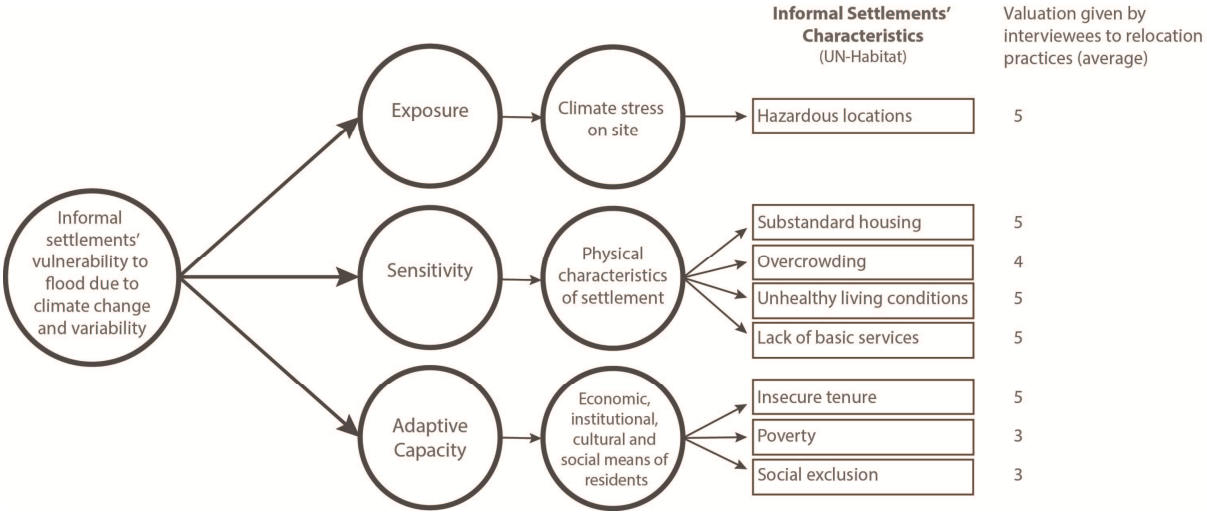

Fig.16. Valuation given by interviewees to the impact of relocation practices on informal settlements' characteristics (average of valuation given by interviewees).

As can be seen in the diagrams, upgrading practices have been valuated by interviewees as having medium or low impact on almost all characteristics. The lowest impact is on substandard housing and insecure tenure. However, relocation practices were valuated as having medium to high impact in all characteristics. The highest ones are hazardous locations, substandard housing, unhealthy living conditions and insecure tenure. In general, upgrading practices have been valuated as having a lower impact that relocation almost in every factor, expect in poverty and social exclusion, in which both policies were equally valuated as having medium impact.

When asked if one of these policies will be more frequently implemented because of CC, 7 out of 8 interviewees replied that relocations will be more frequent. NG2 stated that

'*While PMB has upgraded the largest and more complex settlements, it has become more necessary to address the areas with environmental risks, which is generally resolved by relocations. I don't see a shift in these strategies or that decision makers are considering any kind of shift because of climate change impacts on these issues.'*

07 Discussion

Technical and economic factors

It has been shown that the decision of whether implementing relocation or upgrading is mainly based on technical and economic factors. However, there are other factors that should be included in the decision making process but currently are not, such as the communities' willingness to stay on site or the impacts of extending the city sprawl.

Regarding the technical factors, the fact that the two major policies at national level concerning informal settlements operate independently does not leave room for other lines of action other than relocating population living on floodplains. In this sense, the decision is thus mostly 'objective', delegated to the technical factor of how floodplains are defined. But as Ferris (2014) explains, experts might have different opinions on considering if the land is fit for human habitation. Because of the lack of data and general rigour in the determination of floodplains in Uruguay, what is considered as a 'scientific fact' can sometimes be not exact, and the definition of what is 'habitable' becomes blurry. This opens the possibility of having upgrading program on a floodplain (which does not necessarily contemplate in its design the fact that the site gets flooded), or the relocation of a community which might not be exposed.

Because of CC, land that is currently not on floodplains (100 YRP areas) might be in the future. Without this consideration, relocation practices might displace population to future risky sites. Also, there might be no attention paid to potential exposure to floods on upgrading strategies implemented on informal settlements that are currently not under flood threat but might be in the future (and, following current policies, will have no choice but to be relocated). The IDB's resettlement policy followed by PMB not only lacks specification as to how relocations should be avoided, but also leaves room for poorly implemented practices such as relocating people and 'leaving them' at the same condition as before. This does not follow the guiding principles of the PMB itself which is to improve people's quality of life. Relating this to vulnerability to CC, it might diminish the community's exposure to floods, but not address either their sensitivity or adaptive capacity.

Regarding economic factors, and relating to Wilmsen and Webber (2014), interviews have shown that previous relocation practices have been implemented with simplistic understanding of the

communities (providing a general solution for a group of people that does not necessarily have the same needs), because more tailored solutions would be too costly. But, if the needs of communities are not properly addressed, the negative results of relocations (as seen in DFDR literature) might arise. It is evident that, for households living in extreme poverty and precariousness, the construction works that would be necessary to upgrade them are massive, and carrying this out on floodplains does not comply with national guidelines. However, what could be argued is the limit up to which it is decided to apply relocation instead of upgrading. As was mentioned, only 15% of all settlements in Montevideo had been able to enter the PMB because it does not address settlements on floodplains. This leaves the majority of settlements left to be relocated. And because those communities living in already marginal informal settlements in Montevideo are usually displaced to even more peripheral locations (Cruz, 2005), the urban footprint of the city will expand even more, and communities will live even further away from services and sources of income. On top of this, if we consider CC, this supposedly precise limit that now divides one policy of the other will change. And if these policies are not adjusted to allow for other kind of interventions on floodplains, then communities will have to retreat permanently as floodplains increase or vary.

Piperno *et al.* (2006) have stated that construction of massive infrastructures to avoid floods is not an effective solution, because this has usually led to cause floods somewhere else. This is also not encouraged by DINAGUA (DINAGUA, 2010). Still, there are adaptation techniques at household level (e.g., waterproofing the exterior walls, windows and doors; create raised places to locate valuable items; improve the connection to sewer system; adapt electrical fittings) that could be applied more generally to housing that are within informality. This might mean a greater economical cost than the relocation of that community, but perhaps a lesser social cost.

As stated earlier, considering the social costs essential for relocation practices to be successful (Wilmsen and Webber, 2014). The PNR seems to tackle these issues under its program (e.g., development of skills for the population, activities with the receiving community), but it does not leave room for the implementation of other strategies (such as upgrading) that might have even a lesser impact. As the two frameworks work separately there isn't a formal instance of comparison and a systematic decision making between both policies and their potential results. There should be a case-by-case study of the appropriate solution, with consideration of the community's interest of staying in that particular place. This comparison should not be only economical concerning the implementations themselves, but also considering the costs of expanding the city, the social costs of potential loss of employment and social networks for communities (and the costs of trying to

avoid this). The decision of what strategy to implement should be holistic, not necessarily quantitative but qualitative (Chardon, 2007).

Actors: local governments and communities

It has been shown that the main actor in the decision making process is the national government, by providing the two major frameworks that Municipalities can follow, and by approving the projects. Even though local governments participate fully in the implementation of national policies and even in funding (e.g., by providing land), their lack of capacities impede them to have a greater influence in the decision making processes. Moreover, it does not leave them the opportunity to further develop other strategies at local level. As was stated, both PNRCC and PMCC recognise the importance of municipalities and their roles in addressing adaptation to CC, and the need to increase their capacities. This should be translated also into the policies addressing informal settlements.

But there is another actor that is currently not occupying a major role, and that is the communities themselves. As was shown, PNR considers the participation of the community in that they should sign an agreement and give recommendations, but the plan does not specify what would happen if some members of the community choose not to sign or how those recommendations are actually translated into the design. Also, it is clear that the community does not participate in the actual decision of carrying out the relocation. The same could be said for PMB, where residents are included in the process of implementation but not in the design and decision making processes.

As mentioned before, Hardoy and Satterthwaite (1989) state the importance of locally produced solutions, and also the collaboration between state and community. Within these programs, there seems to be a lack of a long-term collaboration approach between authorities and communities. Rather, participation seems to be merely informative instances and is not considered during design and decision making stages. Both local government's capacities and the communities' collaboration should be further strengthened in order to have policies that are designed in a manner that actually addresses the main underlying issues of these communities, and thus reducing their vulnerability to CC.

Informal settlement policies: adaptation to climate variability

Even though PNRCC recognises the importance of addressing issues such as poverty and education, the plan gives very general lines of action and does not address the issue of informal settlements specifically. Urbanization in floodplains is recognized as a issue to be 'adjusted'. But the plan fails in proposing a specification of what this adjustment should be, how it should be done and by whom. In the case of PMCC, there is no question that maps of impacts of CC of Montevideo are of much necessity and value. However, they provide only a partial picture of vulnerability to CC. A map of vulnerability would mean that exposure, sensitivity and adaptive capacity were included, and this has not been the case. The '*relocations'* proposed both in the Coastal and Built Environment Sectors do not specify who would be resettled, where to or when. It also does not include upgrading as an alternative, even though there are upgrading programs currently being implemented in the city and helping to reduce the urban poor's vulnerability.

On one hand, the two plans relating to CC (PNRCC and PMCC) seem to be very general lines of actions that the government is implementing towards adapting to CC and do not address the issue of informal settlements specifically. On the other hand, the two major plans concerning informal settlement (PMB and PNR) do not tackle CC directly, and are rather solutions for existing vulnerabilities and climatic stresses instead of long term approaches to the housing and floods problems in the country. Because of this, taking into consideration Bicknell *et al.*'s (2009) definitions (see section 03) we could say that they are adaptation mechanisms to climate *variability* and not climate *change*. It is necessary that these strategies contemplate the long term view and future CC in order to be useful adaptation tools, and this could be done by tackling the underlying causes of informal settlement's (e.g., poverty) and by promoting anticipatory strategies (Cruz, 2005) like the provision of land with services or existing housing at affordable prices for the urban poor. It is clear however, as Bicknell *et al*. (2009) state, that reducing the vulnerability to CC means to tackle the vulnerability to existing climate variability. Thus, the programs that are currently being implemented are of major relevance for this goal. Still, if there is a desire to consider CC within urban policy in Uruguay and having a long term vision of the problematic, the anticipatory solutions should be promoted in combination with these.

The varied answers given by interviewees as to whether CC is considered within informal settlement's policies show that it is not yet a widespread topic within the government. There seems

to be a lack of coordination between CC plans and informal settlement's programs that could be solved if all worked under a single framework.

To upgrade or to relocate

The responses of interviewees on the possible impacts of upgrading and relocation on the characteristics of informal settlements show how upgrading programs are regarded as having little impact. Insecure tenure was valuated especially low, even though one of the actions taken within PMB is the formalization of the residents' legal status. This shows that the implementation of the program seems to be far from what the plan dictates. Clearly, all steps within the current plan should be properly carried out and commitment to community-driven development (Huchzermeyer, 1999) should be strengthened for it to be a successful upgrading program.

In the view of interviewees, both policies seem to fail in poverty and social exclusion factors (adaptive capacity) even though (as mentioned in section 06) both programs include actions regarding this. Again, the implementation stages seem to be far from the actual plans. Evidently, poverty and social inclusion are major issues that exceed practices on specific settlements and involve the intervention of several sectors within the government (e.g., education, employment, health). These issues should be addressed in a long term informal settlement strategy, one which would tackle poverty from the root (and thus avoid the creation of informal settlements in the first place) and increase the communities' adaptive capacity.

Also, interviewees have valuated relocation practices as having more impact in all aspects of vulnerability compared to upgrading and generally coincide with the previously mentioned literature about how communities' displacement will be more frequent because of CC. In Uruguay, it is evident that if current policies do not change and the only possible solution given to informal settlements on floodplains is relocation, then this will most definitely be the case. But this might be different if other practices were contemplated on case-by-case basis, where issues analysed not only refer to the characteristics of the site (whether it is a floodplain or not, however it is technically defined) and economical costs of implementation, but also the communities' interests and possible social costs compared to other lines of action.

08 Conclusion

This dissertation has aimed to study the government's decision of implementing either upgrading or relocation practices on informal settlements concerning communities' vulnerability to floods due to CC and variability. In the case of Uruguay, we have seen that the decision is *technical* (informal settlements get relocated if they are on floodplains, defined as 100 YRP areas), and also *economical* (which strategy is less costly to implement). Also, we have seen that national government plays a major role in the design, funding and decision making of these policies, and local governments mainly focus on implementation. It has also been shown that communities generally do not have a voice in this decision. CC is considered in the major plans developed by the government, but this has not been translated into the actual policies concerning informal settlements, which rather concentrate on adaptation to climate variability. Finally, upgrading and relocation practices are regarded as having low impact on communities' adaptive capacity, although both programs include actions that could increase it.

The following could be a set of recommendations for future policy making in Uruguay concerning informal settlements and CC.

Firstly, there should be an increased coordination of the informal settlement policies and CC plans currently being implemented. This could be achieved by having one single framework that includes existing upgrading and relocation strategies with new flood adaptation plans that allows for an in depth case-by-case study, comparison and systematic decision making. The determination of what land is habitable should not only concern physical characteristics of the plots, but also the eventual social and economical costs at a larger scale than the informal settlement (or the new settlement) itself. This should be carried out by local governments with help from the communities themselves. Efforts should be made by local governments to ensure that all actions included in the plans that address communities' adaptive capacity (e.g., capacity building, tenure legalization, maintaining and improving social networks) are carried out in order to strengthen the programs' effect on communities' vulnerability. This new framework should include CC factors specifically in its designs, especially in the determination of which land is safe to receive relocated communities, and also which informal settlements that are currently not under flood threat might be in the future and could be upgraded in advance. For this, the potential impacts of CC identified in the national and metropolitan CC plans should be translated into the actual urban policies that address informal settlements.

Secondly, there should be a promotion of all strategies within national and local governments with a medium and long term vision that address the underlying factors related to vulnerability (e.g., poverty), in an attempt to not only reduce current vulnerability but also prevent the emergence of more vulnerable communities. This can include programs of affordable housing for the urban poor within the consolidated city (not in the peripheries) that actually represent a viable solution to them. This will also help to avoid the continuous extension of urban land.

Thirdly, the national government should strengthen the role of Municipalities in urban policies by increasing their economical, technical and political capacities. By doing this, local governments could further develop their own plans considering the effects of CC on floods and informal settlements, implement them and reinforce them so that no land that is considered risky is further occupied. Also, there should be formal instances of participation between communities and local governments, so that their view on possible lines of actions, designs and implementation are considered within informal settlements practices. There should be further promotion of organizations within informal settlement communities in order to facilitate communication and participation.

This study has presented a brief introduction on the topic of relocation and upgrading practices as adaptation to floods due to CC. Further research could concentrate on the comparison of the effectiveness of upgrading and relocation strategies as adaptation mechanisms to flood and also in relation to other impacts of CC (e.g., landslides, droughts). This could be achieved by the study of implemented programs, gathering information not only from government actors but also from the communities themselves. Also, as the research has focused on the case of Uruguay and Montevideo, it presents great potential for further comparative studies including other cities and countries.

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Appendix 1

This section includes a brief introduction of the two national programs that address informal settlements (PMB and PNR) and the two plans concerning climate change (PNRCC and PMCC) that were analysed during the research.

The "Neighbourhood Improvement" Program (PMB)

Originally called Integration of Informal Settlements Program, the "Neighbourhood Improvement" program (*Programa de Mejoramiento de Barrios*, PMB) was signed in 1999 between the Uruguayan Government and the IDB. Its objective has been to contribute to the improvement of the quality of life of informal settlement's residents, by the upgrading of basic infrastructure and social services. It also aims to reduce poverty, promote the access of land at low cost and stimulate communities' organizations (PMB, 2015). The first stage of the program (2000-2011) included the upgrading of 57 informal settlements (28,375 people). The second stage of the program (2009-2015), includes the upgrading of 47 settlements (17,366 people). The majority of these are in the capital city of Montevideo (PMB, 2013).

Some of the works that are included in the program are: conditioning, extension or construction of water and electricity networks, sewer and drainage systems; construction of paved roads; forestation of public spaces; construction of toilets in existing housing; provision of communal equipment; and relocations (PMB, 2012). The plan also provides the legal assistance for residents to receive the legal tenure of the plots they occupy. After construction works are finished, the plan proposes a final phase lasting 12 months, in which several activities are carried out in order to promote, consolidate and guarantee the social inclusion of all involved (PMB, 2012).

In order to apply for PMB, settlements need to comply with several requisites, such as: settlements need to be properly identified and in the census conducted by INE in 2006; settlements need to contain at least 40 plots and 75% of them need to be occupied by housing; settlements need to be located in urban areas with more than 7000 habitants; settlements cannot be located on environmentally preserved or archaeological heritage areas; settlements cannot be located on areas of risks of natural or anthropic disasters, or in areas that present irreversible contamination levels; settlements cannot be under legal dispute (PMB, 2012).

National Plan of Relocations (PNR)

In 2010, the government established the National Relocation Plan (*Plan Nacional de Relocalizaciones*, PNR), which was specifically targeted to those communities living on floodplains or contaminated sites. Its objective is to improve the health and quality of life of population settled on floodplains or contaminated soil through their relocation and social integration (MVOTMA, 2010). Currently, the program has provided with new housing to 1100 households, and there are other 1290 going through the program (Presidencia, 2015).

Apart from the housing solution that the program provides, the plan also has a strong social aspect. Activities in this regard include the communities' skills development to increase their employability, legalization of their status, activities in the receiving community to strengthen the bond with those relocated, strengthening of grassroots organizations and social networks, childcare and sports activities, among others. The plan addresses specifically the need to maintain the communities' social networks in order to have a successful relocation, as well as providing the population with the proper skills to find proper employment.

The plan establishes the settlements that will be prioritized to enter the program, and these should include the following characteristics: settlements located on floodplains as defined by the National Housing Authority (Dirección Nacional de Aguas, DINAGUA); settlements located on contaminated soil as defined by the National Environment Authority (Dirección Nacional de Medioambiente, DINAMA); the degree of vulnerability of the families, according to poverty and precarious housing, and their incapability of solving their housing situation on their own resources; that there are available and appropriate land for the relocations (MVOTMA, 2010).

National Plan in Response to Climate Change (PNRCC)

The SNRCC developed in 2010 the National Plan in response to Climate Change (*Plan Nacional de respuesta al cambio climático*, PNRCC). In the PNRCC, the national government establishes the main impacts that the country will be expected to suffer because of climate change and variability, the main vulnerable sectors (including the urban poor, among others), and the main lines of action in order to reduce it. The plan recognises that the potential impacts of climate change will increase current social, economic, cultural and institutional vulnerabilities which should be addressed. In this

sense, it suggests that measures should be taken to tackle issues such as poverty, exclusion, education, health, and environment (SNRCC, 2010).

Some of the objectives of the plan are to coordinate institutional actions to create an efficient response to climate change; advance towards an integral management of climatic risk; improve the knowledge of vulnerability to climate change; establish preventive policies that contribute to the protection of the biodiversity and ecosystems, and diminish the population's vulnerability (SNRCC, 2010). The plan establishes three lines of action according to adaptation strategies, mitigation strategies and management. In the adaptation strategies, the plan includes actions involving water resources, energy, ecosystems and biodiversity, production and consumption, and quality of life of the population. Some of the actions proposed towards the improvement of quality of life are the implementation of local land use plans that take into account specifically climate change variables; support the development of risk maps; and analyse and readjust floodplains that are inhabited.

Metropolitan Plan for Climate Change (PMCC)

In 2012, the Montevideo's Municipality published the Metropolitan Plan for Climate Change (*Plan Metropolitano de Cambio Climático*, PMCC), together with the Municipalities of San José and Canelones. This was the first sub-national plan on climate change developed in the country. The PMCC is the result of the Territorial Approach to Climate Change (TACC), which is a partnership between the United Nations and sub-national governments for fostering climate friendly development at sub-national level (UNDP, 2015).

The PMCC aims at contributing with the provision of information concerning climate change, awareness of its potential impacts, and the identification of risks and opportunities related to climate change and variability (PMCC, 2012). The plan acknowledges international trends that show that most actions towards adaptation to climate change are developed at sub-national and local level, and the relevance of local action to strengthen the national and international frameworks and strategies (PMCC, 2012). Thus, the plan proposes that local governments become the key actors in the implementation of national policies concerning climate change.

The approach that the plan proposes towards climate change goes beyond environmental concerns, and focuses on sustainable development more generally. The action plan proposed involves both

adaptation and mitigation techniques that focus on responses involving land use planning, participatory planning and risk management. The plan is organized through five key sectors: Coasts, Built Environment and Health, Agricultural systems and Biodiversity, Transport and Energy. It provides general lines of action for each sector, divided by mitigation and adaptation strategies, specifying the type of action (e.g., economic incentives; construction works; education and research).

Appendix 2

This appendix contains the context and questionnaire presented to each interviewee.

This questionnaire is part of an independent research carried out as part of the MSc Sustainable Urbanism program at the University College of London (UCL). All information received from interviewees will be confidential. The results of the research will be shared with all participants.

Context

Currently millions of people live in informal settlements in Latin America. It is them who are most vulnerable to climate change, because generally they occupy the most hazardous locations and lack adaptive capacity.

For several decades, the Governments in Latin America have implemented different policies towards informal settlements with the objective to reduce informality, such as in situ upgrading and resettlement practices. Research has demonstrated how relocations have lead to communities' impoverishment. However, many studies have shown that because of climate change, resettlement practices might become more common as an adaptation tool.

This dissertation studies how governments decide between the implementation of an upgrading policy over resettlement considering the impacts of climate change on informal settlements, and which are the factors that determine that decision. It is based on the case of Uruguay, and the vulnerability of informal settlements to floods produced by climate variability and change.

Questions

1. Are you familiar with any experience in Uruguay were upgrading or resettlement practices have been applied? Which ones?

2. Considering the experiences that you are familiar with,
    a. Which are the factors in which the policy impacted positively?
    b. Can you name any negative impact of these experiences?

3. Who are to your understanding the institutions or government entities that decide over the implementation of one policy over the other? Do you consider this to be appropriate?

4. Which are the mechanisms through which these institutions or government entities have in the decision making process?

5. In the decision making process of implementing one policy over the other,
    a. Which do you think are the factors that the government considers in order to make the decision?

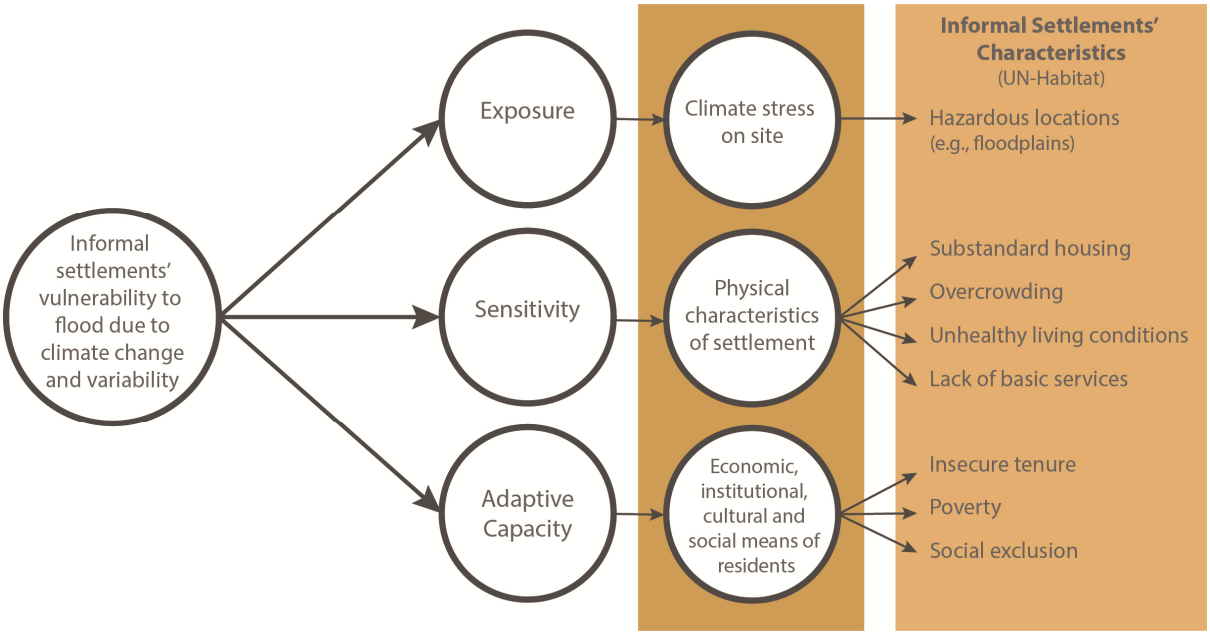
b. Do you think that there should be other factors considered? If yes, which ones?

6. Evaluate in a scale from 1 to 10 the relevance that you consider the Government gives to each of the following factors in determining whether to implement upgrading or relocation to one specific community:
    a. The costs of implementing each one.
    b. The willingness of residents to move or to stay.
    c. The climate change impacts on that particular site.
    d. The political and institutional will
    e. Others (please add any other factor you consider)

7. Considering the factors stated in the previous question, which is the relevance that you consider they should have?

8. Which do you consider are the pros and cons of each policy? (for example, the ease or speed in the implementation).

9. The IPCC defines the following model to define vulnerability to climate change (exposure, sensitivity, adaptive capacity). At the same time, UN-Habitat established eight factors that define an informal settlement. The following diagram shows how the eight factors of an informal settlement influence in its vulnerability to climate change.



Considering the upgrading and resettlement policies, evaluate the impact that you consider that each policy has in these eight factors. In the following table, consider a valuation from 1 to 5, being 1 "no impact" and 5 "high impact".

	Upgrading	Resettlement
1. Hazardous locations		
2. Substandard housing		
3. Overcrowding		
4. Unhealthy living conditions		
5. Lack of basic services		

6. Insecure tenure		
7. Poverty		
8. Social exclusion		

10. Do you think that the issues of climate change are considered within the current design of these policies? How is it considered? In case it is not considered, do you think it should be?

11. Do you think that because of the impacts of climate change in Uruguay, any of these policies will be more frequently implemented than the other? Why?

Appendix 3

This appendix contains the Risk Assessment Form.

RISK ASSESSMENT FORM
FIELD / LOCATION WORK

The Approved Code of Practice - Management of Fieldwork should be referred to when completing this form
http://www.ucl.ac.uk/estates/safetynet/guidance/fieldwork/acop.pdf

DEPARTMENT/SECTION THE BARTLETT SCHOOL OF PLANNING
LOCATION(S) NONE
PERSONS COVERED BY THE RISK ASSESSMENT VALENTINA VINCENT BERTIZ

BRIEF DESCRIPTION OF FIELDWORK There will be no fieldwork, I will be doing my dissertation from London.

Consider, in turn, each hazard (white on black). If **NO** hazard exists select **NO** and move to next hazard section.
If a hazard does exist select **YES** and assess the risks that could arise from that hazard in the risk assessment box.
Where risks are identified that are not adequately controlled they must be brought to the attention of your Departmental Management who should put temporary control measures in place or stop the work. Detail such risks in the final section.

ENVIRONMENT	**The environment always represents a safety hazard. Use space below to identify and assess any risks associated with this hazard**
e.g. location, climate, terrain, neighbourhood, in outside organizations, pollution, animals.	Examples of risk: adverse weather, illness, hypothermia, assault, getting lost. Is the risk high / medium / low ? No risk.

CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**
☐	work abroad incorporates Foreign Office advice
☐	participants have been trained and given all necessary information
☐	only accredited centres are used for rural field work
☐	participants will wear appropriate clothing and footwear for the specified environment
☐	trained leaders accompany the trip
☐	refuge is available
☐	work in outside organisations is subject to their having satisfactory H&S procedures in place
☐	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

EMERGENCIES	**Where emergencies may arise use space below to identify and assess any risks**
e.g. fire, accidents	Examples of risk: loss of property, loss of life

No risk.

CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**
☐	participants have registered with LOCATE at http://www.fco.gov.uk/en/travel-and-living-abroad/
☐	fire fighting equipment is carried on the trip and participants know how to use it
☐	contact numbers for emergency services are known to all participants
☐	participants have means of contacting emergency services
☐	participants have been trained and given all necessary information
☐	a plan for rescue has been formulated, all parties understand the procedure
☐	the plan for rescue /emergency has a reciprocal element
☐	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

EQUIPMENT	Is equipment used?	No	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g. clothing, outboard motors.	Examples of risk: inappropriate, failure, insufficient training to use or repair, injury. Is the risk high / medium / low ?		

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk
☐	the departmental written Arrangement for equipment is followed
☐	participants have been provided with any necessary equipment appropriate for the work
☐	all equipment has been inspected, before issue, by a competent person
☐	all users have been advised of correct use
☐	special equipment is only issued to persons trained in its use by a competent person
☐	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

LONE WORKING	Is lone working a possibility?	No	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g. alone or in isolation lone interviews.	Examples of risk: difficult to summon help. Is the risk high / medium / low?		

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk
☐	the departmental written Arrangement for lone/out of hours working for field work is followed
☐	lone or isolated working is not allowed
☐	location, route and expected time of return of lone workers is logged daily before work commences
☐	all workers have the means of raising an alarm in the event of an emergency, e.g. phone, flare, whistle
☐	all workers are fully familiar with emergency procedures
☐	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

ILL HEALTH	**The possibility of ill health always represents a safety hazard. Use space below to identify and assess any risks associated with this Hazard.**
e.g. accident, illness, personal attack, special personal considerations or vulnerabilities.	Examples of risk: injury, asthma, allergies. Is the risk high / medium / low? No risk.

CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**
☐	an appropriate number of trained first-aiders and first aid kits are present on the field trip
☐	all participants have had the necessary inoculations/ carry appropriate prophylactics
☐	participants have been advised of the physical demands of the trip and are deemed to be physically suited
☐	participants have been adequate advice on harmful plants, animals and substances they may encounter
☐	participants who require medication have advised the leader of this and carry sufficient medication for their needs
☐	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

TRANSPORT	**Will transport be required**	**NO** ☐	**Move to next hazard**
		YES ☐	**Use space below to identify and assess any risks**
e.g. hired vehicles	Examples of risk: accidents arising from lack of maintenance, suitability or training Is the risk high / medium / low? No risk.		

CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**
☐	only public transport will be used
☐	the vehicle will be hired from a reputable supplier
☐	transport must be properly maintained in compliance with relevant national regulations
☐	drivers comply with UCL Policy on Drivers http://www.ucl.ac.uk/hr/docs/college_drivers.php
☐	drivers have been trained and hold the appropriate licence
☐	there will be more than one driver to prevent driver/operator fatigue, and there will be adequate rest periods
☐	sufficient spare parts carried to meet foreseeable emergencies
☐	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

DEALING WITH THE PUBLIC	**Will people be dealing with public**	**No** ☐	**If 'No' move to next hazard** **If 'Yes' use space below to identify and assess any risks**
e.g. interviews, observing	Examples of risk: personal attack, causing offence, being misinterpreted. Is the risk high / medium / low?		

CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**
☐	all participants are trained in interviewing techniques
☐	interviews are contracted out to a third party
☐	advice and support from local groups has been sought
☐	participants do not wear clothes that might cause offence or attract unwanted attention
☐	interviews are conducted at neutral locations or where neither party could be at risk
☐	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

WORKING ON OR NEAR WATER	**Will people work on or near water?**	**No**	**If 'No' move to next hazard** **If 'Yes' use space below to identify and assess any risks**

e.g. rivers, marshland, sea.

Examples of risk: drowning, malaria, hepatitis A, parasites. Is the risk high / medium / low?

CONTROL MEASURES **Indicate which procedures are in place to control the identified risk**

- ☐ lone working on or near water will not be allowed
- ☐ coastguard information is understood; all work takes place outside those times when tides could prove a threat
- ☐ all participants are competent swimmers
- ☐ participants always wear adequate protective equipment, e.g. buoyancy aids, wellingtons
- ☐ boat is operated by a competent person
- ☐ all boats are equipped with an alternative means of propulsion e.g. oars
- ☐ participants have received any appropriate inoculations
- ☐ OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

MANUAL HANDLING (MH)	**Do MH activities take place?**	**No**	**If 'No' move to next hazard** **If 'Yes' use space below to identify and assess any risks**

e.g. lifting, carrying, moving large or heavy equipment, physical unsuitability for the task.

Examples of risk: strain, cuts, broken bones. Is the risk high / medium / low?

CONTROL MEASURES **Indicate which procedures are in place to control the identified risk**

- ☐ the departmental written Arrangement for MH is followed
- ☐ the supervisor has attended a MH risk assessment course
- ☐ all tasks are within reasonable limits, persons physically unsuited to the MH task are prohibited from such activities
- ☐ all persons performing MH tasks are adequately trained
- ☐ equipment components will be assembled on site
- ☐ any MH task outside the competence of staff will be done by contractors
- ☐ OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

SUBSTANCES	**Will participants work with substances**	**No**	**If 'No' move to next hazard** **If 'Yes' use space below to identify and assess any risks**
e.g. plants, chemical, biohazard, waste	Examples of risk: ill health - poisoning, infection, illness, burns, cuts. Is the risk high / medium / low?		

CONTROL MEASURES **Indicate which procedures are in place to control the identified risk**

- ☐ the departmental written Arrangements for dealing with hazardous substances and waste are followed
- ☐ all participants are given information, training and protective equipment for hazardous substances they may encounter
- ☐ participants who have allergies have advised the leader of this and carry sufficient medication for their needs
- ☐ waste is disposed of in a responsible manner
- ☐ suitable containers are provided for hazardous waste
- ☐ OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

OTHER HAZARDS	**Have you identified any other hazards?**	**No**	**If 'No' move to next section** **If 'Yes' use space below to identify and assess any risks**
i.e. any other hazards must be noted and assessed here.	Hazard: Risk: is the risk		

CONTROL MEASURES **Give details of control measures in place to control the identified risks**

Have you identified any risks that are not adequately controlled?		
	NO ☒	**Move to Declaration**
	YES ☐	**Use space below to identify the risk and what action was taken**

Is this project subject to the UCL requirements on the ethics of Non-NHS Human Research? No

If yes, please state your Project ID Number

For more information, please refer to: http://ethics.grad.ucl.ac.uk/

DECLARATION The work will be reassessed whenever there is a significant change and at least annually. Those participating in the work have read the assessment.

Select the appropriate statement:

- ☒ I the undersigned have assessed the activity and associated risks and declare that there is no significant residual risk
- ☐ I the undersigned have assessed the activity and associated risks and declare that the risk will be controlled by the method(s) listed above

NAME OF SUPERVISOR CATALINA TURCU

SIGNATURE OF SUPERVISOR

DATE 18/05/15