

Subscription
contact information
http://www.elsevier.com

The Publishing House of
Science and Technology (CSC) PRESS, Ltd.
No. 100

Coordinates

Climate change and the role of surveyors



Indoor Positioning

Marine Navigation

Climate change and the role of surveyors

Coordinates Vol. X, Issue 6, June 2014

Experts discuss the possible role of surveyors in view of emerging challenges of climate change



Dr Isaac Boateng

School of Civil Engineering and Surveying, University of Portsmouth, UK

Climate change has been one of the main causes of the rise and fall of civilisations, migration and destruction of complex societies from the apocalyptic story of Noah's Ark and the flood, through the ice age to the present time. The development of complex societies and population growth mostly leads to overexploitation of the earth resources to support the complex life styles. In the last century, anthropogenic climate change which is mainly driven by the volume of human emission of greenhouse gases and aerosols in the atmosphere has resulted in global warming and climate change. According to the IPCC (2013) the atmosphere and oceans have warmed, the volume of snow and ice have diminished, sea level has risen and the concentrations of greenhouse gases have increased and some of these changes are accelerating and are possibly irreversible at this stage. Climate change therefore poses severe threat to many countries, territories and cultural heritage of humanity on earth in the 21st century. This articles discusses one of the fall out of the effects of climate change (climate refugees) and assesses the role surveyors could play to ameliorate the problem. Climate change is predicted to bring about more frequent and severe disasters, such as droughts, floods, storms, and hurricanes (cyclones and typhoons). IPCC (2007) identified four zones as among the most susceptible to the effects of climate change: low-lying coastal settlements; rain-fed farming regions and those dependent on rivers fed by snow and glacier melt; sub-humid and arid regions; and humid areas in Southeast Asia vulnerable to changes in monsoon patterns. The climatic changes that threaten these zones are: sea level rise, drought, changes in rainfall pattern, flood, glacial melting and extreme weather conditions (Boateng, 2010).

In the next 20-30 year period, the intensity, frequency, duration and extent of weather related hazards will increase in many parts of the world. However, we are unlikely to see significant changes in the location of these hazards (Ehrhart et al, 2009). While extreme weather events can hit any part of the world, their impact is most acute in the least developed countries, where the poor often live in marginal lands subject to flooding or mudslides, and therefore, are more prone to being displaced (Fritz, 2010). Here are a few recent examples of extreme weather conditions. Hurricane Katrina in the southern USA in 2005, the 2007 floods in Tewkesbury, UK; Burma; Bangladesh; and the multiple hurricanes that nearly destroyed Haiti in 2008, and the numerous typhoons in Asia in 2009 brought huge displacements, catastrophic losses of life and livelihood and made many refugees.

One of the ensuing effects of climate change is the issue of climate induced displacements and the consequent migrants (climate refugees). Over the past two decades, the debate about "climate refugees" among experts, advocacy groups and social scientists has produced lots of different scenarios about environmentally induced migration (El-Hinnawi, 1985; Black, 2001; Myers, 2002; Bates, 2002; Boano et al, 2008; Gemenne, 2011; Piguët, 2012). However, the term "environmental refugee" or "climate refugee" remains somewhat vague and has no international charter.



Victims of flooding at Orissa, India in 2011 (photo sources: Press TV)

Climate refugee

In fact, the issue of climate refugee remains one of the most serious fall outs of global policy on climate change. As a result, significant numbers of people who are climate refugees at the moment are not accorded the needed support under the 1951 United Nations (UN) convention and 1967 Protocol on the Status of Refugees.

One may ask, who is a climate/ environmental refugee. El-Hinnawi (1985) defined 'environmental refugees' as those people who have been forced to leave their traditional habitat, temporarily (internal) or permanently (international), because of a marked environmental disruption that jeopardised their existence and/or seriously affected the quality of their life. This definition addresses all types of environmental changes, and not only those induced by climate change. Bates (2002) observed that El- Hinnawi (1985) definition makes no distinction between refugees who flee volcanic eruptions and those who leave their homes as soil quality declines or because of persistent adverse climatic conditions. Myers (2002) also defines 'environmental refugees' as people who can no longer gain a secure livelihood in their homelands because of drought, soil erosion, desertification, deforestation and other environmental problems, together with the associated problems of population pressures and profound poverty. The International Organisation for Migration [IOM] (2010) introduced a broader term "environmentally induced migrants" and defined it as persons or groups of persons who, for compelling reasons of sudden or progressive changes in the environment that adversely affect their lives or living conditions, are obliged to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their country or abroad.

It is clear from the above definitions that climate refugee is not synonymous to environmental refugee. Climate refugees exclude peoples who migrate as a result of displacement caused by certain environmental disasters like volcanic eruptions, earthquakes, subsidence and landslides which are not influence by climatic factors but tectonic forces. Climate refugee therefore, may be defined as a person or group of persons who are displaced by environmental conditions which are influenced by climate change (e.g. droughts, cyclone/monsoon, rainfall induced-flood, climate induced sea level rise and intense icy winters) and can no longer gain a secure livelihood in their homelands/habitats and are

obliged to leave their habitual homes, or choose to do so, either temporarily or permanently and within their country or abroad.

United Nations Environmental Programme (UNEP) reported that as many as 50 million people could become environmental refugees by 2050 if the world did not act to support sustainable development (Tolba, 1989).



An epic drought killed livestock in Kenya and Ethiopia in 2011 (Photo source: Global Change)

The role of surveyors

Professionally, surveyors have the knowledge, experience, resources and the technical skills required for adapting to the impacts of climate change. Furthermore, surveyors work with the land, people, political and social institutions to bring about sustainable socio-economic development. These professional connections places surveyors at a very important position to advocate and to lead the agenda to protect and accommodate present and future victims of climate induced disasters, particularly, those living in vulnerable communities, which we are already aware, are being displaced or losing their livelihood and could eventually become climate refugees. This agenda could be pursued by local surveying institutions at the national level and International Federation of Surveyors (FIG) at the international level. This is what could connect the surveying profession to managing territories, protecting the environment and evaluating the cultural heritage.

One of the roles of surveyors and perhaps the most traditional and best known skill of surveyor has been in positioning and measurement. Surveyors have been responsible for making the angle and distance measurements that have allowed nations to define unique two dimensional coordinate systems that in turn have been used for mapping. Data gathered by field surveyors or collected from existing spatial databases such as land registers and cadastres can be an efficient starting point for the assessment and evaluation of the impacts of

climate change as well as developing policy indicators. At present, high precision Earth based measurement systems have been developed. Satellite laser ranging (SLR), lunar laser ranging (LLR) and very long baseline interferometry (VLBI), have not only vastly improved the accuracy of national spatial reference systems but have allowed high precision global reference systems to be developed. These have been complemented by a global navigation satellite system (GPS system) which facilitates measurement and assessment of flood risk and vulnerable territories to climate change.

Spatial information management is another role surveyor’s play. In most countries, surveyors not only collect and process spatial data for development, but they also act as custodians of these data. As a consequence, surveyors have first-hand information and knowledge of vulnerable territories and environments that are threatened by the impacts of climate change.

In addition, surveyors facilitating land use change. The effects of climate change will result in changes to livelihoods, human settlements, land use patterns, and tenure systems. The manner in which decisions about access to, use of, and control over resources are implemented and enforced, as well as the way that competing interests in resources are managed, is as central to the success of climate change adaptation and mitigation, as it is to livelihoods of people.



Disaster risk management cycle

Disaster risk management is an important role of surveyor which could be effectively used to deal with climate induced disasters and Climate refugees. The core of adaptation strategy for climate refugees is disaster risk management. The contribution of the Surveying profession to disaster risk management (International Federation of Surveyors [FIG], 2006) demonstrate clearly that modern surveyors play an important role in the field of disaster risk management, although in most cases, the activities take place as part of multidisciplinary task forces. The Figure below shows that surveyors are at the centre stage of disaster risk management process. In fact, surveyors’ foot-print are always present when it comes to disaster risk

management, though their contribution is neither spectacular nor in the spotlight as it is with rescue teams, policemen, doctors, etc. Nevertheless, the surveyors' role is very substantial, but most often, unknown or misunderstood (Roberge, 2005).

It is an indisputable fact that the issue of climate refugees is greatly complex, and potentially expensive, with some countries and global organisations already overwhelmed by the demands of the 1951 conventionally-recognised refugees. However, doing nothing about the looming climate refugee problem, which could potentially cause global humanitarian disaster, is not the best option. On many occasions, the action by the global humanitarian community is either too little or too late. This often results in a cycle of poverty and vulnerability to disasters that is difficult to break. There is the need to develop an international convention on climate refugees for rectification by nations and enforced by the UN. The UN and other regional bodies like the EU, AU, ASEAN, ECOWAS and other should pursue vigorous adaptation strategy for climate refugees now, before disaster strike as the current regime is very weak and unsustainable.

Professionally, surveyors work with the land, people, political and social institutions to bring about socioeconomic development. These important professional connections occur both at local and international levels. This relationship places surveyors at a very important position to advocate and to pursue the agenda to protect and accommodate present and future victims of climate induced disasters, particularly, those living in vulnerable communities, which we are already aware are being displaced or losing their livelihood. Local surveying institutions could pursue this agenda (adaptation and protection for potential climate refugees) nationally and the FIG could also engage its partners like the UN, FAO, UN-habitat and the World Bank on the same agenda internationally. It is important to state that the issue of climate refugees is very complex and may require a huge effort and engagement of the international community. However, surveyors are used to dealing with complex problems and taking a lead role on this issue is not beyond their capacity.

References

- Bates, D.C. (2002). Environmental refugees? Classifying human migrations caused by environmental change. *Population and Environment*, 23 (5), 465–477.
- Black, R. (2001). Environmental refugees: myth or reality? (New Issues in Refugee Research, No. 34). Geneva: UNHCR.
- Boano, C., Zetter, R., & Morris, T. (2008). Environmentally displaced people: Understanding the linkages between environmental change, livelihoods and forced migration (Forced Migration Policy Briefing). Oxford: Refugee Studies Centre.
- Boateng, I. (2010). Spatial planning in coastal regions: Facing the impact of climate change (FIG publication no. 55). Copenhagen: The International Federation of Surveyors.
- Ehrhart, C., Thow, A., & Warhurst, A. (2009) Humanitarian implications of climate change: Mapping emerging trends and risk hotspots (2nd ed.). S.l.: CARE International.
- El-Hinnawi, E. (1985). Environmental refugees. Nairobi: UNEP.

Fritz, C. (2010). Climate change and migration: Sorting through complex issues without the hype. Washington, DC: Migration Policy Institute.

Gemenne, F. (2011a). Climate-induced population displacements in a 4 8C+ world.

Philosophical Transactions of the Royal Society A, 369 (1934), 182–195.

IOM, (2010). Disaster risk reduction, climate change adaptation and environmental migration, available at http://publications.iom.int/bookstore/index.php?main_page=product_info&cPath=41_7&products_id=664

IPCC (2013). Summary for Policymakers, AR5 to Working Group 1, available at www.ipcc.ch/report/ar5/wg1/.

IPCC, (2007). Summary for policymakers of the synthesis report of the IPCC Fourth Assessment Report. Retrieved February 27, 2012, from IPCC website: http://www.ipcc.ch/publications_and_data/ar4/syr/en/spm.html

International Federation of Surveyors Working Group 8.4. (2006). The contribution of the surveying profession to disaster risk management (FIG Publication no. 38). Frederiksberg: The International Federation of Surveyors.

Myers, N. (2002). Environmental refugees: a growing phenomenon of the 21st century. Philosophical Transactions of the Royal Society B, 357 (1420), 609–613.

Piguet, E. (2012). From “Primitive Migration” to “Climate Refugees”: the curious fate of natural environment in migration studies, *Annals of the Association of American Geographers*, 103: 1,148-162

Roberge, D. (2005, April 16-21). After the Tsunami: How the surveying profession can participate in the reconstruction. Paper presented at FIG Working Week and GSDI-8 Conference in Cairo, Egypt.

Tolba, M. K. (1989). Our biological heritage under siege. *Bioscience* 39, 725–728.