AN EVALUATION OF THE USEFULNESS OF ACTOR NETWORK THEORY IN UNDERSTANDING THE COMPLEXITIES OF VULNERABILITY AND RESILIENCE IN POST-DISASTER RECONSTRUCTION

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Abstract
The literature is replete with accounts of the struggle to effectively target and deploy post-disaster aid so as to achieve maximum benefit to recipients, both direct and indirect, over the short- and longer-term. Generally these stories balance success with lessons learned from failure, in order to inform practice in future recovery and reconstruction events. They are often derived from the heroic accounts of key actors in case studies, on the understandable basis that these carefully selected individuals will have been pivotal in designing and directing the implementation of aid programmes. The influence of non-humans such as organisations, systems, processes, or elements of the constructed environment are considered only insofar as they impact upon the experiences of the raconteurs. However actor network theory, a technique originally developed to examine phenomena at the socio-technological interface, ascribes human characteristics such as motives and behaviours equally to human and non-human actants, ultimately to better explain the worldly consequences of their interaction. This paper reports on the ex post application of ANT to data collected in an earlier actor-centric study, to both evaluate its usefulness in disaster research and to identify potential gaps in the disaster research agenda.

Keywords: disaster; resilience; vulnerability; actor network theory.

INTRODUCTION
Disaster management is the structured attention to mitigating the effects of catastrophic events (James, 2008), both natural and human-related (Furedi, 2007), by governmental or non-governmental organisations (NGOs), with the intention of helping restore a degree of safety and normality to those who have been disadvantaged by these events. Whilst initial efforts necessarily tend to focus on the provision of material aid – food, medicine and shelter – there is an increasing emphasis on providing longer term assistance in terms of social support services.

The provision of aid has been characterised variously as "top-down" or "hard" aid, as opposed to "bottom-up" or "soft" aid. The former tend to consist of hazard mapping, engineering, architectural design and structural management programs. These contrast with the latter, which are designed to address community issues by focusing on planning and preparation for potential disasters, allied to the education of the population in relation to disaster risks (O'Hare & Rivas, 2005).

Disaster mitigation and preparedness initiatives in areas prone to natural disasters are the natural operational environment for NGOs. It is frequently the case that these regions are located in developing countries, and are populated by the poor and socially disadvantaged. In a sense it is their disenfranchisement and vulnerability that renders them obvious recipients of NGO aid (Twigg & Steiner, 2002). However it is frequently apparent that their efforts are not altogether successful, resulting in negative impacts upon the populations they set out to assist (Cavill & Sohail, 2007).
The focus of aid and recovery initiatives is often disrupted by the actions of the government authorities in the affected state. Frequently this occurs as a consequence of hastily conceived responses to earlier disaster events, usually in the form of policies to drive to preparedness and mitigation. This may be as a consequence of humanitarian instincts, or out of a desire to be seen to be proactive: any event the hasty rebuilding of communities, livelihoods, and mitigation of future risks often results in an increase in long-term vulnerability (Ingram, Franco, Rio & Khazai, 2006).

It is apparent that in any disaster context there are complex relationships between individuals, groups, and populations, each with their own concerns and motivations. What are perhaps less apparent are the various non-human actants at work in the same contexts; examples would include the crops in the field, sacks of food aid, government policies, and business models of NGOs. Callon (1986) first suggested that in order to understand problems situated at the socio-technological interface it is first necessary to understand the motivations of both human and nonhuman actants engaged in this context, describe a specific problem that occurs there, engage relevant actants in the search for a solution, and obtain evidence from each (using an appropriate spokesperson where necessary). This approach later crystallised into an approach known as Actor Network Theory (ANT) (Latour & Woolgar, 1991).

Since its development ANT has extended its utility as a tool for studying organisation (Czarniawska & Hernes, 2005), geography (Bingham, 1996), innovation (Miettinen, 1999), power (Munro, 2009), gardening (Hitchings, 2003), and education (Fenwick & Edwards, 2010). This paper posits that it may be beneficial to our understanding of the causes of sub optimal outcomes arising from disaster relief to use ANT to unravel the complex interplay between the individuals and communities affected by disasters, and their governmental and non-governmental aid providers. Using data collected for a previous study of the impact of disaster response actors on vulnerability reduction and building community resilience (McVeigh, 2012) as the point of departure, it constructs hypothetical actor networks to illuminate vulnerability reduction/community resilience failures. The paper is ultimately intended to explore the appropriateness and utility of ANT in this context, and is subject to the constraints imposed by the reuse of data collected for a different, though complimentary, purpose.

**ACTOR NETWORK THEORY**

Actor network theory (ANT) provides a sociologically based investigative tool with which to understand how scientific disputes are resolved, new ideas become accepted, and how new tools and protocols are adopted and integrated by a group. Decisions of this kind tend to be transient and are frequently rendered redundant by the passage of time, and the development of new innovations; consequently ANT is not usually concerned with the search for indisputable truth or fact (Latour & Woolgar, 1991; Callon, 1986).

Actor networks are comprised of technical and non-technical elements. The observed performance of a sailing boat is a consequence not only of its technological design features, but also the skills of its skipper and crew. This combination is also responsible for the boats behaviour. ANT acknowledges the heterogenous nature of actor networks by linking the human and nonhuman, sociological and technological, thereby revealing issues at the socio-technical interface (Hanseth & Montero, 1998). It achieves this by enrolling diverse elements into a broadly cohesive network that can then be described and analysed: interestingly these elements may not themselves be aware of their connection to each other (Van House, 2001).

The systematic approach embodied by ANT exposes the nature, extent, and influence of the network’s component parts usually neglected by conventional “heroic” stories of new discoveries. Goguen points out that:

“Newton did not really act alone in creating the theory of gravitation: he needed observational data from the Astronomer Royal, John Flamsteed, he needed publication support from the Royal Society and its members (most especially Edmund Halley), he needed the geometry of Euclid, the astronomy of Kepler, the mechanics of Galileo, the...
rooms, lab, food, etc. at Trinity College, an assistant to work in the lab, the mystical idea of action at a distance, and more, much more. The same can be said of any scientific or technological project." (Goguen 1999)

ANT CONCEPTS
Actor networks are comprised of elements that bend space around themselves, make other elements dependent upon them, and translate the will of others to accept its own language. Practically speaking these elements or "actors" can include humans, groups of humans, organisations, texts, images, and technical artefacts: the term "actant" is often used, in order to avoid differentiating between human and non-human actors. Importantly, all actants are deemed to have their own interests, leading them to desire the alignment of the interests of other actants in the network to their own. If they are successful in this endeavour they will have created an actor network around them, which can be defined as "a heterogenous network of aligned interests" (Callon, 1986).

Network creation involves three major stages that together described as the process of translation. The first stage of translation, problematisation, is initiated by an actant who has identified a discreet problem, defined its boundaries, and identified other actants who could conceivably assist in solving it. If this focal actant canvases the involvement of the others it will have established itself as the obligatory passage point (OPP), which can be thought of as the gatekeeper to the network. It therefore becomes essential to the existence of the network, protecting it by establishing the membership rules. The second stage of translation is interestment, where the focal actant (which is now the OPP) seeks to gain acceptance of its view of the problem through the universal acceptance of its definitions and objectives. If the interessment process is successful it will result in "buy in" – the acceptance by other actants of the OPP's framing of the problem and the process of its solution. This third stage is known as enrolment because the other actants choose to join in the focal actant's cause. (Latour & Woolgar, 1991)

Actor networks need not remain stable. The OPP may exert sufficient social and political power as to keep the efforts of the other actants focused on the problem in which they were initially enrolled. However there is no guarantee that this will be the case: all actants in the actor network have the potential to initiate further translations: if a subsequent translation is successful the initiator will establish itself as the new OPP (Sidorova & Sarker 2000).

The stability of the network requires technological and sociological accord, arising from a continual dialogue between the actants, and generating a social process that endeavours to align their interests: success in this regard generates stability. Given that all the actants have their own diverse motivations and objectives, the extent to which stability can in fact occur is dependent upon the extent to which each one can translate (reinterpret, represent, or appropriate) the interests of others to their own (Aanestad & Hanseth 2000). The translation process is highly political, requiring the interests of the OPP to be "marketed" in order to enlist broader support and can be "embodied in texts, machines, orderly skills (which) become their support, their more or less faithful executive." (Callon et al 1986). Thus it can be seen that the formal processes and procedures defined by governments and NGOs for use in the event of disaster emergencies may have to compete with each other, and also compete with contextual exigencies at the disaster scene, resulting in ad hoc actor networks that couldn't possibly have been envisaged at the outset.

CONSTRUCTING THE ACTOR NETWORKS
McVeigh (2012) conducted in-depth interviews with key actors in relation to disaster case studies, which were intended to reveal their impact on the disaster events, with specific focus on reducing community vulnerability and building community resilience. Although these were initiated as a consequence of the interviewees’ current theatre of operation, the interviews often made reference to multiple contexts, and incidents or events within them. Several of the interviews
referred to the same disaster event, though from different perspectives. Table 1 lists the details of the participants.

Table 1: Interviewees (Source: Authors).

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Organisation</th>
<th>Role</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Professional Consultant</td>
<td>Humanitarian and development – disaster risk reduction</td>
<td>Jakarta, Indonesia</td>
</tr>
<tr>
<td>2</td>
<td>Merlin UK – Professional Consultant in Haiti at Merlin UK</td>
<td>PM in disaster risk reduction</td>
<td>Port-au-Prince, Haiti</td>
</tr>
<tr>
<td>3</td>
<td>NGO – Habitat for Humanity</td>
<td>Co-ordinator of international relief</td>
<td>Amsterdam, Netherlands</td>
</tr>
<tr>
<td>4</td>
<td>NGO – Red Cross</td>
<td>National Disaster Reduction Advisor</td>
<td>Kyrgyzstan</td>
</tr>
<tr>
<td>5</td>
<td>European Commission</td>
<td>Humanitarian aid and civil protection</td>
<td>Bangkok, Thailand</td>
</tr>
<tr>
<td>6</td>
<td>NGO – Oxfam</td>
<td>Humanitarian relief and recovery</td>
<td>Currently in the UK but experience includes relief in Haiti, Pakistan, Zimbabwe and Sri Lanka</td>
</tr>
<tr>
<td>7</td>
<td>Disaster risk management consultant – Global Climate Adoption Partnership</td>
<td>Vulnerability reduction</td>
<td>Currently in the UK but experiences includes vulnerability reduction in SE Asia</td>
</tr>
</tbody>
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The original methodology for the interviews was exploratory in nature, employing an entirely open and unstructured form of interviewing, designed to both probe issues raised by the literature and establish a research agenda for the future. Prior to the interview the respondent was briefed on the area of research, allowing them time in advance to prepare. Generally all the interviews began with the respondent discussing the area of vulnerability; naturally this then progressed to their experiences and the actions they took to reduce vulnerability and/or build resilience. This style of interviewing ensured no boundaries were set, allowing for the scope of experiences to expand and exploratory discussion to occur. Interviewees were given the opportunity to discuss all areas of their work, or other actors’ work which they felt had significant impact -- positive or negative -- on the fields under investigation.

In order to construct the actor networks, which is the subject of this paper, it was necessary to deconstruct the earlier thematic analysis conducted by McVeigh (2012) in order to unpack the full range of actants and their individual concerns/motivations. Whilst identification of human and non-human actants was achieved without recourse to subjectivity (all actants were
explicitly mentioned in the original thematic analysis) it should be noted that the actor networks thus constructed were only partial (other actants could be inferred from the context). Moreover, whilst particular care was exercised when ascribing motivations to non-human actants this activity was necessarily limited by the lack of specific questions directed to this end in the original interviews.

The interviews themselves covered the experiences of the interviewees across several theatres of operation, but for the purposes of this paper only those experiences directly or indirectly relating to disasters in the Caribbean region were included in the analysis. This decision was taken after reviewing all of the interviews on the basis that a) there was sufficient data to create multiple compelling actor networks, and b) the experiences of Haiti and Cuba in many respects encompassed both the best and worst of vulnerability reduction and resilience building practice.

**ACTOR NETWORK CONTEXT 1: HAITI**

Haiti is a developing country, located in the Caribbean sharing a border with the Dominican Republic. The country has a population of 10.1 million and a relatively low life expectancy. The country has a history of dictatorships and politically induced violence. In 2004 an elected leadership took control of the country however political violence still ensues and the country’s human rights conditions are described by the UN as catastrophic.

The political situation in Haiti leaves the country ill-equipped to deal with the management of disasters with a lack of leadership and no mechanisms in place for co-ordination of an emergency response. Meanwhile, economic vulnerability is also high; the economic underdevelopment restricts the export base of the country’s economy. Widespread poverty prevails, with high levels of social inequality: unemployment rates are chronic. Whilst Haiti superficially mirrors elements of more developed countries much of its infrastructure is poor and aging, dating from colonial times; the absence of a meaningful local development policy combined with a collapse in the national economy has increased vulnerability to natural hazard.

Haiti is positioned on a fault line on the Gonave micro plate, leaving it vulnerable to seismic activity. It also lies in the hurricane belt and thus is prone to natural hazards. Throughout history, Haiti has suffered tsunamis, numerous earthquakes, hurricanes, tropical storms, flooding and mudslides. The 2010 Haitian Earthquake was described by the UN and other Aid organisations as the worst urban disaster in modern history. The epicentre of the earthquake struck 15 miles from the densely populated Haitian Capital of Port-au-Prince on January 12th at 4:53pm. It measured 7.0 on the Richter scale, with an estimated 59 aftershocks to follow for almost 2 weeks after, some of which measured 4.5 on the Richter scale.

The earthquake had an immediate devastating impact with thousands initially feared dead. In the days to follow that figure rose rapidly and official estimates of the total death toll stand at 230,000. It was estimated that over 1 million people were left homeless. The quake was subsequently declared to be the worst recorded in the region in over 200 years. The City of Port-au-Prince was in ruins and fires raged down town amidst the rubble, telephone lines were down and there was an electricity blackout. A number of important political buildings were reduced to rubble; the UN headquarters was badly damaged and 37 UN staff confirmed dead, the National Palace suffered considerable damage and a hospital was also destroyed.

The quake was a devastating blow to the country and the knock on effects of the events of January 12th 2010 are still a reality for the Haitian people today. In the aftermath of the quake it was evident that much of its impact had been as a consequence of poor government policies and procedures.

- Haiti was (and continues to be) characterised by a lack of government regulation and control, leading to unregulated urban and rural development.
- Economic policies were driven by the need to create export revenues: cash crops predominated.
• Consequent land clearance resulted in widespread deforestation which in turn increased vulnerabilities to landslides and a general loss of the topsoil necessary to support economically viable agriculture.
• The deforestation also resulted in a lack of timber for construction, increasing local reliance upon concrete as the predominant building material.

Many of the problems continuing to be experienced in Haiti are the consequence of poor economic performance, which have been created and perpetuated by a top-down approach by government to disaster management and recovery. Little attention has been paid to the root causes of vulnerability, and experienced practitioners urge the adoption of bottom-up collaboration between aid agencies and local communities in order to increase levels of education, break the poverty cycle, and develop/implement meaningful disaster preparedness strategies.

ACTOR NETWORK CONTEXT 2: CUBA
Like Haiti Cuba is a developing country situated in the Caribbean in the heart of Hurricane belt, and is also highly exposed to seismic hazards, flooding and land/mudslides. Despite its exposure to natural hazard and frequency of disaster Cuba is regarded as one of the world’s most prepared countries in terms of its approach to, and strategies for disaster management.

Unlike Haiti however, Cuba is recognised as a world leader in the field of disaster resilience because of its successful prevention and mitigation strategies. It contrasts with many developing countries where the lack of planned strategies is often the reason for high death tolls and significant destruction. By way of illustration, between 1996 and 2002 the Caribbean was struck by 6 major hurricanes. Within that time frame, 16 Cubans died as a result of the hurricanes. The Caribbean as a whole lost several thousand lives during this same time period. In 2004 when Hurricane Jeanne hit the Caribbean the death toll was significant in neighbouring Haiti with almost 4000 reported dead. Jeanne struck Cuba with even more deadly force, however not one single life was lost.

Developed countries can indeed learn lessons from Cuba: the USA’s catastrophic response to Hurricane Katrina in 2005 is often cited in this regard. Problems arose as thousands of residents were unprepared for such a disaster, and refused to leave their homes when they were advised to do so by authorities. There was no co-ordinated response plan in place and many died due to a lack of medical facilities.

Cuba has a mature and established disaster preparedness and management strategy. At the beginning of each hurricane season the Government revises its preparedness strategy based on experiences from the previous year. The success of the Cuban approach has been greatly attributed to the education and engagement of the public in protection, emergency response and the recovery process. Building resilience adaptation at the community level is critical and mobilises the entire community in the promotion of mutual health and safety. Everyone is aware of their roles and responsibilities. Particular focus is paid to identifying and assisting those who are most vulnerable.

Citizens participate in a two day hurricane drill, which involves measures such as cutting down potentially dangerous tree limbs and assessing possible scenarios that could prove dangerous if a hurricane was to strike. The key focus of the preparedness strategy is on public participation. Every citizen is well briefed and understands his/her own hurricane refuge location and procedures. As refugees are allocated they are stocked with food and medical supplies. When a hurricane approaches strategies are executed by the National Civil Defence Force, from national government level down to the public, who are kept well informed by radio and television broadcasts with updates on the approaching storm.

Cuba operates a bottom-up approach in terms of preparedness and prevention focusing on the people and the social fabric as opposed to only the technical elements of a preparedness strategy. Their strategy targets the root causes of vulnerability: by executing these strategies the
Government builds resilience across the entire nation, helping to reduce long-term vulnerabilities and mitigating the devastating effects that a disaster could inflict.

In general the actions of the Cuban government in relation to disaster preparedness, vulnerability reduction, and resilience building embrace the following principles:

- Whole-of-community engagement with disaster preparedness initiatives.
- Mutual responsibility amongst the population for health and safety outcomes, including identifying and assisting the vulnerable ahead of disaster events.
- Long-term planning and resourcing of disaster refugees and health facilities.
- Constant communication between disaster actors and the general population before, during, and after disaster events.
- Reduction of social inequalities to mitigate post-disaster vulnerabilities and accentuate resilience outcomes during rebuilding.
- Development of low energy, ecologically sustainable building materials and techniques, allied to education and training of the population in order that disaster-affected residents can initiate rebuilding activities without recourse to expensive imported materials and highly skilled labour.

While some would argue that the Cuban situation has been exacerbated by US economic sanctions against the State, others have argued that it is this very challenge that has triggered Cuba’s enviable resilience in the face of disasters.

IDENTIFYING AND CONSTRUCTING THE ACTOR NETWORKS

The characteristics of an actor network include the existence of a clearly defined problem, the solution of which is a matter of common concern to the actants of which it is comprised. It can be seen from the preceding two contexts that a) disasters do not respect social or geographic boundaries, and b) pre-existing conditions – social, constructed, and governmental – play an important role in determining how post-disaster recovery plays out. Given the exploratory nature of this research, with its focus on assessing suitability of an investigative technique, it was decided that two scenarios were suitable for investigation: a) the influence of post-disaster food aid on the local economy in Haiti, and; b) the influence of resilience planning in Cuba. In both cases the first step was to identify the boundaries of the problem and the actants contained therein. Figures 1 and 2 illustrate the results of this process, identifying firstly the powers and organisations active within the disaster theatre, the actants groups located within the theatre, and their influence upon the specific problem context. The arrows thereafter indicate a detected influence upon the problem solution or problem context.
In the case of Haiti it was apparent that both rural and urban populations had been affected, both directly and indirectly, by the weather event. Direct losses for those immediately affected included property, shelter, crops, and livelihoods. Indirect impacts on those not directly affected included massively increased competition for now-scarce resources. Vulnerabilities in the population based upon high levels of poverty and deprivation were exacerbated by repeated severe weather events.

This structural vulnerability could be traced back to Haiti’s political instability where democracy was a relatively new and predominantly unstable condition, poorly understood by the population. From the politicians' perspective the main focus was on political survival in an environment where corruption was endemic, and street gangs were the most powerful social structure. Government and civil powers were generally ill prepared for severe weather events, and acted in an uncoordinated, reactive mode in the absence of any formal disaster management policy.

The absence of an overarching governmental plan for disaster management ensured a lack of coordination between local and international NGOs, thereby limiting their effectiveness to the short-term. In essence their activities could do nothing to reduce the long-term vulnerability of the population, and certainly did nothing to increase Haiti’s resilience. The lack of coordination between international NGOs ensured that specialised aid – such as emergency housing, engineering services – was applied piecemeal with little or no consideration as to their long-term impact or integration. As a consequence the opportunity to build resilience – to exert a multiplier effect – was missed.

What was perhaps not evident at the time was the impact of food aid on the economic behaviour of the population. International NGOs recognise that although a well-timed cash intervention to the government was preferable and led to better outcomes, issues of local corruption rendered this option impossible, making the direct supply of food aid the next best option. However the availability of NGO food relief reduced the need for the population – and particularly the agricultural sector – to restore their farming capacity. Indeed the removal of the hunger imperative resulted in viable crops that had survived the severe weather event remaining unharvested and rotting in the fields. Given the cyclic nature of grain production (with a proportion held back for sowing in the following year) this has a devastating effect on the agricultural sector as a whole, fundamentally reducing Haiti's resilience to future severe weather events.
In Cuba, which was subject to similar numbers of severe weather events, and where disruption to the rural and urban populations was widespread, it was evident that the long-term impacts of disasters were less severe than in Haiti, and post-disaster scenarios were altogether more constructive. This could be attributed to long-term programmes of vulnerability reduction and resilience building initiated by the government, but enacted by the community.

Cuba can be thought of as a despotic Communist dictatorship or as the last bastion of true socialism, depending upon the viewer's prospective. Objectively, it can be said that political and social structures on the island are stable and mature, and although personal wealth is not a hallmark of Cuban society there are many aspects of Cuban life (e.g. health care, education and aged care) that are centrally supported and widely admired. More importantly, in the context of the current study, societal care for the well-being of the individual extended to a long-standing commitment to disaster management and reconstruction.

The impact on Cuba of severe weather events is markedly less than that experienced by her neighbours. Ongoing training and rehearsal in vulnerability reduction techniques, including community-based simulations and exercises, result in the population behaving in a well ordered way once a severe weather event has been predicted. This includes empowerment of the population at local level to take care of its own members, particularly the vulnerable, and provides them with suitably sturdy and resourced shelters within which to ride out the storm.

Much of Cuba's resilience in post-disaster recovery stems from a political will and commitment to resilience-building. Research and development into building with low technology, locally available materials (including the reuse of salvaged materials), together with the education of the population in their use are fundamental policy cornerstones.

**DISCUSSION**

The previous section introduced two actor networks describing clearly defined problem scenarios related to severe weather events, vulnerability reduction on the one hand and resilience building on the other, in two neighbouring Caribbean states. These were constructed from multiple interviews, conducted for another purpose, some considerable time after the events to which they referred. All subsequent discussion must be considered with these constraints in mind.
It could be argued that the problem scenarios occurred at the socio-technical interface, where the technical component was economic behaviour in the first instance and government policy in the second. In both of these cases the social dimension represented a powerful influence on the level of both the vulnerability experienced and the resilience subsequently demonstrated by the communities affected. In the first case the lack of social cohesion ensured that the choice of aid mechanism to be deployed had to be expedient and necessarily result in sub optimal outcomes. In the second a degree of social cohesion had been engineered by the government and bolstered by complimentary civil defence activities, resulting in year-on-year improvements in societal resilience.

Though both the context and the active actant groups differed in detail the overall challenges faced by both communities were broadly similar. Yet comparing the density of arrows in the active actant groups between the two disaster scenarios is instructive: in Cuba engagement with the problem enlists the entire social structure, whereas in Haiti disenfranchised sections of the community appear to have missed out on disaster relief altogether, and yet criminal street gangs were reported to be controlling the distribution of much of the food aid.

The food aid itself, and perhaps the manner of its distribution, are inanimate objects that would not normally be ascribed their own "motivations", yet actor network theory demands that this be the case (Munro, 2009). It is therefore instructive to reflect on the nature of such motivations: food aid is one of a suite of products marketed by local and international NGOs; its motivation is firstly to be consumed, and secondly to be seen being consumed (as effective marketing to current and potential donors). It may also act as a demonstration of "power", possibly even as a source of dependency or addiction. Such words and phrases are laden with value judgements and could cause offence. Yet it remains the case that NGOs are businesses, rely on being seen to be effective humanitarians, marketing themselves as such in order to generate income streams. Perhaps inadvertently, NGOs may be regarded by aid recipients as representing power, being powerful (certainly more powerful than them), and at some point the ongoing provision of food aid may diminish recipients' capacity to feed themselves.

In the Cuban case study it is apparent that the process of resilience-building was conducted by individuals and groups throughout entire communities. Yet these activities were not aimless or ad hoc, rather they were conducted with coordinated purpose, and that purpose was enshrined firstly in policies that were centrally developed, and subsequently through the agency of civil defence organisations. ANT suggests that these documents and structures have their own motivations, which are given life (or perhaps made visible) by those human actants who are influenced by them. Clearly, in this case, they (policies and organisations) have satisfied the ANT stages of problematisation and interessmant, and the subsequent enrolment of civil society as a whole (Miettinen, 1999). The population invests in resilience-building activities and is willing to accept associated non-human actants as OPPs (Callon, 1986).

It is difficult to imagine a situation in Cuba where the enormity of the disaster, and therefore the long-term reliance upon food aid provided by NGOs, would render the food aid to be sufficiently persuasive as to make it the new OPP in that disaster theatre (though it is not difficult to imagine the need for food aid in the short-term). Cultural researchers (Utsey et al, 2007) e.g. might suggest that the strong community spirit and ingrained training that occurs in Cuba would create a community culture that could, over the short-to medium-term, "lean back on the ropes" provided by food aid whilst being sufficiently resilience to "bounce back" and move forward into reconstruction and the recovery of the food production systems.

For Haitians the high level of social fragmentation combined with a lack of coherent, centralised power resulted in a situation where food aid itself achieved a level of power and currency not envisaged by its providers. The aid was able to establish itself as an OPP, irrespective of the human actants who were distributing it. Under these circumstances neither the presence of viable crops in the field nor the need to reconstruct devastated agricultural infrastructure in order to ensure long-term food supplies were sufficiently enticing to achieve interessmant.
CONCLUSIONS
The point of departure for this paper was to investigate the suitability of ANT for deployment in a disaster-related context in order to illuminate and tame the inherent complexities encountered during disaster relief and beyond, in relation to building resilience and minimising vulnerability.

In conducting this exploratory research the following constraints became apparent:

- ANT requires that the problem boundaries be carefully and clearly defined. Disaster-blighted environments tend to be both complex and dynamic, both of which conditions have the tendency to blur boundaries.
- ANT also requires the fullest engagement with all stakeholder groups: paradoxically it is often the most affected parts of the population who are also the most disenfranchised, and therefore frequently the least contactable/investigated.
- It is apparent that the scope for causing serious offence to some stakeholder groups (e.g. government aid authorities, NGOs, religious fundamentalists, etc) could be significant under certain circumstances, especially when analysing their aid strategies. The extent to which they could therefore be expected to cooperate in such research might therefore be questionable.

In order for ANT to be applied meaningfully to solve a problem (or at the very least, explaining the complex interrelationships between the influences on a problem context) it is necessary to interrogate the actants first-hand, where possible, or to give non-human actants agency through a reliable intermediary. Neither of these conditions could be satisfied in this study – this was known from the outset – but the usefulness of the technique could nevertheless be confirmed (or discounted); indeed such an approach might prove very useful, when for instance conducting scenario planning exercises for potential or imminent aid programmes.

In the event, although motivations that were attributed to nonhuman actants during the course of this research could not be verified by an ongoing interaction with various third parties it was apparent that many of these motivations were implicit in the consequences of the actants’ existence in-theatre. More importantly consideration of these, admittedly esoteric, motivations before deployment of nonhuman actants (such as food aid) might have given aid-related human actants the opportunity to reconsider the manner of their deployment.

REFERENCES


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