Non-Human Agency in Residential Development and Planning: two examples from fringe Sydney

Kristian Ruming

k.ruming@unsw.edu.au

City Futures Research Centre
Faculty of the Built Environment
University of New South Wales
Sydney NSW 2052 Australia

www.cityfuture.net.au

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Abstract: Urban planning and development is a field which unconsciously recognises the role of non-human actors in transforming the market environment – a process which often starts with exploring the constraints of sites or the cost implications of altered development forms. This paper explores some of those non-human actors central to planning and development at a fringe development site in Sydney, Australia. This paper draws upon actor-network theory to position non-human actors as vital to the construction and maintenance of any networked reality, not least residential development. In this reading non-humans represent central actors and intermediaries which circulate through planning and development networks. An actor-network theory framework provides an in-depth analysis of residential development and planning policy which facilitates the identification and tracing of actors/intermediaries which may otherwise be neglected, ignored or forgotten. Special attention is paid to the multiple ways in which non-human actors interact to facilitate the development of residential property and associated policy arrangements – focusing on endangered species and topography.

Key words: Non-humans, actor-network theory, urban planning, Sydney.

INTRODUCTION

Urban planning and development is a field which unconsciously recognises the role of non-human actors in transforming the market environment – a process which often starts with exploring the constraints of sites or the cost implications of altered development forms. While developers and planners express a somewhat unconscious understanding of the role of non-human actors in residential development and planning, this paper explores in more detail the role and power of these non-human actors, by exploring them as part of a larger network of heterogeneous associations, where they impact upon the capacity of planners and developers to facilitate development. This paper draws upon actor-network theory (ANT) to position non-human actors as vital to the construction and maintenance of any networked reality, not least residential development. In this reading non-humans represent central actors and intermediaries which circulate through planning and development

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networks. Drawn from a larger research project which explored the complex interactions of human, non-human, market, discursive and institutional influences on residential property and planning (Ruming, 2007), this paper explores the series of non-human actors tied to policies confronting, first, endangered species and, second, the role of topography in master planned developments at Wyong – one of the largest greenfield development sites in Sydney, Australia. In each case non-human actors become central in shaping the translations of residential development. By exploring the role of non-humans a more diverse and complex picture of power becomes apparent. Power within planning and development is, thus, not centred in institutional or market positions, but distributed throughout networks of development and expressed by both human and non-humans.

This research builds on a growing literature which recognises the role of non-humans in the construction of the urban form (Murdoch and Marsden, 1995; Amin and Thrift, 2002). While ANT has been increasingly used in geography (Murdoch, 1997a, b, 1998; O'Neill and Whatmore, 2000), with increasing attention being paid to the role of non-humans in the construction of hybrid environments, such as gardens (Head and Muir, 2007; Power, 2005), less attention has been paid to their role in shaping the urban form, and by association, housing market functioning, social service provision, inter alia. Each of the case studies covered in this paper illustrates the multiplicity of non-human influence. Following a brief discussion of the case study location a review of ANT, with special emphasis on the role of non-humans, is provided. The next section of the paper explores two examples of non-human actors impacting upon residential development and planning: the Squirrel Glider and topography. Each case study represents a site of network enrolment and negotiation as non-humans both enrol and are enrolled by others in efforts to secure development/planning translations amenable to their more diverse heterogeneous network. The conclusion positions non-humans as central actors in the creation of residential property and highlights the value of ANT in producing more detailed analyses of planning and development.

CASE STUDY: WYONG SHIRE, NEW SOUTH WALES, AUSTRALIA

The Wyong Shire on the Central Coast is part of a growing inter-urban corridor between Sydney and Newcastle, Australia (Figure 1). In the last 15 years Wyong has experienced rapid population growth, expanding at a rate almost double the state average (New South Wales Premier's Department, 2001).

Wyong accounted for 10 per cent of Sydney's total land release in the period 1984–89, and over 27 per cent of Sydney's low cost housing in the period 1990–2000, and it is expected to accommodate 55 000 new dwellings by the year 2031 (NSWDoP, 2006). Mobilising an ANT methodology of 'following-the actors' this research draws on 45 key informant interviews with (human) actors associated with the planning and development of Wyong. Textual and discourse analysis of planning documents and local press facilitated the identification and 'following' of non-human actors (Law, 1991, 2003).
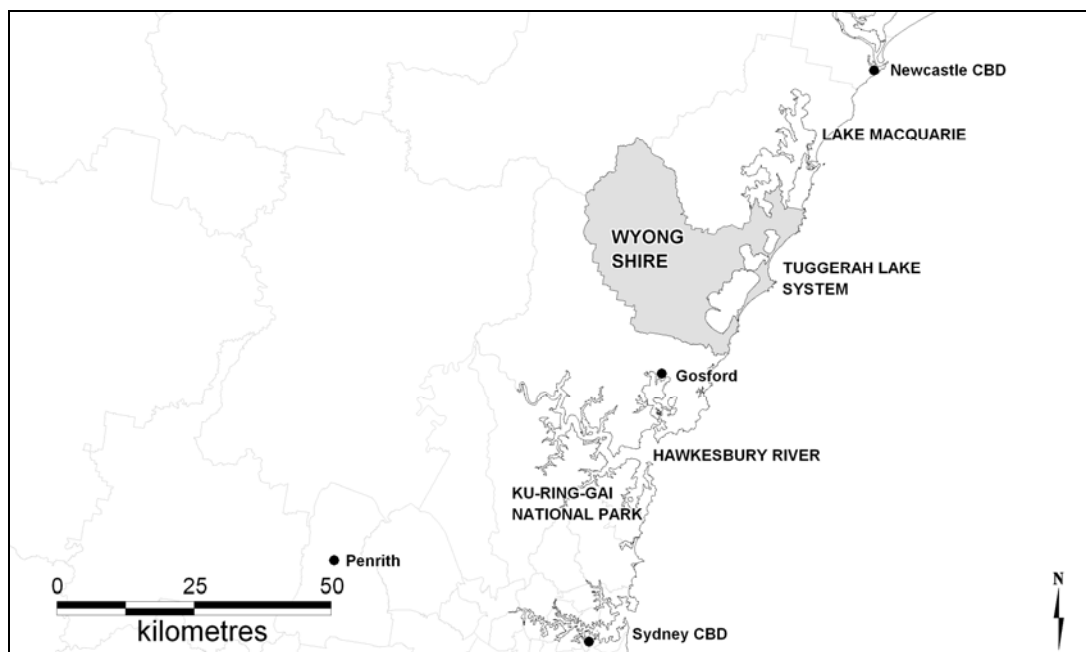

Figure 1 Location of Wyong Shire Council

RECOGNISING NON-HUMAN ACTORS

This research mobilises ANT to recognise the role and influence of non-humans in residential development and planning. Yeung (2002) notes that ANT places its analytical focus on unearthing the complex web of relations between humans and non-humans, and is an attempt to accord those non-humans their due place in the construction of the world. It is also unconcerned with the project of modernity, proposing that there are many possible modes of ordering, not just one (Law, 2000c), and that non-humans are central in these multiple and divergent orderings of life. The role of non-human actors in residential property cannot be overestimated (Pinho, 1997; Murdoch, 1997a).

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As a theoretical premise, ANT moves away from traditional, human centred, readings of the networks which emphasise institutional stability and which are dependent upon continuing consensus and coalition building (Lowndes, 2001). Rather, ANT represents a theoretical approach that is concerned with a commitment to materiality and which recognises that speech, bodies and their gestures, subjectivities and materials all are performances of a strategic logic (Law, 2000c). ANT is a research agenda which is based on no stable theory of the actor; rather it assumes the 'radical indeteterminacy' of the actor (Callon, 1999, p.181). Callon (1987, p.93) argues that an actor network serves as 'simultaneously an actor whose activity is networking heterogeneous elements and a network that is able to redefine and transform what it is made of.' The notion of the network, as used in ANT, provides a description of the complex webs of actor relations effectively serving to decentre the economic and to overcome the binary between subjects and objects (Yeung, 2002). Within ANT the network represents the interconnected character of the social and the technical (and indeed the not-so-technical), and is, thus, positioned as a way of understanding the simultaneously social and technical character of actors' life worlds (Law and Callon, 1988). The study of actor networks is, therefore, the study of associations between different materials and relations through which orders and hierarchies are made (and unmade) and through which society is held together and made durable (Latour, 1986; Latham, 2002).

ANT argues that relationships between humans count for little unless they are held together by durable and resilient materials (non-human actors) (Murdoch, 1998). ANT proposes that society and space is held together, not by humans or passive 'things in themselves', but by the active sets of relations in which the human and the non-human continuously exchange properties, where they emerge from the collective activities of these heterogeneous actors between which powers are distributed, responsibilities allocated, actions constructed and spaces configured (Murdoch, 1997b). ANT, therefore, calls for the interpretation of the hybrid network which places emphasis on the multiple agency of hybridity – the mobilisation of the animate, mechanical and discursive modalities of being within and between differently-configured possibilities of individuality (Whatmore, 1997). These 'hybrid networks' force us to 'take into account the objects that are no more the arbitrary stakes of

(human) desires alone than they are the simple receptacle of our mental categories' (Latour 1993, p.177).

Agency is, therefore, the collective capacity of heterogeneous networks, in which the activities of the non-human count for as much, or more, than the activities of humans (Murdoch et al., 2000). The strength of ANT is the underlying premise that the world is made up of complex 'imbroglios' of human and non-human actors (Latham, 2002). Thus, actors do not exist in and of themselves. Rather, they are constituted in networks of which they form a part, where (apparent) nodes (or actors) are sets of relations or sets of relations between relations (Law and Mol, 1995). Therefore, machines, people, social institutions and the natural world are all effects or products (Law and Mol, 1995). This interpretation of agency does not recognise the distinction between humans and non-humans; rather, it acknowledges that agency is an effect of distributed heterogeneous arrangements of materials rather than the intentional activity of human agents (Hetherington and Law, 2000). This paper focuses on how Squirrel Gliders and topography, in the confines of planning policy, are both effects of network associations and actors/intermediaries which circulate in the construction of new network configurations and central to the process of translation.

Translation is an attempt to dissolve the classic dualism of the natural and the social, as the properties of all entities are derived from their relative position within a network (Murdoch, 1997a). Therefore, no actor has essential qualities or representations (for example the influence if the Squirrel Glider is only apparent in relation to other network actors). Rather, the object is to explore how the ordering of actors (devices, agents, institutions or organisations) generates the possibility that one thing (an actor) may stand for another (a network) (Law, 1992). Callon (1991) outlines four stages of translation: first, *incorporation¸* where actors join and are woven into networks; second, *interressement,* where actors exert influence over others via persuasion; third, *enrolment,* where actors lock others into their definitions and networks; and, fourth, *mobilisation,* where actors speak for the others. Therefore, actors are therefore, heterogeneous engineers because they are always in the process of being made through a multiplicity of different materials that are enrolled and mobilised to form the very relations and connections that make up the network (Smith, 2003). Enrolling is the process by which actors constitute other network actors in their own identity or agency. In this sense

human agents are never located in bodies alone, but rather each actor is a patterned network of relations, or an effect produced by such a network – hence the term actor network. All actors, therefore, draw things together, albeit in particular ways and styles (Law, 2000b). Central to the process of enrolling and the creation of heterogeneous networks is the notion of an intermediary. According to Callon (1991, p.134) an intermediary is 'anything passing between actors which defines the relationship between them'. Callon (1991) suggests that the complexity of the intermediary itself is irrelevant, as long as it remains constant as it circulates and creates networked associations. The difference between actors and intermediaries is the capacity to act as an author, 'an [actor] is an intermediary that puts other intermediaries into circulation' (Callon, 1991, p.141). Thus, an actor mobilises intermediaries to create new arrangements. Further, the capacity to define an actor is inherently empirical, as we must identify and follow those with the capacity to mobilise others for the purpose of securing an appropriate network outcome (Law, 2003).

Translation is central to ANT theorisations of power, which in addition to extending network arrangements through the circulation of resources, involves a mediated exercise of power, where distances are overcome by the successive enrolment of others to form something akin to a single will (Allen, 2003). Therefore, all actors have equal power to influence collective outcomes, whether these are powerful individuals, or their generally overlooked minions, or animals and machines (Leitner et al., 2002). Therefore, individual actors can only succeed by drawing in a complex and ever-changing heterogeneous network of all the animate and inanimate objects and resources needed for success (Leitner et al., 2002). Here the role and type of non-human actors enrolled within heterogeneous associations becomes vital to the expression of power. The ability of the powerful to direct network functioning and 'represent' all the others, therefore, rests on their ability to enrol, control and mobilise a series of key resources or actors (physical, political, economic, social and technical) (Dicken et al., 2001; Murdoch and Marsden, 1995). Although power is positioned as the outcome of network relations, Latour (1988a) argues that there is no predetermined structure of network associations, rather how something holds together is determined in the field of battle, as positions, enrolments and translations are contested. Thus, Latour (1988a) argues that (what may appear to be) a stable actor is, in fact, the product of many forces which agree on nothing and associate only via long networks in

which they are unable to sum one another up. In terms of planning and residential development, the powerful are those who draw together all interested actors and present a network reality.

Importantly, ANT also presents an alternative conception of spatiality (Law, 2000c). In this light, the legitimacy of an actor may be facilitated through a non-spatially present entity. Murdoch (1995) suggests that for any social order to be effective and stable it must spread across space and time; however, quoting Law (1994), he notes that, left to our own devices, our human actions and words would not spread very far at all. The role of these spatial absent actors in the creation of residential property at Wyong is outlined in the following sections as spatially absent actors, such as state based and historical planning policy, mediate current and localised translations of development. This means that materials, such as texts (policy and institutional arrangements) and technologies (science and research), form a crucial part of this ordering (Murdoch and Marsden, 1995). Therefore, any consideration of the length and breadth of heterogeneous associations entails shifting to the exploration of the past, the far-away, and the non-human.

It is impossible, therefore, to have purified, homogeneous network interactions defined by similar types of rules and actions, as hybrid networks are characterised by flows of instruments, competencies, literature, money and information which tie and connect laboratories, enterprises or administrations in unique and specific ways (Latour, 1993). In other words, planning and development at Wyong is unique – the network configurations observed here will not (cannot) be mobilised elsewhere. People (such as planners and developers) simultaneously deal with the social and the technical; they produce and shape scientific knowledge, economics, industrial structures and technologies in a manner potentially conducive to their own ends (Law and Mol, 1995). They are heterogeneous engineers that enrol actors/intermediaries to facilitate network identity. It is the capacity to enrol actors/intermediaries, with special attention to those of the non-human variety, in coherent translations of planning and development which is explored below.

DEVELOPMENT AND ENVIRONMENTAL ACTORS

This section explores two examples of non-human influence in mediating residential development and planning at Wyong. Drawn from a larger study (Ruming, 2007), the objective is to highlight the role

which non-human actors play in framing, shaping and directing residential development and planning and the multiple enrolments and translations required to secure development and policy actor worlds. The first example discussed is endangered species, focusing on the Squirrel Glider, and the *Wyong Conservation Strategy.* The second example explores the role of topography in shaping the planning of a master planned town centre development.

NON-HUMAN 1: ENDANGERED SPECIES AND THE *WYONG CONSERVATION STRATEGY*

Of the multiplicity of non-human actors impacting upon residential property, flora and fauna are increasingly identified as some of the most significant actors influencing the level, success and extent of development (Murdoch and Marsden, 1995; NSWDLWC, 1999; Landcom, 2003). In New South Wales, the increasing emphasis on environmental concerns was initiated under the *New South Wales Local Government Act 1993* which required councils to 'properly manage, develop, protect, restore, enhance and conserve the environment … in a manner that … promotes the principles of Ecologically Sustainable Development (ESD)' (WSC, 2002a, p.2). In recent years the discourse of ESD (as recognition of the impact of development on the environment) has become central to urban planning and development approval (Davies and Christie, 2001; Landcom, 2002a, b). The potency of flora and fauna actors in shaping residential development at Wyong is, in part, due to its unique environmental configuration. Currently 68 per cent of Wyong's land area is covered in native vegetation, and while it accounts for only 0.001 per cent of the Australian continent, it provides the habitat for 33 per cent of known animal and bird species and seven per cent of known plant species (WSC, 2002a). Wyong is habitat for 427 animal and bird species, 62 of which are identified as threatened under the *New South Wales Threatened Species Conservation Act 1995*, including the Green Thighed Frog, the Glossy Black Cockatoo, and the Squirrel Glider and 1086 plant species (WSC, 2002a). The intersection of rapid residential development and relatively untouched natural habitat has led to a situation of conflicting interests in terms of land use planning. In the case of residential development at Wyong, the Squirrel Glider is one of the most influential non-human/endangered species.

The Squirrel Glider (*Petaurus norfolcensis*) is listed as a Vulnerable Species on Schedule 2 of the *New South Wales Threatened Species Conservation Act 1995* (NSWNPWS, 1999). It inhabits dry sclerophyll forests and woodlands and is sparsely distributed along the east coast of Australia and

immediate in-land areas from western Victoria to north Queensland. Despite this relatively wide spatial distribution, the Wyong Shire represents the largest single population of Squirrel Gliders in New South Wales and possibly Australia (Smith, 2000).

In terms of residential approval, under the current institutional arrangements individual developments and individual species must be taken in isolation – the impact of individual developments on individual species must be assessed. Here developers are required to engage (enrol) a series of expert consultants to translate the potential impact of development on all species found on the site. This process occurs through the development of a Species Impact Statement (SIS) for each of the endangered species identified on a site. Under the *New South Wales Environment and Planning Assessment Act 1979* local councils have approval authority, however, given the individualistic translation of development under the SIS (one species and one site), the chance of development triggering 'Significant Impacts' – the fact that development has an adverse effect on the species in question – increases and referral to the National Parks and Wildlife Service as outlined under the *New South Wales Threatened Species Conservation Act 1995*. Thus, on sites with endangered species, negotiations/translations of development are likely to move from the local arena (council) to a State agency. This institutional arrangement is a cause of frustration for council and developers alike:

> The basic issue [with one development is] a narrow corridor running through part of it. It is right on the cusp of being viable for Squirrel Gliders. The bulk of our population of Squirrel Gliders is not protected by conservation zones, so basically if we make a decision in any part of this remnant vegetation, then we will potentially be triggering Significant Impacts because we haven't got the broader thing protected. (Council Officer)

The main question was the environmental corridor. We had developed that from the best scientific evidence available. At the same time the council was performing a shire-wide study of the Squirrel Glider. It was found that some of the species lived in the area. They only found a few but it was considered important enough for the council to look at the development again. So again we went into a process of negotiation, eventually the development was changed again. (Private Planner)

Thus, Squirrel Gliders at individual sites become actors which mediate the success of planning and development. Developers are required to enrol and mobilise various expert consultants and scientific equipment to translate the impact of development. This translation is then mobilised through, first, the negotiation with council officers, and second, through more formalised interactions with the National Parks and Wildlife Services, where developers are required to present a translation of development which does not adversely impact upon the endangered species in question.

A number of state actors argued that the continued development at Wyong, in the absence of a coherent conservation strategy, would severely impact on the environmental quality of the region (Orkopoulos, 2003): 650 hectares of native vegetation and 137 hectares of regenerating vegetation would be lost (WSC, 2002b). Thus, in recognition of the impact of flora and fauna on planning and residential development more broadly, Wyong Council embarked on a process to develop a coherent and uncontested worldview of development and conservation – one which translated all endangered species, such as the Squirrel Glider, while simultaneously facilitating development. This translation was forwarded by the *Wyong Conservation Strategy*. The *Wyong Conservation Strategy* was positioned by council as a policy which (in line with ESD) provided 'the best possible framework for balancing the environmental, social and economic future of the shire' (WSC, 2002b, p.28). It was a network which would translate both endangered species and development processes and objectives, through a series of planning maps outlining conservation and development potential across the Shire as the basis of a revised *Local Environmental Plan*. At its most broad the *Wyong Conservation Strategy* sought to define zones of tight land-use, where areas zoned residential would not be required to engage the National Parks and Wildlife Service because developments were unlikely to

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trigger significant impacts, given that areas of conservation would be defined, together meeting the conservation targets of the Shire as a whole:

> The implementation of new conservation zonings will reduce the number of instances where Species Impact Statements need to be prepared ... The SIS process effectively involves an approval role by the Director General of the New South Wales National Parks and Wildlife Service for many development proposals involving threatened species planning issues. Continuation of this approach without controls to limit cumulative habitat losses will significantly impair Council's ability to make proper planning decisions in order to balance environmental, social, and economic. (WSC, 2002b)

As a policy translation designed to shape development/conservation at Wyong, the *Wyong Conservation Strategy* was facilitated through a series of enrolments, manifest in a computerised planning program (C-Plan). It was argued that the C-Plan computerised methodology represented the most up-to-date planning process of environmental conservation and, therefore, of development planning:

> The C-Plan computer software package has been used by various State government agencies throughout Australia and is recognised internationally as a 'best practice' conservation planning tool. (WSC, 2002b)

Nevertheless, the strength of the final translation is only as good and powerful as those intermediate translations enrolled in its identity. In other words, the capacity of C-Plan to develop a comprehensive translation of conservation/development rested upon those studies, equipment and experts responsible for translating each individual species:

> In the conservation strategy there is now all the technical studies that we did, and then we sought to use a program called C-Plan to analyse the data, which basically is a tool where we try to overlay the data. (Council Officer)

[*Wyong Conservation Strategy*] is based on over 100 layers of information … it is based on the vegetation mapping and the threatened species legislation, and we have actually done on-ground truthing, a lot of specific species studies. Layers and layers and layers of it. (Council Officer)

In an ANT sense, the *Wyong Conservation Strategy* was positioned as powerful because of its ability to enrol, convince, and enlist others into its network (Murdoch, 1995). Texts (truths or knowledges) created through scientific processes potentially become immutable mobiles with the ability to fix pieces of knowledge, allowing these knowledges and translations to be used well beyond their original place of origin, and facilitating long-distance control in the case of conservation and development at Wyong (Callon et al., 1986b; Latour, 1988a). Thus, each layer used to construct the final *Wyong Conservation Strategy* represents an actor world in its own right – a translation of the endangered species/constraint. While the C-Plan methodology claimed the authority to translate environmental issues, each of the enrolled layers could equally be challenged on the basis of scientific and methodological competence. Thus, the C-Plan methodology represented the collection and expression of multiple translations, each with its own actors, intermediaries, methodologies, equipment and potential conflicts. The *Wyong Conservation Strategy* (through C-Plan) attempted to translate for the 26 flora species and 63 fauna species identified under the *New South Wales Threatened Species Conservation Act 1995* (WSC, 2002b), including the Squirrel Glider.

For the Squirrel Glider, an initial target of 7,500 hectares, 50 per cent of all identified Squirrel Gilder habitat, was recommended for inclusion in restrictive conservation zonings in the *Squirrel Glider Conservation Management Plan for Wyong Shire* (Smith, 2002) – the scientific study which would define the Squirrel Glider layer in the *Wyong Conservation Strategy*. This was considered appropriate to sustain a minimum population of 2,200 Squirrel Gliders over the long term (WSC, 2002b). While the Squirrel Glider represents just one actor, one layer of the *Wyong Conservation Strategy* translation, equivalent stories could be told for each layer. The C-Plan translation was an attempt to draw multiple actors into a single and coherent translation of conservation constraints and planning, thereby altering the development translation of developers (i.e. site-by-site). Here council centred policy sought to create a world where, first, development could proceed by removing the necessity to translate

endangered species individually through identifying areas of conservation and actor preservation and thus the site-by-site negotiation of development with council and the National Parks and Wildlife Service – developers would not have to negotiate Significant Impacts because the species would be conserved elsewhere, and, second, through these conservation areas maintain the populations of endangered species – areas of significant Squirrel Glider populations would be excluded from development pressure. Scientifically informed policy was identified as a translation where all actors – human and non-human – could win. In this case the capacity to translate endangered species rested upon the enrolment of a series of more diverse actors and intermediaries, such as expert testimony, scientific studies, and computer modelling, (Ruming, 2006). However, the ultimate success of the *Wyong Conservation Strategy* depended on the further enrolling and translation of actors, ideologies and discourses which were not represented as the simple expression of formal institutional lists, such as the *New South Wales Threatened Species Conservation Act 1995,* but are the expressions and desires of market logics and human actors – actors which were not, in themselves, defined as layers and enrolled in the C-Plan framework. Thus, while non-human actors, such as endangered species, represent central actors, they are also part of a more complex, topological network centred on development and conservation at Wyong.

NON-HUMAN 2: TOPOGRAPHY AND THE WARNERVALE TOWN CENTRE

This section explores the role of topography in mediating planning of the Warnervale Town Centre – a large town centre to be built in the north of the Wyong Shire. The Warnervale site has been identified for residential development since late 1960s. As a result of this long history current planning is required to translate a variety of actors/intermediaries which would not play a significant role in mediating development – such as topography (given that in an ideal world development would not be targeted at sites with difficult topography). Topography played little role in early planning policies at Warnervale (SPANSW, 1973; NSWPEC, 1975) with the site identified primarily for its access to an existing railway line and potential significant residential development. However, under the most recent planning process, initiated in the early 2000s, topography was identified as one of the most powerful constraints directing the development of the site:

We start off with the constraints of the site. Things like gradient issues. (Private Planner)

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What we found was that some of the terrain that had been considered was difficult and that it was going to prove problematic to actually put some of that proposal on the ground. (Private Planner)

The topography of the site challenged the authority of planning strategies and operated as an actor/intermediary which impacted on the objectives and processes of developing a plan for the site – it was something difficult to translate in policy:

[Slope] was always an issue. It wasn't an issue on council, it wasn't an issue on Planning NSW[i], it wasn't an issue on us. It was one of those issues which we had to live with. That probably compromised the final product. (Private Planner)

In particular, the topography of the site mediated four key considerations of development: the operation of development and the market; the construction of transport infrastructure; ideals of new urbanism and urban design; and, institutional arrangements tied to access for people with disabilities.

Topography was positioned by market centred actors as a non-human actor/intermediary with the potential to alter market function and profitability. (Healey et al., 1995; Adams and Watkins, 2002). Topography was seen to mediate market operation through increased costs in developing initial structures, or through potential future costs due to altered designs which accommodate topographical issues – while planning actors must take the topography of the site into consideration, so to must developers responsible for the construction of the town centre, a smaller translation of individual sites. The initial plan for the site recognised that the presence of the elevated land may hinder or add to the expense of the development of big-box commercial activities and small-lot housing which tend to prefer flatter ground on which to locate:

When we did our site analysis it became apparent to everybody that the town centre was going to present problems to development, because of its hill-top location ... It did mean that

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development on the high side would be compromised because it becomes very difficult to put large supermarkets and other large elements onto that kind of land (Private Planner)

The site chosen for the railway station is in the cutting on the ridge line, and to try and get big floor-plate supermarkets, department stores on that sort of topography seemed not to be the right solution. (Private Planner)

Second, the topography of the site was seen to influence the provisions of rail infrastructure, and tied to this, thirdly, urban design drawing on the ideals of new urbanism. The North Warnervale railway station, in accordance with new urbanist planning initiatives, was designed as an easy access railway station, bus interchange, and commuter car park, and was positioned at the centre of the development. While the railway station acted as one of the catalysts for the most recent round of planning of Warnervale and was widely acknowledged as central to ensuring the centre's success, the potential location of the station instigated significant debate between the construction and cost concerns of State Rail (the state department responsible for its construction) and the service, infrastructure, retail and ideological concerns of those human actors responsible for the master plan (Ruming, 2005):

The town centre was driven by the railway station. The station is planned to be on a big saddle. I can completely understand why the railway guys want it to be there, but that makes it difficult in terms of associating the most dense town centre activities with the railway station. (Private Planner)

There is a tension between the location of the railway station and the location of the town centre. State Rail has a very good engineering reason why they want a railway station at exactly where they want it to go. In my view that decision ought not be taken in isolation and there might be functionalities of how the railway affects how the rest of the town centre will operate over an extraordinarily long period of time. (Private Planner)

While it is recognised by the private planners that in terms of funding and topographical constraints, the location suggested by State Rail was the most appropriate, this location is considered inconsistent with the ideological driver of the development – new urbanism. Second, further to funding constraints, if the town centre was relocated and the railway station remained in a location at the top of the hill, one of the central tenets of new urbanist design, transport-oriented development, would be compromised.

It is unsurprising then to find topography explicitly identified as the actor/intermediary responsible for producing a 'bizarre' style of development, one that is opposed to the ideologies of integrated services provision and, especially, new urbanism (Woods Bagot, 2002) – a translation which effectively dealt with topography, resulted in compromised translations for a series associated actors/intermediaries:

> [The only problem was] that the main street was a bit weird how it curved around, but really that was just to try and create a road that had a reasonable slope. We had to come up with a solution that accommodated the slope. That meant that the final design outcome had some rather bizarre characteristics. (Private Planner)

Finally, topography influenced and was influenced by a series of formal institutional arrangement – or legal requirements – which would shape the development of the site. The most important being those institutional constraints which identify acceptable gradients for wheelchair access (AS1428.1) are enrolled as actors which need to be incorporated into the development plan. As a minimum an accessible path should comply with Australian Standard 1428.1. Gradient required by the AS1428.1 (if over 1250mm in length) is 1:14.

Future development at Warnervale was translated through two separate planning documents, each of which presented different visions of development. The first, the *Warnervale District Planning Strategy* was produced in 2002 (Woods Bagot, 2002) while the second, the *Warnervale Master Plan* (LFA, 2004) was released in 2004. Each of these policy frameworks were the product of different actor configurations – each enrolled a different set if actors/intermediaries – and, as a result, offered vastly different translations of development at Warnervale. The development translation offered by the

Warnervale Master Plan was positioned by those responsible for the policy as the more effective enrolment of topographical and related institutional actors. For example, institutional constraints which identify acceptable gradients for wheelchair access (AS1428.1)[1] are enrolled as actors which need to be incorporated into the development plan:

> The [*Warnervale District*] *Planning Strategy* has some really huge flaws. They are trying to put roads that are a one-in-ten gradient in some places, and the steepest gradient for a person in a wheelchair is one-in-fourteen. (Private Planner)

> The master plan essentially involved picking a line that would allow a walking gradient that was compatible with AS1428, which is the disabled access, and ensuring that we could gain the main street that would gradually descend the hill. But it did mean that main street was lengthened, because you are going to a point that is further away. (Private Planner)

The complexity involved in the reconciliation of formal institutional (e.g. disabled access), market functioning (e.g. the needs of supermarkets), and topography at within a comprehensive planning translation at Warnervale is obvious. It was suggested by actors central to the *Warnervale Master Plan* that the initial failure of the planning translation to adequately translate issues of topography was a result of the tight fiscal constraints on state actors (i.e., the ability to pay for the required studies) (Ruming, 2005) leading to an inferior, fallible and weak translation of urban development – topography, as a non-human actor, was not efficiently enrolled and silenced in the *Warnervale District Planning Strategy*. Here the capacity to translate topography was dependent on the enrolment of a comprehensive and capable set of actors and intermediaries – such as scientific and expert analysis. Under the *Warnervale District Planning Strategy* expert actors and equipment were not enrolled as intermediaries to translate on behalf of issues of topography; instead, a cheaper (inferior) translation was initiated, one that did not reflect the impact of topography:

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[1] As a minimum an accessible path should comply with Australian Standard 1428.1. Gradient required by the AS1428.1 (if over 1250mm in length) is 1:14.

There was not enough money to send surveyors out and do a basic five-meter contour interval survey. They relied on orthographic photo maps, which can be out by some pretty significant amounts. We then surveyed a lot of this land, and the orthographic maps have been shown to be wrong. (Private Planner)

The insight of Law (2000a) that the authority of planning policy is reliant on the unquestioned capacity of survey equipment is paramount here. Thus, the translation presented by the *Warnervale District Planning Strategy* is, according to those involved in the development of the *Warnervale Master Plan*, faulty and open to contestation, given that the strength of any translation rests on the strength of those which are enrolled.

In both planning actant networks, the ideal situation was to move the town centre to a flatter site, thereby negating the influence of topography. However, the fixity of the town centre site is due both to a long institutional history (identified in the 1960s) and to issues related to the funding and development of the new railway station. The railway station and the topography of the site therefore represents the nexus of more diverse policy/funding/service networks. Here the influence of topography is mediated by more diverse actor objectives, as the development (funding) of the railway station, as the centre piece of the town centre, hinged on the future plans of City Rail as well as the capacity to build a station – something the topography of the site aided.

While it is recognised by the private planners that in terms of funding and topographical constraints, the location suggested by State Rail was the most appropriate, this location is considered inconsistent with the ideological driver of the development – new urbanism. Here competing network objectives manifest themselves in the efforts to adequately translate topography in a planning framework:

It is the structure of government at the moment. There is not a real big-picture overview that says, 'let's look at the consequences of shifting something in order to gain that objective'. (Private Planner)

As a result the planner suggests that the objectives of State Rail, and the cost and topographical benefits, be downplayed for the benefit of the development translation as a whole:

> There is a tension between the location of the railway station and the location of the town centre. State Rail has a very good engineering reason why they want a railway station at exactly where they want it to go. In my view that decision ought not be taken in isolation and there might be functionalities of how the railway affects how the rest of the town centre will operate over an extraordinarily long period of time. (Private Planner)

The argument put forward by the private planner is a complex translation centred on topography. While the ideological, community, infrastructure and service roles of the town centre are emphasised, this translation equally aids market actors, first by criticising the lack of funding to the project which effectively frames the market at Warnervale (Ruming, 2005; Smith, 2005) and, second, by advocating a shift in location to flatter ground thereby aiding construction. The alternative policy translation which removes topography as an actor (by moves the town centre to an alternative site) is seen by the planners of the site as the most advantageous to service and market networks alike:

> So the conflict was, do you allow a station which will cost perhaps between ten and fifteen million to influence something that is going to cost in the order of hundreds of million? At the moment it would appear that State Rail is committed to and will build the station at a point which is not readily accessible from the flatter lands. (Private Planner)

> So the controlling factor ended up being the station. We had to spend a lot of time trying to get a design that integrated the main street and the station with the topography issues. (Private Planner)

However, the movement of the town centre away from the steepest location would potentially cause two further problems for the master plan translation. First, it would require the relocation of the railway station closer to the new core town centre. This relocation would involve extensive negotiation with actors responsible for the station's development (Department of Transport). However, in many cases

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the capacity to relocate major infrastructure, especially in an environment of stringent state fiscal management and spending, is limited (Gleeson and Low, 2000b; Ruming, 2005). Second, further to funding constraints, if the town centre was relocated and the railway station remained in a location at the top of the hill, one of the central tenets of new urbanist design, transport-oriented development, would be compromised (Ellis, 2002).

CONCLUSION

This paper has recognised some of those non-human actors central to planning and development at Wyong, Australia. An ANT framework provides an in-depth analysis of residential development and planning policy which facilitates the identification and tracing of actors/intermediaries which may otherwise be neglected, ignored or forgotten (Latour, 1988b; Murdoch 1997a; Callon, 1999). Special attention has been paid to the multiple ways in which non-human actors interact to facilitate the development of residential property and associated policy arrangements – focusing on endangered species and topography. While the networks, actors, intermediaries, and interactions explored here represent those central to planning and development at Wyong, they are not fixed or static.

While the majority of research projects which mobilise ANT have focused either on the role which non-humans play in mediating social life and interaction (Latour, 1988b; O'Neill and Whatmore, 2000) or the expansion of non-human actor worlds (Murdoch, 1997a; Whatmore and Thorne, 1997), this research highlighted the role which non-humans play in the creation of formal policy translations and contributes to the small set of research which recognises the vital role of non-human actors within urban existence (Amin and Thrift, 2002). Important examples discussed in this research include: the presence of endangered species; the mobilisation of scientific equipment and computer modelling to create (apparently) coherent policy translations; environmental conservations and market operations; and the influences of topography as an intermediary directing urban design, all of which shape the built environment, residential development market and the capacity of state actors to develop comprehensive planning policy. Thus, given that each network is constituted by a different and variable set of actors, processes, enrolments and translations, only an ANT approach which facilitates the entering and following of each of these actor network configurations has the ability to explore the

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key intricacies and nuances of planning and development, be they human, non-human, institutional, discursive or market-centred.

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[i] The State government department responsible for metropolitan planning.