

Low-Carbon Ability of Neighbourhood Public Open Space (POS) Governance: Explanation from Social-Ecological System and New Institutional Economics

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Even though a raft of literature stresses the significance of public open space (POS) conservation which is vital in shaping a greener and low-carbon environment, particularly for the government-owned POS, issues of underinvestment (poor landscaping) and overexploitation (misuse and illegal conversion) result in negative externalities are persisting. By highlighting the implications of institutional design on common resources and establishing the complex interrelationship among the property-rights structure and distribution of transaction costs with neighbourhood POS governance and its externalities, theories and concepts of social-ecological system (SES) and new institutional economics (NIE) are employed to justify why such POS issues rampantly recur which adversely affect its low-carbon ability. A conceptual framework was synthesised. Findings suggest that the institutional design and change of property-rights structure associated with transaction costs distribution are crucial in determining the neighbourhood commons governance and quality. Various property rights issues are discovered in contributing to high enforcement costs and perverse incentives in POS governance; the incentivised opportunistic behaviour of stakeholders and POS commons dilemmas consequently stymies the advancement towards low carbon direction. This synthesis renders policy and management insights by advocating the importance of institutional-social-ecological position to the public officials so that they may consider re-aligning the POS property-rights system for a greener and more low-carbon environment.

1. Introduction

It is always challenging on how to design greener and more low-carbon cities, particularly when rapid urbanisation contributes to high carbon emission is inevitable. One of the means is via the green facilities provision (POS). The multi-defined-and-functioned POS, namely neighbourhood park, green space, playground and playing fields, community garden, sports and recreational ground, green and urban space, indeed, provide ecological benefits, such as regulation of ambient temperature, pollution reduction, carbon sequestration, and carbon sink, along with the co-benefits of economic and social aspects (Chang and Li, 2016). Despite the immense benefits of POS and numerous research related to its architectural and spatial design and restrictive land use policies for the interest of POS preservation and conservation, issues of depletion and space quality degradation, especially in the context of state-owned POS, with respect to rampant overexploitation (illegal misuse and conversion of POS, and squatters settlement encroachment) and underinvestment (poor landscaping), are still arising that consequently result in negative externalities. Thus, we mainly employ the theories of social-ecological system (SES) and new institutional economics (NIE) as frameworks to explain why the POS issues are rampantly recurring, which may adversely affect the low carbon initiative. A study of the property-rights system and transaction costs (institutional design) on the social-POS interaction and POS quality, whether they subsequently contribute towards low carbon direction, is focused; such institutional lens in the neighbourhood POS context is often neglected (Ling, 2017).

2. SES and NIE Theories on Neighbourhood Commons (POS) and its Low-Carbon Ability

A system composed of organised assemblages of humans and environment in a geophysical setting, SES framework is a valid and utilitarian heuristic platform in understanding and analysing the complex social-POS interaction and its outcome (Ostrom, 2009). In a complex SES, a resource system (a POS), the resource units including the surrounding landscaping, the users including residents, and the institutional systems, including organisations and rules that govern the POS management and consumption rights, are relatively separable but interact to ultimately produce POS outcome and determine its low-carbon ability (Ling et al., 2016). For a more robust analysis, the multidisciplinary NIE theories, covering institutions and property-rights system, transaction costs, property rights issues, common pool resources, self-interest and opportunism, and social (commons) dilemma and externalities, are vitally incorporated into the SES (Kherallah and Kirsten, 2002).

2.1 Neighbourhood POS as Common Pool Resources (CPR)

By virtue of sharedness of neighbourhood commons, it is considered as a CPR. Ostrom (1990) asserts that CPRs of POS must own two attributes, which can exist in any property-rights regime: (i) non-excludable (exclusion of POS is costly) and (ii) subtractible (single use of POS reduces others' use opportunity). This economic good (CPR) is primarily determined by an institutional design, as discussed in section 2.2.

2.2 Institutions, Transaction Costs, and Property-Rights System on Neighbourhood POS

Institutions are the rules of the game (constraints), which are socially formulated to influence and structure social-ecological interaction. They are constituted by formal and de jure constraints (rules, laws, constitutions, regulations or guidelines, policies) and informal and de facto constraints (conventions, customs, and practices) (North, 1990). Such institutional environment institutionalises the property-rights structure and transaction costs. For the transaction costs, they cover market and non-market costs, which respectively comprise the costs of information searching, moving, monitoring, organising, legal consultation, cooperation and negotiation, predicting, and lobbying and queuing. It is crucially relevant to analyse the distribution of transactions costs and perverse incentive for assessing the efficiency of the existing or new institutional design. Generally, having negative or lower transaction costs and perverse incentive are essentially favourable, when one concerns about the rights allocation and enforcement; it signifies lesser time or effort or sometimes money required or is easier to cause them feasible and successful. This paper's measurement of transaction costs mainly adopts the subjective or institutional approach that expresses the costs in the non-pecuniary forms, such as efforts and time consumption, uncertainty, social dilemmas, and opportunism level. Next, in the property-rights system, it comprises property-rights regimes, bundle of economic and legal rights (Buck, 1998). Legal rights are the rights assigned by the authorities and recognised by the de jure and formal institutions. They are to protect the economic rights. Economic rights are the ones concern individuals ultimately; the former grants the ability for them to exercise their rights over a resource (POS). Such rights provide individuals a stream of benefits (ownership, alienation, management, and use) and their respective positions where the entrants have an access right only. A transfer or exchange of divisible economic property-rights, via development and alienation-lease, among individuals, is a form of contractual arrangement (Ling et al., 2016). Buck (1998) argues that the bundle rights of the property are defined by the property-rights regimes and the characterisation can go vice versa. There are four classes of property-rights on the resource regimes, including the state property, common property, open-access resource and private property, although those are often converging. Each of them features different resource governance implications in terms of ownership and accessibility, and other associated rights and duties, including potentially possible types of economic goods. Thus, each regime has its own strength and vulnerabilities in governing the resources (Dietz et al., 2003); the latter's quality varies according to the regime, which has been shown by Webster and Lai (2003) following their work on the adaptiveness and compatibility of property regimes. In many developing countries, namely Malaysia, the civic and neighbourhood POS (playground and community parks) are largely held as the municipal or state property, which is a centralised system, because it is still believed to sustain its quality (Ling et al., 2016), especially their planning and management systems espouse the classic suggestions and models of Hardinian (Hardin, 1968).

Based on the Ling's et al. (2016) findings, there are significant roles and implication of property-rights system and transaction costs distribution on urban and neighbourhood commons quality outcome, which is believed to subsequently influence the POS low-carbon ability. The property-rights are rudimentary in understanding the predicaments related to the overexploitation and underinvestment of ecological goods as this depends on social behaviour (Grafton, 2000). As institutions can determine internalisation of externalities, it is understood that different arrangement of property rights subject individuals' management and consumption behaviour to respective extent of incentives and costs, leading to different outcome of resources. In the POS context, an unfittingly designed and poorly enforced spatial planning policy that leads to highly positive perverse incentive

and transaction (enforcement) cost may cause adverse market-POS interaction and poor POS green quality, which therefore compromises and inhibits the low-carbon direction and low-carbon ability of the POS, as shown in section 2.3 on the property-rights failure and opportunistic social-POS behaviour.

2.3 Opportunism, Social (Commons) Dilemmas and Property-Rights Issues on Governance, Quality, and Low-Carbon Ability of Neighbourhood POS

Along with the above theoretical overview and concepts of SES-NIE components and the implications of institutional-social-ecological position, this section is a further expansion with respect to particular forms and consequences of institutional failures (change in property-rights system) on social-POS behavioural condition. Aside from understanding the possible property-rights issues involved in POS, by integrating the concepts of self-interest, opportunism, and social dilemmas which render a richer analysis on individuals' economic-ecological behaviour, it is enabled to address the issues of how exactly these property-rights failures originate and influence the stakeholders' opportunistic behaviour in POS governance in terms of management and consumption which therefore affect its quality and low-carbon ability.

As the above institutional design and social behaviour are inherently associated, the issue about human nature whether one behaves self-interestedly and opportunistically to maximise his or her advantages (utility) is accentuated, especially in relation to the social-POS governance decision. In an exchange, individuals cannot be presumed to keep their promises and exercise their duties (asymmetric commitment) promptly (asymmetric commitment), and the contract is breached, although agreement has been reached in the ex-ante contract. The opportunism is an essential component in property-rights system and transaction cost economics context; when the aforesaid institutional design is adversarial and unfavourable, opportunism cost is intensified.

There is a direct relationship between opportunism and social dilemmas. It is described as a situation where there is conflict between an individual's maximisation of personal interests and collective interests. The former is considered as a defecting (rational) choice, that entails a dominant strategy, while the latter is known as a cooperative choice. An individual always obtains a higher reward, in the short term at least, when he makes a defecting choice. Within the game theory (prisoner's dilemma model), both social dilemmas: public goods (giving) dilemma and resource (taking) dilemmas are regarded as common/CPR dilemmas, since both significance of contribution/giving (management) and appropriation (taking) aspects are equally important in a common.

In the neighbourhood POS setting, the CPR-based POS dilemmas may involve the following issues), which result in poor quality and loss of POS that compromises its low-carbon ability (Chen and Jim, 2008), particularly in relation to carbon sequestration and carbon storage. Not only the unmaintained, unhealthy or dead plants and trees store or absorb less carbon and other pollutants via photosynthesis, the decayed trees instead contribute to substantial amount of carbon emission, when it involves a great number of POS and trees. Such poor POS condition promotes more indoor activities with high energy consumption that thus contributes to high carbon emissions. These are the dilemmas, namely (a) duties shirking in terms of POS green amenities mismanagement, underinvestment, poor monitoring, and disuse in which they cause the landscape elements such as trees, plants, lawns, grass, and shrubs unmaintained and perished (unhealthy and dying); (b) free-riding that involves squatters and outsiders who exploit the green services without paying equivalent tax and fees that may cause other dilemmas such as vandalism; (c) moral hazard in which the private supplier may not adequately invest and manage the POS when they are co-managed for instance by local government against it; and (d) overexploitation in terms of green landscape vandalism and illegal conversion or misuse of green POS to other profiteering uses, for example to commercial purpose; this is in line with the Tragedy of the Commons (Hardin, 1968). All in all, the CPR dilemmas will be aggravated if more opportunistic behaviour involved; they spawn other types of dilemmas and more severe externalities. For instance, POS maintenance shirking in terms of cleanliness and landscaping induces graver overexploitation, which results in disuse (poor landscaping) and misuse (illegal conversion and loss) of POS (Musole, 2009). Such self-interested and opportunistic-based POS dilemmas, as hinted, are influenced by the environment that encloses them. The environment, in this paper, refers to the institutional design, particularly the failures of property-rights system and high transaction costs on social-POS opportunistic behavioural interaction.

The following, inter alia, is the discussion of possible property-rights failures in social-neighbourhood commons (POS). Attenuation of private rights is the shrinkage/diminution of owners' exclusive bundle of economic rights (benefits), which can be in the forms of accessibility, utilisation, alienation, exclusivity, ownership, and constructability on resources, by the state's restrictive measures, e.g., via zoning and development policies.

By virtue of the severe rights attenuation two distinct opportunistic behaviours are observed in POS context: (i) overexploitation and (ii) management shirking (Frech, 1976). As for the former, it leads to a greater consumption of POS benefits, which may eventually lower the POS health, via rent-seeking and lobbying

behaviour, the genuine use of POS may be illegally defeated; it is used for other uses or converted to commercial use (Ling, 2017). For the latter, since the economic benefit of the commons reduced (cannot transfer, develop, and derive income from it), it signifies the owner's high investment or effective management in the less-value commons is unlikely due to the asymmetric benefit-cost situation; the most rational way is that he is incentivised to underinvest and mismanage. This has maintained Webster and Lai's (2003) contention that property-rights attenuation indeed causes opportunistic individuals to act illicitly.

On the incomplete property-rights, although it is interchangeable with ill-defined property-rights, in which the latter is viewed as unassigned consumption rights in public domain, it, however, does not inevitably entail a complete right, albeit it is well-defined. All complex contracts (rights) are necessarily incomplete; transaction cost matters and is highly positive in ex-ante rights assignation and for considering all possible future contingencies. An incomplete contract has missing provisions and ambiguities (Hart, 1988). For clearer illustration of the incompleteness of rights, Shavell's work is suggested to be referred to, particularly various scenarios and examples are provided and elaborated (Shavell, 2004). Similar to the ill-definition of rights, the non-contractible incomplete rights increase the ex-post transaction costs and perverse incentives. Once the rights enforcement is uncertain, the value, benefits or utility of the property decreases, after considering the unrecoverable loss on the rights infringement by opportunistic individuals. Therefore, such incomplete property rights (unspecified rights and duties) are vulnerable to overexploitation and shirking (underinvestment and mismanagement) (Kim and Mahoney, 2005), for example, unclear and ambiguous procedures on how to maintain the POS landscape like how many times and when to fertilise and water the greenery may cause the commons to be under maintained (Nicita et al., 2007).

Lastly, the issue of misallocated rights or maladaptive (unfeasible) rights regime is discovered. It is synonymously considered as misallocation of resource. This is mainly about the efficiency of the property-rights, for example, to what extent the social-ecological interaction and its outcome are efficiently governed under the current property-rights regime (Webster and Lai, 2003). The resources (POS) should be assigned to those organisations and stakeholders who are in the strongest and most suitable position to govern and manage the resources to contribute to an optimal outcome. Generally, although the institutions are not severely attenuated or have been fully well-defined and secured, their adaptiveness/suitability of the POS regime on its governance, management and utilisation is still questionable, especially various high ex-post costs are involved, particularly under the state property regime, such as political influence, rent-seeking, lobbying and bureaucratic issue, heavily centralised information, overwhelming workload, technicalities, financial budgetary and workforce constraints, and low priority on non-income-generated POS compared to other economic-oriented businesses. Due to the above high cooperation, distance and negotiation costs in enforcing the control and management duties, burdens and perverse incentives are posed not only to government (as a manager) who may likely shirk the monitoring and management task, but also to the users who then may be lured to overuse and misuse (vandalism and land use conversion) (Foster and Laione, 2016).

On the whole, the property-rights failures above are interrelated to each other, which respectively contribute to their own commons dilemmas and negative externalities. This scenario is analogous to Musole's (2009) standpoint that the externalities and dilemmas such as shirking or overexploitation, will be compounded and thus are exacerbated, if those rights issues, including the incompleteness, misallocation of regime, and attenuation, coexist simultaneously, which this is normally observed in one institution. Finally, based on the above theoretical review of SES and NIE, which is underpinned by the below theoretical institutional-economic framework of Buitelaar and Needham's, (2007) (Figure 1), a conceptual (operational) framework (Figure 2) associated with low-carbon issue is demonstrated as follows, in which it succinctly presents a nexus of the interrelationships between the institutional dimension (property-rights issues, high transaction costs distribution) and opportunistic social-POS interaction, which leads to various CPR-POS dilemmas and negative externalities. The loss of POS and its poor greenery quality bring forth inefficient low-carbon ability; thus, the goal of being low-carbon environment in the neighbourhood is compromised.

3. Conclusions and Recommendation

SES-NIE based conceptual framework is truly crucial and relevant, especially at explaining today's state failure on POS governance, quality and low-carbon issues, particularly through the understanding of the institutional property-rights and (perverse) transaction cost and incentives system distribution in social-POS realm. The social-POS opportunistic behaviour and commons dilemmas are indeed incentivised and externalised, when one institution is associated with the above numerous property-rights tragedies that ensue in high transaction cost and perverse incentives. More empirical studies are postulated to confirm and improve this conceptual framework. Exploration of other types of right issues and common dilemmas and their instances by future research are appreciated, perhaps in other common settings.

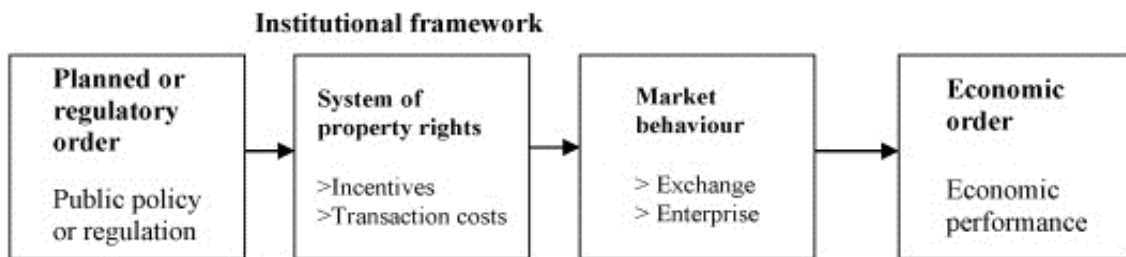


Figure 1: One-way institutional-social-economic framework

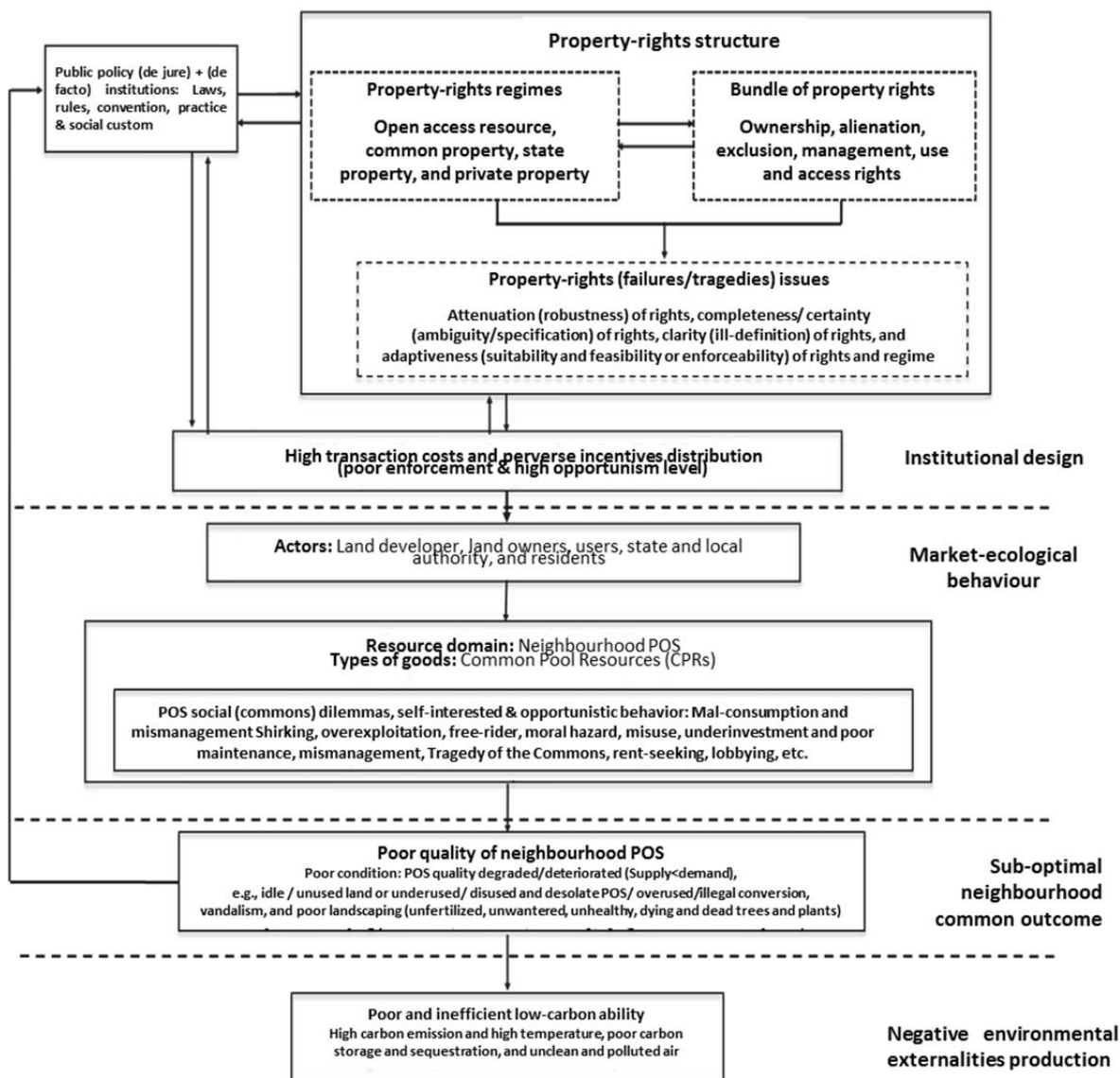


Figure 2: Conceptual framework on the interrelationships among the institutional design failures, social-POS opportunism and commons dilemmas, and low-carbon ability of a neighbourhood CPR-based POS.

The polycentric collective action self-governing model is believed to surmount the conventional centralised regime; it ensues in lower cooperation, monitoring, operation costs and perverse incentives and thus disincentivise the opportunistic behaviour and commons dilemmas (less shirk and overuse). Instead of the state-owned CPR POS, this re-allocation mechanism provides community club goods. Due to its non-rivalry and exclusionary features of POS, it is more efficient and sustainable; it is less contested and renders an

opportunity for control and commercialisation (membership fees), which motivates better management. This synthesis provides policy and management insights by encouraging scholars and public officials to be aware of the importance of institutional approach in POS so that a more liveable, sustainable society (low-carbon environment) is created.

References

- Buck S. J., 1998, *The global commons: an introduction*, Island Press, Washington, USA.
- Chang N., Li D.W., 2016, A study of the temperature-humidity effect and luminous environment design for urban green space, *Chemical Engineering Transactions*, 51, 103-108.
- Chen W.Y., Jim, C.Y., 2008, Assessment and valuation of the ecosystem services provided by urban forests: Ecology, Planning, and Management of Urban Forests: International Perspectives, Ed. Carreiro M.M., Springer, 53-83.
- Dietz T., Ostrom E., Stern P.C., 2003, The struggle to govern the commons, *Science*, 302, 1907-1912.
- Foster S., Laione C., 2016, The city as a commons, *Yale Law Policy Review*, 34, 1-69.
- Frech H. E., 1976, The property rights theory of the firm: empirical results from a natural experiment, *Journal of Political Economy*, 84, 143-152.
- Grafton R. Q., 2000, Governance of the commons: a role for the state? *Land Economics*, 76, 504-517.
- Hardin G., 1968, The tragedy of the commons, *Science*, 162, 1243-1248.
- Hart O., 1988, Incomplete contracts and the theory of the firm, *Journal of Law, Economics and Organization*, 4, 119-139.
- Kherallah M., Kirsten J. F., 2002, The new institutional economics: applications for agricultural policy research in developing countries, *Agrekon*, 41, 111-133.
- Kim J., Mahoney J. T., 2005, Property rights theory, transaction costs theory, and agency theory: an organizational economics approach to strategic management, *Managerial and Decision Economics*, 26, 223-242.
- Ling G. H. T., 2017, Institutional property rights of residential public open space in Sabah, Malaysia, PhD Thesis, Faculty of Built Environment, Universiti Teknologi Malaysia, Skudai, Malaysia.
- Ling G. H. T., Ho C. S., Ali H. M., Tu. F., 2016, Do institutions matter in neighbourhood commons governance? a two-stage relationship between diverse property-rights structure and residential public open space (pos) quality: Kota Kinabalu and Penampang, Sabah, Malaysia, *International Journal of the Commons*, 10, 294-333.
- Musole M., 2009, Property rights, transaction costs and institutional change: conceptual framework and literature review, *Progress in Planning*, 71, 43-85.
- Nicita A., Rizzolli M., Rossi M. A., 2007, Towards a theory of incomplete property rights, *American Law & Economics Association Annual Meetings*, working paper 42, be press. <law.bepress.com/cgi/viewcontent.cgi?article=2037&context=alea> accessed 22.10.16.
- North D. C., 1990, *Institutions, institutional change and economic performance*, Cambridge University Press, New York, USA.
- Ostrom E., 1990, *Governing the commons: the evolution of institutions for collective action*, Cambridge University Press, New York, USA.
- Ostrom E., 2009, A general framework for analysing sustainability of social ecological systems, *Science*, 325, 419-422.
- Shavell S., 2004, *Foundations of economic analysis of law*, Belknap Press of Harvard University Press, Cambridge.
- Webster C. J., Lai L. W. C., 2003, *Property rights, planning and markets: managing spontaneous cities*, Edward Elgar, Cheltenham and Northampton, UK.