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Social justice in coastal erosion management: The temporal and spatial dimensions

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Abstract

Coastal erosion management is primarily based on economic considerations (cost–benefit analysis). From the perspective of social justice (as a particular expression of the wider concept of human rights), however, several arguments can be advanced regarding public intervention in coastal defence management when private property is threatened by coastal erosion. In this paper we examine these arguments at both the short-term local scale and the long-term large spatial scale and consider the merits of inclusion of a social justice dimension in coastal erosion management. The coast provides a range of resources that benefit society as a whole. Coastal residents and property owners face a direct financial loss from coastal erosion but the general public also stands to incur losses other than purely financial if it there is public intervention for the benefit of these property owners. The arguments for public intervention are strongest at the local and short-term scales but they weaken (and even reverse) at geographically larger and longer time scales. At larger scales, the costs to society increase as intergenerational equity, non-coastal residents, climate and sea level change, and the environment are considered. Because of the intensity of interest involved at the local level, we argue that the necessary hard decisions must be made nationally if a sustainable policy is to be adopted. Social justice considerations provide a potential improvement on the traditional economic cost/benefit-based decision-making process of coastal erosion management but they only contribute to sustainability if viewed at the national level.

Keywords: Coastal erosion; Social justice; England and Wales; Sustainability; Environmental management; Coastal management

1. Introduction

Management of coastal erosion is an issue of globally widespread concern. Traditionally, decision-making in this management process is dominated by economic considerations manifest in a cost-benefit analysis approach. In the case of high density urban developments (major cities) the value of defended infrastructure easily outweighs the costs of defence. It is widely considered that such cities would likely be defended against coastal erosion at all costs (Granja and Carvalho, 2000), although the scale of impacts, engineering complexity and mounting costs may eventually blur the simple decision to defend. Such is presently the case in Venice, where the enormous costs of engineering to defend against sea level rise are becoming evident. The Hurricane Katrina disaster has also prompted reappraisal of the coastal management options in New Orleans (Pilkey and Young, 2005). Future projections of very large sea level rise (Tol et al., 2004), if realised, will place unprecedented pressure on economic systems if a defence policy is to be sustained. Recent considerations of the costs of maintaining defences in the light of sea level rise and climatic change have, however, prompted a reappraisal of public funding of some sea defences in parts of England and Wales. This has been accompanied by a call from those whose property is affected by such decisions and some of their political representatives for 'social justice' to be considered in the decision-making process. In

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this paper we examine the social justice arguments relevant to coastal erosion management and assess its implications for future management. We use the situation on the coast of England and Wales as an example, but the principles and arguments have general application.

2. Conceptions of social justice

The term "social justice" came to prominence in the industrialisation of the nineteenth century, when it was first used in the debate regarding the relationship between the ruling classes and the new urban poor (Novak, 2000; Barry, 2005). One definition (Edmund Rice Centre, 2002) maintains (p. 1) that "*social justice reflects the way in which human rights are manifested in the everyday lives of people at every level of society*".

The concept of social justice has had a long currency in social policy (Barry, 2005) and it has recently been applied in the area of environmental management (Syme and Nancarrow, 2001; Kasperson and Kasperson, 2001). The term has various definitions and applications. It is widely regarded in contemporary thinking as encompassing one of the three (social, economic and environmental) elements in sustainable development and this has led to some debate as to its relationship to sustainability (Dobson, 1998, 1999). Dobson (1999, p. 2) maintains that, social justice and environmental sustainability are both elements to be considered in the search for sustainable development, but they relate to different aspects: "justice is about distributing benefits and burdens, while sustainability is about maintaining life support systems". He also contends that there is likely to be a tension between the two as governments seek to pursue both as policy goals. In any case both social justice and environmental sustainability are imprecisely defined and therefore are contested concepts (Dobson, 1998) as the following range of definitions attests.

Social justice is regarded by Novak (2000) as being social in two ways. Firstly, it involves individuals working together with others to accomplish a work of justice without turning to government: the goals can only be achieved by the group and are social in that regard. It also acquires the label 'social' when its benefits accrue to the whole community. It is thus social in its means and in its ends. Novak (2000) notes that this conception of social justice "allows for people of good will to reach different – even opposing – practical judgments about the material content of the common good (ends) and how to get there (means). Such differences are the stuff of politics". Hardin (1987, p. 83) similarly notes that 'strong, interpersonally comparable value judgements' are an important element of social justice. The value judgements involved in social justice are also stressed by Barry (1995, p. 97) who states that "social justice does not determine the level or organizational form of health care, education or social security. In a modern society, social justice certainly does require that all of these should be provided, but it leaves a good deal of scope for variation beyond that".

Social justice is taken by Miller (1999) and Dobson (1999) to relate to a system of principles that govern the distribution of benefits and burdens that arise from that system. Achieving equity in the distribution is key to the social justice goal and Barry (2005) notes that "social justice is, and is normally understood to be, a question of *equal* opportunities".

Some theories of justice stress procedures over consequences i.e. the justice of a situation is determined by how it was arrived at rather than what it actually is (Dobson, 1998). Hardin (1987) also recognised these two different aspects of social justice, noting that it can be considered to mean either the equitable distribution of resources or the use of an equitable procedure. From a practical perspective, fairness (the way in which benefits and costs are distributed through society) as implied in social justice is an important consideration for environmental policy. Policies are more likely to attain popular support and compliance if they are seen to be fair (Field and Field, 2002). Equally, from a procedural perspective, Barry (1995, p. 7) contends that "it would widely be acknowledged as a sign of an unjust arrangement that those who do badly under it could reasonably reject it".

Novak (2000) argues that labelling unfortunate results as "social injustices" is inappropriate. However, at present the concept is poorly and/or variously defined and is therefore amenable to be invoked in this way as a bargaining tool, whether appropriately or not. Novak (2000, p. 11) asserts that social justice is in fact often used as "an instrument of ideological intimidation, for the purpose of gaining the power of legal coercion". In such misuses social justice is used "to blame somebody else, to blame the system, to blame those who (mythically) "control" it." (Novak, 2000, p. 11).

Social justice can be considered at different scales from the large or even whole-society level to the very small group level (Hardin, 1987). At both extremes the core social justice problem is a conflict in which one party bears a cost in order that another party or group may benefit.

A related concept is that of 'environmental justice' which is based on the supposition that environmental ills are disproportionately suffered by the poor or marginalised (Dobson, 1999). It is concerned with achieving an equitable distribution of benefits and ills on this basis. It is usually concerned with problems such as pollution or flooding, which arise from living in societally undesirable locations.

3. Coastal erosion and its management

Coastal erosion is a natural process by which coastlines adjust to varying sea levels, energy levels, sediment supply and existing topography. Over most of the ten millennia of the Holocene Period (characterised by generally rising global sea levels), coastlines have undergone substantial erosion and deposition to gradually assume their current configuration. Some continue to evolve through large-scale redistribution of sediment through erosion and deposition.

Management problems arise when fixed human infrastructure is threatened with destruction by coastal erosion. Current estimates are that 1,062,000 flats and houses, 82,000 businesses, 2.5 million people, 2 m acres of agricultural land worth about £120 billion are at risk from flooding and coastal erosion in England and Wales (Defra, 2001). Of this at least £10 billion of assets are at risk from coastal erosion (Office of Science and Technology, 2004).

Coastal erosion *problems* arise from the presence of human infrastructure in areas threatened by erosion; identifying erosion as a problem is therefore a human value judgement. Indeed, erosion has several natural and societal *benefits*: it liberates sediment for the coastal system that leads to deposition elsewhere, thus maintaining beaches, barriers and dunes (Clayton, 1989); it is a mechanism by which the coastal topography adjusts to minimise wave energy levels at the coast (Woodroffe, 2002); it provides materials upon which coastal ecosystems depend (Newsham et al., 2002) and it creates the scenic cliffed coastal landscapes (Beachy Head, White Cliffs of Dover, Dorset's Jurassic Coast) that are so valued by society for their aesthetic appeal as well as their geological interest.

Despite this, several studies have shown a low awareness among coastal residents of the risks associated with coastal erosion and there is often an expectation that publicly funded engineering structures can and should be used to protect property (Carvalho and Coelho, 1998; Corrina Dahm Economos, 2002).

There are some instances when erosion is caused by or is moderated (positively or negatively) by human intervention. These relate to modification of the sediment budget by, for example, defence of an adjacent sediment source area, interruption of longshore drift by artificial structures, alteration of sediment supply (by dredging, direct removal or river impoundment), and alteration of bathymetry by offshore structures (Pilkey and Dixon, 1996; French, 2001).

When property is threatened by erosion, the broad management options available to humans are (a) to physically intervene to resist coastal erosion or (b) to accept the changes and adapt. Intervention involves either the construction of structures to attempt to halt erosion (e.g. sea walls, groynes, breakwaters) or the application of 'soft engineering' approaches (e.g. beach recharge/nourishment, beach drainage). Accepting and adapting to the changes requires that the coast be permitted to evolve and existing structures are either abandoned or relocated. The various engineering approaches to coastal defence and their environmental implications are described in a voluminous literature (see, for example, French, 2001; Pilkey and Dixon, 1996). While sea defences can be effective in protecting land, they are often damaging to the marine environments on the seaward side; beach narrowing and beach loss often accompany sea wall construction (Taylor et al., 2004; Pilkey and Wright, 1988).

The engineering approach to coastal erosion that threatens infrastructure has been prevalent worldwide for the past two centuries. This has led to large scale armouring of the coast. (Currently about a third of the coastline of England and Wales is protected, CIWEM, 2006.) Within the past two decades, however, there has been a growing recognition that the problems of coastal erosion relate to poorly sited infrastructure rather than a retreating coastline; formal adoption of first 'soft engineering' and then non-engineered responses has ensued. Under a variety of names, these non-engineering responses involve either accepting loss of infrastructure as erosion continues (non-intervention), proactively moving infrastructure (managed relocation), or actively encouraging flooding of low lying areas to promote creation of salt marshes as 'natural' defences (managed realignment). Current practice in England and Wales under the system of shoreline management plans (SMPs) is to designate each stretch of the coast according to one of four basic options:

- Hold the Line;
- Retreat the Line;
- Advance the Line; and
- Do Nothing.

SMPs adopted in 1993 and 1999, normally relate to a timescale of 50 years but have a currency of 5–7 years (Taussik et al., 2006). Second generation plans (currently under development) include reference to three timescales (0–20 years; 20–50 years and 50–100 years) during each of which a particular option will prevail.

There are often important public facilities that are routinely and non-controversially defended at public expense (e.g. Dungeness Nuclear Power Station, Maddrell, 1996). The social justice argument pertains mainly in cases where private property is threatened by coastal erosion. In essence it maintains that society should intervene in some way when the property of individuals or groups is threatened by erosion (the nature of the intervention is immaterial to the general argument). The rationale of such a position is likely to be based on precedent (i.e. much coastal defence has been undertaken at public expense in the past and in other places at present). Coastal defence, however, in Great Britain is a permissive activity that *may* be engaged in by public authorities; there is no legal obligation for public funding of sea defences except in a few specific instances (Pettit, 1999; Defra, 2003). Currently the decision-making process around which option to select (Potts, 1999) is overwhelmingly economic in scope and based essentially upon the value of resources at risk versus the costs of their protection. Little account is taken of whether the assets are privately owned or of other unquantifiable social dimensions. Recently, the designation of Special Areas of Conservation under the European Habitats Directive has caused particular attention to be focussed on the conservation dimension of coastal erosion at such sites and adjacent areas (Defra, 2004; Pontee et al., 2004).

There are clear benefits to living in a coastal location that increase the desirability of doing so, even though there are associated risks (McLaughlin et al., 2002; Corrina

Dahm Economos, 2002). Property values are high at the coast and an indication of the desirability is provided by cases where relocation of dwellings in response to coastal erosion threats, is often by only a small amount, so as to increase safety without losing the benefit of a seafront location. The Belle Tout Lighthouse (now occupied as a house), for example, was moved back (at private expense) a small amount from a retreating cliff edge and its new foundations constructed in anticipation that it will have to be moved again (McGlashan, 2003). In addition to the benefit afforded to coastal residents, large numbers of periodic visitors enjoy coastal resources. Chief among coastal visitor activities in colder temperate regions are walking and sightseeing, with active pastimes taking a secondary role (Penning-Roswell and Tunstall, 1998; Corrina Dahm Economos, 2002).

4. Social justice and coastal erosion

In the context of widespread concern over coastal erosion in Great Britain, the concept of social justice has recently been raised. It has been invoked in the specific context of a policy decision to discontinue maintenance of coastal defences (CCAG, 2005; Marinet, 2005; North Norfolk District Council, 2005) by local residents and politicians who argue that social justice considerations would produce a different outcome. This has prompted a wider consideration of the implications of social justice for coastal erosion management, which heretofore has been based mainly upon economic considerations (cost of assets at risk versus cost of protection) in SMPs. Such considerations do not take account of whether assets at risk are in public or private ownership, whereas most defences are publicly funded. This paper explores the potential relevance and application of social justice arguments to coastal erosion management.

Social justice in this context involves an appeal to society as a whole (represented by the government) to intervene to assist individuals who stand to suffer loss through coastal erosion. The argument to date has centred mainly on the fairness of the outcomes rather than the fairness of the procedures involved in shoreline management in Great Britain. UK government has been receptive to the inclusion of social justice considerations in SMPs and it has been reported recently (2006) in the context of representations made by individuals likely to suffer erosion-related losses that "The [Defra] Minister expressed his readiness to engage with affected communities and a genuine interest in continuing the debate to tackle issues such as how to take into account social justice, specifically compensation issues". (http://www.coastnet.org.uk/?$a = 10$,1& $u = 12$).

The discussion has relevance for the European Convention on Human Rights and Fundamental Freedoms which provides, inter alia, for the peaceful enjoyment of possessions and general protection of property rights (Article 1 of the First Protocol) and the right to respect for private and family life (Article 8), which also extends to a right of access and occupation of the home. Under Article 1 of the First Protocol, no one shall be deprived of their possessions (including property) except in the public interest and subject to the conditions provided for by law. Any measure that interferes with property rights, which in the case of coastal dwellers includes any policy decision in connection with coastal defences, must strike a fair balance between public interests and private rights. Indeed Taussik et al. (2006, p. 27) note that "It may be that an argument could be presented that could demonstrate that a decision not to maintain existing defences was neither in the interests of local property owners and occupiers nor in the 'public interest', although the latter could conceivably be justified on economic grounds. Further exposition of the meaning of 'public interest' would be useful in this respect".

The social justice arguments relevant to coastal erosion management and private property involve several possible options united by the fact that each involves consideration of the merits of public subsidy of individuals for the misfortune they have experienced or are likely to experience through coastal erosion. That public subsidy could take various forms (hard defences, soft defences or financial compensation). The alternative is that the property owners bear the costs of their own misfortune, either by relocating their property physically, abandoning their property or constructing their own defences.

5. Social justice and coastal erosion: a local level, short-term perspective

At the local level the plight of individuals who stand to lose their property as a result of coastal erosion is often emotive (Fig. 1). It is not hard to have sympathy for such people, particularly when the property of many other people in similar circumstances has been protected by previous, publicly funded defences. Indeed Defra does note that "Considerable concern was expressed in the responses to the Government's consultation on *Making Space for Water* about social justice issues associated with this, i.e. where some communities are defended by the general taxpayer and some are not" http://www.defra.gov.uk/environ/fcd/policy/smp.htm. There thus appears to be an arguable case, on the basis of fairness, for equal treatment i.e. if one property gets public defences so should all.

Existing public defences were usually justified on the basis of the value of the property being defended against the cost of defence in a straightforward cost/benefit analysis without regard for the social justice argument. It is now clear that those individuals who were protected in the past by public sea defences benefited considerably at the taxpayer's expense. Defra (2004) has indeed highlighted that those who did enjoy such benefits cannot assume that they will continue to do so into the future. Those defended in the past were often favoured rather than getting their rights. It is thus arguable that inequality was caused by the authorities defending some and not others; if ALL

Fig. 1. Private houses threatened by erosion often provide an emotive basis for appeals for public assistance. Typical situations showing a partly destroyed farmhouse (A) and holiday homes located adjacent to a beach (B) may engender different levels of emotional engagement by the general public.

properties had been left undefended they would have been treated equally. Equality of treatment cannot, however, be considered an ultimate value. If "equality" alone were allowed to dominate, government could not adopt new strategies in the light of new research and understandings (and other realities).

The crude equality argument could force a governing authority to maintain a policy that it knows to be wrong, non-optimum, environmentally damaging, non-sustainable, financially crippling, and unfair to future generations. "Equality" is breached only if there is a clear unfairness in the treatment of people in similar circumstances – and the passage of time, new knowledge, new perceptions of threat, new projections of cost, the country's current wealth, and sustainability issues are all new circumstances. For example, if it is now accepted that a former system of compensation used in the 1930s for, say, winter losses of sheep was ill-advised, over-generous and unsustainable it is unlikely that this equality precedent would be used as an argument for the scheme's indefinite survival. If difference in treatment can be objectively defended it is not unfair and the general good or public interest often provides this objective defence.

It is also true that erosion is not usually an overnight occurrence; often such coasts have been eroding for centuries (see for example Ostler, 2004; Pontee, 2005; Pye and Blott, 2006) and that in these circumstances the individual has a personal responsibility to plan for the inevitable. In many instances erosion is therefore a predictable phenomenon (Fig. 2), unlike episodic storms that cause personal damage as trees collapse on property, for example. In the latter circumstance there is no argument for public compensation of individuals for their bad luck. Instead they rely on their own planning (usually property insurance).

If the *principle* of public intervention is accepted on the basis of short-term, local social justice arguments, the options available have varying implications for the public and those whose property is affected. The benefit of hard defences to the individual is retention of capital assets and the ability to continue living at the coast. Indeed, with the construction of sea defences at public expense, a substantial capital gain is likely to accrue to coastal property owners with the value of the property being enhanced due to its protection. From the public perspective, the immediate and local costs are essentially fiscal; hard defences are expensive and involve the public paying to assist a small number of individuals. The immediate adverse effects on the environment may include loss of scenic quality, loss/difficulty of access (Clayton, 1993), loss of resilience to storm attack and reduction of sediment supply to the coast (Pontee et al., 2004). The full implications of these defences (beach narrowing, loss of sediment elsewhere, loss of amenity, loss of natural habitat) are usually evident only in the medium term and therefore do not feature in short-term social justice arguments.

Soft defences such as beach recharge might be seen as a short-term alternative that does not produce the immediate negative impacts associated with hard defences. This approach might therefore be argued as a better alternative to hard defence since it carries less environmental cost (in the immediate timescale and area). There is, however, evidence that recharged beaches do have impoverished fauna and flora compared to natural beaches, particularly in the short to medium term (Speybroek et al., 2006) and thus a negative impact on the ecosystem is likely to be the major immediate societal cost.

A third form of public intervention is to financially compensate the property owners in some way. This might involve paying them for their loss or paying to have their dwellings physically relocated. In the short term this has the effect of producing a retreat from vulnerable zones while enabling the coast to respond to natural perturbations: it does not carry any of the negative environmental or amenity impacts of the engineered responses. From a public perspective the cost is therefore mainly fiscal. This approach might also been seen as particularly attractive because it is a one-off payment that has positive consequences for the natural environment. A variation on this theme is some form of assistance with insurance such as exists in the United States Federal Flood Insurance

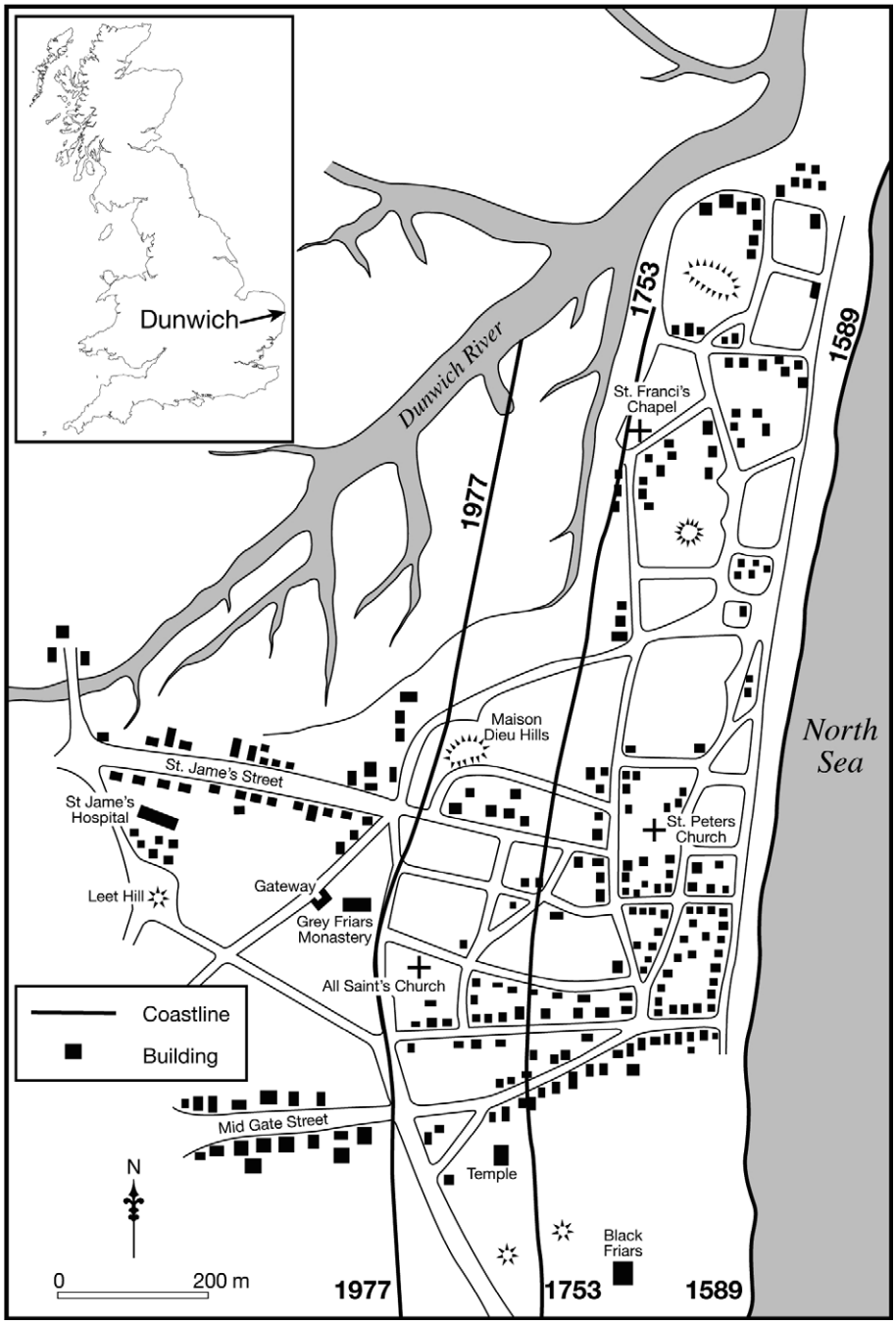

Fig. 2. The shifting erosion zone at the town of Dunwich over the past four centuries. The illustration shows the moving zone of erosion threat and indicates both the long-term nature of the erosion and the shifting nature of any potential compensation zone (after Clayton, 1993). The concerns presently being expressed at neighbouring Happisburgh over coastal erosion and collapse of coastal dwellings would have been played out many times over the centuries at Dunwich.

program (McGlashan, 2003). This subsidises insurance costs and renders it affordable to coast-dwellers and an acceptable risk to insurers. It might be argued that such an approach involves a combination of personal responsibility and public intervention, however, there is substantial public cost with a concomitant gain for coastal property owners.

A particular situation pertains when a stretch of coast has been defended at public expense and then policy changes such that continuing defence is no longer deemed viable. This is the case in parts of north Norfolk and is likely to become more widespread in future as government is unable to afford the maintenance of sea defences (Defra, 2004) particularly in the face of rising sea levels and increased storminess. The effect of this development is that "there is widespread feeling that the negative external effects that benefit the wider public should not have to be borne by individuals in the local community" (Taussik

et al., 2006, p. 4). Affected parties have argued (CCAG, 2005) that such a change in policy demands compensation, because individuals have been damaged by a change in public policy. However, policy cannot be fossilised and if for example car tax is trebled for large 4×4 vehicles for fuel consumption/pollution reasons, the individuals who own them are damaged by a change in public policy. If the change was introduced for good reasons there is no case for compensation. The same is true for council tax when rate increases "damage" owners above a certain threshold. Some feel that if a change in public policy damages someone they should be entitled to compensation or other intervention. Steep increases in the price of cigarettes and banning smoking will "damage" many and may cost some their jobs. But a public good takes precedence. Strict drink-driving laws in the Republic of Ireland are putting many rural pubs at risk and some will close. Community values are also at risk. Nevertheless the public good prevails.

The pro-compensation argument is bolstered by the fact that deliberate adoption of a managed realignment policy elsewhere in England has involved public purchase of land to enable that policy to be carried out (Defra, 2004): the purchased land is then permitted to flood in the expectation of forming new salt marsh areas that create habitats and natural coastal defences. The counter argument is that there is no legal obligation to defend and property owners who thought otherwise were ill-informed. Further, it is argued (Defra, 2004) that those property owners who were defended have already enjoyed considerable benefit at public expense. Therefore a former injustice (to the taxpayer) is being put right.

If the principle of public intervention is rejected, the natural sedimentary system is free to adjust to changing energy levels, sediment supply and sea level change with no loss to society as a whole. At the local level there is short-term financial loss for the individuals whose property is affected if they have not made provision for impending loss. This may be a substantial amount for the individual or group of individuals affected. Additional impacts on property owners include uncertainty regarding the future, stress and other health issues, economic blight, social blight and loss of community spirit, and mistrust of authorities (Taussik et al., 2006). The benefits to society as a whole are that beaches are maintained, a natural coastal landscape is created/preserved, a functioning coastal ecosystem is preserved/created and the amenity value of the coast is sustained.

6. Social justice and coastal erosion: a regional level, long-term perspective

If the arguments relating to social justice in coastal erosion management are considered at broader spatial and temporal scales it is evident that the arguments must also be based on the implications for coastal users who may live some distance from the coast, for other property owners on adjacent coasts, and also for future generations of users and residents. The coast and its resources are enjoyed by non-residents for a variety of purposes and are the basis of a substantial economy and valuable ecosystems and ecosystem services (Costanza et al., 1998). If there is any public intervention to protect private property interests at the coast, there is of course a cost to the taxpayer and other non-residents, and a gain to the property owner but as, in the case of short-term, local perspectives, the details of the social justice arguments will vary according to the specific management approach.

Hard coastal defences are not only costly to construct but they have a finite lifespan and design specifications that determine the conditions they are expected to withstand. The latter now routinely include an allowance for sea level change. This implies that they are expected to be ineffective under certain extreme environmental conditions. All defences require maintenance and eventual upgrading or replacement. This cost will have to be borne by future generations. Indeed, the present generation continues to bear the financial (and environmental) cost of the widespread coastal engineering of the Victorian era. For example, Phillips and Jones (1996) noted that the seawall at Porthcawl, Wales constructed in 1887 was replaced in 1906 and again in 1934 as previous constructions were undermined by continuing wave attack. In 1984 the remnants of the beach in front of the sea wall were covered in tarmac to reduce undercutting. Taylor et al. (2004) show beach narrowing and steepening to be a long-term effect of previous seawall construction around the UK. The same effects have been noted elsewhere (Pilkey and Wright, 1988).

If the cost of maintenance becomes too high, defences may have to be abandoned by future generations. Indeed this is the subject of a recent government circular (Defra, 2004) and the cause of a vigorous campaign by residents of Happisburgh, Norfolk (http://www.happisburgh.org.uk/) to reverse a decision not to continue maintaining 60-year-old defences. With currently rising global sea levels and predictions of near future accelerations of sea level rise (Rahmstorf et al., 2007), the cost associated with the maintenance of coastal defences will certainly increase. If they are not abandoned, this cost will have to be borne by future generations of taxpayers while future generations of coastal property owners enjoy an increase in the value of their assets. The desire for coastal living is likely to lead to ongoing development behind publicly funded coastal defences. This in turn increases the extent and value of property at risk and therefore increases the scale of loss during a catastrophe. The New Orleans flooding exemplifies problems of intensive development in high-risk zones when disaster strikes (Pilkey and Young, 2005). In Great Britain, too it can be seen that in the long term, coastal protection has the effect of encouraging development in high-risk areas and ensures a continuing commitment to hard coastal defences, particularly if purely economic considerations guide policy decisions without considering social justice arguments.

The long-term environmental effects of hard coastal defences are evident in many instances. Sea defences have resulted in narrowing and loss of beaches throughout Great Britain (Taylor et al., 2004) and elsewhere (Pilkey and Wright, 1988). The overall effect of armouring the coast and its attendant environmental degradation has been afforded the name 'New Jerseyization' (Gold, 2004) in recognition of the environmental damage incurred on that coast by hard stabilization. The costs to beachgoers are well illustrated by a description of Happiburgh provided by Clayton (1993) which, before defences were installed, had a wide sandy beach. "The [narrow] beach is now broken up into compartments by ugly, high groynes and a revetment. At high tide a beach user trapped behind the revetment cannot see the sea. At mid-tide each compartment can be reached by a somewhat perilous clamber over the revetment... Once on the lower beach the view in three directions is of a wall of timber... the decayed gabions and lengths of railway line below the cliff, together with the revetment have done little more than reduce the rate of cliff retreat" (Clayton, 1993, pp. 5–6).

Some of the long-term effects of coastal defences result from 'coastal squeeze' as the space available for beaches to exist is reduced by seawalls and revetments Wave reflection from sea walls exacerbates loss of sediment from beaches. In the long term the natural sedimentary system is altered as sediment that was formerly yielded by coastal erosion is no longer available and thus the coastal ecosystem adjusts. This necessitates changes elsewhere in the coastal system outside the area directly affected by the defences. In the case of groynes or offshore breakwaters the natural coastal system is altered and its ability to cope with changing environmental conditions (sediment supply, storms, sea level change) is reduced. The net effect is to require yet more coastal engineering intervention. The ultimate manifestation of this approach is the replacement of all sandy coasts with hard defences. Taiwan, where almost the entire coastline has been subject to hard engineering, probably represents the most extensive modification of this type of any nation (Lin, 1996).

Armouring of the shoreline cuts the sediment supply that is produced by erosion. There are therefore long-term effects on the coastal sediment budget with impacts in the immediate area and in adjacent areas that previously received eroded sediment. If these are coastal depositional features (beaches, dunes), they may suffer erosion as a result of the reduction of sediment input. This effect has been noted in many locations globally and often a sequence of engineering works are undertaken to 'correct' the effects of earlier works (Pilkey and Dixon, 1996; Paskoff, 2003). If deposition of eroded material occurs in subtidal environments, the marine ecosystem will suffer from lack of sediment inputs. There are knock-on effects for areas of human activity. Infrastructure in downdrift locations may be threatened by erosion, nearshore ecosystems may suffer and economic activities associated with them (fishing, aggregate extraction) may be adversely affected.

Seaside towns and cities that have developed in the shelter of a seawall have very limited options for dealing with sea level rise and continuing erosion; they are committed to defence for the foreseeable future. The extent of development behind them means that cost–benefit analysis can never find in favour of anything but defence. If this purely economic consideration were widened to include a social justice argument, the benefit being enjoyed by these coastal dwellers would have to be seen in terms of the costs (financial, environmental, amenity) and benefits (urban amenity; Whitmarsh et al., 1999) to the general public.

In contrast to hard defences, beach recharge/nourishment as a soft defence option may preserve the amenity value of the coast and its sedimentary system. Beach recharge is itself, however, an ongoing operation that must be continued indefinitely if an eroding beach is to be maintained. The ongoing costs of this maintenance will continue into the future and will increase as the volume of material required to maintain the shoreline increases with sea level rise. It has also been shown that the ecological value of nourished beaches is reduced compared to natural beaches in the medium term (Speybroek et al., 2006). There is also the question of sustainability of supply of sediment for ongoing nourishment and the environmental impacts of sediment extraction from the borrow area.

Beach recharge can give a false sense of security. Like natural beaches, nourished beaches are susceptible to the effects of large storms. They will not protect the area landward of them under such conditions. Taking a longer term perspective, like hard defences, publicly funded beach nourishment also encourages development to landward. That development in turn comes to rely on the nourished beach facilities and sustains and augments economic arguments for its maintenance. Furthermore, the increased development reduces further future options for dealing with ongoing sea level rise. Because of the disproportionate benefit enjoyed by typically privileged coastal dwellers in the United States there is a "growing perception that beach nourishment is a form of welfare for the rich" (Pilkey, 2006).

If the coast is allowed to fluctuate freely by allowing erosion to proceed there is no long-term adverse impact on the evolving natural landscape and its ecosystems. This can happen if there is no public involvement but it does involve a direct cost to those whose property is affected. It has been argued that those affected by erosion should receive compensation for their losses because of the public good engendered at private expense. This argument (public good at private expense) is the whole basis of income tax and many other citizen–Government relationships. Such compensation has been argued (CCAG, 2005) to be a once-off payment that removes the problem once and for all. However, as a coast continues to retreat the compensation zone continues to move (Fig. 2) and will do so faster as sea levels rise and storms become more frequent and intense.

An alternative to compensation is that of subsidised insurance. An example is the US Federal Flood Insurance

program, which subsidises commercial insurance rates and thus makes development in the coastal zone more affordable. This in turn has produced several undesirable environmental impacts, including an increase in the number of properties susceptible to erosion (Field and Field, 2002). A reduction or suspension of the scheme would have environmental benefits but costs would accrue to homeowners.

Defending the coast at a time of rising sea level and sediment scarcity locks society into a perpetual commitment of increasing cost from not just financial but also amenity and environmental perspectives. It also encourages ongoing risk-free, environmentally damaging and societally expensive development in an area in which development should be discouraged. The spectre arises of a fully armoured coast with few beaches and an increasing bill for maintaining defences to protect a proliferation of coastal dwellings. From a long term perspective it appears that there is a stronger argument for non-intervention on the basis of the scale of costs to society as a whole and to future generations. These costs will be both financial and environmental.

7. Scale considerations in social justice

The social justice arguments offer a wider range of perspectives for decision-making in coastal erosion management than the traditional economic assessment. The points considered above, however, demonstrate that there are clearly different perspectives depending on the spatial and temporal scales considered. These variations also have implications for sustainability. At the short-term and local scale only, the arguments for public intervention are strongest (Fig. 3). At this scale, the erosion costs suffered by individuals in the community can be argued to be very great and of high local impact in comparison to the immediate costs of coastal protection. The physical and ecological impacts on distant areas, non-resident coastal users, and future generations are discounted and the costs to individuals of non-intervention are maximised. However, focusing only on the immediate social justice arguments ignores the unsustainable situation that may be handed on to future generations. Referring to illegal immigration into the USA Elbel (2002, p. 110) notes that "Focusing solely on the interests of 'justice' for immigrants, both legal and illegal, causes us irresponsibly to ignore the unsustainable society we are creating for future generations". He further argues (p. 110) that "Intergenerational justice – the concern about the well-being of future generations – must be given equal consideration to 'social justice' . . . ." The same point is made by Field and Field (2002, p. 107). "In comparing costs and benefits like this are we not giving undue primacy to the people who are in the better position to have their values counted, namely, present generations? Are we, perhaps, not giving enough consideration to future generations? They are not here to be heard from directly, so the only way they can be factored in is through the bequest motive of present generations, which may not be strong enough".

As the temporal scale increases, the negative environmental impacts of intervention become larger and the costs to future generations are more evident. As the spatial scale increases, the negative implications of sea defences for larger sections of society (e.g. non-resident coastal users) become more evident, as do the implications for more distant sectors of the coastal sedimentary system. The same is true of compensation because the fairness argument may pertain that if some are compensated, all should be. At expanded temporal scales it is clear too that the compensation zone will move as the coast erodes, bringing ever more development into the risk zone. Any of these interventions would promote continuing development in high-risk

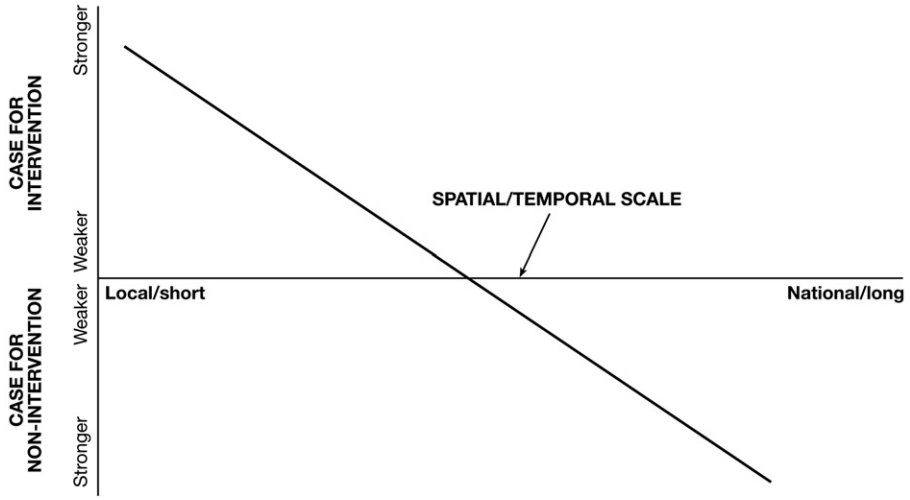

Fig. 3. Relationship between the case for public intervention in coastal erosion management and scale, both spatial and temporal. The case for public intervention becomes weaker as the spatial and temporal scales increase and changes to a case against public intervention beyond a certain threshold. The gradient is likely to differ depending on the form of intervention, but the trend will remain the same.

locations. The balance of social justice arguments (maximum benefit for the largest number of people) therefore tends toward non-intervention.

The social justice argument hinges on whether it is acceptable for society as a whole to pay to alleviate the misfortune of a few coastal property owners. This seems to be an arguable position when considering the plight of an elderly couple, having retired to the coast with their capital tied up in a property threatened by coastal erosion. However, " ... it is well known that justice sometimes conflicts with compassion" (Beckerman, 1999, p. 91) Although the case for intervention is strongest at a local, short-term level, even then it suffers from some weaknesses related to personal responsibility arguments.

It is often necessary to invoke blame in order to overcome opposing personal responsibility arguments. There are several candidates including offshore dredging, adjacent defences, which, if proven to be responsible for erosion could bolster arguments for intervention. (In instances where coast have been eroding for centuries, it would be difficult to advance such an argument.) There is a different set of criteria when erosion is demonstrably caused by other actions (defence of adjacent sediment supply areas, removal of sediment, etc.). It would seem in these cases that there would be some form of social justice-based obligation on those responsible for the offending action to compensate those affected. Such an obligation is, however, quite distinct from a government decision to abandon untenable policies or defences or a decision to do nothing.

At larger spatial scales and long time scales, the intergenerational equity question and the losses suffered by non-coastal residents appear to reduce any social justice argument on the part of coastal property owners to the realm of 'ideological intimidation' (Novak, 2000) at worst and wishful thinking at best. An important consideration at longer time scales is that public intervention of any sort encourages development in desirable but high-risk locations. For long-term sustainability construction in sensitive zones is inadvisable.

8. Discussion

The coastal defence/compensation claims that are the basis of the current social justice argument in England and Wales are made in the context of a quite narrow view of 'fairness', rather than set within any wider philosophical context of either social justice or for that matter environmental sustainability. The context is that a distinct group of citizens (a community, family or individual), perceived to be seriously disadvantaged by a particular problem, demand that government do something to help them, on the basis that there is a moral obligation on government to take such action. The moral imperative is described in terms of the concept of social justice/human rights. Coastal erosion cannot be shared equally as by definition it can only directly threaten those on easily eroded or easily flooded coasts. However, the costs of coastal defences or compensation (and the adverse environmental impacts of intervention) can be spread far and wide among the population as a whole. This question has received some attention in the United States where the issue of taxpayer funding of beach nourishment has been vigorously debated in the press for some time in North Carolina (<http://www.ncspin.com/scratchlog_archive_comments.php?id=00068>). In the same state, taxpayer funding to subsidise movement of private dwellings from the shoreline at Kure Beach exemplified some of the fairness arguments. Local politicians, for example, welcomed the fact that federal funding and not local taxpayer funding was used (Willard H. Killough III, Island Gazette, 23rd May, 2007). The role of local politicians in promoting the rights and interests of coastal property owners in North Carolina (Platt et al., 2002) highlights the dominant position of property owners rights over those of the public, at least in the perception of politicians. A fuller discussion of the perceived rights of beach visitors and oceanfront property owners in North Carolina is given by Kalo (2005).

It is not usually claimed that the people threatened have anything in common outside the fact that they face a common threat. However, a recent newspaper article (Adam Nicolson, The Guardian, October 9, 2006) set claims for assistance (in some cases) squarely within the realm of the environmental justice movement by claiming that disadvantaged communities, lacking political and media influence and access to funds (specifically elderly retirees) are more likely to suffer the consequences of coastal flooding and erosion than more generously endowed communities.

The social justice argument for coastal defences/compensation is relatively new (2005) and was probably prompted by recent human rights legislation. A narrow interpretation of social justice sees it as being about "fairness" or "just deserts" or "equality". A wider interpretation sees social justice as being inextricably linked to and influenced by other "virtues" such as long-term sustainability. There is little advantage in having a fair share of very little or nothing, for example if a beach is lost because the backshore was armoured to give "justice" to a property owner. It is wrong to purchase justice for the relatively few today at the expense of the many tomorrow.

A small-scale example is provided at Portballintrae Co. Antrim, in Northern Ireland where in 1895 a pier was extended to serve the interests of a small group of local fishermen. No doubt they could have made a social justice argument to support this intervention. The cost of this intervention has been borne many years later by thousands of holidaymakers and ratepayers because the pier led to wave energy disequilibrium that destroyed the former wide sandy beach (Carter et al., 1983) and required sea defences to be constructed to defend a road behind the former beach. In this case there is at least the defence that those campaigning for and constructing the pier extension could not have reasonably predicted its effects. Today the potential negative effects of such interventions are well known.

Governments usually operate at the larger scales of strategic perspective, which suggests that they should have an inherent bias against all purely ''local'' interventions. In practice, however, exceptions are made. The principles underlying these exceptions include the following considerations:

(1) There is risk to life or limb.
(2) Cost-effectiveness i.e. a relatively small one-off (or even recurrent) outlay brings substantial relief to those in need. (Even then, government tends to work at the larger scales e.g. cold weather payments to the elderly are national not local.)
(3) The activity or property protected is of national significance, e.g. protection of food supply justifies assistance to farmers, and subsidies to industry create/protect jobs.
(4) Relief of distress. Where suffering is of such a scale or intensity, and so highly publicised, that intervention becomes a political imperative. Non-intervention carries much more political risk than intervention. However, these events tend to be national or international in scale e.g. the Asian Tsunami, the 1953 North Sea Storm Surge.

It is quite easy to make a compelling large-scale strategic case against the construction of coastal defences. (Those still arguing for defences are clearly swimming against the tide in regard to the sustainability ethos and concerns about sea-level rise and increased storminess.) For this reason, compensation is now the crux of the social justice argument for intervention where property is threatened by coastal erosion. Local social justice arguments for coastal defences and/or compensation are rooted in a local spatial and temporal perspective. However, a social justice argument can be upscaled by considering the rights to social justice of future generations i.e. intergenerational justice.

Social justice to future generations is denied if, when no vital national interest is at stake, they are forced to pay for:

- The knock-on effects of present day coastal defences in terms of lost amenities and eroding beaches.
- The future maintenance of defences constructed today. These costs will rise steeply due to SL rise and increased storminess.
- Compensation schemes which are effectively open-ended because the compensation zone will shift landwards with the erosion zone (and will do so at a faster rate as SL rise and storms intensify). Would it be just to deny compensation to people who are not at risk now (1–10 years) but who will be at risk in c. 50 years? Any attempt to limit compensation to the present generation, or to those whose property lies in the area currently at risk, can be criticised as inherently unjust.
- Property compensation to people who can afford to live at the coast and enjoy its many attractions while they (the contributors) cannot.

The temporal perspective is also influenced by societal values at any given time. Donne (1572–1631), for example wrote

> ''If a clod be washed away by the sea, Europe is the less, as well as if a promontory were, as well as if a manor of thy friend's or of thine own were''.

The same perspective, seeing the sea as an enemy to be defeated, continued to the industrial era when the engineer Sir John Rennie asserted the nobility of halting coastal erosion by inserting a barrier between land and sea (Carter, 1982). By then the technical capacity existed to construct extensive defences and many were indeed built in between the Victorian and post-war periods. The growth of environmental awareness since then (and associated nature conservation designations) means that the wider implications of engineering in the coastal zone are considered in coastal erosion management. The attitudes and values of future generations may well differ from the present (and they may well be different in the future); however, it is central tenet of sustainability not to foreclose options for future generations (Kasperson and Kasperson, 2001).

John Rawls, the leading 20th century philosopher in the field of social justice states that ''all ethical doctrines worth our attention take consequences into account in judging rightness. One which did not would simply be irrational, crazy'' (Rawls, 1973, p. 30). Such ''consequences'', however, occur at both small and large spatial and temporal scales (McKenna and Cooper, 2006). If we decide not to defend or compensate several at-risk houses we can be accused of ignoring the consequences for those people. If we do decide to defend/compensate we can be accused of ignoring the consequences for future generations and at great distances away from the site. Private property owners argue that the here-and-now should take precedence – regardless of the long-term risks. This argument assumes that the present needs of present people are more deserving of ''justice'' than the future needs of future people. It is a self-serving, if understandable, position for a resident of Happisburgh, for example.

A national government, however, has a duty to consider *all* outcomes, and it has a particular duty to consider long-term strategic outcomes simply because there is no other higher level of governance or administration charged with taking the longer view. (For example, a decision to discourage air transport would have negative consequence for many citizens, and might cost hundred their jobs, but it might have a longer term benefit of reducing carbon emissions.) It is not viable to argue that central government should ''stay out of it'' and allow the principle of subsidiarity to prevail, i.e. decisions about defence and/or compensation should be made at a local governmental and administrative level. Since the national exchequer will be asked to fund the major share of the costs of any intervention, national government cannot be held at arms length.

It appears that from a social justice perspective, the case for intervention is strongest at the smaller scales i.e.

hundreds of metres of eroding cliff and 1–5 years. At this scale "hard cases" have their greatest emotional impact, and appeals to a communal sense of fair play and social justice are likely to be most effective. In statistical terms the number of degrees of freedom is restricted because no complicating factors (intergenerational, wider public, adjacent sites) are included. The balance of arguments would likely be in favour of public intervention because the majority of those considered at a local scale have some personal interest in public intervention.

As the spatial scale increases from a few hundred metres to kilometres and then hundreds of kilometres, and as the temporal scale increases from years to decades and centuries it is no longer a tenable option to restrict the number of degrees of freedom, i.e. increasingly complex complicating factors must now be considered. Local solutions to local problems must now be objectively analysed for their long-term effects. Examples include: downdrift erosion caused by emplacement of coastal defences, the costs and precedents associated with a new compensation scheme, and the expansion of development behind a new seawall. At these larger scales, regional and national priorities join, and eventually dominate, the local level perspective. At a certain point in the upscaling continuum the social justice argument becomes clouded and then reverses as the social justice rights of many distant and future taxpayers and many distant and future beach visitors loom larger than those of a relatively few at-risk property owners.

The relationship between social justice and sustainability is a topic of recent debate (Dobson, 1998, 1999). It appears that initially it was thought that the concepts would always be compatible but tensions have since arisen between the two. The differences evident here on the basis of scale, suggest that in the case of coastal erosion management, the two converge at large temporal and spatial scales. It is claimed (Marinet, 2005) that shoreline management that does not address issues of environmental impact, social justice, cultural heritage and natural processes is 'patently unsustainable'. Consideration of social justice issues brings an additional range of considerations to the decision-making process in coastal erosion management that extends and, we believe, improves decision-making based upon the traditional economic and emerging environmental arguments. It appears that, at the long term and large spatial scale these social justice arguments (greatest benefit for greatest number of people) lend support to the goal of environmental sustainability, whereas at the short term and small spatial scale they oppose it.

If social justice considerations are to be brought into play in coastal erosion management, it will require a major change in public attitudes that has been created by more than a century of tradition of publicly funded defences. In terms of soft engineering the same effect has occurred in a short time period creating an 'addiction to nourishment' among coastal communities and developers (Garcia and Servera, 2003). Breaking the cycle of construction and defence followed by yet more construction into which society is often locked could be aided by an open and informed discussion of the social justice perspectives.

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