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**Flood Risk Management, Mapping and Planning: The
Institutional Politics of Decision-Support in England.**

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Abstract:

Flood maps play an increasingly prominent role in government strategies for flood risk management. Maps are instruments not just for defining and communicating flood risks, but also for regulating them and for rationalizing the inevitable limits and failures of those controls. Drawing on policy document analysis, official statistics, and 66 key informant interviews, this paper explores the institutional conflicts over the use of the Environment Agency (EA) Flood Map to support decision-making by English Local Planning Authorities (LPAs), whose local political mandate, statutory obligations and professionalized planning culture put it at odds with the narrower bureaucratic imperative of the Agency to restrict developments at risk of flooding. The paper shows how the Flood Map was designed to standardize and script the planning process and ensure LPA decisions were aligned with EA views about avoiding development in zones at risk of flooding without actually banning such development outright. But technologies are also shaped by their users, and so the paper documents how planners accommodated and resisted this technology of indirect rule. Their concerns about sterilizing areas depicted as being at risk of flooding and about the difficulties of actually using the Flood Map for speedy and defensible development control decisions were crucial in its eventual replacement by a new decision-support technology, Strategic Flood Risk Assessments, which then led to the rescripting of the Flood Map to influence a new set of users: the public. The paper closes with some wider reflections on the significance of the case for risk-based governance.

Key words: risk governance, regulation, bureaucratic discretion, cartography, science & technology studies

Word Count: 9721 (exc. Figures and References)

Introduction

Over the last decade or so, Britain has suffered a number of high profile flood events. With critics warning of increases in their frequency and consequences due to climate change and development trends (ABI 2001; Evans et al. 2004), and the Treasury and environmentalists united in their concerns about the financial and environmental costs of structural engineering to prevent floods, government policy has moved away from its traditional emphasis on flood defence to embrace a broader portfolio of measures variously designed to reduce and manage the risks from flooding (Butler & Pidgeon 2011; Faulkner et al 2010; Johnson & Priest 2008; Scrase & Sheate 2005). The basic idea is neatly encapsulated in the title of the government's flood risk management strategy for England: Making Space for Water (Defra 2004; 2005). In contrast to engineered defences designed to keep water away, the new risk-based approach seeks to make 'space' for flooding, both literally and figuratively. The policy publicly acknowledges that "building ever higher and stronger defences is not sustainable" and thus that "it may be necessary to let some places flood more frequently in future. It will be important to understand the potential consequences and help communities to become more resilient and adapt to changing levels of risk" (Defra 2009: paras 60, 65).

Spatial planning and development control play a key role in this new 'risk-

based' approach to flooding. As White and Richard (2007: 513) insist, planning is "the most sustainable method to manage flood risk in that not only can it provide for risk management, it can also avoid or even reduce risk [by] influenc[ing] factors such as the location, type, design, and function, of development". Despite such high hopes, there have been persistent questions about whether the planning system in England is up to the task (cf. ABI 2001; Penning-Rowsell 2001; White & Howe 2002, 2004; Wynn 2005), and the need to improve its capacity to manage flood risks has been a persistent theme of various ex-post investigations and 'lessons learned' reports into the management of flooding and the conduct of the Environment Agency (EA), the non-departmental public body with strategic responsibility for flood risk management in England and Wales. The EA (e.g. 1999: 8; 2003: 12; 2007: 19) has responded to these criticisms by blaming the planning system for allowing inappropriate development and insisting, "our regulatory powers need strengthening" (EA 2003a: 12). However, planning in England is a delegated responsibility of local government, which has historically enjoyed broad discretion in formulating local development plans and licensing applications for development within an overarching, national framework of principles and performance targets set by central government (Cullingworth & Nadin 2006; Rydin 2003; Tewdwr-Jones 1999). Planning professionals are generalists, and while government circulars on planning policy (e.g. Circular 31/47; DoE 1992) have long recommended they seek expert advice about flooding from the EA and its various predecessors, there was no obligation on local planning authorities (LPAs) to heed, or even to seek, that advice.

Recent regulatory reforms have reduced that discretion and increased the influence of the EA over LPA decision-making in England. To tighten controls over developments in flood prone areas, planning policy guidance was revised in 2001 and its status upgraded from a 'circular' to a more formal Planning Policy Guidance Note (PPG25). PPG25 made the EA a statutory consultee on all applications for planning permission in areas at risk of flooding, and flood risk was designated as a material consideration that LPAs must take into account by requiring applicants to produce a formal Flood Risk Assessment (FRA) and LPAs to follow a sequence of risk-based decision rules designed "to avoid such risk where possible and managing it elsewhere" (DETR 2001: 1). Urged by the independent review into the Easter 1998 floods to "assert and defend [more] vigorously its advice" (Bye & Horner 1998: 9), the EA began monitoring LPA compliance with its advice and to name and shame

LPAs granting planning permissions against its advice through the publication of annual High Level Target reports. In 2006, the EA was given additional powers to ‘call in’ for review by the central Government local planning applications granted contrary to its sustained objections, as part of further revisions to planning policy guidance on flooding made when all PPGs were replaced by Planning Policy Statements (and PPG25 superseded by PPS25).

To supplement these formal roles in planning, the EA also produced a series of national flood risk maps to “help local authority planners understand how flood risk may affect and be affected by development proposals” (EA 2010: 3). These maps depict the probability of flooding, using different colors to mark out zones exposed to different levels of risk from fluvial and tidal flooding. The first such map, the Indicative Flood Map (IFM) (see Figure 1a), was published in 1999 and was essentially binary, indicating a safe zone and areas exposed to a risk from river flood events with a 1% annual probability or from coastal flooding events with a 0.5% annual probability. In 2004, the IFM was replaced by a new Flood Zone Map (see Figure 1b), which uses more up-to-date and nationally consistent modeling to recalculate the 1% and 0.5% flood outlines of the IFM, which are now designated as Flood Zone 3 of ‘high probability’. The current Flood Map also outlines a second Zone 2 at medium risk of flooding from an extreme event with a 1%-0.1% annual probability, and for this reason is sometimes called the Extreme Flood Outline (EFO) map to distinguish it from the IFM.¹ The residual area of ‘little or no risk’ is termed Zone 1 (for details on the methodology, see Bradbrook et al 2005). These zones enable LPAs to fulfill the requirements first introduced under PPG25 to apply a ‘Sequential Test’ in formulating their local development frameworks and licensing applications for development so as to steer development away zones at higher risk into those at lower risk and preferably into Zone 1 with little or no risk at all.

[FIGURE 1a – The Indicative Floodplain Map]

¹ We refer to these maps collectively as the ‘Flood Map’ and use the terms IFM and EFO to distinguish between separate editions of it, while reserving the lower case ‘flood maps’ to refer generically to the technology of flood risk mapping in general. It is important to recognize that in addition to the Flood Map the EA has also produced a third national flood risk map as part of the National Flood Risk Assessment (NaFRA). The NaFRA map differs from the EA Flood Map in its methods and assumptions, in particular taking account of flood defences when calculating its flood outlines (Krieger 2011). That flood map is not used to inform planning policymaking, and so is beyond the scope of this paper.

[FIGURE 1b – The Flood Zone Map]

Although promoted as “indicative only, to be used as a basis for consultation and not as the sole basis for decisions on where planning policies apply” (DETR 2001: para 24), such decision-support tools should be understood as political artefacts that “embody specific forms of power and authority” (Winner 1986: 19). Critical cartographers, for example, have emphasized that maps are shot through with relations of power, which they reflect and reproduce (Crampton & Krygier 2006). Deconstructing maps as texts, geographers have highlighted critical silences, such as the erasure of native peoples from lands depicted as empty -- terra nullius — and awaiting European colonization (Harley 1989; Sparke 1998; Clayton 2000), and traced the political programmes advanced through map projections of places, objects, and spaces that are then reshaped, both symbolically and materially, through the very process of their cartographic enframing (e.g. Cosgrove 2000; Demeritt 2001a; Farish 2006; Monmonier 1997). Maps are ways of worldmaking, generative of new ways of seeing and being (Wood 2010). Looking beyond the case of maps explored by geographers, sociologists of science have emphasized how technological systems more generally embody various political and institutional desires and plans. Winner (1986), for example, has shown how the master plans for the New York Metropolitan area devised by Robert Moses included winding parkways to provide easy motor vehicle access to the public beaches of Long Island, but low bridges to discourage buses and so keep them reserved for ‘respectable’ middle class car owners. Interpretative flexibility in both the construction and application of technologies means such political designs are not automatically realized (Pinch & Bijker 1987). Nevertheless, it is increasingly clear that standardization in and through technology is a central, if heretofore often overlooked, motor of modernity, helping to organize and regulate social and political life by ensuring consistency and communicability across time and space (Timmermans & Epstein 2010).

Technical objects, like the flood maps, come to incorporate “scripts” (Akrich 1992), which configure their users by inviting them to perform particular identity positions and practices built into their design. Users, in turn, often adapt those scripts to their own contexts and purposes. Thus it is important to study technology in the contexts of its application and to appreciate the trials of force, as users either submit

or subvert the standards of conduct scripted for them by system designers. In the case of decision support technologies, the aim is typically to make decision-making less arbitrary and more rational by standardizing both the information considered by decision makers and the protocols they use to reach their decisions. While the formalization of medical decision-making has routinely been promoted as a way to transform clinical practice from an art into an evidence-based science (Berg 1997; Timmermans & Berg 2003), Porter (1995) highlights the political implications of adhering to strict decision rules. By reducing the scope for partiality and subjective bias, formal decision rules lend authority to administrative decisions otherwise vulnerable to challenge: “A decision made by the numbers (or by explicit rules of some other sort) has at least the appearance of being fair and impersonal... [and] is a way of making decisions without seeming to decide” (Porter 1995: 8).

This suggests that the use of risk measures, like flood maps, is about more than just providing information with which to assess and thereby reduce the probability and consequences of harms, like flooding. No longer just an object to be governed, risk is increasingly central to the organization of governance itself, providing the concepts and tools to resolve an ever-expanding range of governance problems (Power 2004; Hutter 2005; Rothstein et al 2006). For instance, in a climate of fiscal restraint, risk provides a rationale to allocate resources—whether for flood defences and maintenance, forecasting and warning systems, inspection and enforcement efforts, or on more detailed mapping and monitoring so as to steer those functions more precisely-- where they are needed most, maximizing efficiency while also ensuring the transparency and public acceptance of contentious decisions about who will-- and will not-- benefit from public investment in flood risk management (Krieger 2011). Similarly in the context of spatial planning, risk provides a framework for defining, defending and implementing land use regulations. Taking on that responsibility also entails various institutional risks such as delivery failure, scandal and associated reputational damage, which have repeatedly plagued recent flood risk management efforts in England (Bye & Horner 1998; Pitt 2008). Rothstein et al. (2006: 93) argue that “constructing regulatory objects in terms of risk ... provides a defensible procedural rationality for regulators to manage both their regulatory objects and their enhanced institutional threats”. Finally, the idea of managing flooding as a risk also acknowledges the strategic policy trade-offs involved between minimizing the probability and consequences of flooding on the

one hand as against other competing policy imperatives, such the promotion of economic development and regeneration, conservation of wetlands and coastal habitats, avoidance of planning blight and reduction of public expenditure on flood defence.

The EA Flood Map is thus part of a wider shift in the practice and institutional politics of risk management and planning. In an effort “to ensure that flood risk is properly taken into account” (DETR 2001: para 2), the professional judgment of planners is being challenged by new decision-making procedures and by the increased influence over them by the EA. As the lead agency responsible for flood risk management, the priorities and institutional mandate of the EA are significantly narrower than those of LPAs, whose elected officials answer to local voters and are responsible for discharging a wide array of statutory responsibilities, including local economic development, housing provision and sustainable communities. In this paper we explore this clash of institutional priorities and professional cultures as it was expressed in the trial of force over the use of the Flood Map in planning decision-making. After describing the data and methods for the analysis that follows, we discuss the Flood Map and the ways in which it sought to script planning practice and restrict development exposed to flooding, which the EA and the insurance industry would then be liable for protecting. We then consider the evidence from official statistics about the effectiveness of the Flood Map and its script for planning in achieving those ends before turning to the accounts from planners to consider the ways in which they have accommodated and resisted the new risk-based approach to flood risk management. The paper closes by tracing how the EA’s Flood Map has been superseded by a new decision-support technology, Strategic Flood Risk Assessments, which in turn have led to the rescripting of the Flood Map to influence a new set of users: the public.

Data & Methods

This paper is based on a kind of ‘source’ triangulation between three broad types of primary data about the design and use of the Flood Map in spatial planning. First, we collected and reviewed formal policy documents, such as planning policy guidelines, policy consultation submissions, and Parliamentary Select Committee testimony and evidence, pertaining to flood risk management, mapping, and planning. As matters of public record, they set out the official grounds in which actors publicly explain their

actions to others, and we supplemented them by comparing them against a second body of documentary material collected through Freedom of Information Act requests, including a variety of technical reports (e.g. EA 2003b) and other internal documents not intended for public viewing.

To explore further the ‘backstage’ experiences hinted at, but not necessarily revealed, in those documents, our third data source came from 66 semi-structured interviews, conducted between summer 2006 and early 2009, with EA staff involved in flood risk management policy formulation and implementation (n=21), modelers and consultants involved in the design and building of the Flood Map (n=24), and spatial planners (n=21), from heads of departments, all the way down to case officers working in development control and forward/strategic planning. From that wider set of interviews, this paper draws, in particular, on those with planners. They were selected from a purposeful sample of LPAs designed, first to capture those at greatest risk of flooding and so having the most experience of working with the EA and its Flood Map, and second to reflect the geographic spread across England. Using the EA’s annual HLT reports to identify LPAs by their volume of applications in flood risk areas, interviews were conducted with planners from at least two LPAs in each of the 8 EA regions in England. Interviews took place in participants’ offices, were audio-recorded (with consent), and transcribed. A conversational approach was adopted using open-ended questions to encourage people to reflect on their experiences using their own words. Transcripts were coded and analyzed alongside other documentary material to identify emerging themes and triangulate them against different sources.

The Flood Map and Its Script for Planning Practice

While there is a long history of mapping the high water marks from historic floods to delineate areas at risk from flooding (Monmonier 1997), physically-based, spatially distributed modeling and mapping first took off in the 1960s. In England the first systematic efforts at flood mapping were initiated by the 1973 Water Act. Under its Section 24(5), Regional Water Authorities were required to survey and map areas with flooding problems, typically “to justify proposals for new [drainage] works by showing that the benefits adequately match costs” of agricultural land reclamation (Southern Water Authority, 1979: para 11.1). Not surprisingly, these maps had little influence on spatial planning (Bowers 1983; Penning-Rowsell et al. 1986). Providing

better information to control development around flooding ‘hotspots’ was the explicit aim of the maps called for by Section 105(2) of the 1991 Water Resources Act, but they were patchy in their coverage, inconsistent in their methods, and late in their delivery (Bye & Horner 1998: 43, so that in the aftermath of the Easter 1998 floods, the EA was exposed to severe criticism for its failures both to protect people from flooding and warn them they were at risk.

Among the numerous recommendations emerging from parallel investigations into the Easter 1998 floods by the Parliamentary Select Committee and the independent review commissioned by the Secretary of State, was the need for tighter controls over “future development in flood plain land” (House of Commons 1998a: para 89; cf. Bye & Horner 1998: 5). The EA was also keen “to have its influence over the location and design of new development strengthened” (EA 2001: 32), not least because of the added pressure it placed on its flood defence budgets. However the EA lacked the political mandate for overruling democratically elected LPAs, and there was discomfort within the EA with suggestions about it, as “a non-departmental public body having a right of veto over elected councils over where development should happen” (House of Commons 1998b: question 81).

Rather than outright veto powers, the EA (1998) favored strengthening the general presumption against development, a recommendation echoed by the influential Select Committee report:

we believe that a clear presumption should be made against future development in flood plain land where the flooding risk attached to a particular development, as determined by the Environment Agency, is deemed to outweigh the benefits (House of Commons, 1998a: para 89).

To that end, the Select Committee recommended that the EA make “the production of flood warning hazard maps and their delivery to local authorities” its “highest priority” (House of Commons, 1998a: para 112). In response, the Government Minister for Housing and Planning explained that the “content of the guidance [in PPG 25] has been strengthened” (House of Commons 2000a, para 133), but rejected “a moratorium on any building in flood plains... [which would] essentially be consigning our whole brownfield strategy to the dustbin” (para 120). To enable those competing objectives to be balanced, he called for the EA to “ensure that there is improved information... including flood plain maps and other advice ... for planning

decisions to ensure those decisions reflect the issues that we are all concerned about” (para 137).

The EA Flood Map was thus born of a desire to restrict development exposed to flooding, but to do so indirectly by “influencing and managing the activities of third parties”, in particular the decision-making of LPAs responsible for granting development permission, rather than through any outright prohibition (EA 1998: para 5.3.2). Political theorists associate this regulatory preference for risk communication and suasion over more direct policy instruments of command-and-control as the hallmark of deeper shifts in the nature of governance. Some invoke the idea of an emergent ‘regulatory state’ and a shift away from the centralized exercise of police power and direct provision of social security to an enabling function for the state exercised through various arms-length agencies and indirect forms of regulatory control, such as audit, performance targets, and codified standards of practice (e.g. Majone 1997; Moran 2003). Others look to the governmentality of an ‘advanced liberalism’ in which power increasingly operates beyond the state and at a distance by inculcating new rationalities of rule and self-regulation (Rose & Miller 1992). These rather synoptic accounts of governmental regulation can be fleshed out by drawing on the sociology of science and technology to show how they were enacted through the Flood Map and its visualization of flooding as a calculable risk. In particular the concept of a technological ‘script’ highlights how, like the script of a film, the design of “technical objects define[s] a framework of action together with actors and the space in which they are supposed to act” (Akrich 1992: 208).

In designing its Flood Map, the EA was keen to address the ignorance, wilful or otherwise, of LPAs about the management of flood risks for which it was responsible. Citing “numerous examples of developments... which were allowed against the advice of the Agency and its predecessors” (House of Commons 1998a: para 86), EA officials saw the map as another way in which it was “continuing to seek to influence and educate those [LPAs] least willing to recognise the problems created by development in flood risk areas” (EA 1998: 5.3.6). An official Flood Map would concretize the EA’s knowledge of flood risk and make it both easier for LPAs to access and, at the same time, harder for them to ignore (Bye & Horner 1998; Thomalla 2001; White & Howe 2002).

That desire to “ensure that local planning authorities (LPAs) consult us and take our advice in the planning process” informed the way flood risk was visualized

in the Flood Map (EA 2003a: 12). The map depicted risks from tidal flooding and from fluvial flooding from main rivers, but not those “from localized sources, such as reservoir, storm drain failures, or runoff from fields or urban areas” (Brown & Damery, 2002: 415), which are both more difficult to model in a robust and nationally consistent way and are also not the sole responsibility of the EA to manage. The full significance of those omissions would not become apparent until the extensive surface water flooding in 2007 led the Pitt Review to call for improvements in the modeling and mapping of such risks (Pitt, 2008).

At 1:10,000 the scale of the Flood Map provided to LPAs is deliberately coarse and sufficient only to identify general zones of risk rather than to determine whether individual properties are at risk.² This choice of scale was partly driven by technical limitations imposed by the budget and timescale for delivering the Flood Map (Anonymized research 2010)—the greater the spatial resolution, the greater the demands in terms of data, computational power and other resources required to resolve the additional, small scale processes involved in locally detailed flood inundation modelling. Omitting such local details closed off a line of technical criticism about the adequacy of their representation in the model (Lane et al. 2011).³ The coarse scale of the Flood Map also served to script the behaviour of its users. Without being able to resolve individual properties, LPAs would be compelled first to require developers to commission additional, more detailed flood risk assessments, and second to contact the EA for further technical advice. The choice of scale also indemnified the EA against liability for providing a property-level risk assessment and against complaints about the effects of its Flood Map on property values or access to insurance (Priest et al. 2008).

Another important feature of the Flood Map and its script for planning is its treatment of flood defences. The initial IFM did not show any flood defences at all so as to amplify the perception of risk and encourage consultation. As Geoff Mance, Director of Water Management at the EA explained in 2000:

At this stage we have deliberately not shown whether there is a defence in place. We wanted people to ask questions and to find out. The first thing is to flag up whether somewhere is a risk area and then they can take an

² At 1:20,000 the Flood Maps displayed on the publicly accessible website is even less detailed.

³ As Demeritt (2001b: 322) notes in the case of climate models, peer reviewers and climate change sceptics alike often focus on crude parameterisation of important phenomena and are often “kinder to papers that ignore the phenomenon altogether”.

interest and seek further information (House of Commons 2000b: question 82).

From 2004, the revised and reissued EFO did include “information on where defences are located and the areas benefiting from these defences” (EA 2009b), but its calculation of different zones of flood risk is still based on a natural, or unimpeded, flood outline that specifically discounts the protections provided by defences.

There were several institutional considerations behind their exclusion from the EA Flood Map. First, as the agency responsible for flood defence, the EA has a major interest communicating the residual risk from those defences being overtopped or otherwise failing in the face of extreme events beyond the design standard to which they were built. Although both the Government and the EA have repeatedly emphasized the impossibility of providing absolute protection against flooding, the EA has, nevertheless, been subject to regular criticisms after flood events. In this context, the National Audit Office explained that “defended areas were purposely excluded [from the map] in order not to give the public a false sense of security... that flood defences can remove entirely the risk that flooding will occur” (NAO 2001, para. 2.11). Communicating those residual risks is one strategy for the EA to manage public expectations about its own performance and the institutional risk of blame in the event of flooding. This use of risk, as Krieger (2011: 142-42) explains, “offers a justification for failures to protect... while providing evidence that the EA has discharged its flood management responsibilities competently.”

Second, communicating residual risk is also important for behavior modification and avoiding what Gilbert White (1942) famously termed “the levee effect” whereby the construction of levees lulls residents into a false sense of security, encourages more intensive and less resilient uses of vulnerable flood plains, and leads, ultimately, to much higher losses when defences are overtopped and flooding occurs. Wider public failures to appreciate the residual risk of flooding pose a particular problem for the EA because of the way that flood defence funding is allocated in England. If the presence of protection structures is allowed to spur new development, the resulting increases in exposure to flood risk will, in turn, attract additional resources for flood defences by driving up the benefit/cost ratios used for their allocation in an steady ‘escalator-like’ increase in risk exposure and resulting flood defence spending (cf. Parker, 1995). EA officials were acutely conscious of the moral hazard involved in the diversion of their scarce public funding to protect

inappropriate private development sanctioned by LPAs not responsible for the cost of defending them (House of Commons 1998b: 2000b). By amplifying perception of residual risk, the EA was determined to shift institutional responsibility on to LPAs for preventing inappropriate developments in the first place rather than having to bear the defend them later on.

Lastly, in interviews EA officials also acknowledged how mapping the outline for undefended flood risks tends to increase the spatial extent of predicted flood outlines and thereby to expand the scope of the EA's authority in planning by requiring more people to contact it for detailed, site-by-site assessments.

In interviews EA staff articulated a technologically determinist vision of how the Flood Map would effect change in planners and their awareness and management of flood risk. They assumed that the map would be used as an automatic screening-tool, "the beginning of the chain" for everything planners do (Senior Flood Risk Policy Manager 1). With the Flood Map uploaded onto the internal GIS system of every LPA, all planners would be able to see, at the click of a computer mouse, whether an application falls within a flood zone and where an additional FRA and technical input from the EA is required to inform decision-making. With a standardized screening tool it would no longer be "hit or miss" whether we were consulted on planning applications" (Senior Flood Risk Policy Manager 5); there could no excuses for failing to see where EA advice was required. While the formal aim of the map may simply have been to "increase awareness among the public, local authorities and other organisations of the likelihood of flooding" (EA 2009b), EA officials imagined its role in decision-making to go well beyond mere information provision. As Senior Flood Risk Policy Manager 1 at the EA put it:

[the map] is a way for us to say: don't develop in areas at-risk of flooding. Don't even plan to. Don't even think about trying to develop here and then trying to get us to build defences. If they see its at-risk: don't build there! (original emphasis).

Rather than just guiding decision making, the intention was that planners' decision-making should be determined by the Flood Map. If the map shows some area to be at risk of flooding, then the EA hoped the decision would automatically be: 'don't build there'. To reinforce the authority of that advice, the EA began to monitor LPA compliance and to name and shame those LPAs ignoring its script for planning. As Senior Flood Risk Policy Manager 5 at the EA explained:

High-Level Targets have turned into a bit of ‘name and shame’ for Local Authorities. They don’t like their name being up there on the top of the list. But, in some ways, if they can full justify why they’re going against our advice then good luck to them.

As an ‘obligatory passage point’ through which all planning decisions would be filtered (Latour 1987), the Flood Map was supposed to ensure more rational, reliable and responsible planning approaches to managing flood risk. The map was designed not simply to raise planners’ awareness of flood risks—“to make planners stop and think” as one EA official put it (Senior Flood Risk Policy Manager 5)-- but to discipline them into behaving in certain prescribed ways: by identifying areas at risk from flooding, soliciting expert advice from the EA about development applications in those at risk areas, and then refusing them permission in line with EA advice. Standardizing the cartographic visualization of flood risk, then, creates standards to be upheld by those using the map for decision-support. This new script for planning leaves little scope for planners to exercise professional discretion about whether an area is at risk of flooding or what actions should follow from that expert designation.

Impacts on Planning Outcomes in England

Official statistics provide two measures of the influence the EA on planning outcomes in England. First, the government monitors changes in land use and when these reports are intersected with EA digitized boundaries for Flood Zone 3 it is possible to estimate the percentage of new dwellings built each year in high flood risk areas (Figures 2-3). At the Government Office Region scale, the percentage of new housing built in areas of high flood risk has fluctuated over the period 1989-2010 with no clear trends, either within regions or after major policy changes, such as the introduction of the IFM in 2000 or of PPS25 in 2006, perhaps because of the time lag, which ODPM (2004: 12) estimates “at up to five years for mapping changes to be detected.” At a national scale, however, there is a clear trend. Percentage of new housing being built in areas of high flood risk has slowly increased from 7-8% in the late 1980s to 9-11% in 2008-10. At first glance, this would suggest a failure by the EA to “prevent inappropriate development by working to influence planning policy and decisions” (EA 2003a: 4).

[FIGURE 2 - Percentage of New Dwellings in England Built within Areas of High Risk, by Region, 1989-2010]

[FIGURE 3 - Percentage of New Dwellings in England Built on Previously Used, 'Brownfield' Lands 1989-2010].

However, it is important to recognize that over the same period, government policy has strongly favored the redevelopment of brownfield land, much of which lies in areas at risk of flooding and benefits from flood defences. With the percentage of new dwellings on brownfield increasing from just over 51% in 1989 to 78% in 2009 (Figure 3), it might be argued that just a 1-2% increase over the same period in the proportion of new homes built in areas at high risk of flooding represents a success for the EA and its script for planning.

A second, more direct measure of the influence of the EA on LPA decisions is the EA's annual High Level Target (HLT) 5 report, which identifies "cases where the Agency sustained objections on flood risk grounds and [whether] final decisions by the local planning authority... were in line or contrary to the Agency's advice" (DETR 2001: para 17). Noting, in the most recently published HLT report, that for "the third year running ... over 96% of [planning] outcomes have been in line with our advice", the EA (2009: 5) concludes that the "latest figures suggest that we are influential advisors to the planning system."

[TABLE 1 – LPA Planning Applications Considered by the Environment Agency, 2000-2009]

Closer examination of the data suggests a more complex picture. There have been steady year-on-year reductions in the proportion of applications that LPAs are known to have approved against sustained EA objections, from nearly 40% in 2001/02, the first year after the introduction of the Flood Map and PPG 25, to just under 9% in 2008/09. At the same time the frequency of EA objections on flood risk has increased, as the "national roll-out of the Environment Agency's 'Standing Advice'" on minor applications and its "increasing uptake by LPAs" (EA 2009a: 13) has enabled it to focus its scrutiny on larger, more consequential developments. But in constructing its headline figure of 96% compliance with its advice, the EA is

engaging in statistical sleight of hand, by the dividing the number of applications known to have been permitted by LPAs contrary to EA advice (row 6 in Table 1) by the total number of cases to which the EA objected (row 2 Table 1). This conveniently overlooks the “disappointing” number of cases in which LPAs fail to “inform us of the final outcome of our objections” (EA 2009a: 41), despite the specific requirement to do so in PPS25 (para.29).

These statistics reinforce claims about an ongoing implementation gap between high-level flood risk strategies and LPA practice. White and Richards (2007) found an uneven pattern of uptake of national flood guidance in local development plans, while Wynn’s (2005) survey of English LPAs found that nearly three quarters of LPAs were prepared to accept an application for development in Flood Zones 2 and 3 without the required FRA. This administrative failing remains the leading cause of EA objections on flood risk grounds, and its frustration is palpable:

It is a matter of concern that 7 years after the publication of PPG25 a very large proportion of consultations are still being submitted to the Environment Agency without a satisfactory FRA as required by PPG/PPS25 (EA 2009a: 20)

While most LPA decisions seem to be in line with EA advice and the percentage of decisions taken contrary to EA advice has steadily fallen, it remains much higher than the headline figure reported by the EA, and in addition to 8.8% of applications known to have been permitted in the face of specific objections from the EA on flood grounds in 2008/9, a further 9.4% of applications to which the EA objected were refused by the LPA, but not on the grounds of flood risk, which implies that LPAs did not regard flood risk and EA advice about it as “sufficient grounds for refusal” (Richards et al 2008: 13). Data from the Land Use Change Statistics and HLT reports suggest that planning decision-making may not be following the exact script set out for it.

Responses to the EA and Its Flood Map

Technology is generative, and its effects are not entirely determined by the scripts built into it by system designers. Users and their contexts of application play an important role in shaping the wider ‘technological frame’ within which the capacities of technical objects are ultimately realized (Pinch & Bijker 1987). Whereas the EA hoped its Flood Map would prevent development in areas at risk of flooding, planners

resented EA interference with their professional autonomy, and their responses to the Flood Map reflected deeper institutional tensions between the EA and LPAs.

While acknowledging the risks it poses and often welcoming the Flood Map for helping “draw our attention straight away to the problem areas” (Planner 19), planners also insisted that flooding is not the only sustainability issue that they have a professional duty to consider. In addition to flooding, LPAs are statutorily obligated to promote economic development (PPG1: para 21), greenbelt protection (PPG1: para 30) housing provision (PPG3), and brownfield redevelopment in planning future development trajectories, and as Thomalla (2001: 112), notes, “local councils quite frequently approve planning applications against the advice of the EA owing to the overriding expectation of the economic benefits associated with the proposed development.” Planners were anxious that “the Agency would simply ignore the importance of [these] other planning priorities” (Planner 15), because its narrow script for planning reduced sustainability to a “black and white issue [where] planners must be mad to allow developments in the floodplain” (Planner 10). By contrast, planners saw themselves as promoting a fuller sense of sustainable development, which required them to exercise professional judgement so as to balance competing policy imperatives and secure the best local outcomes (cf. Owens & Cowell 2002). This sense of expert judgement is deeply embedded both in the ethos of the planning profession (cf. Clifford 2009) and in the governance of the planning system, which “above all ... embraces discretion and general planning principles,” for which expert “interpretation is [then] required” to manage the “balancing of conflicting considerations” (Cullingworth & Nadin 2006:52,53).

In addition to these differences in professional outlook, planners drew another distinction between democratically accountable LPAs and the EA: “unlike the Agency, LPAs are political organisations” (Planner 9) and must respond to the wishes of local voters. While professional officers deal with minor development applications as a matter of routine, major development applications are decided upon by elected members, as is the wider Local Development Framework (LDF) within which all such LPA decisions were taken. Since “the way it [the political system] is designed is that we do it [i.e. make decisions]”, it was thus a source of no little irritation for LPAs to be named and shamed by the EA in its HLT reports, as if it were “the judge and jury, whereas their role is to advise us” (Planner 2). As another planner put it “the EA give advice; we give permission” (Planner 6). Many planners felt that in second guessing

LPA decisions, the EA was exceeding its limited political mandate. Though the contradiction went unremarked, this critique of EA interference with the democratically authorized decision making of LPAs sits uncomfortably alongside planners' impassioned defence of their own professional discretion in making those decisions.

Tensions between the EA and LPAs were most acute in low-lying areas and in the centrally designated 'growth areas', like the Thames Gateway, where implementing central government targets for new housing starts and brownfield regeneration put LPAs on a collision course with the EA and its responsibility to manage flood risks. As Planner 9 explained:

they [the EA] fear that we might not take flood risk seriously and from our point of view there's a fear that flood risk is the only consideration they'll accept. That makes it really difficult for low-lying areas, like ours.

In Lincolnshire, for example, the Flood Map positions 96% of Boston and 76% of South Holland in Zone 3 of high-risk (LCC 2007), and under PPG25 LPAs are required to steer development away from those areas. There were widespread concerns that "the map could blight areas by saying you're at such a high-risk of flooding that you can't develop here, which in our area made one or two insurance companies very worried, not to mention the local residents" (Planner 8). In semi-structured interviews, 81% (17/21) of planners expressed concern about the reputational effects of the map which could "blight areas and devalue businesses" (Planner 9), while a further 71% complained the EA was too rigid in its interpretation of the flood zones and failed to acknowledge "greater variability exists within these flood boundaries" (Planner 10). As Planner 1 put it:

Yes 98% of the city is within a flood risk zone. Yet we have a major inland port, motorway, and railway links. So who could deny that Hull is a place to be developed with many sustainable options?

The problem of stigma was also highlighted in the formal responses from LPAs to the PPS25 consultation (DCLG 2006a: 12).

These broader institutional tensions shaped how planners understood and used the Flood Map. Planners were particularly critical of the way the Flood Map ignored the protection provided by flood defences. As Planner 20 remarked:

the Flood Map doesn't take account of defences. Instead, it shows where it would flood if the defences weren't there. Well that's an artificial

picture because defences are there... [OK] we can't say they'll never be breached or overtopped but it's just wrong to say they don't exist.

These concerns about realism were echoed by the Royal Town Planning Institute in its response to the Department of Communities and Local Government (DCLG) consultation on revising planning policies for flood risk:

We do not understand the logic of ignoring existing flood defences in defining Flood Zones... Where flood defences are in place, FRAs must surely acknowledge their existence – otherwise what is the point of installing defences? Inclusion of defended areas... permits a practical and realistic operation of the sequential test, rather than one starting from a theoretical position (RTPI 2006: para 16).

Although many LPAs had followed the EA script for planning in loading the Flood Map onto their own in-house GIS systems as an initial screening tool, it proved better suited to some planning applications than others. Planners certainly welcomed the convenient access to information about flood risk, particularly as many LPAs had lost in-house drainage expertise to budget cuts and outsourcing (DEFRA/LGA 2009), which made it “very hard for us to know when an application might be at risk” (Planner 13). With the Flood Map planners were able to see for themselves what areas were at risk. As Planner 7 explained:

We really like the Flood [Zone] Map because it draws our attention straight away to the problem areas and makes us ask ourselves: should we even be considering this site in the first place; and if so, what extra information do we need to make that decision.

Such praise was most common among those involved in formulating LDF documents. Under the new plan-led system in England, LPAs invest considerable time and resources mapping out where different kinds of developments are to be permitted. With its delineation of three broad zones of increasing flood risk, the Flood Map went with the basic grain of this planning practice, for which the relatively coarse scale of the Flood Map was sufficient for sequential allocation of different activities to different zones within the LPA. As planner 14 reflected:

the policy team really like the map. For us, it's a bit like a constraints map in that it shows us what we need to think about and work around at the strategic level.

By contrast, it was much more difficult to reconcile the Flood Map with the demands of development control, and those involved in this planning function were the most vocal in their hostility to the Flood Map and its script for planning. Its broad flood boundaries, and sequential test to allocate activities between different Flood Zones, were not especially useful guides to development control decisions, as Planner 12 explained:

Perhaps the word 'planning' is a misnomer in development control...

Although we have a unitary development plan, not everything that comes in is related to allocations in the plan. In fact, virtually none of it [is]... So it's extremely difficult to properly sequential test a site because if someone puts up a strong case and we grant permission and two months later a company goes into liquidation up the valley, suddenly there's a sequentially preferable piece of land. Then what do you do?

Moreover, development control works to tighter time constraints than more strategic forward planning, as the LPA's Planning Delivery Grant depends on it meeting a 56-day Best Value target for deciding on applications for planning permission (CLG 2009b). In interviews, planners consistently reinforced the importance of those targets and the consequences, in terms of staff redundancies and service quality, of failing to meet them (cf. DCLG 2006a; RTPI 2006; Wynn, 2005).

This need for speed lay at the heart of two intertwined complaints about the Flood Map and its script for planning. First, planners sometimes complained that the Flood Map did not provide sufficient spatial resolution to judge individual planning applications. As Planner 6 put it, "the accuracy of the [Flood] Map at the level of detail we require for making clear-cut decisions just isn't there". The EA, of course, never designed the Flood Map for that purpose. It wanted planners to require developers to produce a more detailed FRA as part of their application and then to consult the EA for more detailed assessment of its merits. Planners, however, resisted this script. While this was partly a response to complaints from developers about the added costs of requiring an FRA "even for reasonably minor extensions... that might be more costly than the rest of the process put together" (Planner 21), planners were even more sensitive to the impacts on their speed of determination targets of the involved process of consultation and site-specific flood risk assessment envisioned by the EA. They needed greater speed and certainty than such consultation allowed, which takes us to a second reason why Planner 6 thought "there is a problem with the

scale [of the Flood Map] and not being able to drill down to specifics". In interviews planners frequently complained that the EA was too slow in responding to consultation requests, a concern echoed in the responses to the consultations over PPS25:

LPAs were particularly concerned about how the Environment Agency would ensure that responses would be received in time for LPA targets for dealing deciding planning applications to be met (DCLG 2006a: 22).

Such concerns are corroborated by Wynn's (2005) analysis and by the EA itself (EA/LGA 2006: 23), which puts out its standing advice precisely to reduce the need for LPAs to consult it over minor applications and allow it to concentrate its resources on responding to major developments. Nevertheless, Planner 6, for instance, reported that his LPA "receives responses [from the EA] for about 10-20% of submitted applications. This creates a dilemma for us: what do we do in the other 80-90% of cases where there's no feedback? Well, we just grant them permission".

The EA presumed that development applications in Flood Zones 2 and 3 would simply be rejected automatically, but rejections require reasons and can be difficult to sustain in the face of an appeal without robust advice (cf. Tunstall et al 2009). As Planner 2 reflected:

We, as a Local Planning Authority, need to have confidence to be able to say to a developer, and in front of the Planning Inspectorate if necessary, that we have good evidence for denying this application. Any vagueness will not only upset but will be jumped on by developers.

As Table 1 shows, in nearly 10% of cases where the EA has sustained objections on flood risk grounds, LPAs have not felt confident enough to base their rejection on that basis (Richards et al 2008).

In response to those concerns, the EA is committed to updating the Flood Map quarterly to incorporate the very latest science. Long-serving planners recognized that that EFO had improved upon the IFM and was getting better all the time. But this process of continuous improvement led to further complications for development control. First, it suggested that the flood outlines were merely provisional, and this undermined the way that planners relied upon the Flood Map to legitimate their decisions. The Flood Map, explained Planner 14:

gives us a level of certainty. Therefore we can show [developers] the map and discuss with them our reasoning. It's very important to demonstrate,

with a degree of clarity, precisely why we're refusing something and making sure our reasoning stands up.

Second, 28% (6/21) of planners also noted that revisions to the Flood Map created problems for development decisions and planning consents taken under previous flood outlines. Having put the Flood Map up on the wall in his office, Planner 21 recalled how:

three months later we had updated plans from the EA, which was as a response to them gleaming additional information through the planning process to improve the accuracy of those plans. We had developers saying to us which plans are you dealing with. ...We found ourselves in a situation where there were outline planning consents granted on the back of the original maps ... but by the time we got to consider the application the maps had changed. So, which ones apply? And certainly when we dealt with the Planning Inspectorate he thought that this was a moving fixture that is impacting upon the basis on which we would manage the application.

The best flood risk science, then, is not necessarily the most useful science. Rather, as Theodore Porter (1994: 391) remarks, "standardization and proper surveillance are in some ways more important to a public measurement system than a close approximation to true values". Paradoxically, efforts to increase the scientific quality of the Flood Map increased the uncertainties about its application in planning.

Rescripting the Flood Map

Although PPG 25 was the newest and most detailed planning policy guidance note, it was completely revised in 2006 as part of a wider recasting of all planning policy guidance notes into planning policy statements. The new guidance responded to many of the concerns raised by planners about the Flood Map and its script for planning. While LPAs wanted greater flexibility, the EA was concerned that LPAs were not taking a strategic enough approach to managing flood risk across all planning stages. Both agreed that too much time and resources were being wasted micromanaging referrals (DCLG 2006c; DEFRA/EA 2005). In keeping with wider efforts to 'front-load' the planning system (Cullingworth & Nadin 2006), PPS25 called on LPAs to manage flood risk 'upstream' through their LDFs, strategic plans and local policies, which would then structure 'downstream' implementation through

development control. In parallel with this increased emphasis on managing flood risk through LDFs, external controls over development control were relaxed with the phasing out the HLTs and the introduction of an 'Exceptions Test' to enable LPAs to allow essential development to occur in cases, "when there are large areas in Flood Zones 2 and 3, where the sequential test alone cannot deliver acceptable sites, but where some continuing development is necessary for wider sustainable development reasons, taking into account the need to avoid social or economic blight" (DCLG 2006b: para 19). To do this, PPS25 called on every LPA in England to produce a Strategic Flood Risk Assessment (SFRA) to inform its LDF and through that its development control decisions.

The SFRA has thus displaced the Flood Map as the primary decision support tool for planning. For LPAs, the SFRA provides an opportunity to incorporate greater detail than was included in the original Flood Map, which in turn is now being updated by the EA based on local SFRAs. Indeed, even before the revision of PPS25 made the production of SFRAs a requirement, several LPAs "got frustrated that the Environment Agency wouldn't modify their maps so we went out and commissioned our own Strategic Flood Risk Assessment" (Planner 21). With their own SFRA, these LPAs were less reliant on the EA for technical advice and better able to decide on planning applications within the required time scale (see DCLG 2006c: para 60). The EA also sees some advantages in the use of more detailed SFRAs, which free up EA staff from consulting with LPAs over minor applications so they can focus their efforts on major ones and play a more 'strategic' role in flood risk management, in line with the Pitt Review (2008) recommendations and the Flood and Water Management Act 2010.

The technical shift in decision-support technology from the Flood Map to SFRAs also marks a change in the script for interaction between LPAs and the EA. While SFRAs "empower and extend" planners' responsibilities for managing flood risks (Senior Flood Risk Policy Manager 1), the EA itself now serves less as a 'regulator' of planning decisions than a 'strategic enabler' providing LPAs with technical support in fulfilling their new responsibilities for flood risk management. Institutional-political tensions remain, however. SFRAs are paid for by LPAs. In interviews 66% of planners expressed the hope that producing their own SFRAs would enable them to define the flood zones more precisely so as to accommodate development in Zones 2 and 3 under the Sequential and Exception Tests. For the EA,

the concern is that SFRAs could be used to justify inappropriate development. Planner 6 recounted how “one of the Environment Agency’s officers told me that he hadn’t seen a single Sequential Test that proved the development shouldn’t go in the floodplain” (Planner 6). Such concerns are given credence by recent EA-commissioned research, which found evidence “that some SFRAs are being prepared on the basis of existing land allocations in their local development documents [LDF]” rather than as a constraint on those allocations (DEFRA/EA 2009: 1). To retain its influence, the EA acts as an arbiter of scientific quality. It encourages LPAs to use contractors from its approved list of ‘framework consultants’ and can challenge the validity of the resulting SFRAs, if it so chooses. Without EA approval, SFRAs hold little authority (cf. CLG 2009a: para 2.8), as Planner 9 explained:

We came to the conclusion that the SFRA had no validity unless the Agency signed off on it. Otherwise they’ll just ask the Secretary of State to intervene on everything and we would be back at square one. So you have to reach some sort of agreement.

Shorn of its decision-support role for planning, the EA Flood Map has been repurposed as tool for communicating flood risk to the general public (Priest et al 2008). The aim is now to “encourage people living and working in areas prone to flooding to find out more and take appropriate action” (EA 2009b). As with the script for planning, this communicative strategy presumes that public awareness of flood risk is low and that risk and vulnerability can be reduced if those exposed “understand and act on the advice and information given” in map (Defra 2004: para 13.1). In this individually responsabilizing script, people are expected to use the map to assess their own risk and to take appropriate steps to manage it (Johnson & Priest 2008). But experience in other risk management domains suggests such strategies are liable to face resistance from competing models of risk, responsibility, and citizen-state relationships (e.g. Bickerstaff et al. 2008; Petts 2005), while research on flood risk communication in particular highlights the challenges involved in trying to use communication as an instrument of behavior change (Burningham et al 2008; Demeritt & Nobert 2011; Demeritt et al. 2011; Soane et al. 2010).

Conclusion

Flood maps and other forms of risk communication play an increasingly prominent role in new government strategies for flood risk management. Indeed, under the 2008

EU Floods Directive (2007/60/EC), EU member states are now required to produce flood maps as the central instrument of a common European “framework for the assessment and management of flood risks” (European Commission 2007: article 1). As with many framework directives, the Floods Directive presents flood maps in purely technical terms as “an effective tool for information as well as a valuable basis for priority setting and for further technical, financial and political decisions” (para 12).

In this paper we have challenged that all-too-common vision of decision support technologies as purely technical instruments standing outside of politics and feeding neutral information into the political realm. Instead, we explored the ways in which the Flood Map shaped, and in turn was shaped by, institutional tensions between the EA and LPAs over political mandates, institutional priorities, and professional discretion in planning and flood risk management. While the Floods Directive specifies a host of technical details about the information flood maps must include, it is conspicuously silent on these institutional issues about who will use them, how, why and with what wider effects. That silence may be diplomatic given the subsidiary principle and member-state sensitivities about competency grabbing by the Commission, but it begs important questions not just about whether the production of flood maps will achieve the central purpose of the Directive— “reduction of the adverse consequences ... associated with floods in the Community” (Article 1)— but also about what those adverse consequences actually are. Flooding poses direct risks to life and property, but the responsibility for managing those potential harms also creates various second-order institutional risks of blame in the event of failure to discharge that responsibility properly (Rothstein et al. 2006). In this context, risk maps do much more than just represent the spatial distribution of hazards to health and safety. They also provide an instrument for regulating those risks, by defining areas subject to additional controls, and for accounting for the inevitable limits of those controls, both enabling LPAs to over-ride those controls by exercising the risk-based Sequential and Exception Tests and to deflect blame in the event of some flood event by pointing to all the reasonably practicable measures they had taken to mitigate and manage the risks of such an eventuality.

Drawing on traditions of critical cartography and science studies, we showed how the Flood Map was designed to standardize the process by which flood risk was considered in LPA decision-making and thereby to ensure planning decisions were

aligned with EA views about avoiding development in zones at risk of flooding without actually banning such development outright. But technologies are also shaped by their users, and planners actively contested elements of the EA's script for planning and its designs for the Flood Map. Their concerns both about sterilizing areas depicted as being at risk of flooding and about the difficulties of actually using the Flood Map for speedy and defensible development control decisions were crucial in its eventual replacement by LPA-commissioned SFRAs as the main decision support tool for planning.

It is tempting to read this displacement in terms of the longstanding tug-of-war between central and local government over planning and the balance between central targets and regulatory controls as against local autonomy and planners' professional discretion. There is certainly a sense in which the shift to SFRAs, the adoption of a new Exception Test, and elimination of HLTs has given LPAs greater scope to allow development in Flood Zones 1 and 2. But flood maps are, nevertheless, still central to the governance of flood risk and the EA retains substantial influence both over the SFRAs and the LDFs they inform and through them over development control decision making. It is less the fact of regulatory control over planning and flood risk management that has changed than the form and instruments by which those indirect controls are exercised.

FIGURE 1a – The Indicative Floodplain Map, Source: Environment Agency.

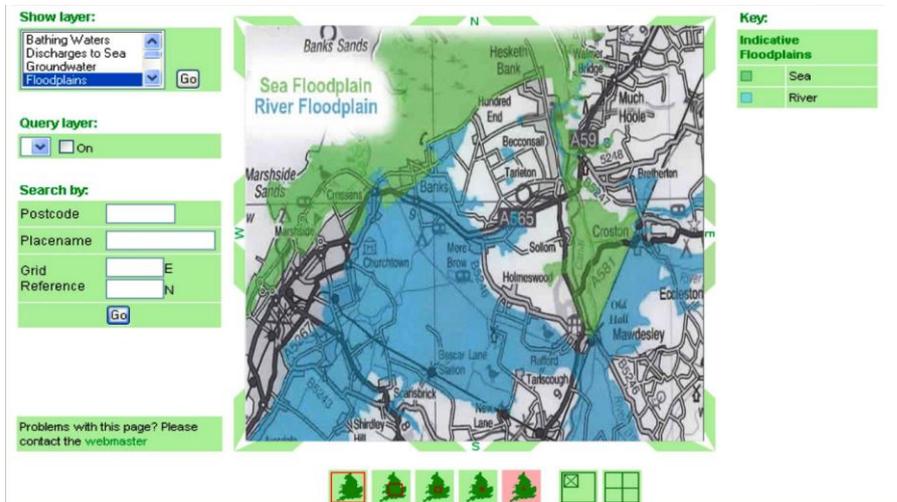


FIGURE 1b – The Flood Zone Map, Source: Environment Agency.

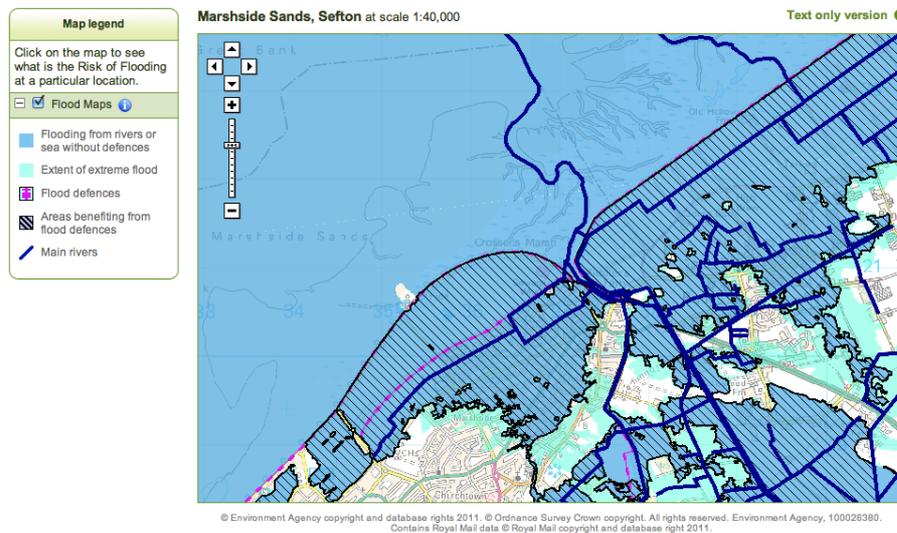


FIGURE 2 - Percentage of new dwellings in England built within areas of high risk, by region, 1989-2010.
 Source: Land Use Change Series table 251.
<http://www.communities.gov.uk/planningandbuilding/planningbuilding/planningstatistics/livetables/landusechange/>

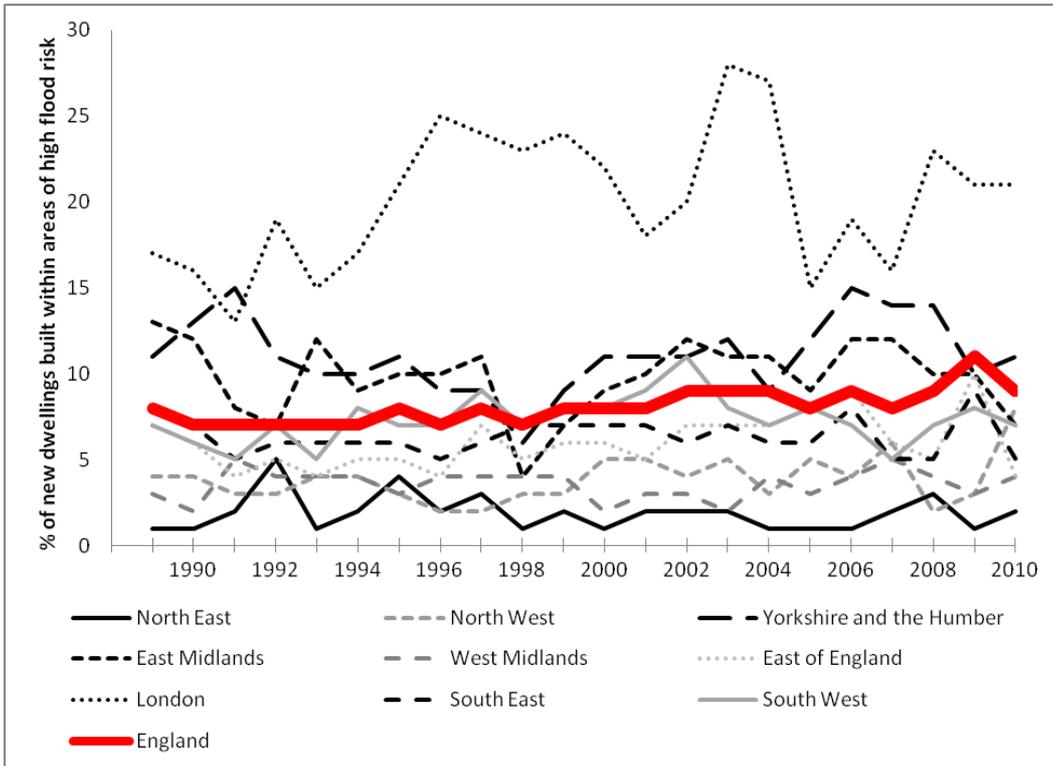


FIGURE 3 - Percentage of new dwellings in England built on previously used, 'brownfield' lands (solid black line) and within areas of high flood risk (dashed grey line), 1989-2010. Source: Calculated from Land Use Change Series tables 221 and 251.

<http://www.communities.gov.uk/planningandbuilding/planningbuilding/planningstatistics/livatables/landusechange/>

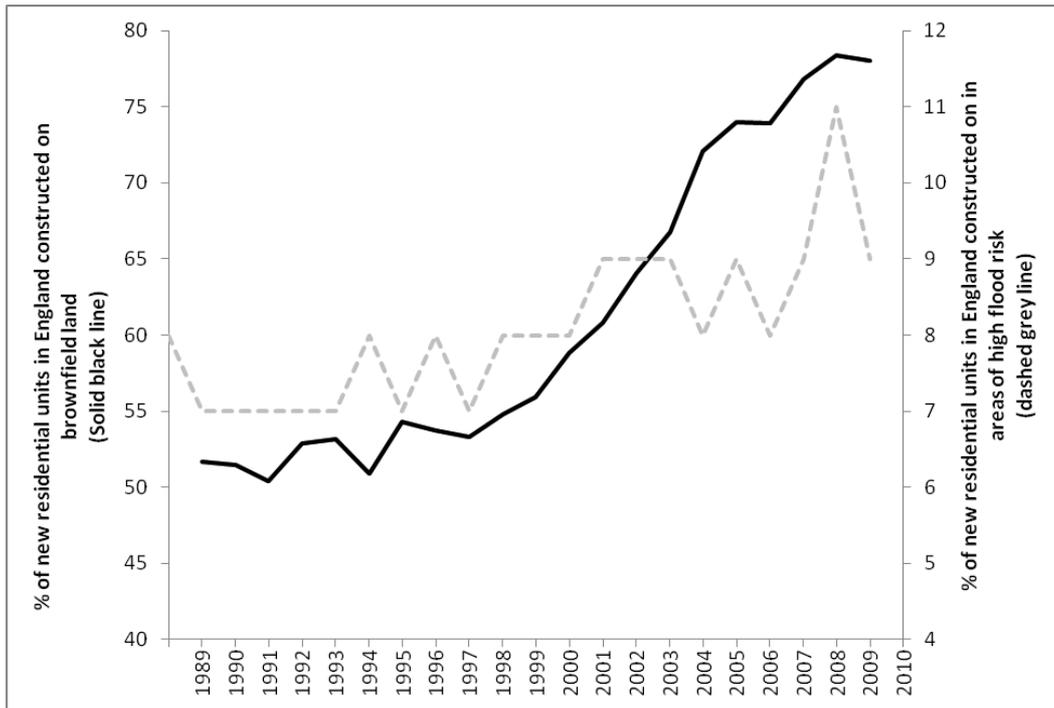
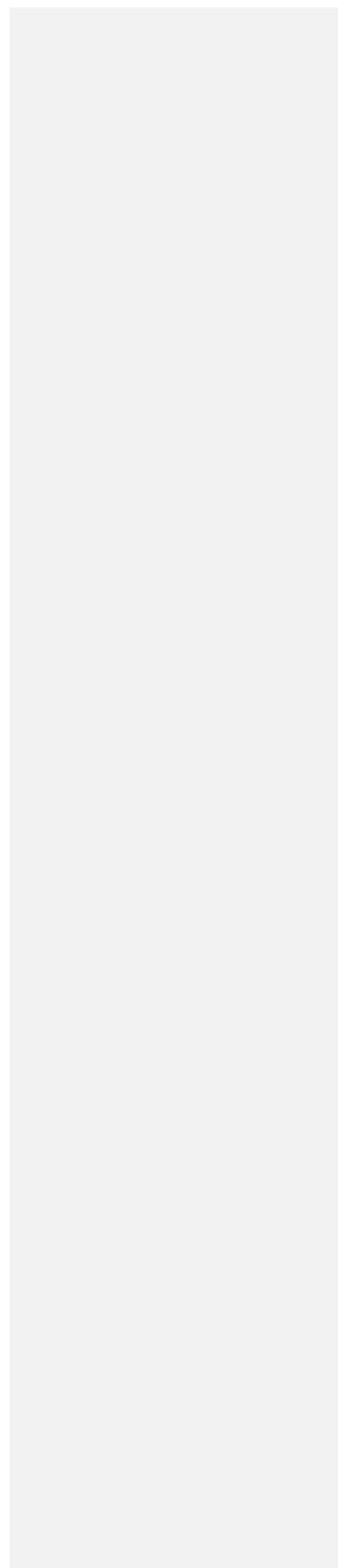


TABLE 1 – LPA planning applications considered by the Environment Agency, 2000-2009. Source:

	2000/01	2001/02	2002/03	2003/4	2004/5	2005/6	2006/7			
Consultations which required detailed consideration on flood risk grounds	23952	24138	20452	22067	13937	11403	10854	Formatted: Position: Horizontal: Left, Relative to: Column, Vertical: In line, Relative to: Margin, Horizontal: 0 cm, Vertical: 0 cm, Wrap Around		
Total EA objections made on flood risk grounds	N/A	2500	4523	5077	4634	4201	4750	6232	5198	
Rate of EA objection on flood risk grounds	N/A	10.4%	22.1%	23.0%	33.2%	36.8%	43.8%	68.3%	42.9%	
Number of applications where EA sustained objections on flood risk grounds and LPA decision is known	629	758	1047	1437	1438	1160	1067	1264	1310	
Number of those cases where LPA decision was in line with EA advice	397 (63.1%)	475 (62.0%)	658 (62.8%)	931 (64.8%)	998 (69.4%)	889 (76.6%)	829 (77.7%)	1021 (80.8%)	1072 (81.8%)	
Number of those cases where LPA decision was contrary to EA advice	232 (36.9%)	283 (38.0%)	221 (21.1%)	323 (22.5%)	248 (17.2%)	136 (11.7%)	110 (10.3%)	124 (9.8%)	115 (8.8%)	
Number of those cases where the application was refused but not on flood risk grounds	14 (2.2%)	N/A	168 (16.0%)	183 (12.7%)	192 (13.4%)	135 (11.6%)	128 (12.0%)	119 (9.4%)	123 (9.4%)	

calculations based on data compiled from annual HLT reports prepared by the Environment Agency



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