

Flood defence: time for a radical rethink

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5th January 2016

1. Flooding crises tend to follow an established pattern. First, there is immediate help and assistance. Then second, there is a “review”. On occasions, this leads to a third stage of genuine reform, but in most cases “sticking plasters” are applied. These are incremental and often sensible, but typically fail to address the core issues and hence provide only a temporary respite.
2. There are very good reasons why “sticking plasters” will not work this time. The conventional approach to flood defence, carried out by the Environment Agency (EA), and financed largely by the Treasury, is at best inefficient. Sometimes it is even counterproductive, encouraging the sorts of land use and land management decisions that can actually make flooding worse in the medium term.
3. Faced with an unprecedented expected rise in the population, and a major house building and infrastructure programme, land use is undergoing an historic and profound change. Flood defences and river catchment management will need to adapt and adjust to these changes – but so too will planning, and agricultural policy. This requires a radical rethink, treating rivers as core natural capital. The recent floods provide the opportunity to do this.
4. There are three steps to the required rethink, and these are set out in this brief summary paper. The first is to work out how much flood defence we need, and what it should comprise of. This requires an economic assessment of the catchment systems and their natural capital. The second step is to create a longer term, sustainable asset-based framework and the associated financial basis. At the core are: a balance sheet; an asset register; a regulated asset base; debt finance; and a corporate

structure. Third, floods defence needs a proper institutional context. Flood defence needs to be put on a stand-alone basis, allowing the EA to focus on environmental protection, structurally separating out operational, project management, catchment management, regulation and catchment planning functions. The paper brings these three steps together to propose a way forward.

The economic approach to flood defence

5. The first step is to sort out what sorts of flood defences we need – what is the optimal level of flood defence. Surprisingly perhaps, the EA does not provide a credible answer, and the answer it does provide leads to a serious misallocation of resources and some perverse incentives for home building and wider land use.
6. The optimal level of flood defence is an economic concept, and takes account of the costs and benefits of flood defence investments, discounted back to the present. It incorporates risk and uncertainty, and recognises that this optimal level is very unlikely to protect all properties from inundation. It does not even require a specific focus on those properties most at risk. In some cases, it may not be sensible to protect those most at risk: the properties might not be worth the costs of protecting them.
7. In applying this sort of economic appraisal to floods, there are three main complications. First, flood defence applies to river catchments and water *systems*, and not to specific projects on a stand-alone basis – *natural capital systems*. Second, land use (and in particular the protection and enhancement of upstream natural capital, agricultural practice and housing and industrial developments planning) plays a critical part is both causing and helping to alleviate flooding. Third, there are positive and negative externalities from flood defence investments. At worst, they can disrupt natural river flows and negatively impact on the environment; at best, they can yield a number of positive benefits to health, recreation, and biodiversity, and thereby enhance sustainable economic growth.

8. The EA's methodology is not an economic one. Its risk management strategy (as set out for example in *Understanding the risks, empowering communities, building resistance* (2011)) focuses on those properties at most physical risk, but this does not provide a sensible way of evaluating what resources should be deployed where and to whose benefit. The Treasury *Green Book* takes an overwhelmingly project-specific approach, rather than look at system (and in this case catchment system) costs and benefits.
9. The conclusion that follows is that we do not have a sound basis for deciding how much to spend, and what and where to spend it. There is an urgent need to put the analysis on a sound economic footing.
10. Worse still, the EA's methodology can create perverse incentives. The consequences of the physical most "at-risk" approach are considerable in determining the incentives created for house building and other developments. The EA's methodology has a perverse incentive at its core: if buildings are placed at high-risk flood locations, they will be prioritised for flood defence, since they will be the most "at-risk". Given this obvious consequence, the EA provides advice to planners on proposed new developments. However this is *advice*, not prohibition, and if the advice is either not given, or is rejected, the EA should then - on its own methodology - prioritise these new properties for flood risk mitigation.
11. House building affects flood risk even if these are in directly "at-risk" areas. The reasons are obvious: new developments typically reduce the ability of land to absorb and hold rainwater. It matters greatly where the 200,000 new homes per annum are built.
12. House building location can be further perversely incentivised by flood risk insurance and emergency funding. Providing insurance below the true costs of the risk insured leads to adverse site selection. Put another way, if new house-owners faced the full costs of both flooding to themselves, and flooding risk increases to others, far more attention would be paid to the location of new housing. FloodRe is the latest example of the deliberate attempt to cross subsidise poor risk locations – on a voluntary basis.

13. Emergency funding to help households recover from flood events is an obvious response to the distress and damage caused to those whose houses are inundated. Many have little spare financial resources, and insurance claims and payments and repairs take time. It replicates other emergency situations – for example, bailing out retail depositors in banking crises.
14. Yet emergency aid creates both moral hazard and encourages the selection of inappropriate locations. In the absence of any such support, and with insurance priced at full risk cost, houses would not be built in areas at serious risk. Flood plain developments would simply not happen as a consequence of the true costs of flooding risk being priced into houses.
15. There is a significant difference between existing houses and the obvious distress and hardship caused to them by floods, and the treatment of new housing developments. Existing houses cannot be easily moved to better locations. New houses can be put in better places. In the absence of the appropriate private incentives based on the true risk costs, the alternative is proper planning, based upon the spatial choices as if the developer faced the true economic costs.
16. The need for such explicit planning regulation is all the greater as the government targets a major house building programme. This reflects the increase in single and low occupancy housing demand, and the scheduled population rise of around 10 million over the next two decades or so (a more than 20% increase in the total population). The major infrastructure developments (in addition to the house building programme) add to the flooding risk and the importance of spatial planning. In combination, this is potentially the largest scale allocation of land for many decades. The scale is awesome.
17. The planning system does not currently properly internalise these true costs of locational decisions. The result is that new houses and other developments are being built in the wrong places, and once built will present a long term and continuing flood management problem.

18. To add to the failures to incentivise appropriate locational decisions for house builders, agricultural incentives are also inconsistent with efficient flood defence.
19. Agriculture takes up most of the UK's landmass, and it is both a major cause of increased flood risks and a major potential means to alleviate these risks. Yet agricultural policies and the associated subsidies pay little or no attention to the flood risk dimensions. Some particular examples include: the much greater exposure to rapid run off from the planting of maize; the soil erosion of such crops; the importance of pasture and grasslands on river margins; the burning and encroachments on heather moorlands; and high stock grazing densities.
20. The farming practices of the upper reaches of river catchments are especially important in determining flood risk. These are also typically the most highly subsidised types of farming, with the lowest agricultural yields. Thus the costs to outputs of adapting practice are lowest, yet they have the highest benefits in reducing flood risk by holding water. They typically also have the greatest value in natural capital for recreation, leisure and biodiversity.
21. In the Somerset Levels case, the changing farming practices directly contributed to the silting of the two main rivers, and there were demands for dredging to deal with the consequences. Upstream farming practices have contributed to the more recent flood events too.
22. Step one is to urgently replace the EA's current appraisal methodology with one based on economics, and thereby shape the incentives for house building and agricultural practices. Flood defence then becomes an integral part of the economics of (natural) river catchments.

The flood balance sheet and flood finances

23. Having worked out how much flood defence of what kinds is needed on a catchment basis, and incorporated incentive-compatible planning and the redirection of some agricultural subsidies, the second step is to put together an assets register of flood defence investments, and to create a

balance sheet. This is precisely what the water industry has had to do, following privatisation, and what every other privatised utility does too. Unless you know what assets you have got, and the state the assets are in, it is not possible to plan efficiently.

24. The utilities can borrow against their assets – as long as the debt and equity liabilities do not exceed the asset values. This holds true whenever an asset is added which has a positive net present value (NPV).
25. The reason this works in the utilities, and therefore they can invest in the optimal assets, is because they are guaranteed a revenue stream to remunerate them. They have regulated asset bases (RABs).
26. For somewhat obscure reasons connected with the botched first attempt at water privatisation in the late 1980s, whilst water companies followed this path – and have as a result been able to make substantive investments to improve water infrastructure – flood defence was split from the water authorities and placed in a public sector agency, the National Rivers Authority (NRA), which subsequently morphed into the EA.
27. The result has been that the flood defence costs of a river catchment are – unlike the water and sewerage costs of the river catchments – not socialised into regular utility bills. In retrospect, this was probably a mistake – splitting out dimensions of the river catchment system management reduced coordination incentives.
28. The NRA and the EA have as a result relied upon *pay-as-you-go*, Treasury grant funds to a considerable extent, though these have now been augmented by an extraordinarily complicated supporting structure of revenue flows. (For an insight, Figure Eight of the 2011 EA paper referred to above gives a flow chart on page 40). This is in contrast to the *pay-when-delivered* model for water.
29. The creation of a flood asset balance sheet for each river catchment is a necessary condition for *pay-when-delivered* investments, and the supporting borrowing.
30. The additional advantage of a balance sheet approach is that it helps to identify capital maintenance – to keep the assets in good order. In the

water case, assets are treated as “in perpetuity” and hence they are not depreciated. Instead they are subject to current cost accounting. Given the expected life of major flood defence assets – be they upstream environmental land managements of moorlands, flood plain meadows or physical barriers – this is also the right approach for flood defence.

31. Given that the revenue stream is no longer socialised in water utility bills and given the river catchment rather than local government spatial dimensions, the balance sheet approach raises a question which cannot be avoided if flood defence is to be optimally provided: where will the money come from?
32. Notwithstanding the search for lots of new “partnerships”, local authority and additional and diverse revenue sources, there are just three possible main answers: the taxpayers; a river catchment charge (like water bills); and insurers and developers.
33. *Taxpayer funding* has many advantages. The government’s cost of capital is very low, and it can provide flexibility – for example now in the Cumbrian and northern floods, and in emergency aid to the Somerset Levels in 2013/14.
34. The disadvantages are well known. Governments are widely regarded as incapable of making *credible* long-term commitments to future funding, and when they try to do so, the private sector demands high returns in response to the perceived lack of political credibility in such commitments. PPP and PFI schemes are examples, which reveal this lack of credibility. Funding is part of the general envelop of public expenditure and has to sit within deficit targets. Adverse economic circumstances lead to the possibility of short-term cuts.
35. It is extremely unlikely that any government will solve this problem which has bedevilled public sector investment for at least half a century. Many officials and many politicians have tried to. None has succeeded, and this suggests the problem is generic and not a flood-specific issue.
36. The second route is a *flood utility charge*, levied largely on a river catchment basis. This would follow the definition of the water and sewerage companies, and it would probably be most efficient to add this

to the water bills, though it could be raised as a separate flood levy. The latter would require a separate customer register and all the costs that go with this. On the other hand, locational variance could be made very specific to risk and more fine grained risk categories. The EA's flood risk maps are a potential tool to this targeting of levies.

37. The third route – *insurance* - is at best a partial one. The industry could use its charge base to direct funds towards the reduction of risks. It could do this directly, or it could offer different premia to householders on the basis of the risk avoidance measures they might take. These might include not just physical barriers to water coming into their houses, but green roofs (as in the Netherlands), tiled rather than carpeted floors and at the limit downstairs areas which can be flooded without significant property damage. An additional pressure might come on water companies to reduce the risk of foul flooding through better management of sewerage.
38. Of these three options, the first has clearly and demonstrably failed to deliver optimal flood defences – not just in the recent floods, but over several decades. The second and third are complimentary. Some element of insurance contribution has an obvious incentive-compatible characteristic. But insurance contributions are likely to be limited and far below the required revenue. That leaves a levy – either directly or via water bills or Council Tax. Of these, water bills are likely to be the most efficient, but there may be greater transparency in fine-tuning the levy if it is on a stand-alone basis.
39. The reason why politicians have shied away from the levy approach is that the voters appear to be resistant to what will be perceived as a new and additional tax. Yet this is an illusion: getting taxpayers to pay or catchment house owners will make little practical difference if the costs are socialised within the catchment systems, and if they are not, then the taxpayer route further institutionalises the idea that others should pay.
40. In practice, the taxpayer route is unlikely to produce the required long term funding. Thus opposing a levy is in reality a demand for the status quo to be continued, howbeit with a bit more Treasury grant. It simply

does not match the need and condemns the system to seriously and permanently sub-optimal flood defences.

Institutional and regulatory structures

41. Step three requires a fundamental restructuring of the institutional architecture, which was created as a result of two serious policy mistakes in the late 1980s and the early 1990s. These were: the way in which the NRA was split from the water authorities at privatisation; and the cobbling together of the NRA, HMIP and various waste bodies to create the EA. These two mistakes have haunted the management of river catchments and flood defence ever since, and in the case of the EA led to a number of serious management problems at the NRA and then the EA.
42. Though the EA could in principle administer a utility-style level system, have a balance sheet, and borrow for a pay-when-delivered system of finance, it would be a very different organisation.
43. The EA was created with the explicit purpose of providing “Integrated Pollution Control”. Yet because of the political and departmental squabbles at the time of its creation, it ended up being a merger of the NRA, HMIP and various waste bodies. Because the NRA at the time had over 6000 staff, and HMIP much less, and because of the sheer scale of the operational demands of the NRA activities, it ended up being a conglomerate dominated by water and floods. The widely recognised result has been an often poorly managed and poorly focussed organisation.
44. Unfortunately in the recent Triennial Review of the EA, the opportunity to create a smaller, more tightly focussed Environmental Protection Agency, sheared of its operational activities, was missed.¹The recent flood gives a further opportunity to rethink this error, and to create a separate flood defence body.

¹ See Helm, D. R. (2013) Triennial Review of the Environment Agency and Natural England. Available from : <http://dieterhelm.co.uk/node/1413>

45. A separate flood defence body, with a balance sheet and borrowing capacity, was contemplated in the discussions leading up to the first National Infrastructure Plan in 2010. The suggestion was that a new floods body would be created as a utility, with a utility-style RAB and the associated regulatory arrangements. This could be a single national body, or on a catchment basis.
46. A new floods utility would not necessarily be a private company. It could be state-owned, though it might need a company structure so that it could be subject to the normal accounting and legal frameworks, and have a balance sheet separate from that of the Treasury.
47. The ownership issue is therefore secondary, and turns on the issues of efficiency, incentives and public acceptability.
48. The problem of coordinating between the various organisations within river catchments would remain. In particular, there is a need to coordinate water, sewerage, agriculture and land use, planning and flood defence. Local initiatives, upstream projects, and a host of other contributions will all feature in arriving at efficient solutions. Decentralisation and localism require a supporting overarching framework.
49. In a separate paper, I have proposed a *Catchment System Operator* model and an overarching *Catchment Plan*.²
50. The floods utility could be a “big” or “small” organisation. This turns on whether it carries out the works itself – asset management, flood monitoring and information, project developments and so on – or contracts out to others – for example, water companies, contractors, environmental organisations, land managers and other specialist bodies.
51. A floods utility approach could go all the way, back to the original water authorities pre-privatisation, and pre- the splitting of the NRA and the water and sewerage companies (created as a result of that split).

² See Helm, D. R. (2015). *Catchments Management, Abstraction and Flooding: the case for a catchment system operator and coordinated competition*. Available from: <http://www.dieterhelm.co.uk/node/1405>.

52. The merged model has both more and less attraction in the presence of a Catchment System Operator, since it is the CSO that determines the optimal catchment investments, and can use competitive tendering to get works done.
53. It is also a question of urgency and timing. Whilst the EA may argue that now is not the time to break it up, since investment is urgent, in practice this is spurious. Now is precisely the time, and if it is urgent then the water companies have the capability and scale – as well as access to borrowing and financial markets – which the EA patently does not, and arguably never will. Under the CSO, there would be lots of opportunities for competitive bidding and new players from across the spectrum – from water companies to wildlife organisations, farmers and many others.

A proposed way forward

54. *The most important single step to be taken now is an explicit recognition that the status quo is not only unsustainable, but is never likely to be sustainable.* The worst reaction to the current floods crisis would be more of the same – a bit more emergency funding, and a bit larger EA budget.
55. A radical rethink starts with working out what an optimal flood defence system would look like. The EA has never carried out this exercise, and its appraisal techniques are not designed to do so. They are aimed at physical risks. Economics, and economic assessment, has unfortunately been largely alien to the EA's approach to flooding. There has never been a full comparative efficiency audit of its performance, such as those to which the water companies are regularly subjected.
56. The second step is to recognise that *pay-as-you-go* in the public sector will always be subject to wider and shorter-term fiscal constraints. The CSR process will never deliver the appropriate funding. The right approach is *pay-when-delivered*, with borrowing financing investment. This requires a floods balance sheet.

57. The floods balance sheet should include the assets and identify the capital maintenance requirements. The liabilities are the borrowings to finance the assets.
58. The revenue to support the investments can come from taxpayers, but in practice this defaults to the current CSR-type approach. It is simply not credible as a route towards a more optimal set of assets. If taxpayers continue to provide the revenue, then the status quo is likely to be the outcome.
59. Some form of floods levy should be applied at the catchment level. The options are a floods levy, an addition to water bills, or insurance contributions. Since the risks are at the system level for the catchment as a whole, it follows that some degree of socialisation of the costs is inevitable, and there is obvious scope to add wider social considerations into the calculation of levy – as happens with water bills now.
60. Flood defence should be split out from the EA, and new flood defence companies created on a catchment basis (within a single overarching structure or replicating the catchment model that the NRA inherited from the water authorities pre-privatisation).
61. The new structure should be corporate, and could be in the private or public sectors. The crucial points are: the ability to borrow; the requirement for a risk register; and the requirement to trade solvently.
62. The creation of Catchment System Operators renders the question of integration with existing water companies and coordination a secondary issue. Practicality points to a full reintegration, but this is not an essential part of the model advocated in this paper.

Conclusions

63. The government now has an opportunity and a choice. It can muddle on with the existing model and add some immediate “sticking plasters”. It can increase the funding and try to improve the EA’s modelling and management. Or, it can seize the opportunity to radically rethink and restructure flood defences in the UK. If it takes the former route,

ministers will need to keep spare sets of wellington boots at the ready for future flood emergencies and crises, and householders can expect more scenes like those in the Somerset Levels, in Cumbria, York and elsewhere to reoccur – again and again. If it takes the later route it can sort out flood defences for a generation. In the process, it could provide a viable long term funding model. For good measure, it could adopt the Catchment System Operator model, increase competition and efficiency in project development and asset management, and it could make the EA a much more focussed Environment Protection Agency. The latter is what the government should do – urgently.