

Internal Drainage Board Beneficiaries and Performance Indicators (Annexes)

Final report FD2659

January 2015

Joint Defra / Environment Agency Flood and Coastal
Erosion Risk Management R&D Programme

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A report of research carried out by Risk & Policy Analysis, on behalf of the Department for Environment, Farming and Rural Affairs

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Annex 1: Information collected from the stakeholder engagement platform

1. Aim of the stakeholder engagement platform

The stakeholder engagement platform forms an online discussion web-site that can be used to post questions and provide background information on the study. The main advantage is that it allows IDBs an opportunity to provide their views and comments in their own time without the need to travel. It also means that the engagement can be developed over time in response to questions and comments from IDBs.

2. Invitations to join the platform

Email invitations were sent to 43 IDB clerk/chief executives. One was returned undelivered and we have been unable to find an alternative email address to date. This means that 42 emails were delivered with invitations to join the stakeholder engagement platform.

3. Response rates

To date (12 September 2012), a total of 32 people have joined the platform. However, this includes members of our project team and the Steering Group and 18 of the people signed onto the site are from IDBs. There are also three anonymous members, who have not provided any details.

4. Interests and concerns

After the initial sign-up page, people are asked to input their interests and concerns. This is optional and the user can enter as many (or as few) interests as they like. Table 4.1 provides the main entries and the number of people agreeing with them (here only additions from IDB representatives are included). The number agreeing is the number of people who have highlighted a 'shared' interest. This may not always reflect all those who have that interest or agree with a comment because people that have signed up earlier may not have seen the interest.

Table 4.1: IDBs	
Interest/comment	Number agreeing
The wider benefits they bring	7
The services they (IDBs) provide	5
Drainage	5
Their role in community	4
Environmental benefits/issues	3
Give value for money	4
Differences between IDBs	3

Table 4.1: IDBs	
Interest/comment	Number agreeing
Flood protection	3
Partnership working/little credit for partnership working	2
Their accountability	3
Understanding local and national drivers	2
Understanding stakeholders needs	2
Adaptive capacity	1
Identifying synergies/common objectives	1
Indicators	2
Integrated solutions	3
National policies	1
Role within FCERM strategy	1
Similarities of IDBs	1
Sustainability	1
Water level management	3
Catchment boundaries not political	2
Adapt service to local needs	2
Development control	1
Consenting and enforcement	1

Table 4.2: Interests and concerns of IDBs now	
Interest/comment	Number agreeing
Little understanding of value of IDBs	7
FDGiA funding/funding	4
Still too many small IDBs	3
Lack of basic KPIs for industry	2
Partnership working/little credit for partnership working	2
Regulations affecting works	3
Accounting for adaptive capacity	1
Asset evaluation	1
Best value for money	1
Flood insurance	1
Flood resilience	1
Lack of synchronised funding streams	1
Real value for money	2
Restrictions to delivering wider service	1
Service delivery	3
Water level management	1
Too much process stifles delivery	1
SAB delivery and funding	1
LLFAs inexperience of FCERM	1
Planning and growth agendas	1
Governance	1

Table 4.3: Future concerns of IDBs	
Interest/comment	Number agreeing
Little understanding of value of IDBs	7
Government policy	5
Implications of climate change	4

Table 4.3: Future concerns of IDBs	
Interest/comment	Number agreeing
Stability of national policy	3
FDGiA funding	3
Stability of funding	4
Maintaining local stakeholder input	1
Obstacles to widening IDB functions	2
EA withdrawal from maintenance	1
CFMPs and Local Strategy objective	1
Water Framework Directive obligations	1
LAs commitment to FCERM	1

Table 4.4: Geographical regions of interest (including area for those with no interests)	
Interest/comment	Number agreeing
Lincolnshire	8
Yorkshire/North Yorkshire	6
Kent	2
Norfolk	2
Suffolk	2
Bedfordshire	2
Cambridgeshire	2
Cumbria	1
Gloucestershire	1
Buckinghamshire	1
Milton Keynes	1
Northamptonshire	1
Hertfordshire	1
Oxfordshire	1

Table 4.5: Wider interests in this study	
Interest/comment	Number agreeing
Value for money of IDBs	6
Ecosystem services	3
Balanced scorecard for IDB industry	3
Efficiency of IDBs	3
Partnership working	3
SSSI and environmental issues	2
Water level management	3
Best practice	2
Sustainable/integrated solutions	2 (emphasis)
Ensuring SUDs function in the future	1
Costs – financial and other	1

Table 4.6: Other comments	
Interest/comment	Number agreeing
A stable industry for IDBs	5
National policies	3
Partnership working	3
Catchment management	1

Annex 2: Questionnaire results

1. Aim of the questionnaire

The questionnaire was designed to elicit views of Internal Drainage Boards (IDBs) on:

- the need for a methodology to assess benefits provided by the activities of IDBs;
- the types of tools and methods that IDBs currently use and which they find most useful;
- the types of benefits that are most and least relevant to them; and
- possible short-cuts in the assessment of benefits that could make an approach more practical and cost-effective.

2. Invitations to reply to the questionnaire

Email invitations were sent to 42 clerks covering 129 IDBs. This was combined with invitations to join the online discussion forum. Initially the link to the questionnaire was only available from the online discussion web-site, but this was subsequently added to reminder emails to encourage people to fill in the questionnaire.

3. Response rates

A total of 17 responses to the questionnaire have been received, equivalent to a response rate of 40% (in terms of number of IDB groups/consortia, etc. contacted) and 43% in terms of number of IDBs represented by the responses (total of 55).

This is a reasonable response rate (for example, when compared with response rates to the JBA questionnaire), suggesting that the results should be relatively representative of IDBs.

4. Analysis of responses

4.1 Current approaches to assessing benefits

Question 1: Do you currently assess the benefits provided by your IDB(s)?

Table 4.1: Responses to Question 1 (number of respondents = 15)		
Response	Number agreeing	Percentage
Always	4	27%
Often	4	27%
Occasionally	6	40%
Rarely	1	7%
Never	0	0%
Don't know	0	0%

Question 2. Do you think that a method to assess the benefits provided by your IDB(s) is needed?

Table 4.2: Responses to Question 2 (number of respondents = 16)		
Response	Number agreeing	Percentage
Definitely, this is a real gap	3	19%
Probably, there may be some advantages	4	25%
Possibly, but I need to know more about what is needed and why	7	44%
No	2	13%
Don't know	0	0%

4.2 Tools and methods

Question 3. Which of the following tools and methods are you aware of and which do you use generally, or for assessing benefits?

Table 4.3: Responses to Question 3 (number of respondents = 16)						
Response	Aware of		Use generally		Use for assessing benefits	
	No.	%	No.	%	No.	%
GIS	3	12%	9	41%	3	30%
Web-based mapping (Google Earth, OS data)	3	12%	7	32%	2	20%
FCERM-AG	9	35%	1	5%	2	20%
Multi-Coloured Manual/Handbook	7	27%	3	14%	1	10%
Ecosystem services	4	15%	2	9%	2	20%

Other responses:

- local knowledge;
- delivery of reducing flood risk is primary, detailed assessment of benefits must be secondary;
- this would depend on what benefits need to be assessed; and
- ratepayer satisfaction, cost analysis, VFM, cost comparisons with similar sized Boards.

Question 4. Which tools and methods do you find most useful?

Table 4.4: Responses to Question 4 (number of respondents = 16)		
Response	Number agreeing	Percentage
GIS	14	47%
Web-based mapping (Google Earth, OS data)	8	27%
FCERM-AG	3	10%
Multi-Coloured Manual/Handbook	4	13%
Ecosystem services	1	3%

Other responses:

- Bespoke Asset Management System;
- ONS website; and
- 2006 IDB Review.

Question 5. Which tools and methods would you like to see used for assessing benefits?

Table 4.5: Responses to Question 5 (number of respondents = 16)		
Response	Number agreeing	Percentage
GIS	11	65%
Web-based mapping (Google Earth, OS data)	6	35%
FCERM-AG	4	24%
Multi-Coloured Manual/Handbook	4	24%
Ecosystem services	3	18%
None, I don't believe that benefits need to be assessed	1	6%
Don't know	1	6%

Other responses:

- local knowledge;
- delivery of reducing flood risk is primary, detailed assessment of benefits must be secondary;
- this would depend on what benefits need to be assessed; and
- ratepayer satisfaction, VFM, comparison costs with other Boards.

4.3 Benefit categories

Question 6. Benefits to be included (managing nature and resources). Which of the categories below do you think are most relevant to your IDB(s) and which are irrelevant?

Table 4.6: Responses to Question 6 (number of respondents = 16)										
Response	Relevant		Possibly relevant		Probably irrelevant		Definitely irrelevant		Don't know	
	No.	%	No.	%	No.	%	No.	%	No.	%
Carbon sequestration and storage in soils, wetlands, etc.	4	27%	5	33%	2	13%	3	20%	1	7%
Waterlogging, flooding, erosion (properties, infrastructure, transport, etc.)	15	100%	0	0%	0	0%	0	0%	0	0%
Control of pests, diseases and invasive species	8	53%	7	47%	0	0%	0	0%	0	0%
Pollination	4	27%	5	33%	3	20%	2	13%	1	7%

Table 4.6: Responses to Question 6 (number of respondents = 16)										
Response	Relevant		Possibly relevant		Probably irrelevant		Definitely irrelevant		Don't know	
	No.	%	No.	%	No.	%	No.	%	No.	%
Soil quality	8	53%	3	20%	4	27%	0	0%	0	0%
Air quality	1	8%	2	17%	6	50%	3	25%	0	0%
Water quantity	13	87%	2	13%	0	0%	0	0%	0	0%
Water quality	10	67%	4	27%	0	0%	1	7%	0	0%

Question 7. Benefits to be included (production of goods and services).
Which of the categories below do you think are most relevant to your IDB(s) and which are irrelevant?

Table 4.7: Responses to Question 7 (number of respondents = 16)										
Response	Relevant		Possibly relevant		Probably irrelevant		Definitely irrelevant		Don't know	
	No.	%	No.	%	No.	%	No.	%	No.	%
Production of grown food	13	87%	1	7%	0	0%	1	7%	0	0%
Collection of natural food (hunting, shooting, wild food)	8	53%	1	7%	4	27%	2	13%	0	0%
Production of energy	7	47%	5	33%	1	7%	1	7%	1	7%
Production of natural medicines	0	0%	3	20%	9	60%	1	7%	2	13%
Production of timber, fibre, aggregates, peat, etc.	6	40%	7	47%	1	7%	1	7%	0	0%
Biodiversity	12	80%	3	20%	0	0%	0	0%	0	0%
Production/provision of water (abstraction)	13	87%	0	0%	1	7%	1	7%	0	0%

Question 8. Benefits to be included (social, cultural and employment benefits).
Which of the categories below do you think are most relevant to your IDB(s) and which are irrelevant?

Table 4.8: Responses to Question 8 (number of respondents = 16)										
Response	Relevant		Possibly relevant		Probably irrelevant		Definitely irrelevant		Don't know	
	No.	%	No.	%	No.	%	No.	%	No.	%
Health and well-being of people	12	80%	2	13%	1	7%	0	0%	0	0%
Health and well-being of community(ies)	13	87%	1	7%	1	7%	0	0%	0	0%

Table 4.8: Responses to Question 8 (number of respondents = 16)										
Response	Relevant		Possibly relevant		Probably irrelevant		Definitely irrelevant		Don't know	
	No.	%	No.	%	No.	%	No.	%	No.	%
Level of involvement in decision-making	12	80%	2	13%	0	0%	1	7%	0	0%
Personal and property rights	9	60%	4	27%	2	13%	0	0%	0	0%
Landscape character	9	60%	5	33%	1	7%	0	0%	0	0%
Heritage values	10	67%	3	20%	2	13%	0	0%	0	0%
Religious/spiritual values	0	0%	5	33%	3	20%	6	40%	1	7%
Knowledge and education	6	40%	7	47%	1	7%	1	7%	0	0%
Aesthetic appreciation and inspiration	1	7%	11	73%	1	7%	2	13%	0	0%
Recreation and tourism	8	53%	6	40%	0	0%	1	7%	0	0%
Jobs directly provided by IDB	10	67%	3	20%	2	13%	0	0%	0	0%

Other responses:

- local knowledge of problem areas and facilitation;
- impacts on protected areas and other government obligations (e.g. Water Framework Directive); NB. Waterlogging and flood risk should probably be separate;
- the above headings are wide and cover a multitude of potential benefits. They are therefore catch alls or possibly, too wide to be of any real help;
- wider stakeholder engagement, Wildlife Trusts, local community interest, etc.; and
- other stakeholders i.e. RSPB, NE, Flood Risk Partners.

Question 9. There are a lot of categories above. Which of the following ways of making the assessment of benefits quicker and easier do you think would be useful?

Table 4.9: Responses to Question 9 (number of respondents = 16)		
Response	Number agreeing	Percentage
Having a core set of a small number of categories that every IDB assesses, with another set that each IDB can choose to include or exclude depending on their specific circumstances	5	29%
Just having a small set of categories that all IDBs use as that would be more comparable	8	47%
Using GIS or web-based mapping tools to identify which benefit categories are relevant	5	29%
Starting with a quick assessment of likely significance of each benefit category, and only focusing on the most	7	41%

Table 4.9: Responses to Question 9 (number of respondents = 16)		
Response	Number agreeing	Percentage
significant ones		
Only having to describe the benefits (not quantify them or assess the benefits in terms of money)	2	12%
Only having to describe and quantify the benefits (not having to assess them in terms of money)	1	6%
Having default numbers or values for each benefit category that can be used to give a quick indication of the likely benefits, that each IDB can build on depending on how much data they have and how much uncertainty they are comfortable with (similar in some ways to the 'quick' approaches in the Multi-Coloured Manual)	0	0%
Don't know	1	6%

Other responses:

- the distribution of IDBs will make a set of core categories difficult to determine;
- a light touch assessment should be adopted to maximise delivery;
- this would depend on the benefit being assessed;
- poor question choice, some IDBs will not participate if options to exclude are offered. there is no question that reviews the IDB area and tries to ascertain what percentage of work is undertaken in urban areas compare to rural areas and how this correlates with income raised. There is nothing on administration costs particularly in relation to larger IDBs that employ direct staff. a number of these pay Clerks/CEO and Engineers quite handsomely including final salary pension schemes;
- not relevant to our small IDB;
- this is a difficult question to answer...need a simple approach; and
- costs must be assessed (VFM).

4.4 Further involvement

Question 10. One of the tasks of our study is to test the tools and methods on a small number of IDBs. Would your IDB be interested in being involved in these tests?

We'll have to choose IDBs with very different characteristics and locations, so we can't guarantee that you'll be selected. We'll also need to work with you during the test, using the data you have available and getting your views on what we've done, so we'll need some input from you to make sure we get the best results.

Table 4.9: Responses to Question 9 (number of respondents = 15)		
Response	Number agreeing	Percentage
Yes, we'd be interested; please tell us more about what is needed	6	35%
Not sure, we'd need to know more before we can commit to being involved	7	41%

No thanks, not at this time.	2	12%
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Question 10a. Please enter the name of the IDB(s) that we can contact to discuss involvement in the tests

- Details provided for six IDBs

Question 10b. Please enter the name of your IDB(s) and a brief summary of any additional information you would like

4.5 Other comments

Question 11. Thank you for answering these questions. Please use the box below if you have any other comments or suggestions.

- It is important to quantify benefits as far as possible - as is done for Environment Agency projects, etc. It seems a mistake to simplify more than absolutely necessary. The EA's FCERM-AG and the multi-coloured manual seem a good starting point. Ecosystem services are likely to be captured (and can easily be monetised) by the FCERM-AG handbook for environmental evaluation (Eftec, 2010). This should cover all substantial ES save drinking water quality improvements.
- We remain to be convinced of the usefulness of the Study.
- Anything that will require 'buy in' from the board will require to be placed in front of a board meeting for resolution but officers happy to assist as far as possible
- We would like to know what the objectives are, as we sincerely believe we offer excellent value for money to the community and are respected in our field.
- There seems little drive to develop key performance indicators. Was this work not covered by the detailed report following the JBA review of IDBs in 2006?
- One way of improving the performance of our systems is for the main rivers to be properly maintained by the EA.
- Who is analysing this data and to what purpose?
- It is an excellent idea to have a standard format whereby IDBs can measure their performance and quantify the benefits to stakeholders. However, by their nature IDBs vary remarkably e.g. pumped and or gravity systems and the measurement of performance should reflect this. In addition, I believe it is important to include some quantitative measurement and to this end stakeholders could get involved in a (simple) feedback process. It would also be interesting to see other organisations which interact with IDBs, such as the EA and highways authority etc. assessed in a similar way.

Annex 3: The Approach to Selecting Core and Optional Categories

A3.1 Overview of different types of framework

There are many frameworks and tools which have been developed to monitor and assess the benefits of different policies and courses of action. A review of these frameworks indicates the types of benefits which are considered. Some frameworks start with a whole list of potential benefits and work through these, ticking off the benefits which are actually found. For example, an ecosystem services framework has been used to look at the benefits of green infrastructure (including wetlands, woodlands, heathlands and grassland) (see Hoelzinger, 2011). Ecosystem services are generally divided into four types¹:

- provisioning services (e.g. supply of food, fibre and fuel);
- regulating services (e.g. climate regulation, water purification, disease regulation, etc.);
- cultural services (e.g. recreation, aesthetics, etc.); and
- supporting services (e.g. soil formation, nutrient cycling, maintenance of biodiversity).

The different services are not necessarily distinct; supporting services generally contribute towards other service categories. For example, nutrient cycling overlaps with erosion regulation (a regulating service), whilst maintenance of biodiversity is picked up in genetic resources (a provisioning service). For this reason, when using an ecosystem services framework to determine monetary values for sites, supporting services should be excluded to avoid double counting (Kettunen et al, 2009).

International work on ecosystems includes the Millennium Ecosystem Assessment which was initiated in 2001. This aimed to assess the consequences of ecosystem change for human wellbeing, as well as the scientific basis for action to ensure conservation and sustainable use of ecosystems². At the UK level, the National Ecosystem Assessment used an ecosystems approach to look at the state of the natural environment. It considered all services in terms of the final service provided (e.g. water supply, crops, climate regulation, etc.) to help avoid double counting between several services which may contribute towards the same good/asset (UK NEA, 2011). Broad habitat types (such as woodlands, freshwaters – openwaters, wetland and floodplains; coastal margins, etc.) were used to classify ecosystems and determine which services were being provided. Ecosystem service flows were then valued where possible and described where monetisation was not practical (for example, when looking at health and shared social values) (UK NEA, 2011).

Prior to the UK NEA, there were already attempts to bring an ecosystems approach into policy making. Indeed, the Government produced an Ecosystems Approach Action Plan in 2007, followed by an update (Delivering a healthy natural environment) in 2010³. The approach has subsequently been used in many other studies across the UK. Case studies which have used an ecosystem services framework have identified benefits in addition to those in the generic list of categories. To ensure that these additional benefits or impacts are included, they

¹ See Ecosystem Services (<http://www.ecosystemservices.org.uk/ecoserv.htm>).

² See Millennium Ecosystem Assessment (<http://www.maweb.org/en/About.aspx#>).

³ See the Defra Internet site (<http://www.defra.gov.uk/environment/natural/ecosystems-services/>).

have been added as addendum services, specific to the location being considered. Examples include the resilience of salmonid stocks and increased estuarine resilience. Using such an approach enables the application of a generic framework whilst ensuring that it is flexible enough to be used in situations where particular benefits require highlighting.

Other frameworks such as the FCERM appraisal guidance begin with potential impact areas. Here the categories are divided into economic, environmental and social benefits, rather than being linked directly to ecosystem services, with the focus on how damages from flooding or erosion are reduced or avoided. A further example is given by a study which looks at the role of ecosystem services and green infrastructure in the economic development of the Bassenthwaite catchment in the Lake District. This study assesses the environment against 11 economic benefit areas (see Rebanks Consulting Ltd, 2010). It then considers the ways in which these economic benefit areas are affected by the environment, with the aim of making the link between ecosystem services and economic development. Valuation is attempted through the use of GVA (Gross Value Added), however, it is acknowledged that there are other potentially more appropriate ways of measuring the benefits of ecosystem services (Rebanks Consulting Ltd, 2010).

Further differences of approach between frameworks relate to whether the benefits or impacts are assessed on a benefit by benefit basis, or whether they are recorded by feature or habitat. For example, a particular type of habitat may be associated with particular services or benefits. In such instances, the assessment focuses on determining the extent of each type of habitat or feature, and then determining the overall level of benefit or service provision. In such cases, it is important that any goods and services provided are linked to beneficiaries; Kettunen et al (2009) note that ecosystem services and their related benefits are defined by users. Thus, there is no service unless there is a beneficiary who may be human or even another species (other species are likely to be relevant when considering biodiversity and designated conservation sites). Where there is no current beneficiary, but there may be one in the future, the service is known as a potential service. A change in circumstances or conditions may result in a potential service becoming an actual service (Kettunen et al, 2009).

A3.2 Long list of potential benefits

The review of frameworks resulted in a range of benefit categories. These categories have been mapped against the ecosystem services considered in the UK National Ecosystem Assessment (see Table A3.1). It should be noted that different studies often use slightly different terminology to describe what is effectively the same impact category. Thus, it is important that any categories ultimately carried forwards for use in the tool are clearly defined and easily understood.

Table A3.1: All Categories from Review of Documents	
Service	Specific category
Climate regulation and carbon emissions	Carbon emissions
	Carbon sequestration and storage by habitat
Hazard regulation (protection	Residential properties at risk

Table A3.1: All Categories from Review of Documents

Service	Specific category
from flooding/erosion)	Business properties at risk
	Infrastructure - care homes at risk
	Infrastructure - electricity generating stations and substations at risk
	Infrastructure - gas works at risk
	Infrastructure - hospitals at risk
	Infrastructure - local authority depots at risk
	Infrastructure - oil refineries at risk
	Infrastructure - police, ambulance, fire stations at risk
	Infrastructure - pylons, cables, pipelines at risk
Hazard regulation (protection from flooding/erosion)	Infrastructure - schools at risk
	Infrastructure - sewage treatment works (STW) at risk
	Infrastructure - telephone exchanges at risk
	Infrastructure - village halls at risk
	Infrastructure - water treatment works (WTW) at risk
	Transport - road at risk
	Transport - railway at risk
	Transport - air transport assets at risk
	Transport - water (sea, estuary, rivers, canals) assets at risk
Disease and pest regulation	Control of invasive species
Pollination	Pollination
Noise regulation	Noise levels
Soil quality regulation	Soil quality
Air quality regulation	Human health
Water quantity regulation	Water quantity
Water quality regulation	Water quality
Food, fibre and energy from agriculture	Crops
	Livestock
Natural medicines	Natural medicines
Food from marine and freshwater ecosystems (including aquaculture)	Fish and shellfish
Game and wild collected food	Game and wild collected food
Honey	Honey
Timber and forest products (also wider natural resources, e.g. aggregates)	Timber and forest products (also wider natural resources, e.g. aggregates)
Peat	Peat
Ornamental resources	Ornamental resources
Genetic resources	Biodiversity as source of genetic material
	Biodiversity
Water	Water supply

Table A3.1: All Categories from Review of Documents	
Service	Specific category
Cultural identity	Community (cohesion, stability, character, services and facilities)
	Political systems
Cultural setting	Health and wellbeing (individual)
	Personal and property rights
	Fears and aspirations (community)
Landscape values	Landscape character
Heritage values	Heritage sites
Religious/spiritual services	Religious sites
Knowledge and education	Education
Aesthetic appreciation and inspiration	Aesthetics
Recreation	Recreation and tourism
Socio-economic	Jobs supported directly
	Jobs supported indirectly

To make the long list more manageable, the categories in Table A3.1 can be grouped according to three main types:

1. Managing nature and resources (similar to regulating services when using ecosystem services terminology);
2. Production of goods and services (similar to provisioning services); and
3. Social, cultural and employment benefits (similar to cultural services with the addition of two categories to capture the number of jobs supported).

Table A3.2 shows these groupings. Consideration of the table shows that there is the potential for double counting to occur if all the categories listed are assessed⁴. For example, within managing nature and resources, water quantity could overlap with waterlogging and flooding. It is therefore necessary to consider the end good or asset which the service results in. This will help ensure that any areas of overlap are only counted once.

Table A3.2: Grouping of Benefit Categories from the Long List		
Managing nature and resources	Production of goods and services	Social, cultural and employment benefits
Carbon sequestration and storage in soils, wetlands, etc.	Production of grown food	Health and well-being of people
Water levels, flooding, erosion (properties, infrastructure, transport, etc.)	Collection of natural food (hunting, shooting, wild food)	Health and well-being of community(ies)
Control of pests, diseases and invasive species	Production of energy	Level of involvement in decision-making
Pollination	Production of natural medicines	Personal and property rights
Soil quality	Production of timber, fibre, aggregates, peat, etc.	Landscape character

⁴ Note that this is unlikely since this list represents the long list and is subject to the opinion of IDBs on which categories are more or less relevant.

Table A3.2: Grouping of Benefit Categories from the Long List		
Managing nature and resources	Production of goods and services	Social, cultural and employment benefits
Air quality	Biodiversity	Heritage values
Water quantity	Production/provision of water (abstraction)	Religious/spiritual values
Water quality		Knowledge and education
		Aesthetic appreciation and inspiration
		Recreation and tourism
		Jobs directly provided by IDB
		Jobs indirectly provided by IDB activities

Feedback from IDBs who have responded to the questionnaire on benefits has been used to identify which of the categories are considered to be more and less relevant. Any category where more than 50% of respondents identified a category to be relevant or possibly relevant was initially identified as 'core'. Those categories which 50% or more thought were probably or definitely irrelevant have been excluded. Other categories were provisionally identified as optional. Table A3.3 summarises the results⁵.

Table A3.3: The Benefit Categories	
Results taking account of IDB views	
Core Categories	Optional Categories
<i>Managing nature and resources</i>	
Water levels, flooding, erosion Water quantity Water quality	Carbon sequestration and storage Control of pests, diseases and invasive species Pollination Soil quality
<i>Production of goods and services</i>	
Production of grown food Biodiversity Water supply	Collection of natural food Production of energy Production of timber, fibre, aggregates, peat, etc.
<i>Social, cultural and employment benefits</i>	
Health and wellbeing of people Health and well-being of community(ies) Level of involvement in decision-making Landscape character Aesthetic appreciation and inspiration	Personal and property rights Heritage values Knowledge and education Recreation and tourism Jobs directly/indirectly provided by IDB

The next stage was then to look for the risk of double counting between categories. This involved identifying which categories could impact on others, or be linked to others. If the link was total, i.e. changes in that category would affect the magnitude of benefits in another, the category was excluded. If the link was partial, i.e. where there could be elements of either category that could be identified as being independent of the other category, then the category was included but the definition of the category was changed to make it clear which benefits could be included. The results are provided in Table A3.4. The final list of categories that make up the benefit framework is provided in Table A3.5.

Table A3.4: Accounting for the Risk of Double Counting			
Results taking account of IDB views		Linkages and Potential Double Counting	Implications for final categories
Core Categories	Optional Categories		
Managing nature and resources			
	Carbon sequestration and storage		Taken forwards as optional category
Water levels, flooding, erosion		Linked to water quantity	Taken forwards as core category covering assets affected

⁵ There were nine completed questionnaires from IDBs, representing an estimated 45 IDBs (35% response rate in terms of IDB representation and 23% response rate in terms of number of returned questionnaires compared with the 43 clerks that were contacted).

Table A3.4: Accounting for the Risk of Double Counting			
Results taking account of IDB views		Linkages and Potential Double Counting	Implications for final categories
Core Categories	Optional Categories		
	Control of pests, diseases and invasive species	May affect production of grown food	Taken forwards as optional category covering 'control of invasive species'
	Pollination	May affect production of grown food	Excluded as captured under production of grown food, biodiversity
	Soil quality	May affect production of grown food, biodiversity	Excluded as captured under production of grown food, biodiversity
Water quantity		Linked to water quantity, production of grown food, biodiversity	Excluded as underlies delivery of most of the other services
Water quality		May affect biodiversity	Taken forwards as optional category
Production of goods and services			
Production of grown food		Linked to water quantity	Taken forwards as core category
	Collection of natural food		Taken forwards as optional category
	Production of energy		Taken forwards as optional category (where energy is for use outside IDB)
	Production of timber, fibre, aggregates, peat, etc.		Taken forwards as optional category
Biodiversity		Linked to water quantity, water quality, pollination, soil quality	Taken forwards as core category
Water supply		May affect production of grown food	Taken forwards as optional category (where water is for use outside IDB)
Social, cultural and employment benefits			
Health and wellbeing of people		Linked to waterlogging, flooding, erosion	Taken forwards as core category
Health and well-being of community(ies)		Linked to waterlogging, flooding, erosion	Taken forwards as core category
Level of involvement in decision-making			Taken forwards as core category
	Personal and property rights	Linked to waterlogging, flooding, erosion	Excluded as impact captured under waterlogging, flooding and erosion
Landscape character		Linked to waterlogging, flooding, erosion; biodiversity	Taken forwards as core category
	Heritage values		Taken forwards as optional category
	Knowledge and		Taken forwards as

Table A3.4: Accounting for the Risk of Double Counting			
Results taking account of IDB views		Linkages and Potential Double Counting	Implications for final categories
Core Categories	Optional Categories		
	education		optional category
Aesthetic appreciation and inspiration		Linked to landscape character, biodiversity	Taken forwards as optional category
	Recreation and tourism	Linked to waterlogging, flooding, erosion; biodiversity	Taken forwards as optional category
	Jobs directly/indirectly provided by IDB		Taken forwards as optional category

Table A3.5: The Final List of Benefit Categories	
Results taking account of IDB views	
Core Categories	Optional Categories
<i>Managing nature and resources</i>	
Water levels, flooding, erosion	Carbon sequestration and storage Control of invasive species Water quality
<i>Production of goods and services</i>	
Production of grown food Biodiversity	Collection of natural food Energy (where energy is for use outside IDB) Production of timber, fibre, aggregates, peat, etc. Water supply (where water is for use outside IDB)
<i>Social, cultural and employment benefits</i>	
Health and wellbeing of people Health and well-being of community(ies) Level of involvement in decision-making Landscape character	Aesthetic appreciation and inspiration Heritage values Knowledge and education Recreation and tourism Jobs directly/indirectly provided by IDB

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Annex 4: Guidance on use of the Benefits Assessment Toolkit

1 Introduction

1.1 What is the Benefits Assessment Toolkit?

The Benefits Assessment Toolkit comprises a benefits assessment spreadsheet with the use of other data sources to inform it. It is intended to assist IDBs in identifying the level of benefits they provide to their stakeholders. To help inform this discussion, the toolkit also identifies who benefits and, if the impacts have been estimated in monetary terms, how much they benefit.

We hope that improved data on the benefits provided by IDBs can help inform the communities they serve and potentially also inform discussions on a range of local issues..

It is important to note that the toolkit and, especially the spreadsheet, have been designed to provide an estimate of the benefits provided by *one* IDB. The toolkit has not been designed to provide a cumulative assessment of the benefits provided by all IDBs.

The toolkit is intended to be outcome-focused, not process-focused. Taking a more targeted approach will enable you to get the most out of the toolkit, by thinking about what type of information and how much detail you need from it. You should then use the toolkit to provide that type of information and level of detail. You may not need to use all the worksheets or all the suggested data sources to achieve your desired outcomes.

1.2 Aim of this guidance

This guidance provides an overview of how to apply the benefits assessment toolkit. It is not intended to be step-by-step guidance since the toolkit has been designed to draw on the existing expertise and experience within IDBs. As such, the guidance focuses on what types of information are needed, potential sources of information, how to use the information to get reasonably reliable results and the likely sources of uncertainty.

1.3 The intended audience

The audience for this guidance is those using the toolkit, especially IDBs and their members.

1.4 Level of application of the toolkit

The benefits assessment toolkit is intended to be used at a series of different levels. This means you can put as much detail in as you feel is appropriate. This could range from:

- completion of the benefits assessment spreadsheet as part of a meeting, through round table discussion based on information and knowledge within the IDB Board;

- addition of extra detail through use of readily available information, such as from GIS or mapping; or
- collection of further detail through site visits, engagement with stakeholders or investigation and research.

There is no measure of what is the ‘correct’ amount of detail. This will vary from situation to situation and from Board to Board. You are encouraged to use your knowledge and expertise to determine when you feel that you have provided sufficient information. You may also want to discuss this with your stakeholders to determine what level of information they would like.

1.5 Overview of the toolkit

The benefits assessment methodology is based on identifying the difference, measured as benefits delivered or damages avoided, between a baseline and another scenario. The most common set of scenarios is likely to be where an IDB wants to demonstrate the range and magnitude of benefits that it delivers. In this case, the baseline is assumed to be the situation if the IDB stopped all activities. Because this could result in significant land use changes, the spreadsheet has been designed based on the assessment of individual IDBs and therefore, it is not appropriate to add the benefits of assessments to provide an indication of the cumulative benefits. This is because the impacts of large land use changes across a number of IDBs, especially adjacent ones, are likely to be considerably larger than the sum of the benefits across individual IDBs. The impacts occurring under the baseline are compared against the scenario of the IDB continuing its activities as at present. The benefits assessment spreadsheet can also be used to compare other scenarios, for example:

- adaptation to climate change:
 - baseline: future situation with no adaptation; and
 - scenario: future situation with adaptation (a number of scenarios could be used to test the benefits of different adaptation measures).
- change in IDB priorities:
 - baseline: current situation with current objectives; and
 - scenario: focus on enhancing food production or enhancing biodiversity.

The benefits assessment spreadsheet uses a simplifying assumption when assessing the impacts of future changes: it ignores time. This means you need to think about what the final changes might be. This assumption introduces uncertainty because it does not take account of gradual changes in terms of damages or benefits but at the same time it means you do not have to make a series of assumptions about what might happen and when. Overall, this means you could overestimate benefits or damages that would not occur immediately, such as some permanent losses. You might also under-estimate some damages, such as where the assumption that relocation or rebuild of assets that are permanently affected means that there are no indirect damages. In reality, it is likely to take time to rebuild or relocate the assets, unless there was prior warning or knowledge that the assets were going to be permanently affected so their replacement could be planned.

In addition, it is important to remember that the methodology measures annual benefits or damages. The spreadsheet is set up so that all the impacts are given as per year values. This means that they need to be converted to Present Values (PV) through the use of discounting if you want to use them to inform capital Grant-in-Aid appraisals. You will also need to consider the implications that ignoring time has on the PV impacts, as Grant-in-Aid appraisals require damages and benefits to be linked to the year in which they occur.

1.6 Using the toolkit

As described above, the toolkit is designed to be used at a number of different levels. Table 1.1, below, identifies the type of information that you can use when assessing the benefits. The benefits assessment spreadsheet is set up similarly to an Appraisal Summary Table (AST) so you can record the qualitative descriptions and quantitative information needed for the low, moderate and high levels of detail. It also includes default values that will allow you to monetise the impacts at the 'low' level of detail. You can modify the calculation sheets within the benefits assessment spreadsheet to enable you to apply the moderate and high levels of detail during monetisation.

Table 1.1: Measuring the difference between the baseline and the current situation				
Detail		Low	Moderate	High
Quantification				
None	Baseline	Qualitative description of impacts	Qualitative description of impacts tailored to specific IDB for most important categories	Qualitative description of impacts tailored to specific IDB for all categories
	Current situation	Qualitative description of benefits of key IDB activities and indication of direction of change	Qualitative description of benefits (tailored to specific IDB for most important categories) and indication of direction of change	Qualitative description of benefits (tailored to specific IDB for all categories), indication of direction of change and likely significance
	Tools	<i>Based on existing knowledge within the IDB (staff input, published documents, etc.)</i>	<i>Additional information from other available sources (including GIS/mapping, reports, plans, etc.) for location of assets</i>	<i>New information from site visits, investigations, engagement, etc.</i>
Some	Baseline	Numbers, types, etc. affected	Numbers, types, etc. affected for the most significant/important categories only	Numbers, types, etc. affected for all relevant categories
	Current situation	Numbers, types, etc. benefiting and indication of direction of change	Numbers, types, etc. benefiting for the most significant/important categories only and indication of direction of change	Numbers, types, etc. benefiting for all relevant categories, indication of direction of change and likely significance
	Tools	<i>Based on existing knowledge within the IDB on number, area, size, etc. of assets</i>	<i>Additional information from other available sources (including GIS/mapping, reports, plans, etc.) to measure and quantify number, area, size, etc. of assets</i>	<i>New information from site visits, investigations, engagement, etc. used to measure and quantify number, area, size, etc. of assets</i>
Monetisation	Baseline	Monetary value of impacts (e.g. damages)	Monetary value of impacts (e.g. damages)	Monetary value of impacts (e.g. damages)

Table 1.1: Measuring the difference between the baseline and the current situation

Quantification		Detail	Low	Moderate	High
			for categories quantified using default numbers	quantified using numbers calculated specifically for IDB for most significant categories	quantified using numbers calculated specifically for IDB
		Current situation	Monetary value of benefits (e.g. damages avoided) for categories quantified using default numbers	Monetary value of benefits (e.g. damages avoided) quantified using numbers calculated specifically for IDB for most significant categories	Monetary value of benefits (e.g. damages avoided) quantified using numbers calculated specifically for IDB
		Tools	<i>Default/average values (e.g. weighted average annual damages)</i>	<i>Readily available benefit transfer values (e.g. Multi-Coloured Manual, EVEE Handbook⁶)</i>	<i>Specially developed values (case study specific)</i>

1.7 The benefit categories

The spreadsheet includes a number of benefit categories. Dividing the assessment into categories makes it easier to complete as you only need to think about one category at a time and how this might be affected. The categories are divided into two types⁷:

1. core categories: these are ones that are relevant to all (or almost all) IDBs; and
2. optional categories: these are ones that will be relevant to some IDBs (so you only need to complete those that are relevant to you).

The list of benefit categories for use in the benefit assessment is provided in Table 1.2. The categories are divided into three different types:

1. Managing nature and resources (similar to regulating services when using ecosystem services terminology);
2. Production of goods and services (similar to provisioning services); and
3. Social, cultural and employment benefits (similar to cultural services with the addition of a category to capture the number of jobs supported).

Table 1.2: The Benefit Categories

Managing nature and resources		Production of goods and services		Social, cultural and employment benefits	
Core	Optional	Core	Optional	Core	Optional
Waterlogging, drought,		Production of grown food	Collection of natural food	Health and wellbeing of	Heritage values

⁶ EVEE (The Economic Valuation of Environmental Effects) Handbook is a supporting document to the Flood and Coastal Erosion Risk Management Appraisal Guidance and can be downloaded from:

<http://publications.environment-agency.gov.uk/PDF/GEHO0310BSFH-E-E.pdf>

⁷ Responses to a questionnaire sent to all IDBs were used as the basis for identifying which categories are core and which are optional.

Table 1.2: The Benefit Categories					
Managing nature and resources		Production of goods and services		Social, cultural and employment benefits	
flooding, erosion				people	
Carbon sequestration and storage	Control of invasive species	Biodiversity	Energy (where energy is for use outside IDB)	Health and well-being of community	Knowledge and education
	Water quality		Production of timber, fibre, aggregates, peat, etc.	Level of involvement in decision-making	Recreation and tourism
			Water supply (where water is for use outside IDB)	Landscape character	Jobs directly/indirectly provided by IDB

1.8 Structure of the remainder of this guidance

Section 2 of this guidance introduces the terms used within the benefits assessment toolkit. Sections 3 to 7 are structured around the worksheets within the benefits assessment spreadsheet.

2 Introducing key terms

2.1 Overview

The guidance uses a number of terms that need to be explained clearly for you to understand what is required. This section provides additional explanation of those terms and can be used as a reference when you are applying the benefits assessment toolkit.

2.2 Baseline

The baseline is the projected situation that would occur under a particular set of assumptions. When identifying the benefits of IDB activities, it is suggested that the baseline be where the IDB stops all its activities. This is similar to a 'do-nothing' baseline. The baseline can be varied to estimate the benefits of other scenarios.

2.3 Current situation

Where the spreadsheet is to be used to estimate the benefits of IDB activities, the current situation is defined as the IDB continuing as at present; this could also be considered to be a business as usual scenario.

2.4 Scenario

A scenario is usually defined as a projection of the future. This means that the baseline can be a scenario where assumptions are made to project what an area might look like if the IDB stopped all its activities. As scenarios are projections of the future, there is no correct answer. All scenarios are based on assumptions and, therefore, include uncertainty in terms of what the benefits might look like and their magnitude.

2.5 Benefits category

The benefits categories are the individual types of impact, usually linked to goods or services that are provided to people. The toolkit is based on an Ecosystem Services Framework, and the benefit categories reflect the range of goods and services that the environment provides to people.

2.6 Core category

Core categories are those benefit categories that are relevant to all, or most, IDBs. The decision as to which categories have been identified as core (rather than optional) is based on responses of IDBs to a questionnaire circulated as part of this study. As the core categories are relevant to all, or most, IDBs, they need to be completed in all assessments.

2.7 Optional category

Like core categories, optional categories have been determined based on responses of IDBs to the questionnaire, and are defined as those categories that are relevant to

just some IDBs. Only those IDBs for which these categories are relevant, need to assess the impacts for these benefit categories.

2.8 Probability of impacts

Assessment of the magnitude of impacts, especially the monetary estimate of benefits, is based on the change in probability of impacts between the baseline scenario and the current situation. Ten different probability levels are included (100%, 50%, 20%, 10%, 4%, 2%, 1.33%, 1%, 0.5% and 0.1%). The probability levels are intended to capture the probability of impacts occurring in order that they reflect changes in water levels (from above ground flooding to drought), as well as impacts that are caused by changes in water levels and how these are reflected within the various benefit categories.

2.9 Beneficiary

The toolkit aims to identify the total benefits of IDBs and to then identify how these benefits are distributed across different beneficiaries. To do this, each of the benefit categories has been allocated across one (or more) of six different types of beneficiary:

- local residents (defined as those within the IDB district);
- local businesses (also defined as those within the IDB district);
- farmers/landowners;
- local authority;
- service providers;
- wider society (defined as those outside the IDB district); and
- wider businesses (also defined as those outside the IDB district).

Where benefits are allocated to more than one type of beneficiary, it is assumed that the benefits are distributed equally. For example, if there are two beneficiary types then 50% of the benefits are allocated to each, where there are three beneficiary types, then 33% of the benefits are allocated to each, and so on. This is a simplification but other allocations would have to be determined on an IDB-by-IDB basis and so would add considerably to the resource requirements of using the toolkit. Hence, it is assumed that this simplification is appropriate within the overall levels of uncertainty associated with the estimation of monetary benefits.

2.10 Direct beneficiary

Direct beneficiaries are people, assets or species who directly benefit from the service or good being provided within the IDB district. Direct beneficiaries include, for example:

- residents who benefit because their houses do not flood;
- walkers who benefit from the provision of recreation;
- farmers who benefit from provisioning services such as food crops, livestock and water supply – and also agri-environment payments for biodiversity and natural resource protection;
- operators of utilities infrastructure which is protected from flooding; and

- operators of transport infrastructure which is protected from flooding.

2.11 Indirect beneficiary

Indirect beneficiaries are people who indirectly benefit from the asset or good being provided within the IDB district, perhaps by visiting an asset or being a consumer of a good, for example:

- people who use the village hall which is protected from flooding;
- people who are supplied with electricity by the generating station/substation which is protected from flooding;
- consumers who purchase food grown in the IDB district; and
- people using roads, railways and air transport assets within the IDB district.

These people may live within the IDB district, or alternatively they may live outside the district but visit, work or undertake recreation within it. Thus, they use assets and goods provided in the district.

2.12 Induced beneficiary

Induced beneficiaries are people who do not directly use the asset or good provided within the IDB district themselves, but benefit from its existence. For example:

- people using a minor road outside of the IDB district which has less traffic because of the presence of a main road within the district; and
- people using hospitals, schools, care homes, village halls and businesses outside of the IDB district which are less busy because of the services provided within the district.

3 Worksheets within the benefits assessment spreadsheet

3.1 Overview

The benefits assessment spreadsheet comprises 35 worksheets. They are (where further guidance is provided, the title of the worksheet is used to hyperlink to the appropriate section or sub-section of this guidance for easier navigation):

1. **Instructions:** this worksheet introduces the spreadsheet, how it can be used, gives a brief description of what each worksheet does and suggests using this guidance to find out more.
2. **Summary of area:** this worksheet is used to record the name of the IDB being assessed, who is undertaking the assessment, and a version number and date (so changes and updates can be tracked). It also provides space for recording key statistics and background information, mainly drawn from the policy statement. This worksheet is also used to identify Environment Assets that may be present within or adjacent to the IDB district. There is a high risk of double counting with Environment Agency benefits where there are EA assets, and a simple approach to accounting for this is included. However, the actual overlap between EA and IDB benefits is likely to be very IDB specific, and to minimise the risk of double counting, it would be worthwhile discussing the overlap with the Environment Agency flood risk managers. This worksheet also includes the approach for dividing benefits between those provided by IDB activities and those resulting from Environment Agency activities. The approach used is simplistic, being based on the percentage of total benefits that are associated with above ground (i.e. flooding) risks versus those associated with below ground (i.e. waterlogging) risks. There were very little data on which to base the percentages assumed in the Summary of area worksheet, so this is a key source of uncertainty. However, it is clearly important to divide benefits across IDBs and Environment Agency to avoid double counting. The default percentages can be revised if necessary, for example, where there are no or only limited Environment Agency activities within an IDB district.
3. **Quick estimate:** this worksheet can be used to give a rough estimate of the benefits of the IDB. It is based on extrapolating benefits identified during Grant-in-Aid appraisals to the whole IDB area. For most IDBs, this approach may be highly uncertain but it can be used very quickly.
4. [Describe and quantify assets](#): this worksheet is used to describe the current situation for each of the core and, if relevant, optional categories. The worksheet provides space to record information that the IDB knows (from the expertise of its staff) or has to hand (from published documents), additional information that may be collected through use of GIS, mapping, or readily available datasets, and new information that the IDB may decide needs to be collected to inform the assessment. Each category includes space for recording direct, indirect and induced impacts (where relevant, with rows blacked out where such impacts are not relevant). The worksheet can be used to record quantitative information alongside qualitative descriptions, and data sources used.
5. [Describe baseline](#): this worksheet looks very similar to the 'describe and quantify assets' worksheet in that it is also set out category-by-category and includes space for qualitative and quantitative information to be recorded on the impacts of the baseline. There are then three other columns that are used to summarise the results qualitatively. The results are: direction of change, magnitude of change and

significance of change. Once this worksheet is complete, the qualitative assessment is finished.

6. OUTPUT-all: this worksheet presents the results of the assessment. It summarises the qualitative assessment from the 'describe baseline' worksheet, as well as including monetary impacts (where these have been estimated). The worksheet also identifies who the beneficiaries are and how much they benefit (again where monetary impacts have been estimated).
7. OUTPUT-core: this presents the same information as the 'OUTPUT-all' worksheet but just for the core categories. The smaller number of categories presented may make it easier to present the results, for example, to stakeholders.
8. OUTPUT-optional: this presents the same information as the 'OUTPUT-all' worksheet but just for the optional categories. Again, the smaller number of categories may make it easier to present the results.
9. Summary by significance: this worksheet presents results tables showing how many and what percentage categories have been assigned to low, medium or high magnitude of impacts, or small, moderate or large significance. These tables could be used to present results to stakeholders.
10. Map of magnitude-significance: this worksheet presents a surface chart showing how many categories are assigned to each magnitude and significance. The overall aim is to give an indication of the overall qualitative impacts in visual form.
11. Summary by beneficiary: this worksheet presents the monetary impacts by beneficiary (unlike the OUTPUT worksheets that present the results by category). The results are in tabular format that could be used in a report or presentation and give total benefits and damages.
12. Chart-total beneficiary impacts: this worksheet presents the monetary impacts in visual form using a bar chart to give an indication of which beneficiaries benefit the most or experience the greatest damages.
13. Chart-IDB benefits by beneficiary: this worksheet presents the breakdown of benefits only (excludes damages) by beneficiary. This is given as an alternative method of presenting the results to the bar chart.
14. Chart-damages by beneficiary: as above but this time the pie chart shows the breakdown by damages (excluding benefits).
15. Summary by category: this worksheet provides the total benefits and damages by category. It shows which categories make up the largest proportion of the total benefits so it could be used to identify where it may be worthwhile collecting specific data to improve the robustness of the benefit (and damage) estimates. The worksheet shows total benefits/damages, those to the Environment Agency and those to IDBs.
16. Chart-total by category: this worksheet presents the monetary benefits and damages in visual form using a bar chart to give an indication of which categories make up the greatest proportion of benefits and damages. The chart shows just the IDB benefits and damages (i.e. it does not include EA benefits or damages)

17. Chart-pie by category: as above but this time the data are presented in a pie chart, showing the proportion of IDB benefits by category.
18. [Calculation Worksheets](#): this worksheet introduces the calculation worksheets that are used to estimate the monetary impacts for some of the categories. There are 17 calculation worksheets.
19. [Carbon](#): this worksheet sets out a simple method for assessing the change in the amount of carbon that is sequestered in soils.
20. [Water levels-Residential](#): this worksheet is used to estimate the impacts on residential properties from changes in water levels. Like most of the calculation worksheets, it uses quick methods and average damage values from the Multi-Coloured Handbook (2010 edition).
21. [Water levels-Business](#): this worksheet enables impacts on businesses from changes in water levels to be estimated.
22. [Water levels-Social Infrastructure](#): this worksheet enables impacts on assets such as schools, hospitals, care homes, local authority depots, village halls and post offices from changes in water levels to be estimated.
23. [Water levels-Emergency](#): this worksheet enables impacts on police stations, ambulance stations, fire stations, coastguard stations, and lifeboat stations from changes in water levels to be estimated.
24. [Water levels-Utilities](#): this worksheet enables impacts on sewage treatment works, water treatment works, phone masts, electricity sub-stations, telephone exchanges, gas works and oil refineries from changes in water levels to be estimated.
25. [Water levels-Transport \(road\)](#): this worksheet enables impacts from disruption to road travel from changes in water levels to be estimated.
26. [Water levels-Transport \(rail\)](#): this worksheet enables impacts from disruption to rail travel from changes in water levels to be estimated. The approach to estimating indirect impacts (on rail users) is currently highly uncertain, however.
27. [Food production](#): this worksheet enables impacts on arable land and grassland from changes in water levels to be estimated.
28. [Energy \(direct\)](#): this worksheet enables impacts on power stations or energy generating areas (such as windfarms) and power lines to be estimated. Again, this is linked to changes in water levels.
29. [Energy \(indirect\)](#): this worksheet enables impacts from loss of power to electricity users due to impacts on power stations or electricity sub-stations to be estimated. This is linked to changes in water levels and the risk that this causes power outages.
30. [Designated biodiversity sites](#): this worksheet enables impacts from changes in water levels on designated and non-designated sites to be estimated, taking account of the level of designation.
31. [Biodiversity-non-designated](#): this worksheet enables impacts from changes in the biodiversity value of different land uses to be taken into account.

32. [Water supply](#): this worksheet enables impacts from changes in water levels on access to abstraction to be estimated.
33. [Heritage](#): this worksheet enables impacts on heritage assets from changes in water levels to be estimated. Due to the paucity of available monetary values, the impacts are based on willingness to pay of visitors to give an indication of the potential heritage value. Since many heritage assets may not be open to the public, these benefits may be difficult to explain to stakeholders. They may also be one of the most uncertain estimates across all the calculation worksheets.
34. [Recreation and tourism](#): this worksheet enables impacts on recreation and tourism as a whole from changes in water levels to be estimated. As the assessment is for use by IDBs to estimate local impacts, no account is taken of the potential for damages to recreation and tourism in the IDB to result in benefits in other locations. This means these benefits cannot be used for capital Grant-in-Aid appraisals without further consideration of the potential for lost recreational opportunities to be picked up elsewhere.
35. [Jobs](#): this worksheet uses current expenditure to estimate the knock-on benefits to other businesses and the number of non-IDB jobs that the IDB activities and expenditure may support.

4 Describe and quantify assets

4.1 What needs to be completed on this worksheet?

There are three columns that can be used to record information. Whether you need to use all three columns will depend on the level of detail you would like to provide. There is also space to record data sources and information, to help maintain transparency and auditability.

The first column to complete is 'Background knowledge' (column D). You can record information that is readily available from published documents or that is based on the knowledge and expertise of IDB employees and the IDB Board.

If you feel that more information is needed than could be obtained from current knowledge, you can review or interrogate other information sources. GIS and mapping may be particularly useful for quantitative information, while reports and plans produced by others may help with those categories that you do not report on in detail. To maintain transparency within the assessment, you should record the sources of data. Table 4.1 provides an indication of data sources that you could use for each of the categories. The table is based on readily available sources and data that is freely available or should be available through, for example, the Public Sector Management Agreement.

Table 4.1: Source of information	
Category	Potential sources of information
Carbon	Local knowledge Corine land cover maps Landsat scenes Direct measurement of carbon sequestered in soils (such as university research carried out in area)
Waterlogging, drought, flooding, erosion: • Residential properties	Local knowledge AddressPoint Web-sites (e.g. Land Registry, Hometrack, Zoopla) Neighbourhood statistics (output area: household spaces, accommodation type, dwellings, housing stock, lowest floor level)
Waterlogging, drought, flooding, erosion: • Business properties	Local knowledge AddressPoint Valuation Office Agency (business rates data) CLG (commercial and industrial floorspace rateable value statistics) Neighbourhood statistics (local authority area: local units by broad industry group, VAT Based enterprises, VAT based local units)
Waterlogging, drought, flooding, erosion: • Social infrastructure	Local knowledge Ordnance Survey maps Neighbourhood statistics
Waterlogging, drought, flooding, erosion: • Emergency services	Local knowledge Ordnance Survey maps Neighbourhood statistics
Waterlogging, drought, flooding, erosion: • Utilities infrastructure	Local knowledge Local Authorities Valuation Office Agency Ordnance Survey Utility companies (but may be confidential) National Grid (gas pipes)
Waterlogging, drought, flooding, erosion: • Transport infrastructure	Local knowledge Ordnance Survey (MasterMap Integrated Transport Network, Vector Map Open Data) Highways Agency/Local Authorities Data.gov.uk (road traffic counts, transport statistics) Canal & River Trust (formerly British Waterways)

Table 4.1: Source of information	
Category	Potential sources of information
	National Rail Trends portal Neighbourhood statistics (Physical Environment – Land Use Statistics) Associated British Ports/port operators
Control of invasive species	Local knowledge Biodiversity Action Plan
Water quality	Local knowledge Environment Agency (waterbody status and river bodies and water quality) Biodiversity Action Plan
Production of grown food	Local knowledge Corine land cover maps Land Registry Rural Payments Agency www.MAGIC.gov.uk Landsat scenes
Collection of natural food	Local knowledge
Energy	Local knowledge Ordnance Survey maps (including Vector Map Open Data) Power companies (but may be confidential) National Grid (electricity network routes) Regional Power Networks (electricity sub-stations)
Production of timber, fibre, aggregates, peat, etc.	Local knowledge Land use classification maps
Biodiversity	Local knowledge Biodiversity Action Plan Corine land cover maps MAGIC (rural and environmental designations) Natural England (nature on the map) Wildlife Trusts Local Biological Records Centre Phase 1 Habitat Surveys Local Authority National Biodiversity Network (NBN) Gateway Local interest groups (bats, birds, mammals, etc.) RSPB and BTO Landsat scenes
Water supply	Environment Agency CAMS
Health and well-being of people	Local knowledge Neighbourhood statistics (Health and Care – General Health (UV20)) Floodzone 2 data
Health and well-being of communities	Local knowledge Neighbourhood statistics (Health and Care – General Health (UV20)) Floodzone 2 data
Level of involvement in decision-making	Local knowledge
Landscape character	Local knowledge www.MAGIC.gov.uk National Parks AONB website (www.aonb.org.uk) Natural England (Joint Character Areas)
Heritage values	Local knowledge English Heritage (World Heritage Sites, Listed buildings, Scheduled monuments, parks and gardens, battlefields) Ordnance Survey maps (including Vector Map Open Data)
Knowledge and education	Local knowledge Local Authority
Recreation and tourism	Local knowledge Ordnance Survey maps (including Vector Map Open Data)
Jobs/expenditure	IDB accounts

The third column in the worksheet is used for new information that has been generated for the benefits assessment method. In most cases, you will not need to

generate specific information unless there is a significant data gap, uncertainty or a need to demonstrate a particular benefit to stakeholders.

The final column should be used to record sources of information, including references where published information has been used. Expert opinion and local knowledge are valid sources of data and information and should be recorded in this column alongside published sources.

4.2 What goes into direct, indirect and induced?

To reduce the risk of double counting, it is important to be clear what the direct, indirect and induced benefits are and who experiences them. Table 4.2 provides a summary of each type of benefits for each category. Not all of the categories require direct, indirect and induced beneficiaries to be described (shown as not applicable (N/A) in Table 4.2 and where rows are blacked out in the spreadsheet).

Table 4.2: Linking Benefit Categories to Beneficiaries			
Benefit Category	Direct Beneficiaries	Indirect Beneficiaries	Induced Beneficiaries
Managing nature and resources			
Carbon sequestration and storage	Humans and other species (through sequestration of carbon helping to limit climate change)	N/A	N/A
Waterlogging, drought, flooding, erosion	Residential property owners and occupiers at risk of flooding or erosion	N/A	Property renters through reduced pressure on demand for short-term rents due to occasional flooding
	Business property owners and occupiers at risk of flooding or erosion	Businesses who trade with/supply/receive goods from the direct beneficiary businesses	Businesses outside the IDB district who may benefit from activity of businesses within the district (but do not trade directly with those businesses)
	Social infrastructure assets at risk of flooding or erosion	Social infrastructure users	Users of other social infrastructure outside the IDB district
	Police, ambulance and fire stations at risk of flooding or erosion	People who benefit from the emergency services	Users of other emergency services which are not overwhelmed because of the services within the IDB district
	Utilities infrastructure at risk of flooding or erosion	Consumers who are supplied by the utilities infrastructure	Users of other utilities infrastructure which is not overwhelmed because of the assets within the IDB district
	Transport assets at risk	Users of the transport network	Users of the transport network outside of the IDB district
Control of invasive species	Native species (since they are now threatened)	N/A	N/A
	Humans and other species from reduction in disease and pests	Farmers in IDB district (reduction in lost crops, livestock production)	Farmers outside IDB district from prevention of spread of diseases and pests
	Boat owners and users through maintenance of navigation	N/A	Boat users outside the district due to reduced congestion

Table 4.2: Linking Benefit Categories to Beneficiaries			
Benefit Category	Direct Beneficiaries	Indirect Beneficiaries	Induced Beneficiaries
Water quality	Abstractors Water body users (e.g. anglers, recreational boating, etc.)	N/A	N/A
<i>Production of goods and services</i>			
Production of grown food	Farmers	Consumers	Consumers (where nationally important quantities or types of crops are produced)
	People with bee hives	Consumers	N/A
	Anglers Aquaculture/fish farming businesses	Consumers	N/A
Collection of natural food	Hunters, shooting parties People gathering wild food	N/A	N/A
Energy	Energy producers (wind, water, access)	Energy users	N/A
Production of timber, fibre, aggregates, peat, etc.	Woodland/plantation owners and operators	Consumers	N/A
	Peat digging businesses	Consumers	N/A
Biodiversity	Populations of species (through increased genetic diversity increasing resilience and adaptability)	Farmers in the future	N/A
	Species and habitats	Indirect benefits (recreation) picked up under other categories	Wider society (from the knowledge that biodiversity is being protected or enhanced)
Water supply	Abstractors Water traders	Consumers (for PWS)	N/A
<i>Social, cultural and employment benefits</i>			
Health and wellbeing of people	Individuals within the IDB district	N/A	Demand for health services outside IDB district
Health and well-being of community(ies)	Local community within IDB district	N/A	N/A
Level of involvement in decision-making	Local community within IDB district	N/A	N/A
Landscape character	People living and working in the IDB district Visitors	N/A	N/A
Heritage values	People living and working in the IDB district Visitors	N/A	Wider society (from the knowledge that heritage is being protected or enhanced)
Knowledge and education	Adults and children using educational sites/resources	N/A	N/A
Recreation and tourism	Recreational users (e.g. walkers, dog walkers, joggers, bird watchers, etc.)	N/A	Recreational users outside the district through reduced congestion
Jobs supported	Employees of the IDB	Businesses supplying the IDB	Businesses receiving income from IDB employees spending their wages

5 Describe baseline

5.1 What needs to be completed on this worksheet?

The first column to complete is the description of the implications of the baseline. Consider the information entered into the 'describe and quantify assets' worksheet and how these assets might be affected under the baseline. Try to describe the impacts in as much detail as you feel is appropriate. As a guideline, the description included for each category needs to include enough detail to explain why you have chosen the direction of impact, magnitude and significance recorded in the next three columns in the worksheet. Some of the categories include default text that you can use, amend or replace, as you wish.

The next column involved identifying the direction of the impacts. There are five choices available:

- +: for positive impacts (benefits);
- -: for negative impacts (damages);
- Neutral: where there is no impact;
- + and -: where there could be both positive and negative impacts (but remember to focus on the impacts on each category separately); and
- Not relevant: where the category is not relevant.

Here record the direction of change between the current situation and the baseline, as that will fit with the descriptions included. The rest of the spreadsheet focuses on the change from the baseline to the current situation; the spreadsheet will automatically reflect this in the output worksheets.

Next is to identify the magnitude of the impact. Again it is important to think only about the category you are identifying the magnitude for. There are three options to choose from on magnitude:

- Large (there is a big impact on those assets that are affected): think just about the assets that are affected when identifying the magnitude of the impact. For example, 100 ha of arable land may become unfarmable under the baseline, so that would be a large impact;
- Moderate (there is a medium-sized impact on those assets that are affected): for example, the 100 ha of arable land may be affected once every few years due to lack of water management on lower lying areas making it more difficult to drain in wet weather; and
- Small (the impact on assets affected only likely to be minor): for example, the 100 ha of arable land may be affected infrequently due to flooding from rivers.

The final step on this worksheet is to identify the significance. This takes account of the extent of the impacts across all the assets in that category, with four options:

- Very significant (all or almost all assets in this category are affected): for example, this would be the case where the 100 ha of arable land is the amount of arable land within the Drainage Board district;
- Significant (the great majority of assets in this category are affected): there is no threshold level defined for the great majority to give some flexibility to the

assessment. For example, this might be the case if the 100 ha of arable land affected is out of a total of 120 ha or 140 ha;

- Slightly significant (assets are affected in specific areas only): in this case, the assets affected may be located in one, or more, specific areas. For example, this could be where the 100 ha is located in two pockets, one of 60 ha and one of 40 ha but the total area of arable land within the Drainage Board district is several hundred hectares; and
- Not very significant (or none): this option would be chosen where the area or number of assets affected is very small. For the 100 ha to be 'not very significant' it is likely that many thousands or tens of thousands of hectares of arable land would be present in the Drainage Board district.

Finally, you should give an indication of the uncertainty associated with the description of impacts and the ratings you have assigned. Again, there are pre-defined definitions to choose from, reflecting the implications of the type of data available to you and the data gaps that may exist on the level of uncertainty that is likely to result:

- Low: assessment supported by specific data and information, expert opinion and local knowledge
- Moderate: limited data and information available, limited expert opinion and local knowledge on data gaps; and
- High: no data or information that are directly relevant, assumptions made and judgements made to fill data gaps.

6 Calculation worksheets

6.1 What are these worksheets for?

The 17 calculation worksheets can be used when you want to estimate the monetary value of the impacts (benefits and damages).

6.2 How reliable are the estimates?

The estimates are based on generic monetary values from a number of sources, in particular the Multi-Coloured Manual (MCM) and Handbook (MCH). Wherever possible, they follow accepted approaches and existing guidance. However, as the values are generic and the approaches are designed to be relatively simple, there will be uncertainty associated with the estimates that are produced. To reflect this, the results in the output tables are given to two significant figures. Uncertainty ratings are assigned at the end of each calculation worksheet. As a default, these are set to high to reflect that generic estimates have been used. Where you use data specific to your IDB, you can consider whether this is sufficient to reduce the amount of uncertainty. As an indication of the uncertainty, it can be assumed that if your IDB is 'typical' of the country as a whole, then the estimates will be reasonable. The more atypical your IDB is, the more uncertain the estimates will be.

You should also consider how much time and resources would be needed to collect the additional data and weigh up whether it is worth investing these time and resources.

Since most IDBs will be atypical, it is possible to refine the calculation sheets to reduce the level of uncertainty. The most important cells to change are likely to be the percentage area that is at risk under different levels of probability. The percentage areas are used in most of the calculations⁸ to enable you to estimate annual impacts that take account of the probability that impacts will occur due to changes in water levels. To change these estimates, you can update the values in cells D16 to M16 in the 'Water levels-residential' worksheet, cells D16 to M16 in the 'Water levels-business' worksheet and cells D114 to M114 in the 'food production' worksheet. All other worksheets are linked to these values so they will update automatically, although you can, of course, change them in all the relevant worksheets if you wish so they are specific to the assets within the category in question. The default values on percentage area likely to be affected are taken from the Multi-Coloured Handbook for residential and non-residential properties, and based on information on the area of agricultural land at risk.

You should consider whether using data specific to your IDB is likely to be worthwhile. This may be the case where:

- your IDB is more atypical than typical for a specific benefit category, so the generic data are less likely to be relevant to your IDB;
- the estimated benefits under that category make up a relatively large proportion of the total benefits; and

⁸ The areas are not used in the carbon, non-designated biodiversity and jobs calculation worksheets.

- where the collection of additional data is likely to reduce uncertainty in the estimates (i.e. where the data you will collect will be directly relevant to the calculations being undertaken).

Uncertainties associated with the generic values used for each category are described in the relevant sub-sections below. Many of the sources of uncertainty are common to most of the categories. However, they are repeated for each category to emphasise how and where uncertainty will have been introduced.

6.3 What information is needed to estimate monetary values?

The type of information needed varies by worksheet. Therefore, guidance is given for each category's calculation worksheet. For all the calculation worksheets, though, you will need to enter data into some of the white cells to generate an estimate of the monetary impacts. Some of the white cells allow you to enter additional detail, beyond the minimum needed to calculate a value. The guidance below will help you identify which cells you need to or can complete and when.

6.4 Carbon

6.4.1 Background and approach

This category covers the sequestration of carbon by soils. This is a process by which carbon dioxide from the atmosphere is captured and stored in the soils. The amount of carbon that soils are able to sequester depends on the amount of biomass in the soil as well as the amount of oxygen that enters the soil. As a result, wetter soils (especially those with permanent water cover) can sequester more carbon⁹.

The carbon worksheet allows you to estimate the change in carbon from changes in land use. The change in carbon sequestered by soils is based on Dawson & Smith (2007 in Ostle et al, 2009).

To complete this worksheet you need to:

1. Identify or estimate how many hectares of each land use type (cropland, grassland, marsh, peatland and woodland) are present in the IDB area for the current situation.
2. Estimate how many hectares would be represented by each land use type in the baseline scenario.
3. For each land use type, enter the number of hectares that would change from the baseline scenario to the current situation by land use type. For example, if you predict that there would be 1,000 ha of grassland under the baseline that is cropland under the current situation, enter 1,000 into cell D5. If you predict that there would be 5,000 ha of marsh under the baseline that is grassland under the current situation, enter 5,000 into cell E6.

You can use Table 9.1 in the MCH to help you decide how land use might change as this shows the tolerance to flooding of different land uses. For example, if the probability of impacts under the current situation is 10% and you have predicted that this will increase to 50% in some areas and 100% in others under the baseline, you

⁹ This is simplistic since wetland soils can produce other greenhouse gases and may lose carbon during summer months (see for example, Holman & Kechavarzi, 2010).

might predict that the area where the probability of impacts increases to 50% would only be suitable as grassland, while the area where the probability of impacts increases to 100% would only be suitable as marsh, or peatland if water levels would mean the area is permanently waterlogged.

The value per tonne of CO₂ is based on the untraded value based on DECC guidance¹⁰. You can update this value by following the link in the carbon worksheet.

¹⁰ To make the calculations easier, the table showing change in carbon sequestered by soils has been converted to CO₂ to enable you to use the DECC value directly.

6.4.2 Uncertainty with the carbon category

The estimated change in carbon sequestered by soils is based on the low end of a range, so is likely to under-estimate carbon benefits or damages in most cases. The low end of the range was used rather than the high end as there was greater consistency between changes from and to different land uses. The source document for the figures on change in carbon gives a much larger range of different land types than is included here, hence, the estimate produced by following the method set out in the carbon worksheet is a simplification. This again will reduce the robustness of the estimated monetary value of impacts on carbon sequestration.

6.5 Water levels

6.5.1 Water levels - residential

Impacts on residential properties are estimated based on the damages that would be caused by changes to water levels. To complete this worksheet you need to:

1. Identify or estimate how many residential properties are present in the IDB district.
2. Estimate how the change in water levels under the baseline scenario would change the probability of impacts from waterlogging or flooding of these properties (you can use the average percentages affected by different floods from Table 4.4 of the MCH to give default estimates if you do not have any other data. The worksheet includes a simple calculator that will estimate the number of properties at each probability level when you enter the total number of properties based on these default assumptions into cell D17).
3. Enter the number of properties whose probability of impacts changes according to the change from the baseline to the current situation. For example, if you have 2,300 properties whose probability of impacts changes from 100% to 1%, put 2,300 into cell K4. Use cells D4 to M13 to record the number of properties whose probability of impacts changes.

You can update the estimated damages (cells D36 to M36) to reflect new damage estimates. You can also change the percentage of the area at probability level (cells D35 to M35) if you know the area of the IDB district at each probability level, but not the number of properties.

If the probability of impacts is 100% or 50%, it is assumed that this would result in permanent loss. Where there are permanent losses, it is assumed that residential properties would be written-off. Probabilities lower than 50% are assumed to result in one-off, or occasional losses.

6.5.2 Water levels - business

Impacts on businesses are estimated based on the damages that would be caused by changes in water levels. To complete this worksheet you need to:

1. Identify or estimate how many businesses are present in the IDB district.
2. Estimate how the change in water levels under the baseline scenario would change the probability of impacts on these businesses (you can use the average percentages affected by different floods from Table 4.4 of the MCH to give default estimates if you do not have any other data. The worksheet includes a simple

calculator that will estimate the number of properties in each risk band when you enter the total number of businesses based on these default assumptions into cell D17¹¹).

3. Enter the number of businesses whose probability of impacts changes according to the change from the baseline to the current situation in cells D4 to M13, as required. For example, if you have 130 businesses whose probability of impacts changes from 100% to 1%, put 130 into cell K4.
4. The impacts on business properties are based on floor area. If you have data on floor area by business type (factory, retail, warehouse, office/other, non-bulk), you can enter this directly (in cells F54 to F58). If you do not have data on floor area by business type, leave these cells empty and the calculation worksheet will use average flood area and typical percentage of each business type. You can also enter the number of each of these business types if you have it (in cells D54 to D58). That will allow you to use percentages that reflect your IDB. However, if you do not have these data, the calculation worksheet will use average values.

You can update the estimated damages (cells D45 to M50) to reflect new damage estimates per m² (for businesses the damages are estimated based on floor area). You can also change the percentage of the area at each probability level (cells D44 to M44) if you know the area of the IDB district at each probability level, but not the number of businesses.

If the probability of impacts is 100% or 50%, it is assumed that this would result in permanent loss. Where there are permanent losses, it is assumed that business properties would be rebuilt or relocated outside the at-risk area (in many cases, this may need to be outside the IDB district). The spreadsheet does not take account of any impacts that might occur between the time that the property is impacted and when it is rebuilt. However, the spreadsheet does use a depreciation factor with a default assumption that the value of any asset impacted is 50% of its rebuild or relocation value. This factor is used to reflect that assets are likely to have been in place for some time so will not be worth their total 'new' value. On average, a value of 50% is taken since this reflects a mid-point between new assets and those with little if any residual value. Probabilities lower than 50% are assumed to result in one-off, or occasional losses.

6.5.3 Water levels – social infrastructure

Impacts on social infrastructure are estimated based on the damages that would be caused by changes to water levels. To complete this worksheet you need to:

1. Identify or estimate how many schools and universities; hospitals and surgeries; day centres, nurseries and care homes; local authority depots; village halls; and post offices and sorting offices are present in the IDB district. There is space for one 'other' category if you have other infrastructure that provide services to the local communities (you can also revise the categories if necessary, you will then also need to revise the estimates of mean floor area (cells E134 to E140)).
2. Estimate how the change in water levels under the baseline scenario would change the probability of impacts on social infrastructure (you can use the average percentages affected by different floods from Table 4.4 of the MCH to give default estimates if you do not have any other data. The worksheet includes a simple

¹¹ These are the same percentages as for residential properties as the MCH does not give estimates for the number of businesses at each probability level.

calculator that will estimate the number of social infrastructure at each probability level when you enter the total number into cell D95, based on the default assumptions¹²).

3. Enter the number of social infrastructure whose probability of impacts changes according to the change from the baseline to the current situation in cells D4 to M13 (for schools and universities), cells D17 to M26 (for hospitals and surgeries), etc., as required. For example, if you have 4 schools whose probability of impacts changes from 100% to 1%, put 4 into cell K4.
4. Like businesses, the impacts on social infrastructure are based on floor area. If you have data on floor area by infrastructure type, you can enter this directly (in cells F134 to F140). If you do not have data on floor area, do not revise these cells (which will automatically give the total by type of social infrastructure) and the calculation worksheet will use average flood area and typical percentage of each type of social infrastructure.

You can update the estimated damages (cells D124 to M130) to reflect new damage estimates per m².

If the probability of impacts is 100% or 50%, it is assumed that this would result in permanent loss. Where there are permanent losses, it is assumed that social infrastructure assets would be rebuilt or relocated where the risk is removed (in many cases, this may need to be outside the IDB district). The spreadsheet does not take account of any impacts that might occur between the time that the property is impacted and when it is rebuilt. As with business premises, a depreciation factor is applied to the permanent losses with 50% used as the default assumption. Probabilities lower than 50% are assumed to result in one-off, or occasional losses.

6.5.4 Water levels – emergency services

Impacts on emergency services are estimated based on the damages that would be caused by changes to water levels. To complete this worksheet you need to:

1. Identify or estimate how many emergency services (sub-divided into police stations, ambulance stations, fire stations, coastguard stations and lifeboat stations) are present in the IDB district. There is space for one 'other' category if you have other emergency services that could be affected.
2. Estimate how the change in water levels under the baseline scenario would change the probability of impacts on emergency services stations (you can use the average percentages affected by different floods from Table 4.4 of the MCH to give default estimates if you do not have any other data. The worksheet includes a simple calculator that will estimate the number of emergency services stations at each probability level when you enter the total number in cell D82, based on the default assumptions¹³).
3. Enter the number of emergency services whose probability of impacts changes according to the change from the baseline to the current situation in cells D4 to M13 (for police stations), cells D17 to M26 (for ambulance stations), etc., as required. For example, if you have 1 police station whose probability of impacts changes from 100% to 1%, put 1 into cell K4.

¹² These are the same percentages as for residential properties as the MCH does not give estimates for the number of social infrastructure at each probability level.

¹³ These are the same percentages as for residential properties as the MCH does not give estimates for the number of social infrastructure at each risk level.

4. Like businesses and social infrastructure, the impacts on emergency services are based on floor area. If you have data on floor area by type of emergency service, you can enter this directly (in cells F118 to F123). If you do not have data on floor area by type of emergency service, do not change the data in these cells and the calculation worksheet will use average flood area and typical percentage of each type of emergency service.

You can update the estimated damages (cells D109 to M114) to reflect new damage estimates per m².

If the probability of impacts is 100% or 50%, it is assumed that this would result in permanent loss. Where there are permanent losses, it is assumed that emergency services assets would be rebuilt or relocated where the risk is removed (in many cases, this may need to be outside the IDB district). The spreadsheet does not take account of any impacts that might occur between the time that the property is impacted and when it is rebuilt. A depreciation factor is applied to the permanent damages, set at a default level of 50%. Probabilities lower than 50% are assumed to result in one-off, or occasional losses.

6.5.5 Water levels – utilities

Impacts on utilities are estimated based on the damages that would be caused by changes to water levels. To complete this worksheet, you need to:

1. Identify or estimate how many utility services (sub-divided into sewage treatment works, water treatment works, phone masts, electricity sub-stations, telephone exchanges, gas works and oil refineries) are present in the IDB district. There is space for one 'other' category if you have other utility services that could be affected.
2. Estimate how the change in water levels under the baseline scenario would change the probability of impacts from waterlogging or flooding of utilities (you can use the average percentages affected by different floods from Table 4.4 of the MCH to give default estimates if you do not have any other data. The worksheet includes a simple calculator that will estimate the number of utilities at each probability level when you enter the total number in cell D92, based on the default assumptions¹⁴).
3. Enter the number of utilities whose probability of impacts changes according to the change from the baseline to the current situation in cells D4 to M13 (for sewage treatment works), cells D17 to M26 (for water treatment works), etc., as required. For example, if you have 13 sewage treatment whose probability of impacts changes from 100% to 1%, put 13 into cell K4.
4. Like businesses and social infrastructure, the impacts on utilities are based on floor area. If you have data on floor area by type of utility, you can enter this directly (in cells F152 to F159). If you do not have data on floor area by type of utility, leave these cells empty and the calculation worksheet will use average flood area and typical percentage of each type of utility.

You can update the estimated damages (cells D141 to M148) to reflect new damage estimates per m².

If the probability of impacts is 100% or 50%, it is assumed that this would result in permanent loss. Where there are permanent losses, it is assumed that utilities

¹⁴ These are the same percentages as for residential properties as the MCH does not give estimates for the number of social infrastructure at each risk level.

infrastructure would be rebuilt or relocated where the risk is removed (in many cases, this may need to be outside the IDB district). The spreadsheet does not take account of any impacts that might occur between the time that the property is impacted and when it is rebuilt. A default assumption of 50% is used as the depreciation factor, in line with the assumption made for other non-residential properties. Probabilities lower than 50% are assumed to result in one-off, or occasional losses.

6.5.6 Water levels – transport (road)

Impacts on road transport are estimated based on the damages that would be caused by changes to water levels. To complete this worksheet you need to:

1. Identify or estimate what length of road is affected, where possible by length of motorway, A roads and critical B roads (those that are used by through traffic for access into and out of the IDB), and other roads.
2. Estimate the significance of impacts on the road network in terms of the length of the delay (in hours) that would be caused. The default value (cell D21) is 12 hours. You can replace this with an estimate specific to your IDB, for example, to reflect the likelihood of greater (or lesser) delays based on current congestion levels.
3. Enter the number of km of road whose probability of impacts changes, by type of road in cells D82 to M91 (for motorway). For example, if 6 km of motorway changes from having a probability of impacts of 20% under the baseline to 1% under the current situation, put 6 into cell K84.

You can also update the number of vehicles per hour if you have vehicle count data. This will be most important where there are roads that carry a lot of traffic as otherwise the estimated impacts may be significant under-estimates. Add your specific data into cells D11 to D13 to replace the national average data.

If the probability of impacts is 100% or 50%, it is assumed that this would result in permanent loss. Where there are permanent losses, it is assumed that the roads would be relocated and the risk removed (in many cases, this may need to be outside the IDB district). The spreadsheet does not take account of any impacts that might occur between the time that the road is impacted and when it is relocated. As with non-residential properties, a depreciation factor of 50% is used for road assets that need to be relocated. Probabilities lower than 50% are assumed to result in one-off, or occasional losses.

The costs of relocation (permanent losses) or repair costs (one-off losses) for direct impacts on road transport can also be updated should better data be available. The values included in the spreadsheet are highly uncertain as they are based on generic data on construction costs of different types of roads.

6.5.7 Water levels – transport (rail)

Like road transport, impacts on rail transport are divided into direct damages (to service providers) and indirect damages (to rail users). Both calculations are based

on the same data to minimise the amount of information you need to enter. Impacts are estimated based on the damages that would be caused by changes in water levels. To complete this worksheet you need to:

1. Identify or estimate what length of railway is affected, by length of mainline and branch line. For direct impacts, the number of stations affected is also included.
2. For the indirect damages, identify which lines are at risk and then compare these with the 'typical' lines given in cells D52 to D60. You can record the specific lines and change the number of lines affected to greater than one, as appropriate.
3. Estimate the significance of impacts on the rail network in terms of the length of the time over which the railway lines would be closed. The default value is a closure of 4 days, based on advice from National Rail.
4. Enter the number of km of railway or number of stations whose probability of impacts changes, by type of rail in cells D5 to M14 (for mainline). For example, if 6 km of mainline railway changes from having a probability of impacts of 20% under the baseline to 1% under the current situation, put 6 into cell K7.

If the probability of impacts is 100% or 50%, it is assumed that this would result in permanent loss. Where there are permanent losses, it is assumed that the railway would be relocated and the risk removed (in many cases, this may need to be outside the IDB district). The spreadsheet does not take account of any impacts that might occur between the time that the railway is impacted and when it is relocated. A depreciation factor of 50% is applied to permanent losses, in line with the other benefit categories. Probabilities lower than 50% are assumed to result in one-off, or occasional losses.

The costs of relocation (permanent losses) or repair costs (one-off losses) for direct impacts on rail transport can also be updated should better data be available. The values included in the spreadsheet are highly uncertain as they are based on generic data on construction costs of railway or stations.

The indirect impacts are based on the number and type of lines that would be closed due to changes in water levels. The damages are based on data from National Rail for the revenue that would be at risk to train operators as a result of increased risks from reduced drainage. Indirect impacts are only assumed to occur where the lines would be affected occasionally. Where there are permanent impacts, it is assumed that the rail lines would be relocated outside the at-risk area, such that indirect impacts would not occur.

6.5.8 Uncertainty with the water levels category

The calculations are based on Weighted Annual Average Damages (WAAD), which the MCH recommends are used where 'the appraiser has little or no understanding of the potential flood depths and return periods'. The generic nature of the estimates means that they are highly uncertain. However, they are considered proportionate given the high level benefit estimates being generated in the spreadsheet.

Relocation and repair costs are used for permanent losses, along with annualisation factors to convert the one-off costs to annual values and depreciation factors to take account of the depreciated value of the affected assets. All of these assumptions

(the repair cost estimates, the annualisation factors and depreciation factors) will introduce uncertainty into the benefit estimates. Whether the benefits are over- or under-estimates will depend on the specific circumstances within the IDB district. There is also an assumption that the relocation costs reflect the length or number of assets that are permanently affected. This will be most uncertain for length-based estimates (such as length of road or railway) as the relocation routes could be much longer than the length that they replace.

For non-residential properties, the Weighted Annual Average Damages (WAAD) are for properties without a basement. Although the classification of non-residential properties does include social infrastructure, emergency services and utilities, data on these properties is of a lower quality than for businesses. As such, the WAAD when applied to social infrastructure, emergency services and utilities are likely to be highly uncertain.

Further uncertainty is introduced where the number of properties (residential and non-residential) at each probability level is based on the generic assumptions from the MCH. Since these assumptions relate to the average proportion of residential properties in a 1 in 200 year flood plain, they are unlikely to reflect the situation within your IDB very well. This will also introduce a high level of uncertainty into the estimates and may under-estimate the impacts on non-residential properties where there is a greater number at higher probability of impacts than suggested by the default assumptions, such as in low-lying areas. An OS map could be used to identify the location of non-residential properties, especially some social infrastructure, emergency services and utilities, hence, provide a basis for an IDB-specific probability level for these assets, reducing the level of uncertainty to some degree.

Impacts on road transport may be under-estimated in areas with above average traffic levels or where roads are already at (or almost at) carrying capacity. The toolkit allows data specific to the roads in question to be included to reduce the level of uncertainty (such as vehicle counts or changes to the number of hours delay). Specific data should be used wherever transport impacts might be significant and they can be reasonably readily collected (this may be easier for road transport through Local Authority road count data than for rail impacts, although passenger data may be available).

The approach for railways for indirect costs is based on information and costs provided by National Rail. Therefore, these impacts may be of lower uncertainty than the direct effects. Some uncertainty will be introduced through the use of 'typical' lines to provide an estimate of the impacts on other lines, but this is considered proportionate given the level of uncertainty introduced through other assumptions for this and other categories.

The impacts of waterlogging are assumed to be the same as for flooding, which is unlikely to be the case. If the impacts relate only to waterlogging of ground and, perhaps, flooding of foundations, then the damages will need to be revised downwards to avoid significantly over-estimating the impacts. The depth-damage tables provided on the CD accompanying the MCH can be used as the basis for revised damage values, although values for specific utilities may not be available,

requiring extrapolation from other types of non-residential properties or engagement with service or utility providers. Conversely, impacts from permanent waterlogging may significantly affect use of some assets (especially roads and railways) and could result in an under-estimate of benefits. It is important, therefore, to remember that the assessment is based on the probability of impacts on that asset, not the probability of flooding.

Caution should be applied if using the estimated impacts on residential property for Grant-in-Aid appraisals as the MCH recommends the use of WAAD for outline studies only. This means that the estimates may be questioned if they are used to justify the need for capital funding. Care is also needed as the monetary values estimated are annual values, ignoring that some properties with high probability of impact may be written-off (this may under-estimate actual damages). The use of annual values means that no capping is used. The need for capping should be considered when estimating Present Value (PV) damages over a long appraisal time horizon. Furthermore, if you would like to use the annual values calculated in the spreadsheet in GiA appraisals, you will need to take account of the timing of impacts. This is because impacts that do not occur until sometime into the future will be discounted. This will be important where the impacts would not occur immediately. For example, if the pumps were switched off, you should consider the time before the assets would be affected by changes in water levels. If this would take, say five years, you would need to reflect this by delaying the onset of impacts until year four (assuming you start the appraisal in year 0).

6.6 Food production

6.6.1 Background and approach

Impacts on food production are estimated based on the change in productivity of land and the use of land from changes in water levels. To complete this worksheet you need to:

1. Identify the area (in ha) of arable, grassland, pigs/poultry and horticulture that is affected.
2. Estimate the change in probability of impacts on arable, grassland, pigs/poultry and horticulture under the baseline scenario.
3. Enter the number of hectares whose probability of impacts changes, by type of land in cells D5 to M14 (for arable land), cells D18 to M27 (for grassland), cells D31 to M40 (for pigs/poultry) and cells D44 to M53 (for horticulture). For example, if the probability of impacts for 2,200 ha of arable land changes from 100% under the baseline to 20% under the current situation, put 2,200 into cell F5.

You can change the values included to estimate the impacts of agricultural land, to update them, or make them locally specific (the default numbers are national averages and will not therefore reflect the grade of land within the IDB district so specific values should be used where available). You can also change whether the impacts are assumed to be as a result of permanent loss for food production or a one-off loss, as well as other input data such as the number of years over which land prices are annualised¹⁵. The default assumption is 20 years, but you can increase or

¹⁵ Annualisation is used to convert the land value to a per year value.

decrease this if you have local data that suggest land prices are annualised (sometimes referred to as capitalised) over a different time period. Take care though as the discount rate used needs to be consistent with the HM Treasury rate of 3.5%; discount rates used by land valuers are likely to be higher so will have lower annualisation time periods.

6.6.2 Uncertainty with the food production category

The main uncertainties with the impacts on food production are the values used for loss of land and output, and the amount of land that is allocated to each probability level. The values used for loss of land and output are based on national averages and reflect just one year of data. You should use land values from your IDB area wherever possible, as the national averages do not reflect the grade of land present. Given the volatility of agricultural crop values, you may wish to use a moving average of gross margin for the one-off losses. This could be a five- or ten-year moving average, depending on the data you have available. The spreadsheet uses a value from 2012 to keep the data requirements to a minimum but where food production is a significant benefit, you may wish to collect and use additional data.

The amount of land at each probability level is based on assumptions on the area of agricultural land at different levels of flood risk for the country as a whole. Clearly, basing the assumption of percentage of all agricultural land in England at each probability level will introduce a high level of uncertainty since much of the low lying land within IDBs will require water level management to retain productivity. Therefore, you should change the proportion of land at each probability level wherever possible (cells D114 to M114).

The approach used in the food production worksheet follows Defra guidance on the treatment of agricultural land, hence, is consistent with approaches used when estimating damages for capital Grant-in-Aid appraisals. Care is needed though as the monetary values estimated in the food production worksheet are annual values. The use of annual values means that no capping is used. The need for capping should be considered when estimating Present Value (PV) damages over a long appraisal time horizon, especially if damages due to permanent loss of land are estimated and the time over which land values are annualised is less than the time horizon used for the GiA appraisal. Furthermore, if you would like to use the annual values calculated in the spreadsheet in GiA appraisals, you will need to take account of the timing of impacts. This is because impacts that do not occur until sometime into the future will be discounted. This will be important where the impacts would not occur immediately. For example, if the pumps were switched off, you should consider the time before agricultural land would be affected by changes in water levels. If this would take, say five years, you would need to reflect this by delaying the onset of impacts until year four (assuming you start the appraisal in year 0).

6.7 Energy

6.7.1 Energy (direct)

Impacts on energy are estimated based on impacts in amount of energy that can be produced and transmitted to, and around, the National Grid. To complete this worksheet you need to:

1. Identify the number of power stations, windfarms, etc., and length of power lines (in km) that are affected.
2. Estimate the change in probability of impacts on power stations and power lines under the baseline scenario.
3. Enter the number of power stations and length of power lines whose probability of impacts changes, in cells D4 to M13 (for power stations, windfarms, etc.) and cells D17 to M26 (for power lines). For example, if the probability of impacts for 35km of power lines changes from 100% under the baseline to 20% under the current situation, put 35 into cell F17.

You can update the cost associated with rebuilding or relocating power stations and power lines, or the repair costs associated with occasional impacts where you have more specific cost information. The values included in the spreadsheet are highly uncertain as they are based on generic data on construction costs of power stations.

If the probability of impacts is 100% or 50%, it is assumed that this would result in permanent loss. Where there are permanent losses, it is assumed that the power stations and power lines would be relocated and the risk removed (in many cases, this may need to be outside the IDB district). The spreadsheet does not take account of any impacts that might occur between the time that the power station or power lines are impacted and when they are relocated. A depreciation factor of 50% is applied to permanent losses, in line with the other benefit categories. Probabilities lower than 50% are assumed to result in one-off, or occasional losses.

6.7.2 Energy (indirect)

Indirect impacts on energy are estimated based on the change in probability of impacts of power outages affecting electricity consumers. This worksheet is automatically completed, using information on the number of residential properties affected to determine the number of electricity sub-stations that could be impacted. You can replace the automatic assumptions if you have specific data on the type and number of sub-stations affected. The automatic calculations may under-estimate the number of larger electricity sub-station that could be affected if you have divided residential properties across a large number of different probability impacts. This is because the spreadsheet divides the number of properties associated with each change in probability by the typical number of customers supported by each type of sub-station. Therefore, if there are 28,000 properties but these are divided across 10 different probabilities, the spreadsheet would only identify distribution sub-stations (serving 150 properties each) and no primary sub-station (6,000 properties) or transformation sub-stations (28,000 properties). If though, you had allocated all the properties to one probability, the spreadsheet would assume that there is one transformation sub-station and four primary sub-stations, alongside the distribution sub-stations.

You can update the number of customers supplied by each type of electricity sub-station, the typical customer distribution, the cost of one hour's power outage for

those customers and the typical number of hours affected, if you have specific or more up-to-date data.

Where there are permanent impacts on power stations or power lines, it is assumed that these would be relocated outside the at-risk area, such that indirect impacts would not occur.

6.7.3 Uncertainty with the energy category

The main uncertainties with the impacts on energy are the assumptions on the probability of impacts, the number and distribution of customers supplied by different types of sub-station, the values used for relocation and repair costs, and costs and duration of power outages.

The percentage of total WAAD used as the basis for valuing the impacts from a change in probability of impacts for power stations, power lines and sub-stations is based on assumptions on the number of business properties at different levels (from the MCH). Clearly, these assumptions will introduce a high level of uncertainty since they may reflect the actual risk to energy assets.

The number of customers typically supplied by each of the four types of electricity sub-station is based on information readily available from electricity companies. As the values are averages, they are unlikely to be applicable to all sub-stations and so will introduce some uncertainty. Much more significant though, is the uncertainty introduced from the assumptions made about the distribution of types of customers (90% being households, 9% being small and medium-sized businesses and 1% being large businesses). As this is an estimate, it is unlikely to reflect the actual distribution and so will introduce a high level of uncertainty. It may, though, be difficult to obtain specific data on customer distribution such that reducing this uncertainty may be very time consuming and resource intensive.

The values for relocation, rebuild and repair costs are based on high level cost data and it is not always clear which costs are and are not included. This is likely to introduce a high level of uncertainty into the benefit estimates. In addition, uncertainty is introduced by ignoring any time delay between electricity assets being affected permanently and being replaced. This time may be minimised where there is the potential to plan for their replacement, such that uncertainty in the benefit estimates would be greatest where there is no warning that the IDB will stop all activities. As a result, it is assumed that there are zero indirect damages if power stations or power lines are to be relocated (i.e. under the 100% and 50% probabilities of impacts).

The costs of power outages are based on a study undertaken in the USA in 2003. The costs taken from this study have been converted to Pounds Sterling using the Purchasing Power Parity and uprated to 2012 values. However, the use of values from the USA may not reflect the value of electricity to UK consumers and so will introduce significant uncertainty.

Energy damages are not usually monetised¹⁶ for a GiA application since it would be assumed that electricity production lost in one area could be replaced by energy from somewhere else (when monetised the impacts become a transfer payment). However, there may be a case for monetising the damages where there would be disruption to electricity services. This may require the annual values used on the energy worksheet to be reduced to reflect the time over which disruptions might be expected to occur. Furthermore, if you would like to use the annual values calculated in the spreadsheet in GiA appraisals, you will need to take account of the timing of impacts. This is because impacts that do not occur until sometime into the future will be discounted. This will be important where the impacts would not occur immediately. For example, if the pumps were switched off, you should consider the time before any assets associated with electricity provision would be affected by changes in water levels. If this would take, say five years, you would need to reflect this by delaying the onset of impacts until year four (assuming you start the appraisal in year 0).

6.8 Biodiversity sites

6.8.1 Designated biodiversity sites

Impacts on biodiversity are estimated based on impacts on designated sites from a change in water levels; those for non-designated sites are based on how changes in land use might affect the extent to which biodiversity is supported or enhanced and are considered separately. To complete this worksheet you need to:

1. Identify the area of internationally, nationally and other/locally designated sites.
2. Estimate the change in probability of impacts to designated sites, taking account of whether the impacts would be negative (damages, i.e. loss of biodiversity) or positive (benefits, i.e. gain in biodiversity). It may not always be possible to determine the net change in biodiversity. This is because an increase in water levels might be beneficial for some species but detrimental to others. If you are unsure, it is better to record your assumptions in the 'describe baseline' worksheet and avoid monetisation of these impacts. For designated sites, especially international and national designations, there may be negative impacts from impacts on the reasons for designation. There is, therefore, a stronger reason for monetising these impacts.
3. Enter the area of land whose probability of impacts changes, in cells D5 to M14 (for international designations), cells D18 to M27 (for national designations) and where there is strong evidence that biodiversity value would change in one direction or the other in cells D31 to M40 (for other/local designations). For example, if the probability of impacts for 55 ha of internationally designated land changes from 100% under the baseline to 20% under the current situation, put 55 into cell F5.

You can update the damages given for different types of habitat, if you have specific damage data. The values given are based on Defra GiA funding contributions (Outcome Measure 4) for recreation/relocation of sites due to permanent impacts and willingness to pay values for different types of habitat for one-off losses or occasional impacts. The most important one to change may be that relocation costs for international designations. By default this is given as £50,000 per ha, based on the cost of creation of intertidal habitat. Where the habitat affected is wet grassland,

¹⁶ Unless power lines have to be relocated, in which case the costs of relocation may be included in the economic appraisal.

a more appropriate relocation cost may be £30,000 per ha. As with the other categories, you can also change the default assumptions on the proportion of the area that is allocated to each probability level (cells D77 to M77); the implications of these assumptions for uncertainty are discussed below.

6.8.2 Non-designated biodiversity sites

The non-designated biodiversity calculation worksheet is more like the carbon worksheet than the designated biodiversity worksheet in that it is based on the likely change in land use from the baseline to the current scenario.

Cells D5 to Q18 provide space to record the number of hectares that change from one land use to another. Each land use type typically has two options:

- land use type with no specific action undertaken to enhance biodiversity (e.g. intensive arable, extensive arable);
- land use type with specific actions undertaken to enhance biodiversity (e.g. intensive arable managed to enhance biodiversity).

These two types of land use are needed to ensure that activities currently being undertaken by IDBs and landowners are reflected in the valuation of impacts. This is particularly important where the benefits are associated with the baseline of the IDB stopping all its activities as changes in land use to a large lake may not necessarily be a benefit to biodiversity. One way of identifying the proportion of land that is currently being managed to benefit biodiversity may be to identify the percentage that is under agri-environment agreements. This can be done by looking at county-wide data published by Natural England:

<http://publications.naturalengland.org.uk/category/3573102#content>¹⁷.

To complete this worksheet, you need to:

- identify the land use that is expected under the baseline scenario (where possible, this should be consistent with the assumptions made for the carbon worksheet);
- identify how the land use will change from the baseline to the current scenario and record the ha that change in cells D5 to Q18 for land use types
- identify how the length of watercourses currently managed by the IDB will change and record the km affected in cells R19 to T21.

There are few studies that have estimated the change from one land use type to another for biodiversity value. As a result, a simple scoring system is used to reflect whether biodiversity will increase or decrease and whether this increase or decrease would be slight (± 1) or significant (± 2). Default scores have been assigned and are used as the basis for estimating how much of the willingness to pay for biodiversity value would be gained or lost due to the change in biodiversity value across the whole IDB district. A specific willingness to pay value can be used in place of the default value (£190 per ha) if this is available. The average width of a watercourse can also be changed from the default assumption of 1m, where appropriate.

¹⁷ Link correct as of 4 April 2013

6.8.3 Uncertainty with the designated biodiversity sites category

The main uncertainties with the impacts on biodiversity are the values used to reflect impacts on designated sites, assumptions on the probability of impacts and the use of a simple scoring system to reflect change in biodiversity for non-designated sites. The values used for permanent losses for the designated habitats are based on relocation and recreation costs, using Defra GiA funding values. Willingness to pay values to conserve or improve habitats are used for one-off losses and for the non-designated habitats. The willingness to pay values have been determined for another site in another location but have been presented in such a way that they are considered appropriate to be used here to give an estimate of the impacts on biodiversity for IDBs. These assumptions can introduce considerable uncertainties because the biodiversity present in your IDB may differ considerably from the biodiversity in the original study. They should, therefore, be treated as an indication of the potential monetary value of the impacts. The value used for the non-designated habitats is based on a meta-analysis, which means it takes account of a large number of studies to come up with an overarching figure, but there is still uncertainty associated with it.

For designated biodiversity, the change in impacts from one level of probability to another is based on assumptions on the proportion of residential properties that are typically located at different probability levels (from the MCH). Clearly, these assumptions will introduce a high level of uncertainty as they are not specifically related to the location of designated sites.

For non-designated biodiversity, the use of a scoring system to reflect the change in biodiversity value is a significant simplification of the differences between different land uses. However, given the lack of available valuations and the amount of data that would otherwise have to be included, it is assumed to be a reasonable approximation. Clearly, though, there will be considerable uncertainty in the estimated benefits or damages.

Many Grant-in-Aid appraisals will include some valuation of the impacts on biodiversity. Care is always needed that the valuation relates to a change in biodiversity or change in habitats, rather than a total value for a particular type of habitat. This is because it is the change that is important and needs to be valued. The values used in the designated biodiversity sites worksheet reflect the value of a change so could be used in a GiA appraisal, although the values for non-designated biodiversity may not be suitable. Care will be needed to make sure that the values are appropriate for the change that would be expected. Furthermore, if you would like to use the annual values calculated in the spreadsheet in GiA appraisals, you will need to take account of the timing of impacts. This is because impacts that do not occur until sometime into the future will be discounted. This will be important where the impacts would not occur immediately. For example, if the pumps were switched off, you should consider the time before any designated habitats would be affected by changes in water levels. If this would take, say five years, you would need to reflect this by delaying the onset of impacts until year four (assuming you start the appraisal in year 0).

6.9 Water supply

6.9.1 Background and approach

The water supply category only covers water that is abstracted in the IDB but used outside. This is to avoid double counting with other categories such as food production or biodiversity. The calculation worksheet for water supply allows both the direct benefits (water abstractors or water transfer) and indirect benefits (water abstracted for Public Water Supply) to be estimated. Impacts on water supply are based on the volume of water affected and the change in probability of impacts. To complete this worksheet you need to:

1. Identify which Environment Agency region you are in as that will affect the average MI/day per licence. You can skip this step if you have actual licensed volumes (and enter the licensed volume into cells D18 to K18, or if you only have a total across all licences in L18).
2. Where you are using the default average licensed volumes enter the total number of licences (cells D17 to L17). Again, you do not need to fill in these cells if you have entered known licensed volumes but you can input the number of licences if you want to.
3. Estimate the change in probability of impacts to the different types of licence (this may depend on location of abstraction, especially where surface water abstraction requires a particular height of water) and enter the number of licences in the cell that reflects the change in probability of impacts (from the baseline to the current situation). For example, if there are 4 Public Water Supply licences with a probability of impacts of 100% under the baseline, and at 2% under the current situation, put 4 into cell I27.

As noted above, you can directly input the total licensed volume of water, by licence type or as a total, if these data are available. You can also update the value (per MI/day) of water (cells D22 to L22) if you have site specific values. As with the other categories, you can also change the default assumptions on the proportion of the area that is allocated to each probability level (cells D85 to M85); the implications of these assumptions for uncertainty are discussed below.

6.9.2 Uncertainty with the water supply category

The main uncertainties for water supply come from the use of default assumptions on the average volume of water abstracted for different types of licence, the values used per MI/day and the probability that licences and the water they provide may be impacted.

Use of average volumes per licence will be a simplification and could over- or under-estimate actual impacts depending upon actual licensed volumes. To reduce the level of uncertainty to some degree, averages are calculated per Environment Agency region rather than nationally. Water transfers also need to be taken into consideration as the IDB watercourse system may provide opportunities for transfer of water from one location to another, especially for Public Water Supply. This could involve very large volumes of water and average values are unlikely to be a good representative of the potential damages in such cases.

The values used per Ml/day are generally associated with the costs of replacing the 'lost' water by utilising other sources. This means it is assumed that licences that can no longer be used, or fully used, could be replaced with new abstraction licences. In many places, this may not be possible due to restrictions on new abstractions. In such cases, the values used are likely to under-estimate the value of 'lost' water.

The change in impacts from one probability level to another for water supply is based on assumptions on the number of residential properties at different probability levels (from the MCH). Clearly, these assumptions will introduce a high level of uncertainty and, where possible, probabilities of impacts for abstraction points specific to the IDB should be determined to reduce the uncertainty.

Appraisals used to put forward a case for Grant-in-Aid funding usually include impacts on abstractions where abstraction points need to be moved. As such the approach used here differs slightly in that it is based on the value of water that is lost rather than the cost of moving to an alternative abstraction location. The values produced by the water supply worksheet may, therefore, need to be capped at the cost of constructing an alternative abstraction point for GiA appraisals. Furthermore, if you would like to use the annual values calculated in the spreadsheet in GiA appraisals, you will need to take account of the timing of impacts. This is because impacts that do not occur until sometime into the future will be discounted. This will be important where the impacts would not occur immediately. For example, if the pumps were switched off, you should consider the time before any abstraction points would be affected by changes in water levels. If this would take, say five years, you would need to reflect this by delaying the onset of impacts until year four (assuming you start the appraisal in year 0).

6.10 Recreation and tourism

6.10.1 Background and approach

The calculation worksheet for recreation and tourism takes account of different types of recreation assets and their likely importance in terms of attracting local visitors and tourists to the area. Impacts on recreation are based on the effect that changes in water levels could have on the use of the recreational assets. To complete this worksheet you need to:

1. Identify how many recreational assets of each type are present in the IDB. The types included are: long distance footpaths, other waymarked walks, cycle ways and bridleways, car parks, camp sites, picnic areas, golf courses, museums, pubs, racecourses, and horse riding centres. There is also space for two 'other' categories relevant to your IDB. Take care though not to double count with assets captured under other categories, especially heritage.
2. The recreation worksheet uses default estimates of visitor numbers as the basis for valuing the impacts, based on the likely importance of the different types of asset in terms of attracting visitors and the level of access. You can replace these with actual visitor numbers if you have them.
3. Estimate the change in probability of impacts of the different types of recreational asset and enter the number of assets in the cell that reflects the change in probability (from the baseline to the current situation). For example, if there are 4 car parks with

an estimated probability of impacts of 20% under the baseline, and at 1% under the current situation, put 4 into cell K85. All the recreational assets are entered into cells D83 to M92.

As noted above, you can directly input the total number of visitors to the IDB if these data are available (cell D34). You can also update the value per visit (cell D36) if you have site specific values. As with the other categories, you can also change the default assumptions on the proportion of the area that is allocated to each probability level; the implications of these assumptions for uncertainty are discussed below.

6.10.2 Uncertainty with the recreation and tourism category

The main uncertainties for recreation come from the use of default assumptions on the number of visitors, the values used per visit and the estimated probability that recreational assets may be impacted.

Visitor numbers are based on guidance used for assessing water quality and water resources benefits (the Environment Agency's Benefits Assessment Guidance and Table 8.2 in the MCH) but, as with all generic values, may over- or under-estimate the number of visitors to the IDB.

The values used for permanent loss are based on the costs of relocating assets, while those used per visitor for one-off losses are based on a valuation study from the United States that generates an overall recreation value across a wide range of recreational activities. The values have been converted to Pounds Sterling in line with Defra guidance, but the applicability of a study from the USA for recreation in England could be questionable. As a result, this could introduce considerable uncertainty into the assessment. To reduce the uncertainty, you would need to identify a value for each type of recreational assets and multiply this by the visitor numbers to each asset. This would be a much more detailed approach to estimating a recreational impact but may be worthwhile where recreation impacts make up a significant proportion of the total impacts.

The change in impacts from one probability level to another for recreational assets is based on assumptions on the number of residential properties at different probability levels (from the MCH). Clearly, these assumptions will introduce a high level of uncertainty unless the recreational assets affected are mainly located with residential areas, in which case the uncertainty may be somewhat reduced.

Appraisals for Grant-in-Aid funding may include valuation of recreational assets, but in many cases these damages are not included as it is considered that impacts on recreation and tourism lost in one area would be benefits to another area (when monetised these are known as transfer payments). You will, therefore, need to adjust the recreational and tourism impacts for GiA appraisal to exclude any transfers. Furthermore, if you would like to use the annual values calculated in the spreadsheet in GiA appraisals, you will need to take account of the timing of impacts. This is because impacts that do not occur until sometime into the future will be discounted. This will be important where the impacts would not occur immediately. For example, if the pumps were switched off, you should consider the time before any recreational assets would be affected by changes in water levels. If this would

take, say five years, you would need to reflect this by delaying the onset of impacts until year four (assuming you start the appraisal in year 0).

6.11 Heritage

6.11.1 Background and approach

The calculation worksheet for heritage takes account of different types of heritage assets and different designations. Impacts on heritage are based on impact that changes in water levels could have on the heritage value of the assets. To complete this worksheet you need to:

1. Identify how many heritage assets of each designation are present in the IDB. The designations included are: World Heritage Site, listed buildings, scheduled monuments, registered parks and gardens, registered battlefields, conservation areas and local listing/local heritage assets.
2. The heritage worksheet uses default estimates of visitor numbers as the basis for valuing the impacts. You can replace these with actual visitor numbers if you have them but be careful since not all heritage assets may be open to visitors so you may under-estimate the potential value of heritage assets if there are no visitors. This is because the number of visitors is used to enable an indicative value of the impacts to be estimated, since the only values that were considered applicable to IDBs were 'per visitor'.
3. Estimate the change in probability of impacts to the different types of heritage asset and enter the number of heritage assets in the cell that reflects the change in probability level (from the baseline to the current situation). For example, if there are 4 listed buildings with a probability of impacts of 20% under the baseline, and at 1% under the current situation, put 4 into cell K50.

As noted above, you can directly input the number of visitors by heritage type if these data are available. You can also update the value per visit (cells D26 to D31) if you have site specific values. As with the other categories, you can also change the default assumptions on the proportion of the area that is allocated to each probability level; the implications of these assumptions for uncertainty are discussed below.

6.11.2 Uncertainty with the heritage category

The main uncertainties for heritage come from the use of default assumptions on the number of visitors, the assumption that number of visitors is an appropriate surrogate for the value of heritage assets, the values used per visit and the estimated probability that heritage assets may be impacted.

Visitor numbers are based on statistics from English Heritage but, as with all generic values, may over- or under-estimate the number of visitors to heritage assets within the IDB. It is important to remember though that the number of visitors is being used as a method for obtaining a 'typical' value for different types of heritage asset since the values available for monetising the impact are all 'per visit'. As a result, using actual visitor numbers could under-estimate the value of impacts on heritage assets, especially where assets are not open to the public.

The values used per visitor are based on one valuation study and use the low and high willingness to pay values for entry to Warkworth Castle. Valuations for heritage assets tend to be very specific and focused mainly on unique assets such as Stonehenge. This makes it very difficult to identify values that can be used here to give a reasonable estimate of the impacts. Use of valuations for Stonehenge would clearly over-estimate the value of the impacts. The Warkworth Castle value may mean that the estimates produced are on the conservative side.

The change in impacts from one probability level to another for heritage is based on assumptions on the number of residential properties at different probability levels (from the MCH). Clearly, these assumptions will introduce a high level of uncertainty unless heritage assets are mainly located with residential areas, in which case the uncertainty may be somewhat reduced.

Appraisals for Grant-in-Aid funding may include valuation of heritage assets. This can sometimes be as cost of relocation (as for the Beachy Head lighthouse). The approach used here is based on putting a value on impacts and is appropriate for use in GiA appraisals but the lack of available values mean that any damages or benefits reported may be questioned, so all assumptions and an assessment of uncertainty should be clearly included along with any benefit or damage estimates. Furthermore, if you would like to use the annual values calculated in the spreadsheet in GiA appraisals, you will need to take account of the timing of impacts. This is because impacts that do not occur until sometime into the future will be discounted. This will be important where the impacts would not occur immediately. For example, if the pumps were switched off, you should consider the time before any heritage assets would be affected by changes in water levels. If this would take, say five years, you would need to reflect this by delaying the onset of impacts until year four (assuming you start the appraisal in year 0).

6.12 Jobs

6.12.1 Background and approach

The jobs worksheet calculates the indirect benefits associated with expenditure of the IDB and the number of jobs that are supported in other sectors of the economy because of the money that the IDB spends. To reflect the benefits to the local area, you need to identify the percentage of expenditure that is spent outside the IDB area. In most cases, this percentage may be high, for example, on contractors or consultants. A typical estimate may be 70%, which means that for every £100,000 spent by the IDB, £70,000 is used to secure services from outside the IDB and £30,000 for services provided by companies located inside the IDB. However, this value will vary by IDB and a specific value should be used wherever possible. It is not always easy to identify what this percentage should be and an approximate percentage is usually sufficient.

6.12.2 Uncertainty with the jobs category

The assumption on the percentage of money spent outside the IDB (leakage) is the main source of uncertainty. There is also uncertainty associated with the multiplier used to estimate the indirect benefits. This is taken from data provided by the

Organisation for Economic Co-operation and Development (OECD) for knock-on benefits from spend in the construction sector. The broad nature of the construction sector means that the multiplier may over- or under-estimate the knock-on impacts but specific data on IDBs or land drainage are not available.

7. Output worksheets

A series of output worksheets are provided that summarise the findings of the assessment in tables and charts. Summary reports using these output worksheets are provided for the six sample IDBs and can be referred to as examples. Many of the tables and charts include caveats surrounding how the benefit estimates and the division of benefits across beneficiaries should be used and/or reported. The main caveats and their implications are:

1. The benefit estimates are given as a per year value and ignore when particular impacts would occur. This simplification means that the total benefits cannot be compared with the costs incurred by IDBs when undertaking their activities. As a result, any attempts to estimate a benefit-cost ratio will be meaningless. To enable a benefit-cost ratio to be calculated, it would be necessary to identify when the impacts are likely occur and discount them accordingly and to cap any benefits that exceed the rebuild or relocation costs (or costs of undertaking specific activities to reduce or remove the impacts of changes in water levels).
2. The method of estimating benefits is based on impacts on one individual IDB. If a cumulative assessment of the benefits of two or more IDBs is required, a new assessment would have to be undertaken that reflects the antagonisms, especially where these IDBs are adjacent. As a result, just summing the benefits of the individual assessments is likely to significantly under-estimate the benefits of the IDBs when considered together.
3. The approach to separating IDB benefits from those provided by Environment Agency assets is simplified. In many cases, the interaction between the two sets of assets/activities may be difficult to disentangle and, as such, the distribution of benefits between IDBs and the Environment Agency is likely to be highly uncertain. However, the current approach does try to distinguish between those benefits associated with 'above ground' (flooding) risks and those associated with 'below ground' (waterlogging/drainage) risks. It is the balance of importance of each of these risks that needs to be assessed for individual IDBs when determining if the default percentages are likely to be applicable, or some changes are needed.
4. The uncertainty within the benefit estimates will vary according to how much specific data has been included. Where generic data are used, the uncertainty is likely to be high and total benefits should not be reported to greater detail than a maximum of two significant figures. In addition, it is recommended that the degree of uncertainty is reported alongside the benefit estimates, especially where these are being presented to and/or discussed with beneficiaries.

8. References

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Annex 5: Results of the Benefits Assessment Toolkit for the Sample IDBs

1 Introduction

The Benefits Assessment Toolkit and benefits assessment spreadsheet have been applied to six sample IDBs. This Annex summarises the results of the application and discusses the relative results as a method of testing the likely validity of the benefits produced by the spreadsheet.

The six sample IDBs are:

1. Bedfordshire and River Ivel Internal Drainage Board
2. Black Sluice Internal Drainage Board
3. Lower Severn Internal Drainage Board
4. Norfolk Rivers Internal Drainage Board
5. North Level District Drainage Board
6. Ouse and Humber Drainage Board

The completed spreadsheets provide the full data and information collected and used. The Sections below provide a summary of the drainage board, the information collected for each IDB and the results produced.

2 Bedfordshire and River Ivel Internal Drainage Board

2.1 Overview of the Drainage Board

The catchment area draining to and including the District is 77,317 ha, while the total area of the Drainage District is 17,852 ha. This includes 15,004 ha of agricultural land and 2,848 ha of urban land (comprising residential and industrial properties, major infrastructure, motorways and other highways). The District also includes 62.9 ha of wetland SSSI, five Local Nature Reserves and 56 non-statutory County Wildlife Sites (Bedford Groups of IDBs, 2010).

The Board has operating responsibility for 12 water control structures, 1.18 km of raised embankments and 21.22 km of strategic ordinary watercourses, and statutory powers to carry out works of maintenance and improvement on 636 km of watercourses. There are also 64.27 km of main river and 27.92 km of river raised embankments, which are maintained by the Environment Agency (Bedford Groups of IDBs, 2010).

Bedford Groups of IDBs (2010) seeks to achieve a standard of flood protection to agricultural land of 20% (1 in 5) and to developed areas of 1% (1 in 100). The Board uses operation and maintenance of flood balancing areas and the channel system to achieve these standards. In addition, the Board monitors the condition of its watercourses, especially those identified as strategic and has in place a routine management programme to ensure that the condition of assets is appropriate.

2.2 Definition of the baseline and current scenario

The assessment has used a baseline that assumes the IDB stops all of its activities (similar to do-nothing). The current scenario is defined as the IDB continuing its activities as at present. The assessment will, therefore, provide an indication of the benefits provided by the IDB from its current activities.

2.3 Main Data Sources Used

Table 2.1 sets out the main data sources used for the Bedfordshire & Ivel assessment.

Table 2.1: Source of information	
Category	Sources of information used
Carbon	Current land use based on data produced by IDB (in particular the policy statement) GIS data on land use
Waterlogging, drought, flooding, erosion: • Residential properties	Neighbourhood statistics (output area: household spaces, accommodation type, dwellings, housing stock, lowest floor level)
Waterlogging, drought, flooding, erosion: • Business properties	Valuation Office Agency (business rates data) CLG (commercial and industrial floorspace rateable value statistics) Neighbourhood statistics (local authority area: local units by broad industry group, VAT Based enterprises, VAT based local units)
Waterlogging, drought, flooding, erosion: • Social infrastructure	Ordnance Survey maps Valuation Office Agency (business rates data)
Waterlogging, drought, flooding, erosion: • Emergency services	Ordnance Survey maps
Waterlogging, drought, flooding, erosion: • Utilities infrastructure	Ordnance Survey maps National Grid (gas pipeline maps)
Waterlogging, drought, flooding, erosion: • Transport infrastructure	Ordnance Survey maps Local Authority vehicle counts Data.gov.uk (road traffic counts, transport statistics) National Rail timetables
Control of invasive species	Biodiversity Action Plan
Water quality	Environment Agency (waterbody status and river bodies and water quality) Biodiversity Action Plan
Production of grown food	GIS data on land use Ordnance Survey maps
Collection of natural food	No data found
Energy	Ordnance Survey maps (including Vector Map Open Data) Eastern Power Networks (sub-stations map)
Production of timber, fibre, aggregates, peat, etc.	Ordnance Survey maps GIS land use data
Biodiversity	Biodiversity Action Plan Natural England (nature on the map; agri-environment statistics)
Water supply	Environment Agency CAMS
Health and well-being of people	Neighbourhood statistics (Health and Care – General Health (UV20)) Floodzone 2 data
Health and well-being of communities	Neighbourhood statistics (Health and Care – General Health (UV20)) Floodzone 2 data
Level of involvement in decision-making	Linked to involvement in IDB decisions (e.g. Board meetings)
Landscape character	www.MAGIC.gov.uk AONB website (www.aonb.org.uk) Natural England (Joint Character Areas)
Heritage values	English Heritage (World Heritage Sites, Listed buildings,

Table 2.1: Source of information	
Category	Sources of information used
	Scheduled monuments, parks and gardens, battlefields) Ordnance Survey maps (including Vector Map Open Data)
Knowledge and education	No data found
Recreation and tourism	Ordnance Survey maps (including Vector Map Open Data) Local Authority footpath/cycle route inventories
Jobs/expenditure	IDB accounts

2.4 Results of the Qualitative Assessment

The qualitative assessment provides a summary of the magnitude and significance of benefits. Table 2.2 provides the results.

Table 2.2: Summary of the qualitative assessment results – Bedfordshire and River Ivel IDB				
Categories (by number)	Magnitude			
Significance	Small	Moderate	Large	Total
Not very significant	2	0	0	2
Slightly significant	8	5	3	16
Significant	0	2	13	15
Very significant	1	0	8	9
Total	11	7	24	42
Categories (by percentage)	Magnitude			
Significance	Small	Moderate	Large	Total
Not very significant	18%	0%	0%	5%
Slightly significant	73%	71%	13%	38%
Significant	0%	29%	54%	36%
Very significant	9%	0%	33%	21%
Total	100%	100%	100%	100%
Significance (by magnitude)	Magnitude			
Significance	Small	Moderate	Large	Total
Not very significant	100%	0%	0%	100%
Slightly significant	50%	31%	19%	100%
Significant	0%	13%	87%	100%
Very significant	11%	0%	89%	100%
Total	26%	17%	57%	100%

Table 2.2 shows that the most common benefits are identified as large, significant (13) followed by small, slightly significant (8). There are, though, 24 large benefits compared with 11 small and 7 moderate. Larger impacts also tend to be more significant with 87% of large benefits being significant or very significant, compared with just 29% of moderate benefits and 9% of small benefits. All of the benefits identified as being not very significant are identified as small, while 87% of significant benefits and 89% of very significant benefits are large in magnitude. This is perhaps not surprising since very significant benefits (affecting all or almost all assets) are

more likely to be large (having big impacts on affected assets), especially given the difference between the baseline (no IDB) and current situation (with IDB).

2.5 Results of the Quantitative Assessment

Monetary values for the benefits have been estimated where a reasonably robust approach is available. Table 2.3 provides the benefits by category. The table shows benefits to IDBs and the Environment Agency.

Table 2.3: Estimated monetary benefits of IDB activities – Bedfordshire and River Ivel IDB				
Category	IDB Benefits	IDB damages	EA benefits	EA damages
Carbon	£0	£-2,000,000	£0	£0
Residential properties	£1,300,000	£0	£11,700,000	£0
Business properties	£140,000	£0	£1,260,000	£0
Social infrastructure	£61,000	£0	£549,000	£0
Emergency services	£390	£0	£3,510	£0
Utilities	£200,000	£0	£1,800,000	£0
Transport (road) direct	£7,500,000	£0	£7,500,000	£0
Transport (road) indirect	£8,000,000	£0	£8,000,000	£0
Transport (rail) direct	£900,000	£0	£900,000	£0
Transport (rail) indirect	£1,100,000	£0	£1,100,000	£0
Food production	£3,420,000	£0	£380,000	£0
Energy (direct)	£300,000	£0	£2,700,000	£0
Energy (indirect)	£3,100,000	£0	£27,900,000	£0
Designated biodiversity sites	£8,820	£0	£980	£0
Non-designated biodiversity sites	£0	£-900,000	£0	£-100,000
Water supply	£1,500,000	£0	£0	£0
Recreation and tourism	£850,000	£0	£850,000	£0
Heritage	£800,000	£0	£800,000	£0
TOTAL	£30,000,000	£-2,900,000	£65,000,000	£-100,000
OVERALL	£27,100,000	annual benefits from IDB activities		

Table 2.3 shows that the overall benefits from IDB activities are estimated at around £27 million per year. All of the monetary estimates (with the exception of road transport where vehicle counts have been used specific to the roads affected) have been made using default assumptions and the level of uncertainty associated with the total benefits is rated as high. These benefits exclude a large proportion of the benefits derived from activities to reduce the risk of flooding rather than the risk of waterlogging, so they may be under-estimated where the IDB undertakes activities on behalf of the Environment Agency. When considering these benefits it is important to remember that they are annual estimates, but that they ignore when the benefits might occur. For example, if the IDB stopped its activities it may take some time before all the assets are affected by increased waterlogging.

Figure 2.1 shows the benefits and damages by category of IDB activities. The figure shows that significant benefits arise from protection of transport infrastructure (both

roads and rail). This is not surprising since the IDB district includes the major arteries of the M1 and A1, as well as rail links to London and Peterborough. Food production and indirect benefits for consumers of electricity also make up significant contributions. Figure 2.1 also shows that there are some damages when compared with the baseline associated with carbon (where wetter habitats could take up more carbon) and non-designated biodiversity sites (where current land use may provide lower habitat value than wetter habitats).

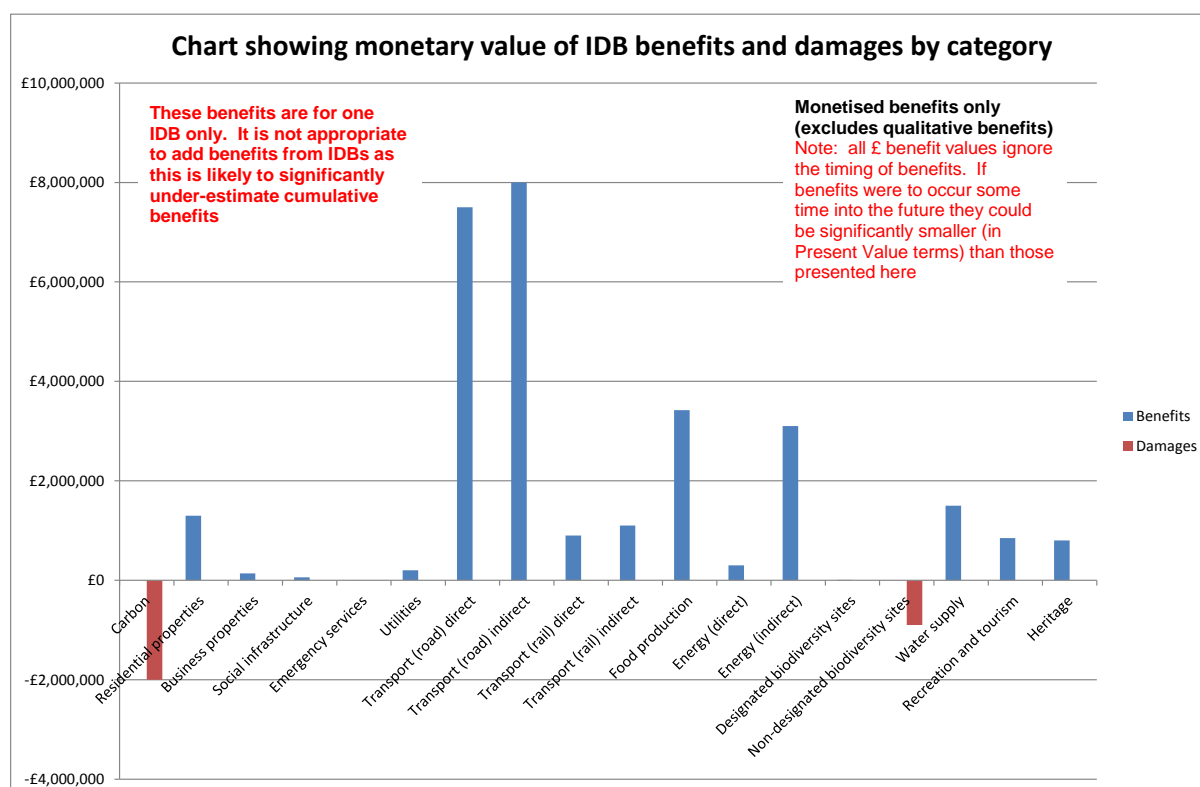


Figure 2.1: Benefits and Damages by category – Bedfordshire and River Ivel IDB

2.6 Benefits by Beneficiary

The benefits assessment spreadsheet divides the benefits across a number of beneficiaries. Figure 2.2 presents a pie-chart showing how much each of these groups benefits from IDB activities. The Figure shows quite an even spread across a number of different beneficiaries, with Local Authorities benefiting most (22%), closely followed by farmers/ landowners (20%), service providers (covering train operators, water companies, energy companies, etc.) at 18% and local residents at 16%.

Figure 2.3 provides a pie-chart showing how the damages (from carbon and non-designated biodiversity sites) are split across the beneficiaries. In this case, it is wider society that is most affected (79%), mainly due to carbon impacts being felt much wider than just the IDB district. The overall damages are, however, much smaller than the overall benefits (£3 million per year compared with £30 million per year) such that the benefits to wider society (£3.4 million) are greater than the estimated damages (£2.2 million).

It is important to remember that the estimated benefits and damages have been equally divided across beneficiaries that are expected to benefit or be affected under each category. This means that the proportion of benefits and damages provides an indication of the extent to which each group benefits, rather than a detailed assessment of their actual benefits. It should also be noted that almost all of the benefit and damages estimates are based on the default assumptions used in the benefits assessment spreadsheet. As a result, the level of uncertainty within the estimates is rated as high.

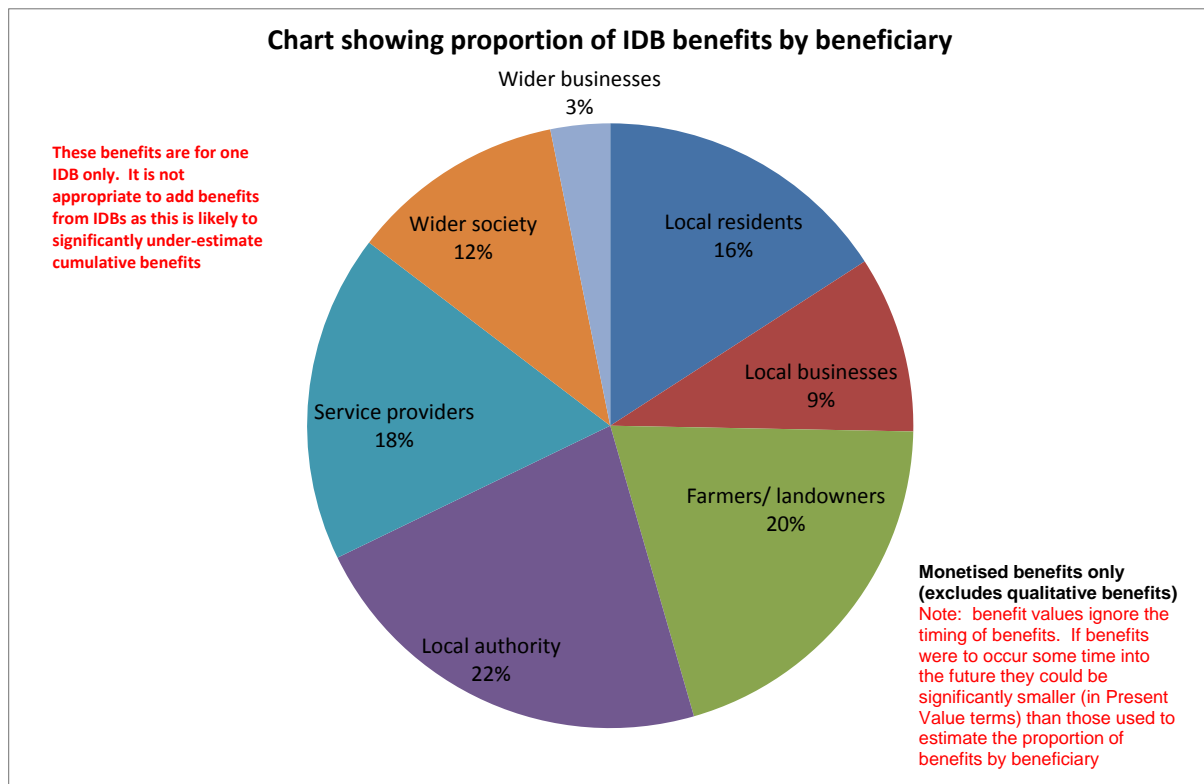


Figure 2.2: Benefits by Beneficiary – Bedfordshire and River Ivel IDB

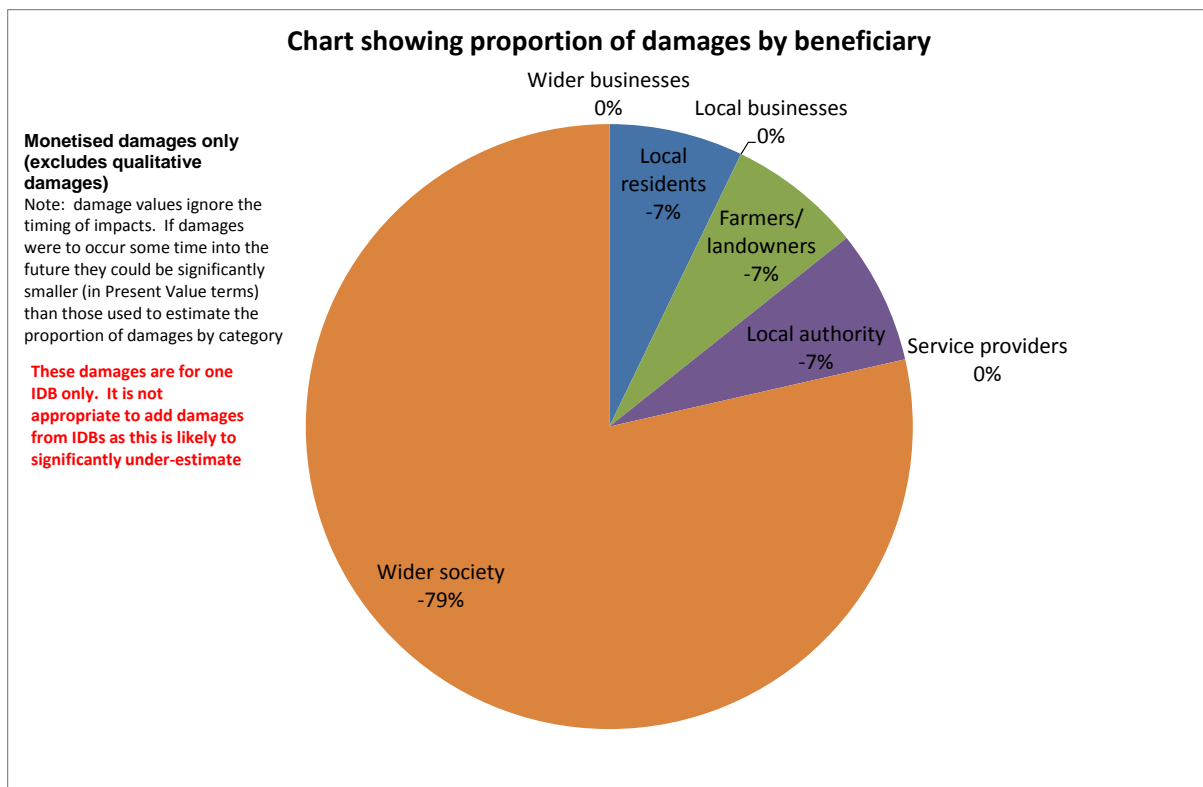


Figure 2.3: Damages by Beneficiary – Bedfordshire and River Ivel IDB

2.7 Summary of Results

Overall, the results of the benefits assessment show that the IDB is predicted to deliver £27 million in benefits per year (£30 million benefits minus £3 million damages). Around £6.6 million of these benefits are estimated to be to Local Authorities, with £6 million to farmers and landowners. Service providers receive an estimated £5.2 million per year and local residents £4.7 million per year. These benefits should not be used as the basis for assessing a benefit-cost ratio for the IDB as they ignore the impact of time. In reality some of the benefits might be delayed (where it takes time for benefits to be realised due to delays in response of the hydrological system) while others might be under-estimated (where assets are assumed to be relocated due to permanent loss). Furthermore, these benefits should only be looked at in the context of the Bedfordshire and River Ivel IDB. They should not be combined with estimated benefits from other IDBs because cumulative impacts will be different.

3 Black Sluice Internal Drainage Board

3.1 Overview of the Drainage Board

The catchment area draining to and including the District is 63,585 ha, while the total area of the Drainage District is 43,345 ha. This includes 40,145 ha of agricultural land and 3,200 ha of other land (including properties and highways, etc.). The District also includes 20 ha of designated environmental interest (Black Sluice IDB, 2009).

The Board's maintained infrastructure comprises 34 pumping stations, 4 km of raised embankments, and 800 km of watercourses. There are also 169.5 km of main river, 172.2 km of river flood defences and 7.9km of sea and tidal defences, which are maintained by the Environment Agency (Black Sluice IDB, 2009).

Black Sluice IDB (2009) seeks to achieve a standard of flood protection to agricultural land of 10% (1 in 10) and to developed areas of 2% (1 in 50). The Board also monitors the conditions of its pumping stations as these are key assets with a long-term refurbishment programme undertaken to ensure that the assets are in good condition to work effectively for a further 30 years. The Board has an established programme of routine maintenance to ensure that the condition of assets is appropriate. Management of flood risk is dependent on the operation of the South Forty Foot Drain. This is maintained by the Environment Agency and is the receiving watercourse for most of the Board's pumping stations.

3.2 Definition of the baseline and current scenario

The assessment has used a baseline that assumes the IDB stops all of its activities (similar to do-nothing). The current scenario is defined as the IDB continuing its activities as at present. The assessment will, therefore, provide an indication of the benefits provided by the IDB from its current activities.

3.3 Main Data Sources Used

Table 3.1 sets out the main data sources used for the Black Sluice assessment.

Table 3.1: Source of information	
Category	Sources of information used
Carbon	Current land use based on data produced by IDB (in particular the policy statement) GIS data on land use
Waterlogging, drought, flooding, erosion: • Residential properties	Neighbourhood statistics (output area: household spaces, accommodation type, dwellings, housing stock, lowest floor level)
Waterlogging, drought, flooding, erosion: • Business properties	Valuation Office Agency (business rates data) CLG (commercial and industrial floorspace rateable value statistics) Neighbourhood statistics (local authority area: local units by broad industry group, VAT Based enterprises, VAT based local units)
Waterlogging, drought, flooding, erosion: • Social infrastructure	Ordnance Survey maps Valuation Office Agency (business rates data)
Waterlogging, drought, flooding, erosion: • Emergency services	Ordnance Survey maps
Waterlogging, drought, flooding, erosion: • Utilities infrastructure	Ordnance Survey maps National Grid (gas pipeline maps)
Waterlogging, drought, flooding, erosion: • Transport infrastructure	Ordnance Survey maps Local Authority vehicle counts Data.gov.uk (road traffic counts, transport statistics) National Rail timetables
Control of invasive species	Biodiversity Action Plan
Water quality	Environment Agency (waterbody status and river bodies and water quality) Biodiversity Action Plan
Production of grown food	GIS data on land use Ordnance Survey maps
Collection of natural food	No data found
Energy	Ordnance Survey maps (including Vector Map Open Data)
Production of timber, fibre, aggregates, peat, etc.	Ordnance Survey maps GIS land use data
Biodiversity	Biodiversity Action Plan Natural England (nature on the map; agri-environment statistics)
Water supply	Environment Agency CAMS
Health and well-being of people	Neighbourhood statistics (Health and Care – General Health (UV20)) Floodzone 2 data
Health and well-being of communities	Neighbourhood statistics (Health and Care – General Health (UV20)) Floodzone 2 data
Level of involvement in decision-making	Linked to involvement in IDB decisions (e.g. Board meetings)
Landscape character	www.MAGIC.gov.uk AONB website (www.aonb.org.uk) Natural England (Joint Character Areas)
Heritage values	English Heritage (World Heritage Sites, Listed buildings, Scheduled monuments, parks and gardens, battlefields) Ordnance Survey maps (including Vector Map Open Data)
Knowledge and education	No data found
Recreation and tourism	Ordnance Survey maps (including Vector Map Open Data) Local Authority footpath/cycle route inventories

Table 3.1: Source of information	
Category	Sources of information used
Jobs/expenditure	IDB accounts

3.4 Results of the Qualitative Assessment

The qualitative assessment provides a summary of the magnitude and significance of benefits. Table 3.2 provides the results.

Table 3.2: Summary of the qualitative assessment results – Black Sluice IDB				
Categories (by number)	Magnitude			
Significance	Small	Moderate	Large	Total
Not very significant	3	0	0	3
Slightly significant	8	6	2	16
Significant	0	3	9	12
Very significant	1	1	11	13
Total	12	10	22	44
Categories (by percentage)	Magnitude			
Significance	Small	Moderate	Large	Total
Not very significant	25%	0%	0%	7%
Slightly significant	67%	60%	9%	36%
Significant	0%	30%	41%	27%
Very significant	8%	10%	50%	30%
Total	100%	100%	100%	100%
Significance by magnitude	Magnitude			
Significance	Small	Moderate	Large	Total
Not very significant	100%	0%	0%	100%
Slightly significant	50%	38%	13%	100%
Significant	0%	25%	75%	100%
Very significant	8%	8%	85%	100%
Total	27%	23%	50%	100%

Table 3.2 shows that the most common benefits are identified as large, very significant (11) followed by large, significant (9). There are 22 large benefits compared with 12 small and 10 moderate. In addition to being more numerous larger impacts also tend to be more significant in magnitude, with 91% of large benefits being significant or very significant, compared with just 40% of moderate benefits and 8% of small benefits. All of the benefits identified as being not very significant are deemed small, while 75% of significant benefits and 85% of very significant benefits are large in magnitude. This is perhaps not surprising since very significant benefits (affecting all or almost all assets) are more likely to be large (having big impacts on affected assets), especially given the difference between the baseline (no IDB) and current situation (with IDB).

3.5 Results of the Quantitative Assessment

Monetary values for the benefits have been estimated where a reasonably robust approach is available. Table 3.3 provides the benefits by category. The table shows benefits to IDBs and the Environment Agency.

Table 3.3: Estimated monetary benefits of IDB activities – Black Sluice IDB				
Category	IDB Benefits	IDB damages	EA benefits	EA damages
Carbon	£0	-£7,000,000	£0	£0
Residential properties	£470,000	£0	£4,230,000	£0
Business properties	£120,000	£0	£1,080,000	£0
Social infrastructure	£45,000	£0	£405,000	£0
Emergency services	£250	£0	£2,250	£0
Utilities	£77,000	£0	£693,000	£0
Transport (road) direct	£4,950,000	£0	£4,950,000	£0
Transport (road) indirect	£0	£0	£0	£0
Transport (rail) direct	£1,700,000	£0	£1,700,000	£0
Transport (rail) indirect	£65,000	£0	£65,000	£0
Food production	£12,600,000	£0	£1,400,000	£0
Energy (direct)	£780,000	£0	£7,020,000	£0
Energy (indirect)	£550,000	£0	£4,950,000	£0
Designated biodiversity sites	£14,400	£0	£1,600	£0
Non-designated biodiversity sites	£0	-£5,400,000	£0	-£600,000
Water supply	£0	£0	£0	£0
Recreation and tourism	£550,000	£0	£550,000	£0
Heritage	£450,000	£0	£450,000	£0
TOTAL	£23,000,000	-£12,400,000	£27,000,000	-£600,000
OVERALL	£10,600,000	annual benefits from IDB activities		

Table 3.3 shows that the overall benefits from IDB activities are estimated at £23 million per year. All of the monetary estimates (with the exception of road transport where vehicle counts have been used specific to the roads affected) have been made using default assumptions and the level of uncertainty associated with the total benefits is rated as high. These benefits exclude a large proportion of the benefits derived from activities to reduce the risk of flooding rather than the risk of waterlogging, so they may be under-estimated where the IDB undertakes activities on behalf of the Environment Agency. When considering these benefits it is important to remember that they are annual estimates, but that they ignore when the benefits might occur. For example, if the IDB stopped its activities it may take some time before all the assets are affected by increased waterlogging.

Figure 3.1 below shows the benefits and damages by category of IDB activities. The figure shows that food production benefits significantly from IDB activities, this is expected as over 90% of the land use within the Drainage District is agricultural. Several major roads are located within the district including the A17 and A52, therefore transport infrastructure, in particular roads, also gains direct benefits. Figure 3.1 also shows that there are some significant damages when compared with the baseline associated with carbon and non-designated biodiversity sites.

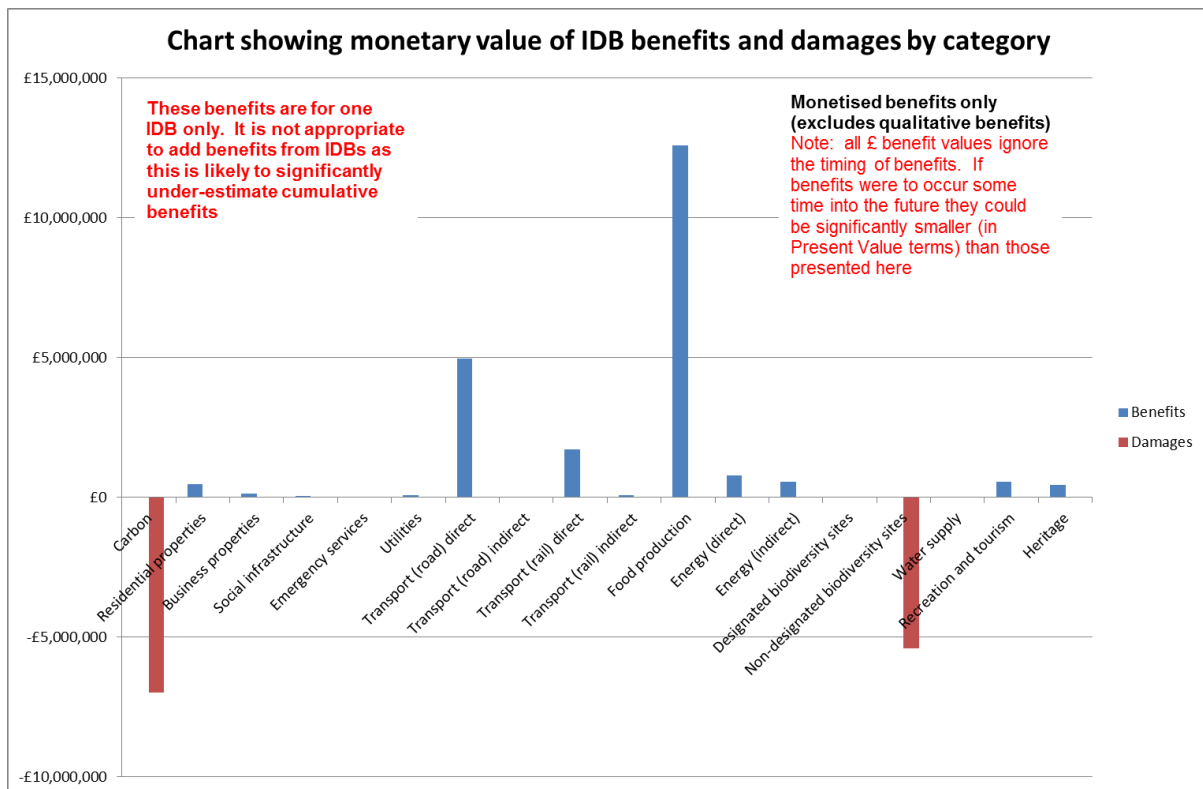


Figure 3.1: Benefits and Damages by category – Black Sluice IDB

3.6 Benefits by Beneficiary

The benefits assessment spreadsheet divides the benefits across a number of beneficiaries. Figure 3.2 presents a pie-chart showing how much each of these groups benefits from IDB activities. The Figure shows that farmers and landowners receive more than half of the benefits (55%). Other significant beneficiaries are service providers at 22% and local authorities at 12%.

Figure 3.3 provides a pie-chart showing how the damages (from carbon and non-designated biodiversity sites) are split across the beneficiaries. Given the nature of the damages it is wider society that is most affected (75%), mainly due to carbon impacts being felt much wider than just the IDB district. Despite the overall damages being outweighed by the overall benefits (£12.4 million per year compared with £23 million per year), the benefits to wider society (£690,000) are dwarfed by the estimated damages (£9.3 million).

It is important to remember that the estimated benefits and damages have been equally divided across beneficiaries that are expected to benefit or be affected under each category. This means that the proportion of benefits and damages provides an indication of the extent to which each group benefits, rather than a detailed assessment of their actual benefits. It should also be noted that almost all of the benefit and damages estimates are based on the default assumptions used in the benefits assessment spreadsheet. As a result, the level of uncertainty within the estimates is rated as high.

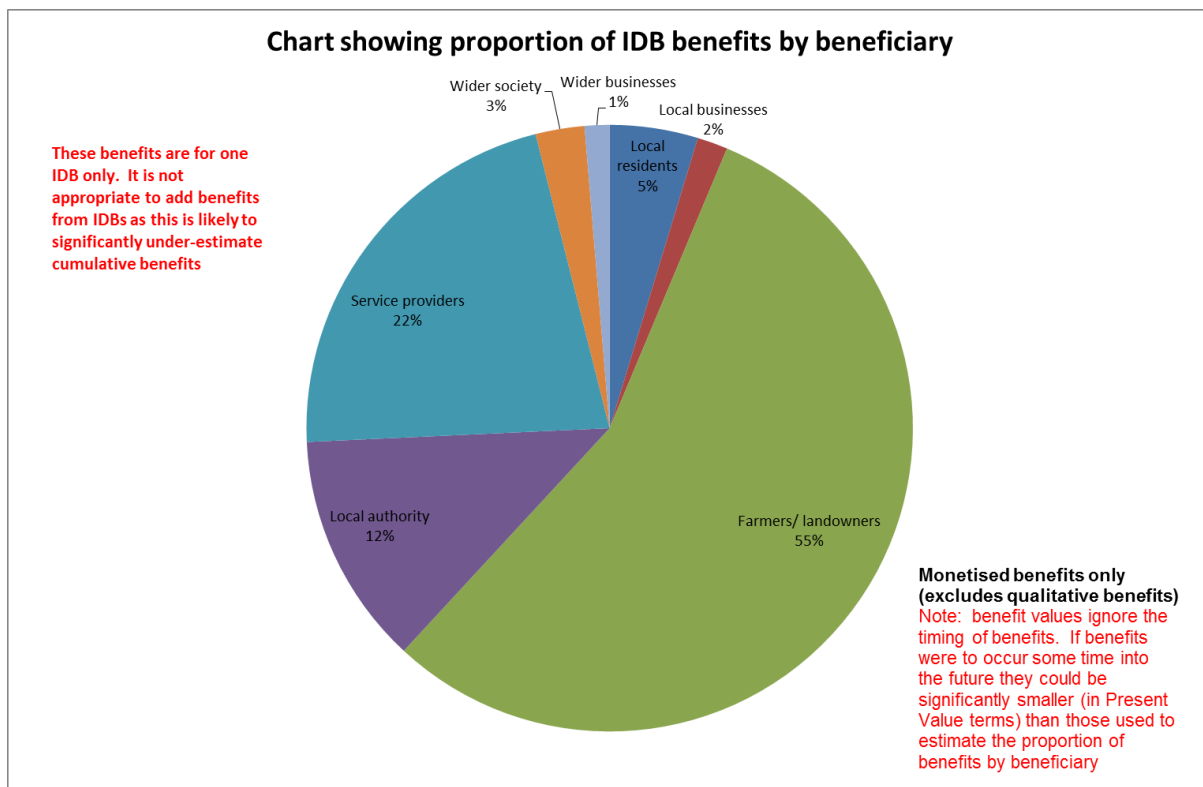


Figure 3.2: Benefits by Beneficiary – Black Sluice IDB

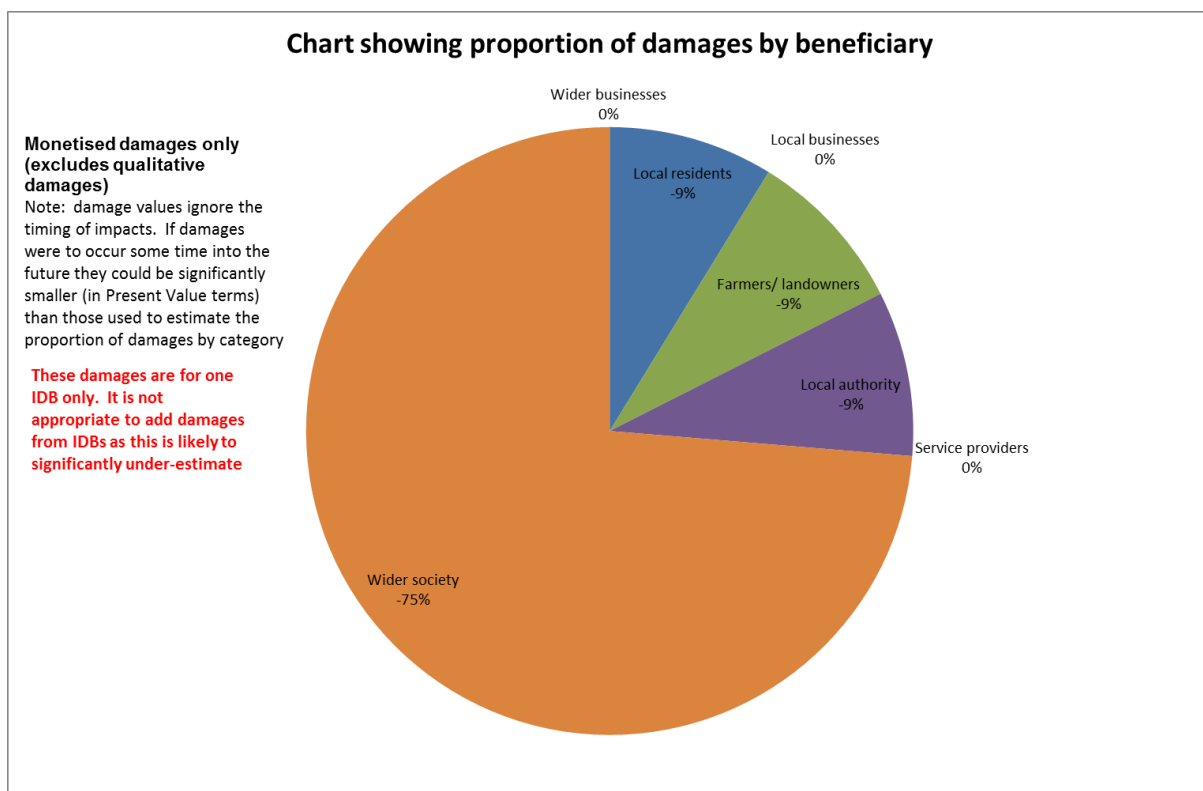


Figure 3.3: Damages by Beneficiary – Black Sluice IDB

3.7 Summary of Results

Overall, the results of the benefits assessment show that Black Sluice IDB is predicted to deliver around £10.6 million in benefits per year (£23 million benefits minus £12.4 million damages). It is estimated that £12.6 million of these benefits will be to farmers and landowners, around £5 million to service providers and almost £2.8 million to local authorities each year. These benefits should not be used as the basis for assessing a benefit-cost ratio for the IDB as they ignore the impact of time. In reality some of the benefits might be delayed (where it takes time for benefits to be realised due to delays in response of the hydrological system) while others might be under-estimated (where assets are assumed to be relocated due to permanent loss). Furthermore, these benefits should only be looked at in the context of the Black Sluice IDB. They should not be combined with estimated benefits from other IDBs because cumulative impacts will be different.

4 Lower Severn Internal Drainage Board

4.1 Overview of the Drainage Board

The total area of the Drainage District is 26,462 ha. This includes 17,419 ha of agricultural land and 9,043 ha of other land (including properties and highways, etc.). The District also includes 276.58 ha of wetland SSSI and 70.9 ha of nature reserves (Lower Severn IDB, 2003).

The Board's maintained infrastructure comprises 6 pumping stations and 12 other water level control structures, 6.6 km of raised embankments, and 518.16 km of watercourses. There are also 182.3 km of main river, 24.8 km of river raised embankments and 100 km of coastal flood defences, which are maintained by the Environment Agency (Lower Severn IDB, 2003).

Lower Severn IDB (2003) seeks to achieve a standard of flood protection to agricultural land of 5% (1 in 20) and to developed areas of 1% (1 in 100). The Board monitors the condition of its pumping stations and watercourses, especially those designated as critical (where overspilling could affect property). A routine maintenance programme is in place to ensure that the condition of assets is appropriate.

4.2 Definition of the baseline and current scenario

The assessment has used a baseline that assumes the IDB stops all of its activities (similar to do-nothing). The current scenario is defined as the IDB continuing its activities as at present. The assessment will, therefore, provide an indication of the benefits provided by the IDB from its current activities.

4.3 Main Data Sources Used

Table 4.1 sets out the main data sources used for the Lower Severn assessment.

Table 4.1: Source of information	
Category	Sources of information used

Table 4.1: Source of information	
Category	Sources of information used
Carbon	Current land use based on data produced by IDB (in particular the policy statement) GIS data on land use
Waterlogging, drought, flooding, erosion: • Residential properties	Neighbourhood statistics (output area: household spaces, accommodation type, dwellings, housing stock, lowest floor level)
Waterlogging, drought, flooding, erosion: • Business properties	Valuation Office Agency (business rates data) CLG (commercial and industrial floorspace rateable value statistics) Neighbourhood statistics (local authority area: local units by broad industry group, VAT Based enterprises, VAT based local units)
Waterlogging, drought, flooding, erosion: • Social infrastructure	Ordnance Survey maps Valuation Office Agency (business rates data)
Waterlogging, drought, flooding, erosion: • Emergency services	Ordnance Survey maps
Waterlogging, drought, flooding, erosion: • Utilities infrastructure	Ordnance Survey maps National Grid (gas pipeline maps)
Waterlogging, drought, flooding, erosion: • Transport infrastructure	Ordnance Survey maps Local Authority vehicle counts Data.gov.uk (road traffic counts, transport statistics) National Rail timetables
Control of invasive species	Biodiversity Action Plan
Water quality	Environment Agency (waterbody status and river bodies and water quality) Biodiversity Action Plan
Production of grown food	GIS data on land use Ordnance Survey maps
Collection of natural food	No data found
Energy	Ordnance Survey maps (including Vector Map Open Data)
Production of timber, fibre, aggregates, peat, etc.	Ordnance Survey maps GIS land use data
Biodiversity	Biodiversity Action Plan Natural England (nature on the map; agri-environment statistics)
Water supply	Environment Agency CAMS
Health and well-being of people	Neighbourhood statistics (Health and Care – General Health (UV20)) Floodzone 2 data
Health and well-being of communities	Neighbourhood statistics (Health and Care – General Health (UV20)) Floodzone 2 data
Level of involvement in decision-making	Linked to involvement in IDB decisions (e.g. Board meetings)
Landscape character	www.MAGIC.gov.uk AONB website (www.aonb.org.uk) Natural England (Joint Character Areas)
Heritage values	English Heritage (World Heritage Sites, Listed buildings, Scheduled monuments, parks and gardens, battlefields) Ordnance Survey maps (including Vector Map Open Data)
Knowledge and education	No data found
Recreation and tourism	Ordnance Survey maps (including Vector Map Open Data) Local Authority footpath/cycle route inventories
Jobs/expenditure	IDB accounts

4.4 Results of the Qualitative Assessment

The qualitative assessment provides a summary of the magnitude and significance of benefits. Table 4.2 provides the results.

Table 4.2: Summary of the qualitative assessment results – Lower Severn IDB				
Categories (by number)	Magnitude			
Significance	Small	Moderate	Large	Total
Not very significant	2	0	0	2
Slightly significant	9	3	3	15
Significant	1	4	13	18
Very significant	1	0	8	9
Total	13	7	24	44
Categories (by percentage)	Magnitude			
Significance	Small	Moderate	Large	Total
Not very significant	15%	0%	0%	5%
Slightly significant	69%	43%	13%	34%
Significant	8%	57%	54%	41%
Very significant	8%	0%	33%	20%
Total	100%	100%	100%	100%
Significance by magnitude	Magnitude			
Significance	Small	Moderate	Large	Total
Not very significant	100%	0%	0%	100%
Slightly significant	60%	20%	20%	100%
Significant	6%	22%	72%	100%
Very significant	11%	0%	89%	100%
Total	30%	16%	55%	100%

Table 4.2 shows that the most common benefits are identified as large, significant (13) followed by small, slightly significant (9). There are 24 large benefits compared with 13 small and 7 moderate. As in other IDB areas larger impacts also tend to be more significant, with 87% of large benefits being significant or very significant, compared with 57% of moderate benefits and just 16% of small benefits. All of the benefits identified as being not very significant are identified as small, while 72% of significant benefits and 89% of very significant benefits are large in magnitude. This is perhaps not surprising since very significant benefits (affecting all or almost all assets) are more likely to be large (having big impacts on affected assets), especially given the difference between the baseline (no IDB) and current situation (with IDB).

4.5 Results of the Quantitative Assessment

Monetary values for the benefits have been estimated where a reasonably robust approach is available. Table 4.3 provides the benefits by category. The table shows benefits to IDBs and the Environment Agency.

Table 4.3: Estimated monetary benefits of IDB activities – Lower Severn IDB				
Category	IDB Benefits	IDB damages	EA benefits	EA damages
Carbon	£0	-£1,000,000	£0	£0
Residential properties	£940,000	£0	£8,460,000	£0
Business properties	£250,000	£0	£2,250,000	£0
Social infrastructure	£16,000	£0	£144,000	£0
Emergency services	£390	£0	£3,510	£0
Utilities	£68,000	£0	£612,000	£0
Transport (road) direct	£12,500,000	£0	£12,500,000	£0
Transport (road) indirect	£3,050,000	£0	£3,050,000	£0
Transport (rail) direct	£1,900,000	£0	£1,900,000	£0
Transport (rail) indirect	£2,050,000	£0	£2,050,000	£0
Food production	£1,170,000	£0	£130,000	£0
Energy (direct)	£610,000	£0	£5,490,000	£0
Energy (indirect)	£2,300,000	£0	£20,700,000	£0
Designated biodiversity sites	£216,000	£0	£24,000	£0
Non-designated biodiversity sites	£0	-£900,000	£0	-£100,000
Water supply	£1,600,000	£0	£0	£0
Recreation and tourism	£1,000,000	£0	£1,000,000	£0
Heritage	£3,550,000	£0	£3,550,000	£0
TOTAL	£31,000,000	-£1,900,000	£62,000,000	-£100,000
OVERALL	£29,100,000	annual benefits from IDB activities		

Table 4.3 shows that the overall benefits from IDB activities are estimated at around £30 million per year. All of the monetary estimates (with the exception of road transport where vehicle counts have been used specific to the roads affected) have been made using default assumptions and the level of uncertainty associated with the total benefits is rated as high. These benefits exclude a large proportion of the benefits derived by activities to reduce the risk of flooding rather than the risk of waterlogging, so they may be under-estimated where the IDB undertakes activities on behalf of the Environment Agency. When considering these benefits it is important to remember that they are annual estimates, but that they ignore when the benefits might occur. For example, if the IDB stopped its activities it may take some time before all the assets are affected by increased waterlogging.

Figure 4.1 shows the benefits and damages by category of IDB activities. The figure shows that the majority of benefits are to transport infrastructure, particularly roads, as the M4 and M5 fall within this Drainage District but also the major train lines between the West Midlands and the South West. There are also notable benefits for heritage, given proximity to Bath and to energy consumers as power stations at Oldbury on Severn and Seabank are located within the district. Figure 4.1 also shows that there are some damages when compared with the baseline associated with carbon (where wetter habitats could take up more carbon) and non-designated

biodiversity sites (where current land use may provide lower habitat value than wetter habitats).

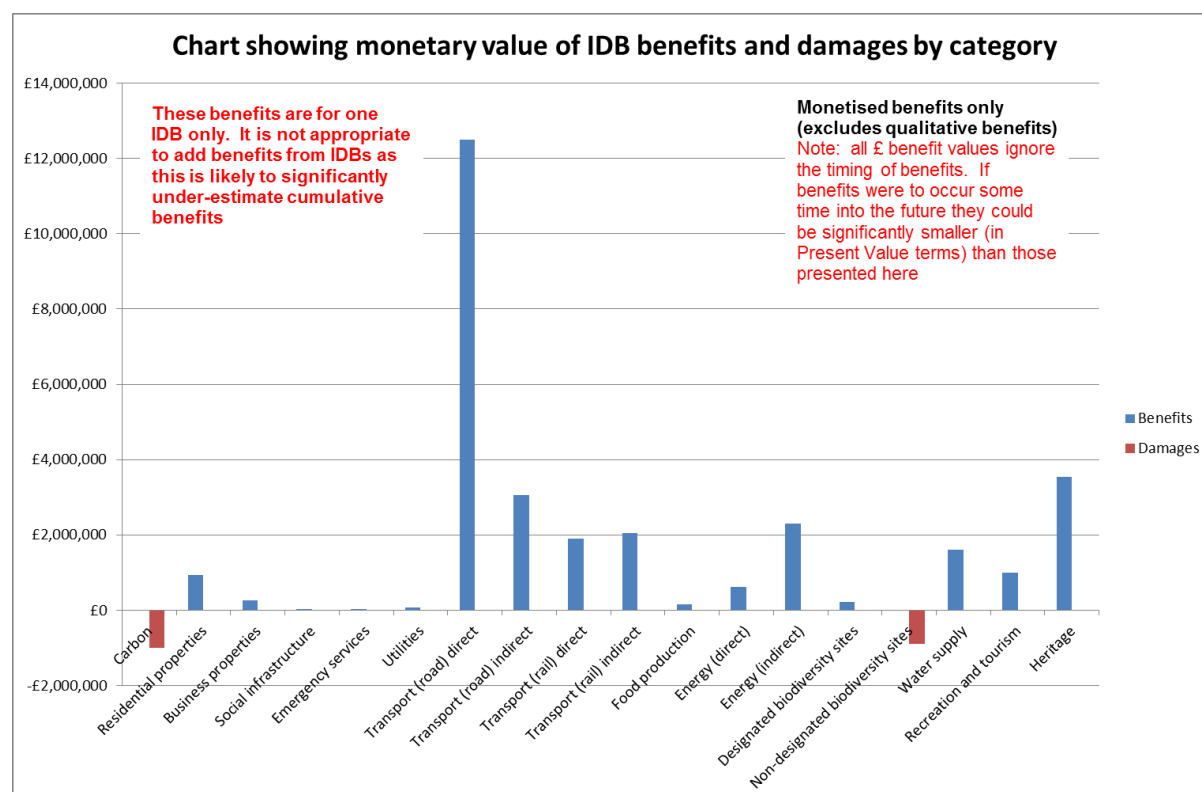


Figure 4.1: Benefits and Damages by category – Lower Severn IDB

4.6 Benefits by Beneficiary

The benefits assessment spreadsheet divides the benefits across a number of beneficiaries. Figure 4.2 presents a pie-chart showing how much each of these groups benefits from IDB activities. The Figure shows that Local Authorities (26%) and service providers (28%) are the predominant beneficiaries, followed by local residents at 15% and wider society at 13%.

Figure 4.3 provides a pie-chart showing how the damages (from carbon and non-designated biodiversity sites) are split across the beneficiaries. As with other IDBs wider society is mostly affected (67%). The overall damages are, however, much smaller than the overall benefits (£1.9 million per year compared with £31 million per year) such that the benefits to wider society (£3.9 million) are greater than the estimated damages (£1.2 million).

It is important to remember that the estimated benefits and damages have been equally divided across beneficiaries that are expected to benefit or be affected under each category. This means that the proportion of benefits and damages provides an indication of the extent to which each group benefits, rather than a detailed assessment of their actual benefits. It should also be noted that almost all of the

benefit and damages estimates are based on the default assumptions used in the benefits assessment spreadsheet. As a result, the level of uncertainty within the estimates is rated as high.

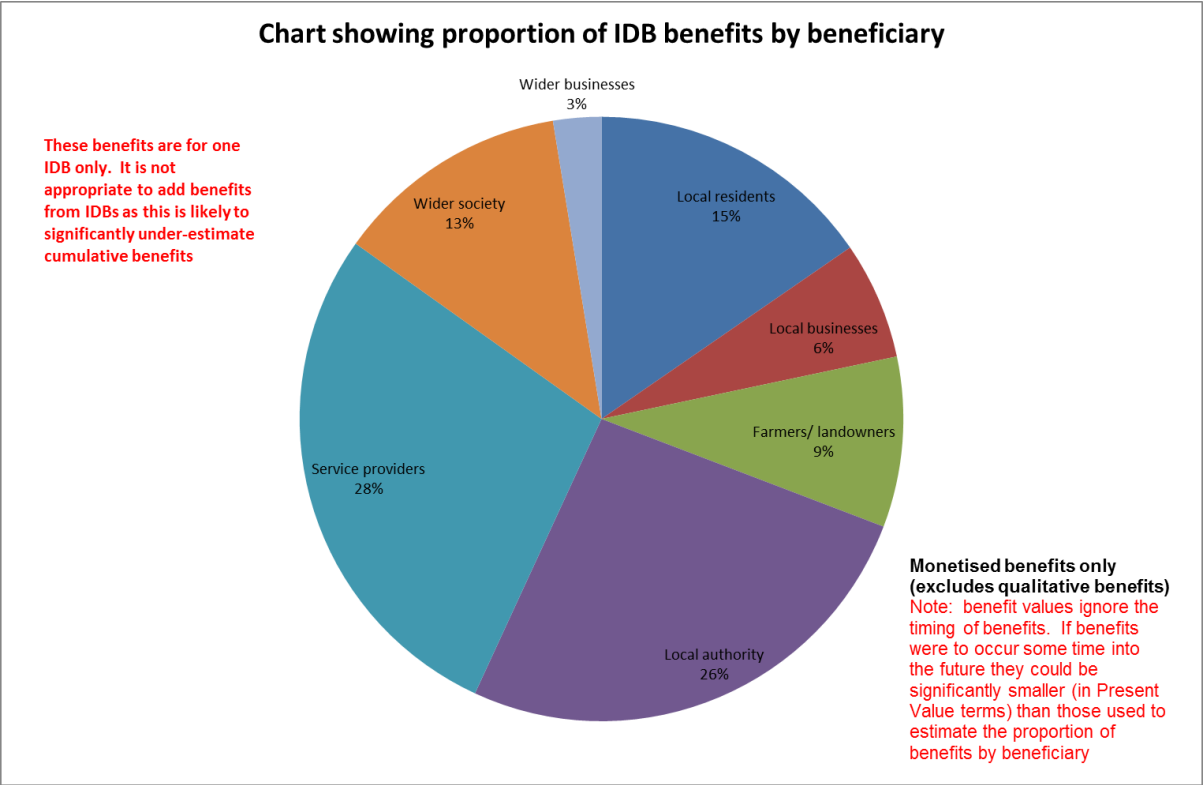


Figure 4.2: Benefits by Beneficiary – Lower Severn IDB

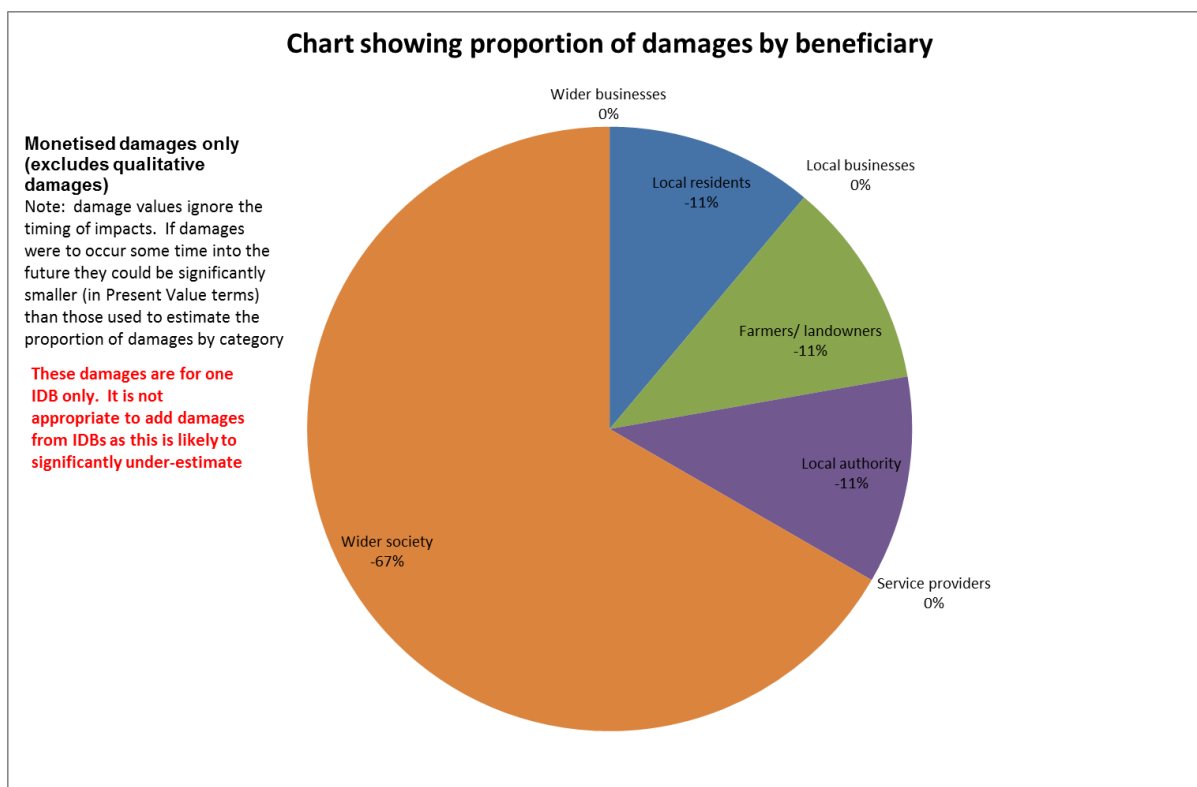


Figure 4.3: Damages by Beneficiary – Lower Severn IDB

4.7 Summary of Results

Overall, the results of the benefits assessment show that Lower Severn IDB is predicted to deliver £29.1 million in benefits per year (£31 million benefits minus £1.9 million damages). The largest beneficiary is Service providers who will receive an estimated £8.9 million per year, closely followed by Local Authorities who will receive around £8.3 million. Local residents will receive £4.9 million and wider society £4.0 million per year. These benefits should not be used as the basis for assessing a benefit-cost ratio for the IDB as they ignore the impact of time. In reality some of the benefits might be delayed (where it takes time for benefits to be realised due to delays in response of the hydrological system) while others might be underestimated (where assets are assumed to be relocated due to permanent loss). Furthermore, these benefits should only be looked at in the context of the Lower Severn IDB. They should not be combined with estimated benefits from other IDBs because cumulative impacts will be different.

5 Norfolk Rivers Internal Drainage Board

5.1 Overview of the Drainage Board

The total catchment area draining to and including the District is 239,005 ha, of which the area of the Drainage District is 14,985 ha. This includes 10,973 ha of agricultural land, 1,851 ha of designated wildlife sites and 2,161 ha of other residential/industrial and other property (Water Management Alliance, nd).

The Board's maintained infrastructure comprises six water level control structures and two tidal sluices, and 417 km of watercourses. There are also 311 km of main river, 100 km of river raised embankments and 9 km of coastal flood defences, which are maintained by the Environment Agency (Water Management Alliance, nd).

Water Management Alliance (2008) seeks to achieve a standard of flood protection to agricultural land of 6% (1 in 15) and to developed areas of 4% (1 in 25). The Board monitors the condition of its water level control structures and watercourses, especially those designated as critical (where overspilling could affect property). A routine management programme is in place to ensure that the condition of assets is appropriate.

5.2 Definition of the baseline and current scenario

The assessment has used a baseline that assumes the IDB stops all of its activities (similar to do-nothing). The current scenario is defined as the IDB continuing its activities as at present. The assessment will, therefore, provide an indication of the benefits provided by the IDB from its current activities.

5.3 Main Data Sources Used

Table 5.1 sets out the main data sources used for the Norfolk Rivers assessment.

Table 5.1: Source of information	
Category	Sources of information used

Table 5.1: Source of information	
Category	Sources of information used
Carbon	Current land use based on data produced by IDB (in particular the policy statement) GIS data on land use
Waterlogging, drought, flooding, erosion: • Residential properties	Neighbourhood statistics (output area: household spaces, accommodation type, dwellings, housing stock, lowest floor level)
Waterlogging, drought, flooding, erosion: • Business properties	Valuation Office Agency (business rates data) CLG (commercial and industrial floorspace rateable value statistics) Neighbourhood statistics (local authority area: local units by broad industry group, VAT Based enterprises, VAT based local units)
Waterlogging, drought, flooding, erosion: • Social infrastructure	Ordnance Survey maps Valuation Office Agency (business rates data)
Waterlogging, drought, flooding, erosion: • Emergency services	Ordnance Survey maps
Waterlogging, drought, flooding, erosion: • Utilities infrastructure	Ordnance Survey maps National Grid (gas pipeline maps)
Waterlogging, drought, flooding, erosion: • Transport infrastructure	Ordnance Survey maps Local Authority vehicle counts Data.gov.uk (road traffic counts, transport statistics) National Rail timetables
Control of invasive species	Biodiversity Action Plan
Water quality	Environment Agency (waterbody status and river bodies and water quality) Biodiversity Action Plan
Production of grown food	GIS data on land use Ordnance Survey maps
Collection of natural food	No data found
Energy	Ordnance Survey maps (including Vector Map Open Data) Eastern Power Networks (sub-stations map)
Production of timber, fibre, aggregates, peat, etc.	Ordnance Survey maps GIS land use data
Biodiversity	Biodiversity Action Plan Natural England (nature on the map; agri-environment statistics)
Water supply	Environment Agency CAMS
Health and well-being of people	Neighbourhood statistics (Health and Care – General Health (UV20)) Floodzone 2 data
Health and well-being of communities	Neighbourhood statistics (Health and Care – General Health (UV20)) Floodzone 2 data
Level of involvement in decision-making	Linked to involvement in IDB decisions (e.g. Board meetings)
Landscape character	www.MAGIC.gov.uk AONB website (www.aonb.org.uk) Natural England (Joint Character Areas)
Heritage values	English Heritage (World Heritage Sites, Listed buildings, Scheduled monuments, parks and gardens, battlefields) Ordnance Survey maps (including Vector Map Open Data)
Knowledge and education	No data found
Recreation and tourism	Ordnance Survey maps (including Vector Map Open Data) Local Authority footpath/cycle route inventories
Jobs/expenditure	IDB accounts

5.4 Results of the Qualitative Assessment

The qualitative assessment provides a summary of the magnitude and significance of benefits. Table 5.2 provides the results.

Table 5.2: Summary of the qualitative assessment results – Norfolk Rivers IDB				
Categories (by number)	Magnitude			
Significance	Small	Moderate	Large	Total
Not very significant	2	0	0	2
Slightly significant	7	18	9	34
Significant	0	3	5	8
Very significant	1	0	2	3
Total	10	21	16	47
Categories (by percentage)	Magnitude			
Significance	Small	Moderate	Large	Total
Not very significant	20%	0%	0%	4%
Slightly significant	70%	86%	56%	72%
Significant	0%	14%	31%	17%
Very significant	10%	0%	13%	6%
Total	100%	100%	100%	100%
Significance by magnitude	Magnitude			
Significance	Small	Moderate	Large	Total
Not very significant	100%	0%	0%	100%
Slightly significant	21%	53%	26%	100%
Significant	0%	38%	63%	100%
Very significant	33%	0%	67%	100%
Total	21%	45%	34%	100%

Table 5.2 shows that the most common benefits are identified as moderate, slightly significant (18) followed by large, slightly significant (9). There are 21 moderate benefits compared with 16 large and 10 small. Larger impacts tend to be more significant with 44% of large benefits being significant or very significant, compared with 14% of moderate benefits and only 10% of small benefits. All of the benefits identified as being not very significant are identified as small, while 63% of significant benefits and 67% of very significant benefits are large in magnitude. This is perhaps not surprising since very significant benefits (affecting all or almost all assets) are more likely to be large (having big impacts on affected assets), especially given the difference between the baseline (no IDB) and current situation (with IDB).

5.5 Results of the Quantitative Assessment

Monetary values for the benefits have been estimated where a reasonably robust approach is available. Table 5.3 provides the benefits by category. The table shows benefits to IDBs and the Environment Agency.

Table 5.3: Estimated monetary benefits of IDB activities – Norfolk Rivers IDB				
Category	IDB Benefits	IDB damages	EA benefits	EA damages
Carbon	£0	-£1,000,000	£0	£0
Residential properties	£1,300,000	£0	£11,700,000	£0
Business properties	£450,000	£0	£4,050,000	£0
Social infrastructure	£120,000	£0	£1,080,000	£0
Emergency services	£410	£0	£3,690	£0
Utilities	£380,000	£0	£3,420,000	£0
Transport (road) direct	£7,500,000	£0	£7,500,000	£0
Transport (road) indirect	£2,300,000	£0	£2,300,000	£0
Transport (rail) direct	£180,000	£0	£180,000	£0
Transport (rail) indirect	£435,000	£0	£435,000	£0
Food production	£2,430,000	£0	£270,000	£0
Energy (direct)	£180,000	£0	£1,620,000	£0
Energy (indirect)	£3,200,000	£0	£28,800,000	£0
Designated biodiversity sites	£3,060,000	£0	£340,000	£0
Non-designated biodiversity sites	£0	-£630,000	£0	-£70,000
Water supply	£550,000	£0	£0	£0
Recreation and tourism	£750,000	£0	£750,000	£0
Heritage	£3,600,000	£0	£3,600,000	£0
TOTAL	£26,000,000	-£1,630,000	£66,000,000	-£70,000
OVERALL	£24,370,000	annual benefits from IDB activities		

Table 5.3 shows that the overall benefits from IDB activities are estimated at around £26 million per year. All of the monetary estimates (with the exception of road transport where vehicle counts have been used specific to the roads affected) have been made using default assumptions and the level of uncertainty associated with the total benefits is rated as high. These benefits exclude a large proportion of the benefits derived by activities to reduce the risk of flooding rather than the risk of waterlogging, so they may be under-estimated where the IDB undertakes activities on behalf of the Environment Agency. When considering these benefits it is important to remember that they are annual estimates, but that they ignore when the benefits might occur. For example, if the IDB stopped its activities it may take some time before all the assets are affected by increased waterlogging.

Figure 5.1 shows the benefits and damages by category of IDB activities. The figure shows that there are significant benefits to road transport infrastructure as the Drainage District covers much of the surrounding area of Norwich City centre which acts as a transport hub for the region, including the A47, A11 and A140. The Norfolk Rivers Drainage District encompasses parts of the Broads National Park, SSSIs and important agricultural land, so as expected there are large benefits to heritage, designated biodiversity sites and food production. There are also significant indirect benefits to energy customers. Figure 5.1 also shows that there are some damages

when compared with the baseline associated with carbon (where wetter habitats could take up more carbon) and non-designated biodiversity sites (where current land use may provide lower habitat value than wetter habitats).

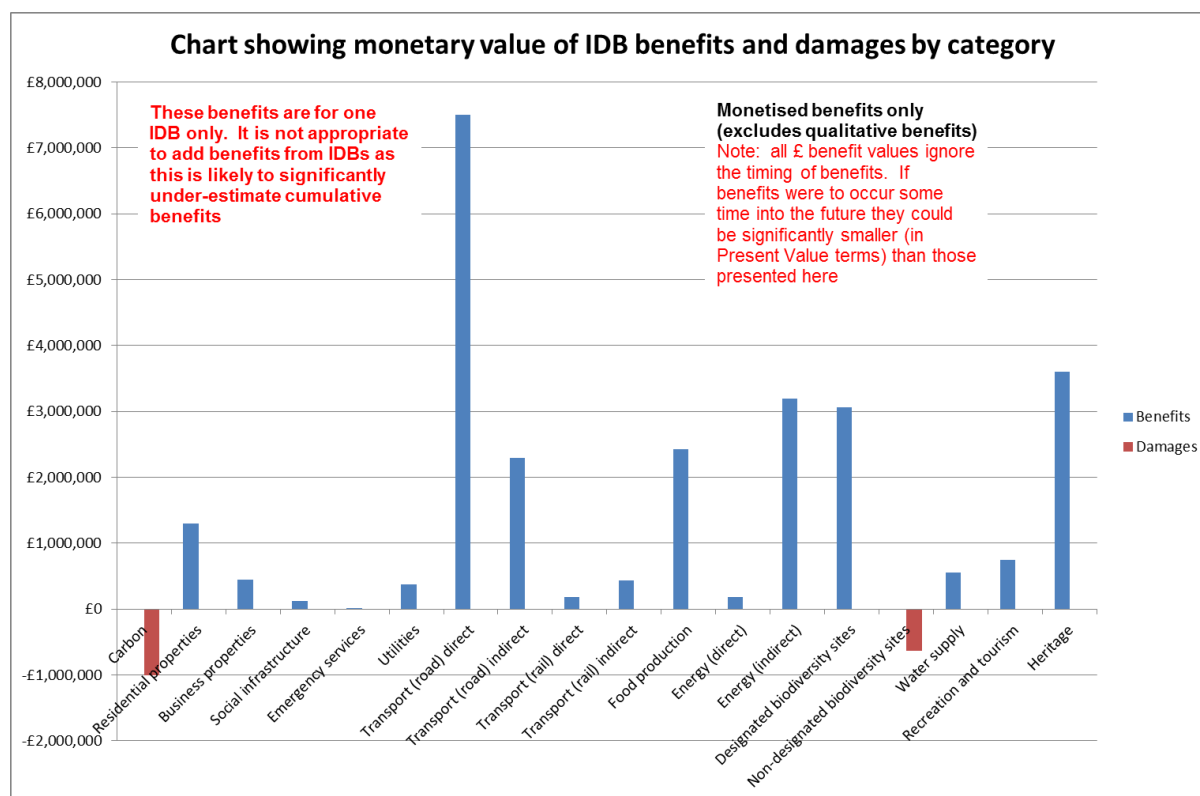


Figure 5.1: Benefits and Damages by category – Norfolk Rivers IDB

5.6 Benefits by Beneficiary

The benefits assessment spreadsheet divides the benefits across a number of beneficiaries. Figure 5.2 presents a pie-chart showing how much each of these groups benefits from IDB activities. The Figure shows a fairly even spread across a number of different beneficiaries, with Local Authorities being the main beneficiary (23%), closely followed by local residents (20%), farmers and landowners and service providers at 17% each and wider society at 15%.

Figure 5.3 provides a pie-chart showing how the damages (from carbon and non-designated biodiversity sites) are split across the beneficiaries. In this case, it is wider society that is most affected (67%), mainly due to carbon impacts being felt much wider than just the IDB district. The overall damages are, however, much smaller than the overall benefits (£1.6 million per year compared with £26 million per year) such that the benefits to wider society (£3.9 million) are significantly greater than the estimated damages (£1 million).

It is important to remember that the estimated benefits and damages have been equally divided across beneficiaries that are expected to benefit or be affected under each category. This means that the proportion of benefits and damages provides an indication of the extent to which each group benefits, rather than a detailed assessment of their actual benefits. It should also be noted that almost all of the

benefit and damages estimates are based on the default assumptions used in the benefits assessment spreadsheet. As a result, the level of uncertainty within the estimates is rated as high.

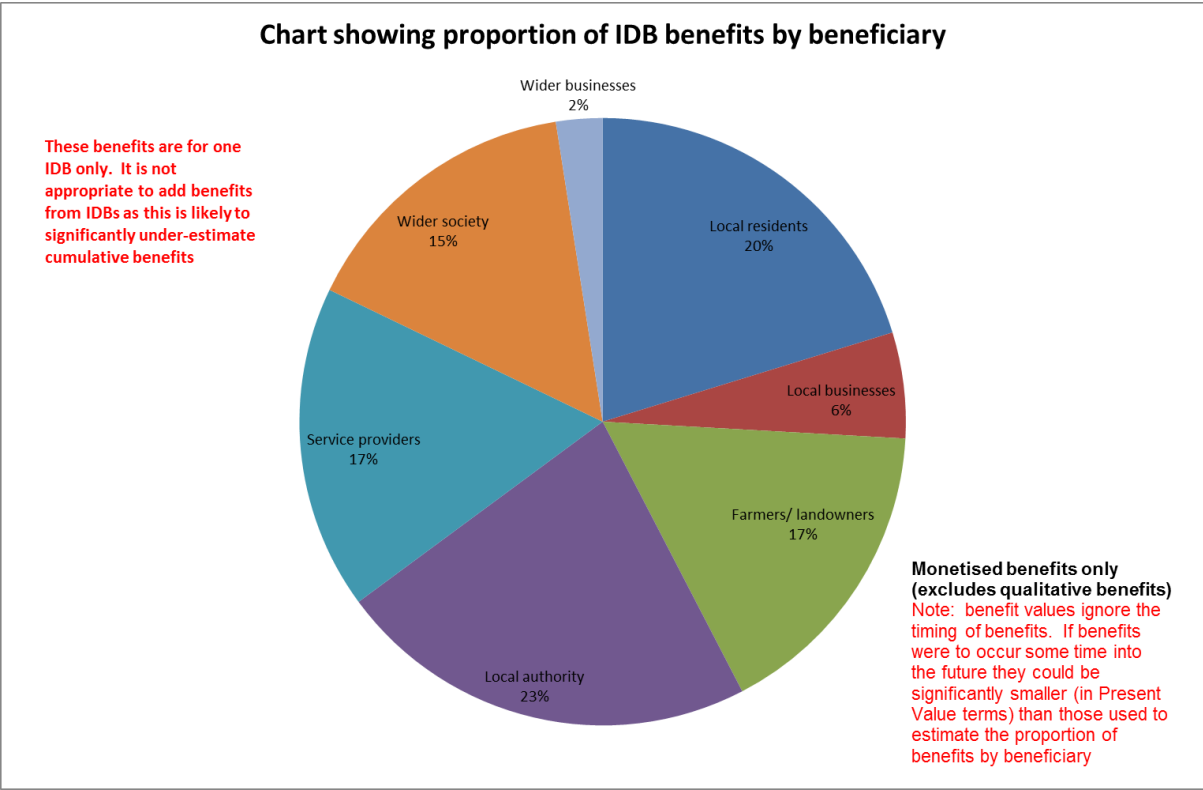


Figure 5.2: Benefits by Beneficiary – Norfolk Rivers IDB

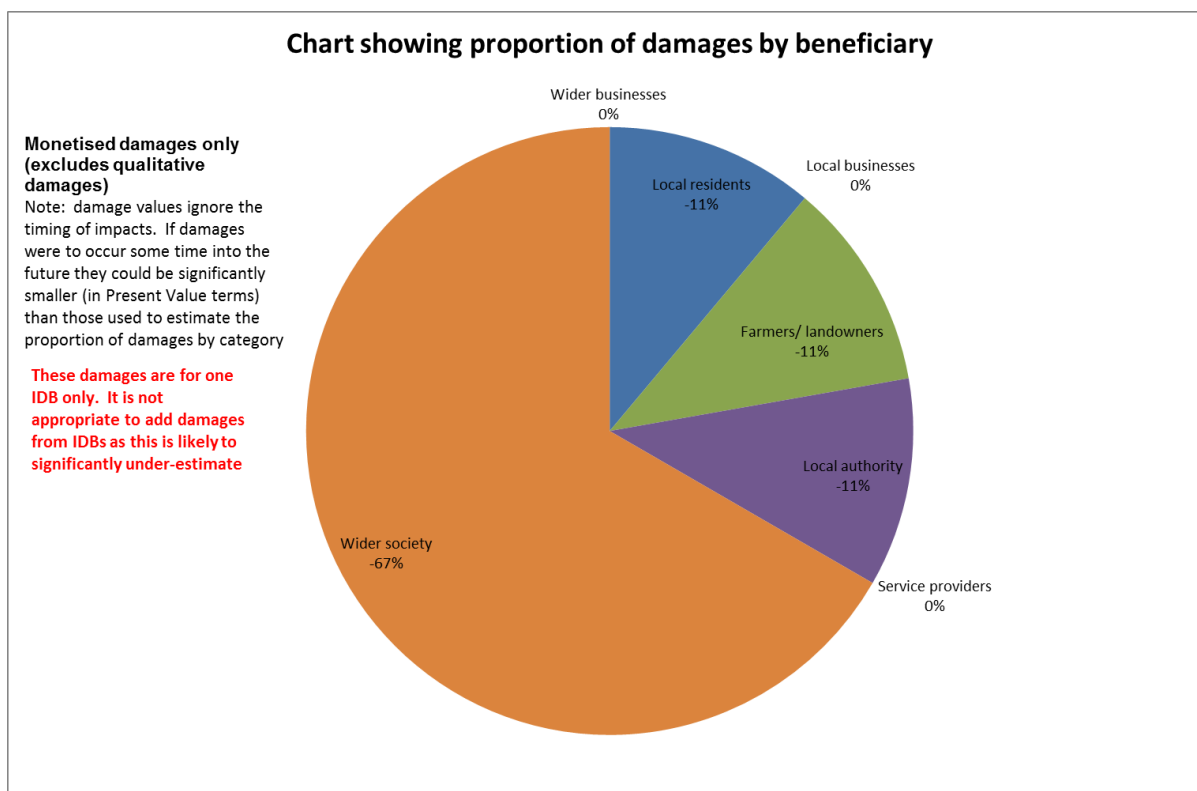


Figure 5.3: Damages by Beneficiary – Norfolk Rivers IDB

5.7 Summary of Results

Overall, the results of the benefits assessment show that Norfolk Rivers IDB is predicted to deliver an estimated £24.4 million in benefits per year (£26 million benefits minus £1.6 million damages). Local Authorities are the largest beneficiary, receiving some £5.9 million each year, followed by local residents who receive £5.4 million. Service providers benefit by £4.6 million per year, farmers and landowners benefit by £4.4 million per year and wider society benefits by an estimated £4.1 million. These benefits should not be used as the basis for assessing a benefit-cost ratio for the IDB as they ignore the impact of time. In reality some of the benefits might be delayed (where it takes time for benefits to be realised due to delays in response of the hydrological system) while others might be under-estimated (where assets are assumed to be relocated due to permanent loss). Furthermore, these benefits should only be looked at in the context of the Norfolk Rivers IDB. They should not be combined with estimated benefits from other IDBs because cumulative impacts will be different.

6 North Level District Drainage Board

6.1 Overview of the Drainage Board

North Level IDB covers an area of 31,623 ha and is mainly reliant on pumped drainage, with 12 pumping stations, 40 other water control structures and 613 km of watercourses (North Level IDB, 2012). Most of the land is agricultural, estimated at 27,427 ha, based on GIS data. The pumps provide the Board's engineers with sufficient control over drainage of the Fens that it is possible to retain water in the summer months for irrigation of crops and the enhancement of the drainage environment (North Level District IDB, 2010).

The level of flood protection for the Board's drainage network is between 1% (1 in 100) and 2% (1 in 50).

The Board monitors the condition of all watercourse and assets under its control or which are maintained by the Board under statutory powers (North Level District, IDB, 2012). Annual maintenance regimes have been established, including, for example, annually carrying out 20km of watercourse cleansing to remove accumulated silt. The cleansing operation is carried out on a five to fifteen year rotation (North Level District IDB, 2010a).

6.2 Definition of the baseline and current scenario

The assessment has used a baseline that assumes the IDB stops all of its activities (similar to do-nothing). The current scenario is defined as the IDB continuing its activities as at present. The assessment will, therefore, provide an indication of the benefits provided by the IDB from its current activities.

6.3 Main Data Sources Used

Table 6.1 sets out the main data sources used for the Norfolk Rivers assessment.

Table 6.1: Source of information	
Category	Sources of information used
Carbon	Current land use based on data produced by IDB (in particular the policy statement) GIS data on land use
Waterlogging, drought, flooding, erosion: • Residential properties	Neighbourhood statistics (output area: household spaces, accommodation type, dwellings, housing stock, lowest floor level)
Waterlogging, drought, flooding, erosion: • Business properties	Valuation Office Agency (business rates data) CLG (commercial and industrial floorspace rateable value statistics) Neighbourhood statistics (local authority area: local units by broad industry group, VAT Based enterprises, VAT based local units)
Waterlogging, drought, flooding, erosion: • Social infrastructure	Ordnance Survey maps Valuation Office Agency (business rates data)
Waterlogging, drought, flooding, erosion: • Emergency services	Ordnance Survey maps
Waterlogging, drought, flooding, erosion: • Utilities infrastructure	Ordnance Survey maps National Grid (gas pipeline maps)
Waterlogging, drought, flooding, erosion: • Transport infrastructure	Ordnance Survey maps Local Authority vehicle counts Data.gov.uk (road traffic counts, transport statistics) National Rail timetables
Control of invasive species	Biodiversity Action Plan
Water quality	Environment Agency (waterbody status and river bodies and water quality) Biodiversity Action Plan
Production of grown food	GIS data on land use Ordnance Survey maps
Collection of natural food	No data found
Energy	Ordnance Survey maps (including Vector Map Open Data)
Production of timber, fibre, aggregates, peat, etc.	Ordnance Survey maps GIS land use data
Biodiversity	Biodiversity Action Plan Natural England (nature on the map; agri-environment statistics)
Water supply	Environment Agency CAMS
Health and well-being of people	Neighbourhood statistics (Health and Care – General Health (UV20)) Floodzone 2 data
Health and well-being of communities	Neighbourhood statistics (Health and Care – General Health (UV20)) Floodzone 2 data
Level of involvement in decision-making	Linked to involvement in IDB decisions (e.g. Board meetings)
Landscape character	www.MAGIC.gov.uk AONB website (www.aonb.org.uk) Natural England (Joint Character Areas)
Heritage values	English Heritage (World Heritage Sites, Listed buildings, Scheduled monuments, parks and gardens, battlefields) Ordnance Survey maps (including Vector Map Open Data)
Knowledge and education	No data found
Recreation and tourism	Ordnance Survey maps (including Vector Map Open Data) Local Authority footpath/cycle route inventories
Jobs/expenditure	IDB accounts

6.4 Results of the Qualitative Assessment

The qualitative assessment provides a summary of the magnitude and significance of benefits. Table 6.2 provides the results.

Table 6.2: Summary of the qualitative assessment results – North Level IDB				
Categories (by number)	Magnitude			
Significance	Small	Moderate	Large	Total
Not very significant	2	0	0	2
Slightly significant	5	7	0	12
Significant	0	10	12	22
Very significant	0	0	11	11
Total	7	17	23	47
Categories (by percentage)	Magnitude			
Significance	Small	Moderate	Large	Total
Not very significant	29%	0%	0%	4%
Slightly significant	71%	41%	0%	26%
Significant	0%	59%	52%	47%
Very significant	0%	0%	48%	23%
Total	100%	100%	100%	100%
Significance by magnitude	Magnitude			
Significance	Small	Moderate	Large	Total
Not very significant	100%	0%	0%	100%
Slightly significant	42%	58%	0%	100%
Significant	0%	45%	55%	100%
Very significant	0%	0%	100%	100%
Total	15%	36%	49%	100%

Table 6.2 shows that the most common benefits are identified as large, significant (12) followed by large, very significant (11). There are 23 large benefits compared with 17 moderate and 7 small. Again, larger impacts tend to be more significant with 100% of large benefits being significant or very significant, compared with just 59% of moderate benefits and 0% of small benefits. All of the benefits identified as being not very significant are identified as small, while 55% of significant benefits and 100% of very significant benefits are large in magnitude. This is perhaps not surprising since very significant benefits (affecting all or almost all assets) are more likely to be large (having big impacts on affected assets), especially given the difference between the baseline (no IDB) and current situation (with IDB).

6.5 Results of the Quantitative Assessment

Monetary values for the benefits have been estimated where a reasonably robust approach is available. Table 6.3 provides the benefits by category. The table shows benefits to IDBs and the Environment Agency.

Table 6.3: Estimated monetary benefits of IDB activities – North Level IDB				
Category	IDB Benefits	IDB damages	EA benefits	EA damages
Carbon	£0	-£6,000,000	£0	£0
Residential properties	£3,700,000	£0	£0	£0
Business properties	£2,300,000	£0	£0	£0
Social infrastructure	£2,300,000	£0	£0	£0
Emergency services	£910	£0	£0	£0
Utilities	£1,600,000	£0	£0	£0
Transport (road) direct	£6,800,000	£0	£0	£0
Transport (road) indirect	£2,200,000	£0	£0	£0
Transport (rail) direct	£670,000	£0	£0	£0
Transport (rail) indirect	£0	£0	£0	£0
Food production	£19,000,000	£0	£0	£0
Energy (direct)	£7,400,000	£0	£0	£0
Energy (indirect)	£18,000,000	£0	£0	£0
Designated biodiversity sites	£5,100,000	£0	£0	£0
Non-designated biodiversity sites	£0	-£4,000,000	£0	£0
Water supply	£1,200,000	£0	£0	£0
Recreation and tourism	£440,000	£0	£0	£0
Heritage	£4,900,000	£0	£0	£0
TOTAL	£76,000,000	-£10,000,000	£0	£0
OVERALL	£66,000,000	annual benefits from IDB activities		

Table 6.3 shows that the overall benefits from IDB activities are estimated at around £76 million per year. All of the monetary estimates (with the exception of road transport where vehicle counts have been used specific to the roads affected) have been made using default assumptions and the level of uncertainty associated with the total benefits is rated as high. These benefits exclude a large proportion of the benefits derived by activities to reduce the risk of flooding rather than the risk of waterlogging, so they may be under-estimated where the IDB undertakes activities on behalf of the Environment Agency. When considering these benefits it is important to remember that they are annual estimates, but that they ignore when the benefits might occur. For example, if the IDB stopped its activities it may take some time before all the assets are affected by increased waterlogging.

Figure 6.1 shows the benefits and damages by category of IDB activities. The figure shows that the majority of benefits are towards food production as the area is largely agricultural and encompasses the important agricultural land of the Fens. Energy infrastructure and customers also receive significant benefits from IDB activities, as a result of the CCGT (combined cycle gas turbine) power stations at Peterborough and Sutton Bridge. Other categories which benefit include road transport infrastructure, designated biodiversity sites and heritage. Figure 6.1 also shows that there are some damages when compared with the baseline associated with carbon (where wetter

habitats could take up more carbon) and non-designated biodiversity sites (where current land use may provide lower habitat value than wetter habitats).

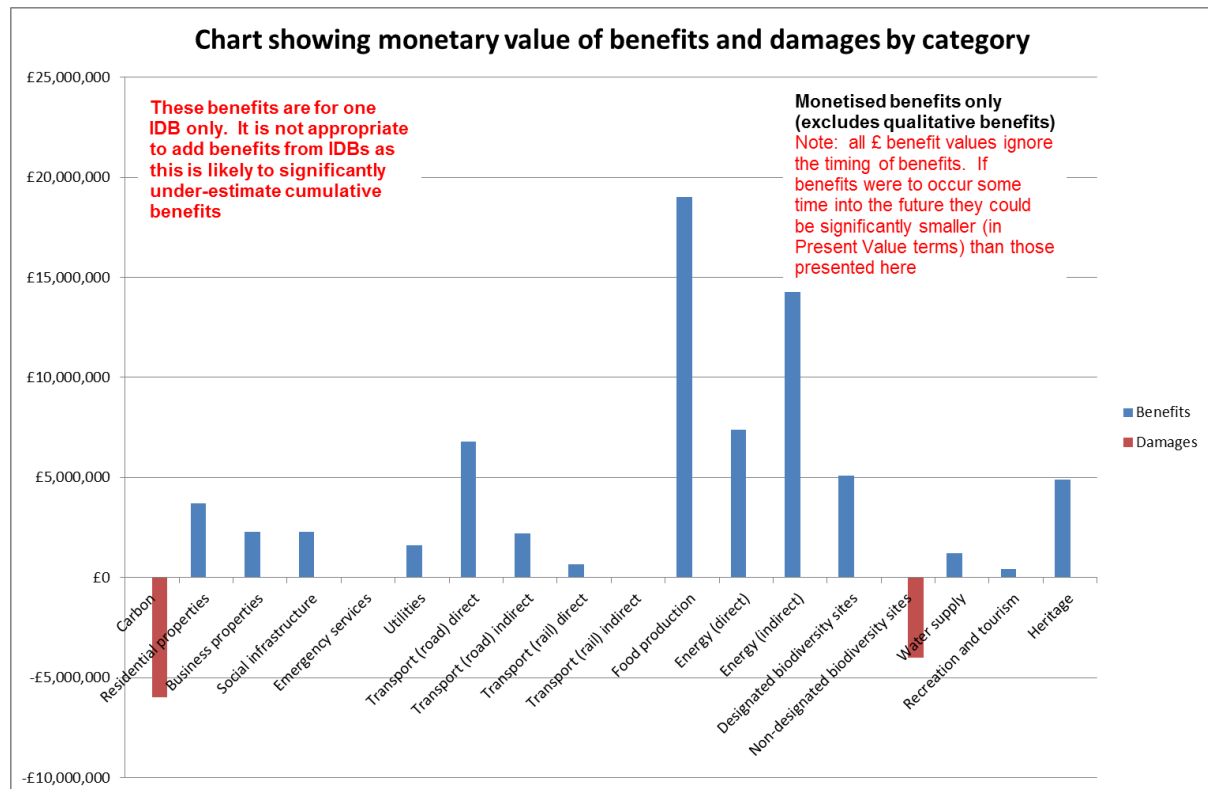


Figure 6.1: Benefits and Damages by category – North Level IDB

6.6 Benefits by Beneficiary

The benefits assessment spreadsheet divides the benefits across a number of beneficiaries. Figure 6.2 presents a pie-chart showing how much each of these groups benefits from IDB activities. The Figure shows the largest beneficiary is farmers and landowners at 32%. Service providers receive 18% of the benefits, followed by local authorities and local residents each receiving 14%.

Figure 6.3 provides a pie-chart showing how the damages (from carbon and non-designated biodiversity sites) are split across the beneficiaries. In this case, it is wider society that is most affected (70%), mainly due to carbon impacts being felt much wider than just the IDB district. The overall damages are much smaller than the overall benefits (£10 million per year compared with £76 million per year); however in this case the benefits to wider society (£7.6 million) are only marginally greater than the estimated damages (£7 million).

It is important to remember that the estimated benefits and damages have been equally divided across beneficiaries that are expected to benefit or be affected under each category. This means that the proportion of benefits and damages provides an

indication of the extent to which each group benefits, rather than a detailed assessment of their actual benefits. It should also be noted that almost all of the benefit and damages estimates are based on the default assumptions used in the benefits assessment spreadsheet. As a result, the level of uncertainty within the estimates is rated as high.

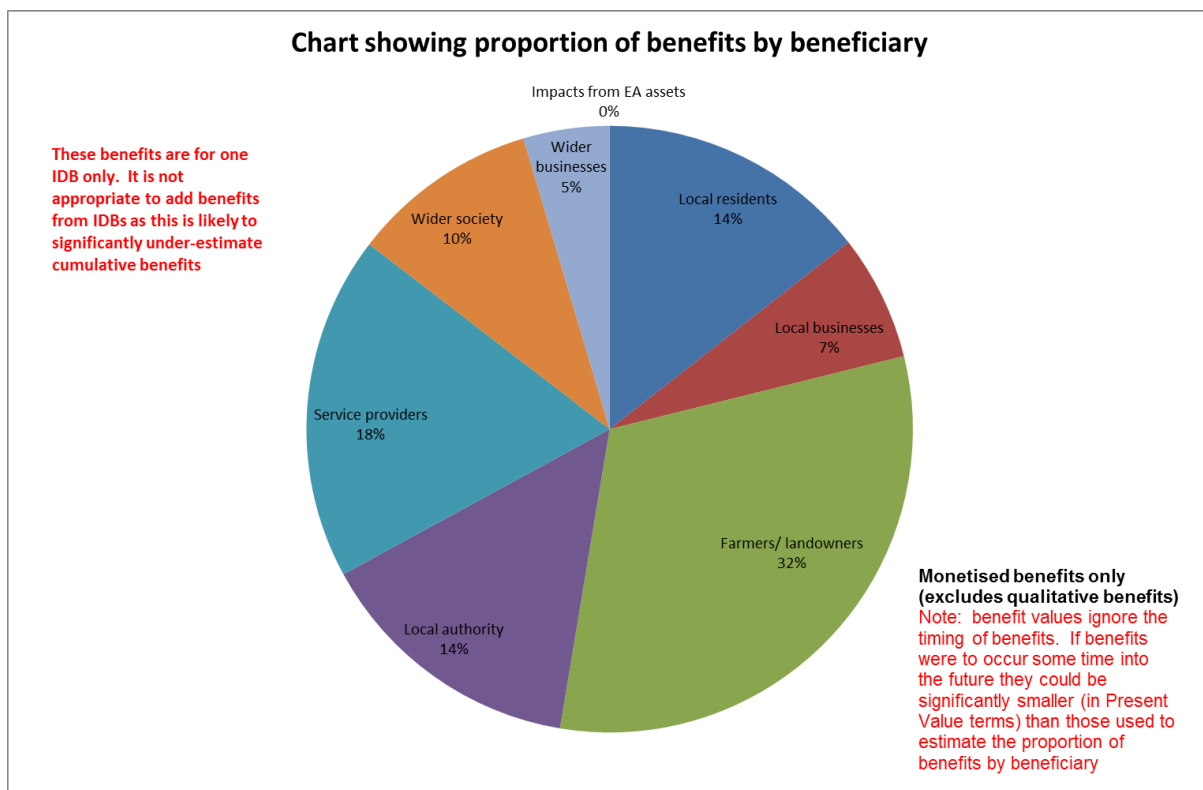


Figure 6.2: Benefits by Beneficiary – North Level IDB

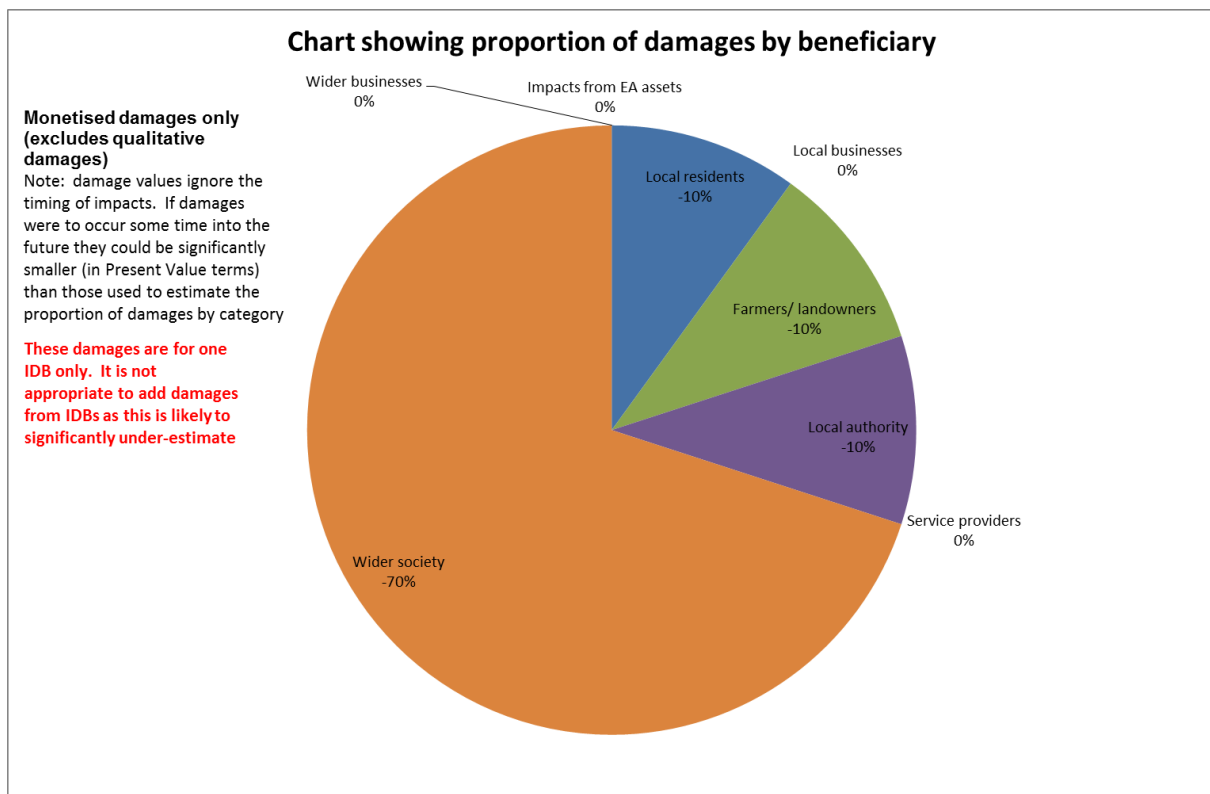


Figure 6.3: Damages by Beneficiary – North Level IDB

6.7 Summary of Results

Overall, the results of the benefits assessment show that North Level IDB is predicted to deliver £66 million in benefits per year (£76 million benefits minus £10 million damages). The biggest share of these benefits will go to farmers and landowners, around £24.3 million per year. Service providers will receive an estimated £13.6 million, whilst local residents and local authorities both receive £10.6 million in benefits each year. These benefits should not be used as the basis for assessing a benefit-cost ratio for the IDB as they ignore the impact of time. In reality some of the benefits might be delayed (where it takes time for benefits to be realised due to delays in response of the hydrological system) while others might be under-estimated (where assets are assumed to be relocated due to permanent loss). Furthermore, these benefits should only be looked at in the context of the North Level IDB. They should not be combined with estimated benefits from other IDBs because cumulative impacts will be different.

7 Ouse and Humber Drainage Board

7.1 Overview of the Drainage Board

The total catchment area draining to and including the District is 47,470 ha, of which the area of the Drainage District is 33,724 ha. This includes 32,077 ha of agricultural land, and 1,647 ha of other land including properties, highways, etc. There are also 99 ha of wetland SSSI, 47 ha of heathland SSSI and 79 ha of SPA (Ouse and Humber DB, 2011).

The Board's maintained infrastructure comprises 17 pumping stations, 53 other water level control structures, and 390 km of watercourses. There are also 77.4 km of main river, 43.5 km of river flood defences and 38.2 km of sea and tidal defences, which are maintained by the Environment Agency (Ouse and Humber DB, 2011).

Ouse and Humber DB (2011) seeks to achieve a standard of flood protection to agricultural land of 10% (1 in 10) and to developed areas of 2% (1 in 50). The Board monitors the condition of its pumping stations and watercourses, especially those designated as strategic ordinary watercourses (where overspilling could affect property). A routine management programme is in place to ensure that the condition of assets is appropriate. Notices of the Board's proposed annual programme of capital and maintenance works is published and placed on deposit at its offices.

7.2 Definition of the baseline and current scenario

The assessment has used a baseline that assumes the IDB stops all of its activities (similar to do-nothing). The current scenario is defined as the IDB continuing its activities as at present. The assessment will, therefore, provide an indication of the benefits provided by the IDB from its current activities.

7.3 Main Data Sources Used

Table 7.1 sets out the main data sources used for the Norfolk Rivers assessment.

Table 7.1: Source of information	
Category	Sources of information used
Carbon	Current land use based on data produced by IDB (in particular the policy statement) GIS data on land use
Waterlogging, drought, flooding, erosion: • Residential properties	Neighbourhood statistics (output area: household spaces, accommodation type, dwellings, housing stock, lowest floor level)
Waterlogging, drought, flooding, erosion: • Business properties	Valuation Office Agency (business rates data) CLG (commercial and industrial floorspace rateable value statistics) Neighbourhood statistics (local authority area: local units by broad industry group, VAT Based enterprises, VAT based local units)
Waterlogging, drought, flooding, erosion: • Social infrastructure	Ordnance Survey maps Valuation Office Agency (business rates data)
Waterlogging, drought, flooding, erosion: • Emergency services	Ordnance Survey maps
Waterlogging, drought, flooding, erosion: • Utilities infrastructure	Ordnance Survey maps National Grid (gas pipeline maps)
Waterlogging, drought, flooding, erosion: • Transport infrastructure	Ordnance Survey maps Local Authority vehicle counts Data.gov.uk (road traffic counts, transport statistics) National Rail timetables
Control of invasive species	Biodiversity Action Plan
Water quality	Environment Agency (waterbody status and river bodies and water quality) Biodiversity Action Plan
Production of grown food	GIS data on land use Ordnance Survey maps
Collection of natural food	No data found
Energy	Ordnance Survey maps (including Vector Map Open Data)
Production of timber, fibre, aggregates, peat, etc.	Ordnance Survey maps GIS land use data
Biodiversity	Biodiversity Action Plan Natural England (nature on the map; agri-environment statistics)
Water supply	Environment Agency CAMS
Health and well-being of people	Neighbourhood statistics (Health and Care – General Health (UV20)) Floodzone 2 data
Health and well-being of communities	Neighbourhood statistics (Health and Care – General Health (UV20)) Floodzone 2 data
Level of involvement in decision-making	Linked to involvement in IDB decisions (e.g. Board meetings)
Landscape character	www.MAGIC.gov.uk AONB website (www.aonb.org.uk) Natural England (Joint Character Areas)
Heritage values	English Heritage (World Heritage Sites, Listed buildings, Scheduled monuments, parks and gardens, battlefields) Ordnance Survey maps (including Vector Map Open Data)
Knowledge and education	No data found
Recreation and tourism	Ordnance Survey maps (including Vector Map Open Data) Local Authority footpath/cycle route inventories
Jobs/expenditure	IDB accounts

7.4 Results of the Qualitative Assessment

The qualitative assessment provides a summary of the magnitude and significance of benefits. Table 7.2 provides the results.

Table 7.2: Summary of the qualitative assessment results – Ouse and Humber IDB				
Categories (by number)	Magnitude			
Significance	Small	Moderate	Large	Total
Not very significant	2	0	0	2
Slightly significant	6	6	4	16
Significant	1	1	14	16
Very significant	1	0	8	9
Total	10	7	26	43
Categories (by percentage)	Magnitude			
Significance	Small	Moderate	Large	Total
Not very significant	20%	0%	0%	5%
Slightly significant	60%	86%	15%	37%
Significant	10%	14%	54%	37%
Very significant	10%	0%	31%	21%
Total	100%	100%	100%	100%
Significance by magnitude	Magnitude			
Significance	Small	Moderate	Large	Total
Not very significant	100%	0%	0%	100%
Slightly significant	38%	38%	25%	100%
Significant	6%	6%	88%	100%
Very significant	11%	0%	89%	100%
Total	23%	16%	60%	100%

Table 7.2 shows that the most common benefits are identified as large, significant (14) followed by large, very significant (8). There are 26 large benefits compared with 10 small and 7 moderate. As previously highlighted the larger impacts tend to be more significant with 85% of large benefits being significant or very significant, compared with just 14% of moderate benefits and 20% of small benefits. All of the benefits identified as being not very significant are identified as small, while 88% of significant benefits and 89% of very significant benefits are large in magnitude. This is perhaps not surprising since very significant benefits (affecting all or almost all assets) are more likely to be large (having big impacts on affected assets), especially given the difference between the baseline (no IDB) and current situation (with IDB).

7.5 Results of the Quantitative Assessment

Monetary values for the benefits have been estimated where a reasonably robust approach is available. Table 7.3 provides the benefits by category. The table shows benefits to IDBs and the Environment Agency.

Table 7.3: Estimated monetary benefits of IDB activities – Ouse and Humber IDB				
Category	IDB Benefits	IDB damages	EA benefits	EA damages
Carbon	£0	£-6,000,000	£0	£0
Residential properties	£1,400,000	£0	£12,600,000	£0
Business properties	£550,000	£0	£4,950,000	£0
Social infrastructure	£84,000	£0	£756,000	£0
Emergency services	£730	£0	£6,570	£0
Utilities	£53,000	£0	£477,000	£0
Transport (road) direct	£5,000,000	£0	£5,000,000	£0
Transport (road) indirect	£1,350,000	£0	£1,350,000	£0
Transport (rail) direct	£1,750,000	£0	£1,750,000	£0
Transport (rail) indirect	£445,000	£0	£445,000	£0
Food production	£12,600,000	£0	£1,400,000	£0
Energy (direct)	£1,100,000	£0	£9,900,000	£0
Energy (indirect)	£5,100,000	£0	£45,900,000	£0
Designated biodiversity sites	£342,000	£0	£38,000	£0
Non-designated biodiversity sites	£0	£-5,400,000	£0	£-600,000
Water supply	£0	£0	£0	£0
Recreation and tourism	£295,000	£0	£295,000	£0
Heritage	£1,750,000	£0	£1,750,000	£0
TOTAL	£33,000,000	£-11,400,000	£87,000,000	£-600,000
OVERALL	£21,600,000	annual benefits from IDB activities		

Table 7.3 shows that the overall benefits from IDB activities are estimated at around £33 million per year. All of the monetary estimates (with the exception of road transport where vehicle counts have been used specific to the roads affected) have been made using default assumptions and the level of uncertainty associated with the total benefits is rated as high. These benefits exclude a large proportion of the benefits derived by activities to reduce the risk of flooding rather than the risk of waterlogging, so they may be under-estimated where the IDB undertakes activities on behalf of the Environment Agency. When considering these benefits it is important to remember that they are annual estimates, but that they ignore when the benefits might occur. For example, if the IDB stopped its activities it may take some time before all the assets are affected by increased waterlogging.

Figure 7.1 shows the benefits and damages by category of IDB activities. The land covered by Ouse and Humber IDB is predominantly agricultural land and as expected this figure shows that this category benefits significantly from IDB activities. There are also significant benefits to energy users and road transport infrastructure as a result of the area's close proximity to major power station and major roads. Figure 7.1 also shows that there are some damages when compared with the baseline associated with carbon (where wetter habitats could take up more carbon)

and non-designated biodiversity sites (where current land use may provide lower habitat value than wetter habitats).

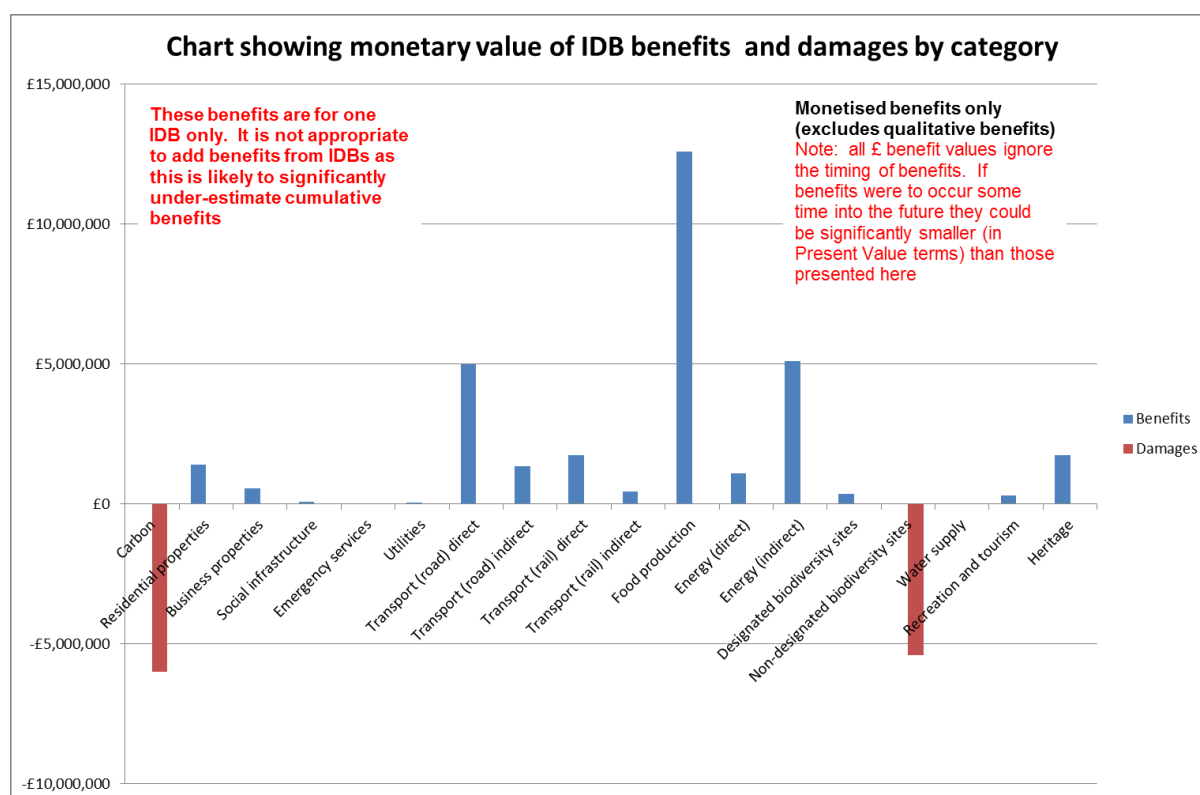


Figure 7.1: Benefits and Damages by category – Ouse and Humber IDB

7.6 Benefits by Beneficiary

The benefits assessment spreadsheet divides the benefits across a number of beneficiaries. Figure 7.2 presents a pie-chart showing how much each of these groups benefits from IDB activities. The Figure shows that farmers and landowners receive close to half of the benefits resulting from IDB activities, at 43%. Other significant beneficiaries are service providers (17%), local authorities (14%) and local residents (11%).

Figure 7.3 provides a pie-chart showing how the damages (from carbon and non-designated biodiversity sites) are split across the beneficiaries. In this case, it is wider society that is most affected (67%), mainly due to carbon impacts being felt much wider than just the IDB district. Although the overall damages are less than the overall benefits (£11.4 million per year compared with £33 million per year), in this particular instance the damages to wider society (£7.4 million) are far greater than the estimated benefits (£2.3 million).

It is important to remember that the estimated benefits and damages have been equally divided across beneficiaries that are expected to benefit or be affected under each category. This means that the proportion of benefits and damages provides an indication of the extent to which each group benefits, rather than a detailed

assessment of their actual benefits. It should also be noted that almost all of the benefit and damages estimates are based on the default assumptions used in the benefits assessment spreadsheet. As a result, the level of uncertainty within the estimates is rated as high.

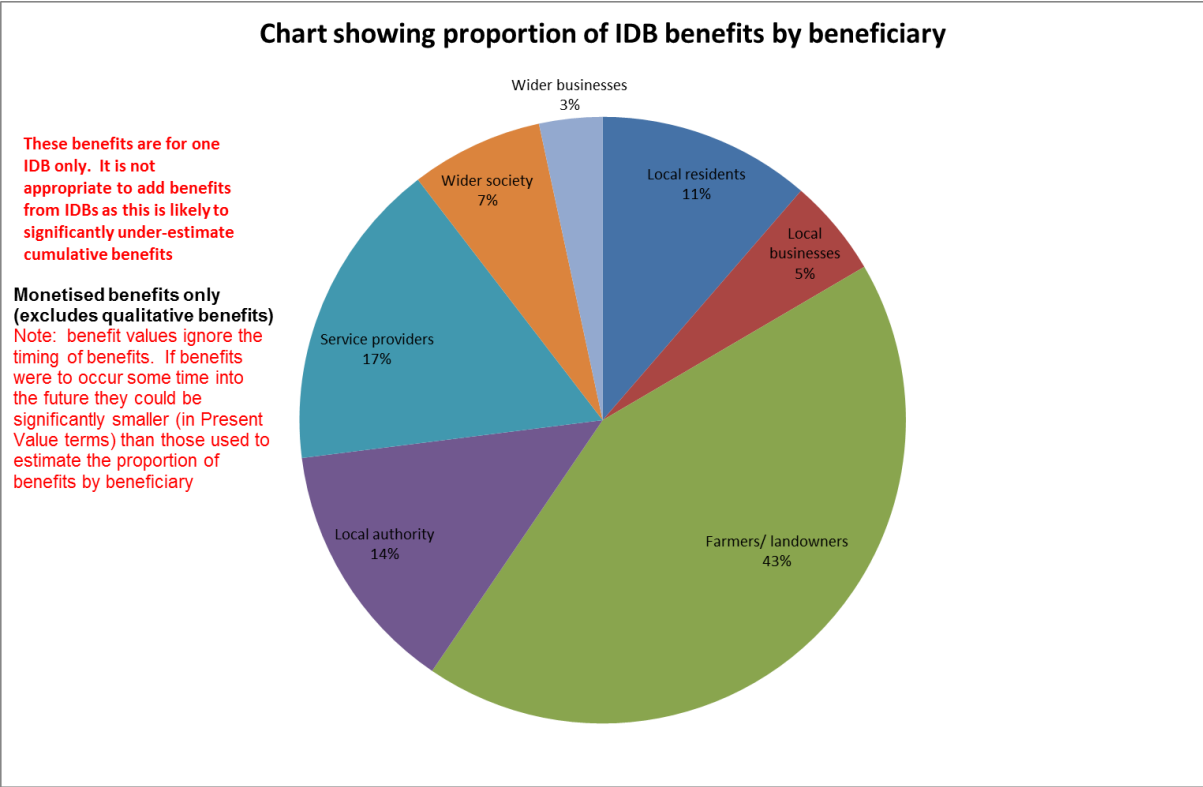


Figure 7.2: Benefits by Beneficiary – Ouse and Humber IDB

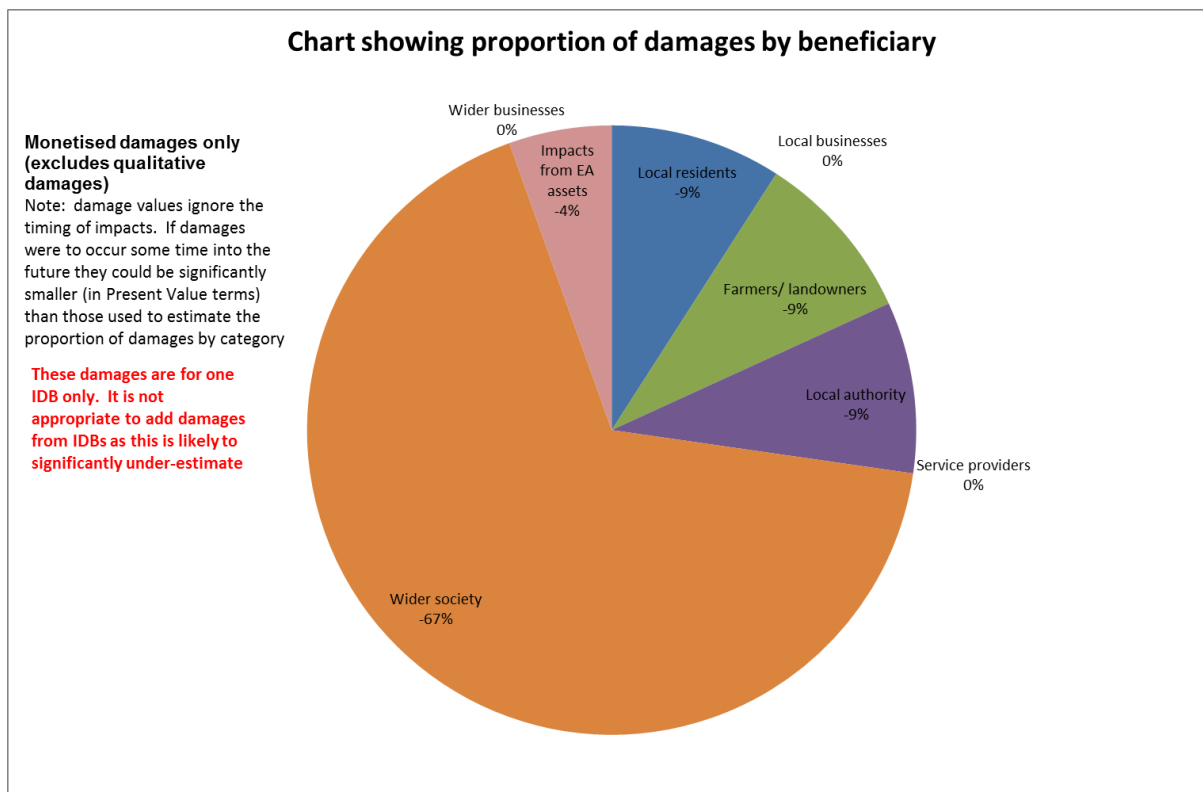


Figure 7.3: Damages by Beneficiary – Ouse and Humber IDB

7.7 Summary of Results

Overall, the results of the benefits assessment show that Ouse and Humber IDB is predicted to deliver £21.6 million in benefits per year (£33 million benefits minus £11.4 million damages). Around £14 million of these benefits are estimated to be to farmers and landowners. Service providers will receive benefits in the region of £5.4 million per year, Local Authorities an estimated £4.4 million and local residents £3.7 million. These benefits should not be used as the basis for assessing a benefit-cost ratio for the IDB as they ignore the impact of time. In reality some of the benefits might be delayed (where it takes time for benefits to be realised due to delays in response of the hydrological system) while others might be under-estimated (where assets are assumed to be relocated due to permanent loss). Furthermore, these benefits should only be looked at in the context of the Ouse and Humber IDB. They should not be combined with estimated benefits from other IDBs because cumulative impacts will be different.

8 References

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Annexes 6: Annexes to the Workshop Report

Annex 1: Workshop Attendees

IDBs and IDB representatives:

- Peter Bateson, Witham 4th IDB
- Giles Bloomfield, Water Management Alliance
- Frances Bowler, Bedford Group of IDBs
- Pete Dowling, River Stour IDB
- James Druett, Lower Severn IDB
- Nigel Everard, Kyle and Upper Ouse DB
- Stuart Hemmings, Black Sluice IDB
- Hugo Marfleet, Lindsey Marsh Chairman
- Andrew McGill, Lindsey Marsh IDB
- Stephen Morris, North Level IDB
- Andrew Morritt, Ouse and Humber DB
- Paul Sharman, North Level IDB
- Martin Shilling, Witham 1st IDB
- Bill Symons, York Consortium of Drainage Boards
- Simon Thackray, Accounts Director, Lindsey Marsh IDB
- James Thomas, Lower Severn IDB
- Ian Thornton, Swale and Ure DB

TAG:

- Tim Farr, RFCC
- Ian Moodie, ADA
- Branwen Rhead, Defra
- Jack Rhodes, RSPB
- Nicola Stirling, Defra
- Jean Venables, ADA
- Mark Welsh, Lincolnshire CC
- Steve Wheatley, RFCC
- Phil Winrow, Environment Agency

RPA team:

- John Ash, Independent Consultant
- Elizabeth Daly, RPA
- Teresa Fenn, RPA
- Lucy Garrett, RPA
- Tony Mann, Resource Strategic Change Facilitators

Annex 2: Workshop agenda

Victory Services Club, 63-79 Seymour Street, London, W2 2HF

16 November 2012

10.00 to 10.30	ARRIVAL and tea and coffee
10.30 to 10.35	Introduction to study (Defra)
10.35 to 10.45	Summary of findings so far (RPA)
10.45 to 10.50 (RPA)	Introduction to workshop aims, objectives and process
10.50 to 11.30	Developing a long-list of indicators (All) Review ideas collected during the study so far (from other research, e.g. JBA report, indicators being used by IDBs, ideas that have been provided during the study to date and a review of indicators used in other countries). Opportunity to put forward your ideas with indicators grouped into four 'perspectives' ¹⁸ ,
11.30 to 12.15	Identifying preferred indicators (All) Opportunity to highlight which of the indicators you prefer, with the preferences of everyone used to identify a short-list of indicators to take forwards for the afternoon activities.
12.15 to 12.30	Summary of preferred indicators (Facilitators)
12.30 to 13.05	LUNCH
13.05 to 14.30	How to measure indicators and prioritisation (All) Opportunity to work in groups to identify the relative importance of the short-listed indicators, provide ideas on if and how they could be measured, and whether they could be implemented in the short term or would require more time (e.g. due to need to collect new data).
14.30 to 15.15	Opportunity to review the conclusions from other groups and add further ideas on how the indicators could be measured, etc.
15.15 to 15.35	Summary of findings (Facilitators)

¹⁸ Based on a Balanced Scorecard type approach, but with the perspectives tailored to the activities undertaken by IDBs (1. maintain/enhance ability to manage water levels including partnership working, 2. maintain/enhance food production, 3. maintain/enhance environmental quality and 4. financial).

15.35 to 15.55 findings (All)	Open session for comments on the workshop and its
15.55 to 16.00	Overview of what happens next (RPA)
16.00	CLOSE

Annex 4: Summary of discussions during the presentations

Several issues and concerns were raised during the introductory presentation. Those relating to the benefits tool (the spreadsheet) included:

- Benefits allocated to energy: are these high enough? Also, do they take into account the relocation of the asset? For example, a power station may need to be moved. It was noted that the electricity benefits as currently calculated are based on the generation capacity of the power stations and the MWh assumed to be transferred by each km of line. This approach has been used because the Multi-coloured Handbook does not provide a method for dealing with electricity;
- Biodiversity: has the quality of each waterbody been considered according to the Water Framework Directive (WFD) status information? It was noted that status data have been recorded in the spreadsheet. However, in terms of overall biodiversity, the spreadsheet only values changes in habitats which are designated, since any change would mean loss of the reason for designation. Changes in other habitats which are not designated are not valued since this would involve making a value judgement about which type of habitat was better;
- Transport: these benefits appear too low. It needs to be made clear that only the road benefits are included. Do the figures represent disruption or loss of asset? It was noted that the benefits have been calculated according to the method given in the Multi-coloured Handbook for dealing with disruption; and
- Capping: have any of the values been capped? It was confirmed that the values have not been capped in the current version of the spreadsheet but guidance is being written and this will include information on capping. The spreadsheet includes annual values, and these are unlikely to be above the value for capping.

Annex 7: Analysis of Indicators

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
Short title	H, M, L	From workshop discussions	Quantitative data needed (if any)	S, M, L	For, against Useful/not useful Issues/comments raised (e.g. at workshop)	Potential for mis-interpretation Doesn't actually provide data that are needed (might be because can't measure what is needed?)	1. Promising, consider further 2. Unlikely, lots of issues
Food production							
Availability of water for irrigation/ abstraction during periods of drought	H	Any actions taken to increase water availability	Qualitative	short-term (less than 12 months)	As discussed at meeting – assume there will be options to select from ? Inappropriate for S&UDB	Descriptive, will depend on objectives of IDB, geography, and need (e.g. wetter areas may not need actions to be taken)	1
		Drought/water management plan/planning, percentage of outcomes/actions achieved	Number of outcomes/actions Number of outcomes/actions achieved	medium-term (1 to 3 years)	I feel that it is most important 3.Performance in relation to food production is not solely about drought. The national economy is	Would need to be accompanied by explanations why certain outcomes/actions hadn't been achieved	1

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
					dependent on security of home production of food, and has recently been proved to be more safe, secure and traceable than food from outside sources.		
		Period of no restriction divided by total period of drought, with the aim being 100%	Measure of time restrictions Measure of total drought period (days?)	long-term (3+ years)		Would need to take account of extent to which IDB can control abstraction and reduce restrictions	1
Number of incidents of waterlogging (number of days), linked to number of complaints from farmers about water levels	H (indicators grouped together)	Depth and duration of incident	Number of incidents Depth (for each incident) Duration (for each incident)	short-term (less than 12 months)	<ul style="list-style-type: none"> the need to link the indicators together; can you have criteria that apply to all?; that they should only apply to systems that are wholly managed by IDBs; that non-food land should be excluded (stewardship, conservations, 	Would need to be accompanied by explanation of cause of incident (as may be outside IDB control) or reason why land was taken out of production	1
Area of land available for agricultural production (actual land versus usable land)		Hectares of land removed from agricultural production	Hectares of land taken out of production due to water levels (not other reasons)	long-term (3+ years)		Potential issue with always knowing exact reason for land being taken out of production, especially where there may be a number of other reasons too (which	
Need to tie in with flooding and waterlogging (ha		Change in area of land protected/not	Hectares of land protected from	My be short-term, but, measurement of change may			

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
protected from each)		protected	flooding Hectares of land protected from waterlogging	require longer data set	<p>SSSIs, etc.); and</p> <ul style="list-style-type: none"> percentage achieved as Environment Agency maintenance standards/condition measurement (97% in high risk systems, etc.) <p>This indicator works for large scale flooding and storage of flood water, but currently large areas of farmland in the fens are waterlogged while drains serving these areas remain relatively dry; farming practises play a big part. Therefore this indicator potentially gives a skewed result if these areas all get reported.</p>	<p>is the defining reason)</p> <p>Needs to be clear baseline (what are you measuring hectares of land protected against?)</p> <p>Need to include definition of what is meant by waterlogging/ flooding so there is consistent measurements across all IDBs</p> <p>Issue with impact of farming practices (drains dry but farmland waterlogged), therefore risk of skewing results</p>	

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
					Completely impossible and impractical to monitor or measure		
Volume of water stored	Additional suggestion during commenting	Volume might be difficult, could measure as area over which water is stored, or areas allocated for storage?	Measurement of area used for storage, or % of area identified for storage that is utilised versus area inundated that had not been identified for storage	Will require definition of what an area identified for storage constitutes Medium-term (1 to 3 years)	Suggested by Project Board	Could be data intensive if too much detail is needed	1
% winter/summer penning level	Additional suggestion during commenting	Measured as extent to which target penning level was achieved	Target penning levels for winter and summer Measurement of when achieved/not achieved Also maybe percentage away from target	Will depend on extent to which additional measurement is required Medium-term (1 to 3 years)	Suggested by Project Board	Could be data intensive if too much detail is needed	1
Maintain the sustainable productive capacity of land by reducing degradation	M	Opinion/contentedness of ratepayers/locals	Feedback from ratepayers/locals, likely to require some form of survey?	short-term (less than 12 months)		Survey would allow question to be tailored so it reduces risk of misinterpretation of indicator, but could	2

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
						be resource-intensive, risk of low returns affecting reliability of indicator	
		Condition assessment every 5 years	Definition of acceptable condition (what is sustainable productive capacity and/or what is meant by degradation) Measurement of area being degraded	long-term (3+ years)		Risk that degradation may be caused for other reasons outside control of IDB (but could be controlled by developing definition that only included factors controllable by IDB)	2
Length of drain maintained/ improved (km) and plant used	Not rated in workshop	Length maintained and improved	Definition of 'improved' Record of length of drain maintained and improved per year	Long-term (3+ years) – need time to develop agreed definitions	Not identified in workshop as one of the indicators to focus on	Need definitions to ensure consistent approach across IDBs	1
'Improve' efficiency and effectiveness of (irrigated) water use	Not rated in workshop	How water is used (productivity)?	Volume of water used, how used and benefits generated	Long-term (3+ years) – need time to understand what indicator means	Not identified in workshop as one of the indicators to focus on	Difficult to identify what is in and outside IDB control	2 Significant risk that indicator would not be meaningful DROPPED

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
Complaints to IDB about partners (water courses/levels, maintenance)	Not rated in workshop	Complaints received by IDB that are caused by others' activities	Number of complaints	Short-term (<12 months)	Not identified in workshop as one of the indicators to focus on	IDB may not receive all the complaints (e.g. where complainant knows who is responsible) Not clear how this would assist IDBs in being more accountable	2 More an issue for partnership working or increasing knowledge of stakeholders over responsibility DROPPED
Reassess agricultural land values	Not rated in workshop	Land valuation on annual (or regular basis)	Value of land (per ha)	Short-term (maybe longer depending on cost of land valuation)	Not identified in workshop as one of the indicators to focus on	Factors affecting land valuation could be outside IDB control (e.g. use of land), but if specific valuation is undertaken this could be factored out (but at greater expense)	2
Measure preferred water level against actual levels achieved (refer to soil moisture deficit)	Not rated in workshop	Compare preferred water levels against actual	Definition of preferred water level Measurements of water level	Short to medium-term (<12 months to 3 years)	Not identified in workshop as one of the indicators to focus on This indicator should not be dropped	May be difficult to define preferred water level (whose preference is to be used?) Would need clear guidelines on timescale to use (daily, weekly, monthly, seasonal, etc.)	1 Taken forwards at request of Project Board

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
LDA enforcement and consents	Not rated in workshop	Number of enforcements and consents	Record of number per year	Short-term (<12 months)	Not identified in workshop as one of the indicators to focus on		2
Availability of water for irrigation against anticipated requirement	Not rated in workshop	Comparison of needs against availability	Measure of available water Measure of required water	Medium to long term (1 to 3+ years)	Not identified in workshop as one of the indicators to focus on	Need to agree whose requirements are included May be seasonal/ weather related factors outside IDB control (although indicator could be used to assess how IDB helps mitigate seasonal fluctuations)	2
Environmental quality							
Water Framework Directive: delivery against measures in the 2 nd round of RBMPs [Note that RBMPs = River Basin Management Plans]	H	Percentage of agreed actions	Number of actions proposed and delivered	medium-term (2015)	<ul style="list-style-type: none"> WFD is a legal requirement; and the indicator is dependent on the staff resources needed <p>Extent of these presently unknown</p> <p>This is relevant if sufficiently</p>	Would need to be accompanied by reasons why/why not measures have been undertaken to ensure factors outside IDB control are taken into account	1

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
					articulated and discussed with IDBs. The lack of dialogue on WFD between the EA and IDBs in the past has limited IDB involvement, and this shouldn't be shown as solely a failure on the part of the IDBs		
What area/proportion of SSSI remedies is completed?	H	none identified	Number of remedies proposed Number of remedies completed (definition of when remedy is assumed to be completed)	short term (immediate/within next year)	<ul style="list-style-type: none"> there is a risk of misinterpretation. For example, the complexity of the task may lead to continued failure beyond the IDB's control 	Would need to be accompanied by reasons why/why not remedies have been undertaken to ensure factors outside IDB control are taken into account	1
Number of ha of habitat created [note that this refers to habitat types as specified by Defra's Outcome Measures]	H	ha of land in HLS or BAP	Hectares of land in HLS or BAP, or habitats created and maintained/enhanced (definition may be required for enhanced)	short term (immediate/within next year)	<ul style="list-style-type: none"> this indicator should consider ha maintained as well as created; and there is a risk of misinterpretation in terms of IDB performance 	Hectares of land in each may be outside IDB control (e.g. due to choices made by NE or landowners)	1

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
Percentage of Biodiversity Action Plan actions that have been completed	M	BAP or other species could be recorded by IDBs whilst undertaking jobs. These data could then be transferred to GIS, allowing the change in distribution over time to be seen	<p>Number of actions proposed</p> <p>Number of actions completed (definition of when action is assumed to be completed)</p>	short-term (immediate/within next year)	<ul style="list-style-type: none"> there is a risk of setting targets which are too low and also missing important aspects <p>These are part of the implementation plans</p> <p>Question around what unit of measure is appropriate here. Number of actions completed may seem the obvious approach but in practice this may underrepresent an IDB who has undertaken an extensive biodiversity programme in relation to habitat creation or specific to a species. At ADA we were keen to encourage a biodiversity auditing approach, facilitating IDBs to</p>	Would need to be accompanied by reasons why/why not actions have been undertaken to ensure factors outside IDB control are taken into account, also if biodiversity auditing approach is in place (and/or explanation of what had been achieved in terms of biodiversity)	1

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
					explain to Defra and their communities what they had achieved in terms of biodiversity. This would not necessarily be annual, but give a better judgement of performance than a single measure.		
Have any activities been undertaken to enhance any particular BAP species or locally important species?	M	Description of actions taken	Qualitative	short term (immediate/within next year)	Not much different from above	May require definition of 'enhance' to ensure consistency across IDBs of what is included	1
With the exception of regulation maintenance works in-channel, has the Board enhanced or created any habitat?	Not rated in workshop	See above	See above, habitat would have to be defined	See above	Not identified in workshop as one of the indicators to focus on	See above, assumed covered by above (definition of habitat as BAP)	Combined with above
Have channels been maintained in an environmentally friendly way (in accordance with Drainage Channel Biodiversity Manual)?	M (indicators merged)	it is difficult to identify a way of measuring this	Proportion maintained in any one year that have been done so in accordance with Manual – but could just be measured as has Manual	short term (immediate/within next year)	<ul style="list-style-type: none"> in-channel works are important, but it is difficult to determine an indicator for this. 	May need to be accompanied by reasons why not (if not)	2

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
			been followed				
Have channels been maintained in an environmentally friendly way (determined by review by Board?)			Requires approach to be determined by Board	Medium-term (needs time for method to be determined by Board)		How to ensure consistency across IDBs, each Board may have different approach	2
Have invasive species been found (more or less)?	Not rated in workshop	Number, occasions, presence of invasive species	Area with invasive species or length, or number of watercourses, proportion of total length (depending on invasive species of interest)	Medium to long-term	Not identified in workshop as one of the indicators to focus on	Resources may be an issue (depending on how indicator is to be measured) May need to identify key invasive species to keep indicator manageable	2
Have species records/incidents of invasive species been submitted to BRC/wildlife trusts?	Not rated in workshop	Yes/no	Records of occurrence and location of invasive species	Will depend on extent to which this is already done/expertise is available	Not identified in workshop as one of the indicators to focus on	Will need to be accompanied by reasons why/why not	1
Is there a catchment-based plan to deal with invasive species?	Not rated in workshop	Yes/no	Presence/absence of plan	Short term (immediate/within next year)	Not identified in workshop as one of the indicators to focus on	Will need to be accompanied by reasons why/why not	1
Is there a strategy and local partnership	Not rated in workshop	Yes/no	Presence/absence of strategy	Short-term (immediate/within	Not identified in workshop as one of the indicators to	Will need to be accompanied by reasons why/why	1 May be could be taken forwards as less formal that

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
arrangements for dealing with invasive species?				next year)	focus on	not	strategy, e.g. 'What action or processes has the IDB undertaken to address invasive or non-native species?'
Have any carbon-related habitats been restored?	Not rated in workshop	Yes/no or area of carbon-related habitats	Definition of what can be included as carbon-related habitats	Medium to long-term	Not identified in workshop as one of the indicators to focus on	Restoration of habitats maybe outside IDB control (or resources required may not be available)	2
Use of an annual environmental audit report/scorecard that could be used to report on indicators and provide some detail behind them (going beyond raw data)	Not rated in workshop	Developed based on combination of indicators, supported by detail behind indicators	Built up from individual indicators	Will depend on timeframe of indicators within the report/scorecard and/or what it required	Not identified in workshop as one of indicators to focus on	Resources required, but could be linked to quick indicators in short-term. Requirement of detail behind indicators will be useful to IDBs as well as beneficiaries as it reduces risk of mis-interpretation (although risk that focus is on numbers, etc. will remain)	1
Have all recordable habitat and species delivery actions been recorded on	Not rated in workshop	Yes/no	Definition of what is recordable	Short to medium-term (depending on IDB experience	Not identified in workshop as one of the indicators to	Would need to be accompanied by reasons why/why not actions have	1

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
the Biodiversity Action Reporting System (BARS) for this year?				of BARS)	focus on	been recorded to ensure factors outside IDB control, and resource implications are taken into account	
Does the IDB provide planning support for sustainable use of floodplain, wetlands and rivers?	Not rated in workshop	Yes/no	Definition of sustainable use to ensure consistency across IDBs	Medium to long-term (to allow time for definition to be agreed)	Not identified in workshop as one of the indicators to focus on One attendee added the comment "Yes – LNPs/NIA"	Risk that indicator could reflect resources available within IDB (or lack of resources)	2
What area of SSSI remedies has been identified as the responsibility of IDBs?	Not rated in workshop	Area of SSSI	Hectares where responsibility is allocated to IDB Also, current condition of SSSIs and how that has changed?	Short to medium-term	Not identified in workshop as one of the indicators to focus on	Would need measurement of success or change to be useful, e.g. based on change in area at each condition status	2
Number of net biodiversity gains per hectare	Not rated in workshop		Definition of what is meant by biodiversity gain Record of	Medium to long-term	Not identified in workshop as one of the indicators to focus on	Normalisation as per hectare value may penalise large boards Land use may be	2

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
			biodiversity gains			outside IDB control	
Compliance with Conservation Regulations (Habitats and Birds Directives; Wildlife and Countryside Act)	Not rated in workshop	Yes/no	Whether compliance is achieved or not	Short-term	Not identified in workshop as one of the indicators to focus on Include the Wildlife and Countryside Act in relation to protected conservation sites and species	Would need to be accompanied by reasons why/why not	1
Benefit of water levels to biodiversity to be monitored at specific sites and impact on the flow in watercourses	Not rated in workshop	Could be qualitative description	Definition of what is an appropriate site, and how to measure	Long-term (requires a lot of actions to be put into place and agreed)	Not identified in workshop as one of the indicators to focus on I'm not sure what this means in practice or the motivation behind it. If it means that we're requiring IDBs to report on how biodiversity best practice is impeding flood conveyance, then it's ill-conceived. How would an IDB do this? It would be better to ask	May be difficult to get consistency across boards	1 Revised to 'whether the IDB has evaluated its drainage network to manage a balance of biodiversity and flood conveyance, as per the Drainage Channel Biodiversity Manual'

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
					whether an IDB had evaluated its drainage network in order to manage a balance of biodiversity and flood conveyance as per the Drainage Channel Biodiversity Manual.		
Consenting of 3 rd party activities (liaison/pre-application partnership)	Not rated in workshop				Not identified in workshop as one of the indicators to focus on		2
Greenhouse gas (GHG) emissions	Not rated in workshop	Would have to be using generic factors, based on use of plant, change in land use	Will depend on emissions that are to be included	Medium to long-term (depending on coverage and use of existing approaches)	Not identified in workshop as one of the indicators to focus on	Could be resource intensive	2
Pollution incident	Not rated in workshop	Number of incidents that are responsibility of IDB staff or actions	Number of incidents and severity	Short to long-term (depends on whether method needs to be developed)	Not identified in workshop as one of the indicators to focus on	Would need to be accompanied by explanations behind any incidents (what caused them, etc.) to take account of factors outside IDB control	1
Water intakes managed –	Not rated in	Number, condition	Number of	Short to medium-	Not identified in workshop as one	Need to link number (condition)	2

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
including permit quantity, transfer quantity	workshop		intakes?	term	of the indicators to focus on	of intakes with a benefit or desired outcome	
No. of County Wildlife Sites	Not rated in workshop	Number	Need to relate to condition, or change in condition (unless new sites are designated)	Short (for number), longer for change in condition (as would need a method)	Not identified in workshop as one of the indicators to focus on	Needs to reflect a change (in number or condition)	2
Defra/NE ELS HLS Environmental Schemes	Not rated in workshop	Number	Need to relate to condition, or change in condition (unless new sites are designated)	Short (for number), longer for change in condition (as would need a method)	Not identified in workshop as one of indicators to focus on	Needs to reflect a change (in number or condition). Needs to take account of factors outside IDB control (Defra/NE decisions, landowners choices)	2
Financial and Cost-Effectiveness							
Is the board compliant with the requirements of external audit?	H (indicators merged)	Yes/No	Requirements to be compliant and evidence to support this using the IDB's annual return	Short term (defined as annual)	<ul style="list-style-type: none"> This should capture transparency code compliance, good governance and publication of key online documents 	Would need to be accompanied by reasons if no, in case this was caused by factors outside IDB control	1
Compliant with requirements of		See above	See above	See above	See above	See above	As above

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
internal auditor							
Have financial statements been reviewed and found to be of suitable quality?	Not rated in workshop	See above	See above	See above	Not identified in workshop as one of the indicators to focus on	See above	1
£ of benefits provided per £ spent	H	Using Flood Defence Grant in Aid (FDGiA) figures as the baseline and adding agricultural land and other factors depending on their relevance to the IDB	Reliable estimate of annual benefits measured against agreed baseline (do-nothing or added value over previous year?)	Medium (defined as 1-3 years)		Could be resource intensive depending on how benefits are to be estimated, requirement to repeat assessment, etc.	2
Maintenance costs per linear km of maintained watercourse	M	Updated IDB1 figures and where appropriate split by watercourse risk	Length of watercourse maintained Cost of maintaining	Short term (annual)	It may be useful to look at trends over time for a single IDB, or compare with other IDBs of similar structure/size etc., as maintenance costs may vary significantly between boards depending on the type and extent of maintenance carried out Information is likely	Will require definition of what is counted as maintenance, and what should be included in maintenance cost	1

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
					to be very much specific to the context/situation/ location of the IDB in the landscape and importance of pumping v gravity		
Pumping station maintenance costs per pumped ha	M		Number of pumping stations Cost of maintaining Pumped area (ha)		Information is likely to be very much specific to the context/situation/ location of the IDB in the landscape and importance of pumping v gravity	Will require definition of what is counted as maintenance, and what should be included in maintenance cost (should capital works, refurbishment, etc. be included?)	1
Maintenance costs as a percentage of total expenditure	Not rated in workshop		Maintenance costs Total expenditure	Short-term	Not identified in workshop as one of the indicators to focus on	Will need definitions of what is included in each	1
Administration costs as a proportion of total spend	M		Administration costs Total costs	Short-term	Costs must be clearly and precisely defined, as these can vary considerably between IDBs Information is likely to be very much specific to the context/situation/	Will need definitions of what is included in each	1

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
					location of the IDB in the landscape and importance of pumping v gravity		
Proportion of total expenditure on administration costs	Not rated in workshop	See above	See above	See above	Not identified in workshop as one of the indicators to focus on	See above	Combined with above
Admin/running costs per £100,000 of income	M	See above	See above	See above		Normalisation per £100,000 income may have unexpected results for smaller or larger boards	2
Ratio of admin cost vs. operations	Not rated in workshop		Admin costs Total operation costs		Not identified in workshop as one of the indicators to focus on	Will need definitions of what is included in each	1
Overhead costs per £ spent on maintenance	Not rated in workshop		Overhead costs Maintenance costs		Not identified in workshop as one of the indicators to focus on	Will require definition of both costs for consistency across boards	1
Revenue budget/expenditure	Not rated in workshop		Total revenue Total expenditure		Not identified in workshop as one of the indicators to focus on	Will require explanations, e.g. why costs are lower/higher in one year than another	1
Capital	Not rated in		Capital budget		Not identified in workshop as one	Will require explanations, e.g.	1

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
budget/expenditure	workshop		Capital expenditure		of the indicators to focus on	why capital costs are higher/lower than budgeted	
Bring agricultural rateable values up to date to identify balance between agricultural rates and special levy	L	For Defra to decide how to measure		Likely to be long-term (defined as more than 3 years)	<ul style="list-style-type: none"> It was thought that this was not really an indicator and more of a task, and was not achievable at the IDB level, but more of a wish list 		2 Not an indicator DROPPED (may need to be considered as task separately)
Contribution to wider partnership management FWMA	L	Ask Local Lead Authority (LLA) for qualitative information	Number of partnerships that IDB is involved in?	Medium term (1-3 years)		Number of partnerships may be misleading for smaller boards	2
Percentage of drainage rates paid	L (throughout year)	Existing data	Proportion of rates paid Proportion of rates unpaid	Short term (annual)	Preferable to have the time period measured in months from the date the demands are sent, percent paid within 3 months of issue date would make more sense I think some longer term indicators could be found around sustained levels of production,	Will need to be accompanied by reasons why not paid to take account of factors outside IDB control	1

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
					although there maybe overriding environmental factors. However, these could be difficult to compile on the part of the IDB. Broadly the collection of agricultural rates should act as a useful proxy for understanding the satisfaction of the agricultural sector in the performance of the IDB.		
Level of bad debt	Not rated in workshop	Linked to above	Needs definition of when debt becomes 'bad debt'	Short term (annual)	Not identified in workshop as one of the indicators to focus on	Would need to be accompanied by reasons to take account of factors outside IDB control	1
Proportion of rates that are uncollected	Not rated in workshop	See above	See above	See above	Not identified in workshop as one of the indicators to focus on	See above	1
Time to collect rates	Not rated in workshop	Days required between bill and payment	Time delay to payment	Short-term	Not identified in workshop as one of the indicators to focus on	Could be resource intensive (but could be built into accounting, especially if electronic)	1

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
Compliance with local flood risk management strategy	Not rated in workshop	Yes/no	Definition of what constitutes compliance	Short-term	Not identified in workshop as one of the indicators to focus on Concern over whether this is sufficient as an indicator in relation to flood risk management, especially where there are few strong partnerships	Will need to be accompanied by reasons why not complying to take account of factors outside IDB control	1
Financial cost effectiveness should be based on outcomes not on how boards do their business	Not rated in workshop				Not identified in workshop as one of the indicators to focus on		2 Not an indicator, more a guide DROPPED
Gross costs of capital work as a proportion of total spend	Not rated in workshop		Capital costs Total spend	Short to medium-term	Not identified in workshop as one of the indicators to focus on	May not be relevant every year if there is no capital spend Capital spend may be restricted due to other factors (e.g. availability of funds)	2
Sickness days of IDB employers	Not rated in workshop	Number of days	Number of sick days	Short-term	Not identified in workshop as one of the indicators to	Will need to be accompanied by reasons behind	1

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
			Number of employees		focus on	sick days, as may not be controlled by IDB requirements of staff	
Performance of partners	Not rated in workshop	Qualitative	Actions of partners and how affect IDB	Medium-term	Not identified in workshop as one of the indicators to focus on	Will need to be used to help explain other indicators?	1
Partnership working (undertaking work on behalf of other risk management authorities or contributing to joint projects)	Additional suggestion during commenting	Amount spent undertaking work on behalf of others, or contributing to join projects (as total spend, or % of total spend)	Method of recognising and measuring where work is being done on behalf of others (outside of 'normal' work)	Short to medium-term (will depend on ease to which this information can be identified and recorded)	Suggestion made during commenting	Will need clear definition of what could be captured here (or perhaps what should not be captured). Could be difficult to ensure consistency	1
Project development costs as a % of total project cost	Not rated in workshop		Project development costs Total project cost (will need to be clear whether this is projected or actual)	Short to long-term (will depend on whether projected or outturn costs are required)	Not identified in workshop as one of the indicators to focus on	Will require definition of what is/ is not included in each cost type	1
Year on year trends in unit costs for works	Not rated in workshop		Unit costs (actual spent?)	Short to medium-term	Not identified in workshop as one of the indicators to focus on	Need clear definition of what is included (risk that work requirements may change over time, affecting ability to compare	2

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
						year-on-year)	
Capacity issues/resource utilisation	Not rated in workshop	Number of resources (staff, plant, financial)	Need definition of what resources are included, how capacity is measured	Medium to long-term (need to agree definitions)	Not identified in workshop as one of the indicators to focus on	Need for clear definitions to ensure consistency across boards	2
Productivity as a % of expenditure	Not rated in workshop		Need to define productivity (how can this be compared across different types of activities, staff, etc.)	Medium to long-term (need to agree definitions)	Not identified in workshop as one of the indicators to focus on	Need for clear definitions to ensure consistency across boards	2
Time taken between grant aid and scheme completion	Not rated in workshop	Time (months, years)	Definition of stage at which time is recorded (when GiA application is submitted, or fund agreed), what constitutes scheme completion?	Long-term	Not identified in workshop as one of the indicators to focus on	May need to normalise or account for different types of project (how to compare one-off capital works, with on-going works, for example)	1
Time taken to achieve grant aid approval	Not rated in workshop	Time (months, years)	Definition of stage at which time is recorded (when GiA application is started, submitted, agreed), what constitutes approval (written agreement, money	Medium-term	Not identified in workshop as one of the indicators to focus on	Will need to be accompanied by reasons as factors may be outside IDB control (e.g. EA review, funding requirements, etc.)	1

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
			in bank)				
Turnaround time	Not rated in workshop	Same as above?	See above	See above	Not identified in workshop as one of the indicators to focus on	See above	As above
Reliance on consultants	Not rated in workshop	Spend on consultants	Expenditure on consultants Number of days input by consultants	Long-term	Not identified in workshop as one of the indicators to focus on	How to differentiate between activities that could be done in-house and those requiring specialist expertise? Could use of consultants provide additional benefits, or be better use of resources (e.g. freeing up staff for other activities)?	2
Number of times specialist advice has been requested and given	Not rated in workshop	Number	Number of requests Number of responses	Medium-term	Not identified in workshop as one of the indicators to focus on	Simple indicator that does not take account of usefulness of advice	1
Time to deal with information requests	Not rated in workshop	Time needed/taken	Timing of request Timing of response Number of responses	Medium-term	Not identified in workshop as one of the indicators to focus on	Requests may not be directly comparable (e.g. some may be more complex) so may need different types of request (but then could get	1

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
						complicated)	
Staff morale	Not rated in workshop	Qualitative	Staff response to questionnaire? Staff turnover	Medium to long-term (requires questionnaire or methods of measuring to be developed)	Not identified in workshop as one of the indicators to focus on	Maybe external factors affecting morale that may need to be captured/removed where possible	1
Return on staff investment	Not rated in workshop	Qualitative			Not identified in workshop as one of the indicators to focus on		2
Take up of seats on the Board by ratepayers	Not rated in workshop		Number of seats available Number filled	Short-term	Not identified in workshop as one of the indicators to focus on	May not provide much meaningful information (may be other factors affecting uptake of seats – these would need to be described where possible)	2
Number of hits to sites with published transparency data	Additional suggestion during commenting	Number of hits	Website needs to be able to count number of hits	Short-term (may need longer if website needs to be revised)	Suggested during commenting	Number of hits does not identify who is obtaining information, so may be misleading	1
% attendance at Board meetings	Additional suggestion during commenting	Number of meetings attended by specific groups (e.g. LAs)	Meeting attendance lists and invitation lists	Short-term	Suggested during commenting		1

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
Number of incidents/accidents and time off due to injury	Not rated in workshop		Number of incidents/accidents Time off work as a result	Medium-term	Not identified in workshop as one of the indicators to focus on	Will need to only include time off due to work-related incidents	1
Level of resources compared to annual spend	Not rated in workshop		Number of staff Annual spend	Medium-term	Not identified in workshop as one of the indicators to focus on	Will need to be clear definition (e.g. FTE staff and what is included in annual spend)	2
Does the board have a formal system to monitor service delivery?	Not rated in workshop	Yes/no	Definition of what is included in service delivery	Medium-term	Not identified in workshop as one of the indicators to focus on	Will need to be accompanied by reasons why not to take account of factors outside IDB control	2
Quality of appointed internal auditor	Not rated in workshop		Will need to define what constitutes a quality appointment	Medium-term	Not identified in workshop as one of the indicators to focus on		2
Contribution to local economy	Not rated in workshop		Will require assessment of how IDB contributes to local economy	Long-term	Not identified in workshop as one of the indicators to focus on	May require resource-intensive approach to reflect all aspects by which IDB contributes to local economy	2
Compliance with transparency code of Local Audit Bill	Not rated in workshop	Yes/no	Definition of what constitutes compliance	Medium-term	Not identified in workshop as one of the indicators to	Will need to be accompanied by reasons why not to take account of	1

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
					focus on	factors outside IDB control	
Foreign/Highland water contribution	Not rated in workshop	Proportion	Volume of water from outside IDB district	Short-term	Not identified in workshop as one of the indicators to focus on	Will only be relevant to some IDBs. May be more of a reason explaining some of other costs, etc.	2
Fully staffed office	Not rated in workshop		Needs definition of what is considered a fully staffed office, e.g. does it cover difficulties of recruiting/ vacancies or some assessment of what is minimum need	Medium-term	Not identified in workshop as one of the indicators to focus on	Might be difficult to get agreed definition	2
Training of staff-cost/benefit	Not rated in workshop	Staff training activities	Number of training days	Short-term	Not identified in workshop as one of the indicators to focus on	May be difficult to include on-the-job training, which could be significant Less time training may reflect resource availability, amount of work, etc.	1
Incident response	Not rated in workshop		Time to respond Success of	Long-term	Not identified in workshop as one of the indicators to	Definition required of how this needs to be measured	1

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
			response		focus on		
It matters to identify what an IDB is doing	Not rated in workshop				Not identified in workshop as one of the indicators to focus on		2 Not an indicator, but support for need for indicators
Overtime, standby, pump attendant, volunteers	Not rated in workshop	Involvement of these people in delivering IDB activities		Long-term	Not identified in workshop as one of the indicators to focus on	Definition required of what is to be measured	2
Diversity – ethnicity, age profile, health and safety wellbeing	Not rated in workshop		Number of staff by ethnicity, age, etc.	Long-term	Not identified in workshop as one of the indicators to focus on	Results may reflect local population rather than any bias	2
Ability to manage water levels							
Formal asset management plan and condition assessment of channels and structures	H	Condition measured against a defined standard	Presence of and compliance with AMP	short-term (could be done immediately)		Needs definition of required condition May reflect resources available in IDB	2
No. of properties and ha. land moved out of significant flood risk	H (indicators merged)	no. of properties and ha. land	Change in flood risk by number of properties or area of land	short-term; long-term if modelling is required	<ul style="list-style-type: none"> may be difficult to measure if a whole area is at risk and protected by work of others (e.g. EA) 	Will need to be accompanied by reasons (e.g. links to partners responsibilities)	1 We will note your comments about the difficulty of defining significant flood risk and add

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
					<p>Flood and/or drought</p> <p>How do you define an area of land moved out of very significant flood risk in year? When the whole of the North Level district is defined as at high risk of flooding on the Environment Agency flood risk maps, it is unrealistic to expect us to be able to remove this area from risk of flooding.</p> <p>Can't be measured unless part of a capital scheme</p> <p>Value of assets?</p>		<p>in further explanation, noting that significant flood risk is defined by the Environment Agency/Defra as being greater than 1:75 (1.33%). However, the wording might need to be changed to reflect the ongoing work of IDBs in terms of maintaining a lower flood risk than would otherwise be the case. We appreciate that for North Level, it would be unrealistic to be able to remove large areas from risk of flooding. However, for other IDBs, this might be something they want to focus on. This issue highlights the point that some of the indicators are likely to be more relevant to particular IDBs</p>

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
					<p>How do you define number of properties moved out of significant flood risk in year?</p> <p>Will only change if there are capital schemes</p> <p>All IDB assets are critical however the question remains regarding the definition of “moved out of significant flood risk in year”.</p> <p>Is this in relation to development, planned or land available for development? If its number of properties developed or area of land developed, neither of these are directly within the</p>		than others.

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
					gift of the IDB, these are not therefore performance indicators, but instead indicators of economic development that is occurring in the area of the IDB.		
Ha. of land within 1:50 standard of protection and no. of properties to 1:75 sop		See above	See above	See above		Standards may need to be revised to reflect IDB objectives	1
Km (or proportion) of watercourses maintained versus man-hours allocated (suggested that this should be cost/km rather than man-hours)	H	reported in km/year and £/km	Km watercourses Man-hours allocated (or costs, see financial indicators)	short-term (could be done immediately)	<ul style="list-style-type: none"> would need to be by set category of w/c it was also suggested that this could be potentially very useful and enables what else has been done with resources to be factored in such as: flood risk, SUDS, Public Liaison, Financial 	Will require definition of what is counted as maintenance, and what should be included in maintenance cost	1 (linked to financial indicators)

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
					Climate		
% of maintenance programme delivered	M	km of w/c maintained as percentage of annual maintenance plan	Percentage maintained Percentage planned to be maintained	short-term (could be done immediately)	<ul style="list-style-type: none"> Concerns that it is condition dependent and what is it really measuring. 	Will need to be accompanied by reasons as to why not maintained to take account of factors outside IDB control	1
		Could be qualitative by number of complaints/year					
Km of watercourse fit for purpose in event of high rainfall event (use historical worst case scenarios already known against 'spare' capacity)	H	km by category of w/c	Km of watercourse identified as being fit for purpose	medium/long-term (medium term is <1 year but data would need to be collected; long-term is >1 year as modelling would be required and funding from other sources would have to be found)	<ul style="list-style-type: none"> this measure would be weather dependant, hence additional information required 	Will need to be accompanied by reasons as to why not performed as expected Definition required of fit for purpose	2
Available capacity of drains at selected times of the year against actual capacity for flow/storage (winter and summer levels change over time)	Not rated in workshop		Km of watercourse Capacity		Not identified in workshop as one of the indicators to focus on	Will need to define timing of measurements to help ensure consistency (but may be difficult to factor in seasonal differences due to geography)	2

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
Length of drain monitored, length of drain improved (>>improved productivity >> incident response)	H	length measured against categories, productivity from farmers and incident response relating to flooding/ waterlogging	Length of drain Condition Change in condition	short-term (could be done immediately)		Will need definition of improved Will need to be accompanied by reasons where factors are outside IDB control (e.g. weather)	2
Drains designated as very poor condition	Not rated in workshop		Length of drain in poor condition		Not identified in workshop as one of the indicators to focus on	Will need consistent definition of poor condition	1
Ability to retain water in a drought	M (indicators merged)	would need specific example cases linked to targets and % achieved in any year. Could also be linked to Water Level Management Plan	Compliance with WLMP See also indicators for food production (which include water use and irrigation indicators)	short/medium/long-term depending on how it was measured and if modelling was required	I feel that it is most important 3.Performance in relation to food production is not solely about drought. The national economy is dependent on security of home production of food, and has recently been proved to be more safe, secure and traceable than food from outside	Will need to be accompanied by reasons for non-compliance as these may be outside IDB control	1

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
					sources.		
Conveyance of water		See above	See above	See above		See above	
Water transfer	Not rated in workshop	Volume of water transferred, or capacity to transfer	Volume of water	Long-term	Not identified in workshop as one of the indicators to focus on	Volume may not be a good measure as it may vary due to demand (which may be outside IDB control)	2
No. of abstractors	Not rated in workshop				Not identified in workshop as one of the indicators to focus on	Unlikely to be in IDB control (abstractions controlled by EA)	2 Outside IDB control DROPPED
Water available for irrigation	Not rated in workshop		Volume of water	Long-term	Not identified in workshop as one of indicators to focus on	Volume may not be a good measure as it may vary due to demand (which may be outside IDB control)	1
Formal water level management plans	Not rated in workshop		Compliance with WLMP		Not identified in workshop as one of the indicators to focus on	Will need to be accompanied by reasons for non-compliance as these may be outside IDB control	1
LD Act enforcements and	L (indicators merged)	numbers of enforcements, consents, planning	Compliance with enforcements and	short-term (could be done		Will need to be accompanied by reasons for non-	2

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
consents		applications, SUDS dealt with	consents	immediately)		compliance as these may be outside IDB control	
SUDS		See above	See above	See above		Will need to identify what needs to be measured	2
% of capital programme delivered	Not rated in workshop		Capital programme planned Capital programme delivered		Not identified in workshop as one of the indicators to focus on		1
'Partners' works or lack of it >>>>>knock on effects to IDBs	Not rated in workshop	Qualitative	Actions of partners and how affect IDB	Medium-term	Not identified in workshop as one of the indicators to focus on	Will need to be used to help explain other indicators?	1
Frequency of incidents where pumping is restricted due to bank full main river (timing for starting pumping ahead of need)	Not rated in workshop		Number of occasions where pumping is restricted	Medium-term	Not identified in workshop as one of the indicators to focus on	Reasons for restrictions may be outside IDB control (e.g. due to high tides)	2
Proportion of precept paid to EA that is spent on linkage between EA Main River and IDB/IDD water courses (whether Main River, low	Not rated in workshop		EA precept paid Spend of money	Medium-term	Not identified in workshop as one of the indicators to focus on	Expenditure is based on EA spend so may be outside IDB control	2

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
risk system, COW or IDB watercourse) to enable IDD's to drain into Main River							
Number of complaints	Not rated in workshop		Number of complaints Type of complaints	Medium-term	Not identified in workshop as one of indicators to focus on	Will need to be accompanied by information on type of complaint, and reasons for it. Would be beneficial to also consider the time to deal with the complaint and outcomes (e.g. learning)	1
Number of incident reports	Not rated in workshop		Number of incident reports	Short-term	Not identified in workshop as one of the indicators to focus on	Will need to be accompanied by details behind the incident reports, as factors may be outside IDB control	1
Number of (unplanned) flood events (changed to just number of flood events/year)	Not rated in workshop		Number of flood events	Short-term	Not identified in workshop as one of the indicators to focus on Definition of flood,	Will need to be accompanied by details behind the flood events, as factors may be outside IDB control. Consistent definition of what is	1, taking into account the actions that the IDB has taken following flood events as much as number of flood events

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
					<p>IDBs don't have the data. Floods are natural phenomena – they are caused by God</p> <p>As above, a flooding event in itself mustn't be perceived to be a failure necessarily on the part of the IDB. Must be careful with the indicators that they don't channel IDBs too far towards a target driven culture. Flooding can be from a number of factors. I think it would also be worth understanding the actions the IDB has taken following flood events as much as the number of events themselves.</p> <p>How would a 'flood</p>	meant by 'flood' is also needed	

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
					event' be measured as IDBs may categorise differently and therefore record activity levels differently for comparative purposes		
Evaluation forms to councils both pre and post works	Not rated in workshop	Questionnaire	Responses to questionnaires	Medium to long-term (questionnaires need to be developed)	Not identified in workshop as one of the indicators to focus on This is interesting and potentially good practice, but it must be remembered that parish councils and town councils are not levy paying authorities. May be better targeted at District and Unitary Councils	Will need consistent questionnaire for all IDBs (to extent possible) Will rely on responses from councils, there is a risk of self-selection bias (i.e. where those who have had problems are more likely to complete the questionnaire)	1
Funds obtained through partnership working	Not rated in workshop	Funds obtained	Total funds obtained from partners	Medium-term	Not identified in workshop as one of the indicators to focus on	Will depend on mechanisms being available to enable funds to be provided Will depend on who benefits from	1

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
					Hardly ever	projects	
Proportion of structures that are remotely controlled/ automated	Not rated in workshop		Number of structures that are remotely controlled/operated Total number of structures	Short-term	Not identified in workshop as one of the indicators to focus on	Will depend on other factors, e.g. suitability of structures for remote control	2
No. of breakdowns	Not rated in workshop	Breakdowns of pumping stations, and other structures	Number of breakdowns by structure	Medium-term (need to determine what needs to be measured)	Not identified in workshop as one of the indicators to focus on	Breakdowns may not have consequences, it may be more important to consider number of negative impacts caused by breakdowns	2
Measure of pumped and gravity drained land as a proportion of the whole set against the cost of pumping station management and use of gates/sluices	Not rated in workshop		Hectares of land that is drained Cost of management of pumping stations and water management assets	Medium-term	Not identified in workshop as one of the indicators to focus on	Will require definition of what should be included in costs	2
Measure risk levels (0-9) on each watercourse against actual work	Not rated in workshop		Need definitions of risk levels Change in risk	Long-term (risk levels need to be defined and agreed and target	Not identified in workshop as one of the indicators to	Will need definitions for consistency, plus also trial of system	1

Table 7.1: Long list of indicators							
Indicator	IDB Workshop rating	How measured?	Data needed	Timeframe for take-up	Views of stakeholders (including IDBs, ADA, LAs, etc.)	Issues with indicator	Recommendation
undertaken (selective not all watercourses) to understand process more clearly, costs, value for money against potential risk (e.g. Trent Valley IDB)			level against key watercourses	watercourses identified and agreed)	focus on	to test definitions (e.g. are they generically applicable?)	
Area of land waterlogged	Not rated in workshop	Hectares of land	Hectares of land waterlogged	Medium-term (to enable definition to be agreed)	Not identified in workshop as one of the indicators to focus on	Will need definition of what is meant by waterlogged for consistency across IDBs	1

Table 7.2: Grouping of long list indicators to be taken forwards for further consideration	
Indicator	
Use of water for irrigation	
Availability of water for irrigation/ abstraction during periods of drought	
Ability to retain water in a drought	
Conveyance of water	
Water available for irrigation	
Measure preferred water level against actual levels achieved (refer to soil moisture deficit)	
Impacts on agricultural land	
Number of incidents of waterlogging (number of days), linked to number of complaints from farmers about water levels	
Area of land available for agricultural production (actual land versus usable land) Need to tie in with flooding and waterlogging (ha protected from each)	
Maintenance of drains, watercourses, pumping stations, etc.	
Length of drain maintained/ improved (km) and plant used	
Maintenance costs per linear km of maintained watercourse	
Pumping station maintenance costs per pumped ha	
Maintenance costs as a percentage of total expenditure	
Administration costs as a proportion of total spend	
Proportion of total expenditure on administration costs	

Table 7.2: Grouping of long list indicators to be taken forwards for further consideration	
Indicator	
Ratio of admin cost vs. operations	
Overhead costs per £ spent on maintenance	
Revenue budget/expenditure	
Capital budget/expenditure	
Project development costs as a % of total project cost	
Km (or proportion) of watercourses maintained versus man-hours allocated (suggested that this should be cost/km rather than man-hours)	
% of maintenance programme delivered	
Drains designated as very poor condition	
% of capital programme delivered	
Measure risk levels (0-9) on each watercourse against actual work undertaken (selective not all watercourses) to understand process more clearly, costs, value for money against potential risk (e.g. Trent Valley IDB)	
Compliance with WFD	
Water Framework Directive: delivery against measures in the 2 nd round of RBMPs [Note that RBMPs = River Basin Management Plans]	
Invasive species	
Have species records/incidents of invasive species been submitted to BRC/wildlife trusts?	
Is there a catchment-based plan to deal with invasive species?	
Is there a strategy and local partnership arrangements for dealing with invasive species?	
What action or processes has the IDB undertaken to address invasive or non-native species?	

Table 7.2: Grouping of long list indicators to be taken forwards for further consideration	
Indicator	
Overall environmental performance	
Use of an annual environmental audit report/scorecard that could be used to report on indicators and provide some detail behind them (going beyond raw data)	
Have all recordable habitat and species delivery actions been recorded on the Biodiversity Action Reporting System (BARS) for this year?	
Compliance with Conservation Regulations (Habitats and Birds Directives; Wildlife and Countryside Act)	
Habitat management, improvement and creation	
Percentage of Biodiversity Action Plan actions that have been completed (with qualitative description of any biodiversity achievements in relation to biodiversity that may not be reflected in percentage of BAP actions completed)	
What area/proportion of SSSI remedies is completed?	
Number of ha of habitat created [note that this refers to habitat types as specified by Defra's Outcome Measures]	
Have any activities been undertaken to enhance any particular BAP species or locally important species?	
With the exception of regulation maintenance works in-channel, has the Board enhanced or created any habitat?	
Whether the IDB has evaluated its drainage network to manage a balance of biodiversity and flood conveyance, as per the Drainage Channel Biodiversity Manual	
Formal water level management plans	
Problems and incidents	
Pollution incident	
Number of complaints	
Number of incident reports	
Compliance with financial and audit requirements	
Is the board compliant with the requirements of external audit?	

Table 7.2: Grouping of long list indicators to be taken forwards for further consideration	
Indicator	
Compliant with requirements of internal auditor	
Have financial statements been reviewed and found to be of suitable quality?	
Compliance with transparency code of Local Audit Bill	
Collection of rates	
Percentage of drainage rates paid within three months of issue date	
Level of bad debt	
Proportion of rates that are uncollected	
Time to collect rates	
Flood and waterlogging risk	
Compliance with local flood risk management strategy	
No. of properties and ha. land moved out of significant flood risk	
Ha. of land within 1:50 standard of protection and no. of properties to 1:75 sop	
Volume of water stored	
% of winter/summer penning level	
Number of (unplanned) flood events (changed to just number of flood events/year), taking into account the actions that the IDB has taken following flood events	
Funds obtained through partnership working	
Area of land waterlogged	
Staff	
Sickness days of IDB employers	

Table 7.2: Grouping of long list indicators to be taken forwards for further consideration	
Indicator	
Staff morale	
Number of incidents/accidents and time off due to injury	
Training of staff- cost/benefit	
Outside factors	
Performance of partners	
Partnership working (undertaking work on behalf of other risk management authorities or contributing to joint projects)	
'Partners' works or lack of it >>>>knock on effects to IDBs	
Time taken for completion of work and tasks	
Time taken between grant aid and scheme completion	
Time taken to achieve grant aid approval	
Turnaround time	
Number of times specialist advice has been requested and given	
Time to deal with information requests	
Incident response	
Accountability	
Number of hits to sites with published transparency data	
% attendance at Board meetings	
Evaluation forms to District and Unitary Councils both pre and post works	

Table 7.3: Comparison between indicator groups identified in Table 7.2 with the structure proposed by the group at the workshop (see Section 3.6 of workshop report)			
Indicator type/group	Areas identified by individual group at workshop by level		
	National	Local Authority	Parish, community
Use of water for irrigation	Adaptation and mitigation to climate change (drought, water shortage, irrigation) Water cycle (supply, shortage, drought)		
Impacts on agricultural land		Underpinning local economy (agriculture)	
Maintenance of drains, watercourses, pumping stations, etc.	Land Drainage Act		Local flexibility that does not meet national priorities
Compliance with WFD	Water Framework Directive		
Invasive species			
Overall environmental performance		Supporting sustainable agenda	
Habitat management, improvement and creation		Underpinning local economy (tourism)	
Problems and incidents		Underpinning local economy (business) Treated effluent disposal Emergency response	Solving local issues
Compliance with financial and audit requirements			
Collection of rates			
Flood and waterlogging risk	Flood risk regulations – risk, hazards and reduction	Asset protection	Reducing flood risk, protecting homes

Table 7.3: Comparison between indicator groups identified in Table 7.2 with the structure proposed by the group at the workshop (see Section 3.6 of workshop report)			
Indicator type/group	Areas identified by individual group at workshop by level		
	National	Local Authority	Parish, community
	Flood and Water Management Act (Risk Management Authority) Catchment Flood Management Plan Making Space for Water	Protecting infrastructure	
Staff			Local knowledge, contact and service
Outside factors	Future development and growth	Static planning, core strategy Growth agenda	
Time taken for completion of work and tasks	Partnership working	Efficiencies through partnership working	
Accountability		Supporting and protecting communities Community resilience Commission services, offering of service	Raise public awareness Public contact and accountability, e.g. the Pitt Review

Table 7.4: Secondary screening of indicators					
Indicator to consider further	Data availability now	Time and resources	Specific data needs?	Implication for time and resources	Recommendation as indicator
Short title	How can it be measured now using available data	Time and resources needed (H, M, L?) to assess performance against indicator	Could measurement be improved by collecting specific data	Change in time and resources needed	1. Propose now 2. Needs to be developed further, so park for now 3. Dropped Aim to include at least one 1 for each category P = measures process O = measures outcome
Use of water for irrigation					
Any actions taken to increase water availability	Qualitative (description of actions taken to increase availability of water)	Low	May require options to choose from	No significant resources required to collect data; needs reporting mechanism	2P (time needed to develop options)
Drought/water management plan/planning, percentage of outcomes/actions achieved	Identification of actions from existing water levels management plans, etc.	Low to medium (depending on number of plans and actions)	Actions taken from plans Record of actions taken Assessment of whether actions result in outcomes being achieved Only applicable or useful to areas with significant surface water abstractions	Initial requirement to identify appropriate actions from existing plans Requires record keeping and reporting of actions and outcomes	2O
Period of no restriction divided by total period of	Time (days) with restrictions placed on	Medium	Records would need to be kept over time restrictions	Initial time to set up	2O

Table 7.4: Secondary screening of indicators					
Indicator to consider further	Data availability now	Time and resources	Specific data needs?	Implication for time and resources	Recommendation as indicator
drought, with the aim being 100%	abstraction Total number of days (e.g. by season/to reflect demand for water)		(and cause of restriction); issue over who is responsible for recording this information) Only applicable or useful to areas with significant surface water abstractions	recording system Time to collect and record information	
Measure preferred water level against actual levels achieved (refer to soil moisture deficit)	Water level provided Target water level	Medium-high (depending on data recorded and whether this is needed just at key points or more generally)	Records needed and reasons why target was not achieved. SMD may require specific measurement unless an indication of SMD could be used (but this would suggest that factors other than water level are important and so could mean that the use of SMD as an indicator could be skewed by other choices (e.g. crop type, land management)	Could be high – would need to be a simplified approach at specific key points to be workable (there is then the difficulty of comparison between IDBs)	2O
Impacts on agricultural land					
Number of incidents of waterlogging (number of days), linked to number of complaints from farmers about water levels	Number of incidents Depth and duration of incident Cause of incident	Low to medium (depending how many of these data are routinely collected)	Consistent method for recording depth, duration, cause of incident Needs to be able to take account of waterlogging,	Initial time to set up and agree consistent method Time to record data in way that informs indicator	3O (due to comments from IDBs over likely practicality of measure – potential to pick up similar outcome using % winter/summer penning level targets attained)

Table 7.4: Secondary screening of indicators					
Indicator to consider further	Data availability now	Time and resources	Specific data needs?	Implication for time and resources	Recommendation as indicator
	Lessons learnt		where farming practices are more important, otherwise there is a risk that the indicator could give a skewed picture Impossible and impractical to monitor and measure		
Area of land available for agricultural production (actual land versus usable land)	Hectares of land available for agricultural production Hectares of land at risk of waterlogging Hectares of land at different levels of flood risk	Medium (may be low depending on records already kept)	Cause of any changes in area of land available for production (may not be needed if indicator focuses on change in waterlogging and flood risk)	Initial time to measure land and the risks Time to record changes in risk (and whether these are temporary (e.g. due to weather, breakdown, etc.) or permanent (e.g. due to change in IDB operations))	20
Maintenance of drains, watercourses, pumping stations, etc.					
Length of drain maintained	Length of drains for which IDB is responsible Length maintained in any year	Low	Record keeping to produce indicator	Limited additional resources needed; needs reporting mechanism	1P (process not outcome so could be interim until a performance measure is identified and available)
Maintenance costs per linear km of maintained watercourse	Length of drains for which IDB is responsible Maintenance costs per year	Low	Record keeping to produce indicator	Limited additional resources needed; needs reporting mechanism Maintained watercourse needs to be defined i.e.	1P (also process rather than performance but could be measured against a target to reflect performance, but would have to reflect differences between IDBs or general trend over time for one

Table 7.4: Secondary screening of indicators					
Indicator to consider further	Data availability now	Time and resources	Specific data needs?	Implication for time and resources	Recommendation as indicator
				does an inspection constitute maintenance?	IDB)
Pumping station maintenance costs per pumped ha	Number of pumping stations Area pumped	Low	Record keeping to produce indicator	Limited additional resources needed; needs reporting mechanism Does this include electricity costs? Cost types that are and are not included must be clearly defined for this indicator to be comparable across IDBs	1P. This will not distinguish between different types, size, etc. of pumping stations
Admin costs compared with total spend, operating spend, maintenance costs	Admin costs Total spend Operating spend Maintenance costs per year	Low (may be medium if definitions result in different make-up of each cost type)	Needs consistent definition of what should be included in each	Time to define and agree definitions Need for recording of costs in line with definitions Both Admin and maintenance need to be defined	1P
Budget divided by expenditure (total, capital, project development)	Total budget Total expenditure Total capital (budget and	Low to medium	Needs consistent definition of what should be included in each	Time to define and agree definitions Need for recording of costs in line with	2P. High potential for misinterpretation if budgets are exceeded without reasons why

Table 7.4: Secondary screening of indicators					
Indicator to consider further	Data availability now	Time and resources	Specific data needs?	Implication for time and resources	Recommendation as indicator
	expenditure) Total maintenance (budget and expenditure) per year			definitions Need for recording of reasons for exceedences of budgets	
Percentage of maintenance programme and/or capital programme delivered	Maintenance programme Capital programme Actions completed	Low	Needs consistent definition of what should be included in each, including what constitutes completed	Time to define and agree definitions Need for recording of costs in line with definitions Need for recording of reasons where programme is not delivered	2P. High potential for misinterpretation without reasons why programme has not been delivered
Drains designated as being in very poor condition	Length of drains in very poor condition	Low to medium	Needs consistent definition of what is meant by 'very poor' condition Condition survey needed annually and done independently, i.e. v costly and benefit questionable	Time to define and agree definitions Need for recording of costs in line with definitions Need for recording of reasons why drains are in their condition	2P. Risk that drains are kept in poor condition for specific reasons (e.g. biodiversity). May be better to look at target condition (but that could be resource intensive). May require a condition assessment, which could be time and resource intensive
Risk level of each watercourse/pumping station against actual work undertaken (change in risk level)	Number of pumping stations Length of watercourses Actual work programmed and undertaken	High (could be reduced by targeting specific locations or set percentage of area at random)	Needs consistent definition of each risk level Needs watercourses and pumping stations to be assessed against each	Record keeping of risk level against definitions and change in risk level over time (linked to work undertaken but also other factors, including those outside IDB control)	2O. Unlikely to be appropriate in short-term

Table 7.4: Secondary screening of indicators					
Indicator to consider further	Data availability now	Time and resources	Specific data needs?	Implication for time and resources	Recommendation as indicator
			risk level		
Compliance with WFD					
Water Framework Directive: delivery against measures in the 2 nd round of RMBPs	<p>Measures required</p> <p>Action taken, including delivery</p> <p>Extent of these presently unknown</p> <p>Need to ensure that there is adequate dialogue between the EA and IDB so that IDB involvement is not limited as a result</p>	Medium (depending upon whether this is already in place)	Definition of what constitutes delivery. Extent of measures would need to be defined	Needs consistent reporting mechanism	2O (based on need to identify extent); need to consider extent of dialogue between IDBs and EA
Invasive species					
Have species records/incidents of invasive species been submitted to BRC/wildlife trusts?	Incidents of invasive species	Low to medium (depending upon actions currently being taken)	Needs consistent approach to recording incidents of invasive species	Record keeping in way that is consistent with BRC/wildlife trusts requirements	2P
Is there a catchment-based plan to deal with invasive species?	None required	Low	Yes/no answer to question of whether such a plan exists	<p>Requires reporting mechanism</p> <p>Outside IDB remit</p>	1P (comments suggest outside remit, but some consideration of invasive species may be important)

Table 7.4: Secondary screening of indicators					
Indicator to consider further	Data availability now	Time and resources	Specific data needs?	Implication for time and resources	Recommendation as indicator
Is there a strategy and local partnership arrangements for dealing with invasive species?	None required	Low	Yes/no answer to question of whether such a partnership exists	Requires reporting mechanism (could be combined with yes/no to whether incidents have been reported) Outside IDB remit	1P (comments suggest outside remit, but some consideration of invasive species may be important)
What action or processes has the IDB undertaken to address invasive or non-native species?	Record of actions or processes in place	Low	Short description of any actions taken	Requires reporting mechanism	1P (to enable some consideration of invasive or non-native species)
Overall environmental performance					
Use of an annual environmental audit report/scorecard that could be used to report on indicators and provide some detail behind them (going beyond raw data)	Will depend on indicators that are to included			Benefit unclear	2P (but could be used to provide reporting mechanism across a number of categories)
Have all recordable habitat and species delivery actions been recorded on the Biodiversity Action Reporting System (BARS) for this year?	None required	Low	Yes/no answer to question of whether records have been delivered	Requires reporting mechanism (could be combined with yes/no to whether incidents have been reported)	1P
Compliance with Conservation Regulations (Habitats and Birds Directives; Wildlife and	Measures required Actions taken, including delivery	Low (measures to ensure compliance should already be in place)	Definition of what constitutes compliance	Needs consistent reporting mechanism	1O (potential to rephrase as suggested in comments)

Table 7.4: Secondary screening of indicators					
Indicator to consider further	Data availability now	Time and resources	Specific data needs?	Implication for time and resources	Recommendation as indicator
Countryside Act)				I am observe that in 'Is the IDB compliant with conservation regulations' there might need to be a responses which is more than Yes / No. Perhaps rephrase to 'Is the IDB entirely compliant with conservation regulations' with an explanation box if No	
Habitat management, improvement and creation					
What area/proportion of SSSI remedies is completed?	Area with planned/required remedies Number of remedies completed	Low to medium	Definition of what constitutes completed	Time to agree definition Benefit unclear	2O
Number of ha of habitat created [note that this refers to habitat types as specified by Defra's Outcome Measures]		Medium to high		Issue with extent to which IDBs own land and, hence, can be responsible for habitat creation	2O. Risk of mis-interpretation needs to be factored in
Percentage of Biodiversity Action Plan actions that have been completed (with qualitative description of any biodiversity achievements in relation to biodiversity that may not be reflected in percentage of BAP actions completed)	Actions required Action taken, including delivery	Low	Definition of what constitutes completed	Time to agree definition These are part of the implementation plans	1P (inclusion in implementation plans may mean these are already covered, plus need to include opportunity to describe biodiversity achievements in year)

Table 7.4: Secondary screening of indicators					
Indicator to consider further	Data availability now	Time and resources	Specific data needs?	Implication for time and resources	Recommendation as indicator
Have any activities been undertaken to enhance any particular BAP species or locally important species?	None required	Low	Definition of what is meant by enhance Yes/no answer to question of whether records have been delivered	Requires reporting mechanism (could be combined with yes/no to whether incidents have been reported) Not much different from above	1O (will require description to accompany above, could be combined into one)
Benefit of water levels to biodiversity to be monitored at specific sites and impact on the flow in watercourses	Qualitative, linked to Biodiversity Action Plan	Medium to high	Records of how water levels and management of watercourses benefit biodiversity (linked to overall environmental performance and WFD)	Requires reporting mechanisms (could be linked to environmental report)	2O Better included as 'Whether the IDB has evaluated its drainage network to manage a balance of biodiversity and flood conveyance, as per the Drainage Channel Biodiversity Manual' to avoid misinterpretation that biodiversity is impeding flood conveyance
Formal water level management plans				Linked to other indicators (water for irrigation, other habitat indicators)	3P. Picked up under other indicators
Problems and incidents					
Pollution incident	Records of pollution incidents Causes of pollution incidents	Medium	Needs consistent reporting mechanism Pollution incident needs to be defined	Requires information on number and causes of incidents Are these within the	1P (comments suggest that this may not be worth including as a performance measure, as pollution incidents would be accidental and would be captured elsewhere,

Table 7.4: Secondary screening of indicators					
Indicator to consider further	Data availability now	Time and resources	Specific data needs?	Implication for time and resources	Recommendation as indicator
				control of the IDB? Where did the indicator regarding number of pollution incidents for which the IDB are responsible come from? Is the suggestion that IDB's cause pollution or respond to pollution incidents? We have no powers regarding pollution and these incidents are always dealt with by the Environment Agency.	e.g. reporting to EA)
Number of complaints	Number and type of complaints	Low to medium	Needs consistent reporting mechanism	Requires information on number and causes of complaints Must be substantiated/justifiable complaints (who decides what is substantiated/justifiable?) Substantiated complaint needs to be defined	1P
Number of incident reports	Number of incident reports	Low to medium	Needs consistent reporting mechanism	Requires information on causes of incidents	1P (could be linked with above to reflect complaints and incidents

Table 7.4: Secondary screening of indicators					
Indicator to consider further	Data availability now	Time and resources	Specific data needs?	Implication for time and resources	Recommendation as indicator
				<p>Incident report needs to be defined</p> <p>The number of incident reports prepared with outcomes in year. To what does this refer, is it about the previous point re complaints?</p>	and response to them)
Compliance with financial and audit requirements					
Is the board compliant with the requirements of external audit?	None required	Low	Yes/no answer to question of whether the board is compliant	Requires reporting mechanism	1P
Have financial statements been reviewed and found to be of suitable quality?	None required	Low	Yes/no answer to question of whether the board is compliant	Requires reporting mechanism	3O. Similar to above, so just one indicator required
Compliance with transparency code of Local Audit Bill	None required	Low	Yes/no answer to question of whether the board is compliant	Requires reporting mechanism	1O (adds to 1, careful wording could reduce this to one indicator)
Collection of rates					
Percentage of drainage rates paid within three months of issue date	Drainage rates requiring payment, records of paid/unpaid rates	Low	Cut-off date for assessing proportion of rate paid	Should be minimal, but will require reporting mechanism	1P. Combined with proportion of rates uncollected
Level of bad debt	Data on unpaid rates	Low	Needs consistent definition of 'bad debt'	Requires reporting mechanism	2P

Table 7.4: Secondary screening of indicators					
Indicator to consider further	Data availability now	Time and resources	Specific data needs?	Implication for time and resources	Recommendation as indicator
Proportion of rates that are uncollected	Drainage rates requiring payment, records of paid/unpaid rates	Low	Cut-off date for assessing proportion of rate paid	Should be minimal, but will require reporting mechanism (as with percentages unpaid)	1O. Combined with percentage of drainage rates paid at say end of June
Time to collect rates	Time between billing and payment	Medium	Record of when bills are sent and when paid (may already be in place) May require target time	Requires reporting mechanism	3P. More easily reflected as percentage paid by set time, so captured above
Flood and waterlogging risk					
Compliance with local flood risk management strategy	None required	Low	Yes/no answer to question of whether IDB is compliant	Requires reporting mechanism	1O
No. of properties and ha. land moved out of significant flood risk	Number of properties and area of land within flood risk bands	Low to high (depending on information already available)	Use of risk levels (e.g. consistent with Defra risk bands) could reduce resource requirements	Requires consistent reporting mechanism Some IDBs may need to collect data on assets at risk How do you define an area of land moved out of very significant flood risk in year? How do you define number of properties moved out of significant flood risk in year? When the whole of the	2O (needs further developing so that benefits of on-going maintenance can be captured) May need to link to achievement of target flood risk as in Policy Statement (but this would be difficult to measure year-on-year)

Table 7.4: Secondary screening of indicators					
Indicator to consider further	Data availability now	Time and resources	Specific data needs?	Implication for time and resources	Recommendation as indicator
				<p>district is defined as at high risk of flooding on the Environment Agency flood risk maps, it is unrealistic to expect it to be able to remove this area from risk of flooding</p> <p>Also needs to cover drought</p> <p>Should this be linked to value of assets?</p> <p>Cannot be measured unless there is a capital scheme</p> <p>All IDB assets are critical however the question remains regarding the definition of "moved out of significant flood risk in year".</p> <p>Is this in relation to development, planned or land available for</p>	

Table 7.4: Secondary screening of indicators					
Indicator to consider further	Data availability now	Time and resources	Specific data needs?	Implication for time and resources	Recommendation as indicator
				development? If its number of properties developed or area of land developed, neither of these are directly within the gift of the IDB, these are not therefore performance indicators, but instead indicators of economic development that is occurring in the area of the IDB.	
Ha. of land within 1:50 standard of protection and no. of properties to 1:75 sop	Area of land within flood risk bands	Low to high (depending on information already available)	Use of risk levels (e.g. consistent with Defra risk bands) could reduce resource requirements	Requires consistent reporting mechanism Some IDBs may need to collect data on assets at risk (linked to above)	1O
Volume of water stored	Unlikely to be measured (unless picked up as volume pumped at some delayed time?)	Medium to high	Area available for water storage Area used for water storage	Needs to be simple or could be very resource intensive	2O
% of winter/summer penning level	Target levels	Medium to high (depending on extent to which target levels are already set)	Whether targets are achieved or not achieved. Needs to be related to key points to avoid having to measure this everywhere	Needs to be simple to avoid being overly time and resource intensive; needs to be at key points (but that may make comparison between IDBs difficult)	2O
Number of (unplanned) flood events (changed to just number of flood events/year), taking into	Number of flood events Causes of flood events	Low	Need to record causes of flooding (as this may not always be the IDB's	Requires consistent definition of what constitutes a flood event	1O

Table 7.4: Secondary screening of indicators					
Indicator to consider further	Data availability now	Time and resources	Specific data needs?	Implication for time and resources	Recommendation as indicator
account the actions that the IDB has taken following flood events			responsibility)	and reporting mechanism	
Funds obtained through partnership working	Funds obtained	Medium to high	Involvement in partnerships, funding requirements and obtained	Needs definition of what constitutes funds obtained	1O. May not be IDB that leads hunt for funds, but would be involved in partnerships and/or requests for funding (but could be included as additional information)
Area of land waterlogged	Area of land that is waterlogged	Medium	Needs consistent definition of what is waterlogged	Requires measurement of area waterlogged in line with definition, and causes of waterlogging	2O
Staff					
Sickness days of IDB employers	Number of days sickness Number of employees	Low	Need consistent measurement of sickness days	Requires reporting mechanism As boards are pretty small anyone with a long term sickness may skew results. Is this a fair measure? I would also question indicators such as 'sickness days' - with small organisations if an individual (s) is off for entirely unrelated reasons	3 DROPPED – comments suggest too many problems with this as an indicator (but this means that there is no short-term measure of morale)

Table 7.4: Secondary screening of indicators					
Indicator to consider further	Data availability now	Time and resources	Specific data needs?	Implication for time and resources	Recommendation as indicator
				the results will be skewed - I believe these types of issues should be dealt with locally. What if no employees?	
Staff morale	Qualitative	Medium to high	Needs consistent mechanism or method of measuring morale	Time required to develop and agree questionnaire	2O
Number of incidents/accidents and time off due to injury	Number of incidents/accidents Time off as a result	Low to medium	Needs consistent definition and coverage of incident/accidents	Requires reporting mechanism Does it include contractor staff if no employees? The indicator would only need to reflect those employees that the IDB is responsible for, and inclusion of contractors could skew the indicator	1P
Training of staff-cost/benefit	Number of training days	Low to high	Needs consistent definition of what is training Benefit cannot be quantified	Time required if benefits of training is to be taken into account, or if on-the-job training is to be included (method for assessing this would need to be developed)	2P
Outside factors					

Table 7.4: Secondary screening of indicators					
Indicator to consider further	Data availability now	Time and resources	Specific data needs?	Implication for time and resources	Recommendation as indicator
Performance of partners	Qualitative	Medium to high	Requires investigation of partners' performance, could be linked to complaints/queries that are not IDB responsibility	<p>Not sure about this one – the EA prioritises work according to risk to people and property. They may scale down activity where this will not increase flood risk – however, IDBs may take a different view. So there is a risk this could be opinion based, possibly divisive and not in the spirit of partnership working.</p> <p>This certainly will not help the newly set up partnerships to work together as it highlights a blame culture rather than encouraging joint working to remedy the problems. If a Main River overtops or an Anglian Water sewer surcharges we know where the problem lies, it is more about preventing a recurrence not listing the failings.</p>	3P. May be difficult for IDB to fully assess performance of partners, and does not encourage partnership working if looking for blame/fault
Partnership working (undertaking work on behalf of other risk management authorities or contributing to joint	Partnerships in existence or joint working	Low to medium	Number of partnerships which the IDB plays a role in. Could also be measured as value of work undertaken as part of partnership as % of	Could require separate recording of spend, therefore, additional time and resource need	2P (would be preferable to have an indicator related to the outcomes of partnership working, e.g. work towards objectives wider than just those of

Table 7.4: Secondary screening of indicators					
Indicator to consider further	Data availability now	Time and resources	Specific data needs?	Implication for time and resources	Recommendation as indicator
projects)			total spend		the IDB, but that could ignore partnerships that help to deliver the IDB objectives)
'Partners' works or lack of it >>>>>knock on effects to IDBs	Qualitative	Medium to high	As above	Should be lower than above as focuses only on partner's work that affects IDB	1P. As above, but only considers implications of partners' performance for IDB
Time taken for completion of work and tasks					
Time taken for completion of work and tasks	Start time of tasks End time of tasks	Medium	Requires detailed reporting of start and end time of tasks	May be difficult to compare tasks, so may need consistent definition of type of tasks to be included and what needs to be measured	2P
Time taken between grant aid and scheme completion	Start time of application Time for completion	Medium to high	Requires definition of when to start and stop counting	Requires time to agree definitions, and reporting mechanism	2P
Time taken to achieve grant aid approval	Start time from application Time for approval to be obtained	Low to medium	Requires reasons for longer time to be recorded as this may be outside IDB control	Requires time to agree definitions, and reporting mechanism	2P
Turnaround time	Start time of tasks End time of tasks	Low to medium	Requires definition of activities to be included	Requires time to agree definitions, and reporting mechanism	3P. Assumed covers all other indicators in this category
Time to deal with information requests	Start time (from request receipt) End time (reply)	Medium to high	Requires definition of end time, especially if follow-up enquiries are received	Requires time to agree definitions, and reporting mechanism	1P (need to be clear what this indicator would provide)

Table 7.4: Secondary screening of indicators					
Indicator to consider further	Data availability now	Time and resources	Specific data needs?	Implication for time and resources	Recommendation as indicator
				All are different – useless. Needs to be a focus on target times, or a satisfactory outcome for the party asking for information	
Incident response	Start time End time	Medium to high	Requires definition of start and end time	Requires time to agree definitions, and reporting mechanism Needs definition all are different	1P
Accountability					
Number of hits to sites with published transparency data	Will depend on current website design and structure	Low to high (depending on current design)	Could require redesign of website to record downloads or hits onto a particular page	Could be significant (and costly) depending on current use of and design of website. Also will not provide information on who is accessing the information (this would require some kind of registration, which could put people off from downloading the data)	2P
% attendance at Board meetings	Attendance by type of attendee (Local Authority, Parish Council, etc.)	Low	Record of attendance (should already be recorded in minutes)	I am quite interested in evaluation of performance by LAs and PCs - in my view IDBs are a low priority / non-existent for LAs - maybe the indicator is more about contribution from LAs - attendance at	1P (could put pressure on Local Authorities to attend, rather than measure performance of IDBs)

Table 7.4: Secondary screening of indicators					
Indicator to consider further	Data availability now	Time and resources	Specific data needs?	Implication for time and resources	Recommendation as indicator
				IDB meetings etc. the pressure should be on LAs to contribute more	
Evaluation forms to District and Unitary councils both pre and post works	Qualitative	Medium to high	Needs consistent method for evaluation Widen this to other flood risk management authorities?	Time required to develop and agree evaluation form	1O (but will need further development)

All of the indicators proposed (1) or to be developed further (2) will need a reporting mechanism. This could be organised through the generation of four reports, one for each of:

1. Management of Board and Board activities:
 - a. Maintenance of drains, watercourses, pumping stations, etc.
 - b. Problems and incidents
 - c. Compliance with financial and audit requirements
 - d. Collection of rates
 - e. Staff
 - f. Outside factors
 - g. Time taken for completion of work and tasks
 - h. Accountability
2. Performance in relation to food production:
 - a. Use of water for irrigation
 - b. Impacts on agricultural land
3. Performance in relation to reduction of risk to assets:
 - a. Flood and waterlogging risk

4. Performance in relation to the environment:
 - a. Compliance with WFD
 - b. Invasive species
 - c. Overall environmental performance
 - d. Habitat management, improvement and creation

A reporting mechanism would enable IDBs to provide the results under each indicator but to support these with reasons underlying the measurement, thus, reducing the risk of mis-interpretation. This will be particularly important where some of the factors underlying performance are outside the IDB's control. There is a trade-off in terms of resource requirements, but this could be reduced through the development of templates.

Table 7.5 considers the indicators from table 7.4 with a recommendation of 1 (propose now) or 2 (needs to be developed further) to assess whether they would provide a measure of performance, and the value added they would provide in comparison to similar indicators. The aim is to identify the most useful indicators.

Table 7.5: Assessing how the potential indicators could measure performance					
Indicator to consider further (1 or 2 from Table 7.4)	Recommendation as indicator	What would be measured?	How could performance be measured?	Could the indicator be developed to measure performance?	Does the indicator provide value added?
Management of Board and Board activities					
Length of drain maintained	1P (process not outcome so could be interim until a performance measure is identified and available)	Length of drains for which IDB is responsible Length maintained in any year	Would need to be converted to measurement of target condition of drains	Would require target conditions to be set at key points or as % of whole	Measurement of % maintained provides process indicator (measures activity undertaken) rather than whether that activity provides benefits CONCERN THAT THIS COULD BE MISLEADING IF IDBS ARE COMPARED

Table 7.5: Assessing how the potential indicators could measure performance					
Indicator to consider further (1 or 2 from Table 7.4)	Recommendation as indicator	What would be measured?	How could performance be measured?	Could the indicator be developed to measure performance?	Does the indicator provide value added?
Maintenance costs per linear km of maintained watercourse	1P (also process rather than performance but could be measured against a target to reflect performance)	Length of drains for which IDB is responsible Maintenance costs per year	Could be combined with target condition to show cost of achieving/ maintained target condition each year	Could be combined with above (target condition) and expenditure on maintenance	Would provide indication of efficiency (but care would be needed as may be difficult to compare IDBs) FOR CONCERN THAT THIS COULD BE MISLEADING IF IDBS ARE COMPARED
Pumping station maintenance costs per pumped ha	1P. This will not distinguish between different types, size, etc. of pumping stations	Number of pumping stations Area pumped	Would need to be converted to measurement of target condition of pumping stations	Would require target conditions to be set; might be difficult to define target conditions that apply to all	Would provide indication of efficiency (but differences between IDBs and pumping stations may mean this is misleading) CONCERN THAT THIS COULD BE MISLEADING IF IDBS ARE COMPARED
Admin costs compared with total spend, operating spend, maintenance costs	1P	Admin costs Total spend Operating spend Maintenance costs per year	Would need to be related to an overall measure of performance (perhaps linked to evaluation results?)	Would have to be combined with quantitative measure of performance through evaluation survey	Would provide indicator of efficiency (could be used to compare IDBs but care would be needed as there may be underlying differences making comparisons difficult or misleading)

Table 7.5: Assessing how the potential indicators could measure performance					
Indicator to consider further (1 or 2 from Table 7.4)	Recommendation as indicator	What would be measured?	How could performance be measured?	Could the indicator be developed to measure performance?	Does the indicator provide value added?
					CONCERN THAT THIS COULD BE MISLEADING IF IDBS ARE COMPARED
Budget divided by expenditure (total, capital, project development)	2P. High potential for misinterpretation if budgets are exceeded without reasons why	Total budget Total expenditure Total capital (budget and expenditure) Total maintenance (budget and expenditure) per year	Could be linked to benefits provided to the various beneficiaries compared with the amount they pay	Would have to be comparison of benefits delivered to each beneficiary (e.g. from benefits assessment spreadsheet), but this cannot capture all benefits in monetary terms so would only be a partial measure of performance	Unclear that this indicator would provide added value (over and above the other efficiency measures) without being linked to benefits OTHER INDICATORS PROVIDE GREATER ADDED VALUE
Percentage of maintenance programme and/or capital programme delivered	2P. High potential for misinterpretation without reasons why programme has not been delivered	Maintenance programme Capital programme Actions completed	Would need to be linked to measure of whether this had delivered target conditions	Would have to be linked to whether programmes had delivered targets, with reasons why if not	Reasons why programme had not been delivered should be picked up under other indicators, thus difficult to see what additional value this indicator would provide OTHER INDICATORS PROVIDE GREATER ADDED VALUE
Drains designated as being in very poor	2P. Risk that drains are kept in poor condition for specific reasons (e.g.	Length of drains in very poor condition	Would need to be linked to measure of whether drains are in target	Would require target conditions to be set for	Likely that there is greater value in looking at water levels in drains, rather

Table 7.5: Assessing how the potential indicators could measure performance					
Indicator to consider further (1 or 2 from Table 7.4)	Recommendation as indicator	What would be measured?	How could performance be measured?	Could the indicator be developed to measure performance?	Does the indicator provide value added?
condition	biodiversity). May be better to look at target condition (but that could be resource intensive). May require a condition assessment, which could be time and resource intensive		condition	drains	than condition of drains per se OTHER INDICATORS PROVIDE GREATER ADDED VALUE
Risk level of each watercourse/pumping station against actual work undertaken (change in risk level)	2O. Unlikely to be appropriate in short-term	Number of pumping stations Length of watercourses Actual work programmed and undertaken	Would be linked to achievement of target risk level	Would require target risk levels to be assigned to each asset (some of this may already be done internally)	Difficult to understand what risk associated to assets would add over risk of impacts OTHER INDICATORS PROVIDE GREATER ADDED VALUE
Pollution incident	1P (comments suggest that this may not be worth including as a performance measure, as pollution incidents would be accidental and would be captured elsewhere, e.g. reporting to EA)	Records of pollution incidents Causes of pollution incidents	Assume that target is zero pollution incidents, and that any pollution incidents would be accidental	Should be picked up elsewhere (e.g. reporting to Environment Agency if there is a pollution incident caused by IDB)	Would be information required if there is a pollution incident, so inclusion as an indicator may not provide any added value NO ADDED VALUE IDENTIFIED
Number of complaints	1P	Number and type of substantiated complaints	Assume that target is zero complaints	Complaints would have to be linked to IDB activity not being carried out. Would need to be an initial assessment of	Number of complaints could be used but there is a risk that complaints are not substantiated or relate to responsibilities of

Table 7.5: Assessing how the potential indicators could measure performance					
Indicator to consider further (1 or 2 from Table 7.4)	Recommendation as indicator	What would be measured?	How could performance be measured?	Could the indicator be developed to measure performance?	Does the indicator provide value added?
				complaint to determine if it was substantiated. This would have to be carried out by the IDB. Complainant could be asked to complete response form as to whether they felt their complaint had been satisfactorily dealt with	others. NO ADDED VALUE IDENTIFIED
Number of incident reports	1P (could be linked with above to reflect complaints and incidents and response to them)	Number of incident reports	Assume these would follow complaints or impacts	Would identify reasons behind impacts or complaints	Maybe more useful in providing explanation behind indicators rather than as an indicator in its own right SOURCE OF ADDITIONAL EXPLANATION BEHIND OTHER INDICATORS
Is the board compliant with the requirements of external audit?	1P	None required (Yes/No)	Not related to physical performance, more compliance	No	FOR IDB1 FORM, as Yes/No, with explanation if No
Compliance with transparency code of Local Audit Bill	1O (adds to 1, careful wording could reduce this to one indicator)	None required (Yes/No)	Not related to physical performance, more compliance	No	FOR IDB1 FORM, as Yes/No, with explanation if No. Could be combined with above as cover same type of issue
Percentage of drainage rates paid within three	1P. Combined with proportion of rates	Drainage rates requiring payment, records of	Not related to physical performance, more administrative	No	Useful for financial measure

Table 7.5: Assessing how the potential indicators could measure performance					
Indicator to consider further (1 or 2 from Table 7.4)	Recommendation as indicator	What would be measured?	How could performance be measured?	Could the indicator be developed to measure performance?	Does the indicator provide value added?
months of issue date	uncollected	paid/unpaid rates	performance		FOR FURTHER CONSIDERATION
Level of bad debt	2P	Data on unpaid rates	Not related to physical performance, more administrative performance	No	Would not provide much added value, IDB will know this but there is little value in reporting it OTHER INDICATORS PROVIDE GREATER ADDED VALUE
Proportion of rates that are uncollected	1O. Combined with percentage of drainage rates paid within three months of issue date	Drainage rates requiring payment, records of paid/unpaid rates	Not related to physical performance, more administrative performance	No	Implicitly reported by recording level of rates paid CAN BE INCORPORATED INTO ANOTHER INDICATOR
Staff morale	2O	Qualitative, through use of a survey to identify issues such as 'opinions count', 'how happy they are in their job', 'opportunities for personal development', etc.	Not related to physical performance, more working conditions	No, although higher staff morale is likely to link to improved productivity, which should help deliver improved performance	Morale is important aspect of performance of organisation but in small IDBs surveys may not be that relevant. FOR FURTHER CONSIDERATION

Table 7.5: Assessing how the potential indicators could measure performance

[illegible]

Table 7.5: Assessing how the potential indicators could measure performance					
Indicator to consider further (1 or 2 from Table 7.4)	Recommendation as indicator	What would be measured?	How could performance be measured?	Could the indicator be developed to measure performance?	Does the indicator provide value added?
					if No
'Partners' works or lack of it >>>>knock on effects to IDBs	1P. As above, but only considers implications of partners' performance for IDB	Qualitative	Relates to performance of other organisations, likely to be difficult for IDBs to measure	No, not for IDBs (although there should be knock-on benefits to IDBs)	Unlikely to provide added value, better to look for involvement of IDBs in partnerships that knock-on benefits OTHER INDICATORS PROVIDE GREATER ADDED VALUE
Time taken for completion of work and tasks	2P	Start time of tasks End time of tasks	Needs to relate to effectiveness of tasks in meeting objectives or reducing impacts/risks	Difficult to expand as tasks are likely to be widely different	Better picked up under other indicators that look at outcomes of tasks, rather than the tasks themselves OTHER INDICATORS PROVIDE GREATER ADDED VALUE
Time taken between grant aid and scheme completion	2P	Start time of application Time for completion	Needs to relate to effectiveness of spend, rather than time to spend the money	Difficult as there are many factors that could affect timing of scheme completion, most of which would not reflect performance	Better picked up under other indicators that look at outcomes of spend, rather than the time to spend the money OTHER INDICATORS PROVIDE GREATER

Table 7.5: Assessing how the potential indicators could measure performance					
Indicator to consider further (1 or 2 from Table 7.4)	Recommendation as indicator	What would be measured?	How could performance be measured?	Could the indicator be developed to measure performance?	Does the indicator provide value added?
					ADDED VALUE
Time taken to achieve grant aid approval	2P	Start time from application Time for approval to be obtained	Needs to relate to effectiveness of spend once approval is achieved, rather than time to get approval (much of which may be outside IDB control)	Difficult as there are many factors that could affect time to gain approval, most of which would not reflect performance	Better picked up under other indicators that look at outcomes, rather than the time to gain approval OTHER INDICATORS PROVIDE GREATER ADDED VALUE
Time to deal with information requests	1P (need to be clear what this indicator would provide)	Start time (from request receipt) End time (reply)	Related to performance in terms of time taken to respond to requests, but there would be a need to reflect different response time depending on information requested	Would need to relate to a target time by type of request, potentially set by ADA (or Defra) rather than each IDB (although allowance would have to be made for the staffing level of IDBs)	Provides an indication of efficiency, and could be short-term indicator that could eventually be picked up through evaluation FOR FURTHER CONSIDERATION
Incident response	1P	Start time End time	Related to performance in terms of time taken to respond to incidents, but there would be a need to reflect different response time depending on type of incident	Would need to relate to a target time by type of incident, but the range of incidents and their possible causes may make this difficult	Range of incident types would make indicator on time of little value, more useful would be indicators linked to impacts OTHER INDICATORS PROVIDE GREATER ADDED VALUE

Table 7.5: Assessing how the potential indicators could measure performance					
Indicator to consider further (1 or 2 from Table 7.4)	Recommendation as indicator	What would be measured?	How could performance be measured?	Could the indicator be developed to measure performance?	Does the indicator provide value added?
Number of hits to sites with published transparency data	2P	Will depend on current website design and structure	Performance could only be measured as publication of information, and perhaps attempts to raise awareness of the information	Difficult, as downloads would have to be made by beneficiaries or interested parties, which is outside the IDBs control	Indicator would reflect level of interest, rather than IDB performance so could be misleading OTHER INDICATORS PROVIDE GREATER ADDED VALUE
% attendance at Board meetings	1P (could put pressure on Local Authorities to attend, rather than on IDBs)	Attendance by type of attendee (Local Authority, Parish Council, etc.)	Does not measure performance but instead interest and priority of IDB (especially for Local Authorities and Parish Councils, etc.)	No, although greater input from representatives of Local Authorities and Parish Councils could improve perception of performance	Indicator could put pressure on Local Authorities, etc. to attend and would provide some information on local input to IDB decisions FOR FURTHER CONSIDERATION
Evaluation forms to District and Unitary councils both pre and post works	1O (but will need further development)	Qualitative, a survey would be required for beneficiaries to complete covering specific elements of performance related to them	Survey would need to provide score (e.g. 1 to 10) to reflect satisfaction and could cover different aspects	Yes, but would be reliant on returns from beneficiaries. Response rates could be useful indicator showing interest of invited respondents	Indicator could put pressure on Local Authorities, etc. to respond. Results could be compared across IDBs assuming consistent survey is used (note though that some local modifications may be required to ensure the survey is relevant to each IDB)

Table 7.5: Assessing how the potential indicators could measure performance					
Indicator to consider further (1 or 2 from Table 7.4)	Recommendation as indicator	What would be measured?	How could performance be measured?	Could the indicator be developed to measure performance?	Does the indicator provide value added?
					FOR FURTHER CONSIDERATION
Performance in relation to food production					
Any actions taken to increase water availability	2P (time needed to develop options)	Qualitative (description of actions taken to increase availability of water)	Would need to be linked to outcomes of actions, rather than just actions	Could be linked to specific actions (for example chosen from a list) that have identified performance benefits (this would need to be generic unless the IDB is able to add performance information specific to its activities)	Could be useful as indication of performance FOR FURTHER CONSIDERATION
Drought/water management plan/planning, percentage of outcomes/actions achieved	2O	Identification of actions from existing water levels management plans, etc.	Would need to be linked to outcomes of actions, rather than just percentage of actions achieved	As above, could be linked to typical performance benefits of actions, perhaps tailored by IDBs where possible	Could be used as quantitative measurement of above (although this might miss measures not in plans) FOR FURTHER CONSIDERATION
Period of no restriction divided by total period of drought, with the aim being 100%	2O	Time (days) with restrictions placed on abstraction Total number of days (e.g. by season/to reflect demand for water)	Reflects performance, to extent that this is controlled by IDB	Already relates to performance	Will depend on specific nature of IDB and definition of restriction FOR FURTHER

Table 7.5: Assessing how the potential indicators could measure performance					
Indicator to consider further (1 or 2 from Table 7.4)	Recommendation as indicator	What would be measured?	How could performance be measured?	Could the indicator be developed to measure performance?	Does the indicator provide value added?
					CONSIDERATION
Measure preferred water level against actual levels achieved (refer to soil moisture deficit)	2O	Water level provided Target water level	Reflects performance, to extent that this is controlled by IDB	Already relates to performance	Could be time and resource demanding and may be outside control of IDB OTHER INDICATORS PROVIDE GREATER ADDED VALUE
Area of land available for agricultural production (actual land versus usable land)	2O	Hectares of land available for agricultural production Hectares of land at risk of waterlogging Hectares of land at different levels of flood risk	Reflects performance, to extent that this is controlled by IDB	Already relates to performance	Could be time and resource demanding and may be outside control of IDB OTHER INDICATORS PROVIDE GREATER ADDED VALUE
Performance in relation to reduction of risk to assets					
Compliance with local flood risk management strategy	1O	None required	Reflects compliance with requirements as aspect of performance	Actual performance would need to link to activities undertaken in response to flood risk management strategy	FOR IDB1 FORM, as Yes/No, with explanation if No
No. of properties and ha. land moved out of significant flood risk (revised wording to ignore new development and	2O (needs further developing so that benefits of on-going maintenance can be	Number of properties and area of land within flood risk bands	Only reflects performance associated with activities that change flood risk (e.g. capital works). Does not capture performance	To add performance associated with maintenance activities, there would need to be an indicator associated with	Change in flood risk is of limited added value, a measure to reflect maintenance of risk at target levels would be of

Table 7.5: Assessing how the potential indicators could measure performance					
Indicator to consider further (1 or 2 from Table 7.4)	Recommendation as indicator	What would be measured?	How could performance be measured?	Could the indicator be developed to measure performance?	Does the indicator provide value added?
take account of changing risk: No. of properties and ha of land whose flood risk has changed)	captured) May need to link to achievement of target flood risk as in Policy Statement (but this would be difficult to measure year-on-year)		of day-to-day work to maintain flood or waterlogging risk at an acceptable level	avoiding any increase in risk, which may be difficult to measure	greater value FOR FURTHER CONSIDERATION
Ha. of land within 1:50 standard of protection and no. of properties to 1:75 sop	10	Area of land within flood risk bands	As above, only reflects performance associated with activities that change flood risk (e.g. capital works). Does not capture performance of day-to-day work to maintain flood or waterlogging risk at an acceptable level	As above, to add performance associated with maintenance activities, there would need to be an indicator associated with avoiding any increase in risk, which may be difficult to measure	As above CAN BE INCORPORATED INTO ANOTHER INDICATOR
Volume of water stored	20	Unlikely to be measured (unless picked up as volume pumped at some delayed time?)	Could be measured as percentage of water stored in areas identified for storage	Would need to have identified areas for water storage (but this may not reflect time required for storage and impacts that this may cause)	Unless clearly defined, this could be very time and resource intensive, and provide little added value OTHER INDICATORS PROVIDE GREATER ADDED VALUE
% of winter/summer penning level	20	Target levels	Could be assessed as percentage of targets achieved (time over which targets are achieved	Use of targets at key points and time over which targets are achieved (measured at	Could be time and resource intensive so number of locations and frequency of

Table 7.5: Assessing how the potential indicators could measure performance					
Indicator to consider further (1 or 2 from Table 7.4)	Recommendation as indicator	What would be measured?	How could performance be measured?	Could the indicator be developed to measure performance?	Does the indicator provide value added?
			where these are set at key points in system)	some agreed frequency) could enable performance to be captured	measurements would need to be appropriate FOR FURTHER CONSIDERATION
Number of (unplanned) flood events (changed to just number of flood events/year), taking into account the actions that the IDB has taken following flood events	1O	Number of flood events Causes of flood events	Reflects performance, to extent that this is controlled by IDB	Already relates to performance	Would require additional time and resources at times when IDBs are busiest, but information on number of events and their causes should be collected anyway, so may not be additional burden FOR FURTHER CONSIDERATION
Funds obtained through partnership working	1O. May not be IDB that leads hunt for funds, but would be involved in partnerships and/or requests for funding (but could be included as additional information)	Funds obtained	Does not reflect use of funds, just collection of funds so does not measure performance	Would need to be revised to measure use of funds and the impact this has on achieving objectives and targets	Funds obtained will reflect need, so may not always be required. Outcomes from funds should be picked up under other indicators OTHER INDICATORS PROVIDE GREATER ADDED VALUE
Area of land waterlogged	2O	Area of land that is	Reflects performance, to extent that this is	Would need to be a method for distinguishing	Waterlogging should reflect where target water

Table 7.5: Assessing how the potential indicators could measure performance					
Indicator to consider further (1 or 2 from Table 7.4)	Recommendation as indicator	What would be measured?	How could performance be measured?	Could the indicator be developed to measure performance?	Does the indicator provide value added?
		waterlogged	controlled by IDB (much of waterlogging may be outside the IDB's control so this could be misleading)	between waterlogging caused by activities of IDB, rather than other causes	levels are not achieved, so should be picked up under other indicators OTHER INDICATORS PROVIDE GREATER ADDED VALUE
Performance in relation to the environment					
Water Framework Directive: delivery against measures in the 2 nd round of RMBPs	2O (based on need to identify extent)	Measures required Action taken, including delivery	Reflects compliance with requirements through delivery of measures as aspect of performance	Actual performance would need to link to measures undertaken and the benefits they provide Could be misleading where there is a lack of dialogue between EA and IDB (may need precursor indicator?)	Measurement of proportion of measures delivered could give interim measure FOR FURTHER CONSIDERATION
Have species records/incidents of invasive species been submitted to BRC/wildlife trusts?	2P	Incidents of invasive species	Reflects submission of records, rather than activities to reduce invasive species	Action on invasive species may not be a core IDB objective, so this is additional to normal activities	Reflects additional activities undertaken beyond what is necessarily required (unless they are notifiable species), therefore, goes beyond what needs to be reported for accountability NO ADDED VALUE

Table 7.5: Assessing how the potential indicators could measure performance					
Indicator to consider further (1 or 2 from Table 7.4)	Recommendation as indicator	What would be measured?	How could performance be measured?	Could the indicator be developed to measure performance?	Does the indicator provide value added?
					IDENTIFIED
Is there a catchment-based plan to deal with invasive species?	1P (comments suggest outside remit, but some consideration of invasive species may be important)	None required	Reflects wider plan, outside IDB control, and does not reflect benefits of actions under the plan	Action on invasive species may not be a core IDB objective, so this is additional to normal activities	Reflects additional activities undertaken beyond what is necessarily required (unless they are notifiable species), therefore, goes beyond what needs to be reported for accountability NO ADDED VALUE IDENTIFIED
Is there a strategy and local partnership arrangements for dealing with invasive species?	1P (comments suggest outside remit, but some consideration of invasive species may be important)	None required	Reflects wider strategy, outside IDB control, and does not reflect benefits of actions under the plan	Action on invasive species may not be a core IDB objective, so this is additional to normal activities	Reflects additional activities undertaken beyond what is necessarily required, but could be captured under partnership working indicator (may need to be specifically included?) OTHER INDICATORS PROVIDE GREATER ADDED VALUE
What action or processes has the IDB undertaken to address invasive or non-native species?	1P (to enable some consideration of invasive or non-native species)	Presence or absence of measures	Measures whether any actions are taken, not efficiency of those actions	Would need to be combined with some measure of efficiency, which is likely to require specific expertise and may not be immediately	Enables indicator on invasive or non-native species to be included

Table 7.5: Assessing how the potential indicators could measure performance					
Indicator to consider further (1 or 2 from Table 7.4)	Recommendation as indicator	What would be measured?	How could performance be measured?	Could the indicator be developed to measure performance?	Does the indicator provide value added?
				measurable	FOR FURTHER CONSIDERATION
Use of an annual environmental audit report/scorecard that could be used to report on indicators and provide some detail behind them (going beyond raw data)	2P (but could be used to provide reporting mechanism across a number of categories)	Will depend on indicators that are to be included	Use of a scorecard could provide the basis for measuring performance	Would need to incorporate a number of performance-related indicators within the structure of the audit report or scorecard	Provides a structure rather than an indicator in its own right FOR FURTHER CONSIDERATION
Have all recordable habitat and species delivery actions been recorded on the Biodiversity Action Reporting System (BARS) for this year?	1P	None required	Reflects submission of records, rather than activities enhance species or biodiversity	Would need to link to activities, perhaps from the BAP, rather than submission of records	Could provide wider benefit from records submitted, but limited additional value as an indicator NO ADDED VALUE IDENTIFIED
Compliance with Conservation Regulations (Habitats and Birds Directives; Wildlife and Countryside Act)	1O (potential to rephrase as suggested in comments)	Measures required Actions taken, including delivery	Reflects compliance with requirements	Actual performance would need to link to any measures undertaken as a result of/to ensure compliance and the benefits they provide	FOR IDB1 FORM, as Yes/No, with explanation if No
What area/proportion of SSSI remedies is completed?	2O	Area with planned/required remedies Number of remedies completed	Reflects proportion of remedies completed as aspect of performance, rather than outcome associated with those remedies (assumed completion of remedies	Actual performance would need to link to remedies undertaken and the benefits they provide	Measurement of proportion of remedies delivered could give interim measure

Table 7.5: Assessing how the potential indicators could measure performance					
Indicator to consider further (1 or 2 from Table 7.4)	Recommendation as indicator	What would be measured?	How could performance be measured?	Could the indicator be developed to measure performance?	Does the indicator provide value added?
			delivers the benefits)		FOR FURTHER CONSIDERATION
Number of ha of habitat created [note that this refers to habitat types as specified by Defra's Outcome Measures]	2O. Risk of mis-interpretation needs to be factored in	Ha of habitat created	Reflects performance, to extent that this is controlled by IDB	Already relates to performance	Creation of habitat may be more dependent on landowner, so may be outside IDB control NO ADDED VALUE IDENTIFIED
Percentage of Biodiversity Action Plan actions that have been completed (with qualitative description of any biodiversity achievements in relation to biodiversity that may not be reflected in percentage of BAP actions completed)	1P (inclusion in implementation plans may mean these are already covered, plus need to include opportunity to describe biodiversity achievements in year)	Actions required Action taken, including delivery	Reflects proportion of actions completed as aspect of performance, rather than outcome associated with those actions (assumed completion of actions delivers the benefits)	Actual performance would need to link to actions undertaken and the benefits they provide	Measurement of proportion of actions delivered could give interim measure COMBINED WITH ANOTHER INDICATOR
Have any activities been undertaken to enhance any particular BAP species or locally important species?	1O (will require description to accompany above, could be combined into one)	None required	Would need to be linked to outcomes of activities, rather than just activities	Could be linked to specific activities (for example chosen from a list) that have identified performance benefits (this would need to be generic unless the IDB is able to add performance information specific to its activities)	Could be useful as indication of performance FOR FURTHER CONSIDERATION
Whether the IDB has evaluated its drainage	2O	Qualitative, linked to	Reflects performance, to extent that this is	Already relates to	Revised wording should reduce time and resource

Table 7.5: Assessing how the potential indicators could measure performance					
Indicator to consider further (1 or 2 from Table 7.4)	Recommendation as indicator	What would be measured?	How could performance be measured?	Could the indicator be developed to measure performance?	Does the indicator provide value added?
network to manage a balance of biodiversity and flood conveyance, as per the Drainage Channel Biodiversity Manual		Biodiversity Action Plan	controlled by IDB	performance	<p>implications, unless such monitoring already forms part of IDB activities (may need to be more open question to invite description of activities in past year, rather than just yes/no)</p> <p>FOR FURTHER CONSIDERATION</p>

Table 7.6: Identifying short, medium and long-term indicators of performance (all those for further consideration from Table 7.5)					
Indicator to consider further (1 or 2 from Table 7.4)	Timing	Data needs	Action needed to enable indicator to be used	Potential links with other indicators	Potential for benchmarking
Management of Board and Board activities					
Length of drain maintained	Medium-term (some development needed); could be replaced by indicator linked to target condition over time	Length of drains for which IDB is responsible Length maintained in any year Target condition of drains at key points (to be identified by IDBs)	Definition of maintenance Guidance on selection of key points	Maintenance costs per linear km of maintained watercourse (by combining target condition to show cost of achieving/ maintained target condition each year)	See maintenance costs per linear km of maintained watercourse
Maintenance costs per linear km of maintained watercourse	Short-term (definitions needed)	Length of drains for which IDB is responsible Maintenance costs per year	Definition of maintenance Target conditions of maintained watercourses would need to be set for measuring performance Would have to reflect differences between IDBs or general trend over time for one IDB	Length of drain maintained (see above)	Would provide indication of efficiency (could be used to compare IDBs, but care would be needed as not all IDBs may be comparable)
Pumping station maintenance costs per pumped ha	Short-term (definitions needed)	Number of pumping stations Area pumped Maintenance costs per year	Definition of maintenance Target conditions of pumping stations would need to be set for measuring performance Would have to reflect differences between IDBs or general trend over time		Would provide indication of efficiency (but differences between IDBs and pumping stations may mean this is misleading)

Table 7.6: Identifying short, medium and long-term indicators of performance (all those for further consideration from Table 7.5)					
Indicator to consider further (1 or 2 from Table 7.4)	Timing	Data needs	Action needed to enable indicator to be used	Potential links with other indicators	Potential for benchmarking
			for one IDB		
Admin costs compared with total spend, operating spend, maintenance costs	Short-term (definitions needed)	Admin costs Total spend Operating spend Maintenance costs per year	Definition of what is included (and is not) within each cost type Would have to be combined with quantitative measure of performance through evaluation survey to measure performance Would have to reflect differences between IDBs or general trend over time for one IDB	Evaluation forms to District and Unitary councils both pre and post works	Would provide indicator of efficiency (could be used to compare IDBs but care would be needed as there may be underlying differences making comparisons difficult or misleading)
Number of complaints	Medium-term (to enable method for substantiating complaints to be developed and agreed)	Number and type of substantiated complaints	Complaints would have to be linked to IDB activity not being carried out. Would need to be an initial assessment of complaint to determine if it was substantiated. This would have to be carried out by the IDB. Complainant could be asked to complete response form as to whether they felt their complaint had been satisfactorily dealt with	May be short-term value until direct measurements of performance are available	Number of complaints could be used but there is a risk that complaints are not substantiated or relate to responsibilities of others
Is the board compliant with the requirements of	Short-term (revision of IDB1 form needed)	FOR IDB1 FORM, as Yes/No, with explanation	Revision of IDB1 form	Compliance with transparency code of Local Audit Bill. Could be	Not relevant, measures compliance not

Table 7.6: Identifying short, medium and long-term indicators of performance (all those for further consideration from Table 7.5)					
Indicator to consider further (1 or 2 from Table 7.4)	Timing	Data needs	Action needed to enable indicator to be used	Potential links with other indicators	Potential for benchmarking
external audit?		if No		combined as cover same type of issue	performance
Compliance with transparency code of Local Audit Bill	Short-term (revision of IDB1 form needed)	FOR IDB1 FORM, as Yes/No, with explanation if No.	Revision of IDB1 form	Is the board compliant with the requirements of external audit? Could be combined as cover same type of issue	Not relevant, measures compliance not performance
Percentage of drainage rates paid within three months of issue date	Short-term (records need to be kept)	Drainage rates requiring payment, records of paid/unpaid rates	Agreement on date at which indicator is measured		Could compare IDBs based on %, but care would be needed as there may be underlying differences making comparisons difficult or misleading
Staff morale	Medium-term (some development needed)	Qualitative, through use of a survey to identify issues such as 'opinions count', 'how happy they are in their job', 'opportunities for personal development', etc.	Need for development of survey, and agreement with sample of IDBs to make sure questions are appropriate		Morale is important aspect of performance of organisation but in small IDBs surveys may not be that relevant, making comparisons potentially misleading
Number of incidents/accidents and time off due to injury	Short-term (records need to be kept)	Number of incidents/accidents Time off as a result	Not related to physical performance, more working conditions	No, although fewer accidents and time-off would directly benefit performance	Would need to be reported for other purposes (e.g. to HSE), therefore may be of limited additional value, could be reported for completeness to enable comparison between IDBs (but may be not be

Table 7.6: Identifying short, medium and long-term indicators of performance (all those for further consideration from Table 7.5)					
Indicator to consider further (1 or 2 from Table 7.4)	Timing	Data needs	Action needed to enable indicator to be used	Potential links with other indicators	Potential for benchmarking
					very informative)
Partnership working (undertaking work on behalf of other risk management authorities or contributing to joint projects)	Short-term (if Yes/No question – could be included on IDB1 form) Medium to long-term if method for measuring needs to be identified	Partnerships in existence or joint working	Could be simple Yes/No question of 'Does IDB actively seek to work with partner organisations to deliver its objectives and wider objectives to the benefit of the local area?'	Could be picked up under Evaluation forms to District and Unitary councils both pre and post works	Could be comparison based on number of partnership opportunities found and utilised
Time to deal with information requests	Medium-term (some development needed)	Start time (from request receipt) End time (reply)	Would need to relate to a target time by type of request, potentially set by ADA (or Defra) rather than each IDB (although allowance would have to be made for the staffing level of IDBs)	Evaluation forms to District and Unitary councils both pre and post works	Provides an indication of efficiency, and could be short-term indicator that could eventually be picked up through evaluation
% attendance at Board meetings	Short-term (records should already be kept, e.g. minutes)	Attendance by type of attendee (Local Authority, Parish Council, etc.)	Reporting of records (as percentage attendance by Local Authority, Parish Council, etc. representatives)		Provides an indication of involvement of beneficiaries and could be used to compare IDBs but indicator may be more useful in putting pressure on Local Authorities, etc. to attend, rather than comparing IDBs
Evaluation forms to District and Unitary councils both pre and post works	Medium-term (some development needed)	Qualitative, a survey would be required for beneficiaries to complete covering specific elements of performance	Survey would need to be developed, based on questions requiring an answer in a score form provide (e.g. 1 to 10) to reflect satisfaction and	Could pick up information required under other indicators to reduce number of indicators (but balance will be needed to keep evaluation survey	Results could be compared across IDBs assuming consistent survey is used (note though that some local modifications may be

Table 7.6: Identifying short, medium and long-term indicators of performance (all those for further consideration from Table 7.5)					
Indicator to consider further (1 or 2 from Table 7.4)	Timing	Data needs	Action needed to enable indicator to be used	Potential links with other indicators	Potential for benchmarking
		related to them	could cover different aspects	short enough to encourage reasonable response rates)	required to ensure the survey is relevant to each IDB)
Performance in relation to food production					
Any actions taken to increase water availability	Medium-term (some development needed)	Qualitative (description of actions taken to increase availability of water)	Could be linked to specific actions (for example chosen from a list) that have identified performance benefits (this would need to be generic unless the IDB is able to add performance information specific to its activities)	Drought/water management plan/planning, percentage of outcomes/actions achieved; might be possible to combine indicators	Could be used to compare activities across IDBs, but may reflect need more than performance
Drought/water management plan/planning, percentage of outcomes/actions achieved	Medium-term (some development needed)	Identification of actions from existing water levels management plans, etc.	Could be linked to typical performance benefits of actions, perhaps tailored by IDBs where possible	Any actions taken to increase water availability; might be possible to combine indicators	Could be used to compare activities across IDBs, but may reflect need more than performance
Period of no restriction divided by total period of drought, with the aim being 100%	Medium-term (some development needed)	Time (days) with restrictions placed on abstraction Total number of days (e.g. by season/to reflect demand for water)	Requires additional records to be kept and/or measurements made		Ability to compare will depend on specific nature of IDB and definition of restriction, could be misleading
Performance in relation to reduction of risk to assets					
Compliance with local flood risk management strategy	Short-term (if Yes/No question – could be included on IDB1 form)	Actual performance would need to link to activities undertaken in response to flood risk management	Could be simple Yes/No question	Indicators reflecting performance in relation to flood and waterlogging	Could be comparison based on compliance

Table 7.6: Identifying short, medium and long-term indicators of performance (all those for further consideration from Table 7.5)					
Indicator to consider further (1 or 2 from Table 7.4)	Timing	Data needs	Action needed to enable indicator to be used	Potential links with other indicators	Potential for benchmarking
	Medium to long-term if method for measuring needs to be identified	strategy		risk	
No. of properties and ha. land moved out of significant flood risk	Medium to long-term if method for measuring needs to be identified	Number of properties and area of land within flood risk bands	To add performance associated with maintenance activities, there would need to be an indicator associated with avoiding any increase in risk, which may be difficult to measure		Change in flood risk is of limited added value, a measure to reflect maintenance of risk at target levels would be of greater value. Risk that this could reflect economic development rather than IDB performance
% of winter/summer penning level	Short to long-term (depending on extent to which targets and measurements are already set and taken)	Target levels, could be time and resource intensive so number of locations and frequency of measurements would need to be appropriate	Could be assessed as percentage of targets achieved (time over which targets are achieved where these are set at key points in system)	Could capture indicators associated with performance for food production, and others related to flooding and waterlogging	Comparison could be made of time that target levels are achieved; reasons why not should help explain differences between IDBs
Number of (unplanned) flood events (changed to just number of flood events/year), taking into account the actions that the IDB has taken following flood events	Short to medium-term (may need some development for some IDBs)	Number of flood events Causes of flood events	Would require additional time and resources at times when IDBs are busiest, but information on number of events and their causes should be collected anyway, so may not be additional burden	Already relates to performance	Could be used to compare IDBs, but underlying reasons behind flood events would have to be taken into account. Could allow best practice and lessons learnt to be shared
Performance in relation to the environment					

Table 7.6: Identifying short, medium and long-term indicators of performance (all those for further consideration from Table 7.5)					
Indicator to consider further (1 or 2 from Table 7.4)	Timing	Data needs	Action needed to enable indicator to be used	Potential links with other indicators	Potential for benchmarking
Water Framework Directive: delivery against measures in the 2 nd round of RBMPs	Short-term (revision of IDB1 form needed) Measurement of proportion of measures delivered could give interim measure	Measures required Action taken, including delivery	Revision of IDB1 form, but need to be able reflect level of dialogue between EA and IDB	May need additional indicator (Has the EA made the IDB aware of actions it could take to help deliver measures in the 2 nd round of RBMPs)	Not relevant, measures compliance not performance
What action or processes has the IDB undertaken to address invasive or non-native species?	Short-term (requires description of actions)	Description of actions (could be chosen from list if available)	Records need to be kept, reporting mechanism required	May link/affect other environment indicators (could also affect flood conveyance)	Could compare actions across IDBs, but need may also vary (e.g. more/fewer invasive species, type of species, etc.)
Use of an annual environmental audit report/scorecard that could be used to report on indicators and provide some detail behind them (going beyond raw data)	Medium to long--term (some development needed of structure and potentially indicators to be included)	Provides a structure rather than an indicator in its own right	Identification of indicators to be included and their status	Would need to incorporate a number of performance-related indicators within the structure of the audit report or scorecard	Could be used to compare IDBs, depending on indicators included and reporting mechanisms used
Compliance with Conservation Regulations (Habitats and Birds Directives)	Short-term (revision of IDB1 form needed)	Measures required Action taken, including delivery	Revision of IDB1 form		Not relevant, measures compliance not performance
What area/proportion of SSSI remedies is completed?	Short-term	Area with planned/required remedies Number of remedies completed	Records need to be kept	May overlap with some other environmental indicators; environmental audit report/scorecard may help reduce overlap or duplication	Measurement of proportion of remedies delivered could give interim measure and could be used to compare progress made by IDBs

Table 7.6: Identifying short, medium and long-term indicators of performance (all those for further consideration from Table 7.5)					
Indicator to consider further (1 or 2 from Table 7.4)	Timing	Data needs	Action needed to enable indicator to be used	Potential links with other indicators	Potential for benchmarking
Percentage of Biodiversity Action Plan actions that have been completed (with qualitative description of any biodiversity achievements in relation to biodiversity that may not be reflected in percentage of BAP actions completed)	Short-term (may already be included in implementation plans for some IDBs)	<p>Actions required</p> <p>Action taken, including delivery</p>	Measurement of proportion of actions delivered could give interim measure	May overlap with some other environmental indicators; environmental audit report/scorecard may help reduce overlap or duplication	Measurement of percentage of actions completed could give interim measure and could be used to compare progress made by IDBs. Qualitative information may be as/more important for some Boards to reflect performance in relation to habitat creation or specific to a species
Have any activities been undertaken to enhance any particular BAP species or locally important species?	Medium-term (some development needed)	Qualitative (description of actions taken to enhance biodiversity)	Could be linked to specific activities (for example chosen from a list) that have identified performance benefits (this would need to be generic unless the IDB is able to add performance information specific to its activities)	May overlap with some other environmental indicators; environmental audit report/scorecard may help reduce overlap or duplication	Could be used to compare activities across IDBs, but may reflect need more than performance
Whether the IDB has evaluated its drainage network to manage a balance of biodiversity and flood conveyance, as per the Drainage Channel Biodiversity Manual	Medium-term (some development needed)	Qualitative, linked to Biodiversity Action Plan	Revised wording should reduce time and resource implications, unless such monitoring already forms part of IDB activities (may need to be more open question to invite description of activities in past year, rather than just yes/no)	May overlap with some other environmental indicators; environmental audit report/scorecard may help reduce overlap or duplication	Could be used to compare activities across IDBs, but may reflect need more than performance

Table 7.6: Identifying short, medium and long-term indicators of performance (all those for further consideration from Table 7.5)					
Indicator to consider further (1 or 2 from Table 7.4)	Timing	Data needs	Action needed to enable indicator to be used	Potential links with other indicators	Potential for benchmarking

Table 7.7: Proposed short, medium and long-term indicators

Short-term indicators	Action needed to enable indicator to be used	Medium-term indicators	Action needed to enable indicator to be used	Long-term indicators	Potential for benchmarking
Yes/No Responses for IDB1 form					
Is the board compliant with the requirements of external audit?	Revision of IDB1 form; indicators could be combined				Could be comparison based on compliance
Compliance with transparency code of Local Audit Bill					
Partnership working (undertaking work on behalf of other risk management authorities or contributing to joint projects)	Could be simple Yes/No question of 'Does IDB actively seek to work with partner organisations to deliver its objectives and wider objectives to the benefit of the local area?	Could be developed over medium to long-term if method for measuring needs to be identified	Could be incorporated into evaluation form		
Compliance with local flood risk management strategy	Short-term (if Yes/No question – could be included on IDB1 form)	Could be developed over medium to long-term if method for measuring needs to be identified	Actual performance would need to link to activities undertaken in response to flood risk management strategy		
Compliance with Conservation Regulations (Habitats and Birds Directives; Wildlife and Countryside Act)	Revision of IDB1 form				
Management of Board and Board activities					
Maintenance costs per linear km of maintained watercourse	Definition of maintenance Target conditions of maintained watercourses would need to be set for	Length of drain maintained at target condition	Guidance on selection of key points		Would provide indication of efficiency (could be used to compare IDBs, but care would be needed as not all IDBs may be

Table 7.7: Proposed short, medium and long-term indicators					
Short-term indicators	Action needed to enable indicator to be used	Medium-term indicators	Action needed to enable indicator to be used	Long-term indicators	Potential for benchmarking
	measuring performance				comparable)
Pumping station maintenance costs per pumped ha	<p>Definition of maintenance</p> <p>Target conditions of pumping stations would need to be set for measuring performance</p>	Pumping stations maintained at target condition			Would provide indication of efficiency (but differences between IDBs and pumping stations may mean this is misleading)
Admin costs compared with total spend, operating spend, maintenance costs	<p>Definition of what is included (and is not) within each cost type (admin, total spend, operating spend, maintenance costs)</p> <p>Would have to be combined with quantitative measure of performance through evaluation survey to measure performance</p>	Evaluation forms to District and Unitary councils both pre and post works	Survey would need to be developed, based on questions requiring an answer in a score form provide (e.g. 1 to 10) to reflect satisfaction and could cover different aspects	<p>Evaluation form could incorporate indicators such as:</p> <p>Partnership working (undertaking work on behalf of other risk management authorities or contributing to joint projects)</p> <p>Time to deal with information requests</p>	Results could be compared across IDBs assuming consistent survey is used (note though that some local modifications may be required to ensure the survey is relevant to each IDB)
Percentage of drainage rates paid within three months of issue date	Agreement on date at which indicator is measured				Could compare IDBs based on %, but care would be needed as there may be underlying differences making comparisons difficult or misleading
Number of incidents/accidents and	Number of incidents/accidents	Staff morale	Need for development of survey to identify issues such as 'opinions count',		Morale is important aspect of performance of organisation but in small

Table 7.7: Proposed short, medium and long-term indicators					
Short-term indicators	Action needed to enable indicator to be used	Medium-term indicators	Action needed to enable indicator to be used	Long-term indicators	Potential for benchmarking
time off due to injury	Time off as a result		'how happy they are in their job', 'opportunities for personal development', etc., and agreement with sample of IDBs to make sure questions are appropriate		IDBs surveys may not be that relevant, making comparisons potentially misleading
		Time to deal with information requests	Would need to relate to a target time by type of request, potentially set by ADA (or Defra) rather than each IDB (although allowance would have to be made for the staffing level of IDBs)	Could be incorporated into evaluation form	
% attendance at Board meetings	Reporting of records (as percentage attendance by Local Authority, Parish Council, etc. representatives)		I'm not convinced what counting % attendance would really tell anyone – basic attendance doesn't necessarily equate to performance and bringing expertise to the table.		Provides an indication of involvement of beneficiaries and could be used to compare IDBs but indicator may be more useful in putting pressure on Local Authorities, etc. to attend, rather than comparing IDBs
Performance in relation to food production					
		Any actions taken to increase water availability	Could be linked to specific actions (for example chosen from a list) that have identified performance benefits (this would need to be generic unless the IDB is able to add performance information specific to its	Might be possible to combine indicators	Could be used to compare activities across IDBs, but may reflect need more than performance

Table 7.7: Proposed short, medium and long-term indicators					
Short-term indicators	Action needed to enable indicator to be used	Medium-term indicators	Action needed to enable indicator to be used	Long-term indicators	Potential for benchmarking
			activities)		
		Drought/water management plan/planning, percentage of outcomes/actions achieved	Could be linked to typical performance benefits of actions, perhaps tailored by IDBs where possible		
		Period of no restriction divided by total period of drought, with the aim being 100%	Requires additional records to be kept on time (days) with restrictions and/or measurements made		Ability to compare will depend on specific nature of IDB and definition of restriction, could be misleading
Performance in relation to reduction of risk to assets					
		No. of properties and ha. land at significant flood risk	To add performance associated with maintenance activities, there would need to be an indicator associated with avoiding any increase in risk, which may be difficult to measure		Change in flood risk is of limited added value, a measure to reflect maintenance of risk at target levels would be of greater value
% of winter/summer penning level Short to long-term (depending on extent to which targets and measurements are already set and taken)	Could be assessed as percentage of targets achieved (time over which targets are achieved where these are set at key points in system)		Could capture indicators associated with performance for food production, and others related to flooding and waterlogging		Comparison could be made of time that target levels are achieved; reasons why not should help explain differences between IDBs

Table 7.7: Proposed short, medium and long-term indicators					
Short-term indicators	Action needed to enable indicator to be used	Medium-term indicators	Action needed to enable indicator to be used	Long-term indicators	Potential for benchmarking
Number of (unplanned) flood events (changed to just number of flood events/year)	Would require additional time and resources at times when IDBs are busiest, but information on number of events and their causes should be collected anyway, so may not be additional burden				Could be used to compare IDBs, but underlying reasons behind flood events would have to be taken into account. Could allow best practice and lessons learnt to be shared
Performance in relation to the environment					
Water Framework Directive: delivery against measures in the 2 nd round of RBMPs	Measurement of proportion of measures delivered could give interim measure	Could be incorporated into environmental audit report/scorecard			<p>Could be used to compare IDBs, depending on indicators included and reporting mechanisms used</p> <p>May need additional indicator (Has the EA made the IDB aware of actions it could take to help deliver measures in the 2nd round of RBMPs)</p>
		Use of an annual environmental audit report/scorecard that could be used to report on indicators and provide some detail behind them (going beyond raw data)	Would need to incorporate a number of performance-related indicators within the structure of the audit report or scorecard		Could be used to compare IDBs, depending on indicators included and reporting mechanisms used
What area/proportion of remedies is completed?	Records need to be kept on area with planned/required	Could be incorporated into environmental audit report/scorecard			Measurement of proportion delivered could give interim measure and

Table 7.7: Proposed short, medium and long-term indicators					
Short-term indicators	Action needed to enable indicator to be used	Medium-term indicators	Action needed to enable indicator to be used	Long-term indicators	Potential for benchmarking
	remedies Number of remedies completed				could be used to compare progress made by IDBs
Percentage of Biodiversity Action Plan actions that have been completed (with qualitative description of any biodiversity achievements in relation to biodiversity that may not be reflected in percentage of BAP actions completed)	Actions required Action taken, including delivery	Have any activities been undertaken to enhance any particular BAP species or locally important species?	Could be linked to specific activities (for example chosen from a list) that have identified performance benefits (this would need to be generic unless the IDB is able to add performance information specific to its activities)	Could be incorporated into environmental audit report/scorecard	
		Benefit of water levels to biodiversity to be monitored at specific sites and impact on the flow in watercourses	Could be time and resource intensive, unless such monitoring already forms part of IDB activities	Could be incorporated into environmental audit report/scorecard	Could be used to compare activities across IDBs, but may reflect need more than performance

Annex 8: The Theory behind Indicators

A8.1 What are indicators?

Gudmunsson (2008) defines indicators as *‘variables, signs or pointers that can be used to represent broader (and perhaps hidden) interests whose selection and construction is based on engagement, and that are intended as an aid to decision-making and action-taking.’*

Lehtonen (2010) expands this to define indicators as *‘variables that are constructed or selected to operationally represent properties of more or less well defined ‘representation targets’ with an aim to allow simplified communication about them’*. The term ‘representation targets’ is based on the definition of Franceschini *et al* (2009) that a representation target is *‘the operation aimed to make a context or part of it tangible’*. Identification of the representation target is the first step to identifying the related indicators.

The differences between IDBs, their aims and objectives and the activities that they undertake could make it difficult to identify one clear representation target. However, if the representation target were linked to the core business, common to all IDBs, then this would significantly facilitate the identification of indicators.

The word ‘indicator’ is often used interchangeably with measure (such as performance measures), although the use of indicator can be preferable as it does not contain the suggestion that everything can be measured. Instead, the use of indicator explicitly suggests that it gives an indication of the factor that is being reported.

A8.2 When can indicators be used?

Indicators can be used at various times and for various purposes:

- to help define a vision and goals, for example, during planning;
- when identifying and collecting data, for example, during activities; and
- to assess progress and determine what new programmes or projects might be needed to meet the overall objectives, for example, during evaluation.

The roles of indicators in the context of this study are (based on Sustainable Seattle, 1998):

- to raise awareness: by creating opportunities to learn about the activities of IDBs and the benefits that they deliver;
- for assessment: by developing tools to allow the performance of IDBs to be monitored and to improve accountability and transparency; and
- to enable action: by fostering dialogue between stakeholders, enabling comparisons to be made and identifying where additional benefits can be delivered.

While the assessment of beneficiaries and benefits gives a snapshot of performance at any one time, the development of indicators would allow IDBs to measure and report on:

- where they are, the current position;
- which way they are going, an evaluation of what has happened so far; and
- how far they are from delivering against targets or goals.

A8.3 How can indicators be made effective?

Lehtonen (2010) reports that *'indicators demanded by policymakers are often not available, existing indicators may not be used in the ways or to the extent intended and the influence of indicators on decision-making can be difficult to identify, let alone measure'*. Lehtonen (2010) concludes that indicators should be developed based on the principle that they will influence, rather than be used. There are then three levels of influence that need to be considered to ensure that the indicators are successful (based on Lehtonen, 2010):

- level 1: beliefs, perceptions and frameworks of thought held by the individuals involved in designing the indicators;
- level 2: deliberation, negotiation, argumentation and dialogue that occurs during the design and choice of indicators where stakeholders promote ways of measuring progress and response strategies; and
- level 3: influence on activities, policies or strategies as a result of measuring progress against the indicators.

Ultimately, it is the salience, credibility and legitimacy of the indicators that determines their influence. To be seen as legitimate to stakeholders, the process of indicator design and development must be seen as inclusive and equitable (Eckley, 2001). The balance between salience, credibility and legitimacy varies across different situations and potentially different IDBs. For example, credibility increases in priority as issues become more controversial. There are also trade-offs between the factors depending on the audience.

The European research project POINT (Policy influence of indicators) analyses the role of environmental and sustainable development indicators in policymaking. Its findings include that to be effective, indicators have to be relevant, useful, and useable for the community for which they are developed and there may not be a 'one-size-fits-all' set. However, it is critical that diverse members of the community reach agreement on a common set of indicators, therefore, stakeholder involvement is an essential part of the project.

A8.4 What approaches already exist?

Kaplan and Norton (1992; 1996; 2001; 2001a) introduced the balancing conceptual reference and the Balanced Scorecard approach as a set of indicators for each of the four dimensions that create value in an enterprise:

- financial: 'to succeed financially how should we appear to our shareholders?';
- customer: 'to achieve our vision, how should we appear to our customers?';

- internal business process: ‘to satisfy our shareholders and customers, what business processes must we excel at?’; and
- learning and growth: ‘to achieve our vision, how will we sustain our ability to change and improve?’

The idea of the Balanced Scorecard is to give a balanced weight to all the important dimensions of a process. This provides a framework, but little in the way of guidance in terms of how to identify, introduce and use appropriate indicators (Neely *et al*, 2000). Genesis (an Australian company involved in developing performance indicators) proposes use of the Tricker Model. This is a framework based on a two-by-two matrix, as shown in Figure A8.1 below.

	Conformance	Performance
Outward looking	Providing accountability	Strategy formulation
Inward looking	Monitoring and supervising	Policy making
	Past and present oriented	Future oriented

Source: Genesis (nd)

Figure A8.1: A Framework based on the Tricker Model

The Performance-Based Management Special Interest Group (2001) introduced the concept of the critical few approach, based on the selection of indicators that balance all the relevant aspects of a system. The ‘critical few’ is identified as being between three and 15 measures, depending on the complexities of the organisation. Like the balanced scorecard, the critical few framework is based on strategically defined business perspectives followed by identification of performance objectives and measures for each perspective.

The Performance Dashboard model (Bourne & Neely, 2003; Eckerson, 2005 in Franceschini *et al*, 2009; Neely *et al*, 1995; Performance-Based Management Special Interest Group, 2001) also aims to control a system with the smallest number of parameters. It considers the most critical financial and non-financial indicators and their effects on the whole system. The results

are shown as gauges on a car dashboard, with each gauge representing a 'roll-up' of measures to give an overall indication of performance by business perspective, for example (NPR, 1999 in Performance-Based Management Special Interest Group, 2001):

- financial: do we have the financial resources and stability to reach our destination;
- customer: are we addressing and meeting the needs of our customers (are they cold (not participating); are they hot (complaining)?
- internal business process: are our internal business processes operating efficiently and effectively?
- learning and growth: are we growing and improving at a sustainable pace (are we moving too fast or too slow)?

However, McCunn, 1998 in Bourne & Neely (2003) found that 70% of attempts to implement performance measurement systems fail. This highlights the importance of focusing on what is practically achievable at this time and can be developed over time, rather than attempting to develop the 'final' product now. This is supported by numerous articles that identify key success factors as:

- ease and speed of implementation: it is important to start with a basic, logical structure that can quickly deliver results;
- metrics that are meaningful to stakeholders;
- use of indicators as a facilitative management tool that help generate actions towards specific goals and not just a method for reporting performance; and
- an approach that is iterative and can be developed over time in response to new conditions. However, it is recognised that this can be one of the most difficult factors to achieve.

A8.5 How should indicators be developed?

A typical approach to developing a set of indicators is based on four steps, where these are four out of six steps in a cycle of development, application and revision of indicators, as summarised in Figure A8.2.

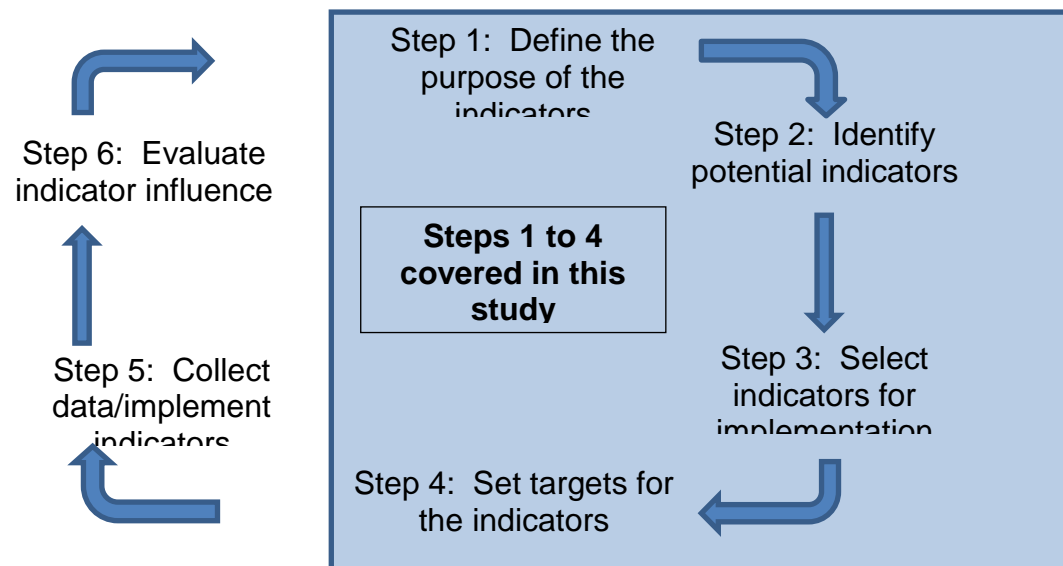


Figure A8.2: Our approach to developing indicators (developed from various references)

The first issue is to identify the framework for organising the indicators. The framework is the way of organising the indicators so that information including connections between indicators can be better understood. This is important as it helps ensure that important issue areas are not left out. This framework will need to cover the following and this approach will help to define the representation target:

- what are the objectives of the IDB/IDBs in general;
- what is the purpose of the indicators (is it to raise awareness, help decision-making, measure progress – or a mix of all three?); and

- what is the focus of the indicators (this could be linked to success criteria for new IDBs as a starting point).

One possible organisation of the framework could be a pyramidal form, linked to the overall objective of IDBs to undertake work to provide land drainage and manage water levels. From these primary powers come statutory duties with regard to the environment and recreation, all of which lead to benefits out to the local community. This is illustrated in Figure A8.3. On top of this could be the balanced scorecard framework (Kaplan and Norton 1992; 1996; 2001) that utilises four dimensions of measurement (financial, customer perceptions, business perspective and learning and growth). Alternatively, Lynch & Cross's Performance Pyramid (Lynch & Cross, 1991 in Neely *et al*, 2000) attempts to tie together a hierarchical view of performance measurement with a business process view. It also differentiates between issues that would be of interest to stakeholders (satisfaction, quality, deliver) with indicators are that interest to the business. Neely *et al* (2000), however, note that Lynch & Cross's framework can be difficult to operationalise.

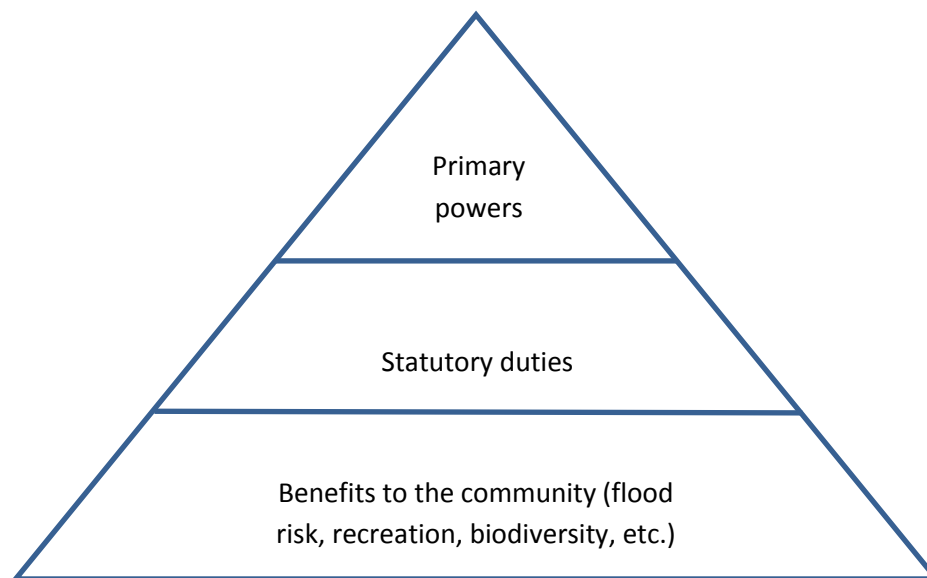


Figure A8.3: One Possible Framework based on the Objectives of IDBs

The next step is to undertake analysis of the long-list of indicators. This involves assessing each indicator against a pre-determined set of criteria (the criteria below are based on: van der Meer, 1999; Eckley 2001; Lehtonen, 2010):

relevance (does it fit with the purpose identified in Step 1);

- understandable (is it clear what the indicator is for and can this be easily communicated);
- reliable (would it give information that people can trust, is it based on reliable information);
- timely (does the indicator report on something that could be changed, improved or negative impacts avoided if action were taken);
- coherence (does the indicator fit within the framework and is it consistent with other indicators, without overlapping unnecessarily);
- achievable (do IDBs have the capability to provide measurements, for example, an ecosystem services indicator could be devised to report on ecosystem services delivery providing IDBs have the (GIS) capability to produce it as necessary);
- coverage (does the indicator cover the whole system or just part of it, does it allow for interactions and linkages between different IDB activities, is it flexible enough to deal with differences between IDBs (such as topography, geography, hydrology)); and
- clear and easy to measure (are data available to measure them, if not, can new data be collected or can they be reported in qualitative terms (not having data should not be a reason to exclude an indicator), what needs to be done to collect the data, it is likely to be cost-effective to do so (what would the benefits of the indicator be versus the costs).

In addition, any barriers to implementation of indicators need to be identified, including how those barriers could be removed and a proposed approach and timetable for doing so.

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Annex 9: Review of indicators used in other fields and other countries

A9.1 Current Use of Indicators

A9.1.1 Indicators proposed and used for and by IDBs

Defra appointed JBA to undertake an independent review of IDBs in 2005. This included an evaluation of performance across all IDBs under six categories (JBA, 2006):

- efficiency:
 - administration costs: proportion of total expenditure and per ha;
 - maintenance costs: per km of watercourse and as percentage of total expenditure;
 - cost of capital schemes: fees as a proportion of IDB scheme cost;
 - use of forward planning: number of IDBs with forward planning;
 - dealing with information requests: potentially as response time although few IDBs had readily available information, and as return of IDB1 forms within required deadlines; and
 - use of IT and telemetry: availability of email access, IDBs with a website and use of computerised accounting systems. For telemetry, the indicator used was number of IDBs using telemetry systems for pump control.
- effectiveness:
 - incidence of flooding: this is complicated by the existence of assets and actions of other operating authorities such as the Environment Agency and coastal authorities, and because some flood events exceeded the design parameters of IDB assets. As a result, no reliable results for quantifying the incidence of flooding were found;
 - responsiveness: again this indicator suffered from a lack of information on response times to notification of flooding or drainage problems, although the time, date, nature of the contact and outcome are widely recorded;
 - discharging environmental duties and responsibilities: implementation of Water Level Management Plans (WLMPs) on priority wetland SSSIs that they are responsible for, and identifying remedies and getting responsibility accepted. Also questions were asked on level of awareness of duties (through promotion of water and wetland habitat conservation in policies, plans and projects);
 - collection of rates and levies: proportion of rates that are uncollected (compared with uncollected Council Tax);
 - completion of improvement works: time taken between approval of grant aid and scheme completion (compared with the wider civil engineering sector);
 - number of complaints against a Board, including type of complaint; and

- how the Board monitors its service delivery: number of Boards with formal monitoring processes in place, although the figures did not distinguish between some form of process and a comprehensive process being in place.
- accountability:
 - quality of financial statements: from a review of published accounts;
 - financial control: compliance with the requirements of external audit and approaches for internal control (but at the time of JBA's review this was only just beginning); and
 - asset management: IDBs with a formal asset management plan.
- representation:
 - ratepayers: take-up of seats on the Board by ratepayers, length of service of elected members and chairmen, number of Board seats (total, per ha and against IDB income);
 - local authorities: average attendance of council representatives and representation relative to special levy contribution; and
 - wider representation: advertisement of meetings and number/type of individuals represented on the Board.
- access to specialist advice: availability of specialist advice from IDBs (including type of advice provided); and
- delivery of wider Government objectives:
 - development of policy statements: response rate of IDBs to deadline of 31 March 2001 (compared with response of local authorities) and number of statements where additional detail was required;
 - access to information: compliance with the Freedom of Information Act 2000 and adoption of ADA's Model Publication Scheme or their own scheme;
 - sustainability: focused on struggles with defining the concept of sustainability rather than indicators, including the absence of a support framework to allow IDBs to link their activities into wider catchment sustainability.

Following completion of the JBA (2006) report, the Water Management Alliance proposed six potential indicators, designed to be straightforward measurements of value for money. These indicators were (Phil Camamile, pers. comm., 2010):

- efficiency:
 - administration costs as a proportion of total spend;
 - drain maintenance cost per linear kilometre of maintained watercourse;
 - pumping station maintenance cost per pumped hectare; and
 - gross costs of capital work as a proportion of total spend.
- effectiveness:
 - number of unplanned flooding evened during the last year; and

- number of biodiversity net gains per hectare.

The proposals included suggestions that the indicators should be voluntary, to develop a benchmarking database using information in the IDB1 form and that IDBS should be encouraged to report on significant deviations from the norm. These indicators were intended for use as a pilot.

In addition, Water Management Alliance suggested an approach that builds upon value-for-money indicators that had been developed by the UK's public sector audit agencies. These cover five core administrative functions (Phil Camamile, pers. comm., 2012):

- finance;
- human resources;
- information and communications technology;
- property management; and
- procurement.

There were (at the time) around 80 indicators of value-for-money split into primary and secondary categories, with the suggestion that IDBs initially pick five of them (once for each of the five core functions). Since the indicator set was to be developed over time, it was also suggested that IDB interests be represented (perhaps through ADA) to ensure they remain appropriate and applicable.

As no action was taken to develop indicators based on these suggestions, the Water Management Alliance has developed four key performance indicators that it uses on an annual basis to measure performance. These are (Phil Camamile, pers. comm., 2010):

- return on staff investment;
- delivery;
- grant funding; and
- reliance on consultants.

The five member IDBs within the Water Management Alliance are scored from 1 to 5 (where 1 is the best) to give an indication of relative overall performance.

Comments from other IDBs (Middle Level Commissioners, pers. comm., 2012) include that there is a need to make others aware of the benefits provided by IDBs and to show how they benefit, rather than identifying who the beneficiaries are (as these are already well-known). Indicators would only be of benefit where they help to publicise IDB operations to a wider audience, which includes those who pay for benefits without realising. It has been suggested that the general public are less likely to be aware of the operations of an IDB where its performance is better (Middle Level Commissioners, pers. comm., 2012).

There may be advantages where identification of benefits assists government to move away from the 'outdated confines' of the Medway Letter. Having methods that provide more modern ways of identifying beneficiaries could, according to the Middle Level Commissioners, help to properly identify the range and extent of areas that could be brought within an IDB, or permit the establishment of a new IDB (Middle Level Commissioners, pers. comm., 2012).

One group of IDBs does not foresee the need for performance indicators, stating that these would be 'time-consuming and bureaucratic, producing little actual benefit and divert attention away from the IDB's main role (Middle Level Commissioners, pers. comm., 2012). They reiterate the difficulties identified in JBA (2006) of comparing IDBs in different areas and of different sizes.

A9.1.2 Indicators proposed and used for and by the UK Public Sector

The Coalition Government's focus is on a drive towards local audits, removing the requirement for centralised inspection and supervision. This resulted in the Local Audit Bill, which was set out in draft legislation on 6 July 2012. It also resulted in the dismantling of the national performance framework, including ending the system of Public Service Agreements set at national level. This had set out a national indicator set for local authorities and local authority partnerships. Its demise reflects the Government's drive towards localism and reflects that development of indicators for IDBs will have to reflect these changes and the responses to them. In particular, the move away from national sets of indicators to locally-derived strategies and goals will need to be an important consideration in the development of indicators for use by IDBs.

Consultation on the draft Local Audit Bill closed on 31 August 2012. Consultation responses on the future of local public audit include a question on reporting of performance (CLG, 2012):

- **Question 30:** Do you think local public bodies should be required to set out their performance and plans in an annual report? If so, why? 57% of responses to this question said 'no', with many feeling that there were better ways to report and that production of an annual report was not a good use of resources.

Although this does not necessarily reflect a disinterest in use of indicators, it does suggest that the majority of public bodies would prefer a move away from this approach. This is supported by CLG (2012a), which sets out the accountability system for local authorities for 2012-13. This identifies that councillors are free to set their own priorities and determine outcomes. CLG (2012a) also states that 'there is no requirement on councils to have a single framework setting out value for money targets or indicators'. However, it goes on to acknowledge that goals are needed for organisations to be effective. Furthermore, councils can be scrutinised by members of the public, which may cover value for money. The proposals for audit also require arrangements to be in place to achieve effectiveness, efficiency and economy. The draft Local Audit Bill includes the same broad scope, with the assessment of value for money intended to be risk-based and proportionate (CLG, 2012).

IDBs are covered by the Local Audit Bill but most will be captured under the proposals for the audit of smaller local public bodies (CLG, 2012b). Smaller local public bodies are defined as those with a turnover of below £6.5 million and will benefit from the following key features (CLG, 2012b):

- a threshold below which smaller local public bodies would not be automatically subject to an external audit, coupled with increased transparency requirements (this is given as £25,000 in the draft Local Audit Bill);
- a proportionate regulatory regime, and the limited assurance form of audit; and
- the option to have auditors procured and appointed by a sector-owned and sector-managed body (or if they choose not to use the sector-led body, they can procure and appoint audit services individually or jointly with the use of an independent auditor panel).

The strengthened transparency arrangements involve a new, mandatory, transparency code for all smaller bodies with a turnover of less than £200,000 (CLG, 2012b). This requires publication of:

- all items of expenditure and end of year accounts;
- minutes, agendas and papers of formal meetings;
- internal audit report;
- list of councillor/board responsibilities (or their equivalent);
- annual governance statement; and
- location of public land and building assets.

It is also recommended that these documents be published online.

Environment Agency (2012) highlights how IDBs should demonstrate that they are providing value for money. This includes (based on Environment Agency, 2012):

- keeping records of inputs and time required for key maintenance and administrative activities;
- records of time against discrete activities by all staff directly and indirectly employed by a Board;
- developing specifications for indicative resource inputs for tasks accounting for at least 25% of expenditure on maintenance or administration; and
- obtaining occasional competitive quotes from internal and external suppliers for a proportion of the work undertaken each year, or comparison against market rates.

To replace the national performance framework and reflect the move to self-driven local government performance management, the Local Government Association has published the Local Government (LG) Inform prototype. This allows anyone in the public sector to access, compare and analyse data on performance, and present their findings. The aim is to provide individual councils with tools to help them manage their performance and to deliver improvements. The LG Inform site is being developed over time and will provide a way to help local authorities to present data to the public in clear, helpful terms. The development of indicators for IDBs will need to follow the same principles. The prototype is open to suggestion for future developments and it may be appropriate to assess whether this offers opportunities for IDBs.

A9.2 Use of indicators in other countries

Indicators are used internationally in a variety of shapes and numbers. A comprehensive bibliography of irrigation and drainage performance indicators is provided by the International Water Management Institute (Burton & Molden, 2005). However, it is not always easy to find indicators within the remit of activities conducted by the UK IDBs. Some transferable examples are given below.

The US River Basin Organisations (RBO), for instance, have developed a long-list of indicators to evaluate integrated river management (Hooper, B, 2006). The 115 indicators are grouped into 10 categories, which include responsive decision making, financial sustainability; training and capacity building; information and research; and accountability and monitoring, among others. The application of general indicators to specific conditions depends on the institutional context of the basin setting where they will be applied. Thus, no basin is a 'greenfield' setting for performance indicator application. The solution is to apply different indicators according to the stage of the RBO development. In any basin setting, RBO managers will identify and apply relevant indicators depending on current practices and level of organisation. Examples of indicator selection are provided in Table A9.1.

Table A9.1: US River Basin Organisations Indicators under different Programmes			
Programme	Objective	Indicators	Data sets
Irrigated Regions Management	Improve efficiency and effectiveness of irrigated water use	Water use efficiency	Water use data
	Matching new and current land use and land management practices to land sustainability and capability	Land use compatibility	Land use change data matched with land capability/sustainability mapping
	Maintaining and enhancing the sustainable productive capacity of the land resource by reducing degradation	Extent of salinized land	Salinity maps
Dryland Regions Management	Matching new and current land use and land management practices to land suitability and capability	Land use compatibility	Land use change data matched with land capability/suitability mapping
	Maintaining and enhancing the sustainable	Extent of salinized land	Salinity maps

Table A9.1: US River Basin Organisations Indicators under different Programmes			
Programme	Objective	Indicators	Data sets
	productive capacity of the land resource by reducing degradation		
	Maintaining and expanding perennial vegetation cover	Extent and degree of land cover	Land cover maps
Riverine Environment Management	Improving planning support for sustainable use of floodplains, wetlands and rivers	Extent and effective use of planning mechanisms	Local and State Government planning instruments
	Maintaining and enhancing the use of floodplain, wetland and riverine flora and fauna	Health of vegetation indicators	Land use data

There are a number of advantages in allowing self-assessment and indicator selection. For instance, it creates greater ownership of the state of best practice in the basin organization based on intimate knowledge of the basin and the basin organization strengths and weaknesses and knowledge of the resources available to remedy faults and build on successes. On the other hand, it may fail to capture the 'bigger picture' of national and state agendas in natural resources management, depending on who is involved, it may not represent all stakeholder interests and finally it can be more easily manipulated by vested interests.

In Australia, industry statistics and benchmarking data is provided by the Australian National Committee on Irrigation and Drainage. Their 2005/2006 benchmarking project included a total of 69 indicators (ANCID, 2007). They are grouped under 6 headings, including environmental, financial and social indicators. The different indicators are supported by statistics and aim to answer 19 questions. Some examples are given in Table A9.2.

Table A9.2: Australian National Committee on Irrigation and Drainage Benchmarking Sample Indicators		
Heading	Sub-heading	Indicator
Environmental indicators		
Sustainability of Irrigation in the Local Landscape	Land and Water Resource Management Requirements in Business Operation	Is the business operating in accordance with a Land and Water Management Plan? Is the business operating in accordance with an Environmental Management System? Is the whole irrigation area ISO 14001 accredited or progressing towards accreditation?
	Sustainable Irrigation Management Practices	The proportion of water supplied to the farm gate which is recycled
Operational indicators		
Water Delivery System Control		The proportion and number of the regulating structures in the supply system that are remotely controlled or automated
Water access arrangements		
System reliability		The level of water supply reliability provided by high and low reliability

Table A9.2: Australian National Committee on Irrigation and Drainage Benchmarking Sample Indicators		
Heading	Sub-heading	Indicator
		irrigation water delivered by the business in its headworks
Social		
Provision of Recreational Facilities for the Community		Does your business provide recreational facilities? Do you have a recreational Advisory Committee? Who are the key interest groups represented on the Advisory Committee? How is the costs of providing recreational facilities met?

Drainage regions in Canada use a unique freshwater quality indicator (WQI) (Environment Canada, 2012). The WQI provides an overall measure of the ability of freshwater bodies to support aquatic life at selected monitoring stations across Canada. It is a water quality guideline-driven tool used to distill large amounts of water quality data at a monitoring station into a single index. The WQI only assesses the quality of surface waters. Groundwater quality is not considered in this indicator. The WQI allows flexibility in the selection of parameters and guidelines. This flexibility allows local and regional water quality concerns to be reflected in the indicator although it makes comparisons among jurisdictions more difficult. The WQI does not directly measure biological integrity; it measures if physical and chemical characteristics of freshwaters are acceptable for aquatic life.

In France, indicators have been developed for water services and sanitation by Eau France (www.eaufrance.fr). The aim of the indicators is to enable comparisons over different years and give a picture of the water management at the national scale. They also aim to provide factual information that can be used to help future political decisions. Development of the indicators is on-going, so there is no information as yet as to whether these aims have been achieved. Tables A9.3 to A9.5 present the indicators proposed for different elements of the water sector.

Table A9.3: Indicators referring to drinking water services
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Type of indicator	Description of the indicator
Subscribers	Estimate of the population served
Subscribers	Cubic meter price (average on 120 cubic meters)
Subscribers	Maximal period of time new subscribers (with a working connection) are expected to wait before supply of water
Water quality	Compliance rate of the analysed samples (microbiological limits)
Water quality	Compliance rate of the analysed samples (physicochemical limits)
Distribution network	Knowledge and asset management of the drinking water distribution network
Distribution network	Efficiency of the distribution network
Distribution network	Volumes used by the distribution network
Distribution network	Meantime between the renewal of the distribution network
Water quality	Protection of the water resources
Subscribers	Occurrence rates of unexpected service interruption
Subscribers	Compliance rate with the maximal period of time new subscribers are expected to wait
Financial management	Amounts of write-offs
Financial management	Rate of unpaid bills for the previous year
Subscribers	Complaints rate
<i>Source: Eau France</i>	

Table A9.4: Indicators referring to collective water sanitation	
Type of indicator	Description of the indicator
Subscribers	Estimate of the number of people served by a waste water collection network
Network	Number of authorisation for discharge of effluent
Sludge	Amount of sludge generated by purification plants
Subscribers	Cubic meter price (average on 120 cubic meters)
Subscribers	Rate of buildings covered by a sanitation network
Network	Knowledge and asset management of the waste water network
Collection	Compliance with urban waste water treatment Directive (91/271/EEC)
Purification	Compliance of purification equipment with national regulations
Sludge	Compliance rate of the disposal of generated sludge with the Directive
Financial management	Amounts of write-offs

Table A9.4: Indicators referring to collective water sanitation	
Type of indicator	Description of the indicator
Subscribers	Overflow rates of effluents in users' premises
Network	Number of sections requiring a frequent maintenance (per 100 km)
Network	Renewal rate of the waste water collection network
Purification	Compliance of the purification equipment with requirements
Collection	Knowledge of the discharge being made to the environment
Financial management	Number of years of debts resulting from the investment in the waste water system
Financial management	Rate of unpaid bills for the previous year
Subscribers	Complaints rate
<i>Source: Eau France</i>	

Table A9.5: Indicators referring to non-collective water sanitation	
Type of indicator	Description of the indicator
Service	Estimate of the number of people served by a waste water collection network
Service	Implementation rate of the non-collective water sanitation system
Compliance	Compliance rate
<i>Source: Eau France</i>	

In the Netherlands, the Dutch Association of Water Boards creates benchmarks for its members on the efficiency and effectiveness of wastewater treatment. The initial benchmarking project had two main objectives (Arthur Anderson & Vertis, 2001 in Tillema, 2006):

- demonstration of accountability to the water boards' stakeholders (including member of the governing bodies, citizens, businesses and the municipal authorities); and
- identification of ways to improve business processes.

There was also an implicit objective, which was to gain legitimacy for the sector as whole (Tillema, 2006).

The approach developed was based on an adapted version of the balanced scorecard with four perspectives of (Tillema, 2006):

- operating;
- financial;
- environmental; and
- innovative.

The four perspectives include eleven major indicators and a large number of other performance indicators (up to 77) (Admiraal & van Helden, 2003). The eleven major indicators include (Admiraal & van Helden 2003):

- operating:
 - purification performance;
 - meeting transportation requirements; and
 - meeting treatment requirements.
- environmental perspective:
 - nitrate removal above the statutory requirement;
 - phosphate removal above the statutory requirement; and
 - environmental conscious score.
- finance:
 - levies (tariff per pollution unit); and
 - total cost of purification (per pollution unit).
- innovative:
 - number of co-operation projects;
 - number of new services; and
 - jury rating of technological innovation.

The Urban drainage benchmark 2010 is based on a web based collection of characteristics of the municipal sewer systems and the municipal organisations using 2009 data (Oosterom & Langeveld, 2011). Examples of Key Performance Indicators in the Urban Drainage Benchmark include:

- physical: length of sewer mains per type, number of connections, number of pumping stations, etc.;
- economical and financial: total cost, operational costs, investments, revenues (such as sewer taxes);

- service level: number of complaints, number of blockages, number of pump failures, average downtime;
- environmental: status of CSO abatement measures;
- personnel: number of staff, contract form; and
- operational: amount of sewer cleaning, amount of sewer inspection, amount of renovation, amount of replacement, number of repairs.

Some of the above indicators such as the financial and service level related indicators are applicable to most organisations. Indeed similar indicators have been already used in previous reviews for the appreciation of the efficiency of IDBs such as administration costs, maintenance costs, cost of capital schemes, information request, etc. (Defra, 2006).

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Annex 10: Benchmarking

Benchmarking is defined by Spendolini (1992 in Tillema, 2006) as '*a continuous, systematic process for measuring, comparing, evaluating and understanding the products, services, functions and work processes of organisations...for the purpose of organisational improvement*'. Benchmarking for public sector bodies is different from that for private sector bodies, not least because there is a need to (Tillema, 2006):

- meet external requirements to provide comparative data;
- demonstrate or increase accountability to the public;
- justify or defend existing performance; and
- prove that the organisation compares well against alternative sector providers,

Benchmarking can be particularly useful for public sector bodies where there is a lack of market signals about success or failure. In such situations, benchmarking can provide an impression of relative performance. The results can be used to develop and implement plans to close performance gaps. At the same time though, benchmarking can be viewed as a method to demonstrate good performance, with public sector bodies focusing on factors that can be used to explain why the organisation is not to blame for lower levels of performance, rather than using the result to improve performance (Tillema, 2006).

Table A11.1: Comparison of theoretical issues with result of benchmarking for the Dutch Water Boards (based on Tillema, 2006)				
Issue	Ambitious board	Satisfied board	Dissatisfied board	Resistant board

Table A11.1: Comparison of theoretical issues with result of benchmarking for the Dutch Water Boards (based on Tillema, 2006)				
Issue	Ambitious board	Satisfied board	Dissatisfied board	Resistant board
Public sector bodies are less motivated to use benchmarking information because they are less subject to market incentives for performance improvements	This board did not question the importance of bridging the performance gaps revealed by benchmarking	This board did not question the importance of bridging the performance gaps revealed by benchmarking	This board did not explicitly aim to improve its future benchmarking scores as performance in absolute terms is more important than performance compared with other organisations, but that the results could be used to judge the appropriateness of its performance targets in absolute terms. This resulted in the board speeding up the implementation of planned performance improvement actions (it effectively used the results as a substitute for market signals)	This board argued that performance in absolute terms is more important than performance compared with other organisations so it did not see the need to conform or improve to the level of 'better' performing boards
Public sector bodies limited exposure to economic markets might help them to consult each other to gather information that can be used to close performance gaps	This board was surprised that no other board had contacted it to learn about its business processes (as these formed the basis for its excellent results)	No consultation or discussion undertaken (this is surprising given their interconnectedness such that the barriers to information exchange are not high). This may be because the boards were hesitant about imitating where they did not regard benchmarking as a low cost means of learning and innovating		
Public sector bodies may be less autonomous and less flexible when developing and implementing action plans	No information given	This board discussed whether it could continue undertaking certain activities that had had a positive impact on its performance (due to concerns about competing with for-profit organisations and the risks involved)	No information given	No information given

Table A11.1: Comparison of theoretical issues with result of benchmarking for the Dutch Water Boards (based on Tillema, 2006)				
Issue	Ambitious board	Satisfied board	Dissatisfied board	Resistant board
Public sector bodies may need more time to take decisions on action plans due to the influence of various stakeholders	There was no evidence that involvement of stakeholders slowed own or impeded decision-making processes. Most decisions were initiated by staff members and the influence of stakeholders was limited, although the boards did pay considerable attention to stakeholder interests when taking decisions. The governing bodies exerted pressure to develop and implement action plans, but their influence on the content of plans was limited. All four boards took 'safe' performance improvement activities (actions that improved their current way of operating), rather than more radical changes.			
Public sector bodies have to make their benchmarking scores public and do may use them as a means to defend rather than improve performance	This board did not show defensive behaviour. Instead, it was disappointed that stakeholders and the media paid little attention to the results. There was no stakeholder pressure to initiate performance improvement	This board did not show defensive behaviour	This board did not show defensive behaviour. There was no stakeholder pressure to initiate performance improvement despite its poor scores	This board's first response to the results was to arrange a press conference to explain its disappointing scores. After this, the scores were disregarded suggesting that once they had explained their scores, they were no longer convinced of the need to use the results to improve performance. The board was surprised that stakeholders did not use the results to exert pressure to improve performance
Public sector bodies often have many objectives resulting in power structures and negotiation affecting the content and implementation of action plans	This board had very clear ideas about their main objectives, with little disagreement amongst stakeholders on the relative importance of the different objectives. They were clear as to how the results should be used	This board had very clear ideas about their main objectives, with little disagreement amongst stakeholders on the relative importance of the different objectives. They were clear as to how the results should be used	This board found that there was disagreement about the relative importance of different aspects of performance. This meant that the biggest current issues took priority, with little attention to likely future issues. The disagreement also hindered quick implementation of proposed actions	This board argued that actions and environmentally friendly behaviour are more important than the paper work needed for implementation of an auditing instrument, postponing implementation by referring to practical issues and other commitments

The conclusions drawn by Tillema (2006) include that public sector bodies may have

The location of public sector bodies and their lower level of autonomy (than private sector organisations due to oversight bodies, governing bodies, political and other

interests and public opinion) can affect both the process of benchmarking (comparison of relative performance) and use of the results. This could include a smaller set of actions that could be implemented to reduce performance gaps (Tillema, 2006) or factors that are outside the control of the public sector body (such as level of deprivation in the local area, geographical constraints or transport links).

In an assessment of the results of a benchmarking approach by the Dutch Water Boards, Tillema (2006) chose four case studies to assess the actions taken by Water Boards. Four case studies were chosen:

- two active water boards: these had developed and implemented action plans in response to the benchmarking results; and
- two passive water boards: these had made little if any use of the benchmarking results in terms of developing action plans.

The results of the research found large differences between the four water boards, such that they were grouped into four generic 'types'. Understanding of these types enabled Tillema (2006) to explore why public sectors organisations may or more not use benchmarking results. Figure A10.1 summarises the main differences between the four types of water board (based on Tillema, 2006).

Active	Passive
<p><i>Ambitious water board</i></p> <p>Benchmarking information used as water board aspires to be among the best performing water boards.</p>	<p><i>Satisfied water board</i></p> <p>Further performance improvements based on the benchmarking results would have been inconsistent with the water board's low-cost strategy.</p>
<p><i>Dissatisfied water board</i></p> <p>Unexpectedly poor benchmarking results urged the water board to use the benchmarking information.</p>	<p><i>Resistant water board</i></p> <p>Benchmarking information was hardly used, due to practical issues and the water board's aversion to the project. The board also used the results to defend rather than improve performance</p>

Figure A10.1: Breakdown of Types of Water Board by response to Benchmarking Results

Table A10.1 examines how some of the theoretical issues that were expected to be seen following benchmarking were (or were not) experienced by the sample of Dutch Water Boards.

The conclusions drawn by Tillema (2006) include that public sector bodies may have difficulties gathering information about business processes, and hence with imitating these processes. As a result, they may not be able to realise the full potential of benchmarking, especially where clear market signals are missing. Where this is the case, it may be necessary to consider institutionalising the imitation process, so co-operation becomes embedded in performance measurement and analysis but also in performance improvement. This could include actions such as (based on Tillema, 2006):

- discussions amongst organisations on business processes that underlie better benchmarking scores;
- development of a benchmarking culture, which involves:
 - an eagerness to learn from others;
 - an openness in exchanging information; and
 - a willingness to adopt or adapt ideas developed elsewhere.
- reduction of the level to which staff member identify themselves with the organisation's current performance, so they are less likely to focus on defending their performance rather than improving it; and
- development of clear strategies, through strong management, that balance the various objectives.

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