The Value of Water Level Management

Economy

ada

Introduction

Foreword from the Chairman

A strong and healthy economy underpins prosperity and the ability to improve living standards. This report shows how much our economy and food supply depends on water level management (both below and above ground level). Pressures from a growing population and climate change can only increase this dependency.

Vital components of our economy rely on the work of Internal Drainage Boards (IDBs) and other flood risk management organisations. These components include electricity and oil supply, transport systems and the ports that link us to global export markets.

Our food security is underpinned by effective water level management, both ensuring that our best agricultural land continues to produce the food we need and to keep open the transport links that bring the food to us.

The food processing industry, which accounts for over a sixth of the whole manufacturing sector, gets most of its raw materials from British farmers. Many of the factories and farms are in areas where IDBs or others manage the water levels.

And we must not forget that the environment maintained by IDBs provides essential ecosystem services as well as supporting a thriving tourist industry.

ADA and the Internal Drainage Boards will play their necessary role in keeping our economy growing, by helping industry and farmers produce the goods and food we need, by helping to keep transport networks connected, all within a high quality environment.

Henry Cator OBE DL FRICS FRAgS

Chairman

Association of Drainage Authorities

Roger Venables

Introduction

About this report

This report is the third in a series of reports highlighting the value of water level management in England and Wales. The first report focused on the value of water level management to electricity supply, revealing that 53% of installed capacity of major power stations in England and Wales are situated within an IDB, while the second concentrated on the transportation network, explaining that water level management, particularly in Yorkshire and the East of England enables both road and rail to keep moving.

About ADA

The Association of Drainage Authorities (ADA) is the membership organisation for water level management organisations in the United Kingdom.

Our members include IDBs, the Environment Agency, Regional Flood & Coastal Committees (RFCCs), Flood Risk Management Wales and the Northern Ireland Rivers Agency. Associate Members include local authorities, consultants, contractors and suppliers. ADA was established in 1937 to watch over and support the interests of drainage authorities at a national and parliamentary level, provide a forum for the exchange of ideas and discussions, and disseminate information of common interest.

ADA is recognised as the national representative of the IDBs in England and Wales.

Phil Brewin

Figure 1: Geographical Distribution of IDDs in England and Wales

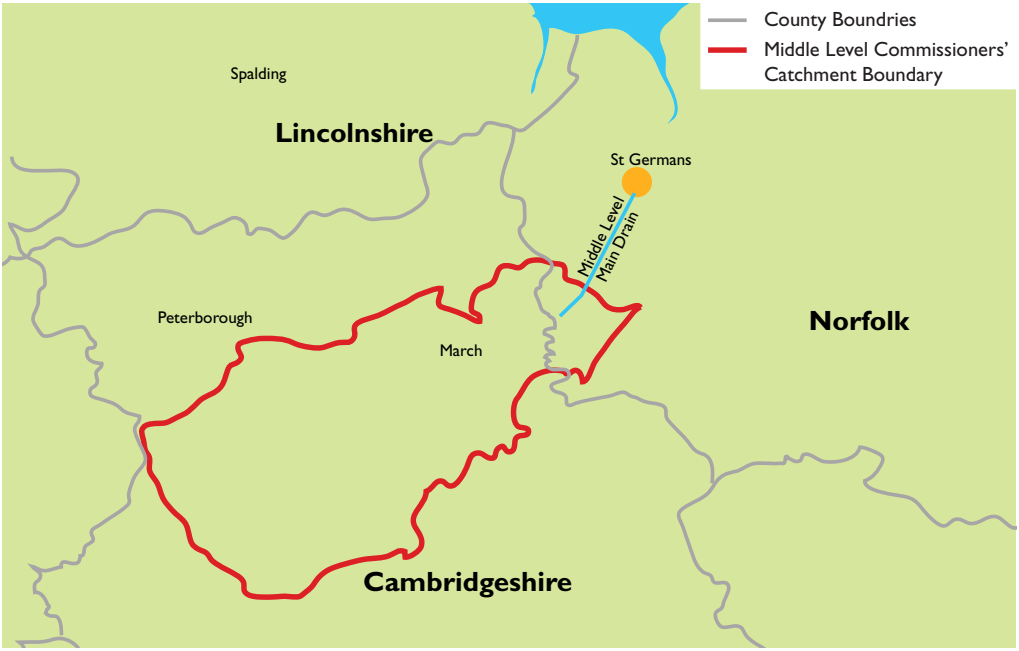


Figure 2: Middle Level catchment boundary, showing the location of St Germans pumping station.

Water Level Management

About water level management

Water level management is the close management of water levels in watercourses and under ground for the purpose of reducing waterlogging and the risk from flooding, and for the sustaining of land uses and the environment.

Low lying areas of England and Wales particularly require the daily close attention of specialist local water level management bodies to actively manage and reduce waterlogging and the risk of flooding. Internal Drainage Districts (IDDs) across England and Wales can be used as an effective proxy for areas where careful water level management is required, as Figures 1 and 2 illustrate. However, it should be noted that there are no longer IDDs in Cumbria, Essex, Lancashire, Northumbria and the Thames catchment.

About Internal Drainage Boards

Internal Drainage Boards (IDBs) are statutory local public bodies in areas of special drainage need in England and Wales, which undertake works to reduce flood risk and manage water levels on behalf of their community. They carefully manage water levels within their IDDs for land drainage, flood risk management, irrigation and environmental benefit.

IDBs cover 9.7% of the land area of England and 1.4% of Wales' land area. They are geographically concentrated in the Broads and Fens of East Anglia, the Somerset Levels, Kent, Nottinghamshire and Yorkshire, where there are extensive areas of low-lying land. The actions of IDBs contribute to the rural and national economy by ensuring the security of communities and productivity of agricultural land within their districts and the viability of local businesses including tourism as well as major sectors of the economy such as food processing.

Managing flood risk

IDBs play a very important part in flood risk management, which has a substantial benefit to the economy. Management of water levels has reduced flood risk to a large number of people and businesses in IDB areas (almost 10% the area of England). Currently IDB activities protect over 900,000 people and 6,000,000 commercial and residential properties, and infrastructure such as roads, railways, electricity distribution, and water treatment and sewage works. Many IDB activities have societal benefits to areas beyond IDB boundaries, for instance in reducing flood risk to urban areas. IDB activity has ensured that the 53% of the UK's total installed electricity generating capacity within IDB areas has continued to function under recent extreme conditions, and significant transport links have remained open.

Case Study: St Germans Pumping Station

The St Germans Pumping Station near the village of Wiggenhall St Germans in Norfolk is the largest in the UK and one of the largest in Europe. It drains the largest single pumped drainage catchment in Britain, some 700km^2 of Fens land (see Figure 2). It provides flood protection to more than 25,000 properties and 100,000 people as well as extensive areas of high-grade agricultural land worth £3.6bn to the south-west of Kings Lynn, all of which totally depend on the timely and reliable operation of the station.

The original pumping station, built in 1934, was pushed to its limits in 1988 when it pumped at full capacity for over 50 hours straight. If there had been a mechanical failure of one or more pumps then the consequences would have been catastrophic. The new £38m replacement pumping station was opened in 2011, with a 40% increased capacity giving it the ability to pump 100 cumecs. This would be equivalent to pumping five Olympic swimming pools every two minutes! The new pumping station also complements its environment and has won several design awards.

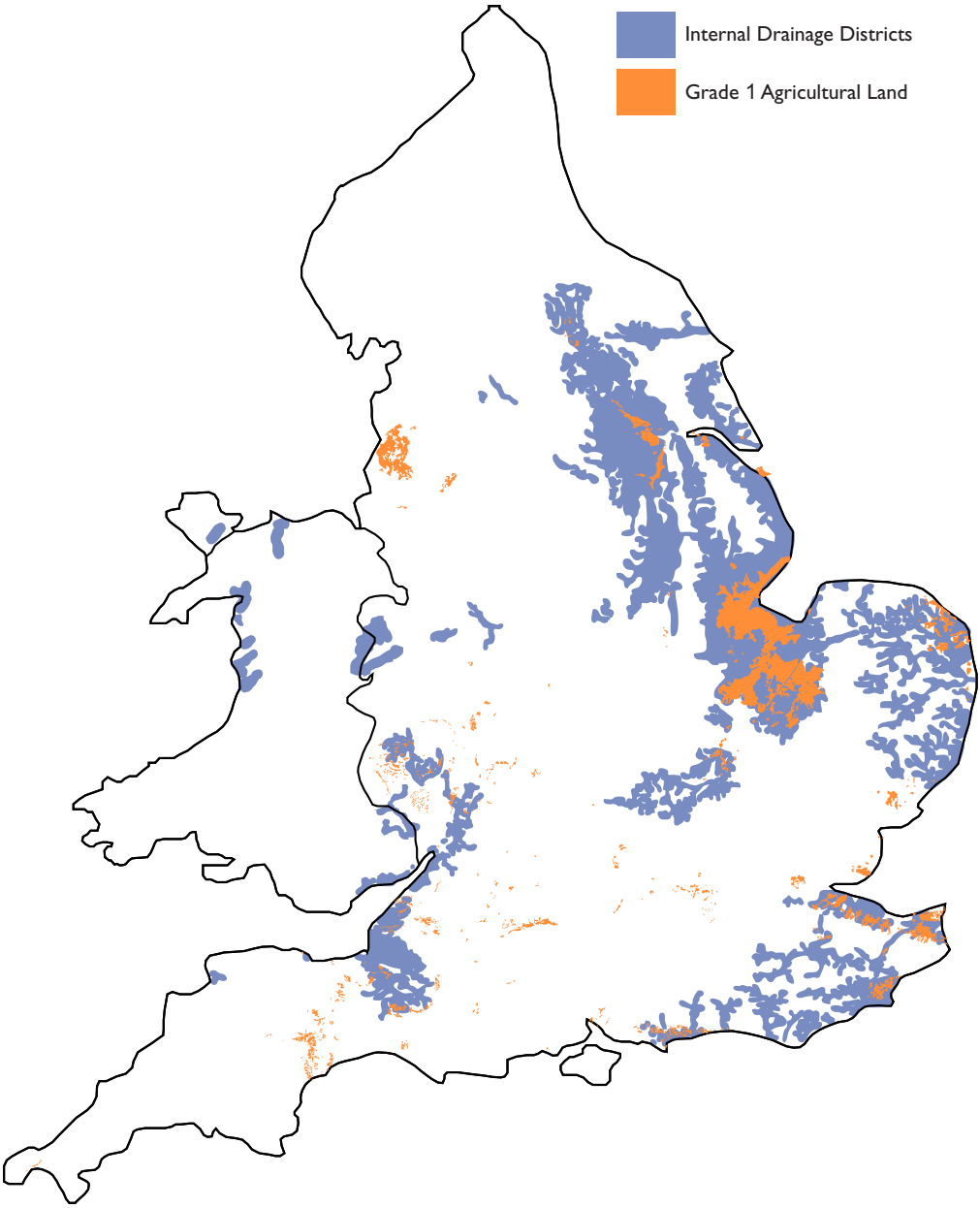


Figure 3: Geographical Distribution of Grade 1 agricultural land and Internal Drainage Districts in England and Wales

Farming and food

There are approximately 50,000 farms or land-holdings within IDB districts in England & Wales growing crops and raising livestock for food. The service provided by IDBs underpins the food production of the majority in the most valuable and productive land in the UK, with over 64% of Grade 1 agricultural land in England situated within IDBs (more than 85% of Grade 1 agricultural land in the North East and Anglian regions is situated in an IDB district, as shown in Figure 3). Water level management by IDBs is an essential component to continuing the food security of the UK.

A significant proportion of England's total agricultural production is from IDB districts. In 2010, about 20% of English arable production was from land in or close to areas managed by IDBs.

IDBs are crucial for food security. In the current global market, food security is a complex issue. However self-sufficiency is an important aspect. Current UK self-sufficiency in food, about 60% for all foods and 70% for indigenous food, is relatively high compared to the first half of the twentieth century, and we are now more self-sufficient than we were in the 1930s or 1950s as yields have been increasing. The total UK agricultural land has fallen by around 2% over the past 20 years, but cereal yields have risen by about 15% over the same period. Without the work of IDBs in maintaining water levels in the majority of our best agricultural land to prevent waterlogging or drought, self-sufficiency would fall significantly, making us far more reliant on imported food and having a significant impact on the food processing industry – the largest manufacturing sector in our economy.

Food related business

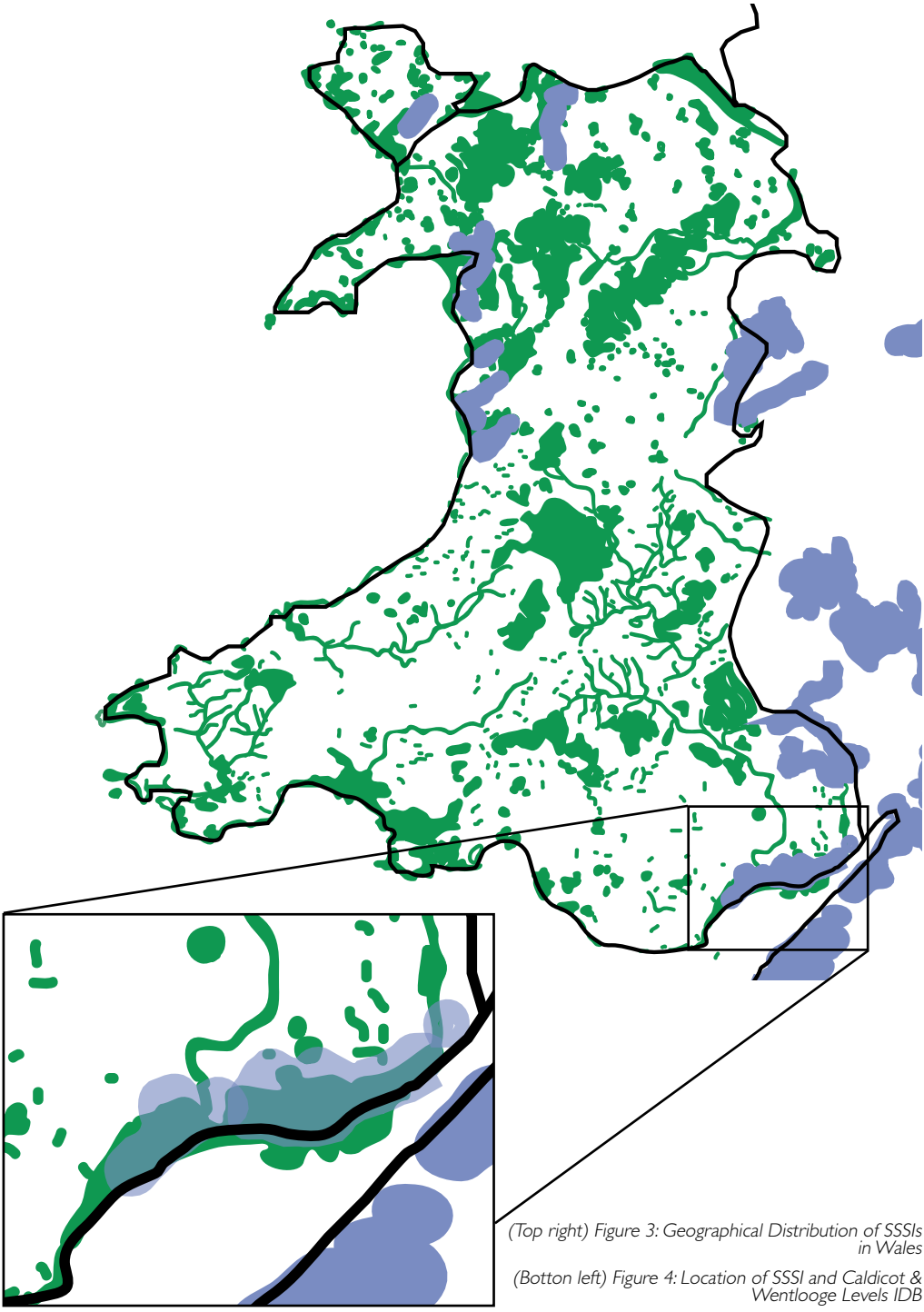
The food and drink manufacturing industry is the single largest manufacturing sector in the UK, with a turnover of £76bn and gross value added of £20.6bn, accounting for 16% of the total manufacturing sector. The industry employs up to 400,000 workers. This represents 15% of the overall manufacturing workforce in the UK. The industry is a key partner for British farmers: buying two thirds of all the UK's agricultural produce. Not only does this key industry rely on the productivity of agricultural land maintained by IDBs, but many food processing factories are in IDB areas partly due to the close relationship between food processing and the agricultural sources of its raw materials. Therefore many food processing factories are reliant on IDB services to protect them and the transport links they rely on from waterlogging and flooding. In the East of England both agriculture and food processing are important sectors of the regional economy. Food processing and distribution generate around 5% of regional GDP and 39,000 jobs. In the Cambridge and Lincolnshire fens, an area with a high concentration of IDBs, a food processing cluster of 450 companies, provides 12,000 jobs and £500 million of added value to the region.

Case study – British Sugar

The UK sugar beet industry makes a total economic contribution of around £800 million each year and is competitive on the global stage with international sugar economists LMC (a leading independent economic and business consultancy for the agribusiness sector) ranking it as the world's most competitive sugar beet industry. Much of the UK's domestic sugar beet crop, and a significant part of the food processing industry, is located in South Lincolnshire, East Northants and Eastern Counties. This generates 52,000 jobs regionally. Four factories alone located in Newark, Wissington, Bury St Edmunds and Cantley process 7.5 million tonnes of beet annually and produce 2.3 million tonnes of products.


British Sugar

Much of the sugar beet that goes into these factories is grown on land that depends for its productivity on IDB work to manage water levels. In addition, three of the four key factories benefit directly from the work of IDBs managing water levels. The Cantley factory is in the Broads IDB area, the Wissington factory is on the River Wissey, which is managed by the Stoke Ferry IDB, and the Newark factory is on the edge of the Upper Witham IDB area.



(Top right) Figure 3: Geographical Distribution of SSSIs in Wales

(Botton left) Figure 4: Location of SSSI and Caldicot & Wentlooge Levels IDB

The environment

The water level management provided by IDBs plays a significant part in maintaining the quality of local environments and key habitats, which make an important economic contribution through supply of ecosystem services. Wetlands, water meadows and peatlands depend on careful management of water levels, keeping groundwater levels within controlled ranges to stop them becoming too wet or too dry. This is important for maintaining biodiversity, but it is also vital for tourism which depends on the quality of the local environment. Many agri-environmental schemes, (voluntary agreements that pay farmers and other land managers to manage their land in an environmentally friendly way, and apply to around 66% of agricultural land in England), depend for their success on IDB services.


Bumblebee Conservation Trust

IDBs conduct their work in accordance with a number of environmental duties, and aim to promote sustainability and the ecological wellbeing within their districts. Every IDB has its own Biodiversity Action Plan and strives to maintain watercourses as sympathetically as possible. They have a specific duty to further the conservation and enhancement of all designated environmental sites within their districts, including 398 SSSIs.

Case study – SSSIs in IDBs

The Gwent Levels, managed by the Caldicot & Wentlooge Levels IDB, comprise the low-lying land between Cardiff and Chepstow, sandwiched between the Severn Estuary and the valleys of Wales. A network of ditches drain the land, which which is an example of one of the most extensive areas of reclaimed wet pasture in Great Britain and the largest area of its kind in Wales.

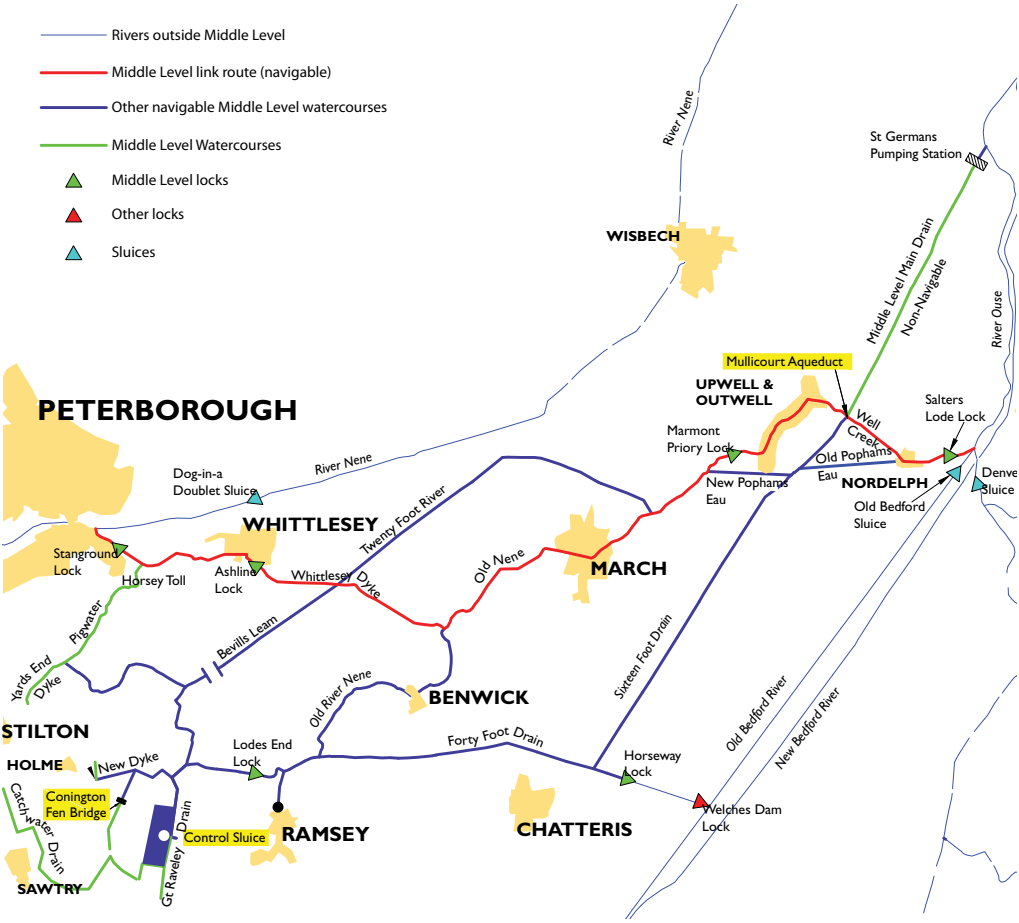
Many of the Gwent Levels ditches are rich in both plant and animal life, some of which are rare or very scarce. The variety of ditch management ensures the survival of these important species. Otters are widespread (though rarely seen) and some of the ditches are home to Britain's smallest flowering plant, the rare Rootless Duckweed. Dragonflies are abundant including the scarce Hairy Dragonfly. Because of this abundance of rare species and habitats, seven SSSIs are located within the Board's area – totalling over 6000 hectares – over 50% of the Board's total area.

As well as their importance for conserving habitats and biodiversity, the SSSIs are also important for the local tourist industry. Important wildlife sites on the Gwent Levels include The Newport Wetlands and Magor Marsh.


Tony Pickup

The Newport Wetlands is run by Natural Resources Wales in partnership with Newport City Council and the RSPB. It has over 100 acres of reed beds and nearly 1000 acres of wet grassland and supports nationally important bird populations.

Magor Marsh is a 64-acre reserve run by the Gwent Wildlife Trust and is one of the few areas of natural peat left on the Gwent Levels. Its ancient ditch systems and its water levels are carefully managed to maintain its important populations of plants, insects and birds.



Cliff Carson

Top: Figure 5: Middle Level Navigation network
Bottom: Figure 6: Narrowboats on the Middle Level Navigation

Tourism

Tourism is important to the rural economy (accounting for 12.6% of employment in rural areas in 2009/10). According to a Natural England survey, in 2011-12 there were 1.41 billion visits by the adult population to the rural environment. Water level management underpins tourism in IDB areas, maintaining the landscapes that people come to enjoy, the rural infrastructure (such as cycle routes and waterways) that they use and the habitats that support the birds and wildlife they come to see.

Bird watching and boating holidays are particularly dependent on the services of IDBs and many specific tourist sites are also in Internal Drainage Districts across the country.

Case study – Tourism in Somerset Moors and Levels

The Somerset Moors and Levels is the largest area of lowland wet grassland and wetland habitats in Britain covering 65,000 hectares (250 square miles) between the Mendip and Quantock Hills. It is a man-made landscape comprising inland peat wetland 'moors' and low-lying coastal clay 'levels' that has evolved over 4000 years of human management. It is dependant on its continuing existence and survival on the activities of the Somerset Drainage Board Consortium that manages the two drainage boards in Somerset, the Axe Brue IDB and Parrett IDB, which predominantly carry out water level management in the Somerset Moors and Levels.

The Somerset Moors and Levels area has international status as one of the most important 'wetland' areas of its type in the world. It is internationally important for migrating birds, such as lapwing, and for breeding waders, making it a Special Protection Area (and Ramsar Site). In the winter, over 80,000 water birds gather across the area. It provides significant habitat for otters and many other rare species, including unusual dragonflies, damselflies, water beetles, crickets and grasshoppers. Both the land and water are special with 22 butterfly species depending on the flower meadows, while the main ditches provide one of the last major habitats for species which lived in England's vanished original marshland.

The Somerset Moors and Levels is a major tourist destination. It is estimated to account for over a third of the £1.16bn that tourism contributes to Somerset's economy and around a third of the over 31,000 jobs in Somerset related to tourism. People come for birdwatching and the wildlife, and also because the relative flatness of the Moors and Levels make the area ideal for outdoor recreation including horse riding, walking and cycling. The tourism industry is supported by a variety of local fare, an established willow industry and arts and crafts that have all developed because of the special landscape, flora and fauna of the moors and levels.

Major attractions for birdwatchers include the Westhay Moors, with millions of starlings arriving to roost amongst the wetland reeds beds, and the RSPB nature reserves at Greylake, Ham Wall and West Sedgemoor, which host a huge variety of birds.

For cycling enthusiasts, there are circular routes of between 22 and 28 miles in length, including The Withy Way, Isle Valley, Avalon Marshes and Peat Moor Routes, and there are also four circular rides around Sedgemoor. Route 3 (The West Country Way, connecting Cornwall to Bristol) and Route 33 of the Sustrans National Cycle Network cross the area and connect to local routes.

Case study – Tourism: boating in the Fens

The Middle Level Commissioners (MLC) provides flood defence and water level management to the Middle Level area of the Cambridge Fens, and is the navigation authority for the navigable waters of the Middle Level system. MLC is the fourth largest navigation authority in the United Kingdom and is responsible for approximately 160 kilometres (100 miles) of statutory navigation and the operation of six navigation locks. The Nene-Ouse Navigation Link forms part of the Middle Level Navigation. The Link is at present the only connection between the Great Ouse and the Main Canal Network. During a normal summer, over 1,000 passages of the Link are made by pleasure craft (see Figure 6).

Local business, employment and trade

Top: Figure 7: Location of oil refineries and ports in around Immingham
Centre: Figure 8: Total Lindsey Oil Refinary
Bottom: Figure 9: Immingham Port

Local business, employment and trade

Local businesses and employment

IDBs provide employment and buy services from local businesses. Every year, IDBs spend almost all of their £60m combined total income locally. Local businesses also supply services to industries such as farming, food processing and tourism which rely on IDB services.

The viability and success of local businesses in the 9.7% of England and 1.4% of Wales managed by IDBs depends on the services that IDBs provide. The transport links that bring in raw materials and take goods to markets rely on management of water levels to keep them open. The generation of electricity and its transmission to businesses is assured by IDB water level management. IDB management of water levels also reduces the risk of flooding to local businesses and the housing of their employees.

Trade

The activities of IDBs are important in safeguarding routes for UK imports and exports. Major East Coast ports such as Immingham, Grimsby and Hull which are conduits for large volumes of the UK's imports and exports (about 13% of UK freight) and parts of the Medway ports complex (which handles about 3% of UK freight) would be effectively cut off from the rest of the country without the intervention of IDBs to keep their transport links operating. Many other smaller but locally important ports such as King's Lynn, Great Yarmouth and Ramsgate also rely on IDBs to keep them connected to their hinterlands. In addition, the safety and continuing operation of infrastructure in many ports benefits from the activity of IDBs to manage flood risk.

Case study – Immingham and Grimsby

Grimsby and Immingham combine to form the UK's largest port by tonnage, handling up to 55 million tonnes of cargo each year. They are located within the drainage district managed by the North East Lindsey IDB and their main land access routes, the M180/A180 and A1/A1M and railway lines (Immingham handles more than 260 rail freight movements a week), run through areas where flood risk is managed by North East Lindsey and other IDBs.

Grimsby retains strong traditional connections to the fishing and food industry, but now its major focus is on importing cars. More than 600,000 vehicles are imported through Grimsby each year, and the port is about to embark on a £25 million investment in the development of the Grimsby Riverside Terminal in order to handle the largest car carriers in operation.

Immingham is predominantly a bulk port – and the UK's premier energy port, handling oil and petrochemicals, coal, iron ore, and renewable fuels for industry. However, Immingham is also home to a network of ferry services connected to Northern Europe and Scandinavia by more than 30 roll-on/roll-off (roro) freight sailings each week to ports ranging from Rotterdam to Gothenburg. These services complement the ferry services which are available from Hull and Goole in order to give UK importers and exporters unparalleled access to North Europe, Scandinavia, and Baltic markets. In addition, there are 15 lift-on/lift-off (lolo) container shipping services, serving primarily the major ports of Rotterdam and Antwerp as well as weekly sailings to Scandinavia and the Baltic.

Oil refining

Without the activities of IDBs, England's supply of petrol, diesel and other oil products would also be compromised. Two of the UK's seven oil refineries, Total Lindsey and Phillips 66 Humber (which are the second and third largest, accounting for over a quarter of UK refining capacity) are located at South Killingholme in Lincolnshire within North East Lindsey IDB's drainage district. As well as making up a significant proportion of the £2.3bn contribution from oil refining to the UK economy, they are estimated to bring in about £120m per year to the local economy. These refineries actively benefit from the actions of the IDB for their continued safe working. Without IDB activity, they are likely to become highly vulnerable to flooding. The infrastructure supporting them, including roads and railways, also benefits from the work of the IDB.

Electricity and transport

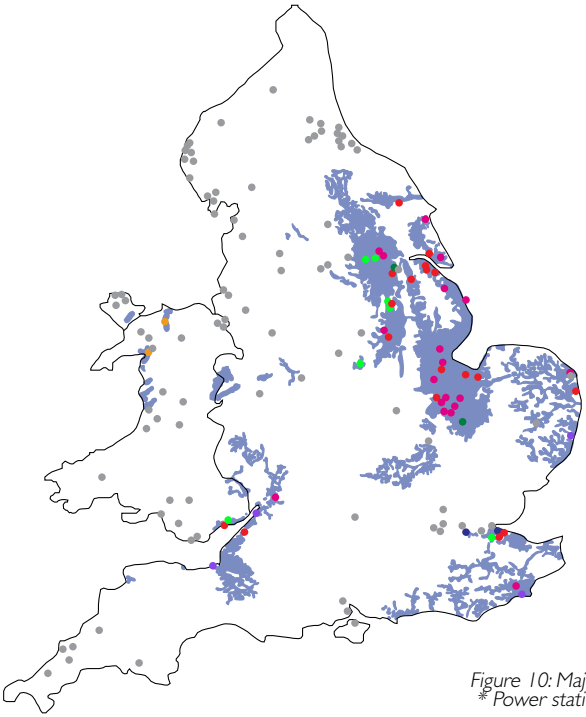


Figure 10: Major power stations in England and Wales and IDDs*
** Power stations with an installed capacity of greater than 1MW*

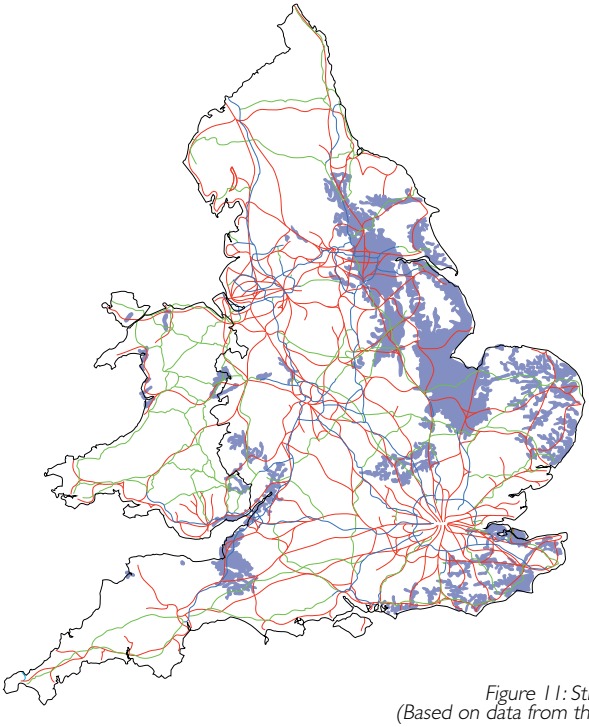


Figure 11: Strategic Road and Rail network in England and Wales
(Based on data from the Highways Agency, Traffic Wales and Network Rail)

Electricity and transport

Our economy relies on electricity for power, heat and light, and transport infrastructure to move people and goods.

Electricity

Much of the existing electricity supply network in England and Wales occurs in areas of potential flood risk. 53% of the installed capacity (potential maximum power output) of major power stations in England and Wales are located within an IDB. Water level management by IDBs ensures the continued safe working of these power stations and the power lines and other electricity distribution infrastructure supporting them.

Electricity distribution is as important to electricity supply as generation itself. Substations are a key part of this transmission system, with almost all homes, businesses, services and industries are reliant on the electricity transmitted through substations. 16% of the high capacity 400kV and 275 kV substations in England and Wales are within IDDs. The actions of IDBs reduce the risk of flooding and damage to these sites and associated infrastructure (e.g. roads and pylons). This in turn helps to ensure an uninterrupted energy supply to all that depend upon it.

Energy Strategy suggests that by 2020 around 30% of our electricity could come from renewable sources, predominantly wind power. Wind power is expected to increase by 2 GW per year for the next 5 years. Currently, 13% of major onshore wind farms in England and Wales are located within IDDs. This percentage is likely to grow as electricity suppliers look for exposed, flat sites for new wind farms. Such sites will need careful water level management to avoiding flooding or damage to associated infrastructure.

Transport

The transportation network in England and Wales is key to ensuring that the country can continue functioning. Almost all sectors of the economy are reliant upon good transport links and, due to the interconnected nature of the transport network, a failure of a single item can lead to the failure of other infrastructure (the snow of December 2010 cost the UK economy an estimated £1 billion per day).

Water level management, which IDBs do on a daily basis, helps to keep groundwater levels low, reducing the problems caused by both waterlogging and flooding. This reduces repair costs to authorities and disruption to travellers.

Almost 6% of all motorways lie within IDDs. The length of motorway affected varies from region to region, but almost a quarter of the affected motorways are within the Yorkshire and Humber Area. Large stretches of the M65, M18 and M180 lie within various IDBs and could be affected without adequate water level management. In England and Wales as a whole, fewer (3%) of A-roads are located within IDDs. However 16% of the A-roads in Yorkshire and Humber and 15% of the A-roads in the East of England (including sections of the A1) are in IDB areas.

Within England and Wales there are more than 26,000km of rail track. More than 5% of this track lies with IDDs. The implications of rail flooding and bank collapses due to raised water levels can be severe because sections of line are likely to be closed and, while diversions can be set up for road flooding, it is unlikely that the same can be done for trains. Passengers will have to use rail replacement services or long diversions along different lines, increasing their journey times (trains in the UK are busier on weekdays than Switzerland, Netherlands, Portugal and Norway combined), and delivery of goods will be delayed with knock-on costs to industry. The actions of IDBs to reduce the risk of flooding and damage to lines help to reduce the amount of flood and groundwater related incidents affecting the rail network, minimising the impact on passengers and the economy.

Conclusions

- The majority of Grade 1 agricultural land is in IDB areas. National food production and food security are heavily dependent on IDB services.
- Food processing, the largest manufacturing sector of the economy, is underpinned by IDB services.
- Key habitats providing ecosystem services such as wetlands; and important local landscapes and environments are maintained by water level management provided by IDBs.
- Tourism depends on the environments sustained by IDBs, and IDBs support, directly and indirectly, many other local businesses.
- A significant amount of UK international trade through England's ports depends on the viability of transport links ensured by IDB water level management.
- A large proportion of the UK's oil refining capacity is dependent on IDB water level management.
- IDB activities reduce flood risk and manage water levels to protect people, property and infrastructure in almost 10% of England.

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For Further information about how ADA members can help your organisation please contact:

Association of Drainage Authorities
6 Electric Parade
Surbiton
Surrey
KT6 5NT

Tel: **020 8399 7350**
Fax: **020 8399 1650**

Email: **admin@ada.org.uk**
Website: **www.ada.org.uk**

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