

# The economics of flood insurance



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# Contents

Introduction	4
Learning Outcomes	5
1 Why flooding happens	6
1.1 What is Flooding?	6
1.2 Flood risk management	7
1.3 Flooding in the UK	9
2 Building on flood plains	12
2.1 Demand factors: why buy homes in flood plains?	14
3 Competitive markets and market failure	16
3.1 The functioning of markets	17
3.2 Individual choices	18
3.3 The demand-and-supply model	19
3.4 Market failure and building on flood plains	20
3.5 Market failure and buying on flood plains	21
4 Options for reducing building on flood plains	22
4.1 How might building on flood plains be reduced?	22
4.2 Compensation through insurance	23
4.3 Potential problems with insurance	24
5 The UK approach to the problem of flooding	27
5.1 Problems with affordable flood insurance	28
5.2 A surprising solution	29
5.3 Weighing up the options	30
5.4 Taking fairness into account	31
5.5 Measuring the equity benefit	33
5.6 The government's policy decision	35
6 Conclusion	36
Glossary	36
References	38
Acknowledgements	40

# Introduction

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This short course is a taster of the Open University Level 2 module, *Economics in Practice*. It will introduce you to some of the practical ways that the theories, tools and techniques of economics are used and impact on our everyday lives.

You will look at the issue of flooding, a problem with a long history but becoming increasingly important globally because of the impact of climate change. Using economic theory, you will explore why market forces alone typically cannot resolve the problems associated with flooding, creating a rationale for government intervention. You will then see how a key tool of economics, cost-benefit analysis, can be applied to assess and weigh the net benefits of such intervention.



# Learning Outcomes

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After studying this course you should be able to:

- begin to understand and confidently use some economic concepts and terminology
- break down the issue of flood risk into some essential elements and apply appropriate economic theory and techniques to its analysis.

# 1 Why flooding happens

The idea of flooding is usually thought of as problematic, yet the natural processes involved and the possibilities for managing water are diverse. Historically, flooding has been beneficial in some ways and costly in others, so that reducing the incidence of flooding and managing its impacts were and still remain important societal goals. However, approaches designed to keep water out of urban or residential areas have become problematic as the changing population and landscape make this goal less attainable and the need to reconnect with pre-urban water management and flooding has been recognised by policy makers. This section looks at the problem of flooding to understand what it is, how flood risk management has been approached historically and how things have been changing in UK flood risk management since the year 2000.

## 1.1 What is Flooding?

Flooding occurs when an area not normally covered in water is temporarily inundated.

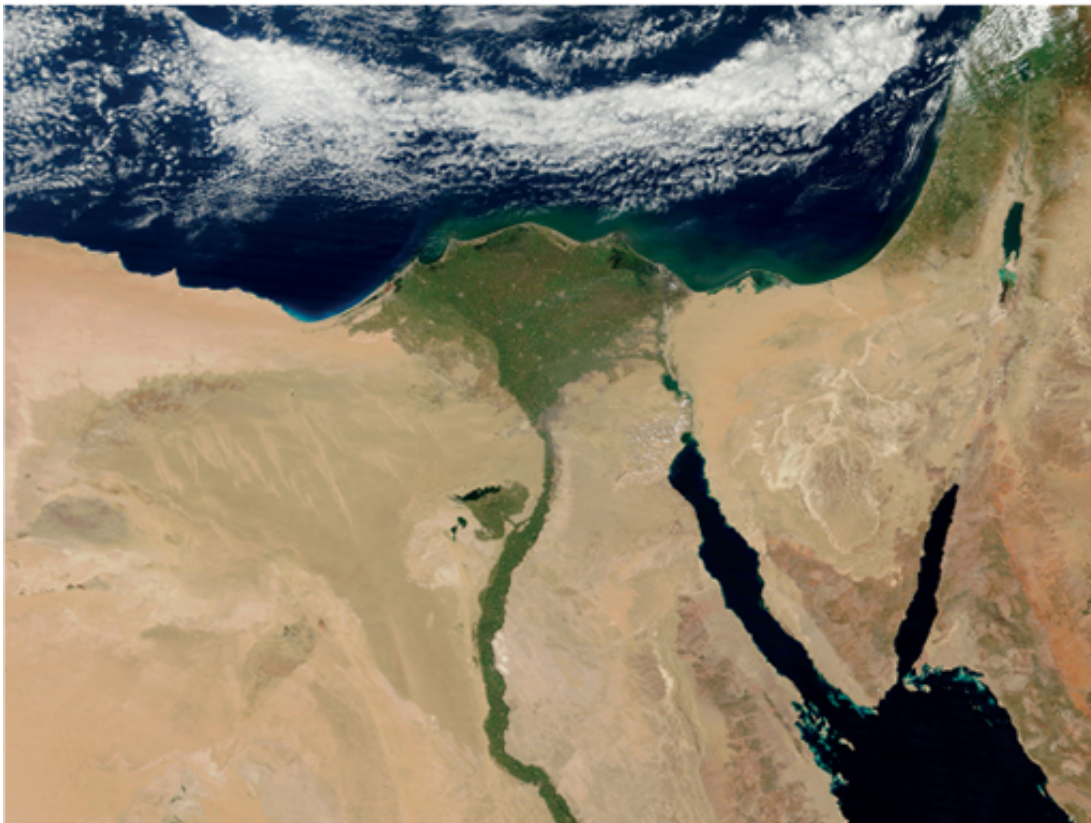


Figure 1 The River Nile, Red Sea and Mediterranean coast

Rivers can flood, for example, as a result of heavy rainfall or in the spring when snow melt from higher altitudes leads to a sudden increase in the volume of water. But flooding is not something that only happens in communities located next to rivers or coastlines. There are six common types of flooding (Flood Guidance, 2009), some of which can even affect

hill-top locations. Explore the types of flooding by scrolling/rolling over/clicking on the images in Figure 2.

Interactive content is not available in this format.

[Figure 2 Types of flooding](#)

### Activity 1 Is flooding a problem?

Allow 10 minutes for this activity

Thinking about the types of flooding described in Figure 2, would you consider some types to be more or less problematic than others? Are there any types of flooding that might be beneficial?

*Provide your answer...*

#### Answer

All types of flooding may be problematic, depending on context. There may be loss of life, damage to property, impact on infrastructure, such as roads and rail systems, bridges and power lines. Sewer flooding, because of contamination, poses additional dangers to health. Depending on the severity and duration of the inundation, these different aspects of damage may exacerbate each other (such as in cases where large scale flooding makes roads impassable, making it difficult to rescue people or get healthcare to them).

On the other hand, flooding may be predictable, expected and harmless. If there is an adequate flood plain to take up the water from river or coastal flooding, it might not be particularly problematic. The flood can simply be left to dissipate over time.

Flooding may even be beneficial to natural or agricultural processes. Civilisation has thrived for thousands of years around the Nile in Egypt, strongly benefitting from agriculture on the flood plains. The annual silt and water deposits make the land extremely fertile. Flooding is therefore not an inherently negative event, but can be problematic if unpredictable, unexpected or badly managed.

## 1.2 Flood risk management

Throughout history, humans have employed measures to manage or protect themselves from flooding. These can be divided into measures that try to keep the water out and those that aim to make space for water using of the land around rivers, lakes, reservoirs and so on as 'catchment areas' to take up and contain the flood water.



Figure 3 Windmills draining the Dutch polders

One of the most longstanding systems to keep water out is the example of the Dutch polders. A polder is land that is at or below sea level. Water is kept out by a system of dykes and dams, with water that seeps in under the dykes being pumped out into a system of canals and rivers. In the Netherlands, pumping was traditionally done using wind power, hence windmills being a feature of the Dutch landscape. Dutch engineers became renowned for their flood risk skills. They were hired in the 1600s to work on the drainage of the Fens in eastern England and, in this century, have helped countries like Bangladesh to build flood defences (The Construction Index, 2015). Dykes (also called levees) and dams are used across the globe, including, for example, New Orleans in the US and a massive dam complex across the Neva Bay, completed in 2011, to protect the city of St Petersburg in Russia. Another iconic dam is the Thames Barrier, in operation since 1982, which can be raised to protect London from flooding due to storm surges along the river from the North Sea.

Keeping water out through massive engineering projects like these has been a popular option, but is costly. Moreover, in the face of rising sea levels and changing weather patterns due to global warming there is no guarantee that existing dykes and dams will not be breached in future, making the need for further investment likely (Kozin, 2019; Lineback and Gritzner, 2014).

## Activity 2 Making Space for Water

Allow 20 Minutes for this activity

Watch Video 1 and think about how a policy of making space for water differs from the idea of keeping water out. Take notes of the arguments that this approach is an improvement on previous understandings of flood risk management, but also consider if there are groups that might find the new approach less effective than the old.

Interactive content is not available in this format.

### Video 1 Making space for water

(West Cumbria Rivers Trust, 2016)

1. What does the 'making space for water' approach advise?

*Provide your answer...*

#### Answer

Making space for water means slowing down the flow of rivers by building wider courses, allowing rivers to meander, and ensuring traditional flood lands or less vulnerable areas are able to take flood water. It also encourages land use that helps manage water, like alluvial forests (in other words, forests growing in the fertile soil deposited by flood water). Key to this approach is thinking about the whole catchment area for water rather than focusing simply on individual cities or inhabited areas, without considering how action taken in one place affects those upstream or downstream.

2. What benefits does a catchment approach to water have?

*Provide your answer...*

#### Answer

Since rivers flow more slowly, flooding is less likely and the flooding happens in more predictable areas. Allowing natural processes to determine how water moves through the environment makes it easier to control. The video gives a good sense of how trying to build walls to keep water out of residential and urban areas may do more harm than good. If rivers are encouraged to run through narrow courses with concrete embankments, they may flow too fast for containment after heavy weather and cause more flooding than if wider channels with natural banks are allowed for them, with concrete embankments only to prevent overflow in heavy weather. This approach also entails reconnecting rivers with their natural floodplains further upstream, allowing them to flow in their old channels and ensuring less vulnerable land is available to flood when needed.

## 1.3 Flooding in the UK

Flooding has always been a feature of life in the UK. But particularly severe episodes, for example, in 1947, 1953 and 2000, have played a major part in the development of its approach to flood risk management. For example, in 1953, a combination of a high spring tide and severe windstorms caused a 5.6 metre rise in sea levels which left 1,600 kilometres of the eastern coastline from Scotland to Kent damaged, 40,000 people homeless and 307 people dead (Landmark Information Group, 2014; Tregaskis, 2013). It triggered a focus of flood management on engineering projects to keep the water out.



Further, though less severe, flooding incidents over the following 20 years caused damage in both agricultural and urban areas and mortgage lenders began to insist that the homes they lent against be covered by flood insurance. Rather than separate flood cover, this was bundled into home buildings policies that cover a wide range of other risks too, such as fire, subsidence, break-in and so on. During this period, while still focusing on physical defences, there was a shift towards protecting urban areas and a noticeable example was the start of construction on the Thames Barrier.

However, public confidence in the government's approach, already waning, was shaken by severe floods in the year 2000, which triggered a shift towards a 'making space for water' strategy and growing unrest in the insurance industry (which you will look at in detail in Section 4).

### Activity 3 Who stands to lose from flood risk and flooding?

Allow 10 minutes for this activity

Suggest which sectors within an economy might be adversely affected and how by a flood and flood-risk.

*Provide your answer...*

#### Answer

The main sectors that might be impacted include:

- **Households.** This includes homeowners and renters who may be directly affected by damage to their homes and disruption to their everyday lives in the event of flooding. Homeowners who are not flooded may still be affected indirectly if their flood insurance premiums increase.
- **Businesses.** Direct impacts included damage to buildings and stock and loss of income due to business disruption in the event of flood and higher insurance premiums for businesses located in flood-risk areas.
- **Government.** The public expect the government to be in control if there is a major flood. It is responsible for relief work and ensuring safety and clean up. It may have to provide welfare support if families are left with no home. Flood events draw public attention to the government's flood management and there may be increased scrutiny and calls for better flood defences in the wake of a flooding episode.
- **Insurance companies.** They provide homeowners and businesses with cover against the financial consequences of flooding. If insurers have correctly assessed risk and have the funds to pay out claims for flood damage, the impact of a flood may be 'business as usual', but if the incidence and scale of flooding increases, insurers will want to raise the premiums they charge.
- **Wider community.** There may also be wider impacts. For example, flooding affects infrastructure, such as transport and power supplies causing disruption beyond just the flood area. In a general sense, all UK taxpayers contribute to government efforts to manage the risk of flooding and respond when it happens, so they are impacted as well.



## 2 Building on flood plains

The idea of making space for water takes into account the natural processes and possibilities of flood management, offering more effective techniques and more realistic goals than relying just on projects to keep water out. Reconnecting with traditional flood plains may be the best way to ensure that river flooding is managed, but it is problematic for households, insurers and government if there are properties built on the traditional flood plains. Unfortunately, in the UK this has not been unusual, especially for residential housing. This section starts to unpack the elements of the problem of flooding using the methods of economics.



Figure 4 Housing developments in areas prone to flooding are commonplace

It may seem perverse to build homes on land that may flood. However, in 2016-17, 11 per cent of new residential properties in England were in areas with a high flood risk compared with 9 per cent the previous year (Ministry of Housing, Communities & Local Government, 2018). The next activity explores the reasons why developers may favour such locations.

### Activity 4 Building on Flood Plains

Allow 15 Minutes for this activity

Search the internet to find information to help you answer the question: why do developers choose to build homes on flood plains? You will need to:

1. Choose a few suitable key words for your search. For example, try searching with the words 'build', 'flood' and 'plain'. Be prepared to inspect results beyond just the first page. Try adding additional search words to refine your search – the search engine may give you some suggestions.

2. Select reliable sources. One way of thinking about the reliability of a sources is to use the PROMPT criteria developed by the OU Library. PROMPT stands for:
- Presentation- Is the presentation of the material professional?
  - Relevance- Is the material relevant to the question asked?
  - Objectivity- Is the information weighed up objectively or designed to persuade you of a pre-defined outcome?
  - Method- How has the information been obtained, analysed and presented?
  - Provenance- Where did the information come from? Who wrote it?
  - Timeliness- How recent is the information? Does it relate to the right time period?

*Provide your answer...*

### Discussion

You will probably have found and used different sources. For this example, the focus was on those whose titles and brief descriptions seemed as if they would be most relevant to the question: 'Flood debate: should we build on flood plains?' and 'Why do we build on flood plains?'. In particular, sources that were fairly recent (timeliness). You should also concentrate on sources you feel you can trust (provenance), such as government, news services, specialist organisations and journals, and academic sources.

The reasons found for why developers choose to build homes on flood plains were:

- Pragmatic reasons – housing shortages create pressure to build on any available land (RIBA, 2018; Chelmi, 2016).
- Aesthetic reasons - people like houses on flat land and find locations near water attractive (and historically towns were built there because of the need for water) (Harvey, 2014).
- Practical reasons - it's easier for builders to build houses on land that is flat and close to existing transport and utilities (water, electricity, and so on) (Harvey, 2016).
- Financial reasons - it's cheap to acquire flood plain land (Thomas, 2016; Chelmi 2016).
- Legal reasons - it's easier to get planning permission for land that is not high up and visible and it's not illegal to build on flood plains (Harvey, 2014).
- Economic reasons - there are no flood-related costs to the builder of building on flood plains – if flooding happens, the costs are borne by others, particularly households (Harvey 2014).

The last reason in particular points to the existence of market failure in the form of an **externality**. An externality occur when an economic transaction produces benefits or, as in this case, costs that are not reflected in the market price.

## 2.1 Demand factors: why buy homes in flood plains?

As you've seen in Section 1, flooding is at best a miserable and costly affair for the households affected and at worst life-threatening. Therefore, it seems irrational that anyone would opt to live in a flood-risk area, but clearly many UK households do.

### Activity 5 Reasons for buying

Allow 15 minutes for this activity

Think of at least one reason why a household might be living in a flood-risk area. Explain how this might be a rational decision. (A rational decision would be where the household has chosen the option that maximises its well-being or benefit, which in economics is called **utility**.)

*Provide your answer...*



### Answer

The decision could be rational if the household knew about the risk and had fully taken on board the cost of making their home flood resilient (for example, using water resistant plaster, siting plug sockets at waist height rather than low down), dealing with flood repairs themselves and/or buying appropriate insurance. To accept these downsides, there would need to be some trade-off against other aspects of living in the area that offset the disadvantages. The offsetting factor might be, for example, the value of being located on flat ground and close to an existing town, perhaps because mobility is limited. An attractive riverside or coastal location might be highly prized. Maybe the home was cheaper than similar properties in other locations, perhaps because the flood risk was reflected in the buying price. Of course, in individual cases, the choice of location might be due to personal factors, such as relatives living nearby. The decision may also have been rational if, at the time of purchase, there was little or no flood risk and the risk has only arisen since, for example due to the shift towards make-space-for-water policies and/or climate change.

Another potentially rational possibility is that the household knew about the risk, but were confident that, say, the government would put in place adequate flood defences or provide compensation (for example, providing alternative accommodation) if the worst happened. This is an example of **moral hazard**. It might not be an unreasonable assumption, because housing is such a sensitive social issue. Voters are not keen to be made homeless by flooding and so the government may feel obliged to pick up the welfare bill of supporting those left destitute by floods. However, the household's decision to live in a flood plain might be less than rational and so a case of **bounded rationality** if its confidence in the government were misplaced.

Similarly, the household could have been acting rationally if, although the flood risk did exist and at the time of purchase, the household was unaware of this. This might be because nobody knew about the risk then and knowledge has only now improved due to better flood-risk measurement and mapping or that this particular household did not know of the risk. In either case, there will have been a violation of the information condition for perfect competition. In other words, there is a market failure as a result of imperfect information. (More precisely, this is likely to be a case of **asymmetric information** because the supplier (builder) presumably knew the risk but the buyer did not.) On the other hand, the household might have had only bounded rationality if they had the information but failed to take it fully into account (for example, over-optimistically assuming that a flood will never happen or the disruption if it did would be minimal).

## 3 Competitive markets and market failure



Figure 5 John Kay, Adam Smith, author of the wealth of nations, c. 1790

You have considered some reasons why firms build on flood plains and households buy homes there. Economic theory provides a way of formalising this type of analysis and, where these behaviours are seen as problematic, offers insights into possible solutions. While there are competing theories of economics, a dominant approach among policymakers is a belief that freely operating markets are the most efficient way of allocating resources in an economy. This approach is captured in a famous quote from Adam Smith (1723-1790), a Scottish philosopher often called the ‘father of economics’:

‘It is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own interest. We address ourselves, not to their humanity but to their self-love, and never talk to them of our own necessities but of their advantages.’

(Smith, 1776, p. 18)

Smith was saying that markets in which buyers and sellers are free to buy and sell the amount they wish of a good, at the best price they can find, will result in prices and quantities traded that represent not just the optimal (best) outcome for private buyers and sellers, but for society as a whole. This underpins the **neoliberal** perspective of **capitalism** that has been prevalent since the 1980s.

For the pursuit of individual goals to also deliver the best outcome for society depends on markets operating in a state of **perfect competition**. If they don't, this is described as a **market failure**. This section briefly explains how economically efficient markets work and models two reasons why there may be market failures in the market for houses on flood plains.

### 3.1 The functioning of markets

The headlines in Figure 6 are commonplace in the world today. These days the existence of the forces of demand and supply is taken for granted. It is accepted that markets typically determine the prices paid for everything from fruit and veg to petrol and property and even the pay for labour. The dominant ideology today is that this price mechanism is the most efficient way to allocate resources, provided that markets trade freely. The underlying premise for this claim is that price encapsulates all the relevant wishes and intentions of buyers and sellers, so a market is essentially an information network.



Figure 6 The price mechanism in action

Suppliers of goods and services are assumed to be 'profit-maximisers'. In other words, they are motivated to sell as much as they can as long as that increases their profits. Therefore, they will carry on selling more up to the point at which the revenue they get from selling one more unit – called **marginal revenue** – equals the additional cost of producing that unit – called **marginal cost**.

Buyers are assumed to be 'utility-maximisers' – in other words they will carry on buying more for as long as their utility (pleasure of satisfaction) from doing so is rising. So an individual or household will want to carry on consuming up to the point at which the pleasure they get from consuming the last unit – called **marginal utility** just equals the cost to them of buying that unit.

## 3.2 Individual choices

Individuals are assumed to have a goal of maximising utility. However, that does not simply mean consuming as many products as possible.

The utility of a product diminishes the more of the product a consumer has. For example, imagine that you are thirsty and begin to drink glasses of water. The first will quench your thirst and be of great utility to you. The second may also be welcome. But there will be a point where drinking another glass of water is not going to yield much additional benefit. There may even come a point at which an extra glass causes you displeasure (negative utility) if it makes you feel bloated and ill.

This concept of utility declining with the quantity consumed is called the **law of diminishing marginal utility**. It applies to most goods and services consumed; and it even applies to the income used to buy goods and services, as illustrated in Figure 7.

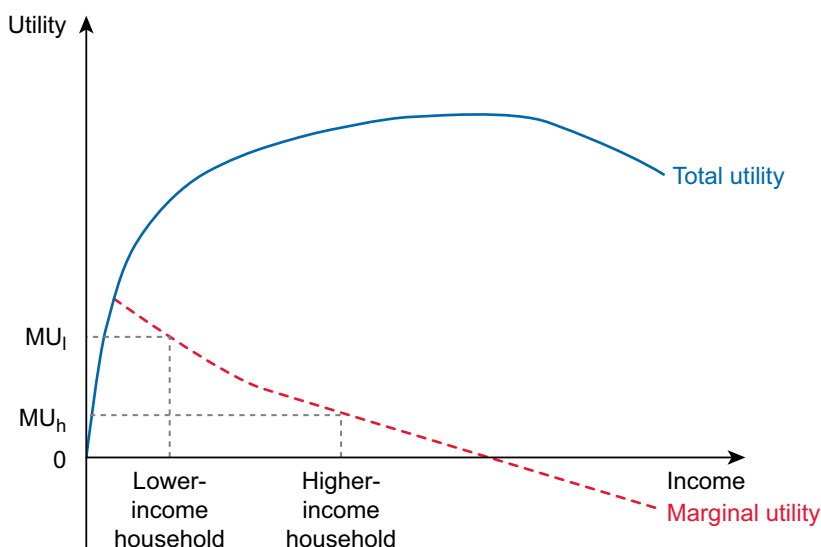


Figure 7 Diminishing marginal utility of income

The horizontal axis in Figure 7 shows total household income, increasing from left to right. The vertical axis measures both marginal utility (MU) and total utility. The lower line traces how the marginal utility of an extra amount of income falls as total household income increases. The upper line traces the total utility that a household gets from its income.

### Activity 6 Diminishing marginal utility

Allow 10 minutes for this activity

1. Which of the following statements are correct? (Select all that apply)

- ☐ a) Total utility is the sum of the utility derived from each unit of a good that is consumed.
- ☐ b) The extra utility from consuming one more unit is called marginal utility.
- ☐ c) Every extra unit consumed provides the same amount of utility as every other unit.
- ☐ d) Each extra unit consumed normally provides less utility than previous units.
- ☐ e) Total utility falls when marginal utility falls.
- ☐ f) Total utility rises as long as marginal utility is positive.

- ☐ g) Total utility always increases the more units a person consumes.

#### Answer

The correct statements are (a), (b), (d) and (f).

2. Figure 7 shows that a lower income household gets a relatively higher marginal utility ( $MU_l$ ) from an extra sum of income than the marginal utility ( $MU_h$ ) that a higher income household gets. For example, the extra sum of income might be £10 a week. Explain why a household with a total income of £100 a week might get more marginal utility from the extra £10 than a household with a total income of £1,000 a week.

*Provide your answer...*

#### Answer

Low-income households are normally unable to buy all the goods and services they want and derive a high utility from those they can. Better-off households can buy much more, including goods and services in excessive quantities or ones they don't need so much. So, just as diminishing marginal utility means that an individual derives less satisfaction from each extra unit of a good or service, it can also be assumed that better-off households derive less utility from a unit of a good or service than lower-income households.

As the activity highlights, consumers don't look at buying a particular good or service in isolation – they are constrained by their income. As a consequence, they must choose how to allocate their budget between multiple goods and services. This creates a trade-off – in order to gain the utility from consuming one product, they must forego others they could have bought instead, in other words there is an **opportunity cost**.

## 3.3 The demand-and-supply model

The buying intentions of people in the market for a particular good or service can be aggregated and expressed as a demand curve like the downward-sloping demand curve shown in Figure 8. The downward slope is showing that as a person has progressively more of a good, they are willing and able to pay less for one more unit in line with the diminishing marginal utility they derive from each extra unit.

Similarly, the selling intentions of all the firms in the market can be aggregated and shown as the upward-sloping supply curve in Figure 8. The upward slope is showing that, subject to costs, if firms can get a higher price for their output, they will be willing to supply more.



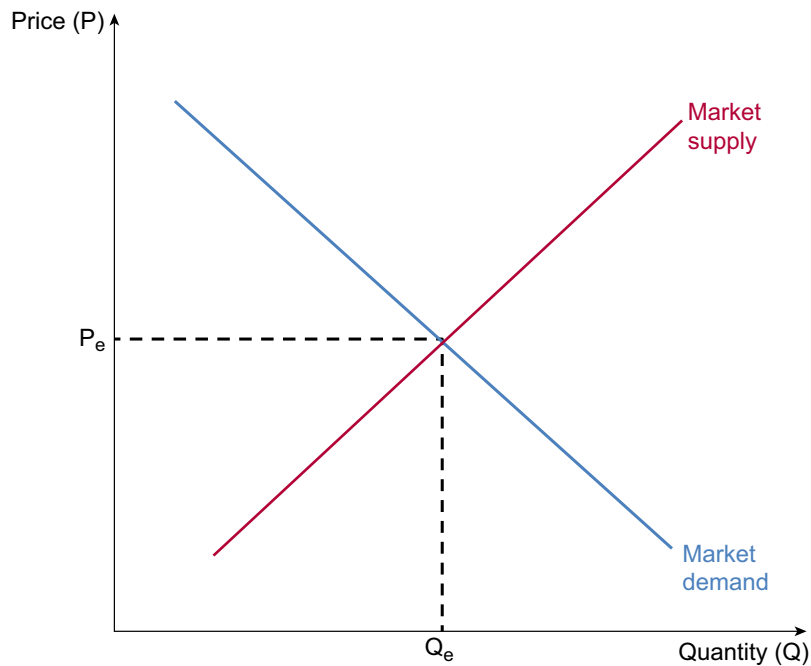


Figure 8 Supply and Demand Curves

The point at which the two curves cross is called the **equilibrium**. The quantity that sellers are willing to supply is exactly balanced by the amount that buyers are willing and able to buy. This point simultaneously determines both the equilibrium output in the market and the equilibrium price.

Looking at Figure 8 you can see that the equilibrium price and quantity are labelled as  $P_e$  and  $Q_e$ .

Provided the market is in a state of **perfect competition**, the demand curve will perfectly express what consumers are willing and able to buy and, at the point of equilibrium, firms will be meeting that demand in the most cost-effective way. Thus, the market works efficiently to provide the best outcome for society.

However, perfect competition can exist only if a number of conditions are met. These include, for example, that all buyers and sellers are **price-takers**, meaning that individually they are unable to influence the price and they must all have 'perfect' information so everyone makes fully informed decisions.

When the conditions for perfect competition are not met (which will often be the case), there is a market failure and the actions of buyers and sellers in the market no longer produce the best social outcome.

### 3.4 Market failure and building on flood plains

In the case of developers building on flood plains, builders will consider the price they are able to sell a home for and decide how many homes to build (and where) in order to maximise their profit from supplying homes.

As you have already seen in Section 2.1, building and selling homes on flood plains can be an attractive option, because alternatives would be more costly (for example: building on more expensive land that is not prone to flooding; building on elevated land that is harder to access or get planning permission for; and so on). In Section 2.2 you saw that there may be a range of reasons why buyers might choose these homes.

Crucially, though, the developers are not basing their supply decisions on the full costs of these homes. They are escaping the cost of future flooding or flood-risk protection, which must nevertheless be borne by somebody. In economic terminology, there is a negative externality of production. The demand-and-supply model can help to demonstrate how this distorts the supply of housing causing more flood-risk homes to be built than the socially optimal amount, as shown in the slideshow in Figure 9.

Interactive content is not available in this format.

[Figure 9 Modelling the negative externality of building on a floodplain](#)

### 3.5 Market failure and buying on flood plains

In addition to a market failure in the supply-side of the market for homes on flood plains, there may also be a failure on the demand-side.

Homebuyers coming to this market, may either have full information and be making rational decisions to buy a home on a flood plain for the variety of reasons you considered in Section 2.2 or they may be making decisions based on imperfect information. That may be for a variety of reasons, for example: because the information is unavailable; it is too costly to obtain; it is available but buyers are unaware of it; or they have the information but are unable to process it accurately. There may be a situation of asymmetric information in the market, with the buyers alone unable to appreciate the ultimate potential costs to them of the flood risk. The demand-and-supply model can help to demonstrate how asymmetry distorts the demand for housing, causing more high flood-risk homes to be bought than the socially optimal amount, as shown in the slideshow in Figure 10.

Interactive content is not available in this format.

[Figure 10 Modelling the impact of asymmetric information on buying on a flood plain](#)

## 4 Options for reducing building on flood plains

Because of market failures, the flood-plain housing market does not operate perfectly and so is not able to provide the socially optimum number of homes on flood plains. In order to address this inefficiency, some kind of intervention could be justified. There are several options for this kind of intervention, some of which might be government-led and others market-led. This section considers a range of options that could have been used to intervene in the UK market.

### 4.1 How might building on flood plains be reduced?

In Video 2 you will hear Matt Georges from the Environment Agency talking about ways to tackle this problem of building on flood plains.

He first makes clear that 95 per cent of local authorities follow Environment Agency advice not to build on flood plains, so this problem is small, relative to the total of new building that is undertaken. However, this still means that some 25,000 homes a year (around 11 per cent of new residential properties in England) were built in areas with a high flood risk in 2016-17 (Ministry of Housing, Communities & Local Government, 2018; Ministry of Housing, Communities & Local Government, 2019).

#### Activity 7 A range of options

Allow 15 minutes for this activity

Watch Video 2. What options does Matt Georges suggests for reducing the amount of building on flood plains.

Video content is not available in this format.

[Video 2 Matt Georges from the Environment Agency](#)



*Provide your answer...*

#### Answer

Matt Georges talks about a spectrum of interventions. The first is to use the planning system: using this to refuse permission to build on flood plains (though note that in England such developments are not banned outright but at the discretion of local authorities).

If developments do go ahead then they can be made more flood resilient through adaptations (such as waist-height electrical sockets) and flood risk reduction measures (such as brick walls and up-river land management changes). While Georges does not say who would pay for these, one option would be to make developers bear such costs thus internalising the externalities you looked at a moment ago.

Georges then suggests initiatives to help people cope if flooding does occur, such as warnings and encouraging people to have flood plans. And the final option he mentions is flood insurance.

## 4.2 Compensation through insurance

In Video 2, the last option mentioned by Matt Georges on the spectrum of options for dealing with the problems faced by people living in homes on flood plain is the option of compensating people through insurance if the worst were to happen.

Private insurance is a way of transferring the financial risk of particular events occurring so they are borne by the insurer rather than the bearer of the underlying risk. For a charge (**premium**) usually paid at regular intervals, the purchaser (**policyholder**) can have peace of mind, knowing that if the worst were to happen, they could make a claim and receive a sum of money (the **payout**). However, it is common for the insurance contract to

require the policyholder to still bear part of the financial risk themselves in the form of an **excess**.

Theoretically, there are two ways in which insurance can be provided: on a mutual basis or on a commercial basis. However, in practice, contemporary insurance involves elements of both. Mutual insurance works through **risk pooling**, which means the risk of suffering a loss is pooled and spread across a large number of people who collectively cover the cost, all paying the same or similar premiums. There is a cross-subsidy from those in the pool who pay the premiums, but do not claim compensation, to those who do claim. However, all benefit from the peace of mind of knowing that if the adverse event did occur, their losses would be covered.

Historically, commercial insurance began with brokers agreeing to cover losses of cargo on trading voyages due to uncontrollable events (theft, weather events, disasters etc.). Rather than the mutual system, in which a pool of cargo ships bearing similar risks might have pooled similar premiums to cover losses, commercial insurers made estimations of the individual risks involved in a voyage and decide on an appropriate premium for the insurance requested. This relied on using data garnered from many previous voyages as the basis for estimating the risk posed by a particular voyage. An appropriate premium could then be charged to reflect the likelihood of having to pay out for losses, with more risky ventures attracting higher premiums than those deemed to be safer. This approach is called **risk-based pricing**. In this system, there is little or no cross-subsidy between policyholders: each pays according to the risk they represent.

In practice, commercial insurers today use a mix of risk-based pricing and risk pooling to offer private commercial insurance. This involves **risk segmentation** by which consumers are divided into ever smaller groups with each group paying different premiums according to the risk of their claiming. The ability to segment risks in this way relies on good sources of data. As data improves and becomes more granular (allowing for finer and finer detail about smaller and smaller groups), it becomes increasingly possible to tailor premiums to ever smaller segments and even to individual policyholders.

Another possible type of insurance would be social insurance, in which the premiums would effectively be paid as taxation and the necessary pay outs, in case of a negative event, covered through help from the government welfare system, such as cash benefits for disrupted livelihoods, state-organised housing for those temporarily displaced, and so on.

In the case of household flooding, the UK has a well-established private insurance market, with cover for flood risks bundled into their buildings and contents insurance.

Homebuyers who have a mortgage are expected to have buildings insurance as a requirement of their loan in order to protect the value of the home the mortgage is secured against. Homeowners without a mortgage have an interest in taking up buildings' insurance because of the potentially disastrous consequences of damage to, or total loss of the home, due to perils such as fire and subsidence, not just flooding. Households in rented accommodation do not themselves buy buildings cover – this is the responsibility of their landlord who may, nevertheless pass the cost on in the rent charged – but may take out contents insurance which will include flood cover for their possessions.

## 4.3 Potential problems with insurance

Increasingly risk-based pricing is the natural direction of travel in commercial insurance markets. The development of – and improvement in – flood risk estimation and flood



mapping is improving the quality and granularity of data and driving a process of increasing risk segmentation. For example, prior to the government initiative to intervene in the flood insurance market, which you will study in Section 5, while the average price of buildings insurance was estimated at £176 to £232 a year (AA British Insurance Premium Index, 2013, cited in DEFRA, 2013), households in flood risk areas could be paying premiums of £1200 to £1500 (Mark Hoban, cited in Environment, Food and Rural Affairs Committee, 2016).



Figure 11 Damaged chalet after coastal erosion caused by a tidal surge, Norfolk 2013

Risk-based pricing addresses the problem of **adverse selection**. This is a type of vicious cycle where the pool of people insured becomes skewed towards those with the highest risk of claiming rather than being spread across a mix of policyholders ranging from low to high risk.

What lies behind adverse selection is asymmetric information, a concept you looked at earlier this course in the context of buying homes on flood plains. But with insurance, the concern is not information that the buyer lacks, rather it is the information that the buyer – the household wanting to buy insurance – has, which is not known by the insurer.

### Activity 8: Asymmetric information and adverse selection

Allow 10 Minutes for this activity

1. Why would asymmetric information be a problem for a flood insurer?

*Provide your answer...*

**Answer**

Insurers fear that prospective customers have information about the risk of their claiming which the insurer is not party to. For example, if householders suspect their homes might flood, they will be more inclined to buy insurance against this risk. Householders who perceive their homes to be safe from flooding will be less likely to take out cover. This will skew the insurance pool towards higher risks.

2. Why might adverse selection be a problem under a risk-pooling approach to flood insurance?

*Provide your answer...*

**Answer**

Under risk pooling, the same or similar premium is charged to everyone and includes a cross subsidy from those at lower risk to those at higher risk. The premium will look too high to the customers who perceive themselves to be low risk, but a bargain for higher-risk customers. As the pool becomes skewed towards higher-risk policyholders, claims will rise. To cover the cost of rising claims, the insurer will need to raise the premium, which will deter even more lower risk customers, and so the process will go on.

3. Which of the following might be remedies for adverse selection in the market for flood insurance? (Select all that apply)

- ☐ Make insurance compulsory
- ☐ Risk-based pricing
- ☐ Require insurance applicants to disclose information they have about the risk.
- ☐ Develop effective flood maps

**Answer**

All the answers are correct. Making insurance compulsory forces a wide spread of risk in the pool and cross-subsidy between the different risks. With risk-based pricing, lower-risk customers pay less and higher-risk customers pay more, in the process reducing or eliminating the cross-subsidy, so that all customers reckon the policy to be good value relative to the risk. The ability to charge accurate risk-based premiums depends on access to good data. This includes any information about the risk that the policyholder has, which can be gathered by asking insurance applicants relevant questions, but also by gathering data from other sources, such as effective flood-risk estimating and mapping.

A further potential problem with insurance is moral hazard. You considered earlier (in Section 2.2) that households might be displaying moral hazard when they buy homes on a flood plain if they are assuming someone else (such as the government or insurers) will bear the financial cost of their decision should they be affected by flooding. Similarly, households may fail to spend money on making their homes more flood resilient if they know they can rely on insurance to cover the cost of repairs. Ways that insurers might try to reduce moral hazard include, for example, reducing the premium or policy excess for households that have taken steps to make their homes more flood resilient, and charging lower premiums for homes in areas with better flood defences.

## 5 The UK approach to the problem of flooding



Figure 12 Homes for sale in Worcestershire in 2001

In the UK, there have been three strands in the government's the approach to dealing with flood risk:

- flood management. In recent years, this has shifted from keeping water out to a policy of making space for water as you saw in Video 1. This increases the conflict between using flood plains to contain water and using them for residential housing.
- land use. The planning system takes into account advice from government environmental agencies which is invariably to avoid building on land at risk of flooding. However, planning authorities and developers do not have to follow this advice and, as you saw in Section 2.1, in 2016-17, 11 per cent of new residential properties in England were being built in areas at high flood risk.
- Private flood insurance (bundled in with home insurance). The financial consequences of homes flooding are managed through households taking out home insurance and private insurer paying out when flooding occurs. For this system to work, it is essential that households have access to affordable flood cover.

By 2013, this three-stranded approach was under serious strain. In this section you will consider why that was the case and what action the UK government took.

## 5.1 Problems with affordable flood insurance

Section 1.3 noted that that UK flooding in the year 2000 created a turning point for the insurance market. Up to then, there had been a 'Gentlemen's Agreement' whereby insurers who were members of the Association of British Insurers (ABI) agreed to provide affordable private flood insurance for all, provided the government invested in flood defences. This meant lower-risk households cross-subsidising the cost of flood insurance for those at higher risk.

However, the Agreement created what has been called 'systemic moral hazard' (Huber, 2004). Since affordable flood insurance premiums understated the true cost of high flood risks, there were perverse incentives for: households to ignore flood risk in their decisions about where to buy and making their homes more flood-resilient; and for developers to build on flood plains. The first decade of the new millennium brought matters to a head because a number of factors collided:

- The cost of flood claims was escalating and set to get worse because of climate change.
- New insurers were coming into the market who were not bound by the Gentlemen's Agreement and so could cherry pick low-risk homes, exacerbating adverse selection for ABI members.
- The government started to favour 'make space for water' approaches to flood management which included allowing flood plains to flood.
- Despite central government starting to advise against building on flood plains, local authorities were still approving such developments and unlikely to stop given general pressure for the economy to provide more homes.
- Advances in flood-risk estimation and mapping were making it increasingly feasible for insurers to solve their problems by switching to risk-based pricing for flood insurance.

As a result of all these factors, the Gentlemen's Agreement collapsed.

Between 2000 and 2013, there was a series of temporary agreements (Statements of Principles) between government and the ABI, but with the insurers no longer guaranteeing to provide flood cover for all or at affordable prices. By 2013, there were numerous news stories of households being charged thousands of pounds for home insurance and facing huge policy excesses or being unable to get cover at all. This had a knock-on effect with lenders unwilling to grant mortgages on flood-risk homes and thus existing owners within flood-risk areas being unable to sell their properties. The last Statement of Principles (ABI, 2008) was due to expire in 2013 and, if nothing took its place, full-blown risk-based pricing for flood insurance looked set to take off.

### Activity 9 Winners and losers

Allow 5 minutes for this activity

Who would have been the winners and losers from risk-based pricing for flood insurance in 2013?

*Provide your answer...*



### Answer

You may have thought of other groups, but here are the main ones:

- **Winners:** households at low flood risk whose insurance premiums would no longer subsidise high-risk households; ABI insurers who would no longer be at a competitive disadvantage to newer insurers not party to any agreement to offer affordable insurance; the economy as a whole since resources would be allocated more efficiently.
- **Losers:** households at high flood risk who would pay more for insurance or, if unaffordable, have to go without; uninsured households affected by flooding; homeowners in high-risk areas unable to sell their homes; local communities where uninsurable and unsaleable homes could undermine local living standards and the local economy.

## 5.2 A surprising solution

By the early 2010s, it was clear that the UK government needed to take action to address the problem of flood risk. The market for housing on flood plains was clearly not working efficiently. Moreover, the previous agreements aimed at keeping private flood insurance affordable had only made matters worse by shielding households from the true cost of flood risk and so encouraging them to carry on buying on flood plains and developers to carry on building there.



Figure 13 Transition by design

In 2010, the government hosted a flood summit which set the direction for the policy options that would be considered. The government then set up working groups to refine the approach. The membership of the working groups was predominantly representatives

from central government, local government and insurers, although evidence was also sought from other parties including community groups.

From the outset, the government saw the problem as one of insurance rather than managing the underlying flooding or building practices. As a result, all the policy options considered by the government were focused on how to prevent a sudden shift to risk-based pricing in 2013 and so ensure households at risk of flooding would have access to affordable insurance. In other words, the government was proposing to perpetuate the very system that seemed to allow the market failures in the flood-plain housing market to persist. The government explained this puzzling choice as follows:

To ensure the availability and affordability of flood insurance, without placing unsustainable costs on wider policyholders and the taxpayer. Doing so will provide assistance to those likely to be disadvantaged by a transition to more risk-based flood insurance pricing including any potential 'unbundling' of flood risk cover. A successful implementation would entail insurance terms adjusting towards risk-reflective pricing at a pace that allows choices to be made by policyholders facing long-term increases in insurance costs unless action is taken, and avoids any risk of instability in insurance, mortgage and local housing markets.

(DEFRA, 2013a, p. 1)

In other words, the insurance-based solution was intended as a stop-gap to create a transitional period during which the economy could adjust to the longer-term objective: the free-market solution of risk-based pricing.

## 5.3 Weighing up the options

Even focusing just on the insurance aspect of flood risk, there were competing policies the government could adopt. The government compared them using a technique called Cost-Benefit Analysis (CBA).



Figure 14 Flood Re was the government's preferred option

CBA is a way of weighing up the costs and benefits of different possible options in order to inform the decision about what to do. Any positive impacts are evaluated as benefits and any negative impacts are evaluated as costs. A process of **discounting** is used, which gives greater weight to costs and benefits occurring today or in the near future than those that will take longer to materialise.

CBA aims to express all costs and benefits in monetary terms so that options can be compared against each other and also against the benchmark of 'do nothing' (also called the 'counterfactual' or 'business as usual'). The 'do nothing' option is not the same as 'no change', because in the baseline situation there may be forces for change at work. In the



flood insurance case, without government intervention the flood insurance market would have changed radically with a shift to fully risk-based pricing.

The government chose to include in its flood-risk CBA a shortlist of four options in addition to the baseline. However, it made clear that its preferred option was a scheme called 'Flood Re'. This involved ensuring that a cross-subsidy from lower-risk to higher-risk insurance customers would continue. In essence, all insured customers would pay a little bit more for their home insurance and the money raised would be used to put a cap on the maximum amount that households would have to pay for the flood insurance part of their cover.

## 5.4 Taking fairness into account

In the type of CBA carried out by government policymakers, called a 'social CBA', economists are concerned about the cost in terms of additional resources, since they could have been used by the economy in alternative ways (in other words, they have an opportunity cost).

Similarly, economists are interested in additional benefits for the economy as a whole. This means that **transfer payments** from agents in one part of the economy to agents in another (such as taxes used to pay for benefits or, in the case of flood insurance, a subsidy from better-off households to less well-off ones) cancel each other out and so are not in themselves a cost or benefit to the economy as a whole. As the government puts it: 'Transfers pass purchasing power from one person to another and do not involve the consumption of resources' (HM Treasury, 2018, p. 40).

Moreover, while the costs and benefits may affect different groups differently, CBA generally aims to identify the option that will maximise net benefit (find the biggest benefit minus cost) *overall*, rather than *for a particular group*. So CBA aims to maximise the net benefit generated (the pie), rather than to decide which groups bear the costs (pay for the pie) or enjoy the benefits (get slices of the pie). This may at first seem counter-intuitive or unfair, because the benefits may not fall on those who bear the costs, or might benefit those who need help least. However, the CBA can be modified to take into account the perceived fairness (also called equity) of a policy. One way of doing this is through 'equity weighting' (also called distributional weighting).

Under the Flood Re scheme, when an eligible higher-risk household buys home insurance, the household pays less for flood-risk cover part of its home insurance. However, the scheme was designed so that lower-income households receive a bigger subsidy than better-off households.

The scheme needed an easy way for insurers to identify low-income households. Imagine the extra admin and suspicion if people had to declare their income when buying home insurance! The chosen solution was to use Council Tax bands since they are readily identifiable from postcodes and broadly correlated to income level (with lower-income households tending to live in lower-valued homes which are covered by the lower bands, such as A to D). This is an example of how doing a CBA must often be very pragmatic, using the data available (in this case, Council Tax bands) as a proxy for what the analysts want to measure (in this case, household income).

Table 1 shows how the premium for flood-risk cover was capped at different levels for households in the different Council Tax bands. For example, the maximum the lowest-income households (in Band A) would pay for flood cover would be £210. This would reduce their home insurance premium from an average £1,140 under fully risk-based

pricing to £650 under the Flood Re scheme. That's a reduction of £490; in other words, the average Band A household receives a financial subsidy of £490.

**Table 1 Expected impact of Flood Re on home insurance premiums by Council Tax band for households at higher risk of flooding**

	A	B	C	D	E	F	G
Baseline: fully risk-reflective premium for combined buildings and contents insurance	£1,140	£1,165	£1,185	£1,290	£1,430	£1,560	£1,850
Flood Re: cap on flood-risk part of the premium	£210	£210	£246	£276	£330	£408	£540
Cost of other cover in home insurance plus insurer overheads and profit	£440	£440	£474	£524	£590	£692	£1,010
Flood Re scheme: expected premium for combined buildings and contents insurance	<b>£650</b>	<b>£650</b>	<b>£720</b>	<b>£800</b>	<b>£920</b>	<b>£1,100</b>	<b>£1,550</b>
Reduction in premium (financial subsidy)	<b>£490</b>	<b>£515</b>	<b>£465</b>	<b>£490</b>		<b>£640</b>	<b>£300</b>

Authors' table using data from DEFRA (2013a, 2013b) [1] Band H (the highest-value homes) were excluded from the scheme as originally designed, but later included (DEFRA, 2013a; 2014).

### Activity 10 The financial cross-subsidy

Allow 10 minutes for this activity

1. Using the data in Table 1, what would the average financial subsidy per household for band E households be?

*Provide your answer...*

#### Answer

The answer is £510. This is the difference between the fully risk-based premium (£1,430) and the premium under the Flood Re scheme (£920).

2. Explain why the financial subsidy each eligible household receives would not normally affect the outcome of the CBA.

*Provide your answer...*

### Answer

The financial subsidy is a cross-subsidy from all households who buy home insurance to those households in the table who are at higher risk of flooding. As such, it is a transfer payment from some households to other households. Since it does not involve the use of resources, it is not included in the CBA.

## 5.5 Measuring the equity benefit

Table 2 reproduces Table 1, but with the addition of some further information. For example, looking at the lowest income households (Council Tax band A), it was estimated that 81,000 households would benefit from the financial subsidy. With an average subsidy per household of £490, the total cost of the subsidy for those households would be £39.7 million.

The next line of the table shows an 'equity weight' for each of the bands of households. This weight is based in the theory of the diminishing marginal utility of income that you considered in Section 3.2. The weight is higher for the lower income households, reflecting the greater utility they derive from extra income, than it is for higher income households.

The total cost of the subsidy for each band of households is multiplied by the equity weight to calculate what is called the 'equity weighted subsidy'. For example, for the Band A households, £39.7 million is multiplied by 2.25 to give an answer of £89.3 million for the equity-weighted subsidy.

The final step is to subtract the unweighted subsidy from the equity-weighted subsidy. The answer is the 'net equity benefit'. For the Band A households, this is £49.6 million (which is £89.3 million minus £39.7 million).

The next activity will help you understand how economists use this answer to take the distribution of benefits (in this case) and/or costs into account when doing a CBA.

**Table 2 Expected impact of Flood Re on home insurance premiums by Council Tax band for households at higher risk of flooding**

	A	B	C	D	E	F	G
Baseline: fully risk-reflective premium for combined buildings and contents insurance	£1,140	£1,165	£1,185	£1,290	£1,430	£1,560	£1,850
Flood Re: cap on flood-risk part of the premium	£210	£210	£246	£276	£330	£408	£540
Cost of other cover in home insurance plus insurer overheads and profit	£440	£440	£474	£524	£590	£692	£1,010
Flood Re scheme: expected premium for combined buildings and contents insurance	<b>£650</b>	<b>£650</b>	<b>£720</b>	<b>£800</b>	<b>£920</b>	<b>£1,100</b>	<b>£1,550</b>
Reduction in premium (financial subsidy)	<b>£490</b>	<b>£515</b>	<b>£465</b>	<b>£490</b>	<b>£510</b>	<b>£640</b>	<b>£300</b>

Number of households receiving the subsidy	<b>81,000</b>	<b>93,600</b>	<b>121,300</b>	<b>92,000</b>	<b>60,600</b>	<b>28,000</b>	<b>23,000</b>
Aggregate financial subsidy, £ million	<b>39.7</b>	<b>48.2</b>	<b>56.4</b>	<b>45.1</b>		<b>12.9</b>	<b>6.9</b>
Equity weight	<b>2.25</b>	<b>1.45</b>	<b>1.05</b>	<b>0.75</b>	<b>0.45</b>	<b>0.45</b>	<b>0.45</b>
Equity weighted subsidy	<b>89.3</b>	<b>69.9</b>	<b>59.2</b>	<b>33.8</b>		<b>5.8</b>	<b>3.1</b>
Net equity benefit	<b>49.6</b>	<b>21.7</b>	<b>2.8</b>	<b>-11.3</b>		<b>-7.1</b>	<b>-3.8</b>

Authors' table using data from DEFRA (2013a, 2013b) [1] Band H (the highest-value homes) were excluded from the scheme as originally designed, but later included (DEFRA, 2013a; 2014).

### Activity 11 Calculating and interpreting the equity benefit

Allow 15 minutes for this activity

1. Using the method described in this section, calculate the equity benefit for households in Band E.

*Provide your answer...*

#### Answer

The answer is -£17.0 million. This is calculated as follows:

- Multiply the average subsidy (£510) by the number of eligible households (60,600). This gives the total cost of the subsidy to all households in Band E of £30.9 million.
- Multiply £30.9 million by the equity weight (0.45). This gives the equity-weighted subsidy of £5.8 million.
- Subtract the unweighted subsidy (£30.9 million) from the weighted subsidy (£5.8 million). The answer is -£17.0 million

2. Can you explain why the equity benefit for higher-income households is negative?

*Provide your answer...*

#### Answer

The equity benefit is a measure of the value society is deemed to put on the fairness or unfairness of the cross-subsidy to flood-risk households. The negative values for higher-income households are telling you that giving subsidies to wealthier people is considered to be an economic cost to society – in other words, those resources could be better used elsewhere in the economy. By contrast, the equity benefit to poorer households is positive.

3. What is the total equity benefit when you add together the equity benefit for all seven bands?

*Provide your answer...*

**Answer**

The total is £35.0 million. (This is  $49.6 + 21.7 + 2.8 - 11.3 - 17.0 - 7.1 - 3.8$ ). Balancing out the economic costs and benefits of the subsidy, the equity benefit is £35 million a year. This figure of £35.0 million is included in the CBA.

## 5.6 The government's policy decision

The government's social CBA found that the Flood Re scheme was estimated to have a net cost to society of -£188 million (DEFRA, 2013a). There was a large amount of uncertainty surrounding this estimate. Various assumptions were altered to see what impact that would have (called a **sensitivity analysis**). In the worst case, the cost climbed to -£601 million, but in the best case there could be a net benefit to society of £224 million. Moreover, other options considered looked more favourable on the basis of the CBA.

Based on the CBA alone, Flood Re would not be obvious choice and the government's decision has been criticised (see, for example, Harrabin, 2015). However, the Flood Re scheme which is due to run for 25 years, until 2039, was justified by the government on the following grounds:

'The government's preference is to work with the industry to secure the affordability and availability of flood insurance...Flood Re protects high-risk properties and makes insurance widely available. This sits well within insurers current business models and the support of the industry would help to ensure a smooth transition in the interim period. Despite the 'best estimate' monetised benefit-cost calculations being unfavourable, there are economic and particularly social factors not fully reflected in this, in particular the importance of providing certainty for individuals, and the avoidance of potential impacts on local housing markets, from concerns about the availability and affordability of insurance. The industry estimate that Flood Re will reflect the existing cross-subsidy in the market and in the short term bills will not increase in general. Over the long term (as a transitional policy) a gradual increase in bills (in response to a reduction in subsidy) for those households at risk will cushion the move to a free market, and risk reflective pricing.

(DEFRA, 2013a, p. 31)

## 6 Conclusion

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In this short-course you have learned about the management of flood risk with regards to residential properties. You used economic approaches to understand why sellers and buyers might choose to build or buy homes that have a high risk of flooding. You considered how the private market for high-flood-risk homes can suffer from externalities that means the market over-supplies these sorts of properties and imperfect information that means demand is also too high.

You considered private insurance as a key way that the UK has historically managed flood risk. Yet, the UK flood insurance market has undergone a lot of changes and the 'Gentleman's Agreement' that prevented the flood insurance market from charging entirely risk reflective prices began to crumble after 2000. After the Statement of Principles of 2008, it was clear that the market would shift to fully risk-reflective pricing in 2013 if the government chose to do nothing to stop it.

You looked at how the economic technique of the cost–benefit analysis (CBA) was used by the UK government as an aid to weighing up its policy options. While CBA generally focuses on the total costs and benefits to society in terms of real resources, you saw how distributional aspects of a policy can be taken into account using equity weighting, a technique based on the economic theory of diminishing marginal utility.

Despite not being the best option according to the government's CBA, the final decision of the UK government was to adopt a scheme called Flood Re under which households at higher flood risk pay subsidised premiums for their home insurance. Flood Re is due to run until 2039. It is intended as a 25-year gradual transition to risk-reflective pricing, which will ease the pressures on the insurance market, but not expose high risk households to a sudden rise in their premiums. The ultimate government aim is to foster the free market to provide the socially optimum number of homes in flood-risk areas with prices there reflecting the true risks and costs corrected for the current market failures. There are challenges to achieving this transition, not least of which is that planning authorities, developers and households will not necessarily use the breathing space afforded by Flood Re to adjust their behaviour in the way the government hopes.

## Glossary

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### Externality

Arises in a market when one economic agent's actions affect the welfare of others in ways that are not reflected in market prices.

### Utility

The amount of satisfaction derived from consumption.

### Moral hazard

The tendency of a person to take on more risk because they believe someone else (for example, taxpayers or an insurer) will bear the financial consequences if the risk materialises.

### Bounded rationality

Capacity for reasoned decision that is constrained by lack of time and ability to process information.



### Asymmetric information

Where one party to an arrangement knows something that another does not and which, had it been known, would have affected the terms of the agreement.

### Neoliberal

Describes a perspective which favours capitalism and freely operating markets as a way of organising economic interactions.

### Capitalism

Social system in which physical and financial capital are mainly privately owned with strong protection of private property rights.

### Perfect competition

Describes a market where a number of conditions are met, for example where no supplier has market power and all agents have perfect information

### Market failure

Occurs where the operation of a market does not result in the most efficient allocation of resources or a situation where a market cannot develop.

### Marginal revenue

The change in total revenue resulting from the sale of an additional unit of output.

### Marginal cost

The increase in total costs as a result of producing one additional unit of output.

### Marginal utility

The additional utility gained when an additional unit of a good is consumed.

### Law of diminishing marginal utility

As the total amount consumed increases, the marginal utility from each additional unit declines.

### Opportunity cost

The opportunity cost of producing (or consuming) a unit of good X is the amount of the next best alternative good Y that could be produced (or consumed) with the same resources.

### Equilibrium

Position in which there is no impetus for agents to change their behaviour or decisions.

### Perfect competition

Describes a market where a number of conditions are met, for example where no supplier has market power and all agents have perfect information

### Price-taker

Describes a buyer or seller that has to accept the price set by the market as given.

### Premium

The sum of money a policyholder pays to have insurance cover. This might be paid as a single lump sum or, more usually, annually or in monthly instalments.

### Policyholder

The customer who has bought insurance.

### Payout

The sum of money the policyholder gets from the insurance if they make a successful claim.

### Excess

(also called a deductible in the US). The first part of any loss that must be borne by the policyholder themselves.

#### Risk pooling

The sum of money a policyholder pays to have insurance cover. This might be paid as a single lump sum or, more usually, annually or in monthly instalments.

#### Risk-based pricing

(also called risk-reflective pricing). Charging consumers a higher amount if the likelihood of their claiming (in the case of insurance) or defaulting (in the case of loans) is higher.

#### Risk segmentation

Dividing a pool of consumers for a particular type of insurance into smaller sub-pools on the basis of characteristics that are thought to predict the risk of claiming.

#### Adverse selection

The tendency for people who have a greater than average chance of suffering an event to apply for insurance to a greater extent than other people.

#### Discounting

The process of re-evaluating future income and costs in terms of what they are worth in the present.

#### Transfer payment

Payment from one economic agent or sector to another not in exchange for goods or services.

#### Sensitivity analysis

Process used to see how the results of an analysis might change if the value of key factors were different from those assumed in the main calculation.

## References

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Association of British Insurers (ABI) (2008) *Revised statement of principles on the provision of flood insurance*. Available at:

<https://www.abi.org.uk/globalassets/sitecore/files/documents/publications/public/mi-grated/flooding/statement-of-principles-england.pdf> (Accessed: 29 September 2019).

Chelmi, C. (2016) *Building on the flood plain*. Available at:

<https://www.groundsure.com/news/building-flood-plain/> (Accessed: 27 September 2019).

Department for the Environment, Food and Rural Affairs (DEFRA) (2013a) *Managing the future financial risk of flooding: Impact Assessment*. Available at:

[http://www.legislation.gov.uk/ukia/2013/269/pdfs/ukia\\_20130269\\_en.pdf](http://www.legislation.gov.uk/ukia/2013/269/pdfs/ukia_20130269_en.pdf) (Accessed: 8 January 2019).

Department for Environment, Food and Rural Affairs (DEFRA) (2013b) *Securing the future availability and affordability of home insurance in areas of flood risk*. Available at:

<https://consult.defra.gov.uk/ahdb-sponsorship-and-agricultural-tenancies/floodinsurance> (Accessed: 8 January 2019).

Department for Environment, Food and Rural Affairs (DEFRA) (2014) *Government response to the public consultation on the Flood Reinsurance Scheme Regulations*.

Available at:

- [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/388915/flood-re-gov-response-201412.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/388915/flood-re-gov-response-201412.pdf) (Accessed: 6 October 2019).
- Environment, Food and Rural Affairs Committee (2016) Oral evidence: Future flood prevention, HC115. 15 June. Available at: <http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/environment-food-and-rural-affairs-committee/future-flood-prevention/oral/34494.html> (Accessed: 29 September 2019). Ministry of Housing, Communities & Local Government, 2018
- Harrabin, R. (2015) 'Flood insurance scheme 'wasteful'', *BBC News*, 5 February. Available at: <https://www.bbc.co.uk/news/science-environment-31138997> (Accessed: 6 October 2019).
- Harvey, F. (2014) 'England's floods – everything you need to know', *The Guardian*, 11 February. Available at: <https://www.theguardian.com/environment/2014/feb/11/englands-floods-everything-you-need-to-know> (Accessed: 26 June 2019).
- Harvey, F. (2016) 'Build on flood plains despite the risks, say UK government advisers'. *The Guardian*, 27 January. Available at: <https://www.theguardian.com/environment/2016/jan/27/homes-and-companies-should-be-built-on-flood-plains-despite-risks-says-panel> (Accessed: 27 September 2019).
- HM Treasury (HMT) (2018) *The Green Book: Central Government Guidance on Appraisal and Evaluation*. Available at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/685903/The\\_Green\\_Book.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf) (Accessed: 8 July 2019).
- Huber, M. (2004) *Reforming the UK flood insurance regime: The breakdown of a Gentlemen's Agreement*. Available at: <http://eprints.lse.ac.uk/36049/1/Disspaper18.pdf> (Accessed: 29 September 2019).
- Kozin, D. (2019) 'St Petersburg's dam is holding back the floods, for now', *The Moscow Times*, 21 February. Available at: <https://www.themoscowtimes.com/2019/02/21/st-petersburgs-dam-is-holding-back-floods-for-now-a64066> (Accessed: 26 September 2019).
- Landmark Information Group (2014) 'The history and future of the Thames Barrier', *Today's Conveyancer*, 31 August. Available at: <https://www.todaysconveyancer.co.uk/partner-news/the-history-and-future-of-the-thames-barrier/> (Accessed: 26 September 2019).
- Lineback, N. and Gritzner, M. L. (2014) 'Geography in the news: polder salvation'. *National Geographic*, 5 May. Available at: <https://blog.nationalgeographic.org/2014/05/05/geography-in-the-news-polder-salvation/> (Accessed: 26 September 2019).
- Ministry of Housing, Communities and Local Government (MHCLG) (2018) *Land use change statistics: 2016 to 2017*. Available at: <https://www.gov.uk/government/statistics/land-use-change-statistics-2016-to-2017>. (Accessed: 7 February 2020).
- Ministry of Housing, Communities and Local Government (MHCLG) (2019) *Housing supply; net additional dwellings, England: 2017 to 2018*. Available at: <https://www.gov.uk/government/statistics/housing-supply-net-additional-dwellings-eng-land-2017-to-2018> (Accessed 7 February 2020).
- Royal Institute of British Architects (RIBA) (2018) 'New report calls on the Government to build flood resilient homes', *RIBA Architecture.com: Knowledge*, 3 May. Available at:

<https://www.architecture.com/knowledge-and-resources/knowledge-landing-page/news-uk-must-build-flood-resilient-homes-says-riba> (Accessed: 27 September 2019).

Smith, A. (1776) *An inquiry into the nature and causes of the wealth of nations*. Edited with an introduction, notes, marginal summary and an enlarged index by Edwin Cannan. Fascimile of the 5th edn. London: Methuen & Co, 1961. Volume 1.

The Construction Index (2015) *Netherlands to help Bangladesh tackle flooding issues*, 17 June. Available at:

<https://www.theconstructionindex.co.uk/news/view/netherlands-to-help-bangladesh-tackle-flooding-issues> (Accessed: 29 September 2019).

Thomas, S. (2015) 'If we're going to build on floodplains, we must ensure homes are adequately protected', *Huffpost*, 3 November. Available at:

[https://www.huffingtonpost.co.uk/simonthomas/if-were-going-to-build-on\\_b\\_8461234.html](https://www.huffingtonpost.co.uk/simonthomas/if-were-going-to-build-on_b_8461234.html) (Accessed: 27 September 2019).

Tregaskis, S. (2013) 'Devastation on England's East Coast after 1953's 'Big Flood' – in pictures', *The Guardian*, 31 January. Available at:

<https://www.theguardian.com/environment/gallery/2013/jan/31/devastation-east-anglia-1953-flood-in-pictures> (Accessed: 27 September 2019).

West Cumbria Rivers Trust (2016) *Making space for water*. Available at:

<https://vimeo.com/174936098> (Accessed: 29 September 2019).

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<https://www.freshplaza.com/article/9166995/huge-demand-for-egyptian-onions-price-nearly-doubled-in-45-days/> (accessed: 12 March 2020); Nikkei Asia Review

<https://asia.nikkei.com/Business/Energy/LNG-prices-in-Asia-plunge-43-as-new-US-supply-hits-market> (accessed: 12 March 2020); ITV News

<https://www.itv.com/news/2019-09-10/uk-employment-rate-hits-record-high-as-wages-surge-higher/> (accessed: 12 March 2020)

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Figure 14: Flood Re

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