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Global Change and Ecosystems

D6.1.2b Institutional arrangements and mapping for the governance of sustainable urban water management technologies: Mapping protocol and case study of Birmingham, England

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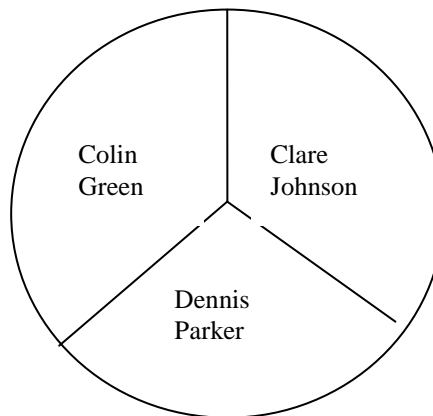
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Institutional arrangements and mapping for the governance of sustainable urban water management technologies

Mapping protocol and case study of Birmingham, England



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| D6.1.2b Institutional arrangements and mapping for the governance of sustainable urban water management technologies: Mapping protocol and case study of Birmingham, England | |
| Audience | The document was prepared for an audience both inside and outside the SWITCH consortium. It is for researchers and others involved with innovation in urban water management who wish to engage with the governance and institutional aspects of more sustainable urban water management. |
| Purpose | The purpose of the document is to provide an introductory rationale, guidance and fully documented example of Institutional Mapping in Birmingham, with a focus on Sustainable Urban Water Management. |
| Background | The concept of institutional mapping was part of the project design, under Work Package 6.1. The lead author of this report, Colin Green of Middlesex University undertook a comprehensive review of the theory and practice of good governance in which he laid the foundation for mapping governance. This report further develops the ideas introduced in the earlier document. |
| Issues | The main developmental problem identified at project inception related to delivering integration through a fragmented mosaic of institutions. The context was fragmented decision making on water management issues, limited stakeholder engagement in resolving water governance challenges, conflicting policies, and in some cases, weak engagement by municipal authorities in the planning and regulation of water related services. Tools were needed to understand the water governance context, support key stakeholders involved in innovation and managing the change to engage in constructive dialogue to address the challenges faced relating to integration and sustainability. Institutional Mapping was one of the key tools to address the issue by assisting stakeholders to examine the governance issues relevant to particular interventions or technologies being considered. |
| Recommendations | <ol style="list-style-type: none"> 1. This document should be used not as a blue-print, but as a basis for developing a plan for mapping key aspects of urban water governance in a city aiming to improve the sustainability of its water management system/s. 2. Institutional mapping should be led by those with strong skills and experience in qualitative research and local knowledge of the context. 3. The details of the institutional mapping should focus on particular technologies or other innovations being considered. |

1 INTRODUCTION

This report is a contribution to the SWITCH project – Sustainable Water management Improves Tomorrow's Cities' Health) where a key objective is to establish a Learning Alliance in each of nine demonstration urban centres in order to advance sustainable urban water management.

This report has two purposes:

- to develop and specify a methodological protocol for preparing an institutional map for urban water management, and
- to prepare an institutional map for urban water management for the city of Birmingham, England, which is one of the demonstration cities for the SWITCH project.

With stakeholder engagement, a key question is: who is a stakeholder? By what right can an individual or group claim to be a stakeholder (Green 2007)? In broad terms, stakeholders can be defined as three overlapping groups (**Figure 1**). Institutional mapping is concerned only with one of these groups: those who have the power to influence the success or otherwise of the takeup of any particular innovation undertaken as part of sustainable urban water management. Stakeholder engagement is fundamentally about power, the power to make decisions, and institutional mapping is concerned with the existing distribution of power as this rests with organisations. Institutional mapping is thus a narrower subset of stakeholder engagement where stakeholder engagement is concerned with who ought to have power as well as who currently has power. Institutional mapping is an empirical exercise. It is also a practical exercise; undertaken with a particular purpose in mind.

Institutions are defined by the existence of some informal or formal set of rules (North 1990; Scott 1995; Uphoff 1986). The distinction between an institution, a system of formal or informal rules, and an organisation, the physical embodiment of a set of rules, has to be maintained. An organisation embodies an internal set of rules which govern what it does, and exists in an environment of rules which determine its relationships with other organisations, individuals and groups. All organisations are institutions but not all institutions are consequently expressed as organisations.

Using the mapping metaphor, organizations are features and the rules are the linkages between those features. In addition, any set of rules necessarily creates both functional and geographical boundaries which limit the action space of each organisation. Those rules themselves as expressive of power as they define who has the power to act or who must agree before another can act in particular ways. Who has the power to act or the power to require their agreement before another can act depends upon the action in question. Hence, the institutional maps tend to be technology specific. In turn, there is a presumption that no single organization will be able to deliver any specific technology and that increasingly the effectiveness of any organization lies in the extent of its ability to influence the actions of others. Rather than the old model of unified organizations on the model of the Tennessee Valley Authority, the new model is one of a mosaic of organisations, from which we have to deliver holistic management. Hence, institutional mapping is a critical first step in the delivery of sustainable urban water management. The crucial problem for governance is then how we can deliver integrated sustainable urban water management through that mosaic of organizations.

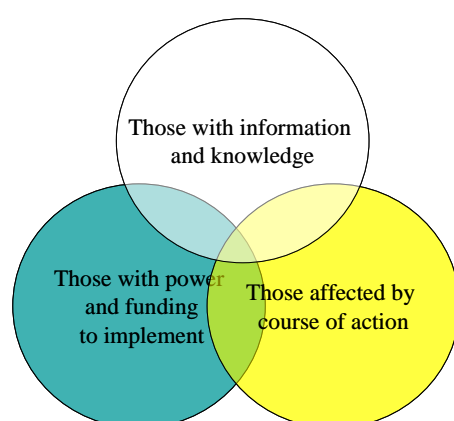
That institutional maps tend to be technology specific is reflective of institutional arrangements; equally, as argued previously (Green 2007), technologies are expressive of social relationships and specifically the rules and power relationships of institutions. A technology either expresses the current social relationships or it implies an alternative set of social relationships.

The requirement for institutional mapping is not dependent upon a theoretical approach based upon urban Regime Theory (Stoker 1996; Stone 1989) – power expressed through social production, and way in which different interests must blend their capacities to achieve

common purposes – but it is consistent with the theory. Similarly, it is consistent with Regime Theory in international relations (Krasner 1983) in which regimes facilitate cooperation by establishing standards of behaviour which signal to all other members that individual states are cooperating. But international relations Regime Theory tautologically defines a regime as “institutions possessing norms, decision rules, and procedures which facilitate a convergence of expectations” (Krasner 1983).

Institutional maps are intended to provide an overview of institutional and governance structures for the management of urban water. They focus upon the key actors or players and their interactions, where power is located, who has the ability to influence decisions, and who makes decisions. In this case they also focus upon technologies as these are partly institutionally differentiated, which explains why Sections 9 onwards of this report comprise part of the institutional map for Birmingham. A caveat that must be entered here is that this draft has not yet been discussed with the stakeholders in Birmingham.

Figure 1 Who can claim to be a stakeholder?



In practice, decision-making about urban water management is multi-layered in that it takes place at the international, national, regional and local levels. Although the focus of this project is at the city level, city level decision-making and operational decision-making at the sub-city level can be, and often is, fundamentally influenced and affected by decision-making at other levels. These levels include the regional, national and international levels where there are potentially important cross-sectoral linkages as well as vertical ones.

The analysis of institutional arrangements which leads to the construction of an institutional map therefore needs to consider each of these levels or layers, so that the institutional map is multi-layered. Therefore, to some extent, institutional arrangements for water management in England are also those for Birmingham (i.e. the city layer is nested within other layers).

Naturally, the extent to which city-level institutional arrangements reflect national arrangements depends upon how each nation is organised and the relative importance of each layer. It is recognised that this varies between nations so that the significance of layers to city level decision-making will differ between countries. Thus, generic issues for England are:

- The country is highly centralised with limited powers and responsibilities delegated to local government. For much of the country there are only two levels of local government (District and County). In some areas, there is a single unitary authority. These are large authorities, there being a total of 420 for England and Wales as a whole. In addition, in some areas, there is a lower level, more local tier, variously called a Parish or Town council. There are around 15,000 such Parish councils but they have very limited powers

and responsibilities. For example, Bideford in the south-west of England has a population of around 15,000. In addition to the two main tiers of local government, the County Council and District Council, there is a Town Council. The relative importance of the three levels of local government can be gauged by the budgets of the three levels: the Town Council has a budget of £171,000; the District Council of £15 million; and the County Council one of £600 million.

- Since England lacks any formal constitution, local government has been constantly reorganised over the last 200 years into larger authorities with less power. The current government has sought to promote a new upper level tier of local government in the form of Regional Assemblies. These were established with the intention that they be elected Assemblies but a referendum in the North East region rejected the proposal for an elected Regional Assembly and no further referenda in other regions have been undertaken. The assemblies therefore continue to exist in what was intended to be an interim form with members made up of elected members from the local authorities within the region. The Regional Assemblies have important responsibilities with regard to preparing the Regional Spatial Strategies covering land use issues.
- Secondly, responsibilities for water are now centralised under a single Ministry (the Department for Environment, Food and Rural Affairs) and those for local government, and land use planning, under a second Ministry (Communities and Local Government Department). The former Ministry includes agricultural issues but the concern is now with socio-economic development in rural areas rather than with the promotion of agriculture. Farming is now seen as a way of conserving the environment and landscape instead of a means of food production, with farmers being subsidised to enhance the environment and conserve the landscape instead of producing crops.
- Thirdly, water and wastewater were privatised in 1989; the existing bodies simply being converted to public companies and the shares sold off on the market. All existing assets of the former bodies were transferred to the new companies. That the existing structure was privatised as it stood means that in some areas both water and wastewater is supplied by one company. In other areas, wastewater management is the responsibility of one company and water supply the responsibility of another company. Price and quality regulation is the responsibility of OFWAT (the Water Services Regulatory Authority), which also has the responsibility that the individual companies continue to be financially viable. Every five years, OFWAT sets the prices which the companies can charge for water and wastewater services in each of the following five years. Those charges are primarily set so as to provide for the investment needed to meet agreed service targets, notably those associated with the environment. The price regime is such that the companies have an incentive to drive down Operation and Maintenance costs but a strong incentive to seek to make additional investments in quality improvements. The Consumer Council for Water is intended to protect the consumers' interest with regard to prices but it has little real influence; the interests of environmental groups and the companies coinciding in that both want additional investments but for different reasons. In turn, the focus of the investment plans to date has been on environmental quality improvements rather than renewing the water and sewer networks.
- Fourthly, unlike most countries there is little in the way of Water User Associations. There are around 190 Internal Drainage Boards (IDBs), which were originally Water User Associations in a form similar to the Waterschappen in the Netherlands, with, as the name implies, responsibility for surface water drainage in some areas of the country. Unlike the Netherlands, the responsibilities and independence of the IDBs have diminished over time rather than expanded.
- The Thatcher government set out to destroy the power of the Trade Unions, and did so successfully. Hence, Trade Unions and other employee organisations make no appearance in the institutional maps for England. This may not be (e.g. the significance of Workers Councils in companies in Germany) the case in other countries.

2 Lessons learnt

Institutional mapping is fundamentally a process of analysis; there is no cook book which will guarantee that an adequate institutional map results. The practical lessons learnt cover:

- How to think about institutional mapping, how to define the problem.

- What to do, and how to do it: practical tools for use in institutional mapping.

The general lessons are:

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| Institutional mapping is very time consuming. |
| Institutional maps are technology specific. |
| It is necessary to understand the nature of each technology for which an institutional map is being prepared. |
| Policy and practice is constantly in a state of change (indeed, the purpose of undertaking Institutional Mapping is to induce change) so it is necessary to see what changes are being contemplated. |
| The process of developing an institutional map is akin to solving a three-dimensional crossword: it is about making connections so there is no single necessary starting point. In turn, there is no protocol which will necessarily result in an adequate institutional map but there are some tools as a general approach expressed as a protocol. |
| Whilst all organisations are institutions, not all institutions are organisations: organisations are concrete manifestations of particular institutions: particular sets of rules. It is important to focus on the rules, the institutions, and not simply map the organisations. |
| An organisation is distinguished by having an internal set of rules which govern its operation, as well as by external systems of rules which define its interactions with others. |
| It is much easier to identify the formal systems of rules, expressed in laws and regulations, than the informal systems of rules: those that are expressions of social norms for example. Informal rules achieve a hegemonic status and so are neither noticed explicitly or open to question. But informal rules are more important than formal rules. |
| Some of these cultural rules will affect the process of institutional mapping. For example, a 'private company' is bound by one set of rules where those rules may be quite different in country A (e.g. England) from those in country B (e.g. Germany). It is difficult to avoid thinking in terms of cultural stereotypes from the perspective of one's own culture. |
| Intra-organisational rules partition what an organisation can do into three sets: what it must do, what it may do, and what it must not do. Whilst the focus of the concern in institutional mapping is upon actions, those intra-organisational rules may define specifically what it can do, and/or the procedures it should adopt, and/or the objectives it is to pursue. |
| This is particularly the case where a written constitution reserves particular powers or duties to specific branches or levels of government. |
| Any system of rules necessarily creates boundaries. Hence, looking for functional and geographical boundaries is a useful route into preparing an institutional map. Definitions of terms in particular define boundaries. |
| That there are rules does not mean that they actually operate. There are many reasons why a set of rules may not be effective in practice. Some rules are simply gestural: they were never intended to be effective. Others are impossible to apply in practice for technical or other reasons; others conflict with other sets of rules. Resources may not be adequate for the rules to operate, or there may be higher priorities. In this sense, corruption is one system of rules which may inhibit or preclude the operation of another set of rules. Equally, specific rules can create the scope for corruption. |
| There are potentially multiple forms of corruption: given the pervasiveness of corruption throughout history, the significant question is under what conditions is corruption relatively uncommon, and why as well as when, in particular, has it been reduced? |
| Institutional mapping is dependent upon the availability of documents (something more than a two metre high pile in this case); access to a repository of documents either in the form of a registry, library or via the web determines the success of the process and the cost of undertaking the exercise. As an example, the Environment Agency's list of the Acts, Directives and Regulations which govern its actions runs to 20 pages. |
| History is important; there is an element of the past determining the present so that understood practices are not open to question. It is, for example, unclear why the then quite common practice of using soakaways to dispose of rainwater died out some 40 years ago. Some technologies (e.g. the use of WCs and piped sewerage) may have become emblematic of modernity, and simply displaced other technologies which were not so seen. |
| Laws, regulations and institutions are a response to the then prevailing technologies and technological capacity and embed expectations about those technologies and the nature of |

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| the problem. For example, in most countries, laws relating to the use of groundwater did not develop because, until the advent of cheap diesel or electric pumps, groundwater could not be accessed in significant quantities. In England, for urban water uses, laws, regulations and institutions all assume the technologies introduced 150 years ago. |
| This reflection of the then prevailing concerns and technologies is reflected in definitions of terms. |
| Terminology becomes specific when defined in terms of particular technologies e.g. the legal definition of a 'sewer'. This specificity inhibits the adoption of alternative technologies such as SUDS. Conversely, in other cases, terminology refers to a well-understood concept and then is vague and ambiguous: an example is 'land drainage'. Such ambiguity can either be constructive or create problems. |
| Definitions are critical. What is not known is whether the degree of ambiguity or absence of definition found in England is a universal problem, or a result of Common Law: an evolving system of law based upon previous cases. It may that in legal systems based on, for example, the Napoleonic Code, definitions are more commonly specifically defined in the law. |
| Growth is still considered both natural and inevitable; this implicit presumption creates a bias. Water metering is thus seen in the context of slowing an otherwise inevitable increase in demand rather than considered as a means of cost recovery when demand has fallen by perhaps 40-50% from present levels, and the use of greywater recycling, SUDS and similar technologies is widespread. |
| Water management is highly coupled to land management and generally subservient to land management. Understanding land management in terms of policies and planning is therefore central. |
| Similarly, Sustainable Development concerns focus upon shifting to carbon neutral development, climate change is taken, rightly, to be the critical problem facing us. Water management concerns are further down the list of priorities and subservient to achieving carbon neutrality. There are some under-analysed problems in achieving carbon neutrality on the one hand and sustainable urban water management on the other. Firstly, water management is energy intensive, particularly for moving water around. Sustainable water management strategies typically rely upon increased use of kinetic energy for pumping and processing, and hence increase energy demands. Secondly, it is known that some wetlands, an otherwise attractive technology to treat wastewater, are methane gas emitters where methane is a very aggressive greenhouse gas. |
| There is frequently an emphasis upon 'Voluntary Initiatives'. It is not clear in individual cases whether these are seen as being more effective than alternatives such as financial incentives or regulations; the difficulties of taking other action (e.g. lack of time to introduce legislation); or the anticipated failure of such voluntary initiatives is seen as a means of legitimising taking stronger action in the form of legislation in the future. |
| There is increasing use of partnerships and informal arrangements; it is difficult to disentangle the functionality of such groups. They may be a means of legitimising action which a key player already intends to undertake on the one hand; or formed to create power to influence a key player (e.g. the conventional NGO); or a means of coalition building to deliver action; or as a means of attitude formation, rather similar to the Chinese practice of proclaiming a slogan. |

2.1 Tools for institutional mapping: how to do it

Rules can be about actions or behaviours, procedures to be adopted, and/or objectives to be pursued. We are concerned with:

1. The rules governing relationships between organisations, individuals, and groups, and
2. The rules governing the behaviour of those organisations, individual or groups. Those rules also specify the boundaries of the individual organisations and groups.

As a problem, institutional mapping is analogous to solving a three-dimensional crossword puzzle. There are a series of clues to which the answers are interdependent so that a possible solution to one clue can help solve another clue. Equally, a potential solution to one clue may be ruled out because it is inconsistent with the answer to another clue. Similarly, a good strategy is to start by finding those clues for which an answer suggests itself as this will

suggest partial answers to other clues. Starting at the first clue and attacking them in sequence is not usually a very effective strategy.

There are four groups of techniques or tools we have found useful in the process of institutional mapping:

1. Finding out the formal definitions of terms e.g. 'river', 'sewer', 'domestic water supply'.
2. A series of questions covering different possible relationships.
3. Diagrams showing relationships.
4. Diagrams showing technologies.

These techniques are aids to analysis rather being prescriptive; thus, they help but their use does not guarantee that a complete institutional map will be developed.

Formal definitions are found in law and in administrative decisions whether these be Acts or regulations. The key parts of the definition are its boundaries and what the thing in question does.

A list of relationships that have been found to be useful in seeking to disentangle institutional relationships are:

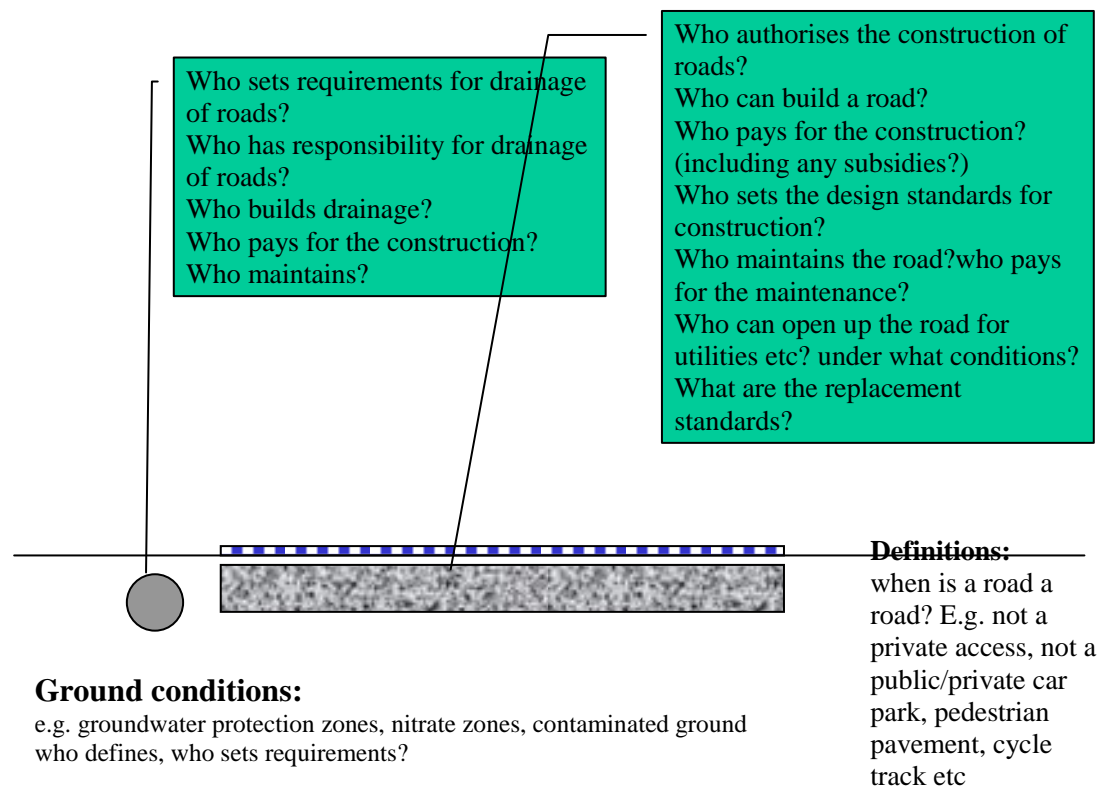
- Who buys it?
- Who sells it?
- Who taxes it?
- Who can lend money for it, or against it as security?
- Who regulates its construction?
- Who regulates the design?
- Who approves it?
- Who recommends it?
- Who maintains it?
- Who repairs it?
- Who operates it?
- Who pays for it?
- Who promotes it?
- Who charges for it?
- Who subsidises it?
- Who builds it?
- Who installs it?
- Who decides to build it?
- Who sells it?
- Who connects to it upstream?
- Who connects to it downstream?
- Who authorises it?
- Who can use it?
- Who can inspect it?
- Who can open it up?
- Who owns it?

Not all these questions apply in the case of every individual technology; equally, there may be a technology for which an additional question concerning a particular form of relationship proves to be the crucial question.

The third strategy is drawing diagrams showing how different organisations are related to each other, particularly vertical relationships.

Finally, three dimensional drawings are means of showing linkages and boundaries which can then be explored (**Figure 2**).

Figure 2 **Permeable pavements**



Having identified the relationships between the organisations, and the organisations who are consequently players, the remaining questions are:

- What are the objectives or interests of those organisations?
- What rules govern their behaviour, including the procedures which they must adopt in making and implementing decisions?

These objectives, interests and rules are not necessarily fixed; there may be scope for constructive ambiguity and reinterpretation. For example, in the western USA, the Prior Appropriation doctrine (Wright 1990) has proved to be inflexible and inappropriate for current conditions (Green 2003). The courts have consequently rediscovered the doctrine of Public Trust (Ingram and Oggins 1992) as a means of protecting the environment.

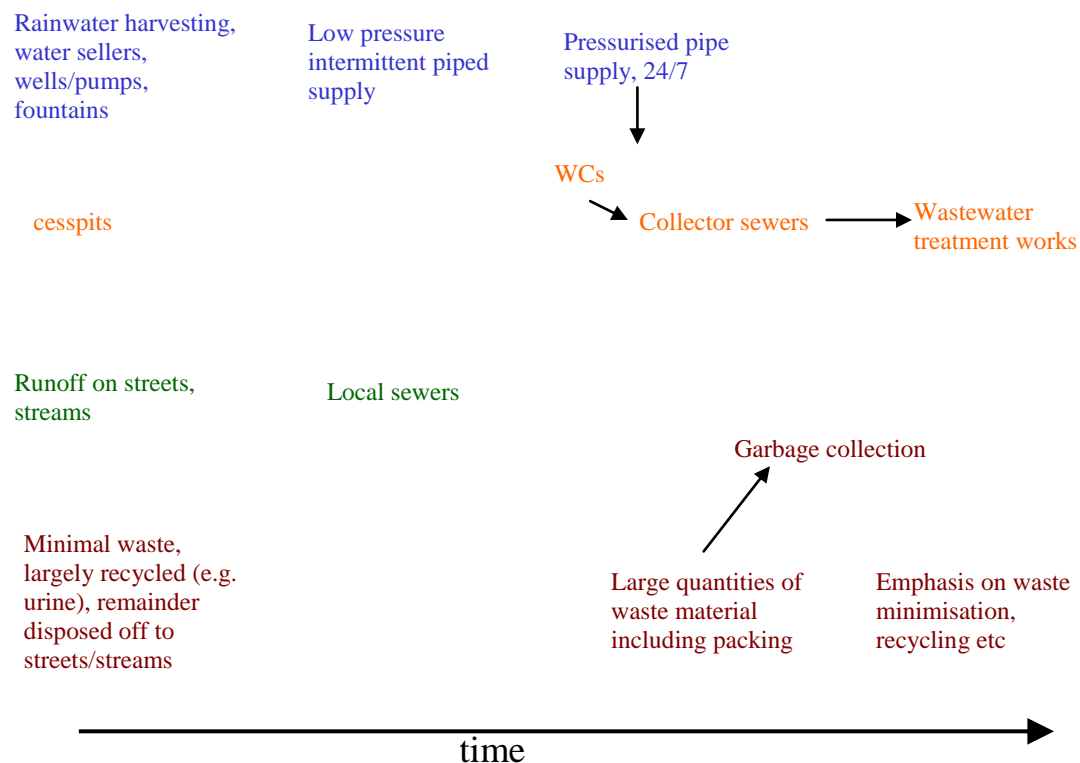
3 URBAN WATER MANAGEMENT

3.1 Background

The SWITCH project aims to achieve a paradigm shift in urban water management to get sustainable, healthy and safer urban water systems. An underlying philosophy is that without institutional change it will not be possible to achieve such a paradigm shift.

The project is based upon the premise that something is wrong with the current way in which we manage and use water in our cities, and as a consequence there are risks to sustainability, health and safety of urban dwellers and the nations in which they live and work. The starting point is that we are currently far away from adopting a model of sustainable urban water management in our cities, and that sustainable solutions are urgently required to meet the challenges which we face in the area of water management.

Figure 3 Generic pattern of evolution in water management



The problems facing cities in developed countries and those in developing cities are different but overlapping. The generic pattern of evolution of water management within cities is shown in **Figure 3**. This is a technologically driven pattern of development; thus, water supply was not available on a continuous basis until cast iron pipes with an adequate system of jointing became available. In London, this only occurred towards the end of the nineteenth century. A key technological innovation was the Water Closet. Its introduction required a reasonably reliable and adequate supply of water; its introduction then increased the demand for potable water by at least 50%. In turn, it meant that the cesspit for the collection of human waste was not longer a viable option in dense cities and required the expansion of the sewer network. The discharge of human waste via the sewers to watercourses turned the rivers into wastewater lagoons and drove the introduction of collector sewers. The eventual recognition that the discharge of raw sewage into the environment, even when discharged well away from human activity, was unacceptable drove the introduction of wastewater treatment works. A fairly simple innovation resulted in a need for massive investment. Thus, now the costs of the sewer network and wastewater treatment systems massively outweigh the costs of providing potable water; in England, over 60% of the entire capital value of the water and wastewater industry is for the sewer network.

So, in technological terms, one message is that cities in developing countries should consider adopting other technological paths than that historically followed in the developing world. Indeed, many of the techniques being proposed are reflections of past practices, updated and improved. For example:

- Rainwater harvesting was widely adopted in the Mediterranean countries and elsewhere (**Figure 4**).
- Source control in the form of soakaways was formerly very common practice in housing design in the UK and elsewhere.
- Reuse of water was commonplace, many sewerage works in the nineteenth century were built with sewage farms (Shuval et al 1996).

- 'Eco-san' toilets in the form of earth closets competed with the introduction of water closets (Moore 1909).
- The collection of faecal matter in cess pits was the traditional means of sanitation. Urine was frequently collected separately because of its value in leather tanning.

Figure 4 Rainwater harvesting – 1742, Capel Manor, Middlesex: pump from storage tanks



The problem for the developed countries is they will have to shift to a sustainable development strategy very largely using the existing asset base; for example, the housing stock in England is being replaced only at a rate of 0.1% per annum.

If the problem for the developed world is to recover from the past whilst those in the developing world have a greater opportunity to choose the future, cities in the two zones face rather different problems. The great wave of urbanisation, the mass movement of populations from rural, predominantly agrarian ways of life to urban areas, is largely completed in the developed world. There is migration between urban areas but effectively nobody left in the rural areas to migrate to the urban areas. There may be migration from other countries to those urban areas but the within country process of rural to urban migration is essentially finished.

In the developing world, the critical problem is the shift of population from the countryside to urban areas. In China alone, the expectation is of 340 million people moving from the countryside to the urban areas over the next 30 years. The problem of providing water supplies and sanitation for such a population is 'challenging'.

However, in quantity terms the problems of water management in cities are less demanding than those of agriculture. Whereas 80 l/p/d is adequate for domestic purposes with around another 120 l/p/d being necessary for all other urban purposes, producing the food for each resident has required between 3 and 6 tonnes of water, all of which is lost through evapo-transpiration. Indeed, many and perhaps most cities export more water than they import in the form of potable water, cities being very effective mechanisms for rainwater harvesting (Green 2003). Thus, the primary problem with cities is the water they export both in the form of surface water runoff and wastewater, creating both a quantity problem, flooding, and a quality problem, pollution.

The SWITCH project is therefore designed to cover all of the elements of the urban water cycle, from water demand management, to storm water management, waste prevention, treatment and reuse, governance and asset management, to river rehabilitation and eco-hydrology.

A key proposition is that sustainable urban water management is only possible if the entire urban water cycle is managed in a holistic manner, rather than on a piecemeal basis. Therefore integrated urban water management is viewed as a precursor to sustainable urban water management, and cross-sectoral cooperation at national and regional levels is considered to be essential. Most importantly the urban water system needs to be managed in the context of the entire catchment.

SWITCH aims at the development, application and demonstration of a range of tested scientific, technological and socio-economic **solutions** that contribute to the achievement of sustainable and effective urban water management schemes in 'The City of the Future' which is projected as 30-50 years from now.

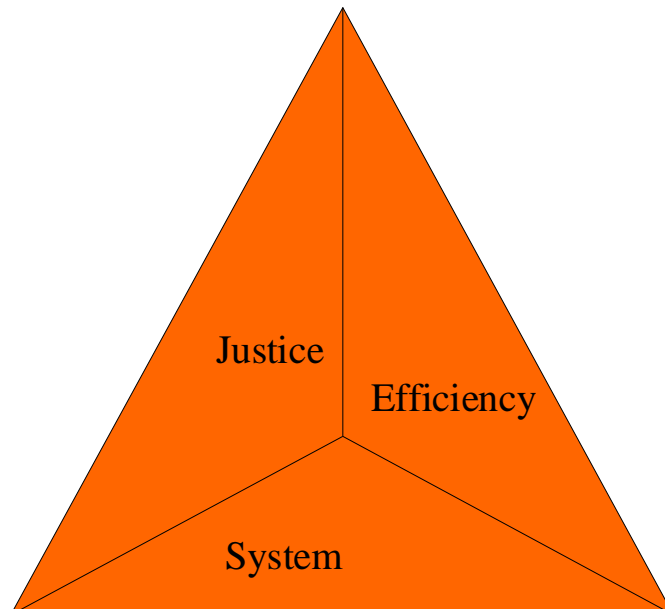
What we seek to do is to do 'better'. Thus a critical question, as discussed in the report on Governance (Green 2007), is:

- what do we mean by 'better'?

Figure 5 proposes that there are three components to the answer to this question:

1. We need to do more with less: to use available resources more efficiently and switch to the sustainable use of resources.
2. The objectives of collective choice are to deliver what in some sense is 'justice'.
3. That managing systems as systems will result in improved performance in both senses

Figure 5 **Doing 'better'**



3.1.1 Solutions

Delivering sustainable urban water management is about doing 'better' where doing 'better' requires the invention and adoption of 'better' technical options. These options might be categorised as follows:

- integration strategies where areas of planning and management traditionally separated at city level (and other levels) are brought together;
- participatory strategies in which key players or actors (also referred to as stakeholders) are brought together in new working groups for a to make policy and plans and to take them forward;
- introduction of sustainable urban water management technologies through new or strengthened socio-economic approaches.

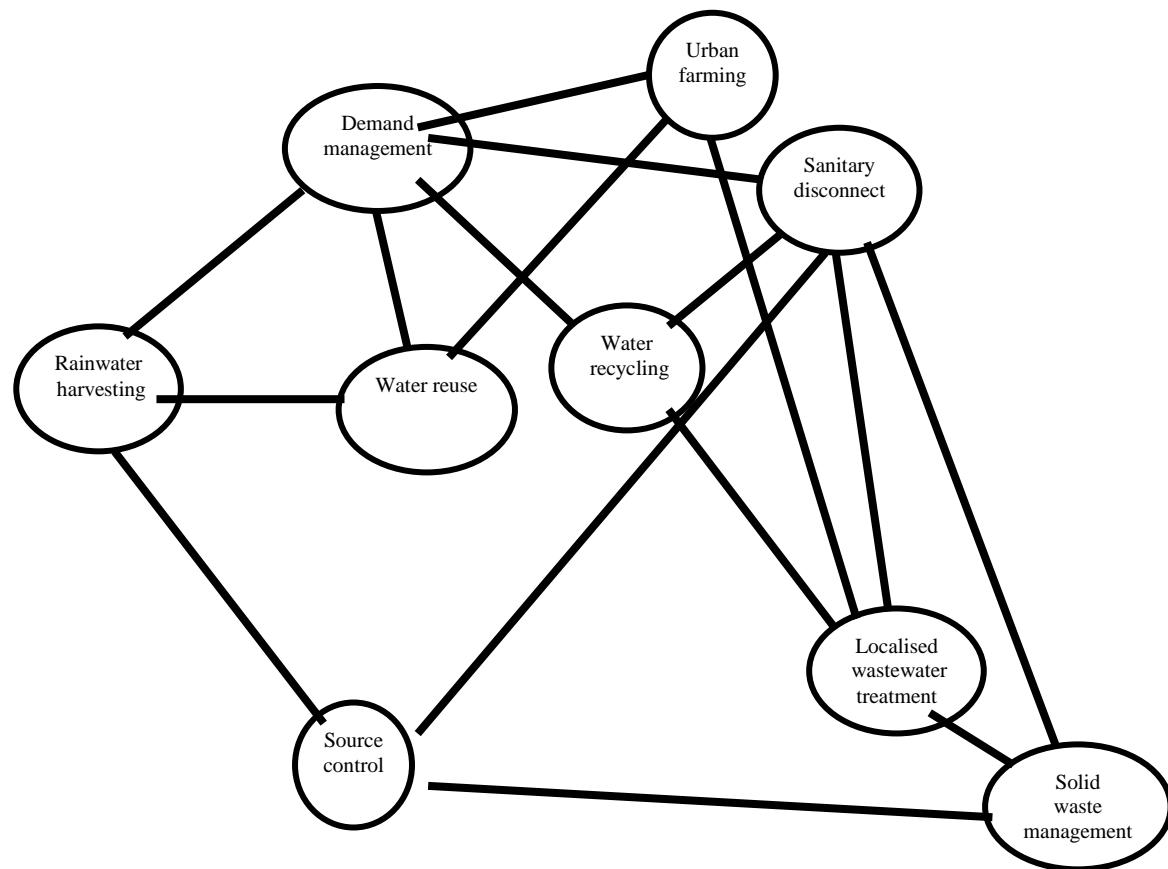
Each of these is linked. For example, integration of urban water management with urban landscape planning and say, urban livelihood planning, brings together key players and stakeholders and points the way towards multi-stakeholder working groups. One of the key interests of these groups will be to find ways of introducing and expanding the adoption of sustainable urban water management technologies.

The SWITCH project focuses upon learning alliances as innovative institutional solutions and conceptualised by Moriarty *et al.* (2005, 9). Learning alliances are defined by Moriarty *et al.* (2005) as 'a series of connected stakeholder platforms, created at key institutional levels (e.g. national, intermediate/city and local/neighbourhood) and are designed to break down barriers to both horizontal and vertical information sharing in order to speed up the process of identification, development and uptake of innovation. Each platform is intended to group together a range of partners with complementary capabilities in areas such as implementation, regulation, policy and legislation, research and learning and documentation and dissemination'.

The conjunction of the concepts of 'social' and 'learning' is critical; it is learning because all decisions or choices involve discovering what is the best course of action to adopt, it is a process of learning which is the best option. We are doing this in the context of change to which we have to adapt and in seeking to do better, we have to invent and innovate. We therefore seeking a future which is different from the past. We can hope to learn from the past to do better but we will not repeat the past. Secondly, Bandura (1977) has emphasized that almost any form of learning is a social act, involving some form of interaction between at least two people. Moreover, the requirement of cooperative action requires that the stakeholders as a group decide what to do; stakeholder engagement is, by definition, a social process.

The central problem is that whilst we seek to manage water on a holistic basis, rules create boundaries and so inhibit holistic management. Moreover, for each specific technology, it is possible for a different set of institutions to be involved. Any new technological innovation may therefore require a new institutional map to be prepared. Equally, writing is conventionally organised linearly and sequentially. Hence, for both reasons, it is necessary to deal with individual technologies separately even whilst regarding them as components of a whole, of sustainable urban water management, with multiple interdependencies between them (**Figure 6**).

Figure 6 system of technologies



For these purposes, nine technologies were described:

- water demand management;
- rainwater harvesting;
- source control;
- water reuse;
- water recycling;
- sanitary disconnects;
- local wastewater treatment;
- urban farming; and
- solid waste management.

Whilst solid waste management is not part of the SWITCH model, what has become clear in the early work in the cities is that water management and solid waste management are interdependent. Both watercourses and sewers have traditionally been, and continue to be, used for the disposal of different forms of solid waste. Therefore, sustainable water management is only possible if wastes are also managed appropriately.

These form four technology 'bundles' as follows:

- water demand management;
- water recycling and reuse, including rainwater harvesting and urban farming;
- source control; and
- wastewater management (including local wastewater treatment, sanitary disconnects and solid waste management).

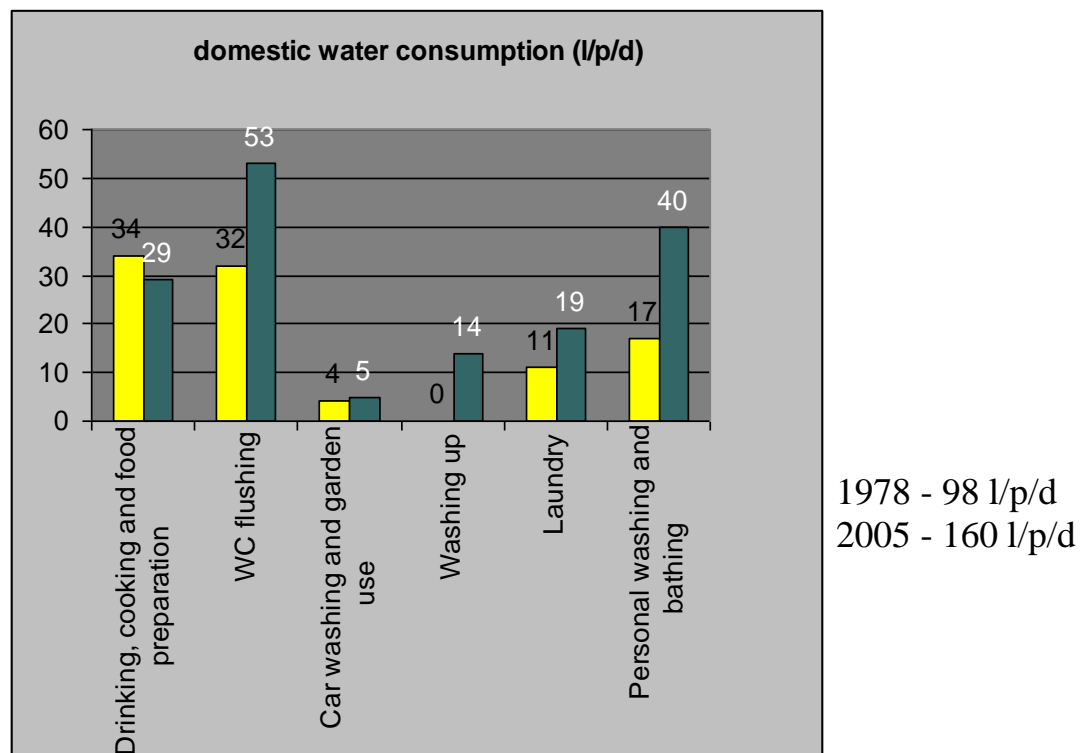
3.1.2 Water demand management technologies systems view

Two critical questions that need to be addressed in considering potable urban water demand are:

- how much is used for what purposes, and
- what are the determinants of urban water usage?

Without adequate answers to both questions it is impossible to either predict future demand or determine the best means of managing demand. Or, indeed, to explain past changes in demand. In general, there is entirely inadequate information to address either question. For example, **Figure 7** illustrates the change in the components of domestic water demand over the last thirty years in England. In particular, the water used for WC flushing has increased by over 50% over that period and water used for personal washing has increased by 150%. The latter may be explained by technological shifts (from bath to shower) accompanied by behavioural changes in frequency of washing. But there is no obvious logic to the former change; given that toilet cistern sizes have fallen over the period, the implication is that toilets are being flushed more often. Managing water usage for toilet flushing (e.g. via dual flush toilet cisterns) requires knowledge of what toilets are used for and when they are flushed.

Figure 7 Water consumption: 1976 and current



One major data gap is that typically we do not know accurately how much water is put into supply – water meters at all scales are subject to rather large measurement errors. In turn, leakage rates are generally a residual estimate between what we think is put into supply and what we think, as measured by the equally unreliable domestic meters, is received. Rates of 15-40% for unaccounted for water are commonplace. Within the dwelling, estimates of wastage, leakage within the dwelling, are also commonly residual figures: very high consumption figures are frequently indicators of internal leakages or wastage. Historically, water demand has followed a Kutnetz curve with increasing water consumption per capita being associated with economic development with per capita water consumption then falling. Thus, in Copenhagen per capita domestic water consumption has fallen from 168 l/p/d in 1989 to around 120 l/p/d today, with a target for 2010 of reducing demand to 110 l/p/d.

Similarly, in the UK the objective is to reduce current consumption levels of 140-160 l/p/d to 80 l/p/d in new construction (**Figure 8**).

Figure 8 Code for sustainable housing

(Source: Community and Local Government Department 2006)

| Code Level | Energy (% better than part L 2006 Building Regulations) | Internal water consumption (l/p/d) |
|---|---|------------------------------------|
| 1* | 10 | 120 |
| 2** | 18 | 120 |
| 3*** | 25 | 105 |
| 4**** | 44 | 105 |
| 5***** | 100 | 80 |
| 6***** | Zero carbon emissions from all energy use in house | 80 |
| 1* Surface water runoff – peak run-off rates and annual volumes of run-off will be no greater than the previous conditions for the development site | | |

The success of demand management is predicated upon an understanding of the determinants of water consumption. In the UK, rather more than half of potable water demand is domestic usage and recreational/leisure usages (e.g. hotels, restaurants, bars) is the next largest component of demand. For domestic usages, the primary local determinants of demand may be argued to be:

- technology
- socio-demographics
- culture
- behaviour

It is rather important to know the relative significance of each of these factors as they are likely to be differentially sensitive to different forms of demand management strategies. It seems likely that a primary determinant is technology: a significant part of the difference in water consumption between England and USA is explicable in terms of technological differences (Green 2003). In particular, front loading washing machines are inherently more water efficient than the top loading washing machines standard in the USA. Toilet cisterns in the UK are siphonic whereas the standard technology in the USA is the flapper valve approach. In principle, it is easier to produce a low flush cistern with flapper valve technology than with siphonic systems but flush volumes in England are lower than in the USA, and flapper valve systems are much more prone to wastage than are siphonic systems. US flapper valve systems are estimated to result in leakage of about 15-30 litres/person/day. Power showers, jacuzzis and hot tubs are all potential disasters for water management although in England a bath with more than 230 litres capacity is specifically excluded, under the 1981 Water Act, as a domestic use for which the companies have a duty to supply water. The same Act defines external uses, except those which can be supplied from a tap rather than a hose pipe, as excluded from the duty to supply water for domestic purposes. This is a good example of the importance of definitions in defining boundaries.

Household size, the age of the population, and income are all important determinants of per capita water usage. Per capita water usage is smaller in larger households than in one or two person households. Per capita water consumption should be expected to be higher in older

households than in younger households because a number of age related diseases (diabetes, prostate enlargement) are associated with increased frequency of urination. However, it has been found that hot water usage is lower in older one or two person households than in households whose members are young. Higher hot water usage is associated with higher incomes but there has been no attempt to derive an income elasticity measure for water.

Washing and bathing are requirements for some religions and such cultural practices have an impact upon water demand. Cleanliness is generally associated with godliness and water is associated with the pure. So, there may be a cultural significance in washing away the waste, the impure, with the pure, water. This association is expressed in the obsession, in some cultures, with the cleanliness of toilets with toilet cleaners advertised to kill germs. Such performance would be more important for food preparation surfaces than for a WC. Gardens may also have a cultural importance.

The clearest example of behavioural change is shown in **Figure 7** in the increase in water usage for personal cleaning. In 1978, it was probably the case that most people will still taking one bath a week; 'probably the case' because there are no statistics. Now, people are taking several showers a week on average. We do not know how long the average shower takes but at average shower flow rates in England, any shower that takes 23 minutes or more uses more water than a bath. For the flow rates of US showers, the length of shower time required to use as much water as a bath is 12 minutes. The increase in water usage to flush toilets also suggests a behavioural change, either an increased propensity to flush after use or an increase in the number of uses made of a toilet.

A knee-jerk response to demand management is to introduce water metering. At present, the penetration of metering in England is quite low but it is steadily being expanded as a demand management measure. The two unanswered questions are, firstly, whether it works as a signal or as an incentive to demand management. Secondly, how do people reduce water consumption in response either to the signal or the incentive? It may work partly as a signal: as an expression that water is scarce. Certainly, experience in the 1976 drought in England and in the Californian drought was that a simple call to save water cut demand by 25% over the short term. As an incentive, water pricing through metering has generally been found to be ineffective: price elasticities for internal usages in the range of 0.10 to 0.20: a doubling of price being required to reduce demand by 10 to 20%. Using price alone to reduce by the percentages desired is consequently not feasible. Metering most obviously should be expected to affect behaviour; it is unlikely to have any impact on socio-demographics and has the disadvantage that higher costs will reduce the scope for consumers to make the investment in water efficient technologies. In addition, in non-domestic uses which are metering in England, it is generally found that firms could increase profitability by cutting water demand by 15-25%. The substantial reduction in per capita consumption in Copenhagen has been achieved without metering, there being only 8,000 meters in 240,000 dwellings.

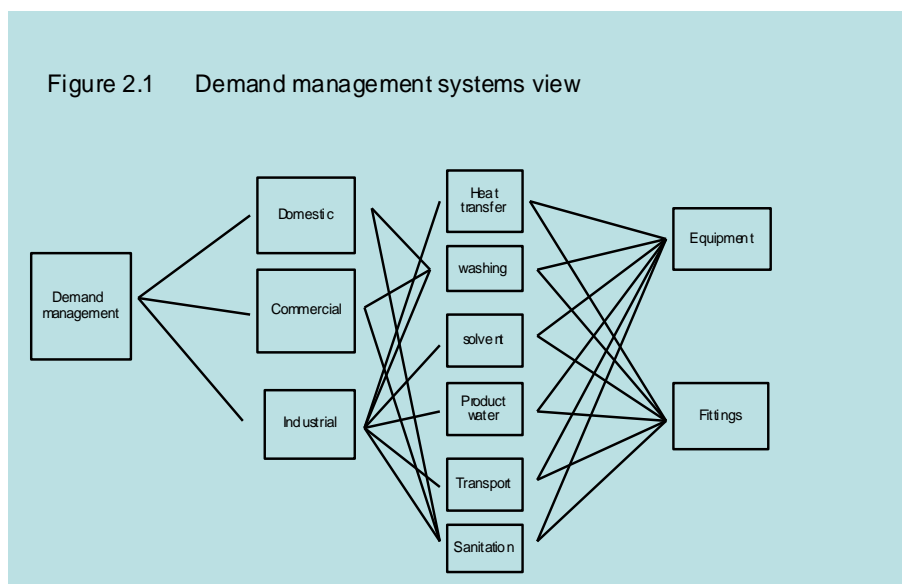
A potential disadvantage, apart from the higher cost compared to other forms of cost recovery, is that it makes water appear as a commodity so that the rich can use as much as they want because they can afford to; water usage may then become a form of conspicuous consumption. But, metering is almost a prerequisite of privatisation in that alternative means of cost recovery for water are effectively taxes and since it is inappropriate for a profit-making company to level a tax, metering means a less intrusive price regulatory system can be adopted. It should be expected to encourage residents to seek out and reduce wastage in the form of leaking pipes, toilet cisterns and dripping taps. But it should not be expected to have any effect on socio-demographics or cultural factors.

One further factor that affects demand for water is climate. Thus, in Singapore, which has one of the most sophisticated demand management and water management programmes in the world, per capita domestic water usage is very high at 260 l/p/d. Residents ascribe this high usage to the hot sticky climate resulting in people taking two or more showers a day.

Figure 9 provides a selective systems view of demand management technologies, involving as it does domestic, commercial and industrial users, a range of principal processes by which water is used or consumed, and a set of water saving technologies and products. The view is

selective in that not every form of water consumption or use process is shown (e.g. water consumption by people by drinking potable water). Water in products refers, for example, to water that may be combined as part of a product e.g. in beer manufacture; transport refers to the use of water to transport products during manufacture, for example as in peas processing; and solvent refers to water used in solvents used as cleaning agents and for various other purposes. Some 80% of commercial and industrial users (i.e. the larger users) are metered.

Figure 9 Demand management technologies

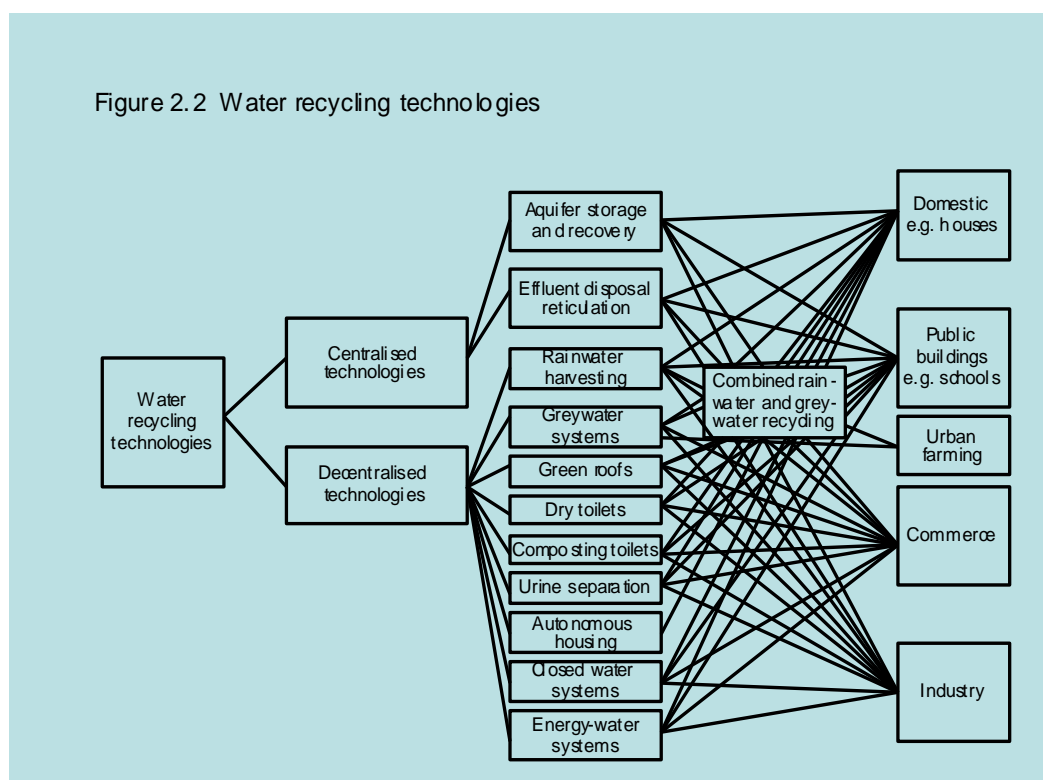


3.1.3 Water recycling system view

Water recycling is not a new concept but the development of water recycling technologies is a fairly dynamic area of technological experimentation, advance and application (Lens et al. 2002; Samuels et al. 2005). Some of the technologies can be considered to be 'conventional', others are 'relatively novel' (in that they are not used in Britain but are found elsewhere), and some are truly 'novel' or experimental. Sometimes it is difficult and not entirely helpful to distinguish between water reuse and water recycling, and they are often discussed together in the literature. Conceptually reuse and recycling are very similar: reuse is taken to be for a purpose which requires a lower quality of water than the original use whilst recycling to be use which requires a comparable quality of water to the original use, and thus requires a higher standard of treatment than does reuse.

In practice, of course, all water is reused, being naturally treated through the soil, the water environment or through evaporation and condensation. All that is being discussed in tightening the reuse cycle, which requires replacing the potential energy used for moving the water by kinetic energy, and commonly solar energy by human produced energy. **Figure 10** is a systems view of water recycling technologies, identifying the principal technologies (EA 2005) and indicating the wide potential applicability of these technologies in different economic sectors. Water can be recycled from a number of sources including industry, stormwater and wastewater.

Figure 10 **Systems – water recycling**



Greywater systems are systems that reuse or recycle the lightly polluted wastewater inside the household. An innovative UK development is the Green Roof Water Recycling System (GROW) which is suitable for multi-occupancy urban dwellings. GROW consists of a number of channels and troughs filled with coarse gravel, planted with vegetation and designed to be mounted on the roof of a building. The greywater is pumped to the treatment system where it passes through the trough media. Organic and inorganic impurities are partly removed through naturally occurring aeration, filtration and biological action. The effluent is passed through UV disinfection and is then returned to the building for non-potable uses. The method is undergoing trials at Cranfield University.

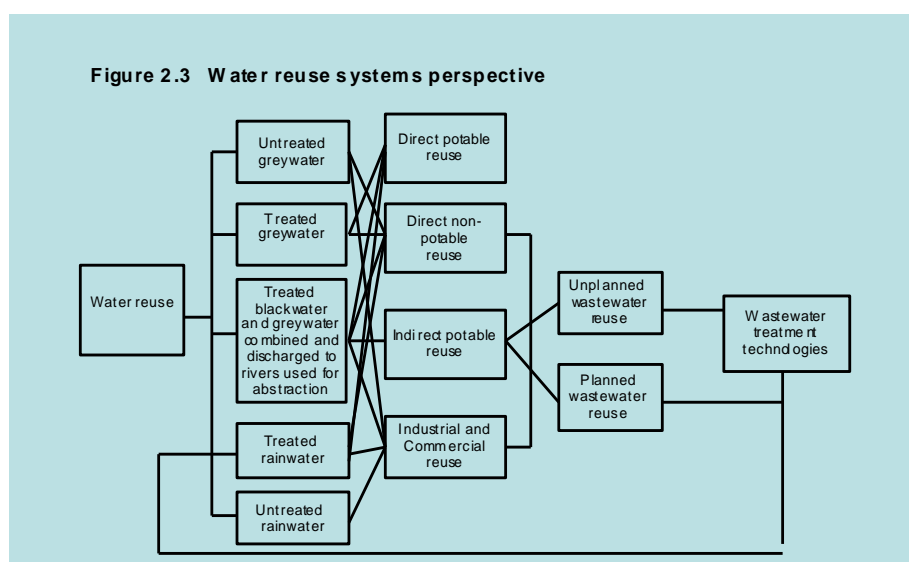
A concern to the water industry in England has been the effect on revenues and costs (Brown 2007a), particularly where the water undertaker is a separate undertaking to the wastewater undertaker. This may be particularly problematic when water is metered; the effect of rainwater harvesting or water reuse will be to reduce the water demand and hence revenue. Costs will increase somewhat in that it is the statutory duty of the water supply undertaker to inspect rainwater harvesting and recycling systems. Since the costs of wastewater are conventionally charged as some multiple of the charge for water supply, revenues for wastewater will also fall whilst the volume of wastewater handled will, in the case of rainwater harvesting, stay unchanged. Where water is reused for toilet flushing, the volume of wastewater will fall but the polluting load will be unchanged and treatment costs are partly a function of pollution concentrations. Whilst the wastewater undertakers do not currently levy additional charges on consumers with rainwater harvesting systems, there is recognised to be a need for OFWAT, the price regulator, to establish a clear set of principles. The companies are not allowed to discriminate between consumers and under the metering plus rainwater harvesting option, other consumers would be cross-subsidising those with such systems. This problem does not arise when the consumer concerned is not metered.

Data on the operating performance of the technologies identified in **Figure 10** are progressively coming available, and some case studies and performance data relating to each technology are assembled and reported by the Environment Agency (2005).

3.1.4 Water reuse

Figure 11 presents a perspective on water reuse which is useful in appreciating the various ways in which water reuse may take place. Rainwater harvesting involves the capture of rainwater by a range of means. Rainwater may either be untreated or treated. For example, untreated rainwater can be used in gardens. Treated rainwater can be used for a variety of purposes depending upon the extent of treatment. It could be used, for example, for toilet flushing or in some industrial washing processes, and it can be used to provide a potable supply of water although the amount of treatment required makes this uncommon.

Figure 11 Water Reuse



For domestic uses, early small scale greywater reuse systems had a low reliability (Brown 2007b) and there is limited experience therefore in their usage. It is an area where there are significant economies of scale in treatment costs, and also energy costs are expected to be relatively high at 1.5 to 2 kWh/m³ (Brown 2007b), along with other O & M costs. Thus, the 'Living Machine' reuse system at BedZed has been decommissioned because both the running costs and the energy costs were higher than relying upon the conventional sewerage system.

Currently, greywater reuse and recycling systems are largely unregulated in England (Brown 2007b), with the exception that there should be no cross connection with the mains potable supply (BS1710 and Water Supply Regulations 1999, and through the Building Regulations approved document H (drainage)). New standards are expected to be developed, with the water quality standards for the water made available for reuse being based upon the 1975 Bathing Water Directive and the 2006 Recreation Waters Directive. More general guidance is given in a number of CIRIA and BSRIA documents (Brown 2007a, 2007b, 2007c; Brown and Palmer 2002a, 2002b; Shaffer et al 2004). This lack of a clear regulatory structure might be expected to have a chilling effect on the rate of adoption of such systems as a result of problems in obtaining construction and public liability insurance in respect of such systems.

The Millennium Dome employed both greywater recycling (10%) and rainwater harvesting (19%) for flushing water (along with some waterless urinals and water efficient fittings), but the majority (71%) of flushing water was taken from groundwater (which was itself contaminated both as a result of proximity to the tidal Thames and because of the contaminated soil conditions). The three systems cut demand to 131,000 m³, a reduction of 72,000 m³. The greywater was treated through a Biological Aerated Filter (BAF) whilst the rainwater was treated through a reed bed. In addition, water from all three sources was finally processed through an Ultrafiltration membrane system, a Reverse Osmosis membrane system, and finally disinfected before use. The level of treatment adopted reflects the criticality of an innovative system in a high profile building which received 7 million visitors over the year in which it was open.

Direct reuse is a common practice for non-potable applications in industry and in irrigation. Indirect potable reuse can be planned or unplanned. Conventional water treatment often involves unplanned potable reuse of treated wastewater. Water abstracted from rivers to provide drinking water includes treated wastewater that has been discharged upstream. This is unplanned in the sense that it is not an intentional part of the wastewater discharge policy that the water will be reused downstream for potable water supply. The abstracted water will still need to meet potable water standards if it is to be used as a drinking water supply.

The extent of water reuse within industry is unknown; in general, there is quite inadequate data on water use within different industrial sectors (Green 2003) but what is available shows marked differences within apparently similar activities. In the Birmingham region, Severn-Trent Water reports that it helped the car manufacturer Jaguar cut water use from 325 million litres in 1996 to 109 million litres in 2001 partly through a new water test facility that recycles water 110 times before it is discharged (STWA 2002). CIWEM (nd) estimates that there are some 3300 water reuse projects around the world, including some 700 in Europe, but it provides no estimate for the number of projects in England. But one technology on the ECA (Enhanced Capital Allowance) list for which tax relief is available are efficient membrane filtration systems, defined as those which allow a minimum of 40% of treated effluent to be reused on site.

Rainwater harvesting is included in this bundle of technologies because it is essentially a water recycling or water reuse technology. This was traditionally widespread in the Mediterranean countries and in India (Agarwal and Narain 1997), and also in rural areas of England (Cox 1978). Rainwater harvesting systems are relatively common in Germany where there are an estimated 100,000 systems, as compared to an estimated 1000 in the UK (Butler et al 2005). The estimates for Germany vary widely with estimates of the rate of annual new builds varying between 20,000 and 50,000, with Koenig estimating that there were several hundred thousand systems installed during the 1990s and the CIWEM reporting that 35% of all buildings constructed in Germany in 2005 were fitted with rainwater harvesting. The turnover of the rainwater harvesting industry in the UK is correspondingly very small at around £1 million/year – compared to a turnover in Germany of around 350 million euros. Nevertheless, rainwater harvesting was incorporated into some of the iconic buildings of the UK, notably the Eden Project and the Millennium Dome (**Figure 12**) and a limited number of other developments (e.g. Castle Vale housing for the Focus Housing Group, Birmingham). The new code for sustainable construction (DCLG 2006) will create a very strong driver for the rapid adoption of rainwater harvesting.

Figure 12 **Dome**



The various forms of 'green roofs' are relatively uncommon in the UK. An audit of greater London identified some 93,000 m² (whereas Goode (2006) reports that there were some 13.5 million m² in Germany in 2001) of which about 2/3's were extensive. Possibly unique to London are 'brown roofs': these use recycled construction waste and are left to opportunistic planting. They seek to recreate the ecology of bomb sites in London which have become an important but now diminishing habit. Unlike Germany where 43% of cities offer incentives for green roof construction ranging from 25-100% of installation costs, no incentives are offered in the UK.

Figure 13 Green and brown roofs (brown roof, London; extensive green roof, Schiphol Airport; intensive green roof, London)



3.1.5 Sustainable urban drainage systems (SUDS)

SUDS can be approached either in terms of quantity management or in terms of quality management (or both); in England, it is very largely being pursued from the former perspective.

When viewed as a system, SUDS technologies are differentially defined dependent on the part of the management 'train' to which they refer. For example, where water is controlled as close to its source of origin as possible it fits the definitional characteristics of a source control technology. However, where water cannot be fully controlled at source but has to be conveyed further along the water management 'train', then these technologies fit the definitional characteristics of site or regional control (**Figure 14**). Filter drains and swales provide an example of this distinction with the former being a type of source control and the latter being a site control runoff conveyance technology (CIRIA, 2001).

It is important to note, however, that these technologies do not function in isolation and it is their inter-linkages in the system of sustainable urban drainage that is all important. Indeed, it is a systems view towards the collective implementation and operation of these technologies

that underlies the guiding philosophy of SUDS technologies in general and Best Management Practices (BMP) in particular. **Figure 15** provides an overview of these technologies.

Figure 14 Surface water management train (CIRIA, 2005)

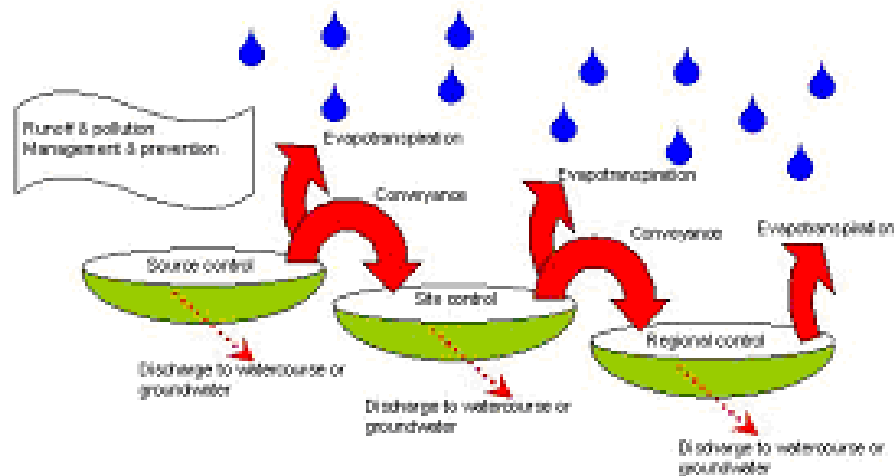
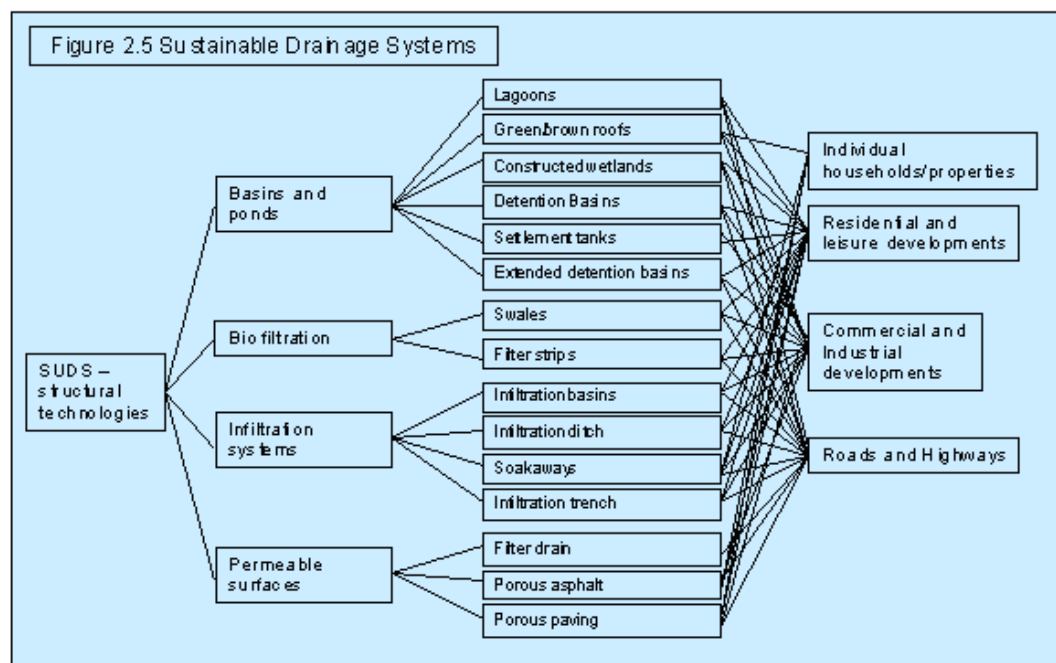


Figure 15 SUDS technologies



The analysis of what is, and is not, a BMP differs from country to country with definitions in the USA and Canada, for example, incorporating technologies which include end-of pipe, regional and catchment based strategies (SWITCH, 2006) and those in the UK and France categorising technologies as including both structural and non-structural ‘housekeeping’ measures (Ellis et al, 2004). In addition, as both the nature and type of technologies change, so definitional change is required. In the USA, for example, the relatively recent mixing of source control technologies with recycling and re-use technologies across new development sites in the application of a Low Impact Development Approach (LID) has led to a new

approach to the definition, and understanding, of integrated urban drainage systems (USEPA, 2001; SWITCH, 2006).

In keeping with the categorisation of SUDS technologies which generally refer to on-site structural controls at the point of rainfall - that are distinct from structural end-of-pipe controls and non-structural 'housekeeping' practices - this report evaluates the institutional maps associated with those technologies which are used in addition to conventional piped systems in the capture and storage of effective rainfall (**Figure 15**). In this way, the definitional distinction between source control technologies whose main purpose is to store water at source and those technologies associated with either conveyance, re-use or recycling close to the point of source can be made.

The most useful elaboration of the range of such SUDS technologies is that provided by the EU 5th Framework DayWater Project (www.daywater.org) (**Table 1**). This divides SUDS into four main 'types' of technologies according to their dominant characteristics: Bio filtration, Basins and Ponds, Infiltration Systems and Permeable Surfaces - a brief definition of each of the technologies associated with these groupings is provided in **Table 1**.

Table 1 Definitions of Structural SUDS (Adapted from daywater.cz and National SUDS Working Group (2004))

| Technology Type | Description |
|--------------------------------|--|
| Biofiltration | |
| Swales | Vegetated broad shallow channels for retaining and transporting stormwater. Vegetation permits particulate filtration. |
| Filter strip | Grassed or vegetated strip of ground that stormwater flows across. Vegetation permits particulate filtration. |
| Storage | |
| Sedimentation tank (silt trap) | Symmetrical concrete structure containing appropriate depth of water to assist the settling of suspended solids under quiescent conditions. |
| Retention ponds | Contain some water at all times and retains incoming stormwater. |
| Detention basins | Depressed basins which are dry most of the time, used to temporarily store and attenuate rainwater during wet conditions. Water is controlled by hydraulic structures to restrict outlet discharge according to required detention time. |
| Extended detention basin | Dry most of the time and able to store rainwater during wet conditions for up to 24 hours. |
| Lagoons | Ponds designed for the settlement of suspended solids. |
| Constructed Wetlands | Vegetated system with extended retention time. |
| Infiltration | |
| Filter drains | Linear drains consisting of trenches filled with permeable material, often with a perforated pipe in the base of the trench to assist drainage, to store and conduct water; they may also permit infiltration. |
| Soakaways | Underground chamber or rock-filled volume: stormwater soaks into the ground via the base and sides. |
| Infiltration trench | A long thin soakaway. |
| Infiltration basin | Detains stormwater above ground which then soaks away into the ground through the base. |
| Permeable surfaces | |
| Porous asphalt | Open grade powdered/crushed stone with binder: high void ratio |
| Porous paving | Continuous surface with high void content, porous blocks or solid blocks with adjoining infiltration spaces; an associated reservoir structure provides storage. |

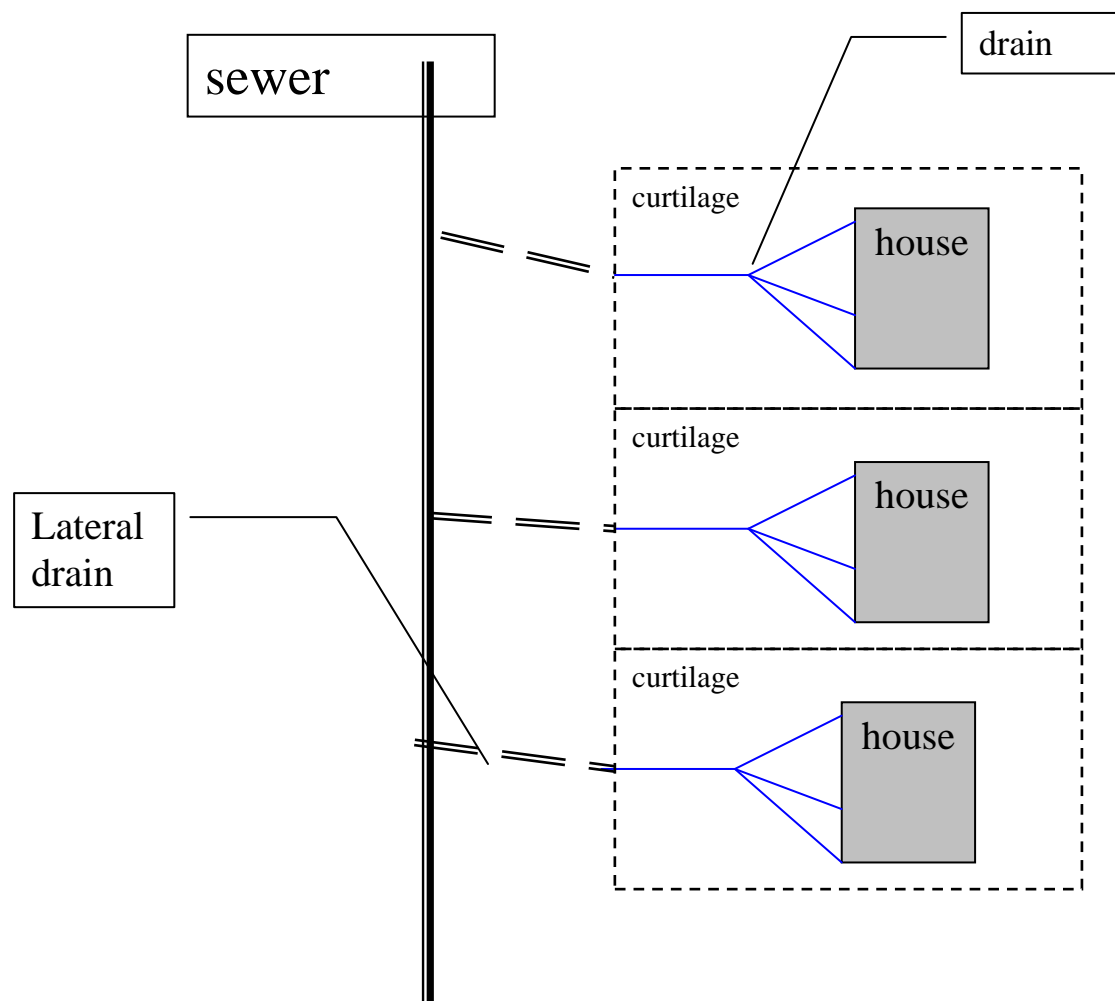
In England, institutional issues are holding up the adoption of SUDS in spite of strong government support for the general adoption of the approach. These issues are:

- the wastewater undertakers' insistence that they are not land drainage authorities (and hence draw a distinction between land drainage and sewerage)
- the definition of a sewer under Common Law.

The distinction between land drainage and sewerage arises because the land owner or developer can, and generally does, require the wastewater undertaker to take over (to 'adopt') the sewers connecting the individual property to the existing sewer network. That is, what it will adopt is specified in technological terms (the sewer) and not in functional terms (surface water runoff from the site). Moreover, the sewer is only a downstream component of an articulated network (**Figure 16**) and the upstream components remain the responsibility of the land owner. Legally, a sewer is also defined as having an outfall; either a connection to another pipe or to a watercourse. Thus, soakaways, a traditional approach to surface water drainage, never were adopted and always remained the responsibility of the land owner.

The wastewater undertaker may require, in doing adopting a sewer, a payment equal to the first twelve years difference between the income generated from the wastewater charges and the cost of operating and maintaining the sewers being adopted. The wastewater undertaker is consequently adopting a long term Operation and Maintenance liability (and the price setting mechanism under which the undertakers operate is specifically designed to drive down O & M costs). So, underlying the wastewater undertakers reluctance to adopt SUDS systems is a further concern about long term O & M costs.

Figure 16 Definition of drains, lateral sewers, and sewers



If the wastewater undertaker will not adopt the surface water drainage system within a development, then the problem becomes one of: who will manage the system in the future? This is a problem given for residential developments the traditional English concern with owner-occupation, and freehold ownership of land, as opposed to renting property. For housing for rent, it is not particularly problematic for the owner of the development to manage the system; where the development is broken down into patches of land ownership with no over-arching ownership, it is.

Thus, currently, the extent to which wastewater undertakers will adopt SUDS is very limited. United Utilities, responsible for the North-West of England, states that it will only adopt underground structures as part of the sewerage system. It will not accept flow attenuation unless the developer has shown that all possible alternatives have been considered. It will only accept sewers draining to a balancing pond provided that:

1. The local authority takes responsibility for maintenance of pond.
2. The freehold of land is transferred to the Local Authority.
3. United Utilities are provided with a Deed of Grant of Rights to discharge to the pond in perpetuity.
4. Measures are taken to prevent flooding of properties.
5. Legal agreements in place between all parties.

Southern Water's published advice is that it does not adopt SUDS and that it will neither adopt balancing ponds nor will it accept on-line balancing ponds. Yorkshire Water advises that underground on-line storage is the preferred method of SUDS and that it cannot adopt either soakaways or ponds, whilst a detention basin would require a private agreement.

Conversely, both Severn-Trent Water covering Birmingham and Wessex Water will give discounts to home owners who are not connected to the sewer network. Severn-Trent estimate that this discount can amount to 36% of the wastewater charge and do not define the means of disconnection. Wessex Water restrict the waiver to soakaways. But, unlike parts of Germany and the USA, there is no reported case of levying wastewater charges based upon the impermeable area of a site, nor of any positive financial incentives to adopt SUDS.

3.1.6 Eco-San

Early WCs faced quite strong competition with earth closets (Hart-Davis 2003); Thomas Swinburne patented a design in which urine was collected separately, and ashes were 'flushed' after each defecation. Henry Moule developed a system which used dried earth rather than ashes. Unfortunately, the water closet won that technological battle, which we are now seeing refought; 'Eco-san' (Esrey et al 1998) having remarkable parallels to the systems of Swinburne and Moule. There are a variety of dry toilets in the market, and some of these are composting toilets. But the most common place adaptation is the waterless urinal whose use is now quite widespread (e.g. Terminal 4 Heathrow Airport).

3.1.7 Wastewater management

Wastewater has conventionally been differentiated into domestic wastewater and trade effluent from industry and commerce. The Public Health Act 1936 gave the owner or occupier of any property other than a factory or manufacturing process the right to connect to a public sewer. Earlier legislation had given the local authorities the right to compel a property to connect to a public sewer, a power intended to eliminate the problem of overflowing cesspits. The Public Health (Drainage of Trade Premises) Act 1937 similarly allowed occupiers of trade premises to connect to a public sewer subject to the control of the local authority. The consequence of this history is that there is now a presumption that all wastewaters will be disposed over via the sewerage system except in rural areas. There are thought to be only 800,000 septic tank or similar systems in the UK as a whole.

Whilst the discharges from domestic users are not metered, and the charges for wastewater, including surface water, management are paid as a multiplier to the charge for water supply,

trade effluent typically is metered. The basis for charging for Trade Effluent, the so-called 'Mogden' formula, was agreed between the wastewater industry and the Confederation of British Industry, the trade federation of the larger industrial and commercial firms. It is made up of two elements: the 'Availability Charge Element' and the 'Operating Charge Element'. The charging formula used for the Availability element is:

$$Ca = NoD \times [(Ra \times cDV) + (Va \times CDV) + (Sa \times TSSI) + (Ba \times sBODI)]$$

Where :

Ca = Total Availability Charge
Ra = Reception Charge
Va = Volumetric/Primary Charge
Ba = Biological Availability Charge
Sa = Sludge Availability Charge
NoD = Number of Days
CDV = Consented Daily Volume
sBODI = Consented Settled Biochemical Oxygen Demand Load
TSSI = Consented Total Suspended Solids Load

The Operating Charge Element is calculated as:

$$Co = AVD \times [(Ro) + (Vo) + (Bo \times Ot/Os) + (So \times St/Ss)]$$

Where:

Co = Total operating charge
Ro= Reception charge
Vo = Volumetric/Primary charge
Bo = Secondary treatment charge
So = Sludge treatment charge
Os = settled Chemical Oxygen Demand of the foul sewage
Ss =Total Suspended Solids of foul sewage
AVD = Actual Volume Discharged
St = fixed strength (settleable solids) of the effluent
Ot = Settled Chemical Oxygen Demand of the effluent

In general, the different wastewater companies applied the same charge factors for each of these elements across their entire service area.

In general, the focus is currently upon reducing water demand and hence the flow loads placed upon the wastewater system rather than upon local treatment. Thus, Envirowise reports that companies have achieved a 20-50% reduction in water and wastewater bills with very short payback periods, but those reductions have been achieved primarily through reducing water use and hence effluent discharged. There, sanitary disconnect in the form of waterless urinals is perhaps the most common measure, with payback periods of six months or less being commonly cited.

Companies, it has been found, look for multiple reasons, rather than a single reason, before making investments: e.g. asset renewal, payback on capital, security of supply, environmental and regulatory issues. The ECA (Enhanced Capital Allowance) scheme operated by HM Treasury, the Finance Ministry, allows companies to write-off over one year the cost of installing some categories of water efficiency equipment and water reuse equipment against tax. Membrane technologies which allow at least 40% water reuse on site are eligible under this scheme.

The other two primary dischargers are domestic users and highways. For new residential developments, the primary interest is on reed bed systems and gravel bed hydroponics (GBH), another form of constructed wetlands (Stott et al 1997). The largest carbon neutral residential development undertaken in the UK to date, BedZED (**Figure 17**), originally included black and grey water recycling (for toilet flushing) through a 'Living machine' system, followed by ultra-violet disinfection. The system has currently been abandoned both because the O & M costs were too high and because it used more energy than conventional sewerage

and sewage treatment services. Reed-beds for both quality and quantity management are quite widely adopted for roads outside of urban areas.

The use of aquifer storage and recovery (ASR) is based on enhancing water recharge to underground aquifers through pumping or gravity feed using wastewater. Passing water through soil is, of course, a long established method of wastewater treatment. This technology is often referred to a 'water reuse' and is used in Australia (e.g. in Adelaide). Effluent disposal reticulation is similar to dual water supply, except that treated wastewater makes up the secondary supply in addition to the potable one.

Figure 17 BedZED



Urban farming is included in as one of the water using sectors. Whilst of great importance globally, it is currently not of significance in the UK. Agriculture has been redefined as a producer of recreational, environmental and landscape services. It may, however, re-emerge as a lifestyle activity associated with a desire for organic food.

3.2 *Urban water management within the sustainable development paradigm*

Sustainable urban water management is only one of the conditions for delivering sustainable development. Arguably, it is also the simplest and cheapest to deliver. The other conditionalities for delivering sustainable development include:

- Energy management and specifically the reduction in greenhouse gas emissions.
- Resource usage in construction.
- Waste minimisation in use.
- Delivery on social objectives regarding justice.

Of these, achieving carbon neutral and then zero carbon buildings is seen as the biggest challenge and involving the highest cost. The additional cost of building to the new 5* housing standards (**Figure 8**) is currently estimated as £20,270 for energy measures and £2,645 for water management, a total increase in construction costs of 28.6%. Once land and other costs are taken into account, this translates into a lower percentage increase in the costs for the dwelling as a whole. In turn, the increase in construction costs might simply result in land costs being driven down proportionally so that the effect on housing costs would be neutral. For water management, the additional cost of achieving the lower 4* standard has been calculated as £125, 1% of the cost of delivering the equivalent energy measures (Cyril Sweett 2007). Other estimates for the additional management costs are similar both in proportional and absolute terms (Environment Agency 2005). A detailed assessment of the costs of delivering a zero carbon and zero waste (Z squared) development of some 2,000 dwellings in the Thames Gateway estimates that the additional costs amounts to 8% (Bioregional 2004).

At the same time, delivering sustainable water management has implications for delivering the other components of sustainable development. Because water is heavy and incompressible, moving water takes considerable amounts of energy. Traditional water management relied heavily upon potential energy in the form of gravity but sustainable water management requires a greater input of kinetic energy. This makes achieving the carbon neutrality conditionality somewhat more difficult. In addition, some forms and locations of wetlands are methane emitters (Mitsch and Gosselink 2000) where methane is a particularly aggressive greenhouse gas. In addition, the resource requirements in terms of pipework, pumps, valves, filters and so for sustainable urban water management may be higher and not all currently use sustainable materials.

4 Change and Institutional Mapping

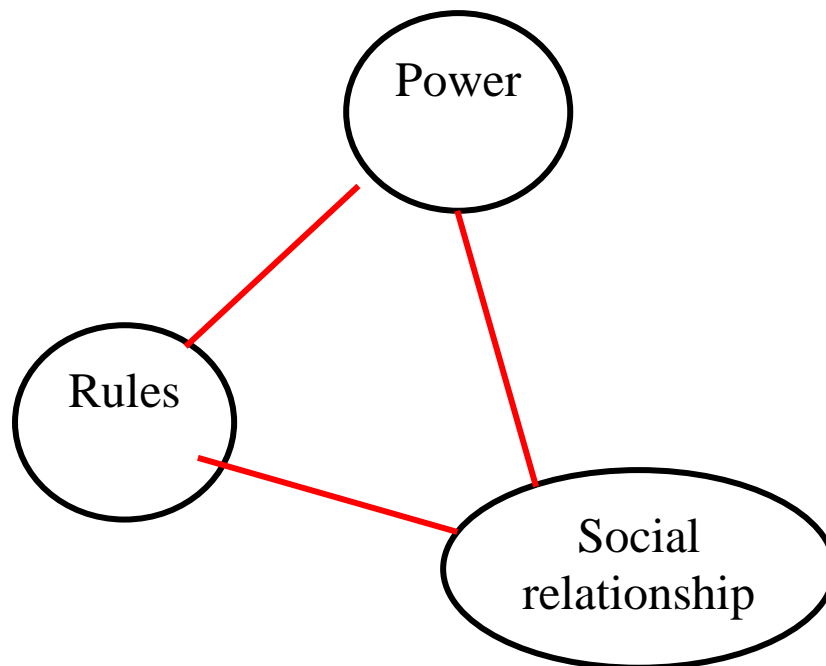
The central focus of the SWITCH project is change, changing what we do in order to achieve 'better' results, where 'better' necessarily means change. Delivering change is about changing behaviour, and thus necessarily the determinants of behaviour. The behaviour itself is expressed commonly through a technology but it is not the technology as such that is important; rather it is the adoption and use of that technology, behaviours, with which we have to be concerned.

The fundamentally moral or ethical question of how to decide what changes should be made, and how to induce those changes are joined into the practical question of: how may those changes be induced? This last issue thus has both a practical side and a moral side.

On the practical side, behaviours have to be interpreted as rational adaptations by the individual, household or organisation to the current situation as they understand and interpret it; as the adoption of the best of the available options. Inducing or introducing change therefore requires changing some characteristic of the current situation as the individual, household or organisation understands and interprets it. Critically, effectively inducing change requires having a good model of the person or group whose behaviour it is desired to change.

The ability to change another is the classic definition of power (Weber 1922). So, the pursuit of change also requires an understanding of the nature of power and who can use it for what purposes. We are, in fact, faced with a triad of power, rules and social relationships, each of which is to a greater or lesser extent a manifestation of the others (**Figure 18**).

Figure 18 triad



Power exists in multiple forms; babies and small children have the power to influence the behaviour of their parents and others. The nature of their power is simply different from that the older child who may physically bully them later in life. What is important about any form of power is its effectiveness and it is important to avoid focusing solely upon some forms of power and omitting consideration of the effectiveness of those forms of power. Defined as the ability to change the behaviour of others, a partial listing of the forms of power was given in the report on Governance (Green 2007) as:

1. the use or threat of the use of force
2. money including bribery
3. reason
4. information/knowledge: hence the claim to have special and authoritative knowledge
5. moral claims (e.g. 'it is not fair')
6. emotional appeals (e.g. 'it will ruin my life')
7. the threat of withdrawal (e.g. threat of legal action, of protest)
8. political influence (e.g. 'I'm a friend of the Minister')
9. social norms (e.g. 'people expect')

We will follow Gramsci (Simon 1982) in arguing that power comes out of social relationships. Thus, the critical difference between a man with a gun and a policeman with a gun lies in the social relationships. In the first case, the man uses the gun in order to try to subvert the dominant social relationships and in the later, the policeman has a gun in order to support the dominant social relationship. Physical force is in turn a sign of failure, the inability to use other forms of power to be power. In practice, effective power is frequently fear: what is important is the perception of the consequences of another applying power rather than the actual consequence of power being applied.

The third element in the triad is rules. Rules are expressions and delimitations of power – who can do what, when, and where, and create power: the ability to do some thing, some place, and sometime.

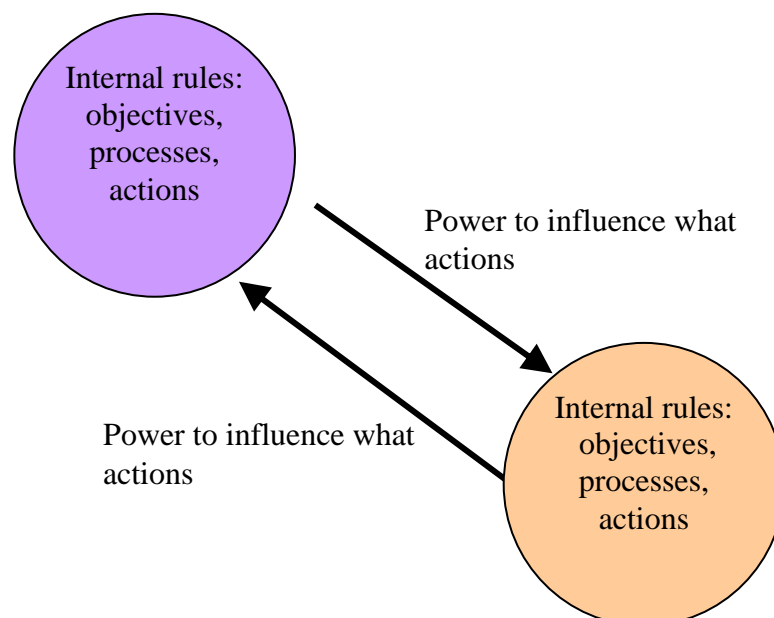
In turn, an institution is conventionally defined as being created by the existence of some set of formal or informal rules (North 1990). Thus, North has defined institutions as being the rules of the game. In this sense, any set of rules creates an institution and thus both markets and households are institutions. Organisations are, as the term implies, groups of people organised to a common purpose and organisations have both internal rules and are governed

by the external rules that apply to that organisation. North describes 'organisations' as the players in the game. So, by definition, an organisation is an institution since it is bound by rules, both internal rules and external rules; thus, an organisation is an institution made manifest. Apparently similar organisations may, however, be manifestations of quite different sets of rules. Thus, for example, whilst we can all recognise a 'community' or a 'household', there are great difficulties in providing a general definition of either because each is cluster of rules but different households and communities are characterised by wide differences in the form and content of these rules.

However, not all institutions are manifest as organisations. What is important for our purpose¹ is the rules and not the organisations; an institutional map is about the formal and informal rules that govern behaviour of the different 'players', and not a description of the individual organisations. The focus is upon the inter-relationships, power, and the internal rule structure governing the individual organisations. Both the internal rules governing an organisation and the external rule environment governing relationships with other organisations and groups are important (**Figure 19**). For example, public limited companies are required by law to give precedence to the interests of their shareholders. Given a conflict of interest between the interests of the shareholders, consumers and their employees, then the company must give priority to the first group. They are also affected by the informal rule set of the share market where short run profitability tends to drive share price and companies fear being seen as 'underperforming' and thus be subjected to a takeover bid where such a takeover bid may be made for the purpose of stripping out and selling off assets which are seen as producing too low a level of profitability. These formal and informal rule sets tend to conflict with the long term capital intensive nature of water management, and the principles of sustainable development in terms of driving down demand.

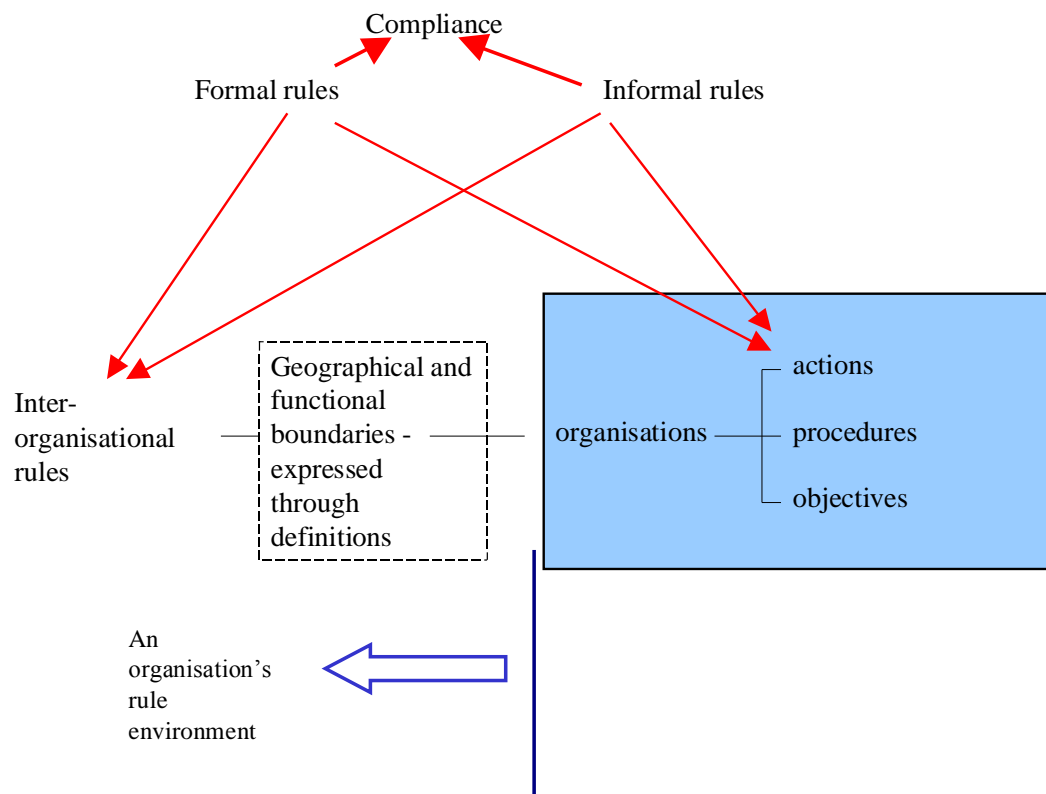
Rules are also expressions of social relationships. As Common (1934), Marx (1981) and Coase (1991) have pointed out, property rights are no more than social relationships articulated and made manifest through the instrumentality of things. 'Private property' simply means that I can enforce some claims upon other people in terms of a particular resource; in the absence of other people, the concept of private property is meaningless.

Figure 19 Internal and external rules



¹ There are many fascinating theoretical questions that we will ignore for the purposes of this exercise

Figure 20 Rules and compliance



Simply because a 'rule' exists does not mean it is complied with, although it could be argued semantically that a 'rule' is one for which the rate of compliance is high. In practice, a critical question is then what is the rate of compliance and why, if the rate of compliance is low, this is the case. **Figure 20** combines these different elements into a single picture.

Those external rules, where compliance pressures are high, create pressures and incentives for an organisation to act, possibly in contradiction to the internal rules governing its behaviour. Clearly, a particular behaviour is more likely to be adopted when the external rules and internal rules both support the adoption of that behaviour. Thus, it may be the case that the adoption of charges for surface water drainage based upon the impermeable area of a property have been adopted in Germany because the municipality has responsibility for surface water drainage and for development control, and is also a taxing authority. The non-adoption of such charges in England may then be the consequence of a privatised company being responsible for surface water drainage whilst the local authority is responsible for development control. In the first case, either the municipality has the internal incentive of minimising the total costs of surface water drainage relative to tax income, or its rule structure of responding to the wishes of the electorate can allow it to offset higher costs against some claim to deliver sustainable development. Conversely, in the case of England, a company whose primary duty is to its shareholders, and where its revenue is currently the result of applying a multiplier to cost of water, lacks any obvious incentive to introduce a separate charging system for surface water drainage. Nor is there for the local authority any clear incentive.

5 Inducing change

In seeking to induce change, the two starting questions are:

- Whose behaviour do we seek to change?
- How do we seek to change it? Or, to what do we seek to change it?

Therefore, the fundamental inter-related questions are:

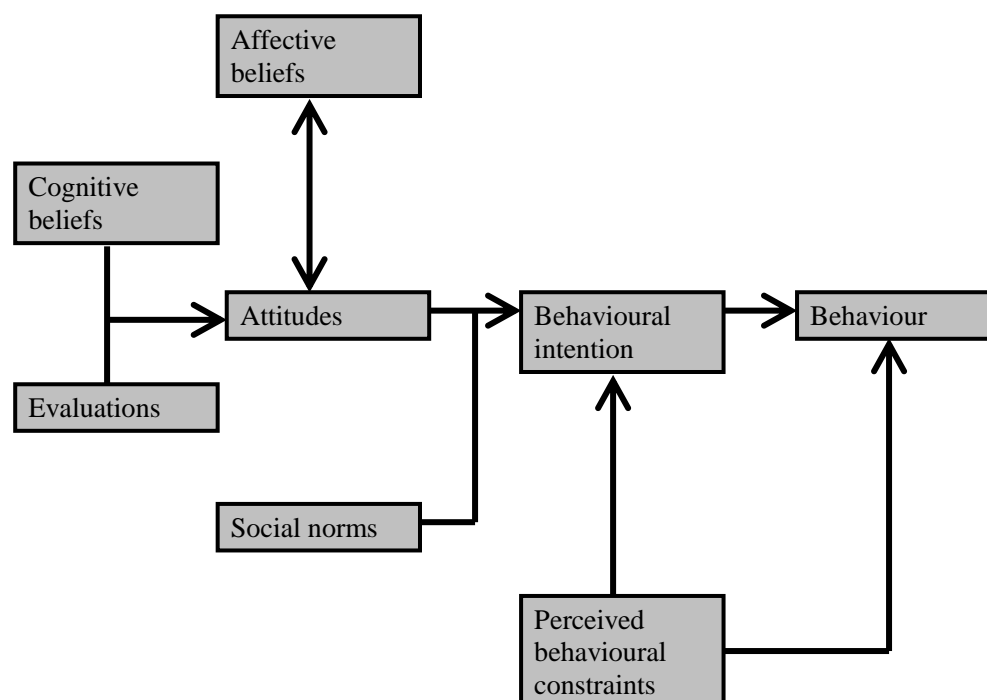
- What strategies exist to bring about the desired change in behaviour?
- Who can influence either positively or negatively the likelihood of such a change in behaviour taking place?

These questions are interdependent questions and part of what joins them are the functional and geographical boundaries necessarily created for institutions through the existence of rules.

In turn, this means that in order to be able to change the behaviour of some individual, household or organisation we have to specify the nature of the behaviour we wish them to adopt or to abandon. This might be a simple behavioural change (e.g. turn off the tap when brushing your teeth) but often it involves a change in technology (e.g. one recommendation to save water is to turn off the shower whilst soaping yourself, but this requires a shower fitting where temperature and flow are separately controlled). Central to the success such attempts to change the behaviour of others is an accurate and reliable model of that other: an understanding of how they decide what to do in the light of their understanding of the circumstances. One obvious reason for the failure of some attempts to change the behaviour of others is that the model of the relevant other is naïve and simplistic. One example of such a naïve model is the 'communication' model: the assumption that the problem of inducing change is simply a problem of transmitting the relevant information by an effective means. Similarly, orthodox economics has fallen into the trap of assuming that prices are always successful in changing behaviour, and that nothing else works, so the problem is simply one of setting the right prices.

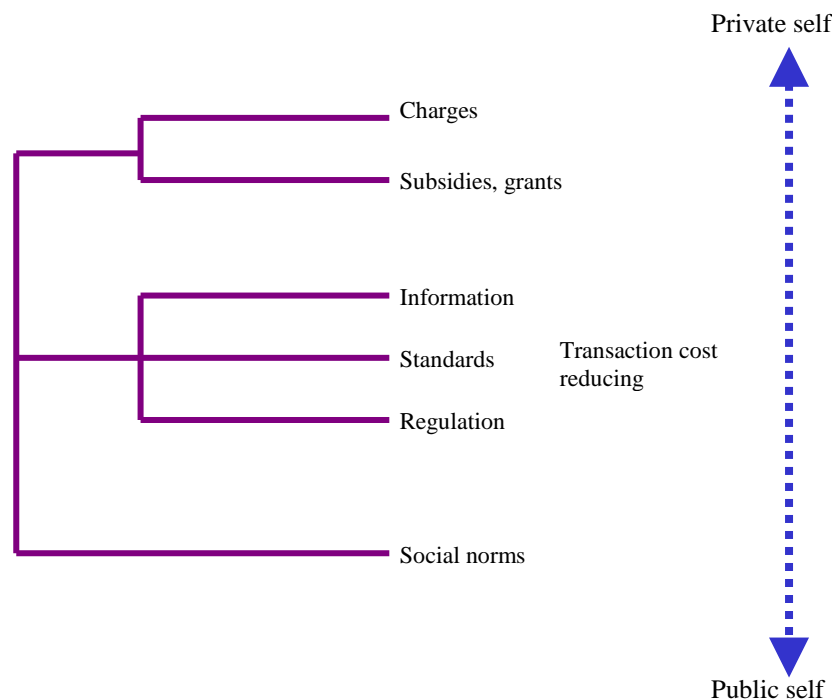
A model of the other widely used in marketing and market research, activities whose success depends on the ability to influence the behaviour of others, is the Fishbein-Ajzen attitude model (**Figure 21**). One element in that model which has been found to be surprisingly important even in such decisions as which toothpaste to buy is social norms. Marketing and market research texts (Assael 1992; Foxall 1988; Kotler et al 1999; Randall 2001; Schiffman and Kanuk 1994) commonly discuss different reference groups whose views or expected views are taken into account by the individual.

Figure 21 Fishbein-Ajzen



In turn, an individual (**Figure 22**) can be considered to have a Private Self and a Public Self (Goffman 1971). The same is true of organisations so that commercial organisations have a concern with their image and with their 'brand' (Kotler et al 1999; Randall 2001). In seeking to induce an individual, household or organisation to change their behaviour we can consequently direct attention either or both to their Private Self or Public Self. Orthodox economics which asserts that prices always work but that nothing else does focuses solely upon the Private Self. Practical micro-economics, marketing (Darnton 2004; Demos and the Green Alliance 2004; Jackson 2005), instead seeks to affect both the Private Self and the Public Self.

Figure 22 **Private and public selves**



Generically, there are three clusters of approaches to induce a behavioural shift (**Figure 22**):

- Those that are targetted at the Personal Self
- Those that are aimed at reducing transaction costs
- Those that are focused upon the Public Self

Conceptually the easiest and perhaps the easiest to change are transaction costs. Transactions costs are the costs of making a choice and adopting a behaviour, and, for our purposes, include the costs of acquiring and interpreting data in order determine what are the possible courses of action open and the consequences of adopting each of those courses of behaviour. Those transaction costs occur on both sides of the demand-supply equation, and include both setting prices and finding out about costs. They include all stocking and transport costs, and all retail costs except in so far as the consumer gains pleasure from the activity of shopping.

Coase (1988) has argued that it is necessary for economics to take transaction costs as a central concern since it is the relative magnitude of the transaction costs associated with the different options which can determine which is the most efficient option to adopt. The lesson from such waste minimisation interventions as Envirowise is that industry and commerce is generally using at least 15-25% more energy and water than would maximise short-run profitability. The general explanation proposed for this apparently inefficient action by firms is that water forms too low a proportion of input costs for firms to spend very expensive management time on water usage. Such interventions as Envirowise thus reduce these

transaction costs and squeeze out resource inefficiencies. Reducing transaction costs may therefore be a very effective means of inducing behavioural change as well as cutting costs.

Again, when the British Standards Institution was founded in 1901, the first two British Standards involved the reductions of the number of structural steel sizes from 175 to 113 and the number of gauges of tramway rails from 75 to 5: this is estimated to have resulted in savings of £1 million a year when £1 was a week's wage for a semi-skilled working man. A proliferation of different but essentially otherwise equivalent in function alternatives requires attention in order to determine which is the best option. Such a proliferation is also likely to cause additional costs throughout the supply chain and also prevent production delivering potential economies of scale. So, one problem reported in the USA is too many different flap valve types and designs for toilet cisterns. As these examples illustrate, regulation can be a very effective way of cutting transaction costs and so potentially changing behaviour, and, incidentally, increasing efficiency.

Corruption is a further form of transaction cost; a form of rent seeking. The prevalence of corruption and the definition of corruption have shown marked changes over time. Thus, the United Kingdom was profoundly corrupt well into the nineteenth century (Wright 1970), so that politicians accused of embezzlement from the public purse could remark on how modest were their embezzlements, and in nineteenth century fraud, theft and embezzlement was the norm in the USA (Josephson 1934). So, the surprise is not that corruption exists but that it is apparently so low in some countries in some periods of time. Corruption (literally 'to destroy') may be described as an illegitimate use of some form of power.

Key questions are therefore:

- what induced the changes to relatively low levels of corruption now considered to be prevalent in some countries, and
- why were many practices then considered to be normal practice redefined as being corrupt?

More generally, a critical question is:

- what transaction cost is it worth carrying in order to induce what change?

This is an important consideration when considering metering. Charging for water on the basis of metering readings is considerably more expensive than alternative methods of charging. The capital cost of even a 'dumb' meter, one that simply counts the total number of units used, is high (OFWAT 2000). Meters require frequent refurbishment, an additional cost (OFWAT 2000) and the costs of both reading the meter and billing upon a volumetric basis are higher than such alternatives as charging on a property tax basis. Consequently, it is first necessary for a meter to pay for itself: the cost of metering must be less than the cost of providing the water which would otherwise have had to be provided but for the savings induced by metering. On this economic efficiency argument, universal metering is unlikely ever to be efficient (Green 2003), and general practice of not metering individual apartments (the low volume users) but only metering the high users is logical.

It is obviously possible to induce change very quickly indeed; pace the rates of market penetration and speed of takeup of such goods as mobile phones, DVD players, HD television and so on. These examples, and the Fishbein-Ajzen model, illustrate the use of appeals both to the Personal Self and the Public Self. Companies like Sony and Mercedes-Benz invest heavily in creating a brand which says something both about the individual product and the public image of those who buy and use one.

Arguably, what is important is consistency across the two selves in terms of the message conveyed. Thus, the behavioural incentive to personal self should be both consistent with the public self and the signal sent to both should imply the same change in behaviour. What I want and what I believe that people like me ought to do, and are expected to do, need to be congruent – not least because others will then respond to me on the basis.

It is to such congruence that the success of water pollution management policies in Europe have been ascribed, notably that in France (Andersen 1994). A reliance on charges, prices,

the appeal to the self has not been very successful and in the successful programmes, those charges are below those necessary to provide an adequate financial incentive for change.

Any instrument of change can be considered as having two components:

1. Signal, and
2. Incentive.

The effectiveness of any instrument therefore depends upon the joint effectiveness of each component. In principle therefore it is necessary to determine what is the effectiveness of each component rather than having some measure of the aggregate response to the instrument as a whole. So, if the price elasticity of domestic water to water pricing is low, then it is necessary to ask whether this is because of a poor signal performance, an inadequate or inappropriate incentive, or an inability by those targeted to adapt in the intended way.

Key questions of the *signal* component are:

- Of what is it intended to be a signal?
- What is the appropriate behavioural adaptation?
- How reliably is the intended message received?

The last question can be further broken down into a number of elements including the likelihood that the message is received, that it is interpreted as intended, and so on.

Key questions of the *incentive* component are:

- What is the incentive?
- What behaviours logically follow from that incentive?
- Is the incentive sufficient and appropriate to the barriers to behavioural change?
- Is it based upon a reliable and accurate model of the other?

For example, the incentive element of water metering might be couched in terms of the Personal Self to save money, or the Public Self as a sign that excessive water usage is socially unacceptable. The two incentives do not necessarily lead in the same directions in terms of behaviours. For example, if someone can afford to pay the costs of supplying water for a swimming pool, then under the Personal Self incentive approach, this is quite appropriate. Under the Public Self incentive approach, this would be a response which expressed a contempt for social norms, and a desire to show the individual's power to flout those social norms.

Any incentive not based upon a reliable and accurate model of the other, one which reflects the barriers to a change in behaviour, should not be expected to be effective. For example, the largest, measured either as total area or as the fraction of water demand, component of the urban infrastructure is housing. Social housing is supply driven: if the behaviour of the suppliers of social housing (now largely in England the Housing Associations), then the behaviour of the consumers of housing does not need to be changed (this is an over-simplification because a change in technologies is likely to require some changes in the behaviour of the users as well). Since Housing Associations finance new development through loans from the Housing Corporation, a change in the requirements of the Housing Corporation is sufficient to induce a shift in the practices of the Housing Associations.

For private construction, the situation is much more complex. Countries differ markedly in the proportion of housing which for rent versus owner occupation. In the case of housing for rent, there are three major interests:

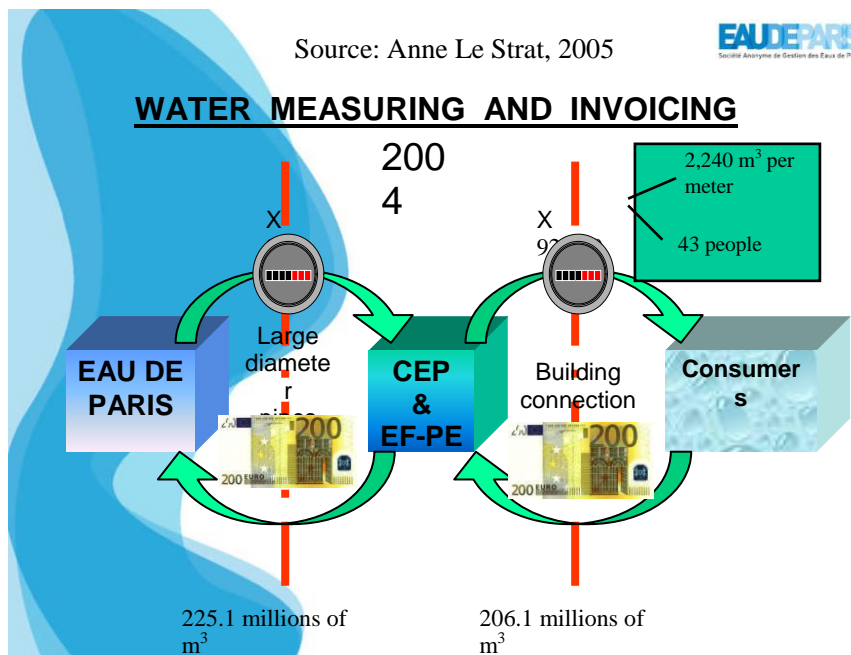
- Those of the developer/owner
- Those of the body providing loan finance
- Those of the occupiers

For example, in Paris, a large proportion of apartments are metered only to the apartment building; **Figure 23** shows that there is an average of 43 people per water meter. That metering only extends as far as the apartment building is generally the case around the world; reports of the penetration of metering are consequently frequently highly misleading. There are then three main possibilities:

1. Apartment building owner allocates a share of bill to individual apartment occupier in addition to rent.
2. Apartment building owner allocates a share of bill to individual apartment occupier and includes that amount into the rent.
3. There exists a formal association of renters who have to determine how the single bill should be split between the renters.

In the first case, the building owner has no incentive to drive down water demand and the individual apartment occupier has no capacity to do reduce their bill. In the second case, the apartment owner has an incentive to drive down water demand but the individual apartment occupier has neither the incentive nor the capacity to do anything to reduce demand. Hence, the evolution in France of companies which offer to help apartment building owners reduce water consumption (Judd 1993).

Figure 23 Paris: water supply and metering



In the third case, if the occupiers of the apartment building have some formal organisation which is responsible for dividing up that bill between the apartment occupiers then there the tenants have an incentive to reduce demand; the question is how much power they have to make physical changes which would reduce demand.

5.1 Compliance

There is nothing quite so futile than making a rule which does not, and possibly cannot be enforced. In particular, rules create opportunities for corruption: most countries have problems with development control because the potential gains to the proposer of the development are so large as to make the costs of influencing in some way those with power to make decisions a good trade-off. Data on the extent of compliance is generally poor; for example, there are no apparent assessments of the degree of compliance with the extensive systems of development consent and building regulation in England.

Thus, three questions which arise in connection with any rule are:

1. Was it intended to be effective?
2. Is it effective? And, if so, why?

Non-Compliance can be sub-divided into a range of categories:

- Formal compliance achieved through corrupt practices.
- No attempt at compliance

- Formal compliance but non-compliance in practice
- Cases formally excluded from compliance requirements
- Rules which were simply gestural in the first place
- Rules which are not enforced
- Rules which are too expensive to apply
- Rules which are impossible to apply

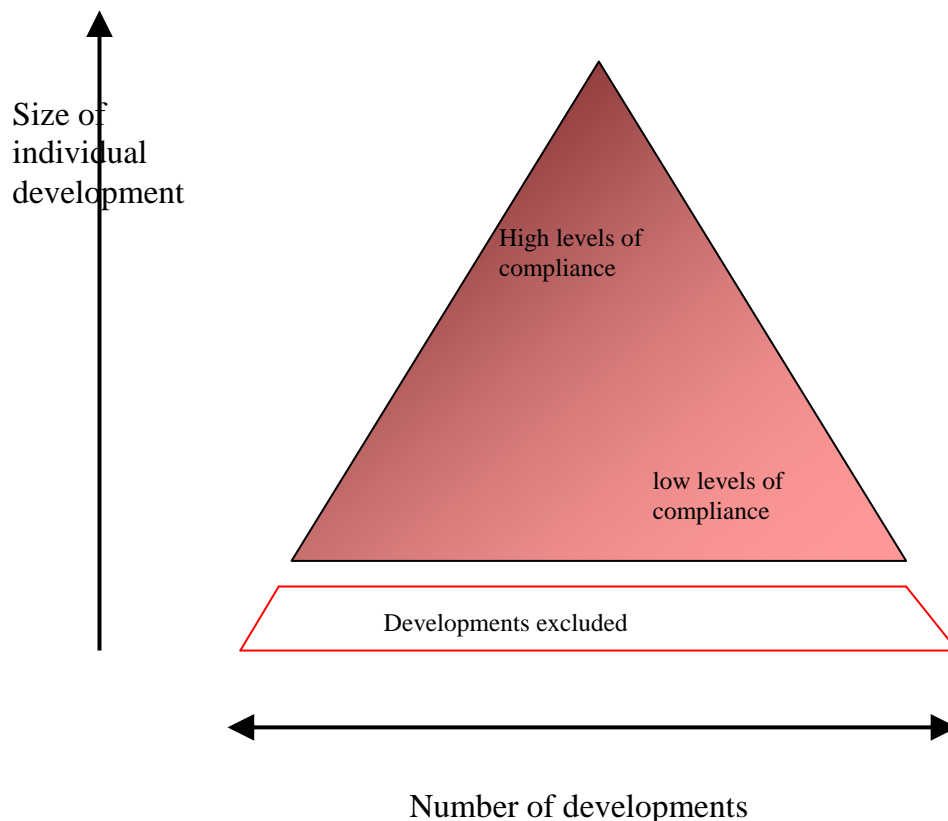
Both development control and building regulations are notorious as producers of corruption around the world. For development control, it is the higher levels of decision makers who are corrupted. For building regulation, it is more usual that it is the lower enforcers who are corrupted.

Where development pressures are intense, then it is commonly the case that development takes place irrespective of planning and building controls, and often irrespective of existing formal land ownership. This has been the case within Europe in the case of Spain, Portugal, Greece and Italy in the last thirty years. Each has had to retrospectively declare millions of properties to be legal which had been built without planning permission. In England, it seems likely that for development control/planning permission the rate of non-compliance as a result of no attempt being made to comply is low. There are no statistics but a cursory review of local authorities reports as to enforcement action being taken against development that has taken place without planning permission suggests that the developments involved are relatively minor. A factor in reducing non-compliance is that development controls and similar controls give power to the neighbouring land occupiers and they are thus likely to report non-compliance by their neighbours. For building regulations, the suspicion is that in England the proportion of building activity for which there is no attempt at formal compliance is much higher. If there is little 'informal development', there is a great deal of 'informal building' in the dwellings sector both in the form of DIY 'Do-it-yourself' and by 'cowboy builders': those simply in it for the money and lacking skills or knowledge. Here, regulations which allow only specified forms of fittings are a strong advantage; hence, WRAS (2001) complaint that it is only an offence to install non-compliant water fittings, it is not an offence to sell them. Banning their sale would prevent them entering the construction chain; banning their fitting assumes that the purchaser knows or cares that their fitting is illegal.

There is always a set of conditions to which the rules are not intended to apply either because the costs of applying the rules would be too high or because applying those rules is seen as too great an intrusion into people's lives. For example, in England, the requirement to obtain planning consent before making changes to a building applies, in the case of homes, only to works above a certain size and some changes are specifically excluded from the requirement. For example, converting a front garden to a car parking area does not require planning consent and the most recent planning consultation document proposes to maintain this exclusion (DCLG 2007). The consequence of this exclusion has been a major increase in the impermeable area in urban areas (London Assembly 2005) and it might be argued that it is more important to halt this increase in the existing areas than to ensure that SUDS options are adopted in new developments.

Overall, the result is something like that shown in **Figure 24** which asserts that whilst there are relatively few very large developments, there are an increasing number as the scale of development diminishes. The shape of this pyramid may vary from country to country. It seems reasonable to expect that, on balance, compliance is greater for the larger scale developments but that it may be non-existent for the small scale developments which may, in total, have a greater impact than the few large scale developments. In addition, there are developments which are specifically excluded from the scope of the rules.

Figure 24 Development: scale and compliance rates



Some rules are ineffective because there was never any real intention that they should be effective; they were instead made to demonstrate compliance with some political imperative, either national or international. Others are not enforced because of other priorities; these other priorities may include the need to make budgetary savings. Other rules may be practically impossible to apply: what is required may itself be impossible, or the requirements of one rule may preclude the possibility of compliance with another rule. The costs of enforcing a rule may similarly preclude its effectiveness.

Central to issues of compliance is the concept of transaction cost (Coase 1988): what is the most efficient outcome depends upon the costs associated with adopting that course of action and of influencing the other to adopt that course of action. In the example of front gardens being converted to car parking, three options might be considered as means of reducing the rate of conversion:

1. Requiring planning consent for any such works.
2. Banning the sales of impermeable pavement materials.
3. Introducing a charge for runoff based upon the impermeable area of a property.

The first involves new costs in the form of the applicant having to discover what is and what is not an impermeable pavement material, applying for permission, and the costs of both processing and enforcing the application.

The second would probably cut costs throughout the distribution and construction chain; the applicant would not be able to choose to construct anything except a permeable pavement and so would not incur the costs of choosing.

The third has really only become practical with the adoption of GIS and its population with data. It involves the additional costs of estimating the impermeable area for each property, and calculating the appropriate charge, levying that charge and processing the payment.

6 INSTITUTIONAL ARRANGEMENTS

6.1 Definitional issues

A typical confusion is between organisations and institutions: the distinction between the two is key. Earlier, it was noted that whilst any organisation is an institution, an institution need not be an organisation. Thus, institutions include organizations and institution can be used as an overarching term. 'Institutions' and 'institutional arrangements' were defined by Craine (1969, 1971) as a definable system of public decision making; and a system that focuses specifically upon organisational entities and governmental jurisdictions. In defining institutional arrangements he suggested that special attention should be paid to the configuration of the relationships established by law between government and individuals; the economic transactions among individuals and groups; and the relationships developed to articulate legal, financial and administrative relations between public agencies. He viewed these arrangements as being shaped by the natural and social environment in which they are established; and he saw institutional studies focusing upon the linkages which tie authority and action together into a public decision-making system.

Craine's perspective which applied to water institutions was one perspective on institutional arrangements to come out of the multi-disciplinary research into resource management during the late 1960s and early 1970s. Others emphasised 'customs' and 'ways of behaving and organising behaviour' (Kaynor and Howards 1971) and 'social guides' as institutional arrangements (Nelson 1973). Howe (1976) followed North in defining the institutional framework within which water management took place as comprising 'rules of the game' (i.e. laws, administrative rules and procedures); 'organisational structure' (i.e. governmental and non-governmental decision making bodies and the formal and informal relations between them); and 'publicly held values and perceptions' (i.e. regarding the roles of government and planning, perceptions of water as a resource, and perceptions of water agencies and their roles and credibility).

Subsequent research into water institutions tended to focus upon evaluations of the adequacy of water institutions once defined and drawing upon the definitions above (e.g. Parker and Sewell 1988; Sewell *et al.* 1985; Organisation for Economic Cooperation and Development 1989, 1993). Some research focused more heavily upon particular kinds of institutional arrangements and their effectiveness e.g. coercive and cooperative prescriptive inter-governmental institutional arrangements for floodplain management (May *et al.* 1996); and innovative land use planning (Burby, 1998; Ericksen *et al.* 2004).

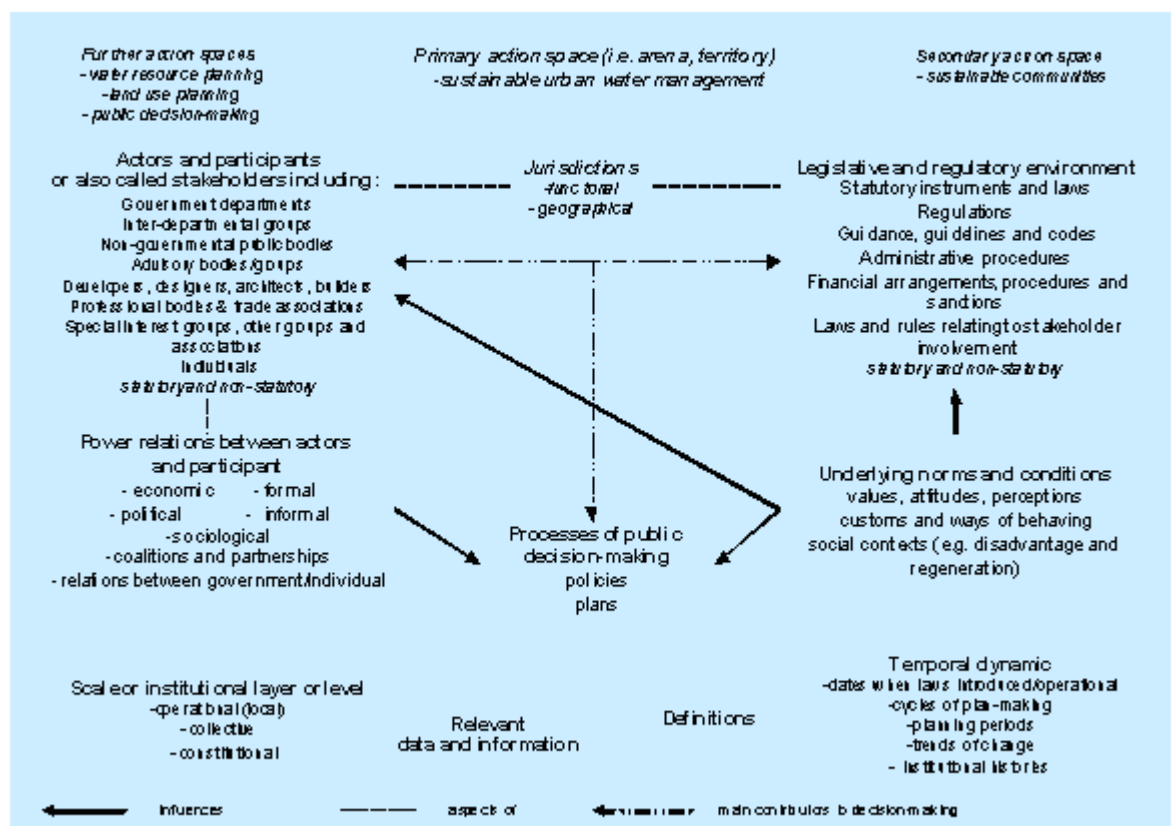
In comparison with the 1970s, today there is a much greater emphasis upon the concept of governance and the role that institutions play in governance. At the same time there is more emphasis upon recognising the importance of stakeholders and the stakeholder perspective (Morgan and Taschereau 1996). Of particular interest are the relationships between stakeholders, and between them and governmental institutions often reflected in coalition and partnerships (e.g. Regime Theory), as being a central part of institutional arrangements. This reflects a growth in analysing 'key players' or stakeholders, stakeholder involvement and the partnership movement in public decision-making (Handmer *et al.* 1991; Paterson 1998). With this also goes a greater emphasis upon local capacity and local capability-building within institutional arrangements (Ericksen *et al.* 2004).

Figure 25 sets out the key elements of institutional arrangements as we perceive them in this project. We identify a primary 'action space' (which is also termed 'action arena' or 'territory' by some researchers (see below)). In this project sustainable urban water management is the primary action space in which we are interested. However, there are a number of further action spaces which are highly relevant to any understanding of institutional arrangements in our primary action space, and indeed there is overlap and interplay between the primary, secondary and the further action spaces identified in **Figure 25**. In reality, even more action spaces than those identified in **Figure 25** can be recognised (e.g. housing planning, regional

economic development planning, and so on), and a choice has to be made about how far to spread the institutional arrangements analysis and mapping.

Figure 25 Institutional arrangement

Figure 3.1 The key elements of institutional arrangements



Two key elements interact in the processes of public decision-making about sustainable urban water management: 1) actors and participants (or stakeholders), and 2) the legislative and regulatory environment (**Figure 25**). Who or how are the rules then set? Classically, a differentiation is drawn between informal and formal sets of rules. Formal rules are set through the legal and regulatory environment and hence through formal political organisations at different levels, including international bodies (e.g. European Union, World Trade Organisation). These 'rules' may be statutory or non-statutory, as may the organisations/agencies which are among the key actors in the management decision making process. 'Rules' (often expressed in statutory instruments) may bestow 'powers' (mandatory or permissive) upon actors, but in 'rules' carrying lesser authority are also likely to be part of the regulatory environment (such as voluntary codes of practice which may be on their way to becoming mandatory codes). The great advantage of formal rules is that they are formalised and hence documented.

But, rule systems are frequently in contention, not least because different interest groups will favour different systems of rules, and the rule systems themselves may be inherently in conflict (e.g. the Water Framework Directive's internal contradiction between 'good ecological quality', stakeholder engagement, and economic analysis: three mutually incompatible principles). Lund (2002) argued that organisations are in contention between the associated

rule systems each supports. More generally, because rules are the embodiment of power, rule systems are inherently contested: for example, the claims of neoliberalism as these contrast, for example, with the traditional mainland European tradition of communal solidarity.

'Informal rules' may arise in different ways through processes of socialisation. Because they are acquired through socialisation, these informal rule systems are taken as givens and consequently, internally, less open to scrutiny. Informal rules include ways of thought, including what is understood, for example, to be 'good engineering practice'. Informal rules are also set by cultural practices, including customs and taboos, and the moral, religious or ethical practices within a society or part of that society: the social norms. They include what are understood to be the principles of justice or equity (as opposed to the formal rules of law).

Informal rules are much more difficult to identify; a successful informal rule system is one which achieves hegemonic status and is not open to debate or question. As such it becomes invisible to insiders. In turn, formal rules should be expected to be the outcome of, and to be subservient to, informal rules.

A crucial element of institutional arrangements is the analysis and mapping of the relative power of actors (or stakeholders), their influence and their interests – and thus the importance of each actor in making change happen. Power relationships can be based upon economic, political and sociological interactions and take place both formally and informally. A key component of this is the power relationship which exists between individuals (say householders, or water consumers) and government.

The four elements at the foot of **Figure 25**: scale or institutional layer or level; relevant data and information; definitions; and the temporal dynamic; are all essential elements of institutional arrangements and their mapping. Institutional arrangements may be analysed and mapped at a variety of scales recognising that there are institutional layers (or levels) e.g. international, national, regional and local. Institutional arrangements are triple layered according to Ostrom and Kiser (1982); Ostrom (1986) and Ostrom and Crawford (1995) (see below). Institutional arrangements cannot be analysed and mapped in the absence of relevant data and information about the action space, about organisations operating within it (e.g. their size, their spending power, and so on), trends (for example in per capita water consumption). A glossary of definitions is also required to lend precision of understanding to the terms and concepts adopted within the institutional arrangements. Finally, we must recognise the temporal dynamic that goes with institutional arrangements: that institutions are constantly changing and that mapping represents a snapshot in time. The temporal factor is also important in defining when 'rules' became implemented or will become implemented; in understanding planning cycles and the time periods associated with plans; and in recognising trends. Institutional histories are also highly relevant because the user of an institutional map (who is interested in bringing about institutional change for a particular purpose) is very unlikely to be able to use such a map effectively unless they know at least something of the path of evolution of key institutions up to the point in time of mapping.

7 INSTITUTIONAL MAPPING

7.1 *What is institutional mapping?*

The objective of this section is to illuminate the process of institutional mapping from which a protocol for institutional mapping is subsequently constructed for this project.

As with any policy project or social change initiative, sustainable urban water management requires for both strategic and tactical reasons to formulate an inventory of institutions involved – or potentially involved; to identify the key players or stakeholders; and to assess the potential for garnering support for, and overcoming barriers or opposition to, the project. It is also necessary to highlight the relevant institution's roles and inter-institutional linkages. The concept of institutional mapping has crept into the literature (e.g. Green 2003; Mahmoud and Orstavik and Nas 1998; Securewater 2004) in recent years. Two obvious questions are:

- Why has this happened?
- Why this particular term?

When organisations were hierarchical, separate and parallel, institutional mapping was not necessary. Institutional mapping became essential when it became necessary to manage systems as systems and to build networks of organisations in order to do so. This requires identifying both the players and the rules of the game.

'Mapping' presents a good metaphor because there are three parallels with geographical mapping:

- It is necessary to identify important features; here, the organisations who are players.
- It is necessary to show the relationships between those organisations: the rules, power and social relationships, and thus the location of each organisation with respect to the others.
- Functional and geographical boundaries are critical in both institutional and geographical mapping.

Aligicia (2006) argues that despite its increasing use and importance in policy-making, institution mapping has so far lacked an underpinning theoretical and epistemic foundation which may adversely affect its legitimacy within the academic community. His paper (Aligicia 2006) is an attempt to contribute to establishing these foundations. He does so by benchmarking institutional mapping against geographical or cartographical mapping, and by reference to several important and insightful sociological theoretical contributions to institutional mapping. He makes a number of important points in relation to the process of mapping as a cognitive process which are highly significant in understanding and setting about the process of institutional mapping. These points included:

1. The cognitive world (i.e. a portrayal or explanation of the institutional arrangements for sustainable urban water management) is never completely isomorphic (or identical to) with the real or operational world. In other words the institutional arrangements which we attempt to map are always going to be an imperfect representation of reality, and there is no escape from this.
2. As well as maps showing the geographical boundaries of agencies, maps are also cognitive structures which include organisational charts.
3. Maps are very similar to theories, and theories can be viewed as a special class of map in that they are a generalised abstracted representation of a body of information on some aspect of social reality.
4. The purpose for which maps are constructed dictates their structure, and their content and validity are directly driven by the interests of their creators.
5. The measure of validity of an institutional map is given by its ability to guide strategic decision-making about change which one wants to bring about - and in our case a) by the extent to which the institutional mapping informs the user with precision about the features of the social/institutional territory which the map user will encounter and b) by illuminating where interventions can be most effectively made in order to advance positive change in sustainable urban water management.
6. An institutional map is based upon an 'interactional field' which is a social or institutional space defined by contextualities, a cluster of actors and processes with geographically, socially, economic and politically defined boundaries. Above we call this an 'action space'.
7. The processes described in 6 above are can only be understood in their temporal contexts – and that institutional arrangements are dynamic and changeable over time.
8. Most social reality, and thus institutional reality, is composed of multiple arenas (i.e. action spaces) linked sequentially or simultaneously, and although for analytical clarity the focus is usually on one arena (actions space), the others are also relevant for a complete picture.
9. It is necessary to conceive of multiple institutional levels, with institutions and rules nested within others – and it is useful to think in terms of 3 levels:
 - a) the operational level

- b) the collective choice level
- c) the constitutional decisions level

Constitutional decisions are the most fundamental because they are rules governing future collective decisions, and they determine who is eligible to craft the collective choice rules. The collective choice level determines the basic framework by which actions take place, and shapes the rules or institutions at the operational level.

8 Institutional mapping protocol

Based on the above a) identification of institutional arrangements b) characterisation and explanation of institutional mapping, and c) the undertaking of an institutional mapping case study of the city of Birmingham England, the purpose of this section is to set out a protocol for mapping institutions and producing institutional maps applicable to sustainable urban water management. The intention is that this protocol can be used for any country to which this institutional mapping protocol is subsequently applied.

The protocol described below has a number of components (numbered 1 upwards). We have deliberately not set out these components as stages, or a sequence of stages. While it will be obvious that there is a logical sequence to the numbering of at least some of these components (suggesting that it is usually preferable to work on some components before others are addressed), it is also our experience that some components may or may not be addressed before others, or simultaneously. Our experience in undertaking the Birmingham case study is that the institutional map is arrived at by a process of iterative refinement, so that components are often best worked upon and then returned to in the light of work on other components, and so on.

A key issue concerns how far to take the institutional mapping, since at one level institutional mapping can resemble mining a hole in the ground in which the hole is defined by its depth and its diameter both of which may be large or relatively small. The answer to the question about how large a hole to dig is best answered by the user for which the map is intended and his/her purpose. The relevant question to be asked of the user is along the lines of 'does the map provide a sufficiently insightful and accurate representation of what the user is likely to encounter on the ground, in order for the user to be able to identify – with sufficient precision – where interventions are likely to bring about the desired change being adopted?'. A second key area of choice concerns the order in which to present the institutional mapping layers (or scales/levels) – city upwards, or international downwards to city.

The elements of the protocol

1. **Specification of who is/are the institutional map creator(s) and who is/are institutional map user(s), and what is/are the technologies concerned.**

At various points in the creation of an institutional map there needs to be a dialogue between the map creator(s) and the map user(s) in order to ensure that the institutional map is sufficiently focused and is providing what is required. The nature of the relevant depends upon the nature of the technology and hence the nature of the technology or technologies being considered must be understood.

2. Clear determination of the purpose for which the institutional mapping is to be undertaken, including what kind of behavioural changes are required.

Institutional mapping is purposive and not descriptive; having identified what changes in behaviour by whom are required for the successful adoption of a technology, the purpose of institutional mapping is to identify who has the power to influence the likelihood of the adoption of those behaviours.

3. Identification and specification of the primary, secondary and further 'action spaces' likely to be relevant to the purpose determined in 1. above, and a preliminary identification of how they interact

The primary action space is sustainable urban water management (**Figure 25**) but secondary and further actions spaces need to be identified. In England the most relevant other interacting action spaces are: sustainable communities policy; land use planning; and public decision-making. However, it is not useful to exclude mention, where relevant, of still further action spaces which include housing planning, regional economic planning, and urban regeneration planning.

Preliminary identification of how these action spaces currently interact should lead to curiosity about their potential for greater interaction in pursuit of the institutional changes and objectives being sought. For example, if the linkages between land use planning, housing planning and the introduction of water efficiency technologies are currently weak and lacking, there is an obvious need to identify this and ways in which institutional linkages might be made stronger.

Our experience with the Birmingham case study is that there may well be a need to iterate this identification process several times as the institutional mapping takes shape in order to check that all relevant action spaces have been included. The 'user' should also have a key input to identification of relevant action spaces.

4. Who are the players? The preliminary familiarisation with the institutional landscape at different levels, scales or layers, and a preliminary identification of these layers and their relative power.

Nations differ greatly in the structure of their institutional arrangements. For example, England has a relatively centralised institutional structure compared to Germany in which the Lande have greater prominence than any equivalent sub-national governmental unit in England.

This involves the preliminary identification of the degree of centralisation or 'sameness' of national and regional (provincial) and local institutional arrangements or the degree of decentralisation and 'non-sameness' to be encountered, and to be taken into account in the mapping.

This stage may will usually require a significant amount of reading of a wide range of reading and reference material, and the use of prior knowledge of the principal institutional features nationally, regionally and locally across a number of action spaces.

5. Selection of sequencing or ordering in which institutional layer mapping is to be presented in the institutional map.

There is a choice between:

- a) beginning at international and then national levels and progressing 'downwards' to the local and operational level; and
- b) beginning at the operational or local level and progressing 'upwards' to the national and then international level.

In practice the map creator may elect to begin analysis at several different levels simultaneously, or to proceed 'upwards' or 'downwards', and an iterative process will be required to adequately trace linkages between institutional layers.

There may or may not be a high degree of centralisation of institutional arrangements (i.e. sameness or non-sameness at the national level), but on balance it appears logical to commence – at least initially - at the city level and move upwards through the layers.

6. Deciding about whether or not the institutional mapping is likely to be different, and therefore presented differently, for each sustainable urban water management technology being considered in the project (see 5. above).

Nine different but inter-related technologies were identified for investigation in the Birmingham case study and were part of the initial conceptual thinking about the project. Initially it was believed that there would need to be a separate institutional map for each technology. There might well be a need for separate maps where institutional arrangements are sufficiently well developed and differentiated for each technology. However, currently in the case of Birmingham this is not the case. At one level institutional arrangements are currently substantially the same for all nine technologies.

7. What are the 'rules of the game?' Setting out in detail the legislative and regulatory environment focusing upon statutory instruments (including primary and secondary legislation) including the international level; regulations, guidance, guidelines, codes, administrative procedures; financial arrangements (including incentives, disincentives, and sanctions); and administrative procedures. These should include laws, rules and arrangements for stakeholder involvement.

This is a central task in institutional mapping (**Figure 25**) and one which will usually consume a significant proportion of the time allocated to the mapping. Statutory instruments and regulations should be identified and specified and should other aspects of the regulatory environment, including responsibilities for policing and enforcing laws and regulations.

It is necessary to distinguish as accurately as possible mandatory and non-mandatory regulations stemming from the law or other instruments. Dates when laws, regulations and other arrangements became operational should be specified.

A key part of this process is identifying both a) functional and b) geographical boundaries. Functional boundaries relate to the responsibilities given to various agencies in the law. Geographical boundaries relate to the geographical jurisdictions of laws, regulations and procedures.

Institutional history may be important and should be explained where believed to be relevant.

8. The informal 'rules of the game'. Explanation of underlying social norms and conditions should be made where considered to be relevant to an understanding of the legislative and regulatory environment; actors and participants, and processes of public decision-making.

Institutional arrangements can only be fully appreciated and understood by knowing how they have been shaped by underlying social norms and conditions which will need explaining where relevant.

For example, the policies and plans followed by Regional Development Agencies in England can only be properly understood by knowing about the context of social disadvantage and inequity in the urban areas concerned. Processes of public decision-making are partly shaped by public attitudes towards involvement in such decision-making, and so on.

9. Compliance: how far do the formal rules operate in practice?

Whilst there are usually rules, they are often not effective in practice for a wider range of reasons: some assessments have to be made of how effective are the rules and why they are or are not effective.

10. The internal rules of organisations as these refer to what they must, may and cannot do; as to the procedures they must adopt; and the objectives they are to pursue.

It is necessary to explain how processes of public decision-making operate and the role of the various actors which participate. These processes may be evolving and changing and direction of change is pertinent.

The public decision-making environment is normally rich in policy statements and plans of various kinds e.g. of water management agencies; of land use planning bodies and so on. These require identification together with the jurisdictions involved and the time scales, start dates and planning cycles of each plan. Plan content is highly relevant.

11. Definitions are required to lend clarity and precision to the institutional analysis and mapping, and so a glossary of terms should be provided.

Formal definitions as adopted by the organizations involved and as embodied in the institutions are critical. Other definitions will need to be added for the purposes of clarity of exposition. Here, the general rule should be to keep these definitions as loose as possible, to avoid unnecessarily precluding meanings.

12. Including relevant data and information in the institutional mapping.

The form of an area's institutions is partly determined by the cultural and political history of that area, but also by the physical and other characteristics of that area. So, for example, the arrangements for water supply in a temperate zone with ample groundwater are likely to be different from those in an arid zone dependent upon rivers for water supply. Judgement will need to be exercised about how much and which data and information to include, but the following kinds of data and information are generally regarded as relevant in the case of sustainable urban water management. The list below is indicative rather than exhaustive.

Population size (of city, country)
Per capita water consumption (and trends in)
Trends in number of households
Owner occupation percentages
Economic activity data

Unemployment
Economic growth rates
Waste disposal (e.g. Kg per person)
Data on the size of organisations and agencies (e.g. annual budget or turnover, number of employees)
Agency or organisation ownership (e.g. whether private, state or publicly owned)

| |
|---|
| 13. Methods of presentation and portrayal of institutional maps. |
|---|

As can be gathered from the above, the process of institutional mapping is multi-faceted and potentially very complex. Presenting an institutional map is therefore a challenging exercise. This challenge can only properly be met by employing a range of methods of presentation of the results of the institutional analysis which leads to the map. These methods include the following kinds of material:

Textual
Tabulated
Graphical (e.g. showing trends in water consumption)
Cartographical (e.g. showing geographical jurisdictions or boundaries)
Diagrammatic (e.g. organisational diagrams showing functional boundaries)
Appended (i.e. information referred to in the text but which is stored separately from the text)
Referenced (i.e. material not contained in the text or appendices but to which the map user is referred)

Institutional maps could also draw upon and utilise the following material where it is considered to be useful:

Photographic
Videographic
Audio

9 INSTITUTIONAL MAP OF BIRMINGHAM

Figure 26 Mailbox



9.1 A demonstration case study

The institutional map described below, and our experience in constructing it, is the basis for the institutional mapping protocol above and the lessons learnt and tools discussed earlier. This institutional map also provides a demonstration example.

9.2 Introduction to Birmingham

Birmingham is a city and metropolitan borough in the West Midlands of England close to the geographical centre of England (**Figure 27**). It is the largest of England's core cities and is generally regarded as the United Kingdom's second city. The city's reputation was forged as a powerhouse of the Industrial Revolution in Britain, and this led to the city being known as 'the workshop of the world' and a 'city of a thousand trades' (Cherry 1994).

The City of Birmingham has a population of 1,001,200 (2005 estimate). The population of Birmingham declined steadily in the 1980s because of a net outflow of residents to other parts of the United Kingdom, notably the West Midlands. But from 2001 when the population had fallen to just under one million (985,000) the city's population has once again grown mainly because of an excess of births over deaths and because of international migration.

Birmingham forms part of the larger West Midlands conurbation, which has a population of 2,284,093 (2001 census estimate), which includes other cities and towns including Solihull, Wolverhampton and the towns of the Black Country.

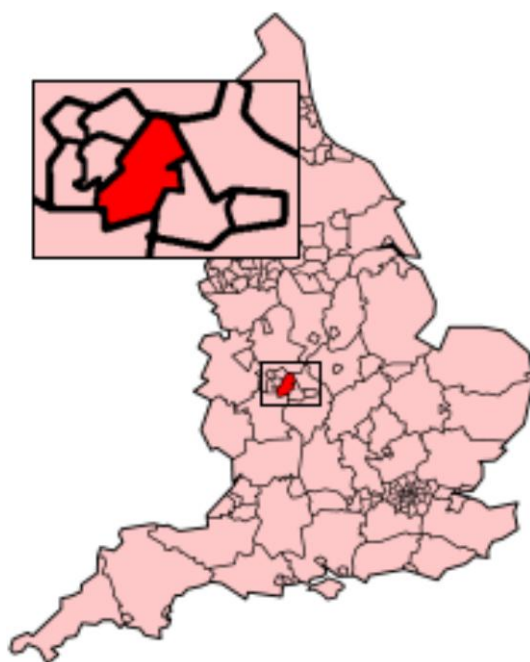
From the mid-18th century onwards Birmingham grew into a major industrial centre with an economy based upon manufacturing and engineering mainly based in small workshops rather than large factories or mills. The city's manufacturing based has declined enormously in the second half of the 20th century and today the economy is based on the service sector (www.birminghameconomy.org.uk).

The location of the Birmingham conurbation across the catchments of the Trent, England's largest river, and the Severn has dictated the organisational form of water management in England. The Severn-Trent Water Authority was created because dividing the conurbation

between two different water authorities would create obvious problems. Hence, England's two most important catchments were treated as one. This solution was continued when the industry was privatised with the creation of Severn-Trent water as the wastewater company which also supplies water to some parts of the two catchments.

Birmingham has an annual rainfall of between 700-750 mms. It claims to have more canals than Venice; a product of the industrial revolution. Those canals and the land around are now a central focus of economic regeneration activities (**Figure 26**). In the late nineteenth century and early 20th century it was one of the great centres of municipal power in the UK; being mayor of Birmingham was a route to becoming Prime Minister – such a transition from local politics into national politics no longer occurs. Possibly the greatest mayor, Joseph Chamberlain, organised the construction of the Elan valley project, completed in 1904, to bring water to Birmingham by constructing a series of dams in Wales and conveying the water 118 miles by tunnels, viaducts and pipes to Birmingham. That system is still a central component of water supply for Birmingham. Overall, South Staffordshire water, one of the two water suppliers to the conurbation, gets 40% of the water resource from the Sandstone aquifer and the remainder from impoundment reservoirs and directly from the river Severn. The position of the other water supplier, Severn-Trent, is similar.

Figure 27 Geographical location of Birmingham



A **fact file** for Birmingham is available in Appendix 1, giving a factual profile of the city based upon Birmingham City Council's 2006 Community Strategy (Birmingham City Council 2006) and the related Strategic Assessment snapshot. A second fact file about water resources in the West Midlands and Birmingham is at Appendix 2. These fact files provide some of the data and information referred to in Protocol. Further data is encompassed below.

9.3 The city's socio-political internal geographical organisation

Within the spatial boundaries of Birmingham City Council, the city is organised into ten political constituencies (for the election of Members of Parliament to the House of Commons located in London) which have also been adopted as 'partnership' Districts (**Figure 28**). The political constituencies are further sub-divided into electoral Wards in which Councillors are elected to membership of Birmingham City Council (**Figure 28**). The Birmingham Association of Neighbourhood Forums (BANF) recognises 70 neighbourhoods at the level below Wards.

Figure 28 The geographical boundaries of Birmingham City Council; its 40 electoral Wards, its 10 political constituencies and Districts



Note: the boundaries of Constituencies are the same as for Districts

9.4 Contexts, customs, attitudes and perceptions

There are a number of underlying social and economic characteristics of the city of Birmingham and its people which have relevance to the purpose of this project. These characteristics are examples of 'Social norms and conditions' described in Protocol (**Figure 25**).

Birmingham has a proud heritage of invention and innovation going back to the Industrial Revolution. This heritage is based not only upon engineering innovations which were crucial in the Industrial Revolution but ways of organising crafts and manufacturing, and ways of transporting raw materials and finished goods. Today Birmingham remains an innovative city (recognised as such in Europe – see Appendix 1) – although access and use of new technologies, such as the Internet, is now below the national average. Access to the Internet varies by ward in Birmingham from 33% to 59%, with a mean of 44% for the city (compared with a national mean of 63%) (Birmingham City Council 2006).

An unusually large proportion of the city's housing stock is in the control of either the local council or housing associations (i.e. social landlords) compared with the national average. Birmingham City Council is therefore in a relatively powerful position to influence the nature of its housing stock and the facilities within them. Added to this, a high proportion (57%) of the

council's housing stock is assessed as in need of modernisation to meet the Decent Housing Standard. This means that the Council has an opportunity to modernise its housing stock over the next decade or so, and this presents an important opportunity in the context of this project (e.g. to fit water saving devices in homes). About one-third of the private sector housing stock is also in need of modernisation and will presumably be progressively modernised over the next decade or so. This also presents an opportunity in the context of this project. Over 15,000 new homes are estimated to be needed in Birmingham over the next five years (2006-11) presenting a further significant opportunity, this time to avoid the need to retrofit sustainable water use technologies.

Birmingham is currently progressing through a major redevelopment of the city, this time replacing much of the redevelopment which took place in the 1950s and 1960s following the second world war blitz. Birmingham City Council recognises that there has been a lack of neighbourhood redevelopment schemes and that the city's communities are experiencing disadvantage related to this. Redevelopment presents opportunities to alter the way in which water is used.

Unfortunately disadvantage and deprivation are important features of Birmingham socio-economic landscape. 10% of the most deprived electoral wards in the country are located in Birmingham which has a very high proportion of Black and Ethnic Minority (BME) communities compared with other British cities. Although disadvantage and deprivation is not always associated with members of BME communities, often these communities experience higher levels of disadvantage and deprivation than others. Alongside this tends to go poor access to decision-making by such communities.

MORI conducts surveys of Birmingham City resident's perceptions and views for Birmingham City Council as part of the Council's approach towards its Community Strategy. Birmingham people are dissatisfied with their environment in a number of ways. In 2004 approximately 44% perceived their city to be 'green'; about 36% perceived it to be 'clean'; and about 33% perceived it to be safe. This suggests a hypothesis that there may be support for sustainability strategies amongst Birmingham people.

The development of a 'sustainable city' is one of the 10 key themes identified an underpinning the vision for the city of Birmingham (see **Insert 1** below). A sustainable city is viewed as one 'where the ways we meet the needs of the present do not compromise our ability to meet the needs of the future' (www.bhamsp.org.uk).

Insert 1

The BSP's proposals for key themes underpinning its vision for Birmingham

We see Birmingham as a city:

- Where people are not disadvantaged
- A diverse and inclusive city
- A prosperous city
- A connected city
- A learning city
- A healthy city
- A well-housed city
- A safe city
- A city of culture and leisure
- A sustainable city

Policy in relation to governance in Birmingham (as well as nationally) is currently in a dynamic evolutionary state, with a much greater emphasis than formerly upon the statutory community leadership role of the local authority (i.e. BCC) and collective responsibility. A much greater emphasis on partnership working is central to this dynamic.

10 Who are the players?

North (1990) describes institutions as the rules of the game and organisations as the players. One obvious question is then as to how do the rules of the game emerge? And, the equally obvious response is that the organisations seek to define those rules. The archetypal organisation that seeks to define the rules is Parliament and Government. One continual critique from those opposing the proposal that the country should have a written constitution is that the courts would then decide what was and was not consistent with the constitution: in short, that Parliament would no longer be able to change the rules. Hence, the key player, when they can be persuaded to be interested, is Parliament and Government.

The key sets of rules produced by Parliament are:

1. Bills which become, when passed, Acts
2. Regulations, guidance and other instructions which are produced by the Ministries without needing to be formally approved by Parliament

The Bills themselves are generally preceded by consultation papers ('Green papers'), which may present options or may simply set out what the government intends to do. 'White Papers' are statements of government policy and thus its intentions.

Hence, there are three points at which other players can influence the definition of the legislative rules of the game through the Government:

- When it is seeking to define policy
- When is formulating draft legislation
- Setting regulations and guidance (e.g. the Building Regulations, Development control).

An additional leverage point is the Parliamentary Select Committees. Their function is to scrutinise the performance of the government. The hearings of the various Committees, one per Ministry, provide scope for challenging existing policy. The most important of these Committees is the Public Accounts Committee of the House of Commons which monitors public expenditure. In part, this is because the National Audit Office (NAO) generally answers to the Public Accounts Committee and each Ministry also has an audit officer, conventionally the most senior civil servant in that Ministry, who must sign off the departmental annual accounts to the NAO.

Parliament itself has two chambers: the elected House of Commons and the House of Lords. The House of Lords is unelected and was originally composed of the landowners (e.g. aristocracy) together with the bishops of the established church and judges. It was reformed some years ago to largely remove the aristocracy, but further reform has been stalemated because there is no agreement as to what should replace it.

However, the executive represented by the Prime Minister and the Cabinet, and hence government ministries, is more important than Parliament. The structure of the executive is now complex; in addition, to Ministries or Departments, the latter terminology is now commonly preferred, there are an increasing number of agencies and other forms of Non-Departmental Public Bodies (**Insert 2**). Increasingly, the role of government Departments is seen as to set policy whilst agencies undertake the delivery. Equally, there is, in the pursuit of joined-up government, the increasing use of inter-departmental bodies such as the Sustainable Development Commission. Simultaneously, the Cabinet Office, which includes the Head of the Civil Service, has a role in co-ordinating government policy across departments. Thus, the implementation of government policy on stakeholder engagement has been driven through the Cabinet Office. As the department both for raising revenue and allocating revenue between departments, HM Treasury, the Finance Ministry, also intervenes in departments as well as setting standards (e.g. on project appraisal, and risk management).

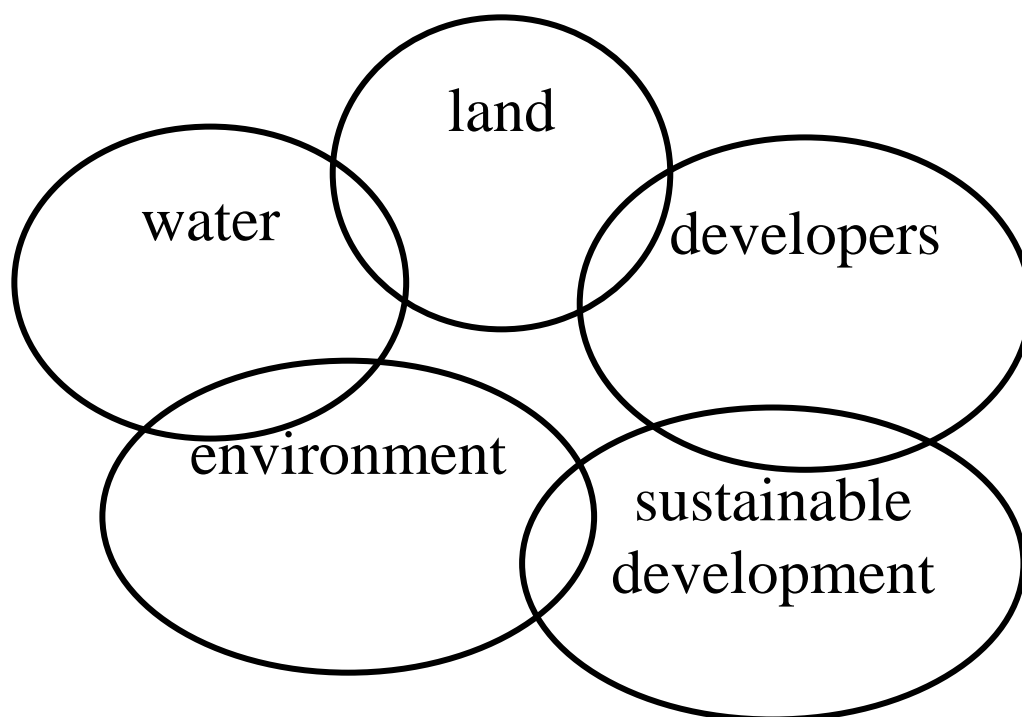
Insert 2 Non-Departmental (Government) Public Bodies

There are 3 types of NDPBs:

- Executive bodies: which carry out a wide range of operational and regulatory functions, various scientific and cultural activities and some commercial and semi-commercial activities.
- Advisory bodies: which are usually composed of a group of experts in a particular sphere advising the government on one narrow issue.
- Tribunals: which have a judicial or quasi-judicial role.

For descriptive purposes, the other players can be summarised in five groups (**Figure 29**). A relatively recent description of the organisational aspects of water management in England and Wales is given in Tunstall and Green (2003).

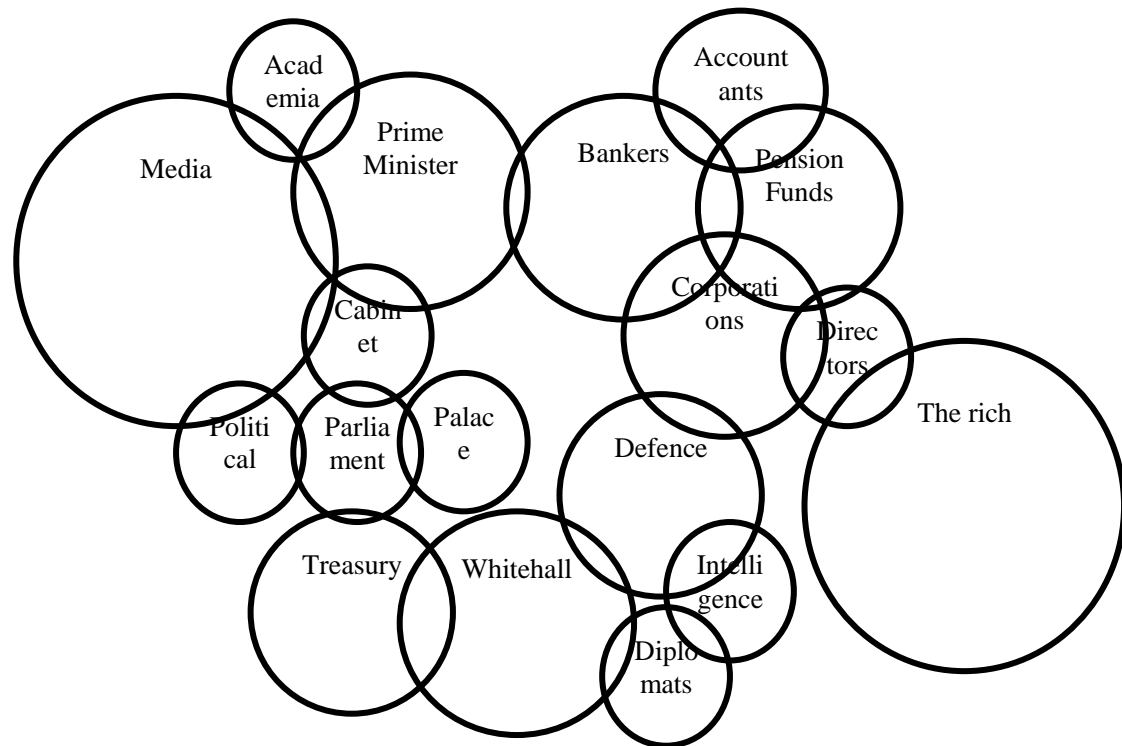
Figure 29 key players



Anthony Sampson has undertaken two assessments of the structure of power in the UK, in 1962 and 2004. **Figure 30** is his assessment of the overall relationships and extent of power between different interest groups in 2004. This picture includes players who are generally unlikely to have an interest in water management (e.g. Defence) and is also a macro-level portrait, treating Whitehall as a unit rather than differentiating between government Departments (with the obvious exception of the Treasury). A key player in Anthony Sampson's (2004) view but not mentioned in the following discussion is the role of the media. The extent to which the media set the agenda or simply follow it is debated. In broad terms, the media have a positive approach to sustainable water management and a concern about climate change, coupled to a negative expectation about the water and wastewater companies. The latter is probably because in part crises and attack makes for better reading,

listening and viewing than promoting; in addition, attack can seem much more the role of an independent media than promotion.

Figure 30 **Anthony Sampson's assessment of the power structure of the UK in 2004**



The key players are:

Environment Agency – this was established under the Environment Act 1995 by combining two central government agencies (the National Rivers Authority and Her Majesty's Inspectorate of Pollution) and the solid waste regulation function from local authorities. It is formally a Non-Departmental Public Body, sponsored by the Department of Environment, Food and Rural Affairs (Defra). It has responsibility for all media pollution prevention and control; integrated water management including water resources, fisheries, recreation; and also for a large proportion of flood defence and land drainage. It is funded almost exclusively from grants from Defra and most of its funding is for capital investment or O & M costs for flood defence and land drainage (Tunstall and Green 2003). It has very little funding available for other purposes.

It is the designated 'competent authority' under the Water Framework Directive. However, it lacks either the powers or the funding to deliver on the Water Framework Directive (Le Quesne and Green 2005). Moreover, it is a scientific bureaucracy which traditionally has seen its job as to determine what is right for the environment and to do it. It is trying to make the necessary radical cultural change to effective stakeholder engagement.

The Environment Act 1995 defines the purposes of the Agency as (S4): "*It shall be the principal aim of the Agency (subject to and in accordance with the provisions of this Act or any other enactment and taking into account any likely costs) in discharging its functions so to protect or enhance the environment, taken as a whole, as to make the contribution towards attaining the objective of achieving sustainable development.... The Ministers shall from time to time give guidance to the Agency with respect to objectives which they consider it appropriate for the Agency to pursue in the discharge of its functions.... The guidance....*

must include guidance with respect to the contribution which The Ministers consider it appropriate for the Agency to make towards attaining the objective of achieving sustainable development.” S6 2(a) “of conserving, redistributing or otherwise augmenting water resources in England and Wales; and (b) of securing the proper use of water resources in England and Wales.” The latest version of Ministerial guidance as required by the Act was issued in 2002 (Secretary of State for Environment, Food and Rural Affairs 2002). This excludes any mention of water conservation but the Water Act 2003 added the duty to make the efficient use of water resources.

The Agency is required to take into account any likely costs in achieving its principal aim, and to take account of the likely costs and benefits in exercising its powers. This includes both costs to people and organizations, and costs to the environment.

Figure 31 Environment Agency regional and district boundaries



OFWAT (Water Services Regulatory Authority)– this is the quality and price regulator who, every five years, agrees an investment programme with each water and wastewater company and allows price rises to finance that programme. Unless the water or wastewater companies would increase profitability through investing or promoting sustainable urban water management then their willingness to do so is dependent upon a specific investment programme being agreed with OFWAT and price rises agreed accordingly. The Authority is responsible to Defra.

OFWAT was established under the Water Act 1989 as part of the process of privatising the water and wastewater industry. Its function was revised by the Water Act 2003 which defines its function (S39):

“Shall exercise and perform the powers and duties in the manner which he or it considers is best calculated –

- (a) to further the consumer objective;*
- (b) to secure that the functions of a water undertaker and of a sewerage undertaker are properly carried out ...*
- (c) to secure that companies are able (in particular, by securing reasonable returns on their capital) to finance the proper carrying out of those functions; and*
- (d) to secure that the activities authorized by the licence of a licenced water supplier and any statutory functions imposed on it in consequence of the licence are properly carried out.”*

“The consumer objective Is to protect the interests of the consumers, wherever appropriate by promoting effective competition between in ... the provision of water and sewerage services.”

“To the achievement of sustainable development”.

Further under the Water Act 2003 (S40) *“Guidance may be issued (by Defra) from time to time (to OFWAT) About the making by the Authority of a contribution towards the attainment of any social or environmental policies set out or referred to in the guidance.”*

Thus, it can be seen that OFWAT is pulled in several different directions, simultaneously being required to protect the consumers' interests whilst enabling efficiently run companies to make an adequate return upon investment, and reflecting governmental social and environmental policies. In an effort to avoid the US regulatory 'rate of return' approach to utility pricing as that was not held to promote efficiency, all UK privatisations were based upon a price setting approach based upon the RPI – x (prices to rise by inflation minus some sum calculated to reflect potential efficiency savings). However, one reason why the industries were privatised was because of the large investments required to meet new environmental and quality standards (Green 2001). Hence, the original price formula adopted was:

$$RPI - x + k$$

Where k was the required allowance to cover predicted capital investment requirements. This last factor has been modified over the years. The three immediate problems experienced were firstly that OFWAT had to second guess the investment plan of the individual company. So, a company might submit a programme of investment and argue that this required a k of 6%; OFWAT has to calculate what are the likely costs of that programme and might then propose a k of 4%. Secondly, in a capital intensive industry, all price regulation inevitably revolves around the cost of capital and hence there has been a long argument as to what is the true cost of capital to the industry (OFWAT/Defra nd). Thirdly, the efficiency incentive applies to O & M costs, so the companies have a strong incentive drive down O & M costs but much less incentive to drive down capital costs. It also brings the question of what is capital expenditure and what is maintenance expenditure to the fore.

Defra – the Department of the Environment, Food and Rural Affairs has central government responsibility with regard to water. Under the Water Act 2003, it *‘... must, where appropriate, take steps to encourage the conservation of water’* (S81). The Department is also required submit reports on this matter to Parliament. The Department's general principles with regard to Integrated Water Management were set out some years ago in its document 'Directing the Flow' (Defra 2002); it is now in the process of updating this guidance. It has three additional

roles. Whilst OFWAT is an independent regulator, it seeks guidance from the government in the form of Defra of what are the government's priorities for improvements over and above those required to deliver on the various EU Directives. Secondly, Defra administers the Common Agricultural Policy (CAP) which is the main basis for funding changes in agricultural land use as these will affect, amongst other things, runoff, diffuse agricultural pollution, pollution of groundwater, and soil erosion. Thirdly, as the department of the Environment, Defra has a leading role in promoting sustainable development, notably through the Market Transformation Programme and the Water Regulations.

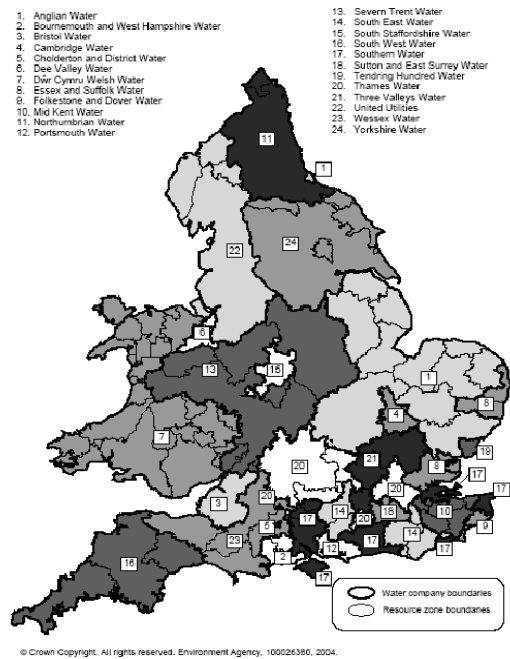
Community and Local Government Department – the led Ministry both for planning and for local government, including central government funding of local authorities. For the last fifty years, UK governments have sought to prevent urban sprawl. But now the government is anticipating a very large growth in the number of households in the South-East of the country and considers that a significant expansion of the rate of housing construction is necessary to stabilise house prices which have for years increased at a rate well above the rate of general inflation. To reconcile these two conflicting principles, the Department is simultaneously promoting redevelopment on 'brownfield' sites, areas which were previously developed; high density development; and the inclusion of 'social housing' within commercial developments. The Department is also a promoter of SUDS and of the recently announced sustainable housing code (CLGD 2006), which includes provisions with regard to water usage and source control. However, whilst the Department is responsible for providing planning guidance, statements of government policy, to local authorities, with respect to water, this advice has so far restricted to flooding – one of the authors was advised that expect a general guidance on the inclusion of water issues into spatial planning would take at least five years to develop.

Water undertakers – In 1989 (Water Act 1989), the existing mixture of water only companies and combined water and wastewater companies were privatised as they stood. Subsequently, there have been a number of takeovers and mergers, but OFWAT is concerned to avoid too great a concentration so as to maintain an element of cost comparison between companies. The Water Act 2003(S82) introduced a duty on all water supply companies ' ..., as to further water conservation."

There are private 13 water supply only companies (also called water supply companies, water supply undertakings, or water undertakers) in the UK (**Figure 33**), and 10 companies which provide water supply and wastewater services. These are companies which were privatised in 1989 and which operate either as PLCs or Limited Companies. They all provide regulated services but some also have substantial un-regulated businesses. Their view of their stakeholders, assembled on Water UK's website (<http://www.water.org.uk/home>) is shown in **Figure 34**.

Figure 32 The geographical boundaries of water resource zones for which Water Companies must submit water resource plans and drought plans to Defra

Figure 1 The water companies of England and Wales and their resource zones



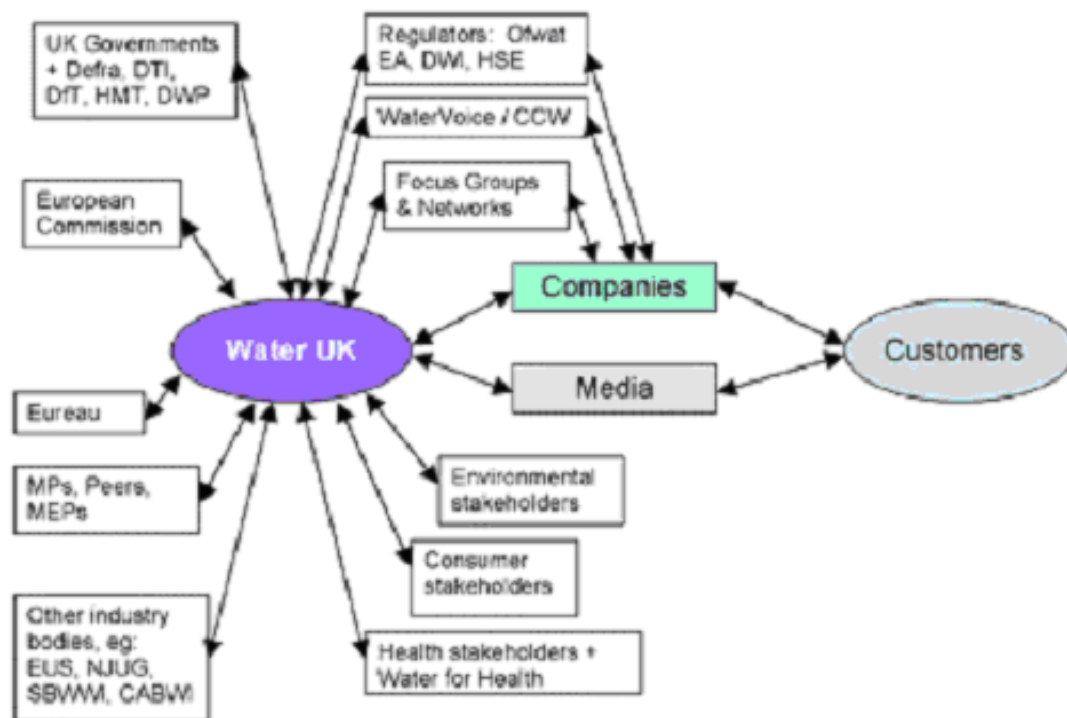
Environment Agency Review of water company water resources plans, 2004 - 9 -

Figure 33 Water supply companies in the UK



Note: the un-numbered regional water supply companies also provide wastewater services

Figure 34 Water UK's stakeholders



Water and sewerage undertakers – On the water supply side of the equation, the companies have the duty under the Water Act 2003 to further water conservation. There is no comparable duty with respect to wastewater and surface water management.

Government and local authorities – The Water Act 2003 established a general duty on all public authorities (S83) “*In exercising its functions and conducting its affairs, each public authority shall take into account, where relevant, the desirability of conserving water supplied or to be supplied to premises.*”

National Audit Office – responsible directly to Parliament, the ‘Comptroller and Audit-General’ being an officer of the House of Commons. Carries out performance evaluations and financial audits of different government departments in order to assess value for money. In particular, it carries out performance evaluations of the Environment Agency and OFWAT, most recently, on behalf of the Public Accounts Committee of the House of Commons, of OFWAT’s actions in promoting water efficiency (NAO 2007).

Audit Commission – Public corporation sponsored by the Community and Local Government Department. Carries out performance evaluations of local authorities, including their performance in terms of the effectiveness of their practice of stakeholder engagement, planning functions, and following from the Water Act 2003, to assess the effectiveness of local authorities in conserving water in their properties.

Royal Society for the Protection of Birds – a long established mass membership NGO and by far the most influential of the environmental NGOs. Through its concern with water birds, it has a very strong interest in the water environment in terms of reducing abstractions (and hence in demand management), reducing pollution, and wetland restoration.

Two bodies which should be described for completeness although they are not important players are:

Drinking Water Inspectorate – responsible to Defra for the quality of drinking water supplied by the water companies.

Consumer Council for Water (CCWater) – represents the consumers interests in water and wastewater, particularly with respect to price and quality issues. Generally ignored because of the strength of the coalition of environmental interests (NGOs and the Environment Agency) and the industry in further investment, and hence price rises.

10.1 The Water Framework Directive (WFD)

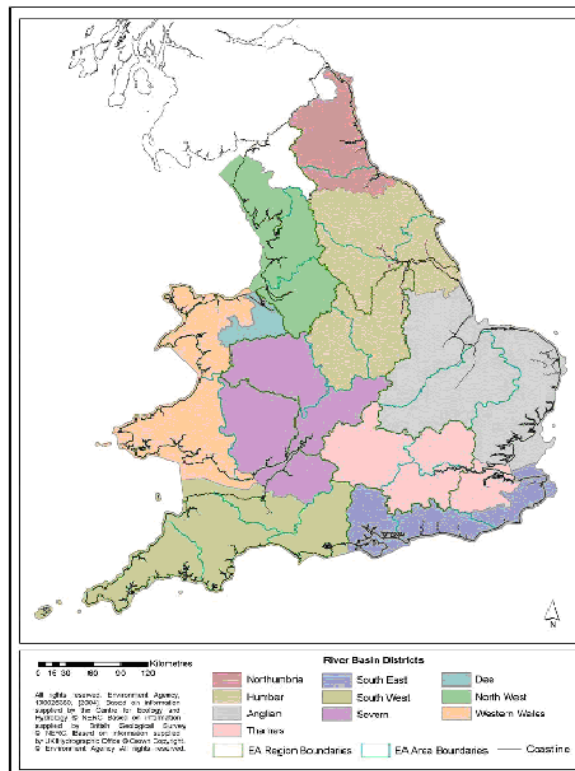
Figure 35

River basin districts to be used for River Basin Management Plans

Chapter Fourteen: Annexes

14 Annexes

ANNEX 1: MAP OF RIVER BASIN DISTRICT AND ENVIRONMENT AGENCY BOUNDARIES



DEFRA and WAG River Basin Planning Guidance

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In Europe, the critical focus of water management is the Water Framework Directive. This was necessarily derived as a compromise. Its positive aspect is that introduced the principle of Integrated Water Resource Management. The downsides are:

- It is internally inconsistent; the principles of fixed environmental standards ('good ecological quality'), stakeholder engagement, and economic analysis embodied in it are mutually incompatible. In addition, economic analysis is incapable of satisfying the burden placed upon it.
- The Water Framework Directive is explicitly excluded by the European Union from the Aarhus Convention on environmental justice, and the stakeholder engagement provisions of the WFD are weak.

- The deadline for delivering 'good ecological quality' is 2015; this is an unachievable deadline.
- In consequence, the next 25 years will be largely taken up with arguments about 'Derogations': relaxations from the target conditions can be given if specific circumstances pertain.
- Each national government has been left to designate the 'competent authority' who is responsible for preparing both the plans (River Basin Management Plans) to deliver good ecological quality in each river basin and for ensuring the delivery on those plans by 2015. The definition of the competent authority, and the definition of 'competent' (Green and Fernandez 2007), are arguably the most crucial elements in the successful delivery of the WFD. But for obvious reasons, the decision as to the nature of the 'competent authority' had to be left to national governments. In turn, in terms of implementing the Directive, there has been a gapping hole in the way of discussion and research as to what are the issues and principles which would guide the definition of a 'competent authority'. Whilst there was a long lead in between the Directive being passed and its introduction, few countries used the lead time to think about the institutional questions.

Under the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003, Defra has given a direction to the Environment Agency to submit RBMPs for each river district by 22 September 2009 (**Figure 35**). Defra has issued River Basin Planning Guidance to the Environment Agency to support this process (Defra 2006). RBMPs are to be produced on a 6 year cycle: 2009, 2015, 2021 (**Figure 36**) gives the timeline for the first plans taken directly from Defra's guidance document).

Figure 36 RBMPs – planning cycle

Chapter Three: Key Steps

Overview Timeline for First River Basin Management Plans

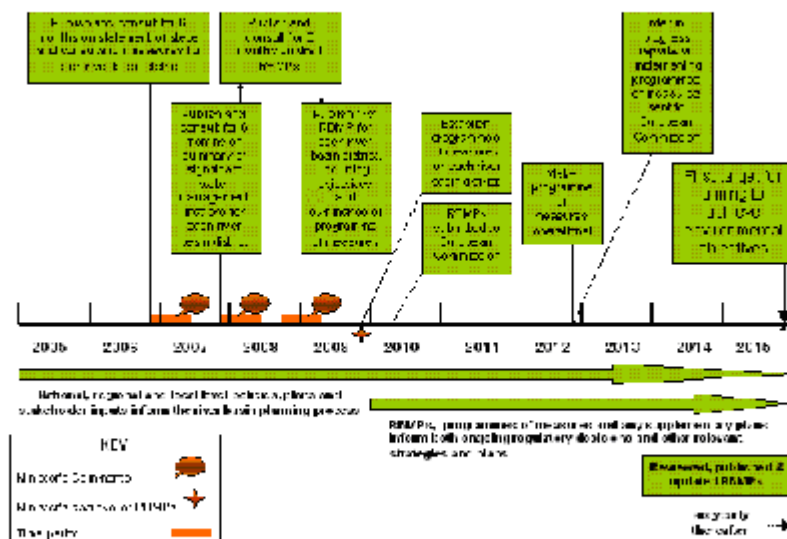


FIGURE 1

DEFRA and WAG River Basin Planning Guidance

10

10.2 Land management

Since all water management is essentially about making the best use of available land, land management is clearly central to water management. In England, land use planning has recently been redefined as 'spatial planning', an important shift of emphasis to a systems approach away from what might otherwise be a piecemeal approach. Since the Second World War, planning and development control has been the central part of development in the UK. Local authorities have been required to prepare development plans and most forms of new development, and changes of use of existing buildings, require planning consent. The notable exception to such development management is agriculture. The local authorities play a central role in this process although their plans have to be approved by central government, and central government provides detailed guidance and instruction (notably PSS documents) as to the form and content of those plans. Now local authorities in the form of the Regional Assemblies must prepare Regional Spatial Strategies (RSSs) through a comprehensive process of stakeholder engagement. Those plans are also subject to an independent Sustainable Development evaluation. Central government, through the local Regional Development Agency (RDA) prepares, in parallel and in consultation, the Regional Economic Development Plan. The relevant local authority then prepares a Local Development Framework (LDF) for the local area within the region. All except the smallest developments or changes in land use (with exception of agricultural land) are then required to seek planning consent via the local authority; consent is more likely if it is in accordance with the development plans. Agricultural land and agricultural buildings have remained largely exempt from the planning system.

Insert 3

Statutory Development Plans

Statutory plans are those that must be produced; they do not then have a statutory force i.e. it is not a requirement that they be followed exactly. Statutory development plans are policy documents that focus on land development which make strategic provision for the long term use of land and buildings in order to provide a framework for local decision-making.

The strategic system for urban sustainable development planning, which links land, water and related planning systems together, is shown in **Figure 37**. This figure shows links, on the one hand with the European level of governance, and on the other hand with the regional layer of governance and planning (which the Government refers to as local governance).

Figure 37 Strategic planning system

The Planning and Compulsory Purchase Act 2004 applies to regional and local planning bodies who have a duty to exercise their functions with the objective of contributing to the achievement of sustainable development and to have regard to national policies and guidance from Ministers in fulfilling the duty. The duty introduced a new planning framework and requires regional and local planning bodies to prepare regional and local spatial plans which contribute to sustainable development achievement. These plans are currently (January 2007) being developed.

Local authorities have formed Local Strategic Partnerships (LSPs) to oversee and contribute to local authority Community Strategies embracing sustainable development. The structuring and membership of LSPs varies but basically includes representatives of the LA's key partners and stakeholders (such as the police, NHS Trusts, voluntary sector bodies, major employers and others). The agenda of the LSPs is about innovative alliance forming around driving strategies forward. The Local Government Act 2000 gives English LAs a permissive power intended to encourage innovative practice by removing uncertainty over extent of LA

powers; provide opportunities to pursue issues raised in Community Strategies; and to facilitate cross-boundary interventions. The power given to LAs is of relevance to sustainable development because it enhances the ability of authorities to act in complex policy areas.

Figure 38 Local Authority County Council boundaries

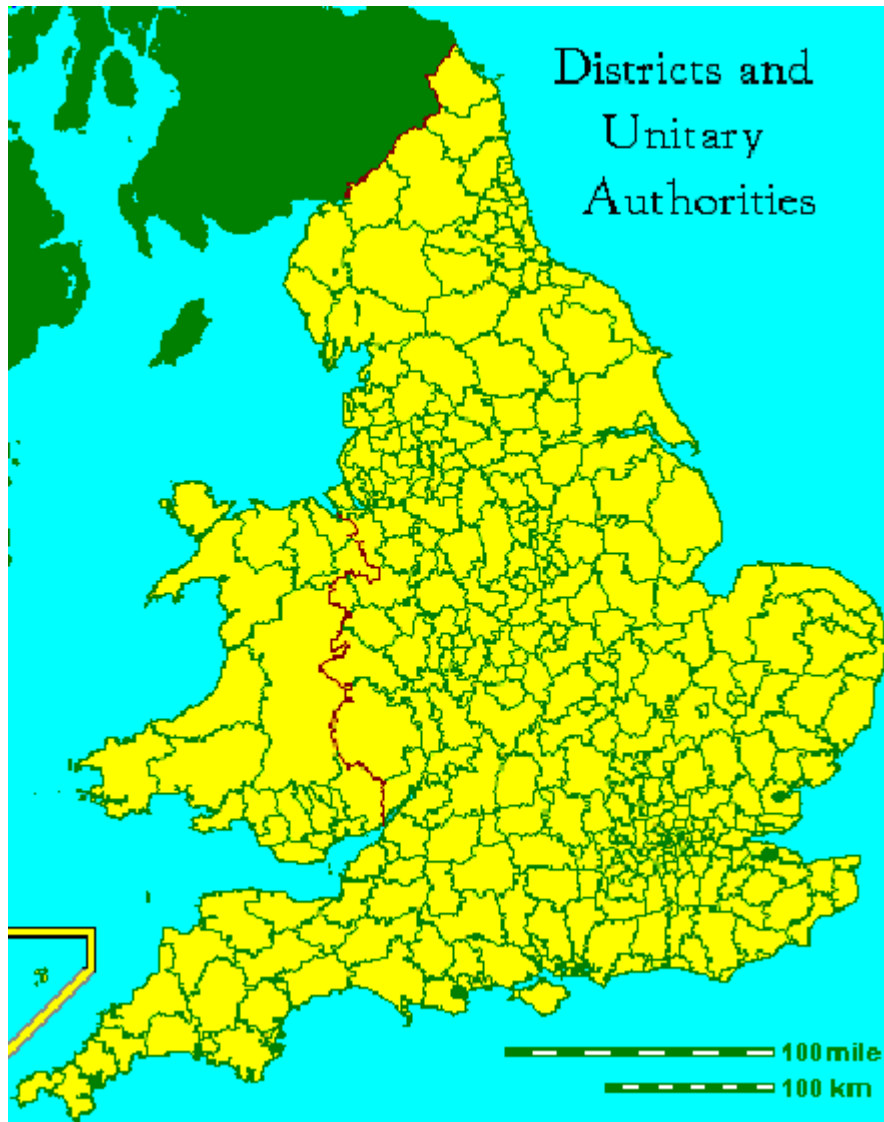
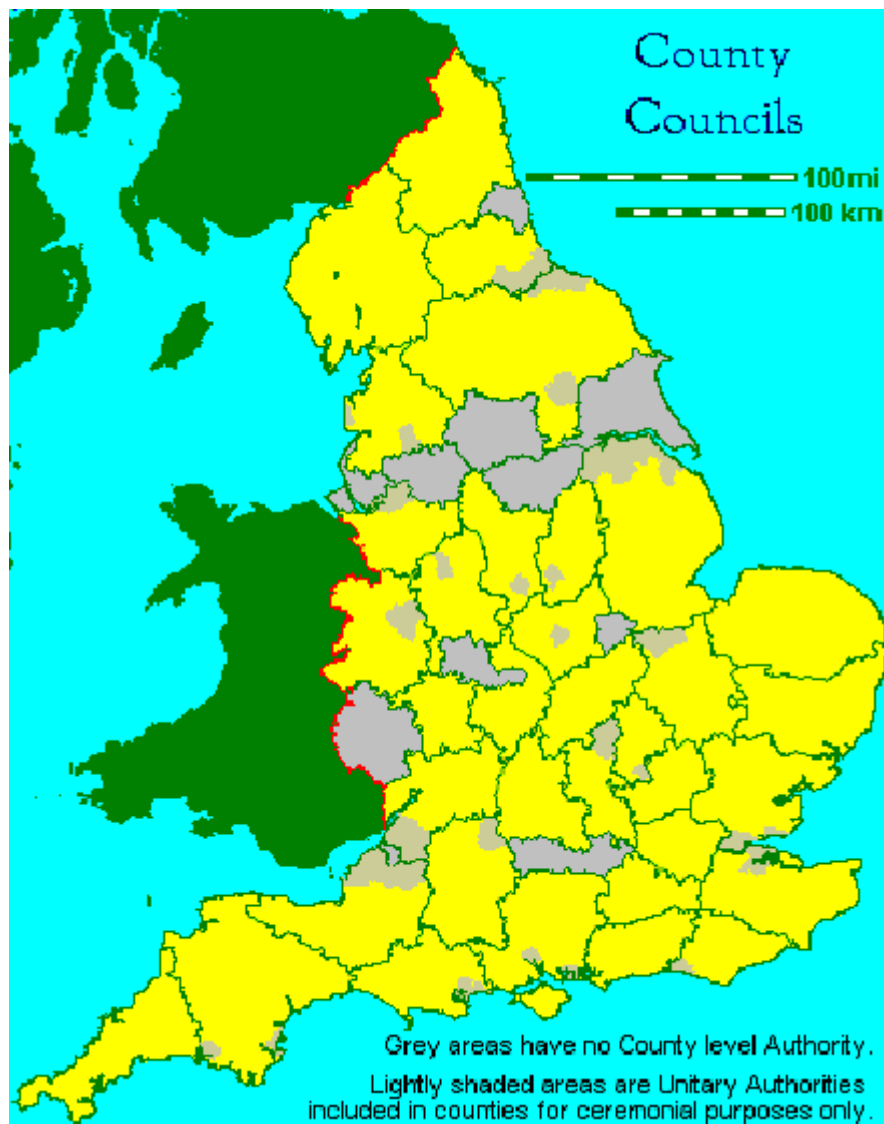


Figure 39 Local Authority District and Unitary Authority boundaries



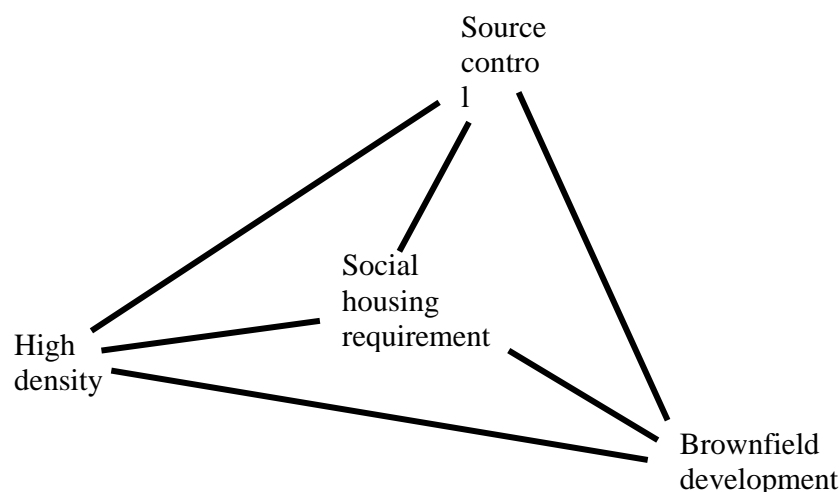
Whilst in principle there is a presumption in favour of development, the planning system does give considerable support to those who already live or work in the area to resist any development which they may consider would reduce their quality of life. It strengthens the hand of 'NIMBYS': 'Not In My BackYard'. Currently, in rural areas, windfarms are being strongly resisted by local communities.

New construction is subject to the Building Regulations and Building Regulatory consent is required both before work can commence and at different points in the construction process. Further consents are required for 'listed' buildings – those which are listed because of their architectural or heritage value – from English Heritage, a central government body and in designated 'conservation areas', from local government. For listed buildings and in conservation areas, there are limits to what alterations can be made to the building or to its appearance: at present, some LAs have been restricting the fitting of solar panels to roofs.

Currently, central government guidance emphasises the preferential redevelopment of urban sites ('brownfield' redevelopment) over the conversion of agricultural and similar land to urban uses ('greenfield' development); and increasing urban densities. Both are intended to

reduce new land take. At the same time, central government also seeks to promote SUDS, and also new development is expected to include a proportion of social housing (low cost housing). In practical terms, there is a tension between the four policies which developers must seek to resolve (**Figure 40**). Central government also creates a presumption against development in flood risk areas (DCLG 2006).

Figure 40 Government policies



In addition, England is already intensely developed and much (47%) of the land which is not already developed is covered by some form of environmental designation (**Table 2**).

Table 2 Environmental designations in England

Designations and other land uses in England (source: Barker review of planning)

| type | number | hectares | % of total land |
|--------------------------------------|--------|-----------|-----------------|
| Sites of Special Scientific Interest | 4110 | 1,072,540 | 8.2 |
| Special Protection Areas | 77 | 609,249 | 4.7 |
| Special Areas of Conservation | 229 | 809,199 | 6.2 |
| Area of Outstanding Natural Beauty | 35 | 2,040,000 | 15.6 |
| Green Belt | | 1,678,200 | 12.9 |
| National Parks | | 994,000 | 7.6 |
| Urban Areas | | 1,100,000 | 8.3 |

The local authorities can also compulsorily purchase land for specified purposes provided that fair payment is made for land so acquired (ODPM 2004a). Equally importantly, the legislation defines by omission those purposes for which the local authorities cannot compulsorily purchase land and buildings. For example, LAs have no powers to acquire buildings and land simply because it floods. Local governments are partly financed through a property tax although for businesses the tax rate is set nationally. There are no local income or sales taxes. Nor is there a development land tax per se although the value of any piece of land is largely determined by what development is permitted on that land but the windfall profits will be taxed through capital gains tax by central government

A comparatively recent development is that of 'Planning Obligations': a developer contributes money or in kind towards the costs of the infrastructural support necessary to service the proposed development. This is a negotiated process (ODPM 2005) and may, for example, include a contribution towards flood alleviation works. In addition, the water and wastewater undertakers require developers to pay an 'infrastructure' charge for connection to water and sewerage systems where that charge is set by OFWAT but does not differentiate markedly

between different areas within an undertaker's area. It is also relatively small. In addition, the permissible price increases set by OFWAT also include an allowance for capacity expansion. However, in addition, the water and wastewater undertakers are reported (Tyler 2006) to have adopted a new approach which adds to the costs to developers. Developers are expected to pay all the costs of construction upstream of the point to which the site services are connected to the public sewer or water main. Traditionally, this connection point was taken to be at the point where the water main or sewer was equal or greater in size to that of the water or main sewer being served. Now, it is reported that the connection point is taken to the point at which spare capacity is available. Whilst developers are consequently asking what are the infrastructure charges and increase in price allowance for expansion intended to cover if not for the increase in capacity, the undertakers new strategy does create an incentive for developers to minimise the additional loads on the undertakers' networks.

Community and Local Government Department – as described earlier.

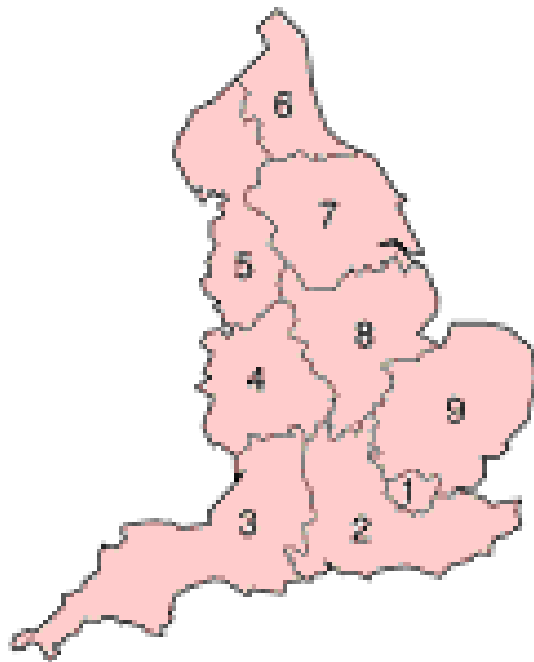
Local government – as described earlier

Government office for region – acts as central focus for all government departments with respect to that region.

Regional Assembly – Regional Assemblies (RAs) (e.g. the West Midland Regional Assembly) are voluntary, multi-party and inclusive bodies which have been established in each of the eight English regions outside of London (**Figure 41**). They are established under the Regional Development Agencies Act 1998 (where they were referred to as regional chambers). The RAs are the bodies that Regional Development Authorities (RDAs) must consult in preparation of its regional economic strategy. They are designated in accordance with the Planning and Compulsory Purchase Act 2004 as the Regional Planning Body for the region with a duty to prepare a regional spatial strategy which includes a transport strategy and a regional waste strategy. They have a role as the voice of the region and can prepare regional strategies, such as regional sustainable development frameworks, taking the lead role in some regions. They also take responsibility since September 2006 for the work of Regional Housing Boards. Thus RAs are now Regional Planning Bodies and take an overview of regional housing markets producing Regional Housing Strategies and advising Ministers on the distribution of resources for affordable housing schemes (delivered through Housing Corporations). RAs also scrutinise the work of the RDAs (Communities and Local Government 2006).

Regional Development Agency – branch of the Department of Trade and Industry. Under the Regional Development Agency Act 1998, nine Regional Development Agencies (RDAs) (**Figure 41**) were created. Their primary duty alongside others is to further economic development and regeneration; promote business efficiency, investment and competitiveness; promote employment; and to enhance skills relevant to employment. They have a duty to contribute to the achievement of sustainable development, where it is relevant to do so. Ministers, including from DCLG, may give them guidance. When first formed RDAs saw their sustainable development contribution falling mainly around the economic pillar, but some have since developed processes to minimise environmental aspects of their operations (some going on to formulate sustainability appraisals). The starting point for all RDA activity is the Regional Economic Strategy (RES) which are required to be subject to a Sustainability Appraisal. There are a number of other strategies which underpin RDA activity including Regional Sustainable Development Framework (a Defra initiative) and Integrated Regional Strategies (an ODPM initiative). These strategies overlap and there is currently some confusion about which takes precedence (Cussons 2006, 24). The parts of RES for which RDAs are responsible are implemented through a Corporate Plan for each RDA. Corporate Plans for 2005-08 have been prepared in the light of guidance from Ministers (the Tasking Framework).

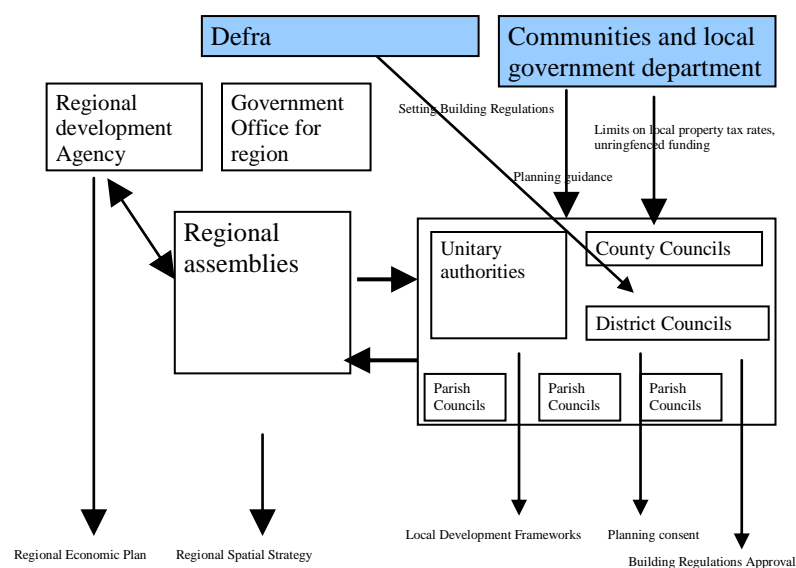
Figure 41 Regions of England



1. London
2. South East England
3. South West England
4. West Midlands
5. North West England
6. North East England
7. Yorkshire and the Humber
8. East Midlands
9. East of England

The regions are also known as Government Office Regions. These regions are those for Regional Assemblies and Regional Development Agencies. It can be seen that the regional boundaries for the RDAs and Regional Assemblies are not consistent for those of the RBMPs or regional wastewater companies.

Figure 42 Local government



10.3 Sustainable development

A network of organisations whose individual development has been driven by differing pressures and priorities over time. Those pressures in the past include promoting energy efficiency, industrial productivity through waste minimisation, and in recent years, particularly by concerns about climate change. Shifting to carbon neutral development is now the dominate focus of government policy (with, in London, delivering the 2012 Olympics being given nearly equal weight). Sustainable water management is thus some way down the list of priorities. Similarly, climate change is one of the great drivers for sustainable water management or perhaps a lever that is being used to promote it. The adoption of sustainable water management is given its primary impetus through association with climate change adaptation, and notably the expected problems with drier summers and more intense rainfall in winter.

The most recent review of the Government's comprehensive strategy for sustainable development called 'Securing the future' published in March 2005 (HM Government 2005) (Insert 4).

Insert 4

UK Sustainable development strategy

- Sets out 5 principles: 1) Living with environmental limits; 2) ensuring a strong, healthy and just society; 3) achieving a sustainable economy; 4) promoting good governance; and 5) using sound science responsibly.
- Four priorities for action: 1) sustainable consumption and production; 2) climate change and energy; 3) natural resource protection and environmental enhancement; and 4) sustainable communities.
- All central government departments to produce sustainable development plans.
- A new indicator set, outcome focused, with commitments to look at new indicators of well-being.

Secondly, there is an enormous diversity of organisations operating in this area, including NGOs and charities. For example, around 28% of schools are members of 'Eco-Schools', an international NGO set up to promote sustainable development awareness in schools. At the same time, the Department for Education is promoting sustainable development, including water efficiency, in schools and the Department of Health is promoting sustainable development in hospitals, again including water efficiency.

Market transformation programme (MTP) – a branch of Defra, this is a key player at national level. The defined purpose of the MTP is to support “*the development and implementation of UK Government Policy on sustainable products. MTP’s aim is achieved by providing consensus-based information to Government, its agencies, industry, trade bodies and others who are involved in designing and implementing policies and measures that influence the environmental impact of products.*” The MTP has prepared a number of reports on water efficient appliances and fittings, and most recent on greywater and rainwater harvesting.

Community and Local Government Department – Proposer of the 'Code for Sustainable Housing' which sets, amongst other things, standards for energy and water consumption.

Envirowise – a government agency originally established as the Energy Technology Support Unit, and now jointly sponsored by the Department of Trade and Industry and Defra, to promote improvements in the use of energy by industry and subsequently transformed to promote waste minimisation within industry. The definition of the problem as one of 'waste minimisation' is possibly an important one as 'waste' carries with it the connotations of inefficiency and carelessness. In particular, it carries out baseline surveys of water usage in the industrial and commercial sectors and defines good practice. It also funds firms to undertake audits of their resource use and waste minimisation clubs of firms. Important

because it claims that companies can make immediate reductions in water usage by up to 50% with payback periods of less than 2 years.

UKCIP (UK Climate Impact Programme) – co-ordinating body for work on adaptation to climate change.

Defra – the Department of the Environment, Food and Rural Affairs has central government responsibility with regard to water. Importance here lies with its responsibility for setting the building regulations, requirements for the structure and services of all new buildings and adaptations, and thus for setting the regulations covering a large part of water management.

H M Treasury – the Finance Ministry with responsibility not only for raising taxation but also for allocating that revenue between government functions. Traditionally, semi-autonomous to the Prime Minister. That taxation raising includes the increasing adoption of hypothecated taxes (ones from which the revenue is committed to some specific purpose), and also of 'green taxes'. Through its tax raising responsibility, the Treasury may allow offsets against tax for particular activities or provide direct subsidies. An important example of the former in this context is the ECA scheme which allows companies to offset the capital cost of some designated forms of water efficiency equipment against tax on profits.

Sustainable Development Commission – an independent advisory Non-Departmental Body which reports to the Prime Minister and acts as a watch dog to review government's progress on Sustainable Development. Housed in Defra.

Sustainable Development Unit – a branch in Defra which is responsible for embedding, monitoring and reporting on sustainable development across government as a whole and the UK.

10.4 Development

Whilst the birth rate in England has fallen to the replacement rate, there is still a high net rate of immigration to the country and between regions, notably to the south-east. At the same time, the rate of household formation has increased. For the past fifty years, successive governments have adopted regional development policies either to increase out-migration (e.g. from the cities in the immediate post-war period) or to regenerate deprived regions, in part so as to reduce out-migratory pressures. Regional development has not had outstanding success in the past and current policy assumes that migratory pressures towards the South-East will exceed the success of regional development strategies. Hence, two important roles for government are perceived to be:

1. Regional development
2. Coping with migration

At the same time, the country is seen as competing with other countries for investment so that seeking to resist migratory pressures might also reduce international competitiveness.

Development is institutionally divisible into two main categories:

- Residential
- Commercial

In turn, residential development can be split into two: for purchase and social housing. Since a negligible proportion of dwellings are customer built for the individual purchaser, developments for purchase are speculative developments. By far the greater proportion of dwellings in England are now owner-occupied and this adds a further complication: dwellings are seen as an appreciating asset rather than as depreciating consumer durable. Dwelling prices generally increase at a rate well above price inflation and home owners rather want this to be a characteristic of the housing market forever. Conversely, as prices are now so high as to make it difficult for first time buyers to enter the market, the Government is seeking to promote the expansion of housing production in order to contain house prices – housing production is now down to around 180,000 units per year so that the total stock of housing is

only increasing at 1% per annum. The demand-supply balance shows marked regional variations with demand greatly exceeding supply in the South-East. The production of 'social cost', low cost housing, is now very low, creating major problems for low income households, and a wider problem for those in key service industry occupations (e.g. firemen, nurses).

For the commercial developer, the ability to assemble land is the key ability.

Community and Local Government Department – the Ministry responsible for housing, planning and local government.

English Partnership – A central government agency responsible for regeneration and the disposal of land owned by central government. Particularly important because of government's emphasis on directing development to brownfield sites and because of its responsibility for recycling land in central government control, coupled to land assembly powers, including compulsory purchase.

Council of Mortgage Lenders (CML) – almost all the bank, building societies and other groups who will lend money to someone in the form of a mortgage against a property in order that the property can be purchased are members of CML. Traditionally, the market was dominated by Building Societies, mutual societies, whose members saved money which was then only invested into mortgages. Hence, housing investment did not directly compete with other forms of potential investment. More recently, the banks have become bigger players and many of the mutual societies have converted themselves in public limited companies. As mortgage holders, they are long term investors who are exposed, firstly, to the risk that the borrower will be unable to repay the mortgage. The extent of this risk depends primarily on fiscal factors and the performance of the national economy. If a mortgagee defaults on the mortgage then the mortgage holder will wish to sell the property in order to recover their loan. So, the second risk factor in granting a mortgage is the resale value of the property. A significant question therefore is whether sustainable water management will increase or decrease the value of a property. However, the CML has so far not looked at this question.

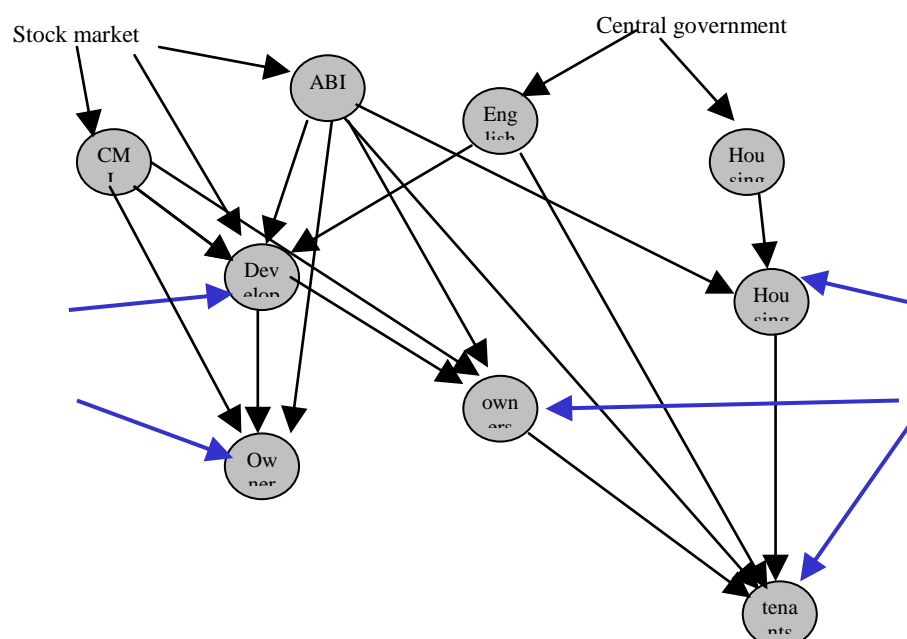
Association of British Insurers (ABI) – trade association of majority of companies offering insurance in the UK. Critically, the availability of a mortgage to buy a property is dependent upon the availability of insurance against structural damage to that property. Hence, in principle, if an insurer will not provide insurance then a new development for sale is unlikely to go ahead. Water management also involves other forms of insurance, notably Public Liability insurance for the building occupier against the risks to others. The ABI has become very active, as has the insurance industry in general, with regard to climate change, pushing strongly for reductions in greenhouse gas emissions: climate change, it considers, may make some currently insurable risks uninsurable. The ABI has been particularly concerned with the risk of flooding – currently, domestic insurance policies automatically include coverage against the risk of flooding. The ABI has been lobbying hard for increased government investment in flood alleviation measures, the adoption of resilient construction in flood risk areas, and the exclusion of new development from flood plains. It is currently studying the implications of the widespread adoption of SUDS but has not yet started to look at the implications of other urban water management strategies (Milne 2007) – although these may have implications in terms of Public Liability insurance.

Pension funds – the pension funds are large scale investors (and control very large sums of money) in both land and in development – particularly in buying development once it has been completed, looking for a safe return in the form of rents. There is also an increasing concern with ethical investment which should encourage them to support sustainable development; the BP pension fund is thus promoting a sustainable expansion of Harlow, the town where the company headquarters is located, by some 50,000 people (www.harlownorth.com).

Housing Corporation – the government agency which provides the loan capital through which Housing Associations fund the construction of new housing (social housing) for rent.

Housing Associations – the main providers of social housing – low cost housing for rent or shared ownership.

Figure 43 Development



10.5 The Environment

There are three groups of major players in this area:

- Central government – notably Defra
- Government Agencies
- NGOs

Defra is the lead ministry with respect to environmental matters as well as with regard to water.

Natural England in its former existence as English Nature had responsibility for the network of Sites of Special Scientific Interest (SSSIs) in the country as well as the national nature reserves. When European designations were introduced, it absorbed responsibility for those as well. It has the responsibility for advising the government on nature conservation in general and is a party involved in the various Biodiversity Action Plans.

English Heritage is responsible for the conservation of buildings and areas of heritage and archaeological interest. When a building is listed as being of historical importance by the Minister on the advice of English Heritage, any change to that building, including repairs, must be approved by English Heritage.

England is unusual in that mass membership national NGOs have been in existence for over 100 years and are major players in the environmental aspects of decision making. The two most important of these NGOs are the Royal Society for the Protection of Birds (RSPB) and the National Trust – the latter is also important because it is a very large landowner. It is interesting to speculate upon why nature conservation interests in England have focused upon birds (the National Trust was originally formed to preserve valued landscapes), but since birds are quite high up the food chain, the consequence is the RSPB is concerned to preserve habitats, and, given the importance of water birds, waterine habitats in particular. It gains its strength through mass membership so that Ministers, chief executives and others are all likely to be members of the RSPB.

As a corollary, the international environmental NGOs are relatively minor players in regard to water, if at all, largely because they do not have an ecological niche to fill. WWF is something of an exception, but the large NGOs, notably Greenpeace and Friends of the Earth focus upon other issues. Some international NGOs, such as the International Rivers Network, are notable by their absence in England.

10.6 Wastewater industry

It is still usual to talk of the 'water industry' although the largest share of the existing investment and of bills is for wastewater collection and treatment. Nor are the interests of the water supply and wastewater industries necessarily consistent, and in a significant part of the country different companies are responsible for water supply and for wastewater services. This focus on the potable water side of sustainable water management can have a biasing effect upon the analysis of the situation.

Defra – Government Ministry with overall responsibility for water policy.

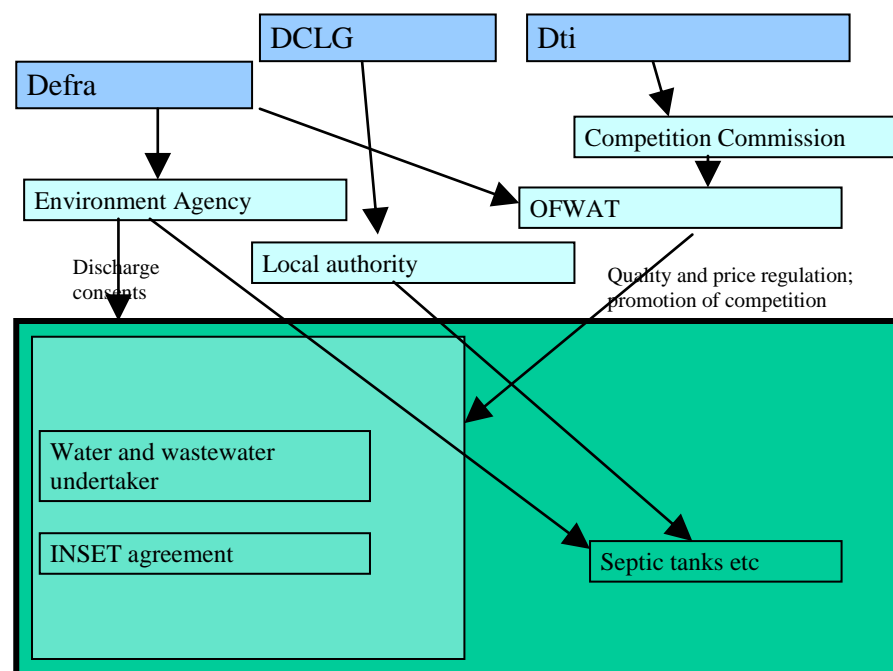
Environment Agency – sets consent standards for discharges to surface water; sets and enforces measures to protect groundwater (including the Nitrates Directive).

OFWAT – price and service quality regulator for the industry.

The wastewater undertakers – the large, regional, privatised wastewater undertakers which also provide water supply within all or part of their region.

UKWIR (United Kingdom Water Industry Research) – A joint undertaking combining the industry, government and its agencies which commission applied research of common interest. Important because a multi-stakeholder advisory group oversees each research project and hence there is a degree of consensus as to the acceptability of the research.

Figure 44 Wastewater industry



Water UK – the trade association for water and wastewater undertakers, partly a lobby group.

CIRIA (Construction Industry Research and Information Association) – the body which conducts R & D on behalf of the construction industry. It has been a particularly important

player in developing guidelines for SUDS. Again, because each project is overseen by a multi-stakeholder advisory group, there is a degree of consensus as to the acceptability of the research.

RSPB (the Royal Society for the Protection of Birds) – the most important of the environmental NGOs, frequently acts in collaboration with other environmental NGOs.

10.7 Water supply

Effectively, the entire country is supplied by mains water provided by one of the privatized water companies. The whole framework of regulation is based upon the assumption that this is the universal means of water provision. Unlike many countries (e.g. Germany, Austria) there is only isolated and small scale provision through Water User Associations. Equally, the historical provision through local authorities was subsumed into regional scale provision prior to privatisation.

So, 'Private water supplies', either serving a single property or a group of properties, are treated as an anomaly and the entire policy and regulatory system is geared towards the management of the privatized utilities. 'Private water supplies' are estimated to number at least 50,000 serving over 160,000 people, most being drawn from groundwater and serving less than 25 people. Little if anything is known about how these systems work institutionally. The regulatory regime for 'Private water supplies' is completely different from the commercial water undertakers; under the 1991 Private Water Supplies Regulations, local authority environmental health officers have a duty to monitor private supplies with respect to drinking water quality. These regulations are currently under review and a risk based approach is expected to be introduced. In addition, local authorities have a general responsibility for the healthfulness of housing under the Housing Act 2004. This Act includes water supplies, sanitation and drainage.

The regulatory approach in this area is framed in terms of Private water supplies being a residual anomaly rather than as a potential alternative means of supply. INSET agreements are the only route through which localised water supply systems can be established.

For purely historical reasons, in some parts of the country, water supply is provided by a privatised water supply company and wastewater services by a different privatized wastewater company. In other areas, a single company both supplies water and provides wastewater services.

Up until comparatively recently, the policy drive was to increase competition (e.g. through Common Carriage) and demand management concerns were largely limited to measures to drive down leakage rates from what were considered to be very high levels, a drive resulting from shortage of water in droughts. The industry was largely geared towards a 'growth as normal' model. Attempts to introduce competition have focused upon:

- INSET agreements: these allow an existing regulated water or sewerage company to be replaced by another at a specific site provided that (a) the customer uses at least 50 megalitres of water a year; (b) the site is not currently served by a water and/or sewerage undertaker; and (c) the existing water and/or sewerage undertaker agrees to the inset. OFWAT must agree to the arrangement. The minimum threshold implies, for example, a housing development of at least 600 dwellings if the new sustainable housing code consumption figures are to be achieved. For comparison, the largest sustainable housing development yet undertaken in the UK, BedZED, consists of 110 dwellings.
- Common carriage provisions: allows the use of a water undertaker's supply system for supplying non-household consumers. The potential supplier must obtain a licence from OFWAT of which there are two forms: (a) a retail licence where the holder buys the water from one water undertaker and sells it to eligible customers or (b) a combined licence in which the holder provides the water and uses the undertaker's supply system to transfer it to the consumer. In both cases, the consumer must have a demand which is 50 megalitres of water or more each year.

At present, there is no specific provision for a company to take over an existing site in order to provide some packaged integrated water and wastewater management service. Similarly, it might be expected that the shift to sustainable water management is likely to result, where groundwater is available, in more 'Private Water' supply systems being created. Integrated systems therefore appear to lie in something of a regulatory vacuum.

The Water Act 2003 (S82) introduced a duty to water supply undertakers “.... *To further water conservation.*” Up until that time, the primary impetus had been towards reducing leakage in the distribution system, that drive having been the result of a number of droughts, but a number of water supply companies lagged in achieving their target levels of leakage. Those droughts provided some impetus towards promoting demand management in the short term, although the immediate response of the companies to the 1993 drought was to assert that there never should be any hose pipe bans (not a use for which they have, in any case, a statutory duty to supply) and hence requiring resource reinforcement. The Public Accounts Committee has recently published a scathing attack upon the efforts of the water supply companies with respect to demand management and the efforts of OFWAT to enforce their duties with respect to water conservation (Public Accounts Committee 2007). Conversely, the water companies are doubtful about the long term effectiveness of demand management measures, but the companies, the Environment Agency and OFWAT are all ritualistically in favour of water metering.

This drive was reinforced by the Water Act 2003 which introduced two new duties for each water undertaker:

- to prepare and to maintain water resources management plans (S62); and
- to prepare and to maintain a drought plan (S63), covering means the undertaker would adopt to restrain demand and to obtain additional sources of water in the event of a drought.

Both plans have to be approved by the Secretary of State at Defra after consulting the Environment Agency.

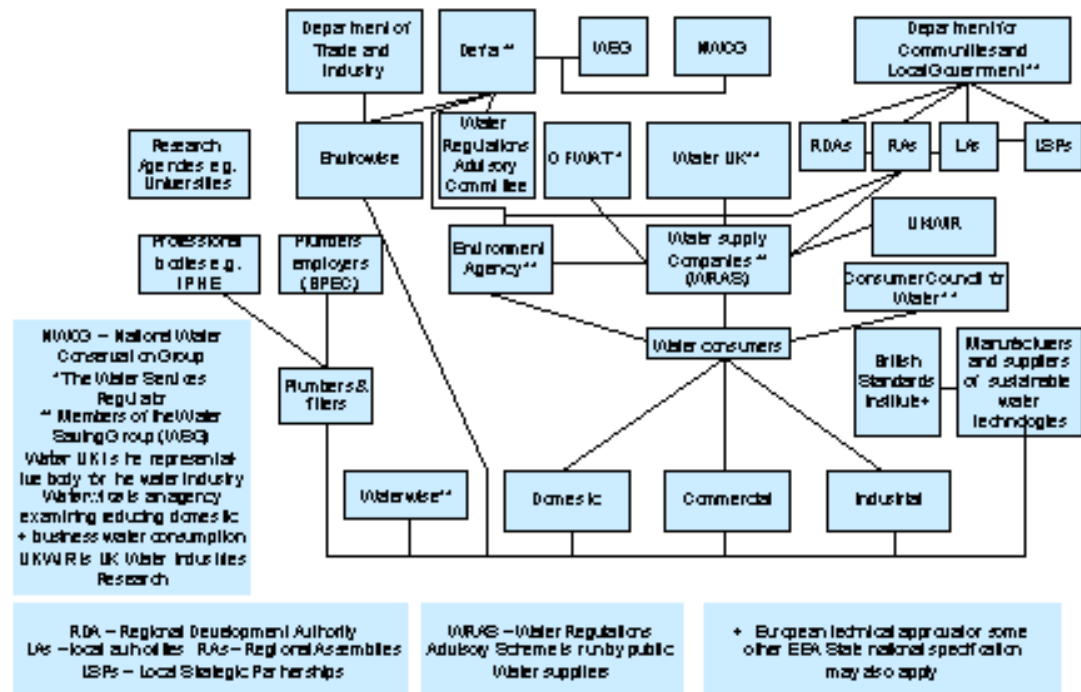
However, the main drive towards demand management comes from outside of the industry and its regulators, coming instead from the Ministries themselves:

- Proposals for water efficient fittings and appliances – notably the Market Transformation Programme operated by Defra.
- The Code for Sustainable Housing from the Department for Communities and Local Government.
- The Water Regulations produced by Defra.
- The Enhanced Capital Allowance (ECA) scheme from the Treasury.
- Waste minimisation activities promoted through Envirowise.
- Government's own application of sustainable development to its own stock of buildings as monitored by the Sustainable Development Commission

Thus, an inter-departmental group called the Water Savings Group first met in October 2005. It is a ministerially-led group which brings together key water industry stakeholders (see **Figure 45** for membership) to promote the efficient use of water. It is clear from the publicly-available minutes of this Group's meetings and its action plan, and because it is led by a Minister, that the Group is influential in decision-making about developments in water efficiency at the national level. The Group is seeking to take a lead in advances in water efficiency. Defra also supports a voluntary group called the National Water Conservation Group which also seeks to bring stakeholders together to influence policy.

Figure 45 **Water supply: the main players**

Figure 7.1 Organisational Institutional map for demand management: showing the principal institutions



Important players at other times have been the NGOs associated with children and child poverty, notably Save the Children and Dr Barnardos. On privatisation, the water and wastewater companies were left with the right to disconnect domestic customers who had not paid their bills, a privileged position as compared to that for other creditors. With the sharply rising water and wastewater bills following privatisation, coupled to the recession and associated high levels of unemployment and child poverty, the medical profession became concerned with the number of families who were disconnected from a water supply for non-payment of water and wastewater bills. So too did the Save the Children fund, a charity generally associated with work in developing countries, and Dr Barnardos. The latter was established in the nineteenth century to care for orphans in the UK and has subsequently reinvented itself to focus on disadvantaged children. The political embarrassment of being attacked by a charity associated in people's minds with child poverty and exploitation in the developing countries was one of the reasons why the government banned the disconnection of water supplies to domestic consumers.

Those and similar charities have continued to have an interest in the effects of water metering on the disadvantaged families, and metering programmes have correspondingly been adjusted to reflect their concerns. But generally they are not currently central players but this might change in the future if the costs of water and wastewater continue to rise, as expected, particularly when an economic recession occurs. The expectation is that water and wastewater charges will continue to rise, not least because both the water and sewer networks are reaching the end of the lives and will need major replacement. Similarly, the consequences of climate change will require substantial investment and the consequences of the Water Framework Directive have been by no means all yet been passed through – the Thames Tideway scheme in London is, for example, expected to increase local water prices by about 10%. Similarly, a reliance on behavioural changes to reduce water consumption might also be expected to concern these NGOs.

OFWAT – sets and monitors service standards (e.g. pressure, reliability) and set price limits on the basis of investment plans submitted by the water undertakers. It is developing guidelines on best practice at demand management.

Environment Agency – Licences and regulates all abstractions from surface and groundwater. Prepares CAMS (Catchment Abstraction Management plans); reviews the water supply undertakers Water Resource and Drought Management Plans on behalf of Defra. The Agency's Demand Management Centre, a clearing house for knowledge in the field, is an international resource. The Agency has prepared a series of guidance documents on water conservation techniques and lists suppliers of appropriate equipment on its web site.

Defra – The lead ministry with respect to water policy and also in regard to building regulations and sustainable development.

Envirowise – a government agency originally established as the Energy Technology Support Unit.

Market transformation programme (MTP) – a branch of Defra.

Water only undertakers – the private companies which only supply water, wastewater services being the responsibility of another company.

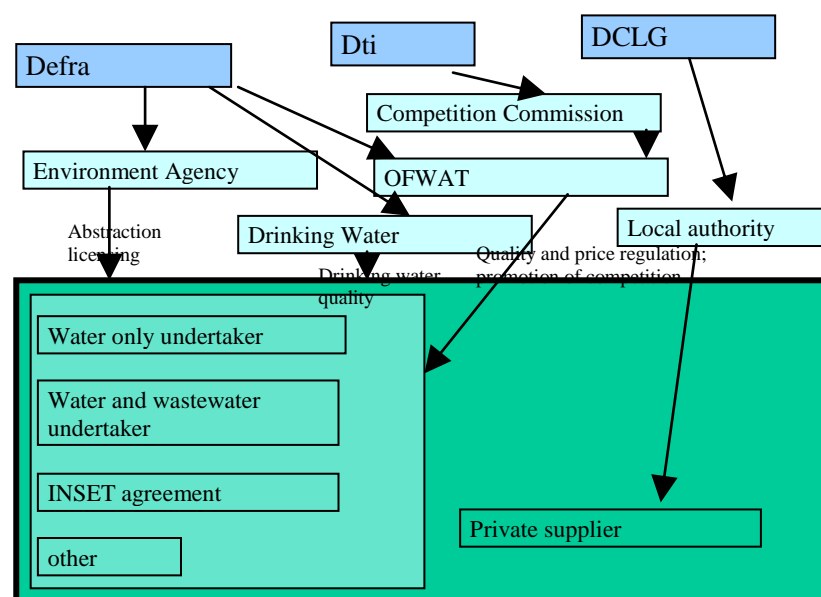
Private supplies – the limited number of individuals or small communities who provide their own drinking water, generally from wells or springs. Regulated by local authority.

DWI (Drinking Water Inspectorate) – responsible for monitoring drinking water quality except where the system is a Private Supply. In the latter case, the responsibility lies with the local authority.

RSPB (the Royal Society for the Protection of Birds) – the most important of the environmental NGOs, frequently acts in collaboration with other environmental NGOs.

Local authority – under the Water Act 1991 (S77) they have the responsibility for regulating and monitoring Private Supplies – each of which must be registered with the local authority.

Figure 46 Water supply



10.8 Land drainage and surface water management

One of the key problematic areas is when land drainage becomes surface water drainage. The land owner is responsible for the management of surface water runoff on their own land. However, the land owner has a right of connection to a public sewer in most circumstance; once the water is in a public sewer it becomes surface water drainage. The wastewater companies insist that they are not land drainage authorities. Equally, whilst the canal network plays a significant role in some areas in surface water drainage, the British Waterways Board, who are responsible for operating and managing the canal network, equally insist that they are not a land drainage authority. In practice, there are only two forms of organisation which are land drainage authorities: the Highway Authorities which have such responsibilities for roads, and the Internal Drainage Boards (IDBs) which have local responsibility in some areas.

A similar boundary problem occurs with watercourses. Until recently, there were two categories of watercourse in England: 'main rivers', for which responsibility for flood risk management lies with the Environment Agency (41,000 kms), and 'non-main rivers', the responsibility generally of the local authority unless the watercourse is within the boundaries of an IDB (22,000 kms). The standard definition of a 'main river' was that one that was shown as such on the map held by the Ministry; that is, all watercourses stated out as non-main rivers unless they were 'mained' through an administrative process by the Ministry (now Defra). By recently, 'non-main rivers' have been re-designated as 'ordinary watercourses' and those defined as 'Critical Ordinary Watercourses (COWs)' have been made the responsibility of the Environment Agency.

The Highway Authority – the local or central government agency responsible for the maintenance and operation of that particular class of roads. Broadly, the major roads are the responsibility of central government and everything else is the responsibility of local government.

Internal Drainage Board (IDBs) – These developed as associations of farmers to drain their land, paralleling the development of drainage over most of western Europe. Hence, the distribution of IDBs reflects the distribution of agricultural land which could be made suitable for agricultural usage after drainage. In turn, this means that IDBs (now about 172 after amalgamations) are more important in some parts of the country than in others. IDBs cover 1.2 million hectares, about 9.7% of the total land area of England but whereas 23.9% of the Anglian region is covered by IDBs, in the Midlands, including Birmingham, it is only 7.0%. With the expansion of urban areas, some towns are now included in individual IDB. A further complication is some of the IDBs are very long established and were created through a specific Act of Parliament. Their powers, duties, and discretionary powers are specific to the particular Act by which they were created. Others have powers under the successive Land Drainage Acts of which the most recent is the 1991 Land Drainage Act. Under the 1991 Act, "an IDB is required to exercise a general supervision over all matters relating to water level management within its district, and to use the powers and to fulfill the duties which are provided under the Land Drainage Act 1991" (JBA Consultants 2006). Those duties are limited:

- General supervision over all aspects of land drainage within the district.
- General duties with respect to the environment and recreation.
- Maintaining a list of all hereditaments.

The discretionary powers granted to a Board are much broader and include the powers to:

- Undertake works to alleviate flooding;
- Improve and maintain the drainage system; and
- Regulate and control activities in and alongside the drainage system to ensure that land drainage and flood risk management is not impaired.

These powers extend to any watercourse within its defined boundaries other than a 'main river' (the responsibility of the Environment Agency).

Some IDBs were established by earlier Acts of Parliament; whilst the general provisions of the 1991 Land Drainage Act apply to these IDBs, powers and duties under the original Act of Parliament which created the IDB may apply (i.e. unless specifically revoked in a subsequent Act of Parliament). In particular, some IDBs have a duty, rather than a discretionary power, in regard to flood risk management. Those other duties may also include those of being a Navigation Authority.

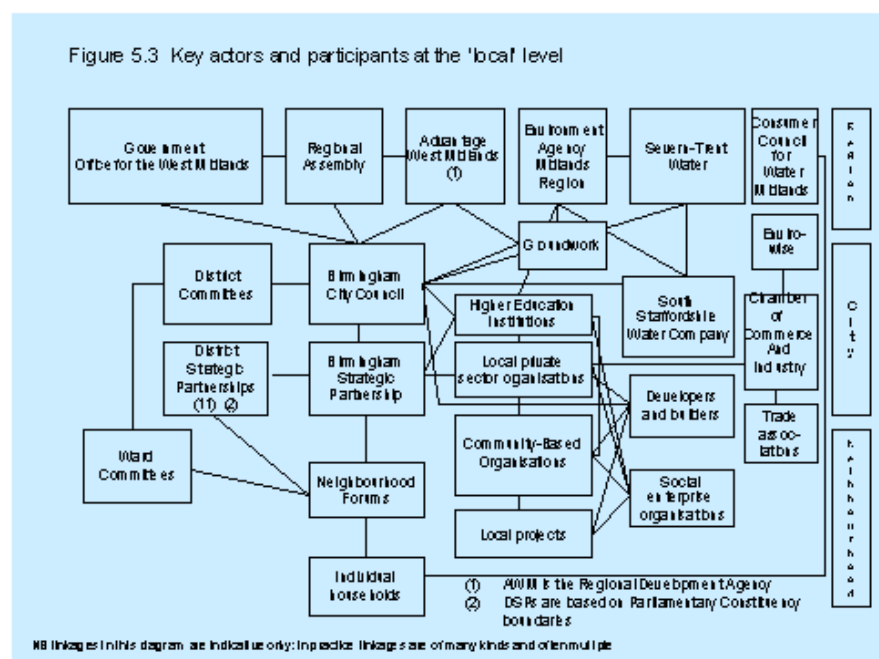
Wastewater undertakers – part of their reluctance to be involved with SUDS lies in their denial that they are land drainage authorities. Their responsibility is limited to receiving that which is in a sewer (i.e. not groundwater and not water flowing on the surface). Getting water into a sewer is the responsibility of the land owner. Since widening their responsibility to cover land drainage could be an open-ended commitment, the reluctance of the wastewater undertakers is understandable.

British Waterways Board (BWB) – a public agency which is responsible for the canal network of around 2000 miles, now largely used as a leisure resource. Birmingham itself has more canals than Venice as a result of its industrial heritage where canals were the essential transport network. Canals are not planned to be used for surface water drainage and BWB permission is required before development can drain into a canal. In Birmingham, urban regeneration has centred around the canal network, particularly about the canal basins, and hence BWB has been an important player in that sense as well.

10.9 Key actors and participants: the local layers

The key actors and participants in sustainable urban water management at the collective-choice and operational levels are shown in **Figure 47** which shows institutional arrangements primarily at the 'local' and city level. The Government Office region for West Midlands is the currently highest level of local government in England (Appendix 3), and so this section and **Figure 47** discusses both regional and local/city level institutions. It is important to understand that **Figure 47** includes existing institutional arrangements which may currently influence sustainable urban water management *or* which may potentially influence it in the future as institutional arrangements are developed.

Figure 47 Local players



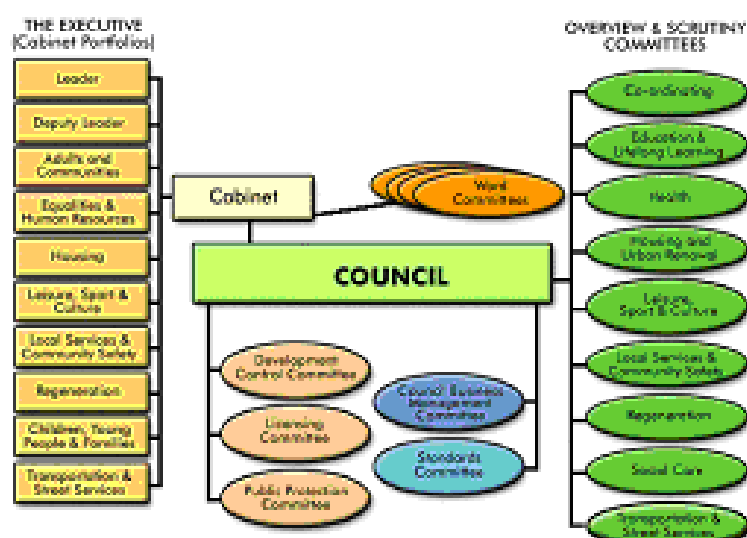
Birmingham City Council

Birmingham City Council (BCC) is a potentially a principal key player in sustainable urban water management but much of its policy and planning currently by-passes sustainable urban water management strategies and measures. Major developments taking place in Birmingham offer an opportunity to address sustainable urban water management and to introduce related technologies, and these developments include major city redevelopment projects and housing developments including affordable housing programmes. Because BCC's policy and planning processes might, in the future, include more specific sustainable urban water management initiatives, and because part of our purpose in this exercise in institutional mapping is to map those institutions in which interventions might be embedded in future, we map the institutions involved below. There are some areas and ways, identified below, in which interventions might be made.

BCC's Constitution is an example of secondary 'rules' based upon the Leader and Cabinet Model of local governance provided by the Local Government Act 2000. BCC's Constitution was formally adopted by the Council in December 2001 and is a substantial and detailed document covering almost every aspect of governance in Birmingham (BCC 2006). The Constitution sets out how the Council operates, how and by whom different types of decisions are made and the procedures which are followed so as to ensure that all decisions are taken in an effective, efficient, transparent and accountable manner. Some of these procedures are required by law, but others have been adopted as a matter of local choice. The Constitution is a dynamic document and requires approval on an annual basis. Members and Officers of the Council are legally obliged to comply with the Constitution.

The City Council has 50,000 employees (called 'Officers') and has 120 elected Councillors from June 2004, with one-third being elected every three out of four years. Councillors (i.e. 'Members') are democratically accountable to all of the constituents of their Ward, and all Councillors meet once per month to hold to account those who take decisions on behalf of the City Council (i.e. the 'Officers'). Chief Officers have delegated powers, granted to them by the Council, to transact business, as most of the day-to-day business of the Council is transacted through Departmental structures. Overview and Scrutiny Committees, amongst other things, hold the Executive to account.

Figure 48 The structure of Birmingham City Council



Note: the Executive includes the Directors of Departments which are listed under 'The Executive' in this diagram

During the past few years, the City Council – which has a current (January 2007) corporate assessment rating of 2 out of 4 (and ‘improving well’) in the Comprehensive Performance Assessment - has been implementing its thinking on devolution and localisation of local government to District/Constituency levels and at Ward levels. This is consistent with the Government’s aim to encourage Councils to ‘get closer to the people’. In May 2003 the Council decided to identify some local government services to be localised and delivered at the District level through District Committees (full details are given in the report of the City Council meeting held on 1 April 2003 on BCC’s website). District Committees were new for 2004/04. Ward Committees are meant to develop and strengthen the representational role of Members and decision-making at the Ward level. Not all Districts have chosen to have Ward Committees.

Certain functions of the City Council involve the Council acting in a quasi-judicial capacity. This happens, for example, in granting planning permission (see Development Control Committee in **Figure 48**).

The Constitution lays down the rights of citizens: some are legal rights and others depend upon the Council’s own processes. In summary, citizens have the right to vote at local elections; to raise concerns with their Councillors; to attend Council meetings; to participate and contribute to investigations of the Overview and Scrutiny Committees; to find out what decisions are to be discussed or decided by the Executive and Officers; to attend meetings of the Executive; to complain to the Council; to complain to the Ombudsman if they believe the Council has not followed procedures properly; and to inspect the City’s accounts.

Birmingham Strategic Partnership (BSP)

The BSP is a key institution in Birmingham in relation to neighbourhood renewal and stakeholder involvement in decision-making but is not yet noticeably involved in initiatives which relate directly to sustainable urban water management. The BSP has, however, developed a Climate Change Strategy and Action Plan for Birmingham.

The BSP was established in 2001 and brings together at a citywide and district level, key public agencies and representatives of the business, community and voluntary sectors to achieve more effective joined up action, particularly in relation to neighbourhood renewal and deprivation. The BSP provides a mechanism for any agency, individual or organisation or group to both influence the vision and strategy for Birmingham and contribute to its implementation. The BSP also seeks to increase opportunities to explore how services can be improved, particularly for groups and areas with the lowest outcomes, and provides a unified and challenging voice to rally change.

The BSP has a Board whose current 31 member organisations are identified in Appendix 4, of which the water and sewerage service companies and the Environment Agency are not currently members. The Board makes strategic decisions and facilitates the delivery of actions of its various partners. The BSP also has a programme board (established in September 2005 as a sub-group of the BSP Board) which has an oversight and coordination role regarding the delivery of the Annual Operational Plan covering the Local Neighbourhood Renewal Strategy, the Community Strategy (called Taking Birmingham Forward) and the Local Area Agreement (LAA) (**Insert 5**).

Insert 5

The Birmingham Local Area Agreement (LAA)

The LAA contributes to a new relationship between government departments and the current agreement runs from April 2006 to March 2009. It aims to improve the quality of life for Birmingham citizens with a particular focus upon improvements for people and places with the greatest need. The LAA is intended to improve local outcomes; ensure joined local delivery around people; provide clearer local accountability and leadership, together with improved efficiency and value for money; and less bureaucracy. LAAs represent a ‘deal’ between local partners and national government.

The BSP also has a family of partnerships, a number of multi-agency collaborations and a network of District Strategic Partnerships that help to deliver the overall strategy for the city. There is also a Birmingham Compact which is a framework for relations between the BSP and the voluntary and community sector in Birmingham.

The BSP is currently (January 2007) working on a governance handbook and has set out a number of principles of engagement for all partnership participants and conflict resolution (www.bhamsp.org.uk).

The long term vision for Birmingham adopted by the BSP in its Community Strategy is in **Insert 6**, and the two key objectives in the vision are supported by proposals for a number for themes.

Insert 6

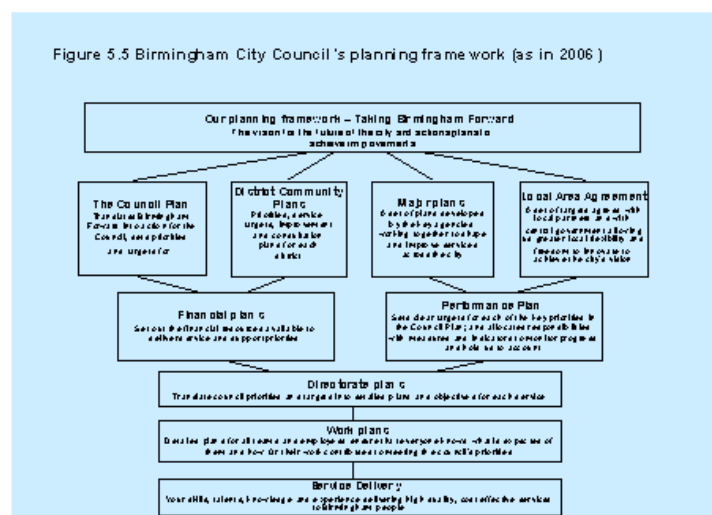
The BSP's vision for Birmingham, adopted in 2002

- A city of national and international significance that has a successful economy and sustainable place in the world economy.
- A city whose local neighbourhoods and vibrant urban villages are flourishing and whose people benefit from its prosperity.

The second Community Strategy, which was finally agreed by the full Council and the BSP Board in October 2005, is the top tier in BCC's framework for planning for the city (**Figure 49**) and is entitled 'Taking Birmingham Forward'. It covers the community strategy period of 2005-2010.

Local Strategic Partnerships (LSPs) were introduced by the Government in 2000 as part of the national strategy for neighbourhood renewal to tackle deep-seated, multi-faceted problems that require a range of responses from different bodies. LSP reflect a view in both central and local government that successful partnership working is essential to solve the multidimensional problems faced by society.

Figure 49 Planning framework



Birmingham City Council's planning framework

The BSP's Community Strategy (Taking Birmingham Forward) is the top tier of planning within BCC: the Council Plan, District Community Plans, Major Plans, the LAA, other plans

and then the Directorate (i.e. departmental) plans cascading downwards (**Figure 49**). Currently the Council Plan does not explicitly address sustainable urban water management measures, but focuses upon improving green facilities in Birmingham (e.g. parks, tree planting) (through 'Greening the City Action Plans', improving the cleanliness of streets; air quality improvement targets; the sustainable and efficient use of energy (including in Council properties), waste recycling, and generally raising environmental standards in the city. A component of the Council Plan is the implementation of an affordable housing development programme with 706 new affordable homes being targeted for completion by March 2006, but again there appears to be no direct linkage with, for example, introducing water saving devices into these homes. BCC's Neighbourhood Renewal Strategy (2003/04) reflects these priorities and but not address sustainable water management strategies or measures. BCC's policy for allotments provides a code for the use of allotments within which sustainable urban water management principles and techniques could be promoted. Currently this is not the case, although it is understood that BCC allotment officers promote water conservation on allotments.

An objective of the Council Plan is to make progress with the following major development projects in Birmingham:

- the Eastside development including the City Park, the Martineau Galleries and a technology-led development creating a learning and leisure quarter;
- a landmark project at Spaghetti Junction, and the Aston Express way;
- finalisation of the West End development framework;
- the New Street Station Gateway; and
- a Casino development for the region.

Although BCC currently has Directorate Plans for Community Safety, Education and the Economy it has not yet published an environmental plan or strategy of this nature.

There is now growing emphasis in Birmingham upon Neighbourhood Forums (linked to Community Based Organisations, projects and social enterprise initiatives) and neighbourhood level initiatives where some sustainable urban water management initiatives could be potentially be embedded, but are not at the moment. There is a wide range of such institutions (see Appendix 4) in Birmingham, and a whole host of initiatives some of which are environmental in nature. For example, the Small Heath Community Forum brings together interests with a stake in regeneration in the city, and it established a 'Learning Laboratory' to rethink the future of the community and issues which included accessing training for women, crime and security, and fly tipping and dealing with retailer's rubbish. (www.lgpartnerships.com/resources/smallheath.asp). Brumcan developed a community recycling business in 1991, being set up as a not-for-personal-profit organisation which subsequently became a company limited by guarantee and a registered charity. In 1998 this lead to the establishment of a trading company called Brumcan Recycling Ltd.

Through collaboration with the Birmingham Chamber of Commerce and Industry, Envirowise (a Government funded environmental advisory service which provides advise on sustainable urban water management technologies and products) regularly holds events for Birmingham and other business organisations in Birmingham – providing a potential route into Birmingham-based private and public sector businesses to adopt water saving technologies (**Figure 49**).

Figure 50 **Birmingham Eastside (from LDA 2006)**



The Eastside project

The planned development of Eastside is part of a larger regeneration of Birmingham City Centre that has been on-going for the last decade. Eastside includes Digbeth, the Aston Triangle and the city centre core retail area, neighbouring Aston University, Aston Science Park and Millennium Point (**Figure 50**). It is a mixed urban industrial area in which a mixture of uses is being encouraged based on learning, heritage and technology. There are plans for a city park, a learning quarter and for river and canal side developments including housing (3,500 new homes are envisaged) (LDA Design 2006).

Birmingham Eastside is being promoted by BCC and Advantage West Midlands, partly drawing upon European Regional Development Funding, and Groundwork Birmingham (the local arm of a national environmental charity) is working on behalf of Birmingham Eastside on a number of environmental dimensions including the feasibility of greywater recycling and rainwater harvesting being adopted (Faber Maunsell 2004). Other feasibility studies include one on greenroofs. Faber Maunsell's report concludes that the potential for rainwater and greywater reuse systems is inhibited by the highly developed nature of the Eastside site and the existence of a combined foul and surface water sewer. There is, however, some potential for introducing new sanitary ware systems and for making further recommendations to developers on water efficient equipment which is already included in the vision for the Eastside development. Faber Maunsell envisage rainwater harvesting to supplement greywater. Faber Maunsell's report is less optimistic about water reuse systems being introduced, but proposes the use of waste water for irrigation systems in public open space. The opportunities for using SUDS within the redevelopment are reported as fairly limited due to the nature of the area and lack of space. The report observes that no local manufacturers of water reuse systems were found; that local businesses supplying components such as tanks and pipework were reportedly extremely busy; and that there may be an opportunity for business locating in Eastside to exploit a local market for such products (Faber Maunsell 2004).

Severn Trent Water (STW)

STW is one of the ten privatised combined wastewater and water companies in England, and was formed from the former Severn-Trent Water Authority which had taken over the public sector water supplies of Birmingham Corporation (as BCC was then) (**Figure 51**). STW is

one of principal companies of Severn Trent PLC which is utility company which is traded on the London Stock Exchange. STW supplies fresh water and treats sewage for approximately 8 million people in the English Midlands and also certain parts of Wales. It takes its name from the two main rivers of the region, the Severn and the Trent. STW is regulated by OFWAT (see below).

Encouraging customers to conserve water and to use it wisely is a central theme of the company's promotional and educational literature and initiatives. The company advocates the installation of water meters in domestic premises and fits them free of charge. The company also works with businesses to encourage innovation. For example, STW advertises on its website (www2.severntrent.com/downloads/htmlreports/environmentalreports/2000) that it has successfully pursued a water efficiency strategy in collaboration with Birds Eye Walls (in ice cream manufacturing).

Like all water companies STW must produce a water resource management plan and a drought plan, although neither are currently publicly available on its website (January 2007).

Figure 51 The geo-hydrological boundaries of Severn Trent Water



The linkages between STW and the BCC policy and plan making and implementation system (**Figure 49**) appear to be mainly in relation to the water company's assets, such as sewers and water mains supply pipes, and STW would expect to be consulted about developments such as Eastside regarding these. There are also a number of technical regulatory matters to do, for example, with the use of greywater and rainwater systems which STW recommends are used as potable mains water back-up systems (Faber and Maunsell 2004, 30).

Figure 52 South Staffordshire Water



South Staffordshire Water PLC (SSWC)

SSWC is a private water company serving a population of 1.2 million with public water supplies only, mainly to the Black Country just to north-west of Birmingham (**Figure 52**), but including parts of the greater Birmingham conurbation such as West Bromwich and Halesowen. The company encourages water conservation and efficiency measures and provides both households and businesses with information on water efficiency measures, including water saving devices, on its website. SSWC also publishes its water resource management plan on its website (www.south-staff-water.co.uk/environment/water_resources.asp) and provision of free water meter installation is part of this plan, as is a policy to compulsorily meter all new household and non-household properties. Interestingly the company's Water Resources Plan for 2005-2030 (SSWC 2006) concludes that

'water efficiency benefits are uncertain and costly. A number of options for widescale implementation were considered but none proved to be economic'.

This statement indicates that SSWC has reservations about water efficiency measures which may, of course, conflict to some extent with its core business which is the supply and sale of fresh water. Even so the company says that it will continue to ensure efficient use of water in its functions and will continue with the current level of water efficiency activity (note that it does not suggest an increase in this activity). SSWC makes 'Hippo' cistern devices available to customers on request and the use of water butts is promoted to all customers.

Environment Agency Midlands Region (EAMR)

The EAMR has significant linkages with the two water companies above (see below) and important linkages with BCC. One set of linkages arises from the consultation requirements placed in the EA by Defra's guidance on river basin planning (see below). Another set of linkages is through the land use planning system (i.e. through planning application and development control). The EA recommends the use of water conservation and efficiency

measures within buildings and development sites and makes these recommendations when consulted by the Planning Authority (e.g. BCC) once planning applications have been submitted. This will be the case, for example, with planning applications relating to the Eastside developments. The EA also comments on the use of SUDS at development sites.

In the case of the Eastside development proposals the EA is collaborating with BCC and Advantage West Midlands (the regional development agency) in supporting 'Sustainable Eastside', and so the Faber Maunsell (2004) report on greywater recycling and rainwater harvesting was supported by them.

Government Office for the West Midlands (GOWM)

GOWM operates at the regional level of local governance and is responsible for working with local partners on a wide range of policies and plans being taken forward by central government departments, including the Government's Sustainable Communities Plan. GOWM works closely with regional partners including Advantage West Midlands and the Regional Assembly.

West Midlands Regional Assembly

The West Midlands Regional Assembly is the Regional Planning Body for the West Midlands (see below). With partners, notably the Environment Agency, the Assembly has created a water resource strategy for the West Midlands which is published by the Environment Agency (2006).

This strategy is significant in terms of sustainable urban water management, and water efficiency measures in particular (**Insert 7**). The strategy sets out an agenda for change. It emphasises the need for a 'twin-track' approach to meeting future water demands which involves a) developing further water resources and b) efficient use of water. It goes on to suggest that the attitude of water companies to reducing water demand through water efficiency is currently insufficiently positive, and it identifies various players as having a key role in change. It also indicates that there is currently an institutional gap in the water efficiency area and that a new 'water efficiency body' is required to make the kind of progress recommended.

The strategy is expected to inform Regional Planning Guidance, the Regional Economic Strategy, and Development Plans as well as individual planning applications.

Insert 7

The water resource strategy for the West Midlands and sustainable water management

The strategy recommends the following:

- Demand management including leakage control and rainwater harvesting with projected water savings of 140Ml.d by 2025.
- Farmers should strive to use water more efficiently.
- The Water and Wastewater companies should promote waste minimisation schemes with their customers. The results should be monitored by the Government, including by OFWAT.
- The Environment Agency should explore with others the idea of an independent water efficiency body, similar to the Energy Trust.
- Planners should seek to ensure that development is sustainable in terms of water demand and waste disposal

Advantage West Midlands (AVM)

AVM is the regional development agency for the region and supports feasibility studies into water efficiency measures in Birmingham (Faber Maunsell 2004). Under AVM's initial parentage a West Midlands Regional Observatory was established in 2002 to improve the quality of information available to regional decision-makers.

AVM is emerging as a key player and leader in the area of sustainable development in the West Midlands and Birmingham. It has provided core funding for the formation of a regional partnership body called 'Sustainability West Midlands' which is recognised by Defra a leading example of a regional sustainable development roundtable. AVM is working with key progressive sustainable development companies, including Severn Trent Water (also Arup, Carillion and Bulmers) to ensure that their views are fed into the West Midlands Economic Strategy. AVM is also supporting and championing the development of sustainable development products and business in the West Midlands and has been successful with a 'Windsupply' project. AVM is increasingly taking a leadership role in hosting a range of co-located organisations such as Envirowise, The Carbon Trust and the Waste Resources Action programme.

Envirowise (see below) has developed resource efficiency clubs and half of the funding for this initiative has been found by AVM.

11 WATER DEMAND MANAGEMENT

11.1 Background

The high economic, environmental and social costs associated with major new reservoir developments led in the latter half of the twentieth century to a number of major controversies (Parker and Penning-Rowse 1980) which in turn introduced the need to seriously consider water demand management techniques such as water metering and leakage control. The droughts of 1976, 1984 and providing a vital set of tools for addressing the gap which arises between water resource more recently (e.g. 2006/07) have continued to force water demand management to the fore in water policy-making.

11.2 Institutional landscape

Figure 46 shows the principal organisational institutions involved in water demand management, from Government departments through to individual water consumers. In practice many other institutions are involved; many of them of a secondary nature.

Table 3 lists the principal current legislation addressing water demand management. A characteristic of this legislation is that most of it is general water industry legislation in which clauses are included on such matters as water metering, with the exception of the more focused Water Supply (Water Fittings) Regulations 1999.

A key feature of the institutional arrangements is the apparently partly conflicting roles of the water supply companies in both providing and charging for public water supplies and seeking to restrain demand through water efficiency measures of various kinds, and through leakage control and reduction from the public water supply system. The tension which exists between seeking to raise revenue through the supply and sale of water to customers and also seeking to restrain water consumer's use of water is perhaps most visible where private water companies are only water supply undertakings (other water companies provide both water supply and sewerage services, as well as other business services). This tension is managed through the Water Services Regulatory Authority, an independent regulator publicly known as

'OFWAT', and it is important that the regulatory regime provides incentives for water supply companies to increase the introduction of water efficiency measures. Currently

Table 3 Principal legislation affecting water demand management

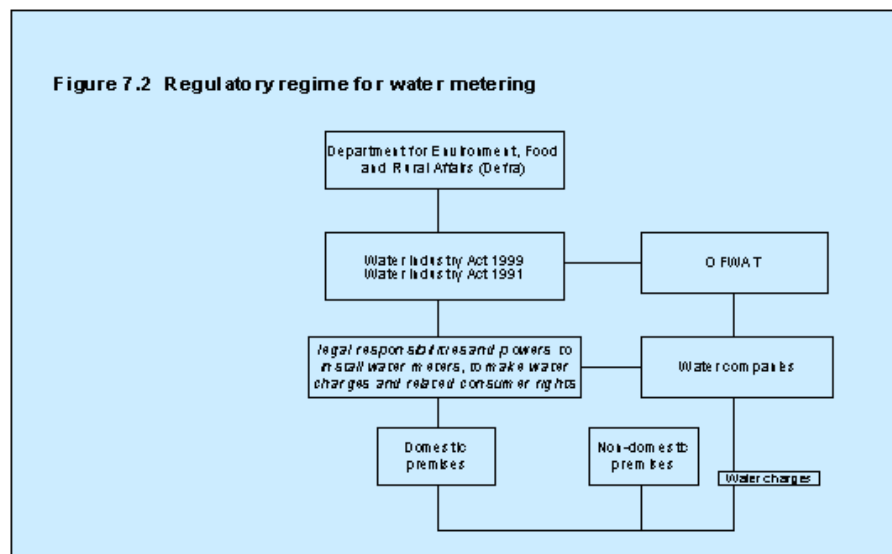
| Law or Statutory Instrument | Content description | Remarks |
|--|--|---|
| Water Act 2003 | Abstraction licensing law Regulatory arrangements Extending competition on water supply | At the water supply end of the demand management system; little or very indirect management control potential at this point over water consumer behaviour |
| Water Industry Act 1991 | Water charges and water metering Duties of water undertakers Protection of customers Quality and efficiency of supplies | |
| Water Industry Act 1999 | Water charges and metering | |
| Water Supply (Water Fittings) Regulations 1999 (SI No. 1148) | Water efficiency fittings and equipment requirements and enforcement | Legislation on water efficiency measures |

not all private water companies are convinced of the efficiencies involved in expanding the use of water efficiency measures, including South Staffordshire Water Company.

A further key feature of the institutional landscape is that in England, the structure of the management regime for domestic water consumption and demand is currently dominated by consumer 'rights', regulated limits on water charges, and the degree to which water supply undertakings (also called water companies) are able to introduce water meters. Domestic consumers have legal 'right' to be connected to the public water supply system and to use public water supplies. Customers pay water charges to the companies which supply water, and OFWAT limits how much companies may charge. Previously water companies have been able to determine whether a consumer will have a water meter or not, but under the Water Industry Act 1999 domestic consumers have say in whether or not they are charged by water meter (**Figure 53**). Domestic consumers (including tenants) who already pay an unmetered charge (and are not using mains water for garden watering other than by a hand-held watering can; not filling a pond or swimming pool; not using a power shower; and not in an area declared as 'water scarce') have a legal right to remain on an unmetered water charge. From 1 April 2000 domestic water users (including tenants) also have a right to pay a metered water charge if they wish, and they can ask a water company to install a water meter free of charge (www.defra.gov.uk/environment/water/industry_metering/rights.htm)

To encourage management of water demand in the commercial and industrial sector, the Department for Food and Rural Affairs (Defra) and the Department of Trade and Industry have jointly funded Envirowise. Envirowise provides free practical environmental information and advice to any UK business, including on water demand management techniques. It is government-funded and is managed on behalf of the Government by Momena.

Figure 53 Water metering



The Regional Assemblies (e.g. the West Midlands Regional Assembly in the case of Birmingham) produce Regional Spatial Strategies which consider development options to meet the Government's housing targets. For example, in the case of Birmingham the Regional Spatial Strategy considers several options which involve an additional 70,800 to 104,900 dwellings between 2001-2006, in addition to the 391,000 already in existence. However, Severn Trent Water (the main water supply company for Birmingham) has indicated that it has water resource availability limits, and the West Midlands Regional Assembly's published water resource strategy (Environment Agency 2006) echoes this important reservation. In turn this places further pressure to expand water demand management.

Under the Water Industry Regulations Act 1999, water companies can apply for water scarcity status. Currently England is experiencing a drought and Folkestone and Dover Water Company has been given water scarcity status. Under this designation, a water company can force water customers to have meters installed. At the same time the Government, adopting proposals of the Water Saving Group, is consulting on extending water metering by making it easier for water companies to apply for scarcity status.

Figure 54 Water Supply (Water Fittings) Regulations

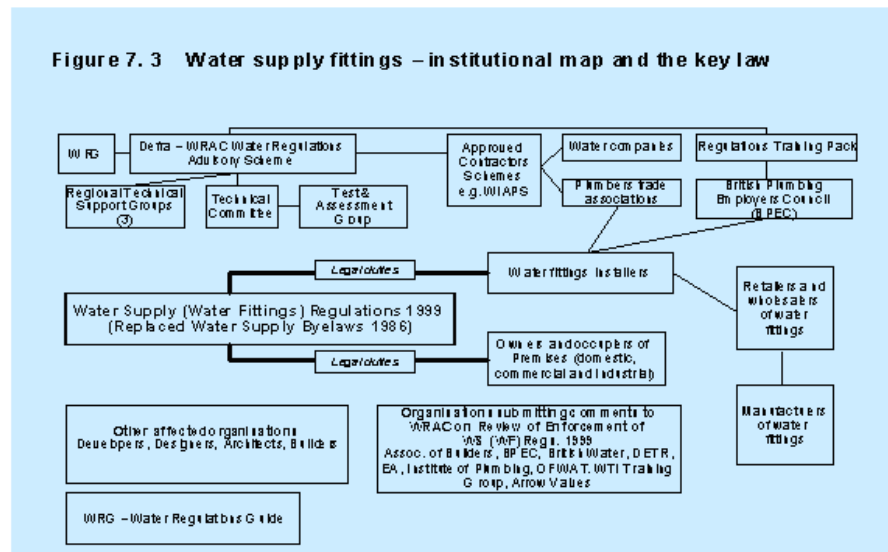


Figure 55 **Installation of water fitments**

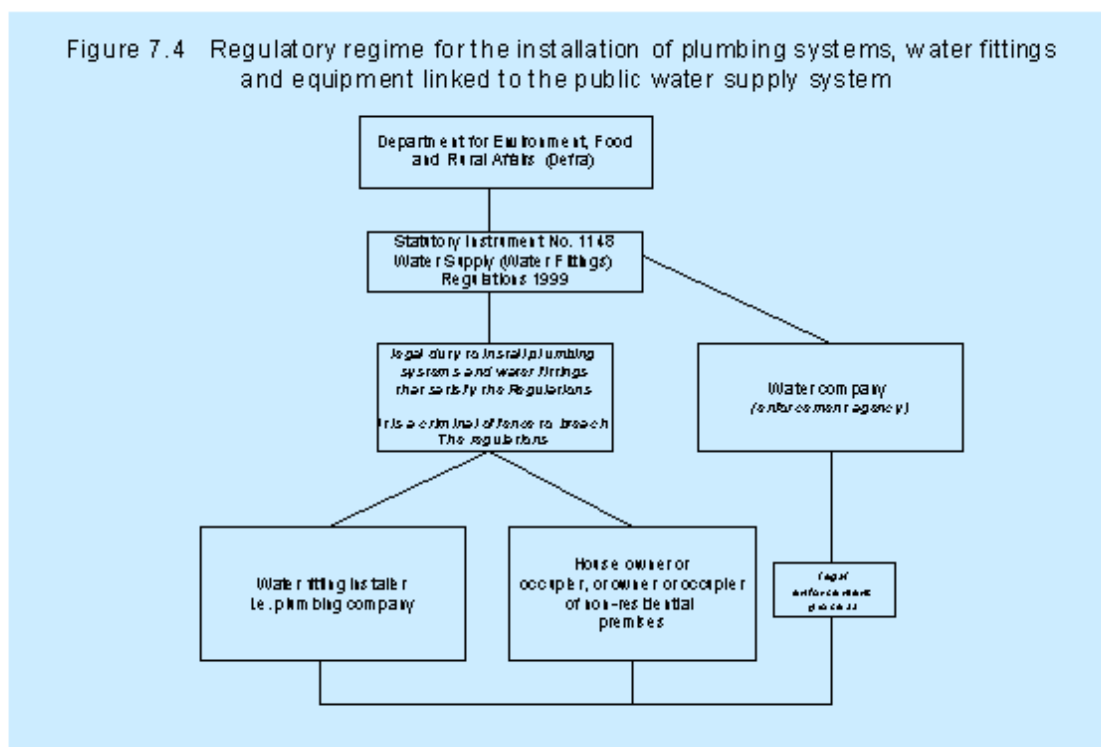


Figure 54 shows in greater detail the principal organisational institutions and key ways in which they are involved in supporting and implementing the Water Supply (Water Fittings) Regulations 1999. WIAPS (Water Industry Approved Plumber Scheme) is just one of 8 different plumber approval schemes currently in operation in the UK. These Regulations are

a Statutory Instrument (No. 1148) which place legal duties on both owners and occupiers of premises and water fitting installers to comply with them. The Regulations concern the legal requirements (quality and standards) for the fitting of water fittings (including water saving products and technologies), and the situations in which they must be used, together with enforcement arrangements (**Figure 55**). Fines may be charged for contravention of the Regulations. All of the institutions referred to in **Figures 53 to 55** have geographical boundaries extending at least to the boundaries of England.

11.3 Rainwater harvesting

There are no regulations specifically concerned with the use of rainwater for toilet flushing, in washing machines or in gardens. The Water Supply Regulations 1999, enforced by the water supply utilities, require that rainwater and greywater cannot connect directly to the potable water supply but must be separated by an air gap. Part H of the Building Regulations 2002, enforced by the local authority, requires that all pipework used for use by non-potable water must be identified by the designated markings; the same requirement is found in the Water Supply Regulations.

11.3.1 Funding and financial incentives

Figure 56 shows the principal funding and financial incentives currently in place in England for installing water saving technologies and products. All water users are expected to fund the installation of sustainable water technologies and products, with the exception of domestic consumers who wish a water meter to be installed.

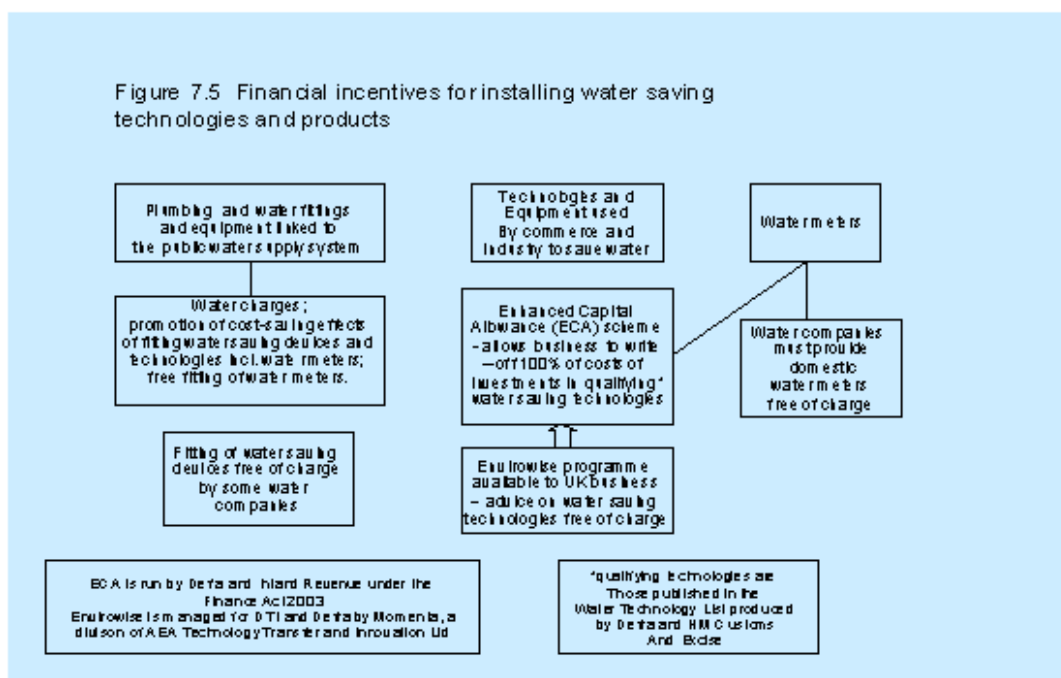
Businesses may take advantage of ECA tax relief scheme (i.e. tax relief on corporation tax or income tax) (www.ex.gov.uk) in respect of the installation of new water technologies and products which are listed in the Water Technology List (WTL). Thus, if a company is paying at a rate of 30% on profits then the installation of WTL product is subsidised to the rate of 30% by central government.

The WTL was first produced in Autumn 2003 and is updated every month. It contains a list of qualifying technologies and products which meet strict water saving/efficiency criteria including:

- meters and monitoring equipment,
- flow controllers
- leakage detection equipment
- rainwater harvesting
- efficient toilets; and
- efficient taps

There appear to be no rebates and financial incentives offered by the water companies in England like those currently available in Australia or the USA. For example, in Seattle, USA. In Seattle the 'Saving Water Partnership' (www.savingwater.org/rebates.htm) publishes a list of rebates and financial incentives available to commercial water users for installing water saving technologies and products. For example, there are rebates for replacing water-cooled ice machines by air-cooled models, and for installing efficient qualifying coin-operated commercial laundry machines. There are also cash incentives to customers replacing inefficient food steamers with efficient ones. The obvious response is that those water supply companies in the USA and Australia are starting from a much higher per capita demand for water as compared to England.

Figure 56 Demand management - incentives



Again, unlike the USA in particular, so far there have only been trials of retrofitting domestic properties with water efficient fittings such as low flow shower heads or low flush toilet cisterns (Public Accounts Committee 2007).

11.4 Barriers and incentives

It is clear that the institutional, legal and funding arrangements for encouraging and ensuring a high level of adoption of sustainable water use technologies designed to satisfactorily manage water demand are currently only part way along their developmental path. Organisations such as the Water Saving Group are seeking to forge a way forward in further developing these arrangements.

Although they are relatively new, the arrangements to encourage the adoption of water fittings which are water-saving technologies and products are reasonably well developed through the Water Supply (Water Fittings) Regulations 1999 (Figure 54). Although these regulations apply to domestic and non-domestic premises, they only apply to non-domestic (i.e. commercial and industrial) premises in so far as fittings connected to the public water supply system are concerned. Currently, there appears to be no similar legislative arrangement for fittings and equipment used in commerce and industry, which may be a shortcoming to be examined further. There are, however, manufacturers of water using equipment and fittings for commercial and industrial users – and many water saving/efficiency appliances and products for the processes in these sectors. The adoption of these water saving technologies in commerce and industry relies more upon a) the motivations of businesses to reduce their costs; b) the effective marketing of water and cost saving technologies by manufacturers; and c) the tax relief incentives provided in the ECA scheme (Figure 56). Legislation for the non-domestic sectors might, however, force the pace of adoption further than at present, but the commercial and industrial sector is much more diverse than the household/public water supply sector and probably much more difficult in which to produce satisfactory legislation if this is the best way forward.

Table 4 **Installation of water fittings which require the consent of the water undertaker (The Water Supply (Water Fittings) Regulations 1999**

| |
|---|
| A bath having a capacity of more than 230 litres |
| A bidet with an ascending spray or flexible hose |
| A pump or booster drawing more than 12 litres per minute |
| A unit which incorporates reverse osmosis |
| A water treatment unit which produces a waste discharge or which requires the use of water for regeneration or cleaning |
| A garden water system unless designed to be operated by hand |
| Any water system laid outside of a building and either less than 750mm or more than 1350mm below ground level |
| The construction of a pond or swimming pool with a capacity greater than 10,000 litres which is designed to be replenished by automatic means and is to be filled with water supplied by a water undertaker |

Enforcement of water fittings regulations is a major issue. The Water Regulations Advisory Committee undertook a review of the enforcement of the Water Supply (Water Fittings) Regulations 1999 during 1 April 2000 to 31 March 2001 (WRAC 2002). The report concluded that while the enforcement regime would become satisfactory on a national level in time, there were areas requiring attention. WRAC made ten recommendations. It was concluded that joint action on these recommendations was required by the water industry, Government, and interested organisations including both professional institutions and manufacturers was required. Among the recommendations WRAC was concerned that non-compliant water fitting products could be lawfully sold but unlawfully installed, and recommended point of retail or wholesale sale control of water fittings in future (**Figure 54**) (to be investigated further by Defra). Instead of having 8 different Approved Contractors with variable entrance requirements, the report recommended a single national model and an agreed minimum entrance standard. Currently many customers wishing to renew old or fit new water fittings are unaware of the difference between approved and unapproved contractors, although lists of Approved Contractors are now available on the web.

There was also a need for increased consistency in enforcing the Regulations, and a best practice guidance enforcement manual was recommended to assist improvement. More robust IT data bases were required to support enforcement and implementation of the Regulations. Because of the evolutionary nature of the new water fittings arena, it was recommended that the Regulations and guidance documents be kept under regular review so as not to act as a barrier to innovation or trade.

In summary, the barriers are:

- There is no incentive for the water companies to promote demand management.
- INSET agreements require the consent of the water and wastewater company or companies serving the area.
- Private supplies are treated as an anomalous residual rather than a potential option.
- The absence of a regulatory framework increases the risks to those who adopt such innovations and has an uncertain impact upon the finance and insurance markets.

Conversely, the incentives are:

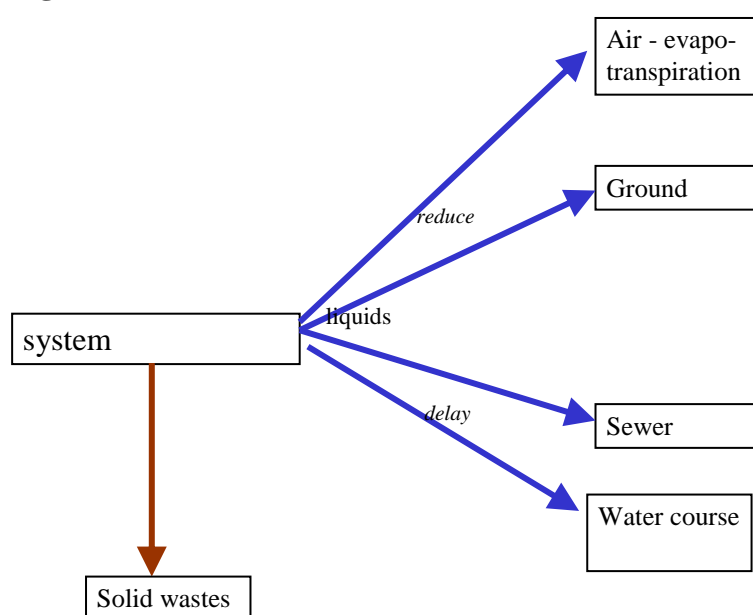
- For industry and commerce, the ECA and Envirowise schemes provide significant incentives.
- For the domestic market, for new development, there is a strong incentive in the form of the Code for Sustainable Homes. But for existing homes, reliance is exclusively placed upon water metering which both has an inadequate effect and is cost-ineffective compared to the alternatives.

12 SUSTAINABLE DRAINAGE SYSTEMS (SUDS)

12.1 Background

Sustainable Drainage Systems (SUDS) consist of a suite of water management technologies and approaches, commonly referred to as Best Management Practices (BMPs), designed to drain surface water in a more sustainable fashion than is commonly achievable using 'traditional' end-of-pipe practices. SUDS may be employed both to improve the quality of the effluent water and/or to make the discharges of water from the site more manageable either by reducing the total quantity of discharges or to delay a proportion of the runoff. **Figure 57** summarises the general approach. In addition to a water stream discharging to air, land, watercourse or sewer, there is typically a stream of solid waste which has been removed from the water stream. Depending upon conditions, and the effectiveness of the SUDS in removing contaminants, that solid waste may itself constitute Hazardous Waste under the Hazardous Waste (England and Wales) Regulations 2005 and its removal from site and disposal will in general be subject to the The Waste Management (England and Wales) Regulations 2006. Hence, as an action space, there are rules governing both the physical aspects of the particular SUDS adopted but also each of the two waste streams: liquid and solid – the exception is disposal of water to air through evapo-transpiration.

Figure 57 SUDS



12.2 Overview of institutional landscape and social norms

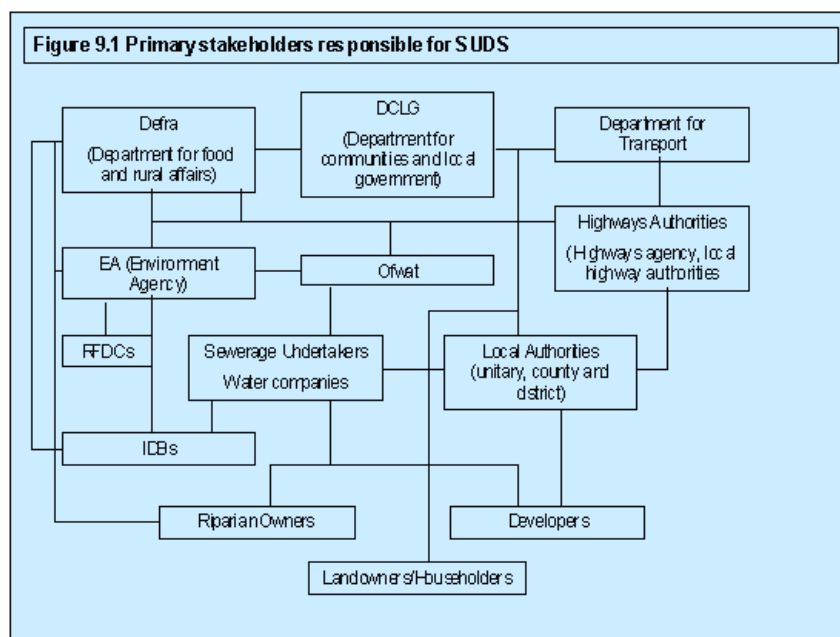
SUDS are widely recognised as a valuable tool for achieving a better mix of socially, economically and environmentally sustainable options in the quest for more sustainable urban water management. In this sense, they are in keeping with the more generic support across society for sustainable solutions and the more specific cross government policy on sustainable development as set out in the Government's latest Sustainable Development Strategy (HM Government, 2005a) and Sustainable Communities Plan (ODPM, 2003). Likewise, they offer a valuable tool for addressing the issues raised in international legislature such as the Water Framework Directive (EU, 2000).

A key characteristic of the institutional arrangements that characterise the regulatory and legislative environment for SUDS in England is that they are reliant on legislation designed and developed for other purposes – most notably legislation relating to traditional 'hard'

engineering and piped systems and that relating to planning (**Table 5**). Unfortunately, this legislation does not make provision for the wider range of components associated with SUDS, leading to a lack of legislative clarity regarding both the ownership and responsibility for SUDS maintenance and a reduction in their uptake (Defra, 2005).

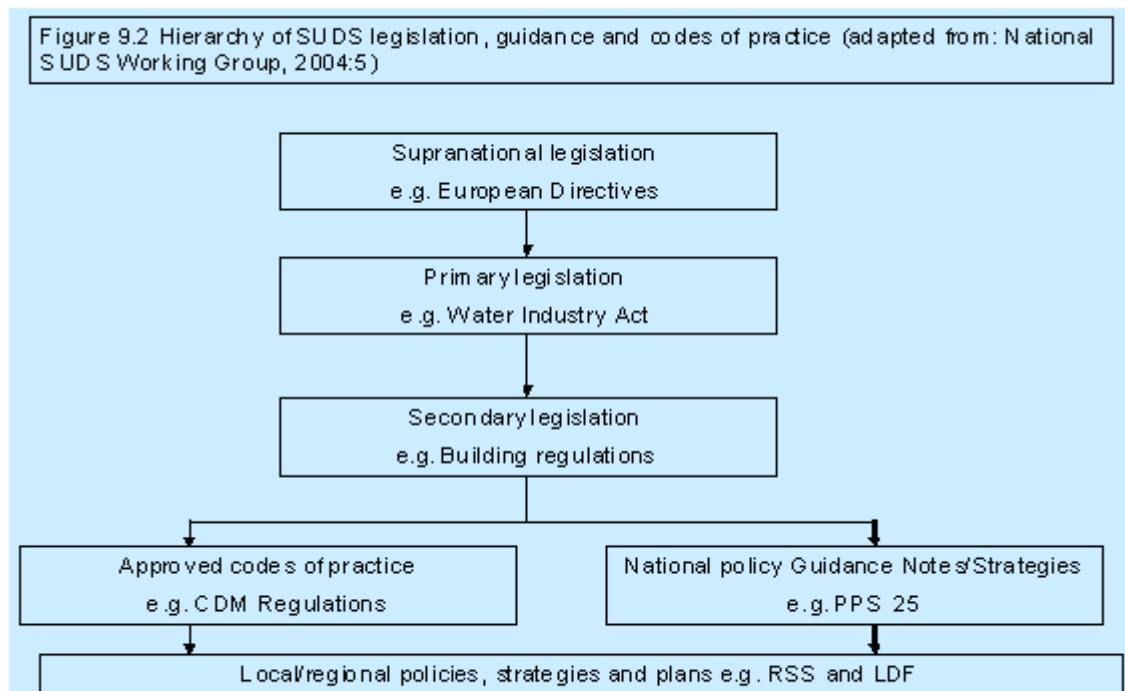
This is further compounded by the fact that the sewerage system is not owned by any one stakeholder - nor is it in common ownership. Instead, a wide range of stakeholders have ownership and maintenance responsibilities for both public and private drainage systems, leading to further institutional complexity, confusion and the non-adoption of a number of SUDS (Defra, 2005). This complexity is somewhat simplified in **Figure 58** which illustrates the inter-linkages between the various stakeholders involved. Their functions, powers and duties are then expanded on in **Table 6**.

Figure 58 Primary stakeholders for SUDS



These stakeholders include a wide variety of public and private organisations, land owners, developers and the public each of which have different statutory and permissive powers deriving from a wide array of legislation and case law history (**Table 5**). In addition, the regulatory environment differentially interprets primary and secondary legislation in its guidance notes and codes of practice at the national level and in its policies, plans and actions at the national, regional and local levels (**Figure 59**). The end result is an institutional landscape which is, arguably, in its present form ill-equipped to deliver a sustainable system of integrated urban drainage management.

Figure 59 Hierarchy of regulation



This conclusion is recognised by the Government which, in collaboration with the Environment Agency, has sought to simplify, clarify and improve the situation - driven initially by the consultations and developments of the National SUDS Working Group in 2003 (National SUDS Working Group, 2003) - which culminated in its Interim Code of Practice for Sustainable Drainage Systems in 2004 (National SUDS Working Group, 2004) - and more latterly by the Government's support for SUDS in its new strategy for managing flood risk and coastal erosion; *Making Space for Water* (Defra, 2004). As part of this new strategy, Defra has announced the implementation of 15 pilot projects which will test new approaches to reduce the impact of urban flooding, pilot new tools and techniques for mapping and managing surface water flow and provide more clarity about the responsibilities of those managing urban flooding (Defra, 2007). It is, however, recognised that many of the problems associated with the implementation, operation and maintenance of SUDS in urban areas of England will require changes to legislation, guidance and decision tools if the current barriers to SUDS implementation are to be tackled and a more SUDS 'friendly' institutional framework is to be developed.

Table 5: Summary of principle legislation, guidance and codes of practice relevant to SUDS

| Nature of legislation | Legislation |
|---|--|
| Supranational Legislation | <ul style="list-style-type: none"> • Water Framework Directive, 2000 • Urban Waste Water Treatment Directive, 1991 • Habitats and Birds Directive, 1992 • Aarhus Directive, 2003 • Integrated Pollution Prevention and Control Directive, 1996 • Dangerous Substances Directive, 1976 • Environmental Impact Assessment Directive, 1985 • Strategic Environmental Assessment Directive, 2001 |
| Primary legislation | <ul style="list-style-type: none"> • Water Industry Act, 1991, 1999 (Section 104) • Town and Country Planning Act, 2005 (Section 106) • The Highways Act, 1990 (Section 38) • Planning and Compulsory Purchase Act, 2004 • Environment Act, 1995 • Public Health Act, 1961 • Land Drainage Act, 1991, 1994 • Water Environment Regulations, 2004 • Sewerage Act, 1989 • Environment Protection Act, 1990 • Water Act, 1989 • Water Resources Act, 1991 • Civil Contingencies Act, 2004 |
| Secondary legislation | <ul style="list-style-type: none"> • Building Regulations (Part H), 2006 • Groundwater Regulations, 1998 |
| Approved Codes of practice | <ul style="list-style-type: none"> • Construction (Design and Management) Regulations, 1994 • Interim code of practice for Sustainable Drainage Systems, 2004 |
| Policy Guidance Notes and Policy Statements | <ul style="list-style-type: none"> • PPS1 Sustainable Development • PPS3 Housing • PPG23 Planning and Pollution Control • PPS25 Development and Flood Risk |
| Technical guidance | <ul style="list-style-type: none"> • Sewers for Adoption Version 6, 2006 • Sustainable urban drainage systems – design manual for England and Wales, CIRIA (C522), (Martin et al, 2000) • Sustainable urban drainage systems – best practice manual, CIRIA (C523) (Martin et al, 2001) • Source control using constructed pervious surfaces, CIRIA (C582), (Pratt et al, 2002) • Sustainable drainage systems – hydraulic, structural and water quality advice, CIRIA (C609), (Wilson et al, 2004) • Model agreements for sustainable water management systems. Model agreements for SUDS. CIRIA (C625), (Shaffer et al, 2004) • Preliminary rainfall/runoff management for developments (EA/Defra, W5-074/A) |

Linked 'action spaces'

Because SUDS do not have an legislated 'action space' as could be described for traditional end-of-pipe technologies, the institutional arrangements that form the structure of powers, duties and actions with respect to SUDS are 'taken' from a range of linked 'action spaces'. This is recognised in the institutional mapping of SUDS in England which draws on the 'action spaces' associated with:

- The Government's sustainable communities programme which provides an opportunity to retrofit urban areas using SUDS;
- The water resource and planning 'action space' which provides the legislation for determining the rights and responsibilities of various stakeholders in the application, maintenance and adoption of SUDS as 'sewers'.
- The land use planning 'action space' which provides a pivotal role in ensuring that SUDS are incorporated into new developments and provides the strategic context for the incorporation of SUDS into regional and local spatial strategies (RSS and LDPs).
- In the development control 'action space' which, as evident in PPS25, not only embraces SUDS as important flood risk management technologies for Local Authorities to promote in relation to building regulations and new developments but also requires Local Authorities to prioritise their use in determining planning applications (DCLG, 2006).

Legislation and regulatory environment

The range of stakeholders and 'action spaces' associated with SUDS highlights a number of legal issues and regulation irregularities which can cause confusion for those trying to implement SUDS. And, as there is no legislation available to enforce the delivery of SUDS, this inevitably leads to their reduced inclusion in the management of water in urban areas. Of the range of legislation involved (**Table 5**), this section highlights those issues which are most noteworthy.

Firstly, the Water Framework Directive now forms part of UK legislation and goes beyond previous legislation; most notably with respect to water quality regulations in the controls to be applied in the discharge of water into the environment and by inhibiting the discharge of pollutants into groundwater from drainage systems. These requirements go beyond the pollution and groundwater contamination regulations already enshrined in UK regulation through the Water Resources Act, 1991 and the Groundwater Regulations, 1998 (National SUDS Working Group, 2003).

As with 'traditional' drainage systems, the discharge of pollutants through filtered and/or unfiltered SUDS must adhere to the laws enshrined in this legislation. Where a SUDS discharge is potentially hazardous, authorisation for discharge is required from the Environment Agency whose responsibility it is to ensure compliance with groundwater protection legislation. Direct discharges into groundwater are prohibited unless covered by prior discharge consent from the Environment Agency (National SUDS Working Group, 2003). Discharge consents from SUDS into surface waters are provided under Sections 85 and 89 of the Water Resources Act, 1991 which requires no consent where discharge is uncontaminated but consent will be required where the risk of contamination is high. Under this condition, the EA will require the developer of the SUDS to undertake a risk assessment before providing any discharge consents.

Of those stakeholders involved in SUDS a number have rights and powers to construct, operate and manage drainage infrastructure. Section 104 of the Water Industry Act, 1991 (as amended 1999) covers three important issues in this regard. Firstly, it sets out the duties and powers of wastewater companies to drain surface waters into public sewers. Secondly, it sets out the rights of owners or occupiers of premises to connect their drainage to the public sewer system. And, thirdly, it provides the legal definition of a 'sewer'. The application of this legislation to SUDS is particularly important for their uptake, adoption and operation.

Under Section 104 of the Water Industry Act, a sewer is defined as 'a pipe or channel taking domestic foul and/or surface water from buildings and associated paths and hard standings from two or more cartilages and having a proper outfall; a proper outfall being defined as "an outfall to a watercourse, public sewer and in some circumstances an adopted highway drain' (Defra, 2005:22). This effectively means that under current legislation the requirement of Sewerage Undertakers to adopt sewers (as illustrated in the latest Sewers for Adoption guidance, 2006) retains a pre-requisite for the existence of a 'proper outfall' which many SUDS technologies do not contain (Defra, 2005) – thus many SUDS technologies do not adhere to the legal requirements of a sewer. This is particularly important for their implementation because the limited capacity of the public sewerage system, plus the lack of any legal definition about what 'type' of water (i.e. clean and foul) is carried by a sewer, means that Water Companies are reluctant to adopt SUDS as sewers due to concerns over the effective management of their assets and the requirements that such rights may have for upsizing the public sewerage infrastructure (Balmforth et al et al, 2006). This caution in the adoption of SUDS is further compounded by the lack of clarity over the cost of SUDS maintenance and the mechanism for their future funding.

Further legislation with respect to the rights and responsibilities of stakeholder towards SUDS drainage can be found in the Highways Act, 1980. In this respect, the incorporation of SUDS into road drainage systems requires an agreement under Section 38 of the Highways Act for new developments and Section 278 for existing developments (CIRIA, 2003). This Act provides Highways Authorities with the powers to construct, adopt and maintain highway drainage infrastructure which includes powers to drain through land owned by other stakeholders where the highway authority is not the riparian owner – which may include the right to drain into public sewers (National SUDS Working Party, 2003). Under Section 100 of the Highways Act, 1980 and Section 89 of the Water Resources Act, 1991 highway authorities do not require drainage consents to drain water either into surface or groundwater. However, where this discharge causes pollution, the Environment Agency has powers under the Groundwater Regulations, 1998 to intervene.

In addition to 'drainage legislation', the uptake, adoption and maintenance of SUDS is highly influenced by UK planning legislation including the incorporation of SUDS into new developments and the retrofitting of SUDS into existing developments. Indeed, it is arguably through the planning legislation that the Government seeks to enhance the uptake of SUDS more generally - as evident in the recent release of PPS25, which clearly state that 'Regional planning bodies and local authorities should promote the use of SUDS for the management of run-off' (DCLG, 2006:34). Similarly, the new Code for Sustainable Homes, calls for the development not to increase the runoff from a site above that which already occurs.

Local Authorities play a critical role in the uptake of SUDS with Section 106 of the Town and Country Planning Act, 1990 (as amended 2005) providing LA's with the power to specify the works to be carried out on developments in connection with SUDS both above and below ground and to determine any restrictions in their use (CIRIA, 2003). This is further enhanced by the latest policy change, as a result of an amendment to Article 10 of the Town and Country Planning Order 1995, and enshrined in PPS25, which requires LAs in the evaluation of development applications to consult the Environment Agency which is now a statutory consultee in the planning process. Ultimately, this legislation is envisaged to offer opportunities for 'operating authorities' to enter into Section 106 Agreements to ensure that SUDS work – whether this operating authority is the Local Authority, the Environment Agency (if SUDS form part of flood defence works) or a Water Company where SUDS have been successfully adopted (CIRIA, 2003:15).

The uptake of SUDS has also been enhanced by the introduction of the Planning and Compulsory Purchase Act, 2004 which requires Local Authorities to adopt a spatial planning approach to both regional and local developments, entailing the creation of a statutory development plan which will provide the framework for the more detailed planning decisions. This requires LAs to develop both Regional Spatial Strategies (RSS) and more detailed Local Development Plans (LDPs) which should provide a 'better' framework for integrating SUDS technologies across space and time for new and existing developments, in accordance with

sustainable development requirements for flood risk management and stormwater management.

Other legislation of particular note to the implementation, adoption and maintenance of SUDS can be found in the most recent Building Regulations (Part H), 2006 which addresses issues of surface water drainage, most notably in relation to soakaways and infiltration systems (CIRIA, 2003). In addition, PPS3 - which sets out ideal housing densities for new developments – can by its very nature be in conflict with the promotion of SUDS under PPS25 due to the reduced space left available for SUDS technologies when the guidance under PPS3 is adopted. In the end, this tension between flood risk management (PPS25) and housing density (PPS3) leads to a lack of a common approach to urban drainage in the planning cycle (Balmforth et al et al, 2006).

12.3 Stakeholders, responsibilities and powers

The primary stakeholders, their responsibilities, powers and duties are provided in **Table 6** limiting the need for any detailed discursive account. Key stakeholders in this regard include the Local Authorities, Sewerage Undertakers (Water Companies), Internal Drainage Boards, Developers and the Environment Agency. This provides for a mix of statutory and permissive powers which are differentiated across the various stakeholders - the linkages between which are provided in **Figure 58**.

Because each stakeholder has differential powers and rights, drawn from differential legislation, there is a significant requirement in the implementation, management and operation of SUDS for cross-stakeholder collaboration. And, without such collaboration the application of SUDS in urban areas of England would not be possible. Indeed, it is a recognition of this requirement for cross-collaboration that has been at the forefront of the development of an Interim Code of Practice for Sustainable Drainage Systems (National SUDS Working Group, 2004) and for the latest Defra integrated urban drainage pilot projects (Defra, 2007).

Two irregularities in particular serve to illustrate this point. Firstly, although Local Authorities, with their associated drainage and planning duties/powers, are arguably the most influential stakeholder for promoting the uptake and adoption of SUDS, this cannot be achieved without cross-collaboration. As it currently stands, LAs have only permissive powers in relation to drainage which means that whilst they have statutory powers in relation to planning, they are reliant on those stakeholders with statutory drainage powers – most notably the Sewerage Undertakers – to ensure that the SUDS which are negotiated under section 106 of the Town and Country Planning Act, 2005 are adopted. Where wastewater Companies regard the design or construction of SUDS to be substandard they have the power to refuse to adopt them (Defra, 2005).

Secondly, the owners of SUDS do not have any legal rights to discharge water into a watercourse unless they are the riparian owner, navigation authority or a highways authority. Rather, the responsibility for the drainage of water from SUDS, and their ongoing maintenance, depends on prior agreements being set between those implementing SUDS and those taking responsibility for their 'adoption' – most notably the Sewerage Undertaker. However, as already noted, there are tensions between the capacity of the wastewater Companies and Local Authorities in this regard.

Table 6 Primary stakeholders responsible for SUDS in England (Sources: CIRIA, 2003; Chouli, 2006; SWITCH, 2007); Balmforth et al, 2006); National SUDS Working Group, 2004).

| Name | Function | Powers and duties |
|---|---|--|
| Defra - Department for the Environment, Food and Rural Affairs | Sets policy and provides strategic guidance. | Formed by Government and reports directly to Ministers. Responsible for sustainable development in 5 strategic areas: climate change and energy, sustainable consumption and production, protecting the countryside and natural resource protection, sustainable rural communities, farming, food, animal health and welfare. Provides funding for the EA as well as grant aid to LAs and IDBs. |
| DCLG - Department for Communities and Local Government | Sets policy and provides strategic guidance. | Formed by Government and reports directly to Ministers. Responsible for building the capacity of communities to shape and protect their own future. Key areas include promoting the development of cities, regions and creating better communities; equalities, fire and resilience, housing, local government, planning, building and the environment. |
| EA - Environment Agency | To protect and enhance the environment and make a positive contribution to sustainable development in England and Wales. Responsible for water resource regulation and planning, water quality regulations and planning, flood defence and drainage, maintenance and operations in statutory main rivers, flood warnings and emergency response. Supervisory duty over LA's and IDBs. Reports to Defra on high level targets. | Powers and duties set out in the Environment Act, 1995. Regulation and executive powers/duties towards water resources, land, water and air quality, prioritising flood and coastal defence investment and resources, providing flood warnings, waste management, navigation, conservation, fisheries and recreation. Responsible for designated main rivers, Critical Ordinary Watercourses (COWs) (since March, 2005) and coastal flooding. A statutory planning consultee as a result of the enactment of PPS25 in December, 2006. Receives its core funding from Defra, levies on LAs and individual charging schemes. |

| | | |
|--|---|---|
| LAs - Local Authorities (county, district and unitary) | A wide range of functions which for SUDS include responsibility for drainage, flood alleviation and the regulation of watercourses which are not the responsibility of the EA or IDBs. LAs have significant planning responsibilities most notably in the production of Regional Spatial Strategies (RSSs) and Local Development Plans (LDPs) which aim to provide the spatial strategy to assist in day-to-day planning decisions. In addition, LAs are often the Highways Authority with its corresponding functions. | Powers bestowed by a number of parliamentary acts including, the Public Health Act, 1961, the Land Drainage Act, 1991, the Civil Contingency Act, 2004, the Town and Country Planning Act, 2005, the Highways Act, 1990 and the Planning and Compulsory Purchase Act, 2004. Duties under the amended Town and Country Planning Act (1995) |
| Highway Authorities | Responsible for draining areas within the highway boundary. For minor and regional roads the highway authority is usually the Local Authority. For trunk roads and motorways it is the Highways Agency. | Powers and duties legislated in the Highways Act, 1990 and the Land Drainage Act, 1994. Also responsible under the Civil Contingencies Act, 2004 for planning and managing recovery operations following major flood events. |
| Sewerage Undertakers | Responsible for providing and maintaining a public sewerage system, which includes sewers carrying surface water away from impermeable areas belonging to buildings. | Powers and duties set out under part IV of the Water Industry Act 1991, 1999 which requires sewerage undertakers to provide and maintain a drainage and sewerage system to ensure effectual drainage in its area, and to authorise and charge for the discharge of trade effluent to sewers. Privatised companies accountable to shareholders. Regulated by Ofwat, most notably through its 5 year periodic review process. |
| IDBs - Internal Drainage Boards | Supervisory duty over flood defence and drainage for low-lying land in England and Wales. Regulatory responsibility for ordinary watercourses in specified areas – not responsible for main rivers and COWs. | Powers and duties set out in the Land Drainage Act, 1991, 1994 and the Environment Act, 1995. Responsible for the maintenance, improvement, operation and construction of drainage systems, conservation and revenue-raising in their specified areas. Funded by Defra, the EA and levies on LA's, landowners and farmers. |

| | | |
|--|---|--|
| Ofwat (Water Services Regulation Authority) | Economic regulation of the water supply and sewerage companies in England and Wales. | Responsible for ensuring that customer interests are protected through the activities of the privatised water supply and sewerage companies. Powers derived from the Water Act, 1989. |
| Landowners | Responsible for drainage within their property boundary (cartilage). | Duties under the Land Drainage Act, 1991 and 1994 not to cause flooding to adjacent land as a result of changes to drainage on their land. |
| Riparian owners | Similar responsibilities as Landowners but also responsible for drainage channels and watercourses along their property boundary. | Rights to receive a flow of water in its natural state, without undue interference in quantity or quality and a right to protect their property against flooding from the watercourse and also to prevent erosion of the watercourse banks or any structures. Responsible for maintaining bank and bed of watercourse to avoid obstruction of flow and a duty not to alter flow so as to increase downstream flooding of others. Main duties legislated in The Public Health Act 1961, The Land Drainage Acts of 1991 & 1994 and the Water Resources Act 1991. |
| Developers | Responsible for the design, construction and drainage of their projects. | Duties under the Building Regulations (Part H), 2006 and the Town and Country Planning Act, 2005 |

12.4 Processes of decision-making, policies and plans

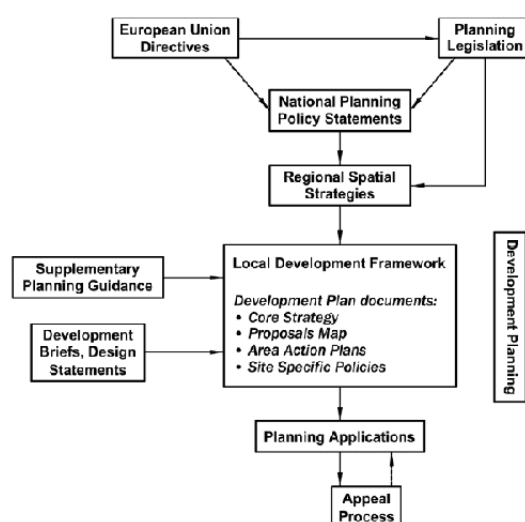
National policy for the implementation of SUDS is primarily driven by the planning process with the core elements of national policy and guidance provided in PPS25 issued by the Department for Communities and Local Government in December 2006. This policy statement 'sits' within a more general national policy framework for sustainable development and stakeholder engagement (HM Government, 2005a&b). It is also complemented by a number of other policy statements, most notably PPS1: *Delivering Sustainable Development*, PPS3: *Housing* and the PPS: *Planning and Climate Change* which is currently under consultation. These documents set out the policies, plans and decision-making processes through which SUDS should be implemented; complemented as they are by more specific codes of practice, regulations and design statements (See Table 9.1)

The main components of the planning system are shown in **Figure 60** (see also **Figure 37**). This illustrates the central importance of Regional Spatial Strategies (RSS) and Local Development Plans (LDPs) as the mechanisms for embracing government policy more generally, for providing increased community engagement in decision-making and for providing a framework from which individual planning applications can be assessed. Central to both RSSs and LDPs is the requirement for flood risk to be accounted for at all stages of

development, with regional and local planning bodies and authorities required to appraise, manage and reduce flood risk in their preparation and implementation.

SUDS are seen as an important tool in this process, particularly for new developments (DCLG, 2006). Indeed, in the process of planning application decisions, PPS25 requires that Local Planning Authorities 'give priority to the use of SUDS' (DCLG, 2006:5) and support rainwater drainage requirements as set out in Building Regulations (Part H), 2006 which prioritises infiltration drainage over watercourses and then sewers (DCLG, 2006:34). PPS25 also requires new developments to implement surface water drainage which can cope with above design capacity and does not increase the rate of peak flows post development (DCLG, 2006:34). In addition, PPS25 makes it clear that ownership and responsibility for SUDS should be clarified early in the development design process, using Section 106 agreements where appropriate. It should be noted, however, that whilst PPS25 clarifies the government's policies, plans and recommended processes through which decisions should be made, this remains a guidance document with no statutory or enforcement requirements, suffice the new requirement for the Environment Agency to act as a statutory consultee on all significant planning applications.

Figure 60 Components of the planning process (Source: Balmforth et al et al, 2006:54)



12.5 Guidance notes, codes of practice and funding arrangements

In addition to the Government's policy guidance notes, SUDS are supported by an interim code of practice developed by the National SUDS working group and a number of technical, design and best practice manuals produced most notably by the Construction Industry Research and Information Association (CIRIA) and the Government. Those of particular relevance are illustrated in **Table 5**. These provide developers, local authorities and other key stakeholders with highly valuable, and in many cases detailed, guidance on how to construct, implement and operate SUDS in order to make best use of their water quality, quantity and amenity value. They also provide guidance on how best to ensure that potential problems do not become barriers to their adoption and operation.

In this respect, it can be argued that the guidance and codes of practice with respect to SUDS technologies in England is highly developed. The problem is that the guidance with respect to the strategic implementation of SUDS is not. As a result, although there is detailed guidance concerning specific technologies there is little guidance on how these should be integrated given the institutional landscape within which they are implemented, operated and

maintained. This has led to a number of calls for improved guidance most notably for the introduction of a 'SUDS for adoption' guide similar to that available for sewers (WRc, 2006).

In addition to this lack of guidance for integrating SUDS technologies across urban areas there is also a lack of any common funding/funding source from which to finance these technologies (Balmforth et al, 2006). This funding 'problem' is not so much associated with capital investment, which can be secured via the development process with local authorities in particular able to commute sums from developers in this regard. Rather, it is a concern over the funding of future maintenance, operation and renewal costs – most notably for those being requested to adopt SUDS technologies, and hence 'take-on' these future costs. For the wastewater Companies this is of particular concern because, although they can secure maintenance costs through surface water sewerage charges, their funding structure is calculated on the basis of Ofwat's 5 year periodic review process which inhibits longer term strategies for capital maintenance programmes, and in turn the adoption of SUDS (Balmforth et al, 2006).

12.6 Barriers and Incentives

The rate of uptake of SUDS in England has been considerably slowly than in Scotland, probably as a result of the differences in barriers and incentives. The barriers to uptake are substantial and the incentives weak. The barriers are:

- The legal definition of a 'sewer'.
- The uncertain magnitude of O & M costs and the problems of responsibility for those works.
- The disincentive to the wastewater companies to promote SUDS.
- The restrictions the wastewater companies place on what systems they will adopt as sewers.

The incentives are weak and there are a number of notable gaps in the pattern of disincentives as compared to other countries:

- The Planning Guidance and the Code for Sustainable Homes provide strong impetus towards the adoption of SUDS for quantity control purposes.
- Conversely, no wastewater company now currently appears to charge for surface water runoff on the basis of impermeable area.
- Only a few companies allow a rebate on the sewerage charge if surface water is not discharged to a sewer.
- SUDS systems are not currently included in the ECA regime so industry and commerce does not get tax relief if they install SUDS.

Figure 61 Greywater reuse for garden watering



13 WATER RECYCLING AND REUSE

13.1 Background

Water recycling may be defined in a number of ways (see for example the Glossary of Terms) depending on whether the objective is to provide water for potable or non-potable uses or both. An alternative definition to the one given in the Glossary of Terms is - the planned and deliberate use of treated wastewater for any beneficial purpose such as drinking, irrigation, recreation, industry, and the recharging of underground aquifers.

In England water recycling is already used to some extent in industry, and reclaimed water (i.e. wastewater that has been treated for reuse) is also used for some non-domestic purposes, but recycled water is not currently used for potable purposes. The institutional regime for water recycling is currently therefore in its infancy.

The UK's Chartered Institution of Water and Environmental Management (CIWEM) defines water reuse as: *'the process whereby wastewater treated to an appropriate standard, is reused for a variety of beneficial purposes. The treated water ready to be reused is recycled or reclaimed water'* (<http://www.ciwem.org/resources/water/resuse.asp>).

From this definition it is clear that water reuse and water recycling are very closely related and difficult to separate concepts and technologies. Furthermore the institutional arrangements for water recycling and water reuse currently overlap in major ways. The institutional arrangements for water reuse and wastewater management also overlap.

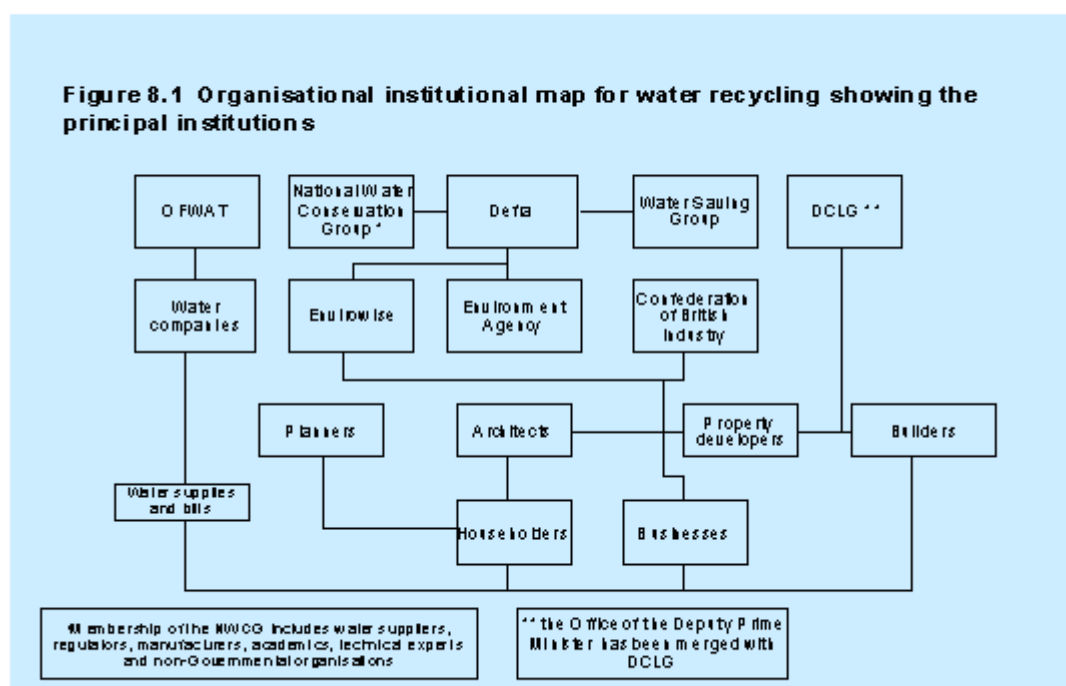
13.2 The institutional landscape: water recycling

The Department for the Environment, Food and Rural Affairs (Defra) is responsible for all aspects of water policy in England. Defra is the organisation with the greatest power to encourage the development and adoption of water recycling and water reuse, but it is not able to implement policies to achieve this on its own. Defra is dependent upon at least one other central Government department. The Department for Communities and Local Government (DCLG) (which has now absorbed the Office of the Deputy Prime Minister (ODPM)) is responsible for the promotion, planning and development of sustainable communities. DCLG is responsible for the nation's land use planning system and nation's building regulations through which water efficiency may be promoted and implemented at ground level, and ODPM (now DCLG) produced the Code for Sustainable Homes (DCLG 2006) which is also likely to be influential in the planning of new housing developments.

The Environment Agency receives funding from Defra and has a duty to manage water resources and control abstractions through a system of licensing. Its powers to introduce water recycling and reuse are limited, although it can do a lot to promote more efficient use of water. The Water Companies are required under the law to protect public health and provide an affordable water supply to customers, and they are sufficiently close to water consumers to influence their water consumption behaviour through water pricing and through provision of public information promoting behavioural changes. OFWAT has primary duties to ensure that water companies properly carry out, and are able to finance, their functions under the Water Industry Act 1991, and is indirectly involved in water recycling and reuse.

Water companies are responsible for developing water sources and resources, and water supply and sewage disposal companies, such as Severn Trent Water, are involved in ensuring that much of the water used for the public supply and industry is treated and returned to the freshwater environment so that it is available for re-abstraction and reuse downstream.

Figure 62 Organisational and institutional mapping for water recycling



An inter-departmental group called the Water Savings Group first met in October 2005. It is a ministerially-led group which brings together key water industry stakeholders (see **Figure 62** for membership) to promote the efficient use of water. Water recycling is considered to be a water efficiency technology. The Group considers itself as contributing to the long term sustainability of water supply and has developed an action plan which covers all aspects of water efficiency. It is clear from the publicly-available minutes of this Group's meetings and its action plan, and because it is led by a Minister, that the Group is influential in decision-making about developments in water efficiency at the national level. Defra also supports a voluntary group called the National Water Conservation Group which also seeks to bring stakeholders together to influence policy.

One of the pre-requisites for a powerful drive to introduce new water technologies such as water recycling technologies is a water technology intelligence and advisory service which actively promotes the advantages of such technologies and can demonstrate their benefits. Envirowise is described in the section on demand management institutions, and operates a Government-funded advice and information service for UK business on water efficiency and other equipment, including water recycling technologies.

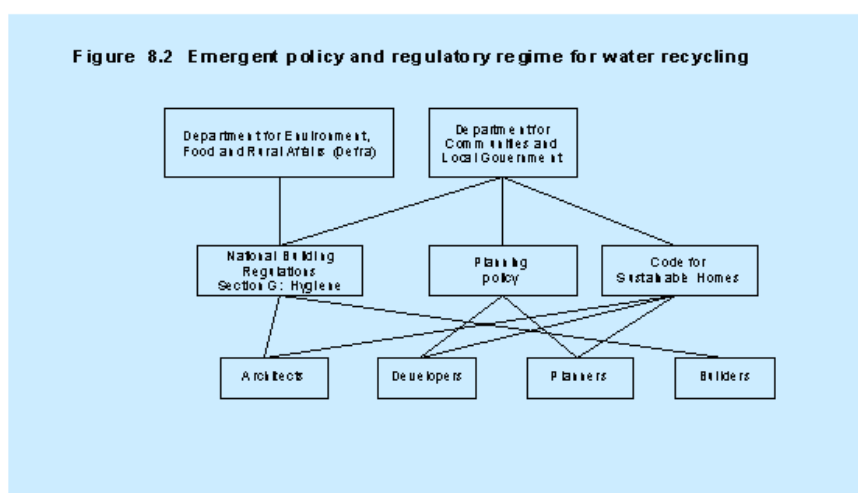
Planners, architects, property developers and builders all have a potentially important role to play in responding to policies, regulations, codes etc. relating to water recycling. In addition the Confederation of British Industry is considered by the Chartered Institution of Water and Environmental Management to be a key player in influencing the adoption of re-use and recycling in British industry (<http://www.ciwm.org/policy/policies/efficiency.asp>). In turn householders and business also have a key role to play, but it is preferable to have house buyers purchase houses already fitted with water saving/recycling systems than to persuade existing home-owners to retrofit them, although there is potential here for gradual change and adoption of new technologies.

Legislative and regulatory regime: water recycling

Currently, in England there is no legislation as such relating discretely and directly to water recycling, although there are elements of the Water Supply (Water Fittings) Regulations 1999 which are applicable, although they do not refer specifically to water recycling fittings.

Regulations relating to water efficiency in general, and to water recycling in particular, are currently under-developed, but are on a progressive evolutionary path (**Figure 63**).

Figure 63 Water efficiency and recycling regulations



Planning policy is progressively reflecting the sustainability and sustainable communities agendas and has now developed to a reasonable degree in this respect, but the linkage between the land use planning process and water efficiency issues is not yet well developed. Planners are currently in the process of becoming more aware of water efficiency (including water recycling) and related sustainable water management issues, and they are gradually being more fully addressed in local plans.

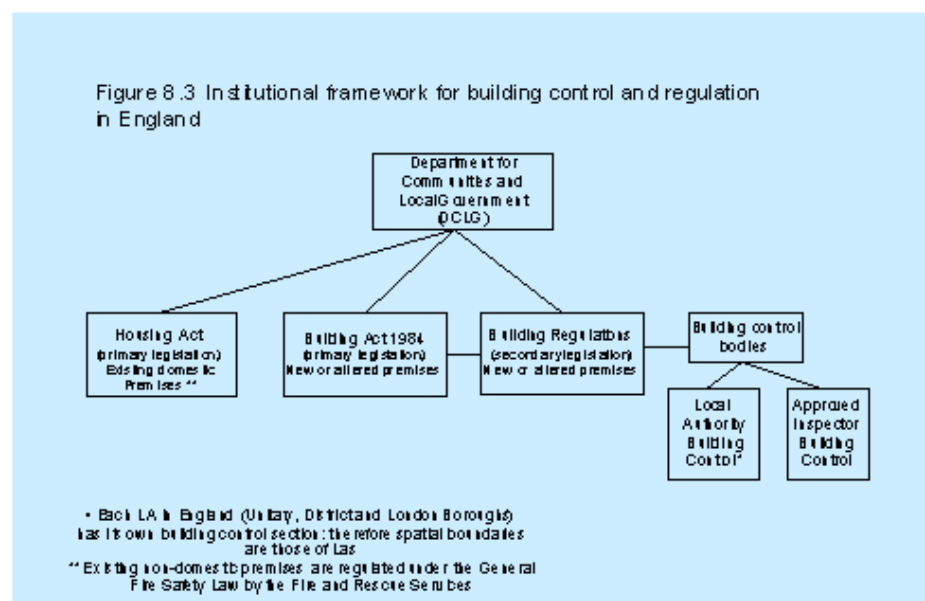
The national Building Regulations provide a potentially strong regulatory regime through which sustainable water technologies and products, including water recycling technologies, can be encouraged and indeed required. Currently this is not the case because the Building Regulations are under-developed with regard to water saving and recycling technologies. Section G of the Building Regulations is the section relating to water equipment standards and currently inadequately reflects the water efficiency agenda. Indeed it was not until the Building Regulations of 2005 were published that water use fittings were incorporated for the first time (mainly referring to toilets and taps). The Minutes of the Water Savings Group refer to reviewing and strengthening Section G for the future, and to a review of this section being undertaken by ODPM (now DCLG).

In 2006, DCLG produced the Code for Sustainable Homes (**Figure 8**). This Code, which was intended to be a partnership between ODPM (now DCLG) and the Building Research Establishment (a registered charity), is a voluntary code of standards for the building of sustainable buildings which incorporates sections on water efficiency. However, the proposed standard refers to the water consumption norms or standards expected in homes of different size, and this therefore only indirectly relates to water recycling. In so far as water saving technologies will be required to achieve the water consumption norms, the code is helpful in pushing developers and builders towards water recycling technologies. The code refers only to rainwater collection systems for watering gardens.

The current regulatory regime appears to be in its infancy. However, it is possible to see how voluntary codes can lead step-by-step to mandatory regulations in future. The Building Regulations are already mandatory and have therefore have leverage. Compliance with Building Regulations and the new Code for Sustainable Homes are significant issues, and the monitoring and enforcement regimes need to be robust. What is apparently unknown is the extent of non-compliance with the existing regulations, particularly with expansion of DIY work in the home and the work of small builders. A recent DCLG discussion forum produced anecdotal evidence but no quantitative data. The relatively high rate of misconnections to sewers (i.e. surface water drain to foul sewer or wastewater drain to surface water sewer) suggests that the error rate is likely not to be trivial. Similarly, in 2002, it was reported that 10 people die each year and 756 people are hurt as a result of unsafe electrical fittings. The solution adopted in other countries has been (a) to make fittings for reused or recycled water incompatible with those for potable water and (b) require that pipework and fittings for the former purpose be clearly colour coded.

Non-compliance with or contravention of Building Regulations is a criminal offence and action may be taken under the Building Act 1984 against any person who contravenes them. If convicted a person is liable to a fine of up to £5,000 for each offence. Section 36 of the same act allows a Notice to be served to the owner to remove the works or bring the work into compliance. The minutes of the Water Savings Group for 18 May 2006 refer to level 0 of the Code for Sustainable Homes becoming mandatory at some stage. The Building Regulations, which are usually annually updated, are administered by DCLG under the Building Act 1984 (**Figure 64**). This Act covers the role of approved inspectors, approved document status, powers of entry and enforcement. Each local authority has a building control section which is responsible for compliance which means that local authority geographical boundaries are relevant in the operation of building regulations. The Sustainable and Secure Buildings Act 2004 covers sustainability and enforcement but is related mainly to fuel, energy and power in buildings and not water fittings.

Figure 64 Building regulations



13.3 Green roofs

In the absence of any British standards, the practice is to follow the German FLL (Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau) standards (FLL 2002). CIRIA is in the process of producing guidance for the UK and this expected shortly. The design of roof structures is covered by the Building Regulations. Unlike Germany, there are neither formal incentives to install green roofs per se or incentives to reduce surface water runoff from a site. Thus, London currently only has a bit more than twice the area of green roof as does Linz in Austria.

13.4 Funding and financial incentives: water recycling

The funding and financial incentives for installing water recycling systems and equipment is currently not significantly different to that for demand management technologies in general (**Figure 56**). Businesses may take advantage of the ECA tax relief scheme using the same rules as for water demand management explained above. There appear to be no rebates or financial incentives available to homeowners other than the incentives provided by water charges and household consumer's interests in keeping their water bills to a minimum.

13.5 Barriers and Incentives

There are currently few and rather weak incentives to adoption water reuse or recycling, and significant barriers. There is no apparent incentive for a water supply company to promote water reuse or recycling, and where water is metered, there is a positive disincentive to induce any real fall in demand. Nor is there any obvious incentive for the wastewater company to promote these practices except where capacity is currently limited in volumetric terms. For developers, the procedure for an INSET agreement, including the required agreement of the water and wastewater companies in whose geographic area the site lies, is likely to add both time delays and costs. The general absence of regulations and standards increases the risk and consequences of failure, including the risk of legal liability. The principles of sustainable development, notably of energy efficiency, may be a barrier to the adoption of these techniques.

Conversely, the adoption of these techniques may increase the likelihood of receiving planning consent, and the Code for Sustainable Homes creates a pressure for the adoption of the technique but only where the developer is seeking to deliver a high standard. The Envirowise programme is likely to be a good incentive for change in the commercial and industrial sector, as is the ECA programme.

14 Eco-san

The Water Supply Regulations 1999 are solely concerned to protect potable water supplies from back-contamination through water fittings. Hence, if a fitment does not use water, then the Regulations do not apply. This will be the case for composting toilets and some forms of toilet in which the faeces and urine wastestreams are separated, or waterless urinals. But the general provisions of the Building Regulations do apply. Currently, whilst waterless urinals are included in the ECA scheme, composting toilets are not.

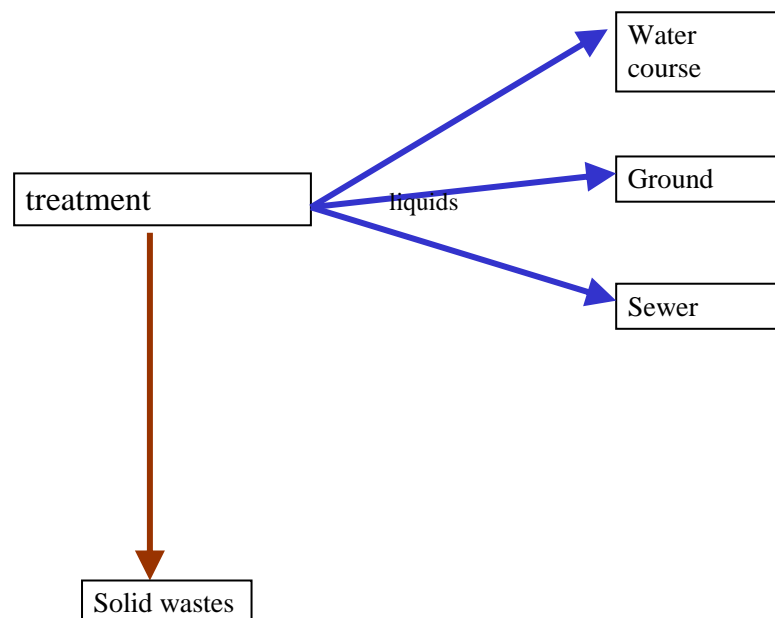
15 WASTEWATER MANAGEMENT

The presumption is still that connection to a sewer, coupled to conventional sewage treatment, is the standard option. Under the 1875 Act, planners may require a connection to a public sewer where an existing sewer is within 30 metres of the site. The Environment Agency's guidelines (Environment Alliance 2006) still have a presumption of connection: *"Developments proposing the use of private sewage treatment systems are usually only acceptable where connection to the public sewer is not possible. Although if a treatment system is proposed that offers a more sustainable solution to the overall water management of the site, that might be acceptable."* This document also offers a flowchart whose sequence runs:

- Connect to foul sewer?
- Access to land for drainage field?
- Watercourse, coastal water or surface water sewer?
- Is a system with no discharge appropriate?

On site wastewater treatment will produce a residual stream of water and an additional stream of solid waste (**Figure 65**). Even an essentially closed system will require an emergency release for treated or semi-treated water, and all systems will produce a stream of solid waste. In England, discharge of water either to a water course or to groundwater requires a licence from the Environment Agency under the Water Resources Act. Conversely, there is a presumption of a right to connect to a public sewer, owned and operated by the wastewater undertaker. The disposal of the solid waste, including sludge, requires a licence, issued by the Environment Agency, or the use of a licenced contractor, again licenced by the Environment Agency under the Waste Management (England and Wales) Regulations 2006. Waste designated as Hazardous Waste under the Hazardous Waste (England and Wales) Regulations 2005 is subject to more detailed provision concerning its ultimate disposal. This designation is dependent upon the materials in the waste and not the source so a reed bed system might produce hazardous waste requiring disposal as such.

Figure 65 Sewer linkages



The Construction Products Regulations 1991 set out the essential requirements that any new sewage treatment works must satisfy in the UK. These regulations are enforced by the Trading Standards Authorities (part of local government).

15.1 Barriers and incentives

The assumption of a conventional sewerage system is so engrained in expectations that anything else is treated as a potentially problematic exception. This is notably the case for domestic properties. The sustainability of on-site treatment is open to question, notably in terms of energy usage and the possible methane emission from wetland systems (which does not appear to have been explored). INSET provides an option for more extensive use of onsite treatment but is limited by the requirement that the wastewater undertaker in whose geographical area the site lies must give agreement. For commercial and industrial firms, the inclusion of membrane systems in the ECA scheme provides a financial incentive.

16 Urban farming

Historically English cities followed the same development path as cities in other countries – there being around 800 million farmers engaged in urban and peri-urban farming, 200 million market gardening, and in many cities 60-90% vegetables produced within city or city edge (Molder 2007). Again, one hundred years ago wastewater reuse for agricultural use was standard. Both positions have now changed drastically.

Historically, urban farming in the form of allotments was important in England. At the peak, there were 1.4 million allotments (generally about 250 m²), rather more than 1 per 10 households, and in the Second World War, it is estimated that 10% of the UK's food needs were met from allotments. Local authorities have a legal obligation to provide allotments where the demand exists; the produce must be for the personal consumption of the plotholder and their family. Allotments were originally a response to land Enclosures where Common land was parcelled out amongst the Commoners. Those with few or no defined rights were consequently left landless. 'Allotments' were thus small plots of lands provided for the landless poor in rural areas (Burchardt 2002; House of Commons Select Committee on Environment, Transport and Regional Affairs 1997-98). The 1867 Allotment Act required local authorities to provide such land if there was demand; by the end of the nineteenth century, the focus of provision was on the urban poor rather than on rural areas. However, the numbers of allotments has now fallen dramatically to around 297,000. But there is reported to be a resurgence in demand to some 330,000 as a result of a new demand for home produced vegetables – allotments now produce an estimated 16,000 tonnes of vegetables in London each year and vegetable seed sales now exceed flower seed sales (Vidal 2007). There is a similar resurgence in the number of households keeping chickens – an estimated 200,000 – and in bee-keeping (35,000).

The climate of England is such that horticulture generally only requires supplementary irrigation. Hence, water supply is not an issue. Allotment watering by hosepipe is believed to be covered by the current powers under the Drought Direction 1991 (made under s74(2)(b) of the Water Resources Act 1991) to ban the use of hosepipes for garden watering. The Government intends to make their inclusion as a form of 'private garden' clearer (Defra 2007)

However, the earliest form of wastewater treatment in England, following the report of the first Royal Commission, was land treatment. So, by 1875 there were some 50 land treatment sites in England. The same approach was followed across much of Europe so that by 1904 Paris was irrigating some 5400 ha with raw sewage as part of the treatment process. By 1910 Berlin was treating some 310 million m³/day using 17,200 ha of farms (Shuval et al 1986). The same approach was exported to other countries. This approach was largely abandoned for a number of reasons. Firstly, with continuing urbanisation in the early twentieth century, the urban periphery areas in which the sewage farms were located became part of the suburbs. Secondly, the areas involved were very large; in the case of Berlin, several times the size of the city. Whilst sewage farms have largely been abandoned as means of wastewater treatment, the disposal of sludge to farm land is still seen as the best disposal option.

The third form of 'agricultural' land use in English cities is gardens. At estimated 19.7% of the total area of Greater London is domestic gardens (London Assembly 2005). Whilst traditionally some of this area was devoted to growing vegetables – but legally water supplied via a hose pipe is not a domestic use and hence the water companies have no duty supply water for purposes which involve the use of a hose pipe. Instead, the primary issue with gardens is the rate at which they are being converted to impermeable areas. In particular, front gardens have and are being converted to hard standing for vehicles. There are wide variations between the regions with over 40% of front gardens so converted in some regions (London Assembly 2005). In London, the area so converted is estimated to be 32 km².

Whilst most forms of development in England require planning permission (granted by the local authority), the conversion of front gardens and the making of a connection with road are deemed to have planning consent. The only exception is in Conservation areas (London Assembly 2005). There is no requirement that the paved areas are constructed using permeable pavements or any other source control measure.

17 Solid waste management

Water in its different forms has always been a convenient means of carrying away different forms of waste. There are practical reasons: flow under gravity will eventually remove most things. In addition, most religions and cultures associate water with purity and so there may be a symbolic value in purifying waste through water. The most obvious example of the practical convenience of water and probably also of the symbolic value of water is the Water Closet. But the consequence is all forms of water are used for the disposal of waste, particularly in the absence of other means of disposing of that waste. Rivers have long been used to dispose of anything from animal carcasses to weapons. Surface water sewers have been used as proxies for rivers when a watercourse is not conveniently available and sewers as a means of disposing of any waste product including household chemicals, cooking oils and fats, and, fortunately briefly, via garbage disposal units, food wastes. The consequence has been that urban water courses rapidly became open sewers in many cities (Ponting 1991); improvements in urban rivers in consequence depended in large part upon removing waste streams from water. This requires means of removing waste by other means; a problem that has increased with higher incomes which have been associated by increased waste production (not least through increased packaging but also through increased food waste – an estimated 30% of all food brought in England is thrown away uneaten) coupled to a fall in the rate at which waste is reused and recycling. Thus, municipal waste is now estimated to amount to 30 million tonnes a year in the UK. Traditionally, garbage scavenging resulted in a high proportion of waste being reused and poverty meant that there was a high degree of reuse; currently, only 12.3% of municipal waste in England is either composted or recycled, and another 8.8% is incinerated with energy recovery. The average household generates c 23.8 kg waste each week and currently only 3.4 kg is recycled (Defra 2003).

Successful reduction of pollution problems therefore depends to a significant extent upon disconnecting waste production from the water system rather than treating the sewer system as a means of disposing of all waste products. Thus, it has been argued that a virtue of SUDS is that it results in the disconnection of surface water drainage from the sewer system and hence precludes engine oils etc entering the sewer system.

Separation within the foul sewer system is a further requirement. Whereas sewers were traditionally the means of disposing of dead animals (and occasionally people as in the Roman practice of dumping executed criminals into the Cloaca Maxima), the domestic practice has now come to be one of using toilets to dispose of cotton buds, sanitary towels, condoms and, sometimes, disposable nappies. It is highly desirable to remove these items from the wastewater system: those areas where the drainage system is unable to cope with toilet paper may have an advantage. Major causes of sewer blockages are fat, oil and grease (FOG) and particularly used cooking oil (UCO) from restaurants and similar commercial establishments. Preventing these materials entering sewers is important: currently London is experimenting with the collection of UCO for conversion to biofuels (Mayor of London 2007).

Thus, there are four primary requirements for solid waste management:

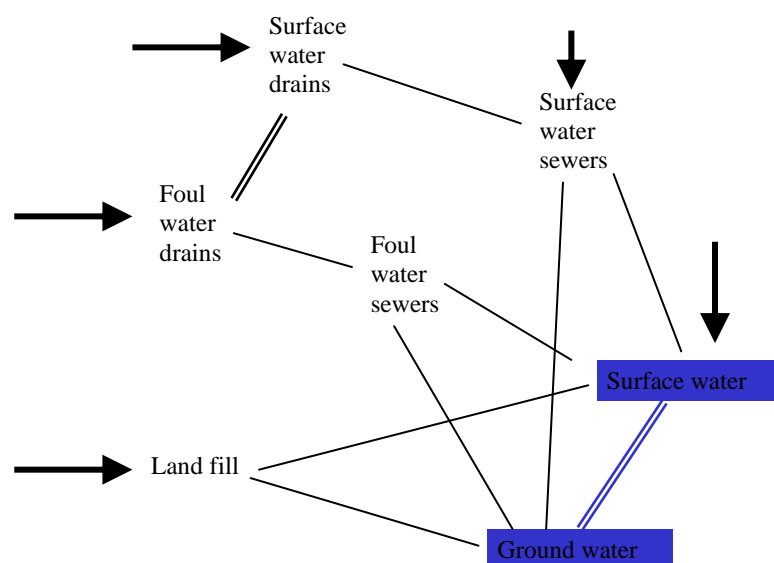
1. Separation of waste streams: much of this is hand-sorted but physical disconnection is desirable where possible.
2. Access to the site generating the waste in order to collect it, or provision of local storage points to which there is access generally by lorries.
3. Provision for bulk storage and treatment of the different waste streams.
4. The system must be acceptable, including affordable, to those generating the waste.

It is, of course, desirable to seek primarily to reduce the amount of waste that is generated.

Historically in England, as with many countries now, much 'waste' was recycled and reused by scavengers. The 1848 Public Health Act allowed the creation, and in some cases required, the formation of local Boards of Public Health with the purpose of improving the sanitary condition of towns. Where one was established, it was required to clean the streets in its district, removing dust, ashes, rubbish, filth, dung and soil. The 1875 Public Health Act merged the local health boards into the local government districts. It also required that householders keep their waste in a movable receptacle. An amendment in 1907 to the 1875 Public Health Act extended refuse collection to trade waste. The Public Health Act of 1936 made any accumulation of waste which is prejudicial to nuisance, a Statutory Nuisance and allowed the prosecution of uncontrolled dumping, cesspools, and scavenging. The Environment Protection Act 1990 separated waste regulation from operational local authorities and the Environment Act 1995 passed waste regulation to the Environment Agency.

The Waste Collection Authority is now a local authority; in those areas with two tier local authorities, it is the District Council, otherwise it is the Unitary Authority (i.e. Birmingham City Council). The Waste Collection Authority has a responsibility under the Environment Protection Act 1990 to collect municipal waste. Municipal waste includes all household waste, street litter, municipal parks and gardens waste, council office waste and some commercial waste. It has a duty to collect household waste from each household on a regular basis. The costs of waste collection are met from the general local property tax. The disposal of the collected waste then requires a licence from the Environment Agency; any material disposed off to landfill is taxed as a means of driving down such disposal. Current legislation affecting waste has been summarized by wastewatch (www.wastwatch.org.uk). However, illegal dumping of rubbish ('fly-tipping') on odd corners of land (and to watercourses) continues to be a problem; Birmingham city has set up an environmental crime unit to deal with a problem which currently costs £4 million/year.

Figure 66 water and solid waste linkages



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19 GLOSSARY OF TERMS

Allotment

A plot or strip of land which in the UK is usually rented from the local council and which is used for gardening and/or horticulture by residents. Allotments may have sheds and greenhouses on them.

Approved contractor

A person who a) has been approved by the water undertaker for the area where a water fitting is installed or used, or b) has been certified as an approved contractor by an organisation specified in writing by the regulator.

Aquifer storage and recovery

Recharge of underground aquifers with stormwater or treated wastewater, either through pumping or gravity feed, for subsequent use.

Autonomous housing

Houses that are (almost) completely self-sufficient, including in their use of water.

Birmingham Strategic Partnership

See Local Strategic Partnership.

Blackwater

This is water which has been used in toilets, or a toilet fixture such as a bidet or urinal, or water which has come into contact with these water fittings. Water used to wash soiled nappies is also considered to be black water. Black water will have a high level of bacterial contamination

Catchment Management Plan

This is a non-statutory document which aims to balance resource utilisation and conservation, enabling the water resource to be protected, enhanced and, where appropriate, restored. CMPs recognise the interaction between land, water and other environmental resources and catchment management planning attempts to establish an integrated and holistic framework to secure the future well-being of the water environment.

Catchment Flood Management Plan

A non-statutory document that sets out strategies for managing flood risk on a catchment basis.

Centralised water infrastructure

Water technologies developed on a city-wide or otherwise large-scale basis, such as large-scale water resource development or city-wide water distribution networks.

Closed water systems

Houses or other properties where all domestic-type wastewater is collected and treated for potable use. There are as yet no known systems available for practical everyday use according to the Environment Agency in 2005.

Combined rainwater and greywater recycling

Systems incorporating elements of both rainwater harvesting and greywater recycling.

Community-Based Organisations (CBOs)

Grassroots organisations who seek or have some role in deciding on the use of resources which belong to the community; they usually depend upon recognition and support from the community. Sometimes 'community governance' structures may become integrated into the formal system of decision-making and government.

Composting toilets

Toilets that collect faeces and urine and exploit the natural composting process to produce a natural fertiliser.

Comprehensive Performance Assessment (CPA)

The framework which the Audit Commission employs to measure the performance of all local councils. Councils are ranked into five categories from 0 stars to 4 stars denoting high performance.

Consumer

Any occupier of any premises to which a water undertaker has agreed to provide water services or is actually providing water services.

Constructed wetlands

Vegetated system with extended retention time

Core cities

These are the City Councils of England's eight largest cities outside of London – Birmingham, Bristol, Leeds, Liverpool, Manchester, Newcastle, Nottingham and Sheffield. The core cities group works together, and with Government, to develop policies to strengthen their economies.

Decent Homes Standard

Government has laid down by law that everyone is entitled to live in a home that is wind and watertight, warm and has modern facilities. Housing departments such as Birmingham's are working towards ensuring the council homes meet the standard by 2010. A minimum standard is defined.

Detention basins

Depressed basins which are dry most of the time, used to temporarily store and attenuate rainwater during wet conditions. Water is controlled by hydraulic structures to restrict outlet discharge according to required detention times.

Development Plan Documents

These are documents which LPAs must prepare. They include the core strategy, site specific allocations of land, and where necessary, area action plans.

Distributed water infrastructure

Decentralised water technologies located at the local community or development level rather than at a regional level. These technologies include for example, water saving devices, local water abstraction, fit-for-purpose water supplies and point of use water treatment systems. This term applies to water supply, stormwater and drainage and wastewater systems.

Drought Plan

These plans contain strategies for each Water Company area for addressing drought. They are implemented under the Water Industry Act 1991, Drought Plan Regulations 2005.

Dry toilets

Toilets requiring no or minimal water use, such as pit latrines, chemical toilets and incinerating toilets.

Dual supply systems

Two pipe systems, one conveying potable water and one non-potable. These systems carry a risk of cross-connections.

Effluent dual reticulation

Similar to dual water supply except treated wastewater is used for the secondary supply.

Energy-water systems

A range of technologies or practices that harness energy from the various water flows and in so doing achieve energy efficiency and/or treatment measures.

European Spatial Development Perspective (ESDD)

A policy document based on the EU's aim of achieving balanced and sustainable development, in particular by strengthening economic and social cohesion. The ESDD is legally non-binding. It provides spatial development guidelines which transcend national boundaries and give national spatial development plans a broader context.

Extended detention basins

Dry most of the time and able to store rainwater during wet conditions for up to 24 hours

Filter drains

Linear drains consisting of trenches filled with permeable material, often with a perforated pipe in the base of the trench to assist drainage, to store and conduct water; they may also permit infiltration.

Filter strip

Grassed or vegetated strip of ground that stormwater flows across. Vegetation permits particulate filtration.

Green roofs

Vegetated building roofs used to capture, store, release and evaporate rainfall.

Greywater (also called Graywater)

All of the non-toilet wastewater produced in a household, including that from baths, showers, sinks, washing machines and dishwashers. Although greywater does not need extensive chemical or biological treatment before it can be used in the garden or for other uses (e.g. car washing) it must still be used with care because it usually contains grease, hair, detergent, cosmetics, dead skin, food particles and small amounts of faecal matter.

Infiltration basin

Detains stormwater above ground which then soaks away into the ground through the base

Infiltration trench

A long thin soakaway

Lagoons

Ponds designed for settlement of suspended solids

Local Area Agreement (LAA)

A new deal between local partners and national government with potentially new flexibilities and freedoms at city/local level to deliver outcomes for a city or local area which are themselves based on national and local priorities).

Local Development Framework (LDF)

A non-statutory term used to describe a folder of documents which includes all of the LPA's local development documents (i.e. development plan documents which form part of the statutory development plan, and supplementary documents).

Local Strategic Partnership (LSP)

Introduced by Government in 2000 as part of a national strategy for neighbourhood renewal to tackle deep-seated, multidimensional problems facing society. The Birmingham Strategic Partnership is an example of an LSP. The LSPs lead the coordination, planning and implementation of the Community Strategy (in the case of Birmingham, for Birmingham) which is based upon a vision of the city in the future.

Non-Governmental Organisation (NGO)

The term is used in a variety of ways all over the world, and depending on the context in which it is used, can refer to many different types of organisation. In its broadest sense an NGO is one that is not directly part of the structure of government.

Porous asphalt

Open grade powdered/crushed stone with binder; high void ratio

Porous paving

Continuous surface with high void content, porous blocks or solid blocks with adjoining infiltration spaces; an associated reservoir structure provides storage

Public water supply

A communal water supply system providing potable water for domestic and non-domestic premises.

Rainwater

Water captured directly or indirectly from rainfall. Rain may be collected from roofs and other sealed surfaces using various rainwater harvesting devices such as gutterings, water butts and storage tanks. Rainwater may be filtered to exclude leaf debris and other organic matter.

Rainwater harvesting

Collection and storage of rainfall from roofs and reuse for non-potable applications.

Recycled water

This is treated wastewater that has undergone additional filtration and disinfection process to make water safe for non-potable (non-drinking) uses such as watering gardens or lawns, irrigating landscapes, watering parks and school sites.

Regional Development Agencies

These are non-departmental public bodies which.....

Regional Economic Strategy

A statutory strategy which takes an integrated approach to economic development and regeneration by addressing business competitiveness, productivity, unemployment, skills, social exclusion and physical decay. These strategies provide a regional framework for economic development, skills and regeneration, and a framework for national and EU programmes. Produced for each governmental region.

Regional Housing Strategy

These strategies prioritise housing needs of each governmental region to allow decisions to be taken about how housing resources should be allocated within the region. These strategies take an overall view of housing need, housing investment priorities, and affordable housing targets. They provide a regional context for LAs in drawing up their own housing investment strategies.

Regional Housing Boards

These are established in each governmental region and strengthen the linkages between housing, the planning framework, and economic development, and they coordinate arrangements for determining priorities for housing investment.

Regional Strategic Development Framework (RSDF)

The Government envisages that RSDFs will be high level statements setting out a vision for sustainable development in each governmental region, and the region's contribution to sustainable development at the national level.

Retention ponds

Contain some water at all times and retains incoming stormwater

Sedimentation tank (silt trap)

Symmetrical concrete structure containing appropriate depth of water to assist the settling of suspended solids under quiescent conditions

Shoreline Management Plan

These are plans which are provided by the relevant operating authorities (usually maritime Borough Councils, District Councils, and the Environment Agency) to identify long term, sustainable protection for the coastal defence of our shoreline (against coastal erosion and sea flooding). The first set of SMPs (SMP1) were completed in 1999 and SMP2 data collection begins in 2007/08.

Soakaways

Underground chamber or rock-filled volume; stormwater soaks into the ground via the base and sides

Stakeholder

Persons or groups whose interests and activities strongly affect and are affected by the issues concerned, who have a 'stake' in a change, who control relevant information and resources and whose support is needed in order to implement the change.

Structure Plan

An old-style development plan which sets out strategic planning policies and forms the basis for detailed planning in local plans. These plans will continue to operate for a time after the commencement of the new development plan system, by virtue of specific transitional provisions.

Sustainable Communities Plan

A programme issued by Government to set the framework for delivering sustainable communities over the next 15-20 years. The main focus areas are sustainable communities, housing supply, new growth areas, decent homes and countryside and local environment.

Sustainable urban drainage systems

A suite of water management technologies and approaches designed to drain surface water in a more sustainable manner than is commonly achievable by traditional end-of-pipe practices.

Swales

Vegetated broad shallow channels for retaining and transporting stormwater. Vegetation permits particulate filtration.

Unitary Development Plan

An old-style development plan prepared by a Metropolitan District or some Unitary Local Authorities containing policies equivalent to the Structure and Local Plan. These plans will continue to operate for a time after the commencement of the new development plan system, by virtue of specific transitional provisions.

Urban farming

Horticultural activities undertaken in gardens and allotments in urban areas

Urine separation

Specially-designed toilets that allow urine to be collected separately from faeces for use as a natural liquid fertiliser.

Water appliance

A machine which makes use of water such as a dish-washer or a commercial laundry machine.

Water demand management

A management approach which seeks to control the quantity of water lost and consumed from the public water supply system. A number of techniques are involved including leakage control and reduction; water metering and pricing; and water efficiency measures of various kinds.

Water fitting

A component of a water installation, other than a pipe, through which water passes or in which it is stored.

Water meter

A device for measuring the quantity of water passing through it.

Water recycling

See Recycled water

Water reuse

The process whereby wastewater treated to an appropriate standard, is reused for a variety of beneficial purposes. The treated water ready to be reused is recycled or reclaimed water.

Water undertaker

A public or private company supplying water. Also called a water supply undertaker.

20 APPENDIX 1

20.1 FACT FILE FOR THE CITY OF BIRMINGHAM

Summary

- Birmingham's population is growing again after decades of decline. The proportion of residents from black or minority ethnic community continues to rise, as does the number of different communities living in the city. The city has one of the lowest proportions of white community members of cities in England.
- Birmingham people are positive about their city – in particular about its shopping, universities, buildings and public spaces – but they are also critical of certain aspects of life in the city such as violent crime rates and the city's environment.
- The educational attainment of young people in the city has been rising more rapidly than the national average, but the growth in the number of graduates has been slower. Access to and use of new technologies such as the Internet is below the national average.
- Significant improvements in the number of homes meeting the Decent Homes Standard have been made. However, a substantial proportion of homes in both the private and public sectors are still in need of repair and modernisation. Levels of overcrowding are above the national average, and particularly affect some minority ethnic groups. Homelessness application rates are declining but levels of homelessness are still significantly above the national average – and this shows a need for affordable housing in the city.
- Birmingham is the safest city amongst England's core cities. Levels of crime have been falling more rapidly than nationally and trends in accidents are downwards. However, violent crime in the city is rising. Improving crime and safety is a priority for Birmingham residents.
- Birmingham is the economic driver of growth in the West Midlands, but recent economic growth in the city has been comparatively slow. The proportion of economically active adults living in the city is below the national average. Some of this is linked to skills gaps and to problems of poor health. Employment in Birmingham is expected to grow over the next ten years, mainly through increased demand for higher skilled jobs.
- Life expectancy in Birmingham is below the national average, with considerable variation between parts of the city. Infant mortality is a significant problem and is substantially above the national average.
- There are large variations in the quality of life across the city. Different neighbourhoods and different communities experience variations in health, jobs, educational achievement and levels of crime. Lack of neighbourhood renewal remains a significant problem for many people, with a clear impact on aspects of life such as children's achievement at school.
- 44% of residents are under 30 years of age (38% nationally)
- Almost 50% of under 5's are from a Black Minority Ethnic background
- Birmingham has more housing rented from a social landlord (i.e. the council and housing associations) (27% in Birmingham compared with 19% nationally)
- There are high unemployment rates (over 20%) in Aston, Washwood Heath, Lozells and East Handworth
- On the European Innovation Scorecard Stockholm has the highest score. Bristol outranks Birmingham which is second amongst English cities
- GDP per head. In Europe Frankfurt has the highest GDP (68,548 euros per head). Outside of UK cities (excluding London) Edinburgh has the highest GDP per head in the UK. Birmingham has the 6th highest GDP of UK cities other than London (just over 25,000 euros per head)
- Satisfaction levels with neighbourhood as a place to live vary greatly: it is 92% in Sparkbrook and 66% in Erdington

- Birmingham has 10% of the most deprived wards in the country
- In the local elections of May 2006 Birmingham had an unusually large number of people who voted for 'non-mainstream' political parties such as the British National Party, Respect and the Greens
- Employment in manufacturing is projected to keep falling, whereas jobs in the service sector are projected to grow
- Failure of new businesses has been falling but remains above the national average
- Life expectancy in the city is 77.8 years, which is one year below the national average
- Death rates are high in Birmingham – 730 deaths per 100,000 compared to 650 nationally for all ages
- 19% of all houses are council-owned (13% nationally)
- 57% of council housing stock needs modernisation to meet the decent homes standard – this is an improvement of 10% since March 2004
- 37% of private homes need modernisation
- 15,905 new homes are needed over the next 5 years (2006-11)
- 75% of streets met acceptable cleanliness standards
- Waste recycling has risen and the amount going to land fill is falling
- Traffic on roads in the major source of air pollution
- City Council water consumption has been falling over a long period of time, but started rising again slowly since 1998.

Housing tenure in Birmingham in 2001 (%)

| | Birmingham | England |
|---------------------------------|-------------------|----------------|
| Owner occupied | 60 | 69 |
| Rented from council | 19 | 13 |
| Rented from housing association | 8 | 6 |
| Rented from private landlord | 12 | 12 |

Source: Birmingham City Council (2006) Birmingham Community Strategy: Strategic Assessment; Birmingham City Council (2006) Birmingham Community Strategy: Strategic Assessment – A Snapshot.

Historical summary

Birmingham grew from a small Anglo-Saxon farming village into a major industrial and commercial village, and it was during the Industrial Revolution (from the mid-18th century onwards) that the city grew into a major industrial centre characterised by numerous small workshops rather than large factories or mills. In 1801 the city had a population of 73,670 but by 1901 this had risen to 522,204.

The city's large network of canals, constructed from the 1760s onwards to transport raw materials and finished goods, was one of the keys to industrial growth, as were the railways which arrived in Birmingham in 1837. Birmingham was granted city status in 1899 by the then monarch, and constructed its first University (University of Birmingham) in 1900. Birmingham suffered heavily in the blitz in world war two which led to extensive redevelopment during the 1950s and 1960s leading to a reputation for the city of architectural ugliness based on concrete and ring roads.

In recent years the city has been transformed once again, and the city centre has been extensively renovated and restored with the construction of new squares, restoration of old streets, buildings and canals, and the demolition and subsequent redevelopment of the Bull Ring shopping centre which now contains an architecturally unique department store.

Geographical summary

Birmingham is located on the *Birmingham Plateau* – an areas of relatively high ground ranging from 150-200 metres above sea level and crossed by Britain's main north-south

watershed between the basins of the Rivers Severn and Trent. These rivers have several tributaries including the Tame, Rea and Cole. The underlying geology in the south and east of the area is Keuper marl interspersed with Bunter pebbles, and to the north and west there is harder Keuper sandstone. The area has a cool temperate climate.

Economy summary

Although Birmingham grew to prominence as a manufacturing and engineering centre, its economy today is dominated by the service sector which in 2003 accounted for 78% of the city's economic output and 97% of its economic growth. The city's economy went through a major de-industrialisation transformation during the 20th century which made redevelopment of large areas of the city a major preoccupation, and one reinforced by the effects of the blitz in the second world war.

Birmingham is now an important financial and administrative centre. The city's central business district now has the largest concentration of administrative and private sector office-based employment in England outside of Central London. The city employs over 100,000 people in banking. Tourism has become an increasingly important part of the city's economy with major facilities such as the International Convention Centre and the National Exhibition Centre being located in Birmingham –accounting for 42% of the UK conference and exhibition trade. Birmingham city centre is the UK's second largest retail centre with an annual turnover of £3 billion euros.

Birmingham has a proud heritage of industrial innovation and invention, particularly that relating to the Industrial Revolution but focused upon a tradition of individual craftsmen. The largest manufacturers were associated with steam, electrical and petrol transport and power industries; and the production of trains, engines, motorcycles, bicycles, cars and ship components. Today scientific research is expanding in the city, including research into nanotechnology and sustainable water management at the University of Birmingham.

Politics summary

Birmingham City Council is the largest local authority in the UK. Following a reorganisation of boundaries in June 2004 the city has 120 councillors representing approximately one million people in 40 electoral wards.

After the election of 4 May 2006, there is no overall control, with the 120 seats being divided between the Labour (44 councillors), Conservative (41 councillors) and Liberal Democrat (33 councillors), with 2 others. There is a Conservative/Lib Dem coalition with a Conservative Group Leader of the Council and a Lib Dem Group Deputy Leader of the Council.

Birmingham has 11 parliamentary constituencies which are represented in the House of Commons by one Conservative, one Liberal Democrat and nine Labour Members of Parliament.

Birmingham is the seat of the Government Office for the West Midlands region.

Source: <http://en.wikipedia.org/wiki/Birmingham>

21 APPENDIX 2

Water resources in the West Midlands and Birmingham

Parts of the West Midlands are among the driest areas of England and Wales with annual rainfall totals in the Vale of Evesham (to the south-west of Birmingham) being less than 650 mms on average. In a typical year, the West Midlands receives around 750 mms of rainfall and Birmingham receives 700-750 mms. Much of the effective rainfall (that not taken up through trees and plants and lost through evaporation) occurs in the winter. The effective rainfall currently amounts to about 200 litres per head per day throughout the West Midlands. In a dry year problems arise in balancing supply and demand for water.

Currently surface water throughout the majority of the West Midlands is fully committed to existing abstraction and environment in the summer, and no significant further resources is reliably available. In some areas the licenced groundwater abstractions exceed the sustainable limit, potentially affecting rivers and wetlands. The Environment Agency is working with water companies and abstractors to restore sustainable abstraction in these areas.

The largest use of water is for public supply. Over 1400 litres per day are abstracted for this purpose in the West Midlands. Household use accounts for about half of this, and non-household about 30%. Industries additionally abstract around 230 Ml/d for their own direct use. Much of the water used for public supply and industry is treated and returned to the freshwater environment and is available for abstraction downstream, but it is returned some way from where it was abstracted.

Direct abstraction by farmers for spray irrigation amounts to an average daily abstraction of a further 80 Ml/d, and is mainly abstracted in the summer months when river flows are lowest. Peak day irrigation demands can exceed public supply demand heightening the impact of irrigation.

Water supplies in the West Midlands come from a range of sources. The area has a number of public water supply reservoirs including Tittesworth, Blithfield and Draycote. Additionally, the Elan Valley Reservoirs, located to the west of the West Midlands in mid-Wales, provide an important source of supplies to the region.

Many users abstract directly from the rivers including the Severn, Wye and Leam which are regulated to support public water supply abstractions. There are also many smaller storage reservoirs throughout the West Midlands. Groundwater is an important source of direct abstraction by farmers and industry, as well as for public water supply. A quarter of the region is underlain with aquifers.

The West Midlands public water supplies are provided by Severn Trent Water, South Staffordshire Water Company and Dwr Cymru and all have well integrated distribution networks.

- Source: West Midlands Regional Assembly (2006) A water resources strategy for the West Midlands. Published by the Environment Agency.

22 APPENDIX 3

Institutional history –Regional Government in England

The 'region', also known as Government Office Region, is currently the highest tier of local government sub-national entity of England in the United Kingdom. There are none such regions.

Creation of some form of provinces or region for England has been an intermittent theme of post-Second World War British governments. The Redcliffe-Maude Report proposed the creation of eight provinces in England which would see power devolved from central government. Prime Minister Edward Heath's administration in the 1970s did not create a regional structure in the Local Government Act 1972, waiting for the Royal Commission on the Constitution, after which government efforts were concentrated on a constitutional settlement in Scotland and Wales for the rest of the decade. In England the majority of the Commission suggested regional coordinating and advisory councils for England, consisting largely of indirectly elected representatives of local authorities and operating along the lines of the Welsh Advisory Council. A minority report led by Lord Crowther-Hunt and Alan Peacock suggested seven regional assemblies for the UK instead, with five in England.

In April 1994 the administration led by Prime Minister John Major created a set of ten Government Office Regions for England. This was a means of coordinating the various regional offices of central government departments which had become established but were slightly different in each region. Also the Maastricht Treaty encouraged creation of regional boundaries. Following the Labour Party's victory in the 1997 general election, Regional Development Agencies were created. In 1998 the ten regions were reduced to nine as Merseyside merged with North West England.

In 1998 regional assemblies were created in each of the nine English regions. The powers of the assemblies are limited, outside London, they are not directly elected. The functions of the English regions are essentially devolved to them by Government departments or have been taken over from pre-existing regional bodies such as regional planning conferences. Each of the nine regions has Government Office with some responsibility for industry, employment, training, agriculture, transport and the environment; including a Regional Development Agency. There are no regional elections, outside London. Local representatives on regional assemblies are nominated by the councils within each region and 30% of members represent regional stakeholders. The nine regions are also England's European Parliamentary constituencies.

Criticisms of the current regional structure include that the regions remove powers from other levels of local government (i.e. the counties and districts outside of London) or that as the regions of the EU they are unsuited to English needs for local governance. The geographical scope of the regions has been criticised with claims that they are too socio-economically diverse, and that the boundaries were set without consultation.

- Source: http://en.wikipedia.org/wiki/Regions_of_England

23 APPENDIX 4

Birmingham: Inventory of players, actors and stakeholders

Advantage West Midlands (1)

Development Trust Association for the West Midlands – seeking to lead to the development of economic prosperity. The Advantage Community Loan Fund provides loan finance for economically viable, community based organisations that are run as not-for-profit enterprises in the West Midlands region.

(www.advantagewm.co.uk)

Allotments UK Forum

A national website and network which promotes some water saving technologies e.g. water butts.

(www.allotments-uk.com/forum)

Aston Reinvestment Trust

A leading UK local community development finance institution raising funds from the private and public sectors to lend at commercial rates to small businesses and social enterprises.

(www.reinvest.co.uk)

Aston University (1 HE Sector)

Birmingham Association of Neighbourhood Forums (BANF) (1)

Birmingham and Solihull Social Economy Consortium

BSSEC is a practitioner-led network of agencies and enterprises involved in the social economy in Birmingham and Solihull. It is involved in creating a shared, strategic approach to the development and growth of the social economy.

(www.bssec.org.uk)

Birmingham Chamber of Commerce and Industry (1)

Provides networking, events, expert advice, specialist support, exhibitions, sponsorship opportunities, and a host of other products and services, for the business community.

(www.bci.org.uk)

Birmingham City Council (1)

(www.birmingham.gov.uk)

Birmingham College of Food, Tourism and Creative Studies (1 HE sector)

Birmingham Community Empowerment Network (1)

Govt funded programme designed to give communities in Birmingham a say in decisions that affect their area and strengthen their ability to take action to create better place to live.

(www.bcen.net)

Birmingham Cultural Consortium (1)

Birmingham Race Action Partnership (1)

BRAP aims to change institutional policy and practice around race equality through partnership working with MME communities.

Birmingham Strategic Partnership

The Local Strategic Partnership for Birmingham, and one of a network of such LSPs formed for each local authority in the country after introduction by the Government in 2000. Members are key stakeholders in Birmingham including key public agencies and the

representatives of business, community, voluntary and faith sectors. Leads the development of Birmingham City Council's Community Strategy.

Birmingham Voluntary Service Council (1)

An independent charity working with and on behalf of the voluntary and community organisations of Birmingham.

Brumcan

Set up in 1991 by CSV Environment and Friends of the Earth as a not for personal profit organisations and became a company limited by guarantee and a registered charity. Its aim are to advance education relating to the benefits and environmental improvement generated by recycling waste materials and generally to improve the physical environment of Birmingham and the surrounding area.

(www.brumcan.co.uk)

Centre of the Earth Project, Birmingham

This project aims to explore issues relating to the environment and the theme of citizenship; to broaden young people's awareness and understanding of issues in the local community and how they relate to the wider world; to develop core skills of communication and ICT as well as to build confidence and self-esteem. The project is a partnership between those young people needing a boost in confidence and self-esteem and those who are already well motivated and could offer support to their peers. The schools involved are situated in the multi-cultural inner city area of Handsworth, Birmingham which has many significant social, economic and environmental disadvantages. Commenced in October 2000.

(www.standards.dfes.gov.uk/studysupport/casestudies/centroearth)

Centro (1)

Centro promotes and develops public transport across the West Midland Metroplottian area.

Coalition of Disabled People: Birmingham

Birmingham Disabled People's Empowerment Network (BDPEN) is a new network organisation that aims to bring together all disabled people and disabled people's groups and organisations in Birmingham.

(www.bcen.net/codpb/index.php?module etc.)

Co-Enterprise

Based in Digbeth, Birmingham, provides free business advice and support to community groups and individuals wanting to develop business ideas into sustainable social enterprises.

(www.coenterprise.co.uk)

Conservative Group of Birmingham City councillors

Currently comprises 41 councillors led by the Leader of the Council: Mike Whitby

Eastern Birmingham Primary Care Trust (1 PCT sector)

Edgbaston Community Network

Community networks such as this exist to encourage community members to get more involved in local decision-making and to make their neighbourhoods a better place

Environment Agency West Midlands Region

Government Office for the West Midlands (1)

Coordinates the work of Government departments at the regional level and with local partners.

Groundwork Birmingham and Solihull

A charity which was established as an effective force for change in Birmingham in 1994. Works in partnership with local people and businesses to build sustainable communities through joint environmental action. Part of a nationwide network of Trusts.

(www.groundwork-birmingham.org.uk)

Heart of Birmingham Primary Care Trust (1 PCT sector)

Kanjans

Kanjans is a community organisation (Kanjans Women's Enterprise Ltd) based in Birmingham. Kanjans designs services and programmes for the needs of the local area. Provides mainstream education, training and capacity building for the voluntary and community sectors with a strong specialism in the arts, education and cultural areas. (www.nearbuyou.co.uk)

Jericho Community Business

Located in Balsall Heath. Promotes and helps social enterprise to develop. (www.jcp.org.uk)

Jobcentre Plus (1)

Part of the Department of Work and Pensions.

Labour Group of Birmingham City councillors

Currently comprises 44 councillors led by Councillor Sir Albert Bore

Learning & Skills Council, Birmingham and Solihull (1)

Liberal Democrat Group of Birmingham City councillors

Currently comprises 33 councillors led by Councillor Paul Tilsey

Members of Parliament (MPs) for Birmingham

There are currently 11 MPs representing constituencies in Birmingham.

Members of the European Parliament for the West Midlands

There are currently seven seats and seat holders.

Newman College (1 HE sector)

North Birmingham Primary Care Trust (1 PCT sector)

NBPCT aims to commission and provide locally sensitive primary care services. (www.northbirminghampct.nhs.uk)

Severn-Trent Plc

A company serving 3.7 million households and business customers across England and providing purification, operating and testing services in the UK and overseas (www2.severntrent.com)

Severn Trent Water

A major water and sewerage company serving Birmingham and the Midlands. (www.stwater.co.uk)

Small Business Service

The SBS is an agency of the Department of Trade and Industry. Its aim is for the UK to be the best place in the world to start and grow a business. (www.businesslink.gov.uk/)

Smallheath Community Forum

Birmingham City Council is developing the concept of 'Learning Labs' to stimulate innovation throughout its operations. These 'labs' are designed to bring together groups of people pursuing a common purpose or problem. The Smallheath Community Forum brings together interests with a stake in the regeneration of the city, and it is constituted as a company limited by guarantee with charitable status. The agenda has included environmental issues such as fly tipping, car repair premises, and retailer's rubbish, but also issues such as security and crime, leisure needs, and access to training especially for women. (www.lqpartnerships.com/resources/smallheath.asp)
(Contact: Dilbagh.dhami@birmingham.gov.uk)

South Birmingham Primary Care Trust (1 PCT sector)

SBPCT is one of the largest PCTs in the country commissioning primary care services for 383,000 people.

(www.southbirminghampct.nhs.uk)

South Staffordshire Water Company

A major water supply company providing water supplies for Birmingham.

(www.south-staffs-water.co.uk)

St Basils (1)

One of the largest agencies in the UK working with young people at risk from homelessness or actually homeless.

The Digbeth Trust

Located in the historic Digbeth area of Birmingham. The Trust is a source of development funding and support for grass roots voluntary and community organisations seeking to develop community facilities and services. Helps voluntary and community organisations (VCOs) in Birmingham and surrounding areas.

(www.digbethtrust.org.uk)

The Colebridge Trust

An independent, not-for-profit social enterprise company established and managed by local people with the support of Solihull Council and other local voluntary and community organisations

(www.colebridge.net)

The Diocese of Birmingham

(www.birmingham.anglican.org)

University of Birmingham (1 HE sector)**University of Central England (1 HE Sector)****UnLtd**

Organisation for supporting and funding social enterprise in Birmingham.

(www.unltdideasbank.org.uk)

West Midlands Police (1)**Notes**

(1) denotes membership of the Board of Birmingham Strategic Partnership

(1 HE sector) means that there is one representative for the 5 HE sector institutions on the BSP Board

(1 PCT sector) means that there is one representative for the 4 PCTs on the BSP Board

References

Birmingham City Council (2006) Birmingham Community Strategy: Strategic Assessment and Strategic Assessment Snapshot

Cherry, G (1994) Birmingham A Study in Geography, History and Planning, ISBN 0-471-94900-0

www.bhamsp.org.uk