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Vital environmental information at your fingertips?

Dieter Zinnbauer

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UK and German e-government strategies under scrutiny

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**Anglo-German Foundation
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VITAL ENVIRONMENTAL INFORMATION AT YOUR FINGERTIPS?

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Executive summary

This paper is a report on the findings of an exploratory research project examining the accessibility of data on the quality of the local environment, such as water and air quality, via the Internet and how these efforts are integrated into e-government initiatives in the UK and Germany. Environmental information disclosure is increasingly regarded as a promising regulatory innovation. Being able to access real-time information about drinking water quality or air pollution in one's neighbourhood can assist citizens in critical heath and lifestyle choices for themselves and their families. What's more, being able to evaluate how pollution levels have changed over time or how they compare to other neighbourhoods can have an enormous impact on political choices and environmental accountability. Key to all this is the ability to find the data that matter and to gain easy access to them in timely fashion; new information and communication technologies, particularly the Internet, appear to provide ideal tools to support this process and dramatically enhance the efficacy of such environmental information systems.

This exploratory study represents a first step in assessing the status quo as regards electronic access to environmental quality indicators in both the UK and Germany, using two neighbourhoods in Berlin and London as case studies. Despite the promise of the Internet and engaged strategies for electronic government in both countries, the study found a mixed performance with regard to both water and air quality indicators. While some data are available online, they are typically very difficult to locate, insufficiently contextualized, poorly coordinated across different levels of government and presented in ways that make them difficult to use in effectively holding environmental policy-makers and service providers to account.

The Berlin and London cases also show that a number of very innovative techniques and approaches are being experimented with, albeit in a very fragmented manner. Overall, the provision of environmental data online could benefit enormously from a greater readiness on the part of e-government practitioners to cede control over information presentation by also providing access to the raw data sets which users could then process and manipulate according to their own needs.

1 Introduction: Why electronic government for environmental accountability?

1.1 An innovative instrument in the toolbox of environmental policy-making

Imagine a category of information that is not only vital for the purpose of holding your political representatives to account and for evaluating the performance of your local administration, but is also fundamentally important for individual choices with regard to health and well-being. Environmental quality indicators (EQIs) constitute such a category.

EQIs play a central role in fundamental individual health choices. Reliable information about the quality and composition of the local drinking water, for example, is essential not only for people suffering from certain allergies or nutritional deficiencies, but for any family wondering how best to use tap water in their diet. Timely information on ozone levels or pollution spikes helps asthmatics and athletes alike to schedule their daily activities.

In addition to making vital choices about health and lifestyles more informed, EQIs can also represent a significant step forward in the political accountability of environmental service providers and policy-makers. With their focus on tangible performance *outcomes* EQIs go beyond conventional dimensions of transparent governance, such as disclosure of budgetary and decision-making information, which tend to be process- or input-oriented. EQIs can help people to evaluate the environmental performance of local industries and service providers, the degree to which local environmental targets are being met or the distribution of environmental risks and thus the differential impact of environmental policy-making on different neighbourhoods or socio-economic groups.

Being able to compare and track these quality indicators across political districts can invigorate political competition, stimulate political engagement and help people to better understand local policy trade-offs and priorities. With these benefits EQIs are widely celebrated as part of a promising new generation of information-based regulatory instruments that operate on the basis of both political and consumer choices. In this context EQIs can be ideal complements or even more flexible and effective substitutes for other forms of regulation via market prices and direct regulatory intervention (Graham 2001).

1.2   A promising start

These democratic aspirations associated with EQIs are far from utopian. Emerging experience with EQI disclosure programmes forcefully underscores the possible practical benefits. The success of existing environmental information disclosure has been spectacular. In 1986, the USA established a Toxics Release Inventory with mandatory reporting of toxic industrial emissions, with all data being made publicly available online. Between 1988 and 1997 this helped to reduce the atmospheric emissions of some 260 known carcinogens included in the registry, by more than 85% in California and by 42% across the USA (Sand 2002). A World Bank pilot project on environmental information disclosure in China, Thailand and Indonesia also reports very positive results, contributing to the growing consensus among public policy experts that information disclosure and ensuing public pressure can often be a superior alternative to conventional command and control regulations (Wang et al. 2002).

The widespread enthusiasm about access to information as an instrument for environmental policy-making is also enshrined in a variety of international legal frameworks and conventions to which both the UK and Germany have signed up. Several EU Directives lay down standards for access to environmental information in member states, most directly EU Directive No. 313 of 1990 on Freedom of Access to Information on the Environment. The 1992 UN Earth Summit recognizes in the Rio Declaration of Principles the need "to ensure access, at the national level, to environmental information" as one of the core principles of environmental justice. Some concrete provisions are laid down in the 1998 UNECE Aarhus Convention on public access to environmental information, of which both the UK and Germany are signatory states. Finally, a commitment to deploy new ICTs for environmental objectives was articulated in the UN World Summit of the Information Society (WSIS) Action Plan of 2003, which encourages "Governments, in cooperation with other stakeholders … to use and promote ICTs as an instrument for environmental protection and the sustainable use of natural resources" (WSIS Action Plan).

1.3   Tackling the delivery problem: enter the Internet...

Until quite recently the main obstacle to unlocking the full potential of EQIs appeared to be technical. How can vast amounts of frequently updated information be made available to individual users, in an easy-to-use, easy-to-customize format? How can citizens be empowered to gain access to these types of information wherever and whenever they need them? How can non-expert individuals be enabled to figure out whether the drinking water in their pipes is safe for little children, whether jogging through the neighbourhood at 6.30pm means inhaling high doses of pollutants, whether local government is on course with its environmental targets and whether environmental quality is better or worse in other neighbourhoods?

The new information and communication technologies (ICTs) seem to provide the perfect tools for tackling the problems involved in making EQIs accessible and actionable. The Internet, in particular, offers unprecedented capabilities for collecting, recombining,

sharing, broadcasting and visualizing large databases. What's more, the Net can offer many of these data-processing opportunities in a distributed manner, meaning that they can be performed at the periphery of the network by end-users. Provided that the data are made available in a format that is compatible with common desktop software applications, the options for the user to pick and choose information and process it according to their own needs are infinite. All this bodes well for making EQIs more accessible and useful for a wider public. In short, the Internet appears to be tailor-made for EQI access, and ready to take environmental accountability and informed individual health choices to a new level.

Furthermore, many countries, including the UK and Germany, have committed themselves very strongly to harnessing the new ICTs for updating and enhancing governance processes, an application that is usually referred to as electronic government (e-government). The normative paradigm that underpins these e-government efforts is often characterized as the creation of more people-centred government, an ambition that appears to dovetail perfectly with the benefits that widespread access to environmental quality indicators promises.

The widespread enthusiasm about the potential benefits of electronic government is also reflected in the scale and scope of related initiatives. Both the UK and Germany have begun to roll-out extremely ambitious and wide-ranging e-government initiatives and have set aside considerable funds for this purpose. The German government launched a comprehensive e-government action plan, Bund Online, to bring more than 100 federal agencies online by the end of 2005, with an overall investment of EUR 1.65 billion. In the UK, the Blair government committed a total of GBP 1 billion for an even more ambitious initiative to make all government services accessible online by 2005 (Booz, Allen and Hamilton 2002).

Taken together, all this suggests that electronic access to environmental information should be a major area of activity and an integral part of the sweeping e-government initiatives that the UK and Germany are implementing. The following empirical investigation will provide a first step in assessing the extent to which this is really the case.

2   The research design

It is beyond the scope of this exploratory investigation to comprehensively map the current state of electronic access to environmental information in the UK and Germany. Instead, the study confines itself to two major categories of environmental information: air and drinking-water quality. The current state of online availability for these two categories in the UK and Germany will be explored in user-centric fashion by picking two neighbourhoods, one in Berlin and one in London, and carrying out an online search for relevant information. More specifically, the set of questions that each hypothetical household will try to research online are:

- How good is the drinking water in my neighbourhood?
- How bad is the air pollution in my neighbourhood?
- If I can find these environmental quality indicators online, what do the data mean? What are the implications for my health? Are legal limits being exceeded? Are environmental targets being met? How does my neighbourhood compare with others? Have things got better or worse over time?

Performance will be evaluated in view of the twin aspirations of environmental data provision online to (i) support individual health choices and (ii) enhance environmental accountability. The resulting evaluation framework will consider criteria in the following categories:

- **Data scope** (includes the range of pollutants and quality parameters that are measured, as well as the granularity of the monitoring network. The latter determines how relevant the measured data can be to the local environment of the particular household).
- **Data context** (includes questions about how intelligible and easy-to-interpret the data are: are plain-language explanations provided on how the data are measured and what the measured results mean for health risks; is it possible to see whether legal limits and thresholds are being exceeded?)
- **Data presentation** (includes criteria on how the data are visualized, how they can be searched and how easy it is to download them in raw format and process, recombine and analyse them with standard software tools).
- **Timeliness** (includes the time-lag between measurement and data availability, as well as the frequency of reporting and measurements).
- **Data trends** (includes criteria on how easy or difficult it is to examine data trends over time and compare quality and trends with the situation in other neighbourhoods).

It is important to note that these criteria shape the overall performance in multiplicative rather than additive fashion. The effective relevance of the presented information is codetermined by all these criteria. An excellent performance in one of the categories mentioned above is rendered almost useless if performance in another category lags behind too far. For example, an extensive monitoring network and detailed information provision is not of much use if the data are made available only with a two-year time lag.

Similarly, an engaging and easy-to-understand visual presentation of a data series is of limited utility if it is not possible to select and display the same data series for a neighbouring community and display it alongside for easy comparison.

The overall analytical framework provided by these two types of environmental quality indicator and the guiding criteria for assessing them cover categories of environmental data that are central to both individual health concerns and environmental accountability. In addition, the framework focuses on the meaning and context of the data, rather than on simple availability and it emphasizes the ability to compare performance, assess goal achievement and attribute responsibility, all of which are preconditions for generating and fine-tuning political accountability in respect of environmental performance.

A user-centric approach that simulates an information search as undertaken by a normal household, rather than by an Internet or environmental expert, also makes it possible to consider issues of visibility and user-friendliness, regarded as major challenges in the context of the digital information inundation that the Internet has unleashed.

The two local neighbourhoods chosen are Berlin Mitte, Germany (post code 10115) and Tower Hamlets, London, UK (post code E2 7HJ). Both are areas in which the principal investigator has lived. This means that the simulated information search is based on comparable and in both cases average (non-expert) prior knowledge about the administrative structures and environmental responsibilities that can be expected to be in place for each community. The local and national official e-government portals for both countries and communities were selected as the most plausible starting points for an information search by such an average household. For the German household these portals are www.bund.de (national) and www.berlin.de (local). For the London household they are www.direct.gov.uk (national) and www.london.gov.uk (London). All four portals are widely promoted and even a household with only average Internet skills and limited interaction with its local authorities is likely to have been exposed to some kind of promotional material and become aware of them.

The simulated online search was carried out between May and August 2005. In order to complement the desk research and the online search simulation, several short interviews with e-government practitioners and policy-makers in the UK and Germany were conducted, both in person and by e-mail during the same time period.

3 Research findings: how polluted is my local environment?

3.1 "Wie gut ist mein Trinkwasser in Berlin-Mitte?"

3.1.1 Who monitors what? Interlocking responsibilities of local, state and federal authorities

Since 1975 Germany has been systematically monitoring, recording and centrally consolidating data on drinking water quality in the so-called BIBIDAT database. The database contains information on 50 different chemical and biological parameters that are measured at more than 10,000 water production plants, amounting to a total of 2 million items of information, 200,000 of which are updated annually.

The database is hosted by the Federal Environment Agency (Umweltbundesamt – UBA). It runs on a WINDOWS NT platform and uses ACCESS and Regiograph data formats, both of which are standard formats that can be processed by a wide range of popular software applications, at least in the Windows environment.

The legal basis for collecting and reporting statistics on drinking water quality is provided by the EU Directive on Drinking Water (98/83/EU), the Federal Law on Environmental Data Collection (Umweltstatistikgesetz) and the Federal Drinking Water Ordinance of 2001. These legal frameworks constitute a right for every German citizen to obtain information on the quality of their drinking water from the local health authorities and/or the local drinking water provider.

Unfortunately, the public does not enjoy direct access to BIBIDAT data at federal level. Authorized data users are the Federal UBA, the Federal Ministry of the Environment, as well as related agencies at state and European levels. The main reason for the lack of public access to the data at consolidated federal level was given by a representative of the UBA: besides some general reporting requirements, the ownership of comprehensive data on drinking water quality lies with the state, not the federal authorities. This results in the co-existence of very different approaches to data collection, storage methods and processing across German states. The ensuing patchwork is further intensified by the fact that local health authorities, as the bodies responsible for monitoring drinking water at local level, are no longer directly subordinate to the environmental ministry of the respective state, but now report to the local authorities, thereby further localizing the provision of information on drinking water quality. As a result, the most likely point of reference for getting information on drinking water quality should be the local environmental authorities and/or the local water provider.

3.1.2 Locating the relevant information: a winding click-path with many dead-ends

To illustrate the difficulties involved in locating the relevant information we shall describe the user experience in some detail.

Of course, it would be unrealistic to expect our household in Berlin Mitte to be knowledgeable about all the administrative intricacies and distribution of competencies that pertain to reporting on water quality, as outlined above. Equipped with a vague notion of how to access government information, the household consults the main portal of the federal government (www.bund-online.de). From there, the most obvious reference to environmental information leads to the Federal Ministry for the Environment. This site offers a theme called *environmental information* and after a bit more navigation through several sub-levels with quite intuitive headings the visitor arrives at an *Environmental Data Catalogue* (Umweltdatenkatalog), a comprehensive repository of environmental data sources and providers with a very versatile search mask that also allows searches by geographic region. A query on drinking water data in this catalogue yields links to a detailed description of two databases, including the abovementioned BIBIDAT. However, no direct access to these data-holdings is provided. A curt note explains that the database is for official use only and cannot be publicly accessed. Only a contact e-mail for a representative of the UBA, the agency in charge of the database, is provided. Upon contact the official confirms that the data repository is not open to the public. No further links to other data-holdings are provided by the catalogue. After considerable time spent wandering around deep inside this comprehensive system of websites, the search ends in a dead-end.

A second attempt to locate the information starts with the portal of the local authorities (www.berlin.de). Again, following the most intuitive links through a number of related themes and sub-themes the browsing ends in a dead-end with no data on water quality obtained and also no practical links or information provided on where to get this type of information. After this second trail has gone cold after quite a lot of clicking and reading, impatient users might be prepared to give up and decide that there is no relevant information available online. However, one last try, a keyword search for drinking water conducted via the built-in search facility at the local government website yields a direct link to *Berlin Waterworks* (http://www.bwb.de/). Two intuitive links further and the user is presented with a map of Berlin and a very versatile search interface for locating the water supplier for a particular neighbourhood and accessing the data it monitors and reports on water quality parameters in the relevant neighbourhood.

3.1.3 Online data scope, timeliness, context and presentation: little emphasis on context and comparability

The data made available online by the local waterworks include an overview map of the measured values for a handful of major water quality parameters. A click on the closest waterworks leads to an information sheet with values of almost 50 organic and inorganic substances, as well as other water quality parameters. In terms of explanatory annotations the user finds the precise scientific names of the measured substances and indicators, as well as the legal limits for each pollutant.

Figure 1 shows how the information is presented online.

One major shortcoming is that the data are not embedded in any kind of relevant background information, for example on which pollutants are most dangerous, how they relate to specific health risks and what this means for consumption by children, and so on.

Unfortunately, the data are not available in real-time. In July 2005 the latest accessible water quality indicators were for 2004. Similarly, the overview results for a handful of
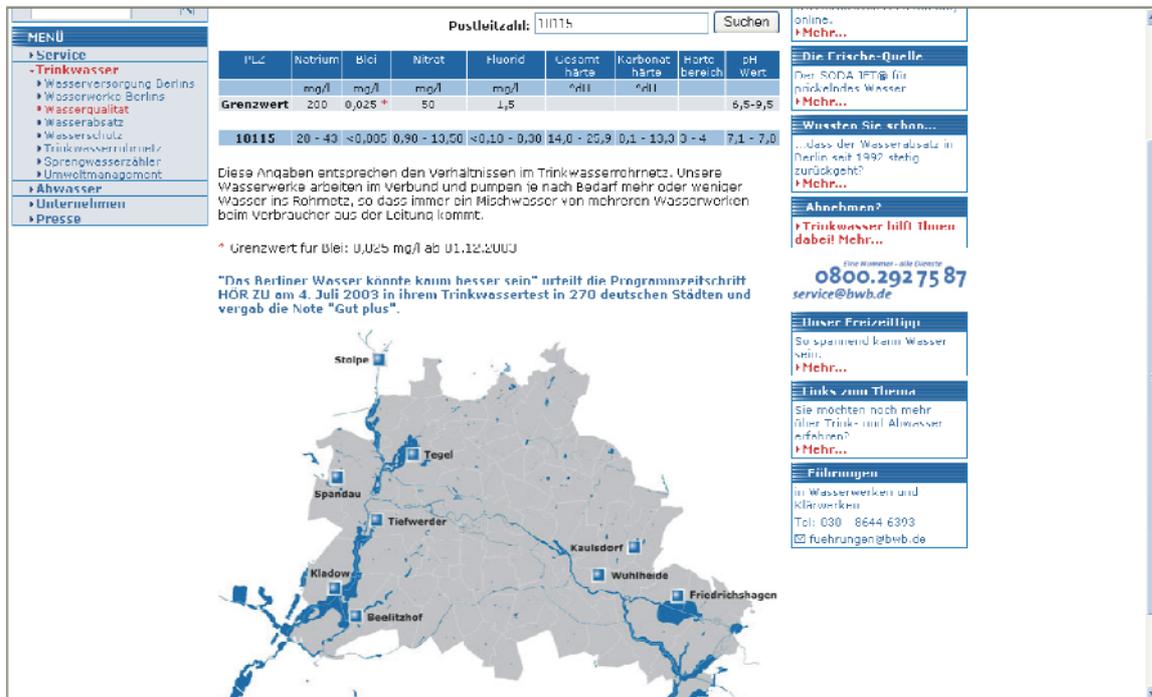
Figure 1
Water quality in Berlin-Mitte

major quality indicators as shown in Figure 1 above do not come with any information about when these values were measured. This one-year time-lag seems acceptable for purposes of the ex-post accountability of the performance of the water supplier, but it is not suitable for providing guidance on how to adjust current water consumption in case of pollution spikes or even longer-term, more structural pollution problems.

The search capabilities that are provided for the database are very good. The relevant waterworks can be located via a clickable map of the city or a search by post-code. Unfortunately, however, the presentation of the data is very basic. Data are presented in online tables only. No graphs or other visual aides are used and no raw data are provided for downloading and analysis by the user. Similarly, no time series of data trends are available and comparing parameters across waterworks is extremely difficult and needs to be done manually. A plus feature of the data presentation is that at least the legal limits are presented alongside the measured data for some basic environmental accountability.

3.2 The UK situation: How good is my drinking water in London Tower Hamlets?

3.2.1 What data are collected and by whom? Regulatory oversight for a privatized sector

In the UK, responsibility for regulating and monitoring drinking water in England and Wales falls to the *Drinking Water Inspectorate* (DWI), which was set up in 1990 as an independent body to oversee drinking water quality after the privatization of the water

industry in the late 1980s. Again, the EU Drinking Water Directive of 1998 and subsequent amendments are considered a major driving force in establishing more stringent reporting and monitoring requirements and expanding the legal standards set by the UK Government.

3.2.2   Locating the relevant information: a tedious journey

Our average household in London Tower Hamlets starts its online search with the main UK e-government portal for citizen's services: www.direct.gov.uk. Following a series of quite intuitive links to a subsection of the website the user arrives at the main UK portal for different types of environmental information, called *What's in Your Backyard* (http://www.environment-agency.gov.uk/maps/). This portal, which is hosted by the Environment Agency, is exemplary in its ambition to provide a one-stop shop for local information on different environmental quality parameters. A search by postcode leads to a wealth of information on water quality for rivers and drinking water management zones, but unfortunately does not yield data on drinking water quality for the London neighbourhood. What's more, in several attempts to query the site, the search by postcode proved somewhat erratic, producing results list with several dead links or temporarily unavailable websites.

However, as it turns out, a persistent visitor who climbs back up from the *What's in Your Backyard* platform to the top-level homepage of the Environment Agency (EA) is eventually more successful. A simple search for drinking water at the EA homepage offers a link to the DWI's website as top search result. Here, a link named *Water Quality in Your Area* leads to a clickable map of England and Wales that shows the operating areas for the 26 water suppliers in the UK. A click on Thames Water Works, the supplier for East London, leads to an excerpt from the DWI's annual report on *Drinking Water for England, 2004*. This is the most relevant online information source on local drinking water quality that could be located for the London neighbourhood. The information provided via this website is described in more detail in the next subsection.

A second attempt to locate the information through a search that starts at the local level at the portal website of the Greater London Authority (http://www.london.gov.uk/gla) produced some general background information but no useful results. Similarly, following a link on water quality at the official e-government website of Tower Hamlets (www.towerhamlets.gov.uk) leads only to an e-mail contact address, but does not provide any links to data.

3.2.3   Online data scope, timeliness, context and presentation: comparability and cognition as persistent issues

The DWI annual report on drinking water quality, to which the search via the national government portal eventually led, presents not only the reported values of more than 50 water quality parameters, alongside their legal limits, but also the number of tests and failed tests and information on the distribution of test results (the values for the 1%ile and 99%ile).

Figure 2 shows how the data are presented online.

In contrast to the wealth of background information on water issues on the *What's in Your Backyard* portal, there is no further explanation of the test results, rendering the

Parameter	Prescribed Concentration or Value	Total number of tests	Tests failed	1%ile	99%ile	No. of zones with failures
1,2 Dichloroethane	3 µg/l	2062	0	<0.1	<0.1	0
Antimony	5 µg Sb/l	1901	2	<0.5	2.2	2
Arsenic	10 µg As/l	1902	0	<0.8	1.6	0
Benzene	1 µg/l	2057	0	<0.1	<0.1	0
Benzo(a)pyrene	0.01 µg/l	2168	0	<0.001	<0.001	0
Boron	1 mg B/l	1896	0	<0.07	0.134	0
Bromate	10 µg BrO$_3$/l	158	0	<0.6	4.3	0
Cadmium	5 µg Cd/l	1901	0	<0.5	<0.5	0
Chromium	50 µg Cr/l	1902	0	<5	16.97	0
Copper	2 mg Cu/l	1906	0	<0.002	0.388	0
Cyanide	50 µg CN/l	13	0	<2	<5	0
Escherichia coli	0/100 ml	20991	14	0	0	14
Enterococci	0/100 ml	2060	6	0	0	6
Fluoride	1.5 mg F/l	2078	0	0.066	0.626	0
Lead	25 µg Pb/l	11145	64	<0.5	19.7	51
Mercury	1 µg Hg/l	13	0	<0.05	<0.05	0
Nickel	20 µg Ni/l	1908	0	<2	6	0

Figure 2
Water quality as presented online by Thames Water Utilities (excerpt)

data quite difficult to interpret for the "unordained" user. Equally disappointing, the data are presented only as online tables in PDF format, making extraction for further analysis quite tedious.

This also means that comparative data sets, both as time-series and as comparisons with neighbouring communities supplied by other water companies, are extremely difficult to construct. Back issues of annual drinking water reports are available until 1999 but the PDF format makes comparison a time-consuming affair of manual copying and pasting.

3.3 Air quality: the German situation: Wie hoch ist die Luftverschmutzung in Berlin-Mitte?

3.3.1 What data are collected and by whom? Stronger federal oversight

When it comes to air pollution the federal government retains stronger legislative competencies vis-à-vis the German states or local authorities than is the case with drinking water quality. Detailed legal provisions, including monitoring and reporting

requirements, are provided by federal laws and ordinances. The Environment Agency (UBA) maintains its own monitoring network across the country, which complements similar initiatives in all the German states. Data from both the federal and the state monitoring systems are consolidated by the UBA.

3.3.2   Locating the relevant information: meandering paths

Locating online data on local air quality with the help of the main federal government portal is far from easy. No direct link or useful reference seems to exist. Only users who find their way more or less independently to the Umweltbundesamt and its website (Environment Agency) are put on the right track. From this site a prominent link leads directly to a major portal on air pollution data from federal and state-level monitoring networks.

Interestingly, when starting the information search at the local, as compared to the federal government level, a visitor ends up with a different entry point and a very different user interface to state-level data. But getting there is not easy. It requires knowing or guessing that the Administration for City Development (Senatsverwaltung für Stadtentwicklung) provides online access to the Berlin-wide air quality monitoring network, a navigational choice that is not particularly intuitive. Data presentation and scope on the federal and municipal sites differ from each other somewhat (see below) and only the federal database links also to the city-wide network, not vice versa. As a consequence, depending on whether our household starts its search at the local or the federal level it will use different information interfaces and differently presented information when examining air quality in the neighbourhood.

3.3.3   Online data scope, timeliness, context and presentation: a solid start

The federal portal on air pollution provides information on five main pollutants (O_3, SO_2, CO, NO_2 and $PM10$) from 68 monitoring points for the wider metropolitan area of Berlin. Lists of links to background information on monitored pollutants are provided, but an accessible concise introduction to each group of pollutants is lacking. The possibilities for searching, sorting and displaying the data are very comprehensive. Clickable overview maps and search builders with dropdown menus make it very easy to put together customized searches. Data outputs in the form of graphs clearly display the development of pollution levels in reference to legal limits. Time-series with different timeframes and measuring intervals can be chosen. In conjunction with update cycles that range from daily to hourly, depending on monitoring point and pollutant, this provides a household in Berlin with a fairly good picture of the current levels of air pollution and their development over time in the neighbourhood. Figure 3 shows the main search interface for accessing data on air pollution in Germany, while Figure 4 shows some of the data that can be retrieved through the municipal information network.

The versatile data presentation also helps the user to understand how these local pollution patterns typically vary over the course of a day, thereby enabling the household to shift daily activities around in order to limit exposure. Apart from a coarse overview map that colour-codes geographic regions according to different pollution levels, the measured values from different monitoring points are difficult to view alongside each other, limiting the options for direct comparison of pollution across different neighbourhoods. However, all retrieved information is downloadable as *.csv* data. This is
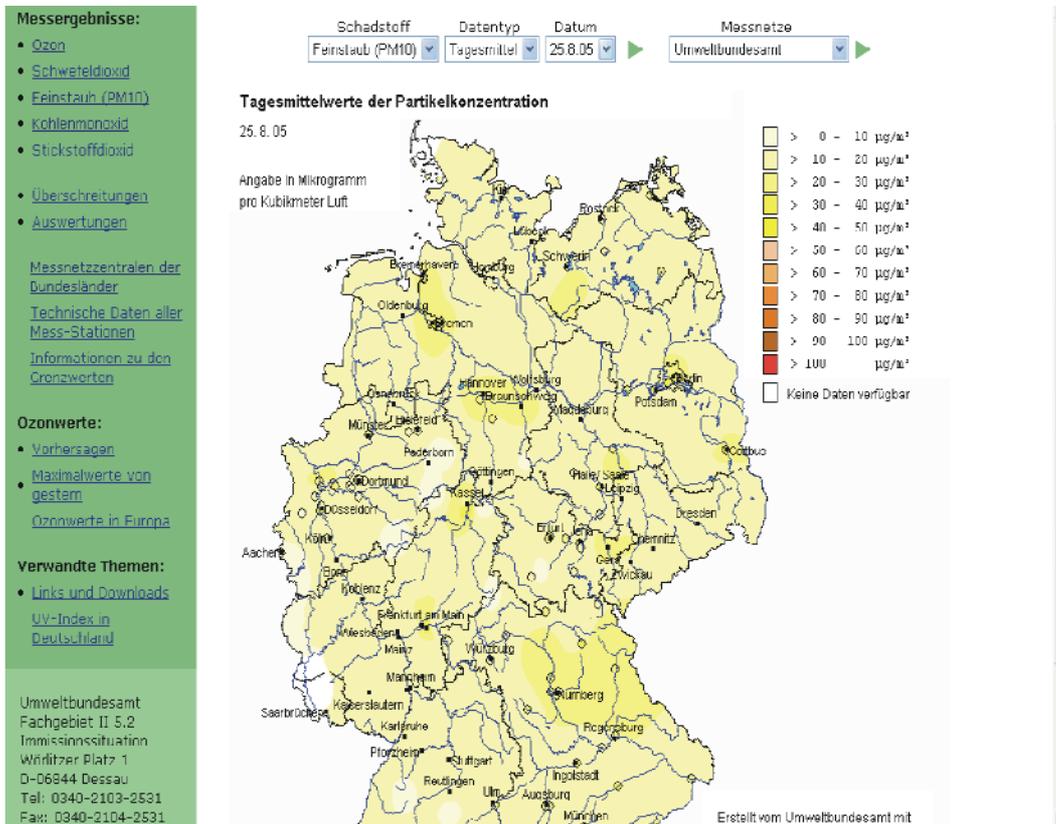
Figure 3
Selecting data series on air pollution for Germany (excerpt)

Figure 4
Air quality data for Berlin: municipal network

exemplary and greatly increases the usefulness of the information provided, since the *.csv* format is readable by almost all database applications and thus empowers individual users to recombine the data and subject them to further processing and analysis of their choice.

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The information provided through the municipal network is similar in scope, but offers fewer options for querying the data and, unfortunately, no link to the slightly more versatile and powerful federal online site.

3.4 Air quality: the UK situation: How bad is the air pollution in London Tower Hamlets?

3.4.1 What data are collected and by whom?

In the UK, air quality is measured by a network of more than 1,500 monitoring points operated on behalf of the Department for Environment, Food & Rural Affairs and the Devolved Local Administrations (DEFRA). For the purpose of monitoring, the UK has been divided into 16 zones and 16 urban agglomerations. A website maintained for DEFRA serves as portal on air quality information in the UK and provides an entry point to all data streams recorded in these 32 regional clusters. For London the Environmental Research Group at King's College carries out data collection across the capital through an initiative called the London Air Quality Monitoring Network. The legal and policy frameworks for monitoring ambient air quality are provided by the EU Air Quality Directive of 1996 and subsequent amendments and were transposed into national law in 2001.

3.4.2 Locating the relevant information

The visibility of the national portal on air quality information is quite good. Starting from Directgov (www.direct.gov.uk), a user in search of information on air pollution quickly arrives via some intuitive links again at the *What's in Your Backyard* site maintained by the Environment Agency. From there a link to the Air Quality Page of DEFRA eventually leads to the National Air Quality Information Archive, the main entry point to the data collected in the UK's 32 regional air monitoring clusters. A clickable map helps zoom in on the monitoring points that are closest to our household in London Tower Hamlets.

In contrast to this relatively easy and intuitive search, locating information on air quality via local government websites is more difficult. The Greater London Authority website provides information only on strategic policy initiatives with regard to air quality but contains no further links to any monitoring data. Starting directly at the website of Tower Hamlets leads to better results. Via the three intuitive links of *Environment, Pollution Control* and finally *Air Quality* it leads to the London Air Quality Network run by the Environmental Research Group of King's College, the main local entry point to air quality data for London.

3.4.3 Online data scope, timeliness, context and presentation: some exemplary ideas

On the website of the London Air Quality Network the closest monitoring point to our household provides data for NO2, SO2 and PM10. Apart from this narrow focus on only three major pollutants for this particular monitoring point, the London Air Quality Network is in many respects exemplary in its use of the Internet for data visualization and communication. The search mask is very versatile. For Tower Hamlets a comfortable search by postcode or via a clickable map yields three monitoring points in the vicinity of the
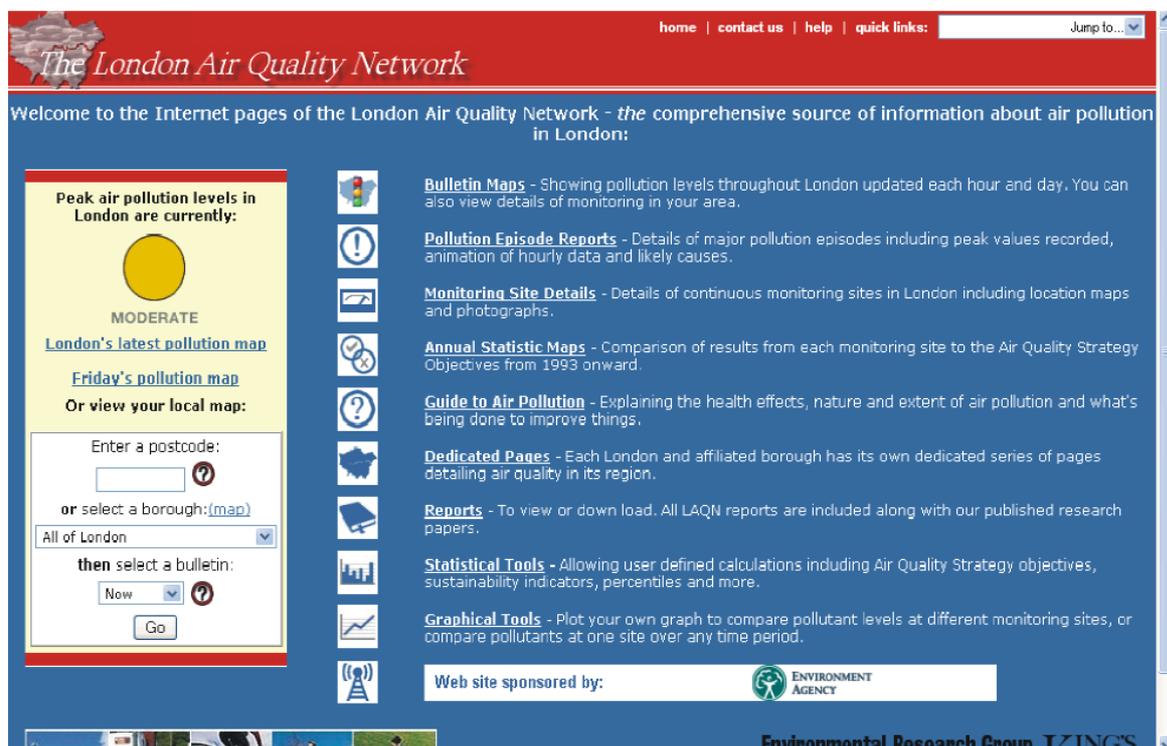
Figure 5
London Air Quality Network: main interface

household. Update cycles range from hourly measurements to daily reports and summaries are provided for weekly and annual trends.

Figure 5 shows the main user interface for the London Air Quality Network

Performance comparison and evaluation is made easy through several features. A colour-coded rating system provides a quick overview of pollution hotspots across the city. Users can also build their own comparative queries across different monitoring points and thus view data from different neighbourhoods alongside each other. Another very innovative functionality is the ability to search the data according to so-called pollution episodes, with catchy labels – for example, Smog June 2005 – allowing visitors to link news stories about environmental events to concrete data profiles as reported by the monitoring network.

Figure 6 shows how the data are presented for the closest monitoring point in London E2 7HJ.

A very useful feature for boosting environmental accountability is a direct link from the measured data to related environmental policy aims as outlined in the government's clean air strategy. The London Air Quality Network also provides a number of online statistical tools for visitors to carry out their own analysis.

The only major shortcoming of the site is that data output is provided only in the form of online tables and graphs. Data cannot be downloaded in raw format, which would give the user full control over data processing and further analysis. The latter is a strength of
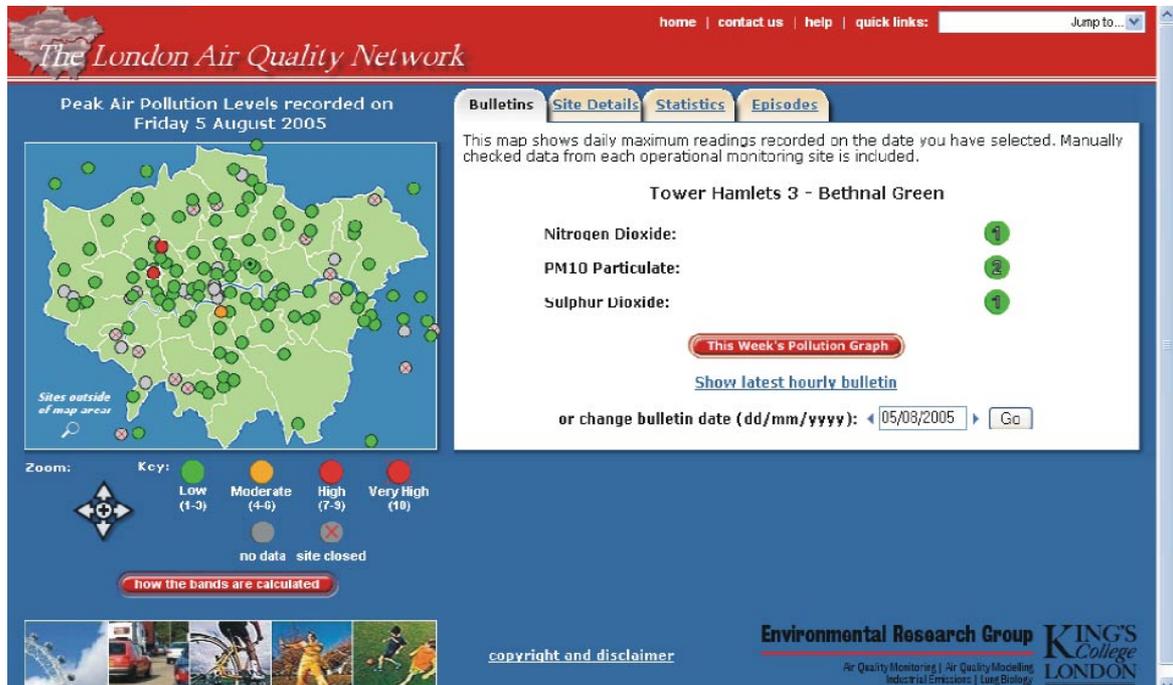
Figure 6
Accessing data for Tower Hamlets

the Air Quality Archive, the national entry point to monitoring data provided by DEFRA. The site offers the option of retrieving data series as *.csv* files and having them sent directly to an e-mail account. Interactivity is further supported by the option to post and review feedback on the site and access detailed usage statistics. At the same time, the DEFRA site offers only one monitoring point for Tower Hamlets and one user interface, while data visualization features are less advanced than on the local Air Quality Network site, too. This leads to a very peculiar situation: taken together the two websites offer an unrivalled package of features and functionalities that use the Internet in very innovative ways to make environmental information useful to the public and strengthen environmental transparency and accountability. However, no cross-references exist between the two sites. As a consequence, residents searching for information on air quality in their neighbourhood are likely to end up at only one of the two sites and make do with the features and limitations found there. This is an unfortunate and, given the connective capabilities of the Internet, altogether very unnecessary disconnection.

4 Conclusion: A mixed bag and a steep learning curve

The simulated searches for information on air pollution and drinking water quality in London and Berlin clearly demonstrate that neither the UK nor Germany are making full use of the Internet's potential in their e-government initiative to enhance access to environmental data. While both countries do collect vast amounts of information on air and water quality, it is quite difficult for the public to gain effective access to it, despite the fact that this type of information is essential not only for a wide range of individual health choices, but also for holding policy-makers, service providers and polluting industries to account. In both countries it is somewhat easier to find comprehensive and actionable information on air pollution than on water quality. However, a general lack of attention to data context, presentation and especially visibility and data integration diminishes the utility of the information made available online. In both countries locating the relevant information is a very tedious affair, despite ambitious e-government initiatives that emphasize transparency and citizen-centred information provision. Information on air and drinking water quality for a particular neighbourhood is buried deep inside large website systems. Unearthing this type of information requires either a very specific knowledge of institutional competencies, and thus of the specific entities that collect and hold the information, or expert Internet search skills and significant tenacity in trying to find the right path.

Given the premium capabilities of the Internet in interlinking separate and geographically distributed information repositories it appears bizarre that, depending on the starting point of the information search, a visitor might end up at two very different information collections and thus with very different data access, processing and presentation functionalities, with little interconnection or integration between them.

The ability to use the information provided for the purpose of holding policy-makers or environmental service suppliers to account for their performance is further hampered by a relative lack of tools for displaying data series from different neighbourhoods alongside each other. Furthermore, access to downloadable raw data in a format that makes it easy to carry out further analysis is more the exception than the rule.

4.1 No clear frontrunner

Overall, neither country clearly outperforms the other in providing online access to environmental information. Germany does a somewhat better job in providing access to information on drinking water quality, while the Air Quality Network for London provides a more versatile user interface and better contextualization of the data than its German counterpart. The fact that no single practical implementation of online access to environmental data is consistently superior to the others and that best practices and innovative solutions are scattered across different systems is an important lesson in itself.

It underscores that no definite best way forward can be discerned, but that the endeavour of harnessing the Internet for environmental accountability and citizen's choice is very much a project in the making that can profit considerably from a comparative stocktaking of innovative solutions in other fields and other countries. More attention to implementations elsewhere and information-sharing across borders should therefore be an integral task when charting the future path for this important e-government area in both countries.

4.2   Ample scope for improvement

Considerable challenges remain in respect of making the Internet work for environmental accountability in the legal, policy and institutional environment.

First, as the analysis has shown, both in Germany and the UK major impulses for enhancing access to environmental information have come from outside the domestic political sphere. The EU directives on environmental information, as well as on drinking water and ambient air quality, in conjunction with aspirational commitments made by both countries under the UNECE Aarhus Convention of 1998 and the UN Earth Summit of 1992, are viewed as major drivers of change for more extensive and coordinated public provision of data on environmental quality, including drinking water and air pollution. These dynamics of change are unfolding in the context of what an expert on freedom of information issues has called a "culture of administrative secrecy" that persists in the public sector in both countries (Sand 2002). Besides some specific, but limited domestic legal provisions on access to environmental information, general freedom of information legislation at national level was until very recently too limited to support effective enforcement of citizen's rights in this area and too marginalized to help establish information disclosure as important objectives for e-government strategies in either country. In the UK, the Freedom of Information Act of 2000 only fully entered into force in January 2005, while Germany cleared the main parliamentary hurdles on the way towards its first federal freedom of information law only in July 2005.

In terms of institutional constraints, German interviewees have confirmed that consolidated online provision of data on drinking water quality across the country is hampered by the interlocking and largely devolved responsibilities for monitoring and reporting and by the sheer number – over 7,000 – of local water providers. The inadequate interconnection of interfaces for London air quality data as provided by local and national authorities seems to point to similar problems with coordination across devolved governance structures.

However, the obstacles presented by interlocking competencies should not be overestimated. Such concerns are partly based on the premise that information presentation and information architecture need to closely map onto and can essentially only reflect existing institutional structures. However, the opportunities for distributed networking and collaborative publishing that the Internet affords have relaxed the requirement that only a central coordinating body could possibly bring about a central coordinated information presentation of environmental data. Minimum reporting requirements are already standardized across communities by legislative frameworks and several Internet tools are at hand to consolidate the data presentation and make the

measured parameters more comparable across communities. These tools include the use of open data exchange formats such as XML or RSS feeds that build bridges for data exchange between different information systems. Other Internet-enabled options range from distributed publishing tools, which allow providers to paste their data directly into a central database, to plain link collections, which simply provide a uniform searchable entry point for locally maintained information. These and other tools afford different degrees of data integration. But they all have in common making data more comparable and paving the way for enhanced environmental accountability. All these tools are woefully underused in the current online information provision systems for drinking water quality in Germany or air quality in the UK.

4.3 No clear link between performance and ownership

The impact of ownership structures on access to environmental quality information is ambiguous, as the example of the water sector shows. RWE, a multinational utilities conglomerate holds stakes in both the London and the Berlin water suppliers, but in London the water works are fully privatized, while in Berlin the State of Berlin holds a controlling stake in the municipal supplier. These differences notwithstanding, the households in Berlin-Mitte and London–Tower Hamlets face similar challenges in locating relevant information on drinking water quality. In neither case is the information provided sufficiently integrated into the related e-government portals. In addition, the scope, quality, timeliness and presentation of the data are, with regard to both neighbourhoods, rather basic, well below what the Internet could do to enhance environmental accountability and health choices in this domain. In the UK, privatization in the water sector is credited with having enhanced the transparency of water quality. As Hood and Rothstein point out in a study on risk management in the public sector, the government seized upon the privatization of the water supply to draw up contracts with water companies that contained more stringent reporting and quality disclosure requirements than were previously in place for water provision under public ownership (Hood, C., and Rothstein, H. (2001).

In sum, examining the analysis of Internet use in the UK and Germany for providing access to essential environmental quality parameters clearly indicates that much more can be done to fully exploit the benefits of the Internet for environmental accountability. Some of the institutional constraints hampering progress in this area have been elaborated on in the analysis. From a broader, somewhat cynical perspective on ICTs and society one might add the plausible suspicion that the relation between new ICTs and freedom of information is often viewed as too straightforward to require an in-depth conceptual or practical elaboration and too banal to qualify for a prominent place in visionary conceptions of governance in the Information Age. It is hoped that this comparative analysis of the UK and German approaches to Internet use for information provision on drinking water and air quality can make a small contribution to motivating further comparative research into these issues and to stimulating greater attention from e-government practitioners to both the opportunities that the Internet affords in this area and the many innovative ideas developed and interesting lessons learnt outside the domestic sphere of e-government activity.

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