CLEAR Info Progress Report
Document Control Sheet

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CLEAR Info Project Report

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Action 2.3 Evaluate the transferability of data integration to other forms of data

1. Introduction

The CLEAR Info project team developed a data integration system which aggregates site-based data from regulated sites up to company level. This data integration system processes the data efficiently, identifies where there may be errors in the data, and is flexible enough to allow new datasets to be added. The system includes a reporting tool which enables compliance reports to be produced at site, company and sector levels. The data integration system and compliance reports both have the potential to be used as tools to aid environmental regulators in more effectively implementing EU legislation.

Using the Environment Agency as an example of a typical environmental regulator, the project team considered the:

- → technical and practical issues which would need to be overcome to integrate data from other sources into a data integration system;
- → different technical options (master data management systems) currently used by the Environment Agency to integrate data;
- → the potential for using the CLEAR Info data integration system to generate data the Environment Agency currently produces to help implement the requirements of EU legislation; and
- → potential benefits of applying the CLEAR Info data integration system to other forms of data.

The project team identified additional drivers to make data publicly available and to promote the re-use of data which they considered relevant to most regulators.

The information in this desk study has been gathered from a variety of sources including:

- → Interviews with Environment Agency colleagues from a range of departments including Legal, Evidence, Data Mapping and Modelling Information, Regulated Industry, Enforcement, EU and International Relations and Fisheries & Biodiversity.
- → Reports compiled by the Environment Agency for the purpose of increasing compliance with or meeting statutory reporting requirements related to EC legislation.
- → The Zero Based Review of all data/information and environmental reporting requirements; undertaken as part of the Department for Environment, Food and Rural Affairs (Defra) Smarter Environmental Regulation Review programme.
- → Aether UK Ltd, and internet research.

2. Integrating data from other sources

The basic principles of data integration remain the same regardless of the technology used, however, not all data is suitable for integration. Generic characteristics can be used to determine if data is suitable for integrating and aggregating such as:

- → The data must be in an electronic format and in one or a small number of databases collated to Regional if not National level.
- → The majority of the data should be selectable from a group of options rather than free text. This enables a data integration tool to group data into standardised lists.
- → The datasets must have some commonality that can be used to link them together for example, a field detailing company name, permit number, management team, or geographic location.
- → Search fields / categories have been pre-defined for example, company, sector, or water catchment.
- → There are numerical fields for example, tonnes of waste or number of pollution incidents.
- → There is a structure to organise or aggregate the data against such as internal business structure, geographic location, company hierarchy.

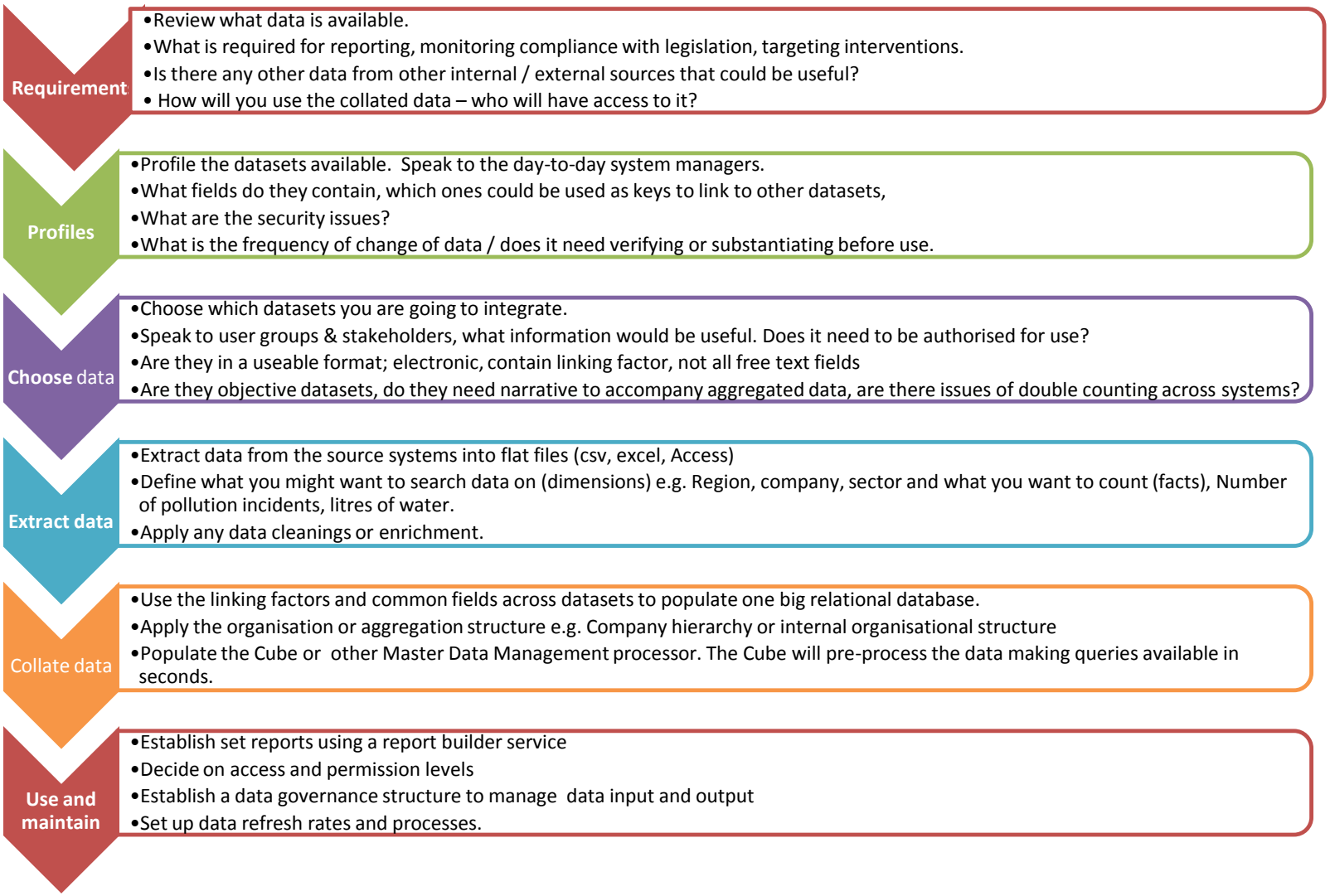
If data does not meet all of these criteria it may still be possible to integrate it but more manual cleansing and pre-processing will be needed. This will be more resource-intensive and the cost-benefits would have to be carefully considered.

Once it has been established that the data is suitable for integrating and aggregating, the basic process of preparing and integrating data involves:

- → identifying requirements;
- → profiling data;
- → choosing data and
- → extracting data.

This process is explained further in Figure 1. More detail about the process the project team followed to integrate Environment Agency data can be found in the reports for Action 2.1 and Action 2.4.

Producing a Collated Dataset (Process)



3. Technical options: master data management systems

The Project Team used Microsoft Business Intelligence Stack to build the CLEAR Info data integration system. However, there are several alternative master data management systems and software packages available on the market.

Some examples of different master data management systems used by the Environment Agency provide insight into the variety of data management methods an environmental regulator might use. These are summarised below:

a) **Sharepoint and Microsoft Access** is used to implement the Eels (England and Wales) Regulations 2009 which are enacted under the Habitats Directive 1992. The regulations ensure eels are provided with safe passage around obstructions. In this case, the Environment Agency links datasheets in SharePoint to a Microsoft Access database. SharePoint forms the front end for Environment Agency local staff to enter and update asset data. The database is made up of a series of queries that enable automated reporting via buttons.

b) **Microsoft Access and Oracle database** are used to hold Water Information Management System (WIMS) data such as environmental monitoring and water quality permitting information. SlimWIMS is a Microsoft Access database which connects to the WIMS database to allow easy, user-friendly access to a number of key datasets, including: sampling points, discharge consents, and samples and measurements.

It links to online mapping and satellite imagery (EasiMap), allowing rapid analysis of environmental data with statistics, graphs, reports and data exports. It can also report on sampling programme delivery, and provide a cost analysis for different programmes. There are currently two versions of SlimWIMS, one running in Office 2003, and the other in Windows7. The software is self-contained, and can be run from a zipped file. Only completed samples on WIMS are accessible. Data can be exported for analysis in Excel or ArcMap. SlimWIMS connects to regional WIMS databases using Access online database connectivity.

c) **Case Management System (CMS)** is a single IT system to support the Environment Agency's enforcement work from start (suspected offence) to finish (clean up and post-enforcement action). The system is delivered securely to 2,500 users across the organisation, including operational staff and their line managers, national business planners, lawyers and other support function staff.

CMS is built in an Impact Level 3 (IL3) security environment, and has gone through a full accreditation process to prove that it is 'IL3 compliant'. Reporting in CMS will be done through Business Objects XI (BOXI) by a limited number of people. Only a small number of people will be able to create new reports and set up report templates and different levels of access will be implemented. A much larger group of users will be able to manipulate these reports and run them. All users will be able to view these reports.

d) MS Business Intelligence Stack. Across the Environment Agency, a number of data integration tools use the same software package as the CLEAR Info data integration system. Whilst these are in various stages of development their presence demonstrates how transferable the technology is to other forms of data. The data integration tools identified through this desktop study are summarised below:

→ **Corporate performance** brings together management data about the Environment Agency (time recording, personnel data) that is related by 'Organisational String' (rather than Company Name or Site). The indexing (master data management) strategy is still under development, however, the system is ready to go into production.

→ **Monitoring Information** currently brings together information from direct environmental monitoring (such as rain gauges or river levels) and contains information on what the Environment Agency measures, where and why. In the future it will also include actual monitoring measurements. Combining this data with regulated business compliance data from the data integration system could provide greater insight into industry's effect on local environments.

→ **Flood Analytics** pulls together information about flood risks, warnings and mitigations based on property locations. This tool is currently at the pilot stage with plans for it to go into production to help with the implementation of the Flood Risk Directive (2007/60/EC).

At present the pilot Flood Analytics dataset and reporting cube has many functions for the Environment Agency including future flood planning, responding to Freedom of Information Requests (FOI) and the sale of data to the insurance market.

The GIS layers within the flood analytics cube could be particularly useful to an environmental regulator in identifying target businesses to approach. For example, combining flood modelling maps with data on businesses that hold permits could identify those businesses at potential risk of flooding. These businesses would benefit from support in developing climate adaptation plans.

4. Generating data to implement EU legislation

The learning obtained from the CLEAR Info project has the potential to inform the Environment Agency's approach to better regulation and respond to the UK government's commitment to streamlining data and reducing environmental reporting requirements for regulated business.

4.1 Data compilation

To explore further how the CLEAR Info data integration system might be used to generate data to more effectively implement EU legislation, The project team engaged with a cross section of teams across the Environment Agency to identify where data is compiled and used to drive regulatory compliance. Two examples were identified where the Environment Agency analyses regulatory and other data on the state of the environment to produce information presented to the public through public registers and reports.

The potential benefits of using the data integration system in these areas are considered in the following sections.

4.1.1 Public Registers

The Environment Agency has a statutory obligation to publish certain information. To meet this requirement, the organisation's website provides access information through an electronic public register (ePR). The key registers available are:

- → Environmental permits (industrial installations; waste operations, radioactive substances, water discharges).
- → Waste carriers, brokers & dealers.
- → Hazardous waste producers.
- → Waste exemptions.
- → Water discharge exemptions.
- → Enforcement action.

The current ePR application is a traditional database application which allows internal and external users to look up summary registration / permit / license details, searching by location (postcode or town), permit holder, permit reference or local authority.

There is significant potential benefit to be gained from presenting this data using the CLEAR Info data integration system, as opposed to the existing application, specifically:

- → Broader access to the data (from a data cube as opposed individual data items) would allow customers the opportunity to leverage more value from that data by making it simpler and easier to join it with other available data.
- → Providing public access to a data integration system rather than a prescriptive and controlled query tool would support the move towards delivering improved access

to public register data - moving more towards a ‘data-sharing’ approach, rather than an application.

→ The data integration system would simply provide data and allow customers / partners to self-serve, rather than the current method of answering queries.

→ It would be easier to add in some of the peripheral data sets which sit outside the current ePR application (for example, Waste Electronic and Electrical Equipment (WEEE); register for end-of- life vehicles; national packaging waste database; large raised reservoirs) and provide a more comprehensive, all-in-one register.

As with all data-sharing / access initiatives, appropriate controls would be required to ensure compliance with data protection legislation and commercial restrictions.

4.1.2 Reports

A summary of the reports identified through this desk study, and the EU Directives they relate to, are presented in Table 1.

As several of the source data sets used to generate data for these reports have already been incorporated into the CLEAR Info data integration system, there is potential to generate the data needed for these reports using the data integration system.

Anecdotal evidence from staff interviewed indicates that having a single reporting tool to generate the data for a number of reports could reduce the risk of conflicting information being generated by different data analysts, ensuring the organisation produces ‘one version of the truth’.

Current processes for generating data vary, but most appear to be quite resource intensive. The actual cost savings offered by moving to a single system have not been calculated for the purposes of this desk study. This is an area which any regulator adopting a single data integration system should consider.

The use of a master data management system also has the advantage that once standard reports have been created, they can be quickly populated with the latest data because the data has all been pre-processed.

Whilst theoretically, this data could be generated using the CLEAR Info data integration system, there may be financial, political or practical challenges to doing so. To explore these in greater detail, and to gain greater understanding of the practicalities involved, the project team:

→ Trained and interviewed staff responsible for producing existing data (super-users).

→ Compiled case studies on two of the key reports identified.

Super-user training: The project team trained a number of super-users, currently responsible for compiling data reports, to establish whether the data integration system could be used to generate the data they need with no, or minimal modification.

Initial feedback indicates that the system has potential, but that a number of issues would have to be resolved including agreeing data sources, data treatment, data quality and consistency standards, ownership / responsibilities for data, and data security sign-offs. Full details of the super-user report-builder testing will be reported against Action 3.1.

	Water Framework Directive (Directive 2000/60/EC)	**Habitats** Directive (Council Directive 92/43/EEC)	**Batteries** Directive' (Directive 2006/66/EC)	**Packaging and Packaging Waste** Directive (94/62/EC)	**WEEE Directive'** (Directive 2002/96/EC)	**Waste Framework** Directive' (Directive 2006/12/EC)	**Large Combustion Plants** Directive' (Directive 2001/80/EC and 2001/81/EC)	**Industrial Emissions** Directive (Directive 2010/75/EU)	**RoHS** Directive (2011/65/EU)
Sustainable Business Report	✔		✔	✔	✔	✔	✔	✔	✔
Regulated Industry: Annual Hazardous Waste Report	✔		✔		✔	✔		✔	✔
Regulated Industry: Annual Waste Crime Report						✔			
Regulated Industry: DEFRA Hazardous Waste Report			✔	✔		✔		✔	
Regulated Industry: DFM European Waste Statistics			✔	✔	✔	✔			✔
Regulated Industry: National EPR Compliance Report					✔	✔		✔	✔
Regulated Industry: Water companies Performance Report	✔								
Land and Water: River Basin Management Plans	✔								
Land and Water: Annual Assessment of Eel to ICES	✔	✔							
Land and Water: Annual Assessment of Salmon to ICES	✔	✔							
Evidence Planning Assessment & Reporting. Significant Water Management Issues	✔								
Account management reports for Waste Companies						✔			

Table 1: Key reports containing environmental data in the context of driving compliance with EU legislation

Case Studies: In order to establish whether the CLEAR Info data integration system could generate this information, two of the key reports were considered in greater detail:

→ The sustainable business report.
→ River basin management plans.

The data profiles of these reports (which datasets are used to compile) have been assessed against the data profile of the CLEAR Info data integration system. The case studies also consider the potential benefits offered by using the CLEAR Info data integration system to generate the necessary data. Copies of the two case studies are contained in Annex 1 and 2.

The CLEAR info project has also explored the potential for the data integration system to improve reporting on greenhouse gas and air pollution emissions and removals. Annex 3 contains a case study which draws upon previous research, and builds upon the CLEAR Info approach, to identify a number of key elements that should to be a focus for future work.

Further investigation could help define efficiency savings or new ways of working in more detail. It could also identify other areas of implementing EC legislation that could benefit from integrated data and reporting.

5. Findings and conclusion

By reviewing other methods the Environment Agency uses to generate data to implement EU legislation, it appears that the CLEAR Info integration tool could support, enable and create new opportunities for abstracting, collating and transforming data for publication and the high level reporting which environmental regulators use to support implementation of EU legislation.

In summary, the potential benefits offered from using this, or another master data management system with similar functionality, include:

→ **Efficient data compilation**. Generating data that an environmental regulator already compiles but in a more efficient way.

There is significant potential resource savings to be gained from compiling and presenting data for ePR and reporting purposes using a data integration system, both for the regulator and the regulated.

→ **Providing greater insight**. Developing new combinations of data within the integration tool, or taking products from complimentary Master Data Management Systems and combining them to provide insight that enables a regulator to target their regulatory intervention.

For example, in the future environmental monitoring data could be combined with CLEAR Info data to provide greater insight into industry's effect on the local environment. The GIS layers produced by the flood analytics cube could be combined with permit data to identify businesses at potential risk of flooding – helping the regulator target businesses which need support to develop climate adaptation plans.

→ **Unique identification of entities.** Further development of the linkages between legal entities will allow an activity/emission/risk at a spatial or organisational level to be aggregated and attributed to interested parties (owning companies/ regulators/ community parties).

Work is needed to establish a link database of entity identification numbers (e.g. value-added tax or company numbers). This information needs to be transmitted with any environmental information associated with an entity so that the data can be linked to related entities. Work has started but there is much more to do and many stakeholders need to be engaged such as national tax and company registration systems.

If data from other sources were incorporated into the CLEAR Info data integration system or into another master data management system with similar functionality, there are some common issues which would have to be resolved.

→ **Governance.** Formalising responsibilities and ownership for the data feeds required to keep the data integration system up to date would be essential, as would agreeing data sources, data quality and consistency standards, ownership and responsibility for data.

→ **Security.** If the system were opened up to provide external, direct access to the reports being generated (such as ePR), security controls would have to be put in place such as login's, authentication and authorisation controls, and firewall changes. Adaptations will depend on the methods used

→ **Development.** The CLEAR Info data integration system is currently operating in a test environment. To allow integration of other data sets with live feeds to keep the data up to date, would require the tool be moved into a production environment.

→ **Risk and call to action scoring.** Systems for scoring environmental risk/impacts and understanding uncertainties (likelihood) should be established and agreed across Europe. These systems would enable decision-makers to spot and react to important issues quickly. They also enable rapid communication of important information derived from detailed analysis of large quantities of data.

CLEAR Info provides a new starting point for transparent and efficient data integration in the future, building on its exploration of entity linking and approaches to using integrated data to inform decision-makers.

Annex 1

Case Study: Sustainable Business Report

The Environment Agency's 'Sustainable Business Report' was last published in November 2013. It provides a summary of the environmental performance information used to drive the Environment Agency's engagement with industry to create a better environment for business and communities. The report includes detailed technical annexes which provide trend data. Regulatory areas covered in the report include; emissions to air, pollution incidents, permit compliance, water company performance, and stopping illegal waste sites.

The information in the report is linked to the Environmental Permitting Regime (EPR) which meets requirements within the following European Directives:

- → Industrial Emissions Directive (2010/75/EU)
- → Water Framework Directive (2000/60/EC)
- → Habitats Directive (92/43/EEC) / Council Directive (99/31/EC)
- → Waste Framework Directive (2008/98/EC)
- → WEEE Directive (2012/19/EU)
- → Batteries Directive (2006/66/EC)
- → Mining Waste Directive (2006/21/EC)
- → Groundwater Directive (Directive 2006/118/EC) and daughter directive
- → Public Participation Directive (2003/35/EC)

The data profiles of the Sustainable Business report and the CLEAR Info data integration system can be seen in table 2 below:

Sustainable Business Report	Description	CLEAR Info data integration system
Pollution Inventory Electronic Data Capture	Pollution Inventory data that contributes to the European Pollutant Release and Transfer Register (E-PRTR)	✔
Hazardous Waste	Both Registrations and returns databases	✔
Compliance Classification Scheme	Information on permit breaches, causes and severity	✔
Operational Risk Assessment	Environment Agency site-based risk scoring for sites permitted under EPR	✔
Sites of High Public Interest	Objective register held by the Environment Agency for high profile sites	✔
National Incident Reporting System	Data on pollution incidents reported by the public	✔
National Enforcement Database	Data on enforcement notices and prosecutions	✔
Future Approach to Regulation	A set of Environment Agancy sector classifications	✔
Case Management System	Records the Environment Agency's enforcement activity	X
Compliance Assessment Database	Information on when and why a permitted site has been visited by Environment Agency staff	X

Data on Small to Medium sized Enterprises (SMEs) and a new database developed in the South East of England for Landfill Operators are not currently included in the Sustainable Business Report but could be incorporated into the CLEAR Info data integration system.

The Environment Agency produces further sector-specific information to provide an accurate picture to industry and businesses on where they should be focusing their efforts to improve their environmental performance. This is used by Sector Groups within the Environment Agency to plan regulatory activities.

Sustainable Business Report Limitations:

→ Errors in base data require significant resource to correct.

→ The change management process is manual. Changes can occur when new sites are added, an existing site changes operations or varies their permit. Similarly a change in regulation thresholds can result in a group of sites dropping in or out of requiring a permit or move from one sector to another. This presents a reporting risk as the data processing for the sustainable business report takes six months. If changes occur during this time they have to be manually tracked through the whole process. Clarification is needed on the criteria used to put an operator into a particular sector with an automated change management process.

→ Errors in the data can occur when producing year on year trends as variations in legislation or substantial sites cannot be easily back calculated.

Potential Benefits of using the CLEAR Info data integration tool:

→ Querying across data sets may help identify trends and correlations, presenting opportunities to identify different approaches to monitoring. For instance, points allocated to breaches to obtain a performance score would enable queries. These could be used to investigate links between frequent or persistent lower level breaches and the potential to lead to a more significant breach with serious environmental harm. Another example could be exploring links between pollution incidents and OPRA scores or frequency of site visits.

→ Time could be saved by automatically matching incidents entered on the Pollution Incidents Database with addresses on the OPRA database to identify permit numbers. This would replace the current manual approach which is very time consuming.

→ The tool has the facility not only to document changes but to also retrospectively apply them at the touch of a button. For example if a company's main activity changes, its sector code may change – impacting upon the performance of the sector they were attributed to. Similarly, OPRA data is obtained in April, however, sites may change (for example, their permit may be varied) in August, so reports produced after August will show discrepancies with those produced from April to August.

→ Simple fixes via Governance and Controls and technical fixes could be improved by the use of flagging. These automatic processes would release staff time from data input so that more time could be spent on data analysis.

→ Reporting on companies could be more holistic and flexible. Wider questions could be investigated such as 'is the number of operators increasing or decreasing?', 'which sectors have the most exemptions?' or 'how has a new regulation affected industries?'

→ Increased flexibility in reporting would help target resources where needed, for example targeting pollution prevention work in areas with the worst discharges. Also, reporting could track the impacts of population growth by, for example, quantification of discharge to sewers.

→ The data sets currently used have a narrow basis, for example, by site. The CLEAR Info data integration system can connect disparate databases, and using technologies such as Look Up tables, can make matches across the data sets much more efficiently than can be achieved manually. This enables more flexible reporting including higher level overviews, such as by Sector.

Annex 2

Case Study: River Basin Management Plans

Under the European Water Framework Directive (WFD) the Environment Agency map the rivers basins in England, consisting of lakes, reservoirs, streams, rivers, canals, groundwater, transitional waters (estuaries) and coastal waters.

The Environment Agency is the lead authority in England for implementing the Water Framework Directive (WFD), a European directive which provides the main framework for water management in Europe. The WFD requires a management plan be drawn up, reviewed and updated every six years for each river basin district. River Basin Management plans set out the state of the water environment and the measures required for any artificial or heavily modified water bodies if they are to achieve good ecological potential by a set deadline to achieve compliance with WFD.

River Basin Management Plans data profiles are comprised of the following data sets:

- → WFD River Basin Districts
- → WFD Monitoring Network
- → WFD River Waterbodies
- → WFD River Waterbody Catchments
- → WFD Lake Waterbodies
- → WFD Transitional (Estuarine) Waterbodies
- → WFD Coastal Waterbodies
- → WFD Groundwaterbodies
- → Protected Areas Register
- → WFD Classification
- → Reasons for Failure Database
- → WFD Transitional Waters typology
- → WFD Lakes Typology
- → WFD River Catchment Typology
- → Surface Water Risk Assessment

River Basin Management Plan Limitations:

The CLEAR Info data integration tool does not currently contain the range of data sets needed to compile such reporting. If River Basin Management Plans were to be created from a data integration system it may be better to compare profiles with the current flood data cube. This uses the same technology and software as the CLEAR Info project but may have a more similar data profile.

Potential Benefits of using the CLEAR Info data integration tool:

→ The data profile comparison showed that the River Basin Management Plan reports use substantially different datasets then are currently in the CLEAR Info cube. However if the River Basin data sets were integrated in the same way as the CLEAR Info data, there would be great potential in linking the systems together to provide new insight into failing water bodies. WFD data describes why a water body may be failing, due to factors such as Biodiversity Oxygen Demand, pH, levels of micro-organisms, or nitrates. Maps of failing water bodies could be combined with geographical locations of industrial and waste sites using GIS. Overlaying this with regulated industry emissions records from the CLEAR Info collated dataset and the reasons water bodies were failing could lead to more targeted management plans. Further insight could be gained if additional datasets were added such as agricultural data to evaluate the extent of issues such as diffuse pollution on WFD.

→ By combining data sets to provide greater insight, the CLEAR Info data integration system may add value to water quality data. For example, Surface Water Data (relating to surface and ground water interactions), and Mine Water Pollution Data (using GIS) to explore the potential for investigating how pollution behaves with different water types. This could be linked with British Geological Survey's work to 'type' water based on primary geology.

→ Similarly, integrating data from Fisheries and Biodiversity could aid analysis to show if improved water quality was linked to improved fisheries or improved biodiversity.

→ The latest version of Data Flow Maps is used to provide a clear line of sight between critical data and the outcomes to which the data contributes. Several of the Data Maps relate to EU Legislation and therefore may contain opportunities for implementing the CLEAR Info integration system. With further investigation data flow maps could be used to identify areas where collated data could be used to meet environmental objectives, as set by EU legislation.

Annex 3

Case Study: Greenhouse gas and air pollution emissions/removals reporting

Introduction and background

The work done a number of years ago on streamlining EU environmental data reporting http://ec.europa.eu/clima/policies/package/docs/streamlining_cc_ap_reporting_en.pdf

focused on greenhouse gas and air pollution emissions/removals. This study looked at opportunities within the spectrum of different EU decisions and regulations for streamlined reporting. The key elements were focused around data flows in the following two regimes:

- → 'national perspective' (nationally derived estimates of emissions and removals for different national activities such as power generation, residential heating, road transport, fuel combustion, refinery and chemical processes)
- → 'installation perspective' (installation specific information reported by organisations to regulators and compiled for EU reporting. This included data for EU ETS, E-PRTR, LCPD (large combustion Plant directive), and other reporting covered now under the industrial emissions directive.

The results of the work provided a roadmap indicating which parts of the different European decisions and regulations could be modified to improve data flow the original source (installation reporting or national statistical compilation) into European datasets on environmental pressures (focused on greenhouse gas and air pollutant emissions/removals).

The EU continues to strive for this improved data flow. However there is no coordination around the implementation of the roadmap, which spans a number of different and changing European commission departments and therefore has no ownership. The current problems are clear. Data reported at installation level is difficult to gather and use at national level. There are a number of fundamental differences in the way data is reported and classified that make it difficult to integrate the data with other national statistics. As a result data is often reported several times placing a burden on businesses and industry. In addition, a large amount of expert effort is required to join the datasets up on a regular basis. This effort by industry and environmental experts could be better channelled towards improving the quality (accuracy) of data and increasing the time spent using the data to inform decision-making.

Project findings

CLEAR Info provides a step in the direction of these improvements. CLEAR Info provides a new starting point for transparent and efficient data integration in the future, building on its exploration of entity linking and approaches to use integrated data to inform decision-makers. The timing is right, with EU new 'Digital Agenda for Europe' (European Commission, 2014) creating important opportunities for the improvement of E-PRTR and other industrial emissions directive reporting. In the UK the red tape challenge has created opportunities to explore improvements in data flow which reduces the burden on industry and regulators.

The key elements which could be focused on are highlighted below.

Unique identification of entities. Further development of the linkages between legal entities is needed. This will allow an activity/emission/risk at a spatial or organisational level to be aggregated and attributed to interested parties (owning companies/ regulators/ community parties). Work is needed to establish a link database of entity identification numbers (e.g. value-added tax numbers or company numbers). This information needs to be transmitted with any associated environmental information so that the data can be linked to related entities. Work has started but there is much more to do and many stakeholders need to be engaged. Particular stakeholders include national tax and company registration organisations.

Transmission of key information. This should try to work towards INSPIRE standards but as a minimum should consider the minimum information on:

a. A period (for which the information is relevant (e.g. year, month, our, day))
b. A metric (tonnes of pollutant, tonnes of product, euros spent, numbers of livestock, land area, water abstraction) clearly defined with units.
c. An indicator of accuracy/certainty (quantitative or semiquantitative).
d. Geography (defining a area line or point)
e. A classification (economic sector source category) with definition of classification used.
f. An entity identification number.
g. The usual meta data including ownership date of update, validity references to methods, data sources and assumptions etc.

Risk and call to action scoring. Systems for scoring environmental risk/impacts and understanding uncertainties (likelihood, agreed and understood across Europe. These systems enable decision-makers to spot and react to important issues quickly. They also enable rapid communication of important information derived from detailed analysis of large quantities of data.

Next steps and recommendations

As a regulator the EA has an opportunity to put in place a framework that works to these standards and enables efficient data flows for a zone analysis and for European reporting. Over the next year to 2 years there are opportunities to influence EU reporting for industrial processes under the E-PRTR, the industrial emissions directive and EU ETS.

Further exploration of these topics will help to provide a basis for improving data flows and enabling full integration of datasets so that analysts and business leaders can have a clear picture of risks and opportunities related to the environment.

Further work should focus on supporting the regulator/installation reporting interface and ensuring that data can be reported once by installations and used as much as possible by all interested parties (whilst respecting confidentiality issues). This type of initiative will not only improve environmental data but also help to improve data that underpins our economic and social understanding for example improve our understanding of energy consumption and fossil fuel use in industrial processes, water demand, and environment assets.