Developing State of the Environment Indicators in the Croydon

An Interactive Qualifying Project submitted to the faculty of Worcester Polytechnic Institute in partial fulfillment of the requirements for the Degree of Bachelor of Science

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Abstract

The government in the United Kingdom removed the 2007 National Indicator Framework and instated budget cuts to local authorities. Still, Croydon's Sustainable Development Service finds the annual production of the *State of the Environment Report* important to pursuing the borough's environmental interests. This project proposes a cost efficient process for generating future editions of the *Report*. The process is consistent with practices of boroughs in England, and includes a workbook to store indicator data and templates to generate the report.

Acknowledgements

Executive Summary

Over the past forty years, environmental sustainability has become an area of concern for policy makers and the public alike. In order to monitor how policies meet environmental needs, policy makers developed frameworks of indicators to measure trends in the environment. These trends are then reported in environmental documents. In 2010, the newly elected government of the United Kingdom removed the National Indicator Framework and implemented nation-wide budget cuts, reducing the funding of environmental departments. These changes left many local authorities without a guideline or resources for monitoring and reporting on the environment.

The London Borough of Croydon's Sustainable Development Service created its first *State of the Environment Report* in 2010, prior to these governmental changes. Despite receiving a fifty percent budget cut and no longer having a mandated set of environmental indicators on which to report, the Service wishes to continue producing the report annually. The past process used for developing the *Report*, however, lacked formal organization and required substantial resources. In order to produce the *State of the Environment Report* on an annual basis, a new process needed development to save both time and money for the Council.

The team examined four environmental reports to determine positive and negative attributes of such reports: 1) Croydon's *State of the Environment Report 2010,* 2) Islington's *State of the Environment Report 2010-11*, 3) the Wales *"A Better Place?" State of the Environment 2005,* and 4) Massachusetts DEP *State of the Environment Report 2006*. From these reports the team determined the following best practices: 1) reports should utilize graphics displaying data for clear trend determination, 2) reports should include thorough text, but not too much that it becomes lengthy and intimidating, 3) reports should include roughly one text box per graphic, and 4) reports should inspire readers so they feel that their actions make a difference in the environment. For example, sections titled "What can I do?" or "What have we achieved so far?" provide such inspiration.

In developing a process for generating the *State of the Environment Report 2011*, the historical indicator data needed storage and organization, new data needed collection, the final report needed an easily updatable design, and the contents of the report required summarization in a user friendly pamphlet.

1. **Excel Workbook for Data Storage:** All data pertaining to the *State of the Environment Report* was collected and organized in Excel spreadsheets.

2. **E-mail Templates:** The team used e-mails to collect data from contacts. Data collection by this method took about three weeks.

3. **Report Template**: The team created a template in Microsoft Publisher for the organization of the final *State of the Environment Report*. The template consisted of a graph, picture, and a corresponding text box for each indicator. To make future reports, the team copied and pasted the necessary material into the template.

4. **Tri-fold Pamphlet Template:** The pamphlet makes the *Report* more accessible and understandable to the public who may not understand the details of the *Report*. The team constructed the template in Publisher. The process of updating this template was the same as updating the report template.

5. **User Manual:** The team constructed a manual so that the future constructor of the *State of the Environment Report* would have step-by-step instructions on the use of the workbook and templates.

The team also evaluated Croydon's previous year's indicator framework to account for the changes that occurred over the past year. Indicators were classified as kept, added, removed, or partially completed.

- **Kept:** Indicators in this category were kept for use in future reports. An example of an indicator in this category is **"**Air Pollution - NO_2."

- **Added:** Indicators in this category were added to the framework. The new five year plan for "Croydon Council CO_2 Emissions" was added.

- **Removed:** Indicators in this category were removed from the framework. "Tackling Fuel Poverty" and "Reducing CO_2 Emissions from Croydon Council's Operations," for example, are no longer measured.

- **Partially Completed:** Indicators in this category will be kept, but the data will not be available until after the time allotted for this project. This includes many indicators relating to waste management.

To help evaluate the process, the team conducted interviews with six boroughs: Brent, Islington, Merton, City of London, Sutton, and Kirklees. The team found that all of these boroughs face difficulties similar to Croydon in developing indicator frameworks and reports. All of the boroughs interviewed shifted their focus to carbon emissions, the only environmental indicator still mandated by the national government. Indicators now rely more heavily on the

predicted future availability of the data. The main difference among the boroughs in the selection of indicators is the group who makes the decision. Some boroughs receive direction from their corporate management or from an Environmental Management System (EMS), while other boroughs rely on the judgment of the creator. Croydon falls into the latter category, but Councilors give the final approval on the reporting of the indicators. Furthermore, many of the boroughs interviewed use similar processes in creating environmental reports. E-mails are sent to gather data, which are stored in Microsoft Excel worksheets, and then text and data are compiled to form the report. Some boroughs also use a template for the final report.

From the interviews and the requirements outlined by members of Croydon's Sustainable Development Service, the team determined that for the process to be effective it would need to be easy, quick and inexpensive to use. The final evaluations of the process were:

- **The process is successfully repeatable.** The team completed ninety-four percent of the report in five weeks. The team estimates that in the future, the process would take seventy-three working hours to complete. Utilizing this process would cost only the salary of the person compiling the report.

- **The process compares favorably to the best practices of other boroughs making environmental reports.** The team's process closely relates to that of Islington, which is currently considered the greenest borough in London (Cerar, 2010). The template report improved upon a similar process in Kirklees, a borough highly regarded in England for its green practices. The addition of the pamphlet should bring many benefits to the Council's Sustainable Development Service, sparking the attention of the public without generating much cost.

After an overall analysis, the team considered this the best way to reduce time and money spent in creating the *State of the Environment Report*. The team recommends the following possible amendments to the process that could improve it for the future:

- **The compilation of the report should be divided between members of the Sustainable Development Service.** This will reduce the time per person to create the report and make adding the development of the report feasible to add to the yearly objectives of the Council workers.

- **Web-based data storage may facilitate the data collection step.** This option will eliminate the need to copy and paste the indicator information into the final workbook.

- **An EMS would be beneficial in the environmental reporting process.** Four boroughs had an Environmental Management System (EMS) or Eco-Management and Audit Scheme (EMAS). These systems help meet goals by improving services, saving money, and meeting specific legislation. An EMS or EMAS would insure that the annual production of the *State of the Environment Report* would take place even if the central government does not require or fund environmental policies. This recommendation, however, will not be fiscally feasible under the current budget constraints, but could be beneficial in the future.

Authorship

All team members participated in the writing of each chapter in this report. Before writing the team reached a consensus chapter organization and division of the work. Each team member wrote their own part individually, and the team met to review and compile it. The team took turns editing the report and tracking any changes made so that the next person could review these changes and make edits of their own. This continued so that everyone made some critique to each part.

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1.0 Introduction

Environmental sustainability consists of preserving the natural resources in the environment for the future generations. In order to meet this goal, experts and policy makers created frameworks of environmental indicators which measure the levels at which organizations maintain sustainability. Such policy makers present their findings from the frameworks and benchmarks within environmental reports raising public awareness of sustainable practices in their community.

In 2007, the central government of the United Kingdom, under the control of the more environmentally involved Labour Party, established the National Indicator Framework. The framework consisted of 198 indicators, ten of which related to the environment. The London boroughs used the National Indicator Framework to generate environmental reports. Then in 2010, the Conservative Party, displaying less concern with environmental policies, gained control of the central government and dismissed much of the Framework. The effect left the UK without a guideline for measuring and reporting on the state of the environment. The Conservative Party further instated nation-wide budget cuts impacting several councils' ability to generate environmental reports and collect indicator data. The London Borough of Croydon faces these issues, but still desires to produce an annual environmental report.

In 2010, Croydon produced its first *State of the Environment Report* which contained a set of twenty eight environmental indicators such as "CO_2 Emissions," "Transport and Air Quality," "Waste, Recycling and Street Cleanliness," and "Green Infrastructure and Climate Change" (Strategic Partnership Croydon, 2010a). Although the National Indicator Framework no longer mandates these indicators, they remain key areas of concern to the Croydon Council. The Borough's Sustainable Development Service, the team that produced the *Report*, lost the necessary funding to generate the *Report* using the same process that produced past *Report*. Therefore, the Croydon Council identified the need for the development of an efficient, inexpensive process for identifying, compiling, analyzing, and reporting relevant data to produce the *Report*.

To aid the Council in addressing this need, the team identified two project goals: 1) propose an improved process for updating the *State of the Environment Report* and environmental indicator framework, and 2) compare and analyze environmental reporting techniques. To accomplish the goals, the team worked with the Croydon Council's Sustainable

Development Service conducting a series of interviews with policy makers in the Croydon Council. The team constructed a workbook containing relevant information to the *State of Environment Report* using Microsoft Excel. The data contained within the workbook underwent thorough evaluation using the information gathered through interviews. A review of environmental indicator literature aided in this evaluation determining whether the indicators effectively communicated Croydon's environmental status. The project produced a repeatable process for the annual update of the *State of the Environment Report*. In the future, the compilers of the *Report* will have a detailed guide, streamlining the work involved. The guide includes: 1) a workbook containing all the historical data, 2) template e-mails for new data collection, 3) a template for the *Report* constructed in Microsoft Publisher where data and text can be imported from the workbook into the document, and 4) a pamphlet template created in Microsoft Publisher which summarizes the *Report*. Ultimately, an evaluation of the process concluded the Council will save both time and money in creating the *State of the Environment Report*. In order to determine cost and time efficiency, the team conducted a comparison of the time and money spent this year to the corresponding expenditures for the *State of the Environment Report 2010*. The team also conducted interviews with environmental experts in councils of other boroughs to determine the techniques used across London. Further tests displayed the process will remain easily repeatable on an annual basis.

2.0 Literature Review

Many local and national governments hold sustainability as a high concern. Therefore, many governments have created environmental frameworks tailored to their current requirements. From such frameworks, policy makers develop lists of indicators to measure for an extended period of time. This allows government to track environmental progress. Croydon currently has twenty eight environmental indicators; however, the central government recently dissolved much of the National Indicator Framework. Further, budget cuts within the Croydon Council directly affect indicator data collection.

2.1 Sustainability

The term sustainability has greatly evolved over the past forty years. According to Charles V. Kidd, "the literature relating to sustainability is so voluminous that full analysis is not practical. And if it were practical it would probably not be worth the effort" (Kidd, 1992). This variety of information created a broad spectrum of viewpoints on the sustainability definition. This section provides a background on sustainability as it relates to defining environmental indicators in the London Borough of Croydon. It reviews the history and evolution of the term sustainability, shows the pliability of the concept in various interrelated areas, and highlights difficulties in creating a singular universal definition.

2.1.1 Origins of Sustainability

According to the Oxford English Dictionary, the term environmental sustainability can be traced back to the 1960's and 70's (Oxford University Press, 2010). At this time, the prevalence of discussions about the environmental consequences of human activities grew rapidly. An environmental movement driven by many powerful publications demonstrated the adverse impacts of economic development on the environment (Kidd, 1992). Rachel Carson's *Silent Spring* related the use of pesticides, such as DDT, to the declining bird populations. New York Times bestseller, *Silent Spring* raised public awareness about the dramatic effects of pesticides and other chemicals on ecosystems (Kidd, 1992). Carson's book challenged the belief that the development of new chemicals created unlimited benefits without negative consequences. Further, the Club of Rome's *Limits to Growth* (Meadows, Meadows, Randers, and Behrens 1972) highlights the impacts of the growing economy and its impacts on the world's resources. These factors include "population growth, depletion of resources, pollution, degradation of the environment, or some combination of these" (Kidd, 1992). This work includes a model of the

economy based on the results of many simulations showing that uncontrolled economic growth would ultimately lead to a collapse in the economy. Theoretically, the collapse would occur through the depletion of finite resources and increases in pollution causing the environment to fail under the growing population. *Silent Spring*, *Limits to Growth*, and other works of the time period met harsh criticism declaring their assumptions flawed and their findings exaggerated. Even these works, however, contained no reference to the term sustainability.

Similarly, ecologists used the term sustainability to mean "a state or condition that can be maintained over an indefinite period of time" (Pisani 2006). While the ecologists concerned themselves with the sustainability of particular species, most people did not apply sustainability to human development until 1987 with the publication of *Our Common Future* by the World Commission on Environment and Development (WCED) (McManus, 2007). *Our Common Future*, also known as the *Brundtland Report*, defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). The United Nations' concern for the global environment and climate change prompted the report. The writers hoped to outline current world problems in regards to environment, society and economy as well as to "propose long-term environmental strategies for achieving sustainable development by the year 2000 and beyond" (WCED, 1987). As a result, the ideas of sustainability and sustainable development grew into popular terms, and many countries throughout the world continue to implement sustainable measures in their policies.

The early documents led to defining the realms to which experts apply the term sustainability. Kidd traces these realms to six roots (Kidd 1992):

1. "The Ecological/Carrying Capacity Root" applies the ecological idea of carrying capacity, the number of organisms of a single population that the environment can support without any stress. When the number of organisms exceeds the carrying capacity, the environment no longer supports the population, and the population will decline until again falling below the carrying capacity. This root proposes the idea that the earth can only support a finite number of organisms (Kidd, 1992).

2. "The Resource/Environmental Root," concerned with the rapid consumption of resources, claims that the growth of the human population will cause resource usage at a

higher rate than Earth can sustain. This root places importance in maintaining "environmental quality" so that resources remain available (Kidd, 1992).

3. "The Biosphere Root" focuses on how human activity degrades resources through pollution. This root bears concern to human actions causing climate change and global warming, and preserving common resources for future generations (Kidd, 1992).

4. "The Critique of Technology Root," originating from a counter-technology movement, draws on the theme that the development of technology will degrade humanity. This theme further applies to the harmful effects technology has on the environment (Kidd, 1992).

5. "The 'No Growth-Slow Growth' Root" questions the desirability of continual economic growth. This root claims the sustainability of a slow growing economy or a steady state economy far exceeds that of an economy demonstrating continual growth (Kidd, 1992).

6. "The Ecodevelopment Root" involves balancing the developing economy with more environmentally minded practices (Kidd, 1992). Unlike the "'No Growth-Slow Growth' Root" this root encourages economic growth, but attempts to make it more sustainable through environmental policies. Most policy makers find favor with this view of sustainability.

These roots and origins show the wide range of areas now associated with sustainability. This broad application of the term makes sustainability difficult to truly define.

2.1.2 Defining Sustainability

The general literature on the subject of sustainability does not claim one universal definition for the term. Bell and Morse generalize sustainability by proposing a sustainable system requires system quality to either remain the same or improve (Bell and Morse, 2008). System quality can have different interpretations depending on the value system of the individual defining it. These values fall into four main categories: economic, social, environmental, and cultural (McManus, 2007). As shown in Figure 1, the definition does not necessarily fall under one category, for all overlap, however emphasis can usually be placed on a single area.
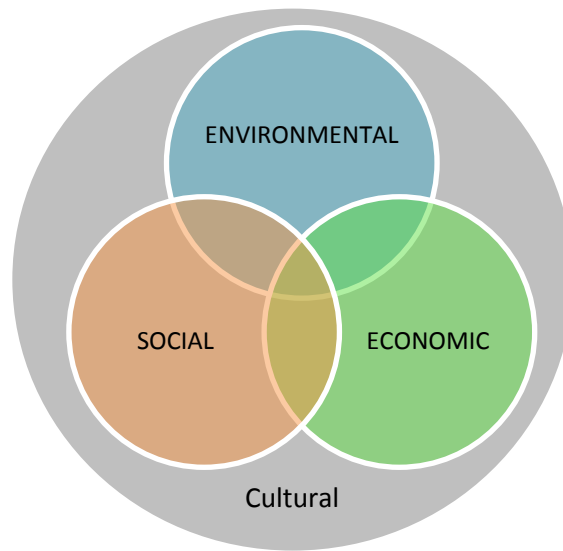
The World Commission on Environment and Development's definition of sustainability mentioned earlier focuses on the idea of preserving resources for future generations. This definition mainly falls under the social category, however according to the *Brundtland Report*; the environment must remain sustained as the economy grows. Kidd's "The 'No Growth-Slow Growth' Root" offers another example of a differing definition for sustainability. The achievement of economic sustainability may or may not be concerned with the environment; however, it certainly affects society. Some definitions of sustainability exclude the economy altogether and are only concerned with conservation of the environment and natural resources. The general literature refers to a definition of this type as "strong sustainability" (Bell & Morse, 2008). The WCED definition, an example of "weak sustainability," further includes the substitution of social and economic values (Bell & Morse, 2008). Weak sustainability concerns more with the cost efficiency involved in sustainable actions (Bell & Morse, 2008). A complete definition of sustainability, must weigh the value of all categories and their connection with each other.

Bell and Morse also state the importance of incorporating system barriers and a time scale for measuring the system (Bell & Morse, 2008). For example, sustainability can fall into a global scale, national scale, or local scale. The sustained qualities depend on where the boundaries fall. Budget can also limit defining boundaries (Bell & Morse, 2008). The definition of sustainability must include a time scale. All information on sustainability of a system depends on a previously determined reference point (Bell & Morse, 2008). The system could, for

example, represent ten years to hundreds or thousands of years depending on the quality defined. This said determination of the endpoint must also occur in advance. Bell and Morse further note that different aspects within the sustainable quality may require different time scales depending on the system.

Sustainability represents proactive approaches to environmentally minded practices and development. Since the 1960's, concern has increased not only with the human impacts on the environment, but also with how these impacts contribute to climate change in particular. The United Nations helped to lead the world in integrating environmental sustainability policy and climate adaption into the governments of its constituent nations through documents such as *Our Common Future*, *Agenda 21* and *The Kyoto Protocol*. In Europe especially, governments commonly institute sustainable development policies. A definition of sustainability must reflect the sustained qualities, the boundaries, the limitations, and the time scales established to make and carry out these policies.

2.1.3 Croydon and Sustainability

The discussion of how the London Borough of Croydon fits into the worldwide sustainability scope relies heavily on Croydon's own definition of sustainability. The Croydon Council provides a short history on the evolution of sustainability which includes various works noted earlier in the section. The council draws attention to *Limits to Growth, Our Common Future,* and *Agenda 21* (Croydon Council, 2011). Another work of council focus, the paper *A Better Quality of Life*, outlines the United Kingdom's Strategy for sustainable development. The Croydon Council recognizes and accepts *A Better Quality of Life*'s definition of sustainable development, which states:

> Our Strategy for sustainable development has four main aims. These are:
> - social progress which recognizes the needs of everyone;
> - effective protection of the environment;
> - prudent use of natural resources; and
> - maintenance of high and stable levels of economic growth and employment (SDU, 1999).

The Croydon Council wants to earn the distinction as the "greenest borough in London," but its competing economic and social goals constrain the amount of resources the borough can devote to promoting environmental sustainability. Budget cuts under the new government further reduce these resources. As outlined in the *State of the Environment Report 2010*, Croydon would

like to focus on several key environmental items including: "Reducing Carbon Dioxide Emissions," "The Low Carbon Economy," "Transport and Air Quality," "Waste, Recycling and Street Cleanliness," "Green Infrastructure and Climate Change," and "Climate Change Adaption" (Strategic Partnership Croydon, 2010a). The boundary of the borough, as well as the borough's budget represents the system boundaries for sustainability in Croydon. The second boundary, the budget, recently became a determining factor as the Sustainable Development Service budget has drastically shrunk. Part of this project determined to what extent the budget boundary influences the development of annual state of the environment reports. Croydon also takes time scales into account in the *Climate Change Action Plans*, establishing short term and long term goals (Croydon Environment and Climate Change Partnership, 2010). Overall, Croydon appears to have a strong definition of sustainability; however, recent budget problems may cause further limitations.

2.2 Indicators

Sustainability, in terms of the environment, involves moving to healthy ecosystems and creating a foundation for a more eco-friendly planet (Organization for Economic Co-Operation and Development, 2008). Broad sustainable development objectives require a method of collecting and measuring data. Several necessary methods to measure sustainability exist. A set of benchmarks, also known as reference points, track the progress of the overall sustainability goal. A benchmark aids in measuring sustainability by "determining the current situation or position relative to the stated objective" (University of Missouri, 2000). Thus, it establishes a baseline to which all future data that can be compared. This allows researchers to easily see changes that occur in the environment and monitor the achievement of a given goal (University of Missouri, 2000). The U.S. Environmental Protection Agency defines environmental indicators as "a numerical value that helps provide insight into the state of the environment or human health" (U.S. Environmental Protection Agency, 2010). Fundamentally, a communication tool used to help convey information to the general public, indicators measure and track global temperatures (Dahl, 2007). When observing temperature change, as seen in Figure 2, as time progresses, the global temperature increases. From this indicator, the public can observe Figure 2 and grasp the overall message that the temperature is increasing.
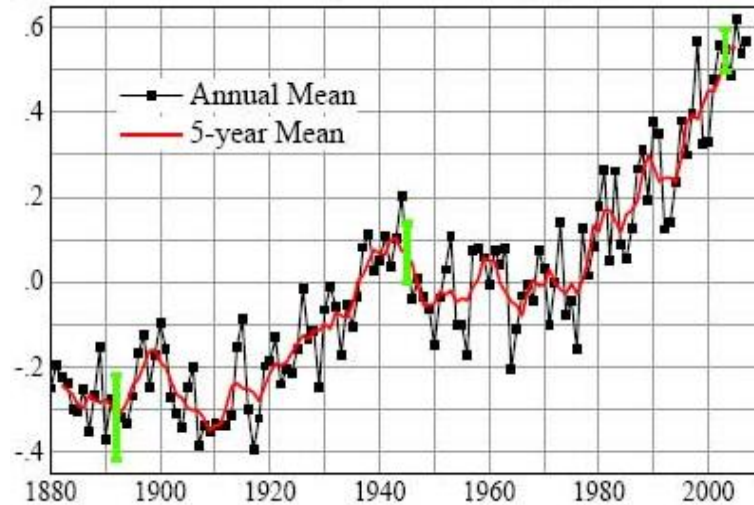
Indicators require measurability and direct relation to a specific environmental condition. They provide insight into trends in various elements of the environment in a specific place over a given period of time (U.S. Environmental Protection Agency, 2010). By developing a set of indicators as well as establishing a firm benchmark, an individual is able to meet the current demands for performance, accountability, and results. Indicators identify measurability while benchmarks provide a baseline for comparing measurements (University of Missouri, 2000).

Using indicators to evaluate the environment can greatly benefit the government and other governing bodies. By developing and using indicators, concerned parties can interpret and present data in a simplified, clear, and concise manner. This can then establish how well a particular area is progressing towards its sustainability goals. Furthermore, if results from a particular indicator show a progression away from the desired objective, this can offer a warning for local officials to take further actions (United Nations, 2007).

Choosing the correct indicator for a specific situation can prove difficult. Accordingly, indicator frameworks provide a "comprehensive and highly scalable information-driven architecture that is policy relevant and understandable to members of society and will help people decide what to do" (Dahl, 2007). Since 2007, the United Kingdom has recognized a National Indicator Framework. The Framework consisted of 198 indicators which served as a guide for measuring and monitoring sustainability for the United Kingdom (Department for Environment Food and Rural Affairs, 2009). The indicators listed in this Framework are grouped into seven categories based on their predictive outcome. The outcomes cover a variety of topics

such as building stronger communities, creating safer communities, benefiting children and young people by examining their safety, health, and achievements, emphasizing adult health and wellbeing, tackling exclusion and promoting equality, local economy, and environmental sustainability (Department for Communities and Local Government, 2007). The environmental indicator set, Table 1 shown below contains ten general key environmental indicators. Most cities and boroughs do not use all of these indicators, but choose those most relevant to their particular needs and goals (Department for Environment Food and Rural Affairs, 2009). The table explains what each indicator involves, whether the indicator requires qualitative or quantitative analysis, and any limitations that exist. For many indicators, certain limitations make data collection difficult. For instance, the indicator that measures ozone depletion often proves difficult to interpret, as the data does not "reflect the actual amount released into the atmosphere and that individual substances vary considerable in their ozone-depleting capacity" (Organization for Economic Co Operation and Development, 2008).

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Indicator	Sector of Concern	Qualitative/ Quantitative	Limitations
Climate Change	Relates the effects of carbon dioxide & global warming to the earth's environment.	Greenhouse gas emissions and CO_2 emissions.	There is a report that is published yearly which signifies any progress that has been made.
Ozone	Ozone depletion, specifically over Arctic regions.	Measurements on production and consumption of methyl bromide and halons.	"Keep in mind that they do not reflect actual releases to the atmosphere."
Air Quality	"Effects of air pollution on human health, ecosystems, and buildings, and their consequences."	"Fine particulates, NO_2, toxic air pollutants, and acute ground-level ozone pollution episodes."	Efforts are needed to monitor and estimate the population exposure.
Waste Generation	"Impact from inappropriate waste management on human health and on ecosystems."	Data from waste companies and other organizations that deal with waste management.	Sparse in most countries, making data collection and analysis difficult.
Freshwater Quality	"Impacts of water pollution on human health."	Appropriate waste water treatment, must be taken.	Data on water treatment and toxic compound emissions is available.
Freshwater Resources	"Inefficient use of water and to its environmental and socio-economic consequences."	Seasonal water quantity issues, either a shortage or excess of water.	If measurements are not frequently taken there will be a lack in historical data.
Forest Resources	How human activities affect "forest diversity and health, and their consequences."	Land development, intentional forest burning, and agriculture expansion.	Trends over a long frame of time are available but they tend to lack historical information.
Fish Resources	"Human activities on fish stocks and habitats in marine but also fresh waters."	Pollution loads, developments along the sea line, and transportation on and around water sources.	Data about fish catches and production as well as fish populations in that area.
Energy Resources	The "effects of energy production and use on greenhouse gas emissions."	Transportation and use of fossil fuels.	Specificity of measuring efficiency must be developed.
Bio - diversity	"Impacts of human activities on biodiversity."	Oil spills, habitat alteration, and alteration of population dynamics.	Data is specific to threatened and endangered species and areas protected by the government.

2.2.1 Qualities of Indicators

The process of developing valid and effective indicators should entail "a simple and unified method, commonly agreed issues and targets of wide applicability, transparency in the process and agreement between partners on the process" (Dahl, 2007). Generally, five main themes determine if a sustainability indicator is valid (Sustainable Measures, 2010a).

1. An indicator should address the carrying capacity of the community and determine if the community uses resources faster than they can be replenished (Sustainable Measures, 2010).

2. An indicator should relate to the community and tailor to the needs of the location (Sustainable Measures, 2010).

3. An indicator should speak to the general public. Although some indicators can appear focused on one particular aspect of the environment, they must have a big picture goal that anyone can comprehend. Accordingly, indicators should have clear and understandable presentation to the general population. Technical indicators tend to leave citizens that do not know the terminology or implications of such an indicator at a loss. To better communicate the overall effect that an indicator depicts, the data presentation must maximize everyone's understanding so they can adapt to improve the results in the future. For example, rather than presenting pollution data in parts per billion, pounds of pollution per year may maximize understanding (Sustainable Measures, 2010).

4. An indicator should have longevity. The indicator should retain validity over several decades to allow for the recording of comparable data over many years to study change (Sustainable Measures, 2010).

5. Lastly, an indicator should show linkages between the overall goal and the impact on the community. Generally, broadly focused indicators do not appear to examine the details of the effects on a population. For example, in the 1980's a town in New Hampshire experienced a growth in jobs. However, the indicator used to examine this failed to show that most of the jobs were seasonal retail jobs with no benefits and low hourly wages. Thus, this indicator failed to "link to the social or environmental aspects of the community" (Sustainable Measures, 2010).

2.2.2 Indicator Selection

Indicators cover many themes. According to the United Nations, important indicator groups include economics, health, governance, education, demographics, natural hazards, atmosphere, land, water (oceans, seas, and coast), freshwater, biodiversity, economic development, global economic partnership, and consumption and production patterns (United Nations, 2007). The UN presented specific indicators relating to each of these themes in 2007 as a reference for countries worldwide. Further, they issued a document containing the methodology for evaluating the indicators presented. This document outlines all the indicators that stem from the aforementioned themes, including information regarding policy relevance of the indicator, a methodological description, data assessment, agencies involved in the development of the indicator, and references to aid in researching the indicator (United Nations, 2007a). These indicators span a broad, vague definition of sustainability, rather than just the environmental aspects of sustainability. On the other hand, this project focused on fewer, more specific indicators, and covered them with great detail.

Another system of indicators developed by Kent Portney utilizes only 34 indicators compared to the UN's 96, but focuses more strictly on the environmental aspect of sustainability and less on social and economic factors highlighted by the UN (Portney, 2003). Portney breaks the indicators into subsections much like the UN, grouping them by relevance to a "sustainable indicators project," "'Smart Growth' activities," "land use planning programs, policies, and zoning," "transportation planning programs and policies," "pollution prevention and reduction efforts," "energy and resource conservation," and "organization/administration/ management/coordination/government" (Portney, 2003). Table 2 contains a chart of Portney's chosen indicators.

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	The overall elements of the Taking Sustainable Cities Seriously Index
	Sustainable Indicators project
1.	Indicators project active in last five years
2.	Indicators progress report in last five years
3.	Does indicators project include "action plan" of policies/programs?
	"Smart Growth" activities
4.	Eco-industrial park development
5.	Cluster or targeted economic development
6.	Ecovillage project or program
7.	Brownfield redevelopment (project or pilot project)
	Land use planning programs, policies, and zoning
8.	Zoning used to delineate environmentally sensitive growth areas
9.	Comprehensive land use plan that includes environmental issues
10.	Tax incentives for environmentally friendly development
	Transportation planning programs and policies
11.	Operation of inner-city public transit (buses and/or trains)
12.	Limits on downtown parking spaces
13.	Car pool lanes (diamond lanes)
14.	Alternatively fueled city vehicle program
15.	Bicycle ridership program
	Pollution prevention and reduction efforts
16.	Household solid waste recycling
17.	Industrial recycling
18.	Hazardous waste recycling
19.	Air pollution reduction program (i.e., VOC reduction)
20.	Recycled product purchasing by city government
21.	Superfund site remediation
22.	Asbestos abatement program
23.	Lead paint abatement program
	Energy and resource conservation/Efficiency initiative
24.	Green building program
25.	Renewable energy use by city government
26.	Energy conservation effort (other than Green building program)
27.	Alternative energy offered to consumers (solar, wind, biogas, etc.)
28.	Water conservation program
	Organization/administration/management/coordination/governance
29.	Single governmental/nonprofit agency responsible for implementing sustainability
30.	Part of a city-wide comprehensive plan
31.	Involvement of city/county/metropolitan council
32.	Involvement of mayor or chief executive officer
33.	Involvement of the business community (e.g., Chamber of Commerce)
34.	General public involvement in sustainable cities initiative (public hearings, "visioning" process, neighborhood groups or association, etc.)

Portney developed his set of indicators based on other indicator systems, such as "Indicators of Sustainability from San Francisco" and "Sustainable Community Indicators from Sustainable Seattle" (Portney, 2003). He also emphasizes that when comparing cities and their methods of developing and evaluating indicators, great importance lies in noting the similarities and differences regarding population and demographics of the different cities (Portney, 2003). For example, a large city would likely spend more time developing indicators on the efficiency and environmental friendliness of the public transportation, but a smaller city may put particular emphasis on the sustainability efforts of individual businesses.

2.2.3 Data Collection

There are many techniques for collating indicator data available such as phone calls, e-mails, online queries, and interviews. Important steps include contacting people well in advance, explaining the purpose, and providing a set deadline. These allow the contact to understand the request as well as ask any questions he or she may have in light of the data (Making it Work, 2009). Computer programs aid in the collection of data. These programs allow the user to input data with ease. Several data collection methods are user friendly and easily implemented. These programs can be interchangeable and some are superior at obtaining specific data than others (Making it Work, 2009).

Microsoft Excel, generally used to gather numeral data, allows for organized data collection. Each dataset has the option to have its own worksheet within the entire Excel workbook. This allows for each data set to remain separate from others. Tables and datasets help track and manage large amounts of data. Several options to share the information located within an Excel workbook include separate worksheets, sharing over a network, and constructing forms with Microsoft Visual Basic. Forms can also allow information to be entered into a complex Excel worksheet with ease (Microsoft, 2011).

On the other hand, Microsoft Access can also aid in numerical data collection. Microsoft Access, a data management system, produces a database. Creating the database is quite technical, but a myriad of resources and programs provided by Microsoft and other software companies make it more manageable. Such programs make it easy to input data in table form and make associations between sets of data, which help track changes over time and make associations between data gathered on different indicators. Important aspects of database design are that it has separate tables for each indicator, it holds or asks for enough information for the program to

make the appropriate associations, it presents each indicator's data in a clear and understandable manner, and that it is ultimately a helpful tool for storing, viewing, and analyzing the data (Microsoft, 2011a).

Creating a database can be very complex; however, a simplistic outline would be to use the following steps: 1) "determine the purpose of your database," 2) "find and organize the information required," 3) "divide the information into tables," 4) "turn information into columns," 5) "specify primary keys," 6) "set up table relationships," 7) "refine your design," and 8) "apply the normalization rules" (Microsoft, 2011a). Ultimately, a database must be easy to view, update, and maintain by anyone who accesses it. These characteristics ensure the data remains accessible by everyone that fines it helpful information.

The Bureau of Labor Statistics (BLS), located in the United States of America, conducts a monthly survey of employment hours and earnings from about 400,000 businesses. Several methods have been used to obtain this data including posted mail, FAX, e-mail, and Web-based collection. The BLS utilized Excel spreadsheets to obtain data from each State (Jackson and Eickman, 2007). These sheets were initially sent to each individual State via e-mail, however, with such a large data collection sample, sheets became hard to manage. The BLS found that "the use of spreadsheets was well received by the end users as they were already familiar with Excel" (Jackson and Eickman, 2007). By sending these sheets via e-mail each respondent was able to save a copy of their submission for their own records. This allowed the respondent to utilize the same data collection system when collecting their own data (Jackson and Eickman, 2007).

Eventually, the BLS relocated the Excel workbook into a Web-based collection system. Here, each State could input their data directly into the workbook. This allowed the BLS, who normally has to manually input the data, to allow the program to manage the data for each Excel file with ease. The BLS found that the use of the spreadsheets "decreased respondent burden and cut down on the processing time for most States" (Jackson and Eickman, 2007). The online collection system allowed for minimal respondent effort and yielded a large amount of data collected. The BLS recommended that the integration of Excel spreadsheets with web surveys is plausible when collecting simple numerical data. When managing qualitative data, however, an online system becomes difficult to manage (Jackson and Eickman, 2007).

2.3 Indicators in Croydon

In the United Kingdom, the Department for Environment, Food, and Rural Affairs (Defra) introduced the Local Government Performance Framework in April 2008. The Framework strengthened the Local Area Agreements and the Local Strategic Partnership to grant local governments more power and responsibility. The central government expected that granting power to the local government would streamline improvement as the local authorities' best know their own areas. The "Local Government" and "Performance Framework" pages on the Defra and Communities Websites, now archived, no longer receive updates. The Framework expired in March 2011 and no longer receives support by the new central government (Department for Environment, Food, and Rural Affairs, 2010).

The Framework contained a list of National Indicators the local governments used in order to assess the livability and sustainability of the area. The indicators in the *Handbook of Definitions* provided ways of assessing everything from education to crime rates (Department for Communities and Local Government, 2008). The indicators Croydon needed reviewed, the environmental indicators, represented indicators 185 to 197, in the Local Government Performance Framework (Department of Communities and Local Government, 2010). These indicators covered topics such as climate change preparation, flood and coastal erosion, household waste, air quality, and littering. Chapter 1 of the *Handbook* explains that any indicators and details not mentioned in the handbook fall under the discretion of the local authorities. Furthermore, they also hold responsibility for reporting the data to the central government and the public. The Croydon Council created the *State of the Environment Report 2010* in response to this requirement.

Annex #4 of the *Handbook of Definitions* contains explanations of each indicator with different sections including: rationale, definition, formulas for data assessment and collection, examples, purpose of the indicator, recommended time to collect the data, as well as guidance and suggestions. The *Handbook* aids in deciding which indicators are the most time or cost effective for Croydon to use and for assessing the less quantifiable indicators such as Indicator 188, the indicator on adapting to climate change. As one set of values cannot assess adapting to climate change, each indicator gets rated on a system of 5 levels. The levels range from 0 to 4, with Level 0 meaning that the borough or authority has just begun to assess environmental

threats, and Level 4 meaning that the borough or authority is making full use of a climate change action plan (Department for Communities and Local Government, 2008a).

In response to National Indicator 188, Croydon created the *Climate Change Mitigation and Adaptation Action Plans* in 2010. These plans provide information relevant to Croydon's goals for environmental sustainability in the future. The *Mitigation Action Plan* contains information discussing the Croydon Council's strategy for preventing climate change within the borough (Strategic Partnership of Croydon, 2010). The plan emphasizes the importance of this document by using charts and graphs that show the effects climate change will have on the borough. Croydon expresses particular concern about changes in the amount of rainfall in the winter and summer seasons. Studies have shown (see Figure 3) that winter rainfall increased (leading to the increased incidence of urban flooding) while summer rainfall has been decreased (Croydon Environment and Climate Change Partnership, 2010a).

Defined probability levels for climate change projection (UKCP09)

Probability level	Description
10%	Very unlikely to be less than
33%	Unlikely to be less than
50%	Central Estimate
67%	Unlikely to be greater than
90%	Very unlikely to be greater than

% probability of winter precipitation level change, based on a medium emissions scenario, SRES (UKCP09)
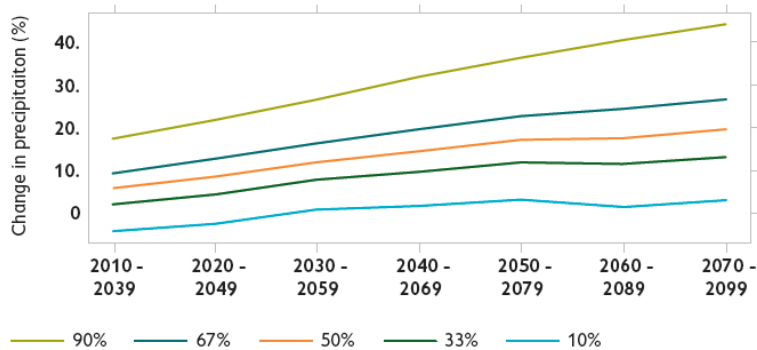
Figure 3: Predicted Level of Rainfall in winter with Estimates Ranging from High to Low (seen in the table above) (Croydon Environment and Climate Change Partnership, 2010a)

The Croydon *Climate Change Adaptation Action Plan* includes information on Croydon's strategy to live with a changing climate in the likely event that climate change does take place (Croydon Environment and Climate Change Partnership, 2010). In *2010 Croydon's State of the Environment Report*, the two plans' indicators combine into one document. Each document relied on National Indicators and therefore the documents' indicators closely follow the indicators laid out in the *Handbook of Definitions* (Strategic Partnership Croydon, 2010). Many of the indicators draw on similar data. For example, the efficiency of homes as well as the efficiency of the different types of transportation in Croydon deals with CO_2 emissions (see Figure 4).
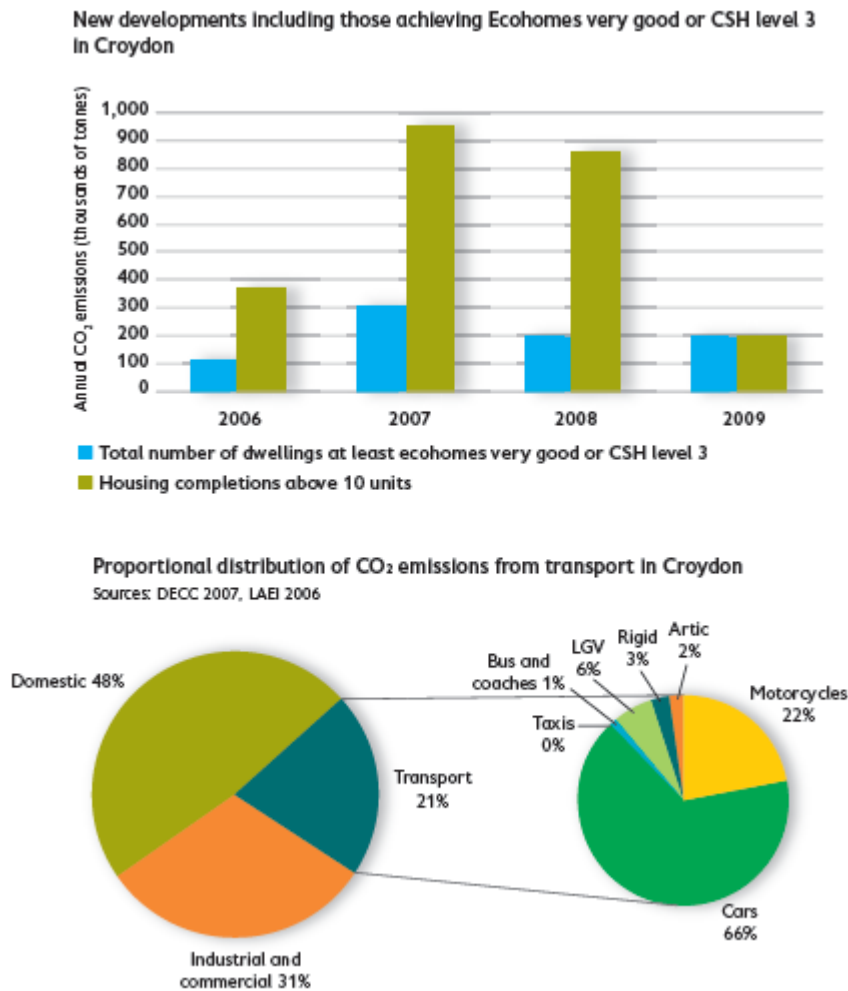
Figure 4: Efficiency of Different Types of Transportation in Croydon Based off of CO_2 Emissions (Strategic Partnership Croydon, 2010).

Since the Local Government Performance Framework expired, some local authorities such as Croydon have developed their own set of indicators and their own methods of keeping the indicators up to date. Croydon wanted to modify their set of indicators to account for a smaller budget so that they could more clearly monitor progress in reaching the original goals established when the National Indicators (Strategic Partnership of Croydon, 2010).

3.0 Reporting Background

In the Literature Review, the team identified both the National Indicator Framework, which feeds into Croydon's *State of the Environment Report 2010*, and Ken Portney's *Taking Sustainable Cities Seriously Index*. These sources were used to analyze current trends in indicator development. To learn more on the subject of sustainable development and indicators, the team conducted an interview with Doug Fine, the Assistant Commissioner for Planning & Policy at the Massachusetts Department of Environmental Protection (DEP). This interview was semi-structured where the team provided a general agenda of topics in advance. This general method generated a discussion without restricting Mr. Fine from elaborating on any topic he regarded as important. The topics discussed included indicator selection, evaluation, and longevity.

3.1 Massachusetts DEP Interview

Mr. Fine discussed with the team the different responsibilities of his job at the Massachusetts Department of Environmental Protection, and answered all of the team's questions thoroughly. The transcript for this interview can be found in Appendix A. The team focused primarily on the different aspects of an environmental report and how to best display the indicators. Learning how to choose which indicators should be included in a report proved helpful for the project.

Also discussed were the problems state of the environment reports and their indicators encounter within a government system. The indicators can often only be traced back a few years because the senior government officials change with the election of a new governor (elections happen every 4 years). Attitudes on the importance of environmental indicators as well as the attitudes on environmental protection can change whenever the administration changes. Sometimes environmental indicator reports are only called for to support the re-election campaign of the sitting governing administration or party. The team found Croydon experiencing same problem except that the party change occurred on a national scale. Croydon realized this problem and wishes to continue measuring environmental indicators despite the change in government requirements.

The team learned that ambient environmental indicators are more effective and informative when measured over longer periods of time, because the environment changes very slowly in response to the changes in environmental inputs (pollution emissions/discharges and

resource usage). Rarely an indicator measured over a period of 3 or 4 years would show a significant change in ambient condition of the environment. In order to make the audience of the report aware of changes in the indicator trends, measurable changes must exist. A vague change will not show the impact of the organization's efforts on improving the environment.

In response to the difficultly of displaying short term indicators, Mr. Fine discussed the importance of recognizing the audience for Croydon's *State of the Environment Report*. The *Report* could target the public, the Council, or interested people within the environment field. In most cases these state of the environment reports actually target multiple audiences. The goal of the report could display the achievements of elected officials, tell a story, or bring attention to important successes and losses about which the public should know about.

Mr. Fine suggested using icons or symbols with colors that tell the reader whether an area shows improvements, stagnation, or degradation. Trend icons help the public as reports often contain difficult graphs and deciding between a positive of negative trend can prove challenging. For example, a positive slope of the history of CO_2 emissions in an area indicates worsening air quality; on the other hand, a positive slope on the graph for the amount of protected forest in an area indicates the council attempting to improve the quality of the environment. The team observed similar icons in Islington's *State of the Environment Report 2009* where a green checkmark meant improvement, a yellow line meant that the area stayed the same and a red "X" meant that the area failed to improve or needed improvement (London Borough of Islington Council, 2009). A public audience wants first to know about the current environment, and second, if the environment has improved in previous years. The example Mr. Fine used involved drinking water; people want to know "Is it clean, is it safe?" and "Is it cleaner or safer than it was last year, five years ago, or ten years ago?" (Fine, 2011). The "Golden Indicators" targeted the correct audience, conveyed a message an audience could easily understand, and used a long time horizon (Fine 2011).

It is very important that the indicators should tell a story or show causes and effects clearly. Many indicators rely on numbers of *activities* performed by a government and are common in reports, rather than environmental *outcomes*. The number of environmental law enforcement actions, for example, represents an activity based indicator. This indicator has multiple contributing factors that may confound results. If the numbers of actions decrease from one year to the next, it could mean that the number of infringements decreased representing a

positive, or it could mean that enforcement agencies spent less time enforcing the particular law, representing a negative. Even an indicator such as the amount of CO_2 emissions from cars can tell different stories. The level of emissions could rise even if cars become more energy efficient because of the additional factor of increased number of miles traveled per vehicle. Such indicators must include an explanation of their causes.

In terms of how to decide which indicators to include in a report when working on a tighter budget, Mr. Fine provided a short list of requirements. In order to be cost-effective, the report should use previously recorded indicators. He suggested against creating new ones because: a) developing the new indicator will not have a long term history and b) new methods of data collection, measurement and analysis carries great expense. Science should drive an indicator, meaning that the indicator should be fact based and proven to have an impact on the environment. The indicator should be able to tell a story in order to gain public awareness. Finally an indicator should have low complexity; simple indicators tend to have more cost-effective implementation. Overall, it was expressed that a better report has a few good, effective indicators rather than many poorly organized ones.

Doug Fine directed the team towards reviewing the Massachusetts DEP *State of the Environment Report 2006*, and the Wales *A Better Place? State of the Environment 2005*. By comparing these two sources with various other reports and frameworks, the team found similarities and key themes in specific environmental indicators. This comparison established pros and cons for each report and identified common reporting techniques which provided a more extensive understanding of the necessary aspects of measuring and reporting environmental benchmarks.

The team reviewed four environmental reports to identify favorable environmental reporting techniques. The team examined Croydon's *State of the Environment Report 2010* along with Massachusetts DEP *State of the Environment Report 2006*, Islington's *State of the Environment Report 2010-11* and the Wales *A Better Place? State of the Environment 2005*. Croydon's *State of the Environment Report 2010* followed a model of the Islington report and Mr. Fine suggested that the team examine the Wales report as he considered it to be the ideal report (Fine 2011). Table 3 contains the summary of comments made for each report.

Report	Positives	Negatives
Croydon's State of the Environment	• "What has been achieved?" and "What can I do?" sections relate text to reader • Good amount of text	• Copied tables and graphs are hard to read • Graphs are confusing • Some percentages do not add up to 100% • The text is too long and wordy • There are typos throughout the report • Micrograms per meter cubed is a confusing statistic
Islington State of the Environment Report	• Examples are short • Explains the pictures • Explains graph with bullets	• Long titles hard to understand • Too much clutter causes unnecessary eye movement • Not a lot of past data • Irrelevant graph too simple/unnecessary
Welsh *A Better Place?*	• Title other than Sate of the Environment Report is more interesting • Concise color scheme • Simple introduction • Simple Forward • Emphasizes society and what it can do • Page per topic adds to simplicity • Fact on each page- states problem in clear terms • Better or worse (with a little further explanation) clearly shows trend • Column for good and column for bad • "What we need to do" section relates to reader • Little introductory puts section into perspective • Importance of subject is defined clearly • Overall section summarizes the entire report	• Simple graphics not very inspiring • no connection with real life • Where we live section is simple but vague • Titles are too simple • No graphs or charts- numbers are listed but no pictorial representations to aid the eye • "What we need to do" section is very general talking about big goals which is good but doesn't give the reader a sense of what he can do perhaps not including "We" would clear things up. "What needs to be done"
Massachusetts DEP State of the Environment Report	• Covers all bases of indicators (air, land, and biodiversity) • Relates information to daily life • Breaks down forward into chapters • "Looking ahead" section shows what will be accomplished • Stories make text more interesting	• Too many words • Quotes next to titles are unnecessary • Too many specific examples • Graphs are not described • Pictures are unclear/ bad quality

In Croydon's report, the "What has been achieved?" and "What can I do?" sections were positive aspects because they demonstrate to the reader how he or she can make a difference in preserving the environment. However, the team found that many of the graphs were unclear and could display the data in a more reader friendly manner. The DEP Report covered all of the main topics of indicators established in the literature review, however the team also thought that the excessive detail in the narrative sections of the report would intimidate rather than inspire the reader. The Islington report appeared well written with thorough explanations, but some of the graphs contained insufficient information and displayed no trend. The design and layout of the Wales report was effective in making the report easy to understand quickly though it lacked graphs or figures, which could have aided the understanding of the numbers and trends.

3.2 Croydon's Needs

To assess the Croydon Council's requirements for their report, the team conducted three interviews with the Council officers directly, particularly those whose work contributes to the *State of the Environment Report*. All of these semi-structured interviews were conducted in person. Questions addressed to these subjects, as shown in Appendix B, included:

- Specifically, what does the council hope to measure in the borough and why?
- What indicators have they used in the past?
- Who is the intended audience of the *State of the Environment Report*?
- What is the message the indicators are designed to express?
- What limitations constraining the types of indicators included in the *Report*?
- What data will be available concerning indicators, past, present and future?
- How the Council would like to evaluate the data for trends?

Information from other reports and interviews with the other boroughs also initiated discussion with the Sustainable Development Service regarding benefits to Croydon and environmental reporting techniques.

Members of the Council established as contacts for interviews included Peter McDonald, Bob Fiddik, and Muhammad Ali. Mr. McDonald is an officer in Strategic Transport, also, as head of Sustainable Development in the Croydon Council; the team learned that Mr. Fiddik possessed information regarding environmental policy, where as Mr. Ali works more with the indicators. Table 4, below, displays the position held by each of these Croydon Council officers.

Table 4: Croydon Council Main Contacts

Council Member	Position	Area of Expertise
Peter McDonald	Strategic Transport Officer	Transport and Historical information regarding the Sustainable Development Service
Bob Fiddik	Head of Sustainable Development	Policy planning and development
Muhammad Ali	Carbon Reduction Officer	Carbon emissions and sustainable development

Upon arrival at the Croydon Council the team used information gathered from Mr. Fine to form questions for the members of the Croydon Council with experience in the Sustainable Development Service and who also had a vision of the final product. Peter McDonald, who has the most experience with the Sustainable Development Service, stated that he would like to see the *State of the Environment Report* target the average person as well as the important personnel in the Council. He reasoned that if the Council had a higher awareness of the importance of the environmental changes, they may provide a larger budget to the Sustainable Development Service. Also, the final *Report* must meet approval by the Head of Sustainability, Councilor Perry. Mr. McDonald supported Mr. Fine's opinion that the public wants to know the current trends in the environment in a concise manner. Utilizing icons to display the trend for each indicator makes it easy to understand the complex information.

4.0 Workbook

The overall goal of this project, proposing an annually repeatable process for the annual update of Croydon's *State of the Environment Report*, has many possible solutions. The team, along with Mr. Ali and Mr. McDonald, recognized the importance of data collection as an essential aspect of this process. Responsibility for the physical collection of most of the data does not fall to the Sustainable Development Service, but rather falls to other teams within the Croydon Council and various external organizations. Great importance lied in retrieving this data for placement within the *State of the Environment Report*.

For the publication of the *State of the Environment Report 2010*, one individual spent approximately six months working solely on the *Report*. The most time consuming and frustrating part of writing the previous *Report* included finding the people who had data and retrieving it from them. The files of raw data from the previous *Report* have many deficiencies, reflecting the difficulty in compiling them. The cryptic organization of the files leads to difficulty finding historic data. Placed in multiple layers of sub-folders, many of the files could not be easily accessed because the computers were not able to recognize the long file paths. Furthermore, some of the data used in the *Report*, were not found in the raw data files.

To address these deficiencies, the team consolidated all the data into one, organized file. The team considered three different programs to address the requirements: Microsoft Access, Google Docs, and Microsoft Excel. These programs were evaluated for qualities that provided a solution to the problems listed in Table 5 below. The left column lists the problems and difficulties that using the previous process of creating the *State of the Environment Report* presented. The center column lists the requirements for a new process that the team felt would solve the corresponding problem. The right column lists the possible solutions that would meet the requirements of the improved process.

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Problem with Previous Process	Need	Ideal Solutions
Data is disorganized and scattered throughout a multitude of files and folders. Navigation is difficult.	A method of keeping all files and data in one place.	Use a program that can store all data in one file, but separate the data within the file to reduce confusion.
Text and descriptions of graphs and pictures is not found anywhere but in the report itself.	A method of keeping track of the changes in text, making it easy to edit or update.	Use a program that can organize text as well as data. Use a program that allows the user to install macros that enable those updating the data to save time when copying large amounts of text.
Graphs stored in Excel files. Links to tables often broken or in some cases the tables did not exist.	Graphs that automatically update with changes to data. Graphs must also be able to be exported to other programs so that they do not have to be recreated to be in the report	Use a program where graphs automatically sync to additions, deletions, and changes in data without the need for reformatting. Use a program from which graphs can be easily exported and edited in other programs.
Gathering data through e-mail contributed to disorganization of data.	A method of allowing others to input data by themselves.	Put a program online or on the Council's internal website, the Intranet for which a link can be sent to the person providing the data.
Data not easily accessed by anyone outside of the Council. Those inside the Council cannot open some of the files.	A method of storing the data that makes it accessible (but not necessarily editable) by everyone.	Use an online program or database that allows for some security so that data can only be edited by those qualified to do so.

Microsoft Access initially seemed the most promising because data could be entered in an organized format which utilized tables for managing the data. Furthermore, in the more recent versions of the program, the owner of the data can share it with other users through Microsoft SharePoint. This could have aided in the updating of the data by the other teams in the Council. However, the Council computers use a version of Microsoft that does not support SharePoint, and while Access produces graphs, extracting them from the program and placing them within the *Report* proved difficult. Ultimately, the team decided against its use.

Google Docs, an online spreadsheet program available through Google, has many similarities to Microsoft Excel, particularly in terms of in its layout and level of sophistication. It performs many of the same functions as both Access and Excel with the added benefit of online availability so that anyone invited to edit it can do so. The team found the online availability a positive aspect because it would cut down on the amount of file management necessary if Google stored the data. Also, because it's online, everyone uses the same version of the program and that consistency will remain even when the program is updated. However, the greatest obstacle that using Google Docs presents is that it requires every person editing the document to have a Google account. This creates an extra step making people less likely to report their data. Also, due to the amount of data it would need to hold and the older computers used by the Croydon Council, the program loads documents very slowly, thus making it difficult for the data collectors as well.

Microsoft Excel allowed for all the data storage in one file and generates professional looking graphs quickly and easily. Furthermore, the graphs can easily export to the *Report* in Microsoft Publisher. In addition, the team found Excel user-friendly and commonly used by many people within the Council. Each page of the *Report* corresponds to a page in the Excel workbook, to maintain organization, and large boxes contain the text present in the *Report*. Excel, like Access, currently has the SharePoint feature, but given its unavailability on the computers at the Council, the team decided to use e-mail to gather data. It was because of these features that the team decided to use Excel to create the workbook.

The Excel sheets followed a fairly uniform template, a sample of which can be seen in Figure 5. The workbook included a worksheet for each individual indicator. The e-mailed sheets contained the boxes for new information, color coded gray, and all other boxes were locked to protect old data or text from inadvertent alteration. The worksheets also contained a button

created using Microsoft Visual Basic. The button corresponded to a macro coded such that upon clicking the button, the text from a section of the page in the previous report would copy and paste into the box for the text for the current report. Including a button for each sub-section made the updates easier if no changes to the text needed to occur. In each worksheet the graphs updated automatically when the individual entered new data into the designated cells. The format of the graphs produced corresponded to the proper color scheme for the *Report*. This allowed them to be easily placed into the *Report* template.

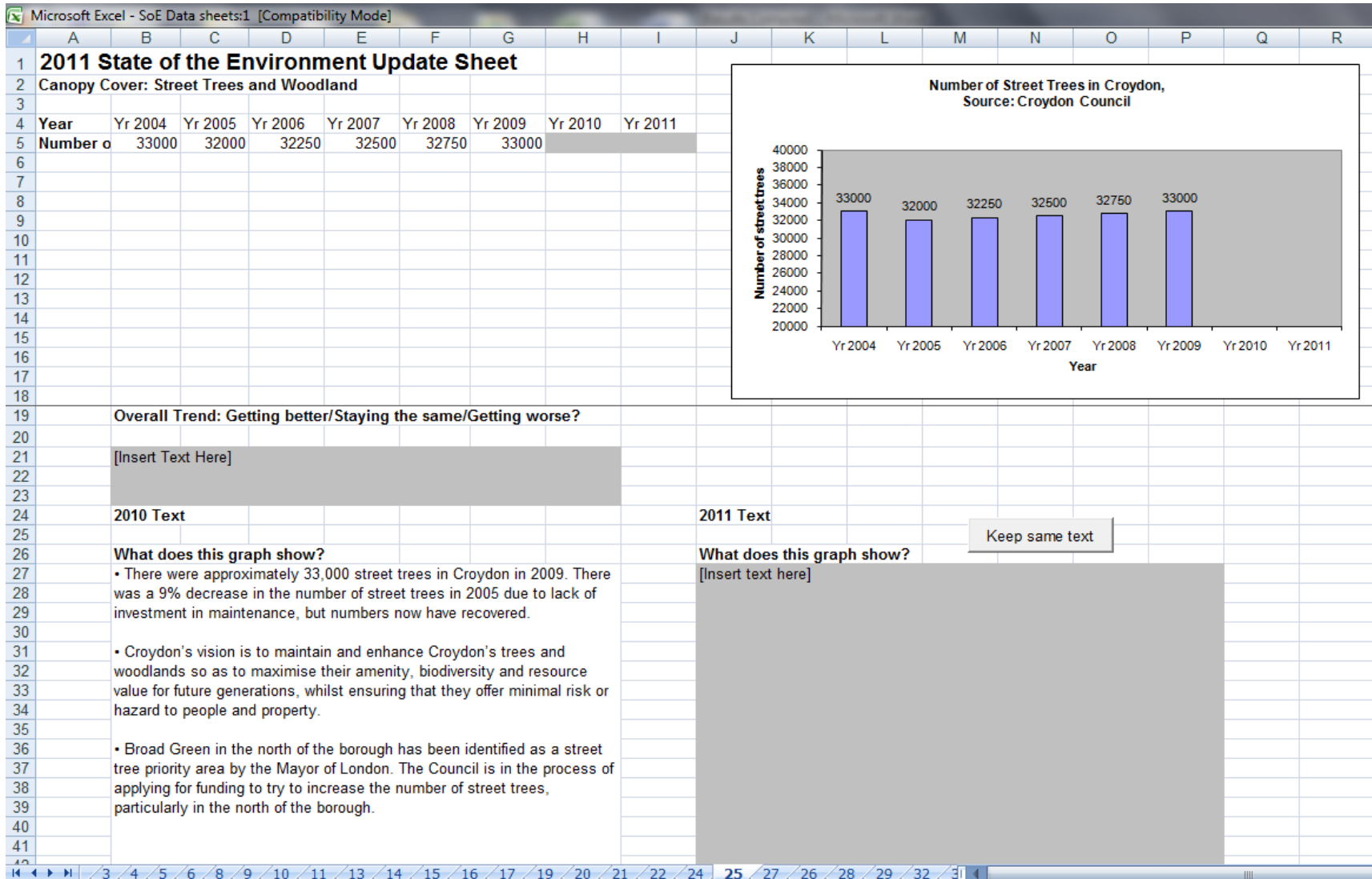(blank space has been left to maintain integrity of figure)

Figure 5: Example Worksheet from Overall Workbook

The final workbook contained thirty seven pages and thirty six graphs along with all the text present in the *State of the Environment Report 2011*. Each page in the workbook correlates to a page in the *Report*. In the future, the workbook can grow and develop if more indicators are included in the *Report*.

The layout of each worksheet within the workbook responded to the needs of the Croydon Council. The types of data and indicators that it contained depended on the historical data available in Croydon. The workbook allowed other departments to view data relevant to them in tabular and graphic fashion. This allowed them to observe indicators as well as analyze data that is significant to them. This also allows an individual to track added information over time centralized in one location. The final workbook is located on the Croydon Council server under the Sustainable Development Service's corresponding folder.

4.1 Data Collection

A series of e-mails sent to the individuals responsible for collecting the data was used to solicit the new data added to the workbook. The Sustainable Development Service provided a list of contacts for these individuals to the team upon arrival. When no response from the contact was obtained, further e-mails were sent which resulted in finding all the required data. The team developed a template to construct these e-mails. The team created individual pages of the workbook, sent as attachments to the individuals believed to have the data pertaining to the update of these pages. Sending only the pages relevant to each person made it easy for him or her to provide the appropriate data and return it to the team. This method also added a safety feature to the process in that a contact could not change information from the original workbook because it was not made available to them.

The team considered methods other than e-mail for data collection. These included using Survey Monkey, a free online survey generator, or placing the workbook on the Croydon Council's internal-facing Website, called the Intranet. However, both these approaches complicate the process rather than improve it. Survey Monkey would have allowed for collecting both the data and the text, but would not have updated graphs for the users so they could easily see the data and discuss the summary and overall trend. Publishing the document on the Intranet would have required a great deal of work from the Information Technology department, and the contact within the department suggested against it. Also, this would still require e-mails to gather the data collected by individuals outside the Council, creating further complexity.

5.0 Templates

Two templates were created for the Sustainable Development Service's use: the *Report* template as well as a pamphlet template, which provides a snapshot from of the environment by highlighting summaries of each indicator in the *State of the Environment Report.* These final recommendations involved collating information collected from the first two goals. The indicators from the *State of the Environment Report 2010* put into the workbook allowed the team to determine which indicators still relate to the goals of the Croydon Council.

The team considered three programs to produce templates for the *State of the Environment Report* and pamphlet: Microsoft Word, Microsoft PowerPoint, and Microsoft Publisher. Table 6 is structured in the same manner as Table 5. All of these programs were evaluated for their ability to solve the problems listed in the left column. In this case, the problems relate to the part of the process involving the creation of the templates for the report and the pamphlet.

Table 6: Requirements for State of the Environment Generation Process

Problem with Previous Process	Need	Ideal Solutions
The original method (Microsoft PowerPoint) did not allow for advanced graphics or custom layouts. Thus requiring use of the Council's design team, which can be expensive.	A simple method which allows the creator of the template to create professional looking graphics and layouts without much effort.	A program which the Council has available that is able to produce professional-looking layouts that can easily be copied to become the pages for the report.
The previous method did not properly format with standard paper sizes.	A method of standardizing the template so that it can be used each year and can be made available in different mediums if requested	A program which is made to allow the user to print and format the template or report easily.
No previous method for creating the pamphlet existed.	A smaller document that summarizes the State of the Environment report.	Use a program which allows the user to choose different formats to create a brochure-style template.

Microsoft Word, a user friendly program, has a template feature and a brochure feature as well as a page that easily manipulates into a template. After looking into this further, Word appeared less versatile in terms of template design than desired. Formatting issues made everything uniform as well as printable margin limit space. Also, the template features became available on Microsoft Word 2007 and higher, but the Croydon Council uses Microsoft 2003. This became the deciding factor in eliminating it as an option.

Microsoft PowerPoint earned consideration for creating a template because the previous *Report* was originally created using this program. After looking through the data from last year's *Report*, the team found multiple attempts made using this program, all of which lacked organization. When looking into the program in detail the team discovered that creating a repeatable template was infeasible. Although this program appeared more promising than Microsoft Word, it did not have all of the desired features for easy formatting. The team eliminated this program as an option because a non-reusable template would require more time and money.

Ultimately, the team decided to utilize Microsoft Publisher. Publisher, a user friendly program, allowed for the generation of a simple template. This allowed the use of Excel spreadsheets for charts and graphs and gave flexibility in choosing graphics and inserting text where appropriate. In the template produced, the editor can easily click in the desired spot and insert the appropriate text by copying it from the workbook containing the updated text. The template also contains space for the graph generated from the workbook. When copied into the template in Microsoft Publisher, the graph automatically formats to the desired size so that it looks standardized throughout the *Report*. The template allows the trend of each indicator to be easily updated. Under the title there is either an arrow up, sideways, or down signifying the trend either improving, staying the same, or getting worse. There is also a grey circle containing a question mark indicating there is not enough data to determine a trend. The user can choose from these four options and insert the most appropriate, as indicated in the workbook. Each page generally includes two pictures: a graph representing the data and a picture relating the indicator to everyday life. The text boxes are colored to the corresponding color for each chapter. This makes it easy for the reader to identify which chapter they are reading. The colored text boxes also help to show what is being described by appearing directly under or above the subject of focus. The pamphlet template is used in the same fashion as the template for the *Report,* copying

and pasting. The template is set up so that there is a picture or graph and corresponding text for each chapter in the *Report.* The final template for the *Report* can be seen in Figure 6 and the inside of the final pamphlet template can be seen in Figure 7.

(blank space has been left to maintain integrity of figure)

[#] [Insert Title Here]

[Insert Overall Trend Here]

[Insert Title Here]

[Insert Text Here]

[Insert Title Here]
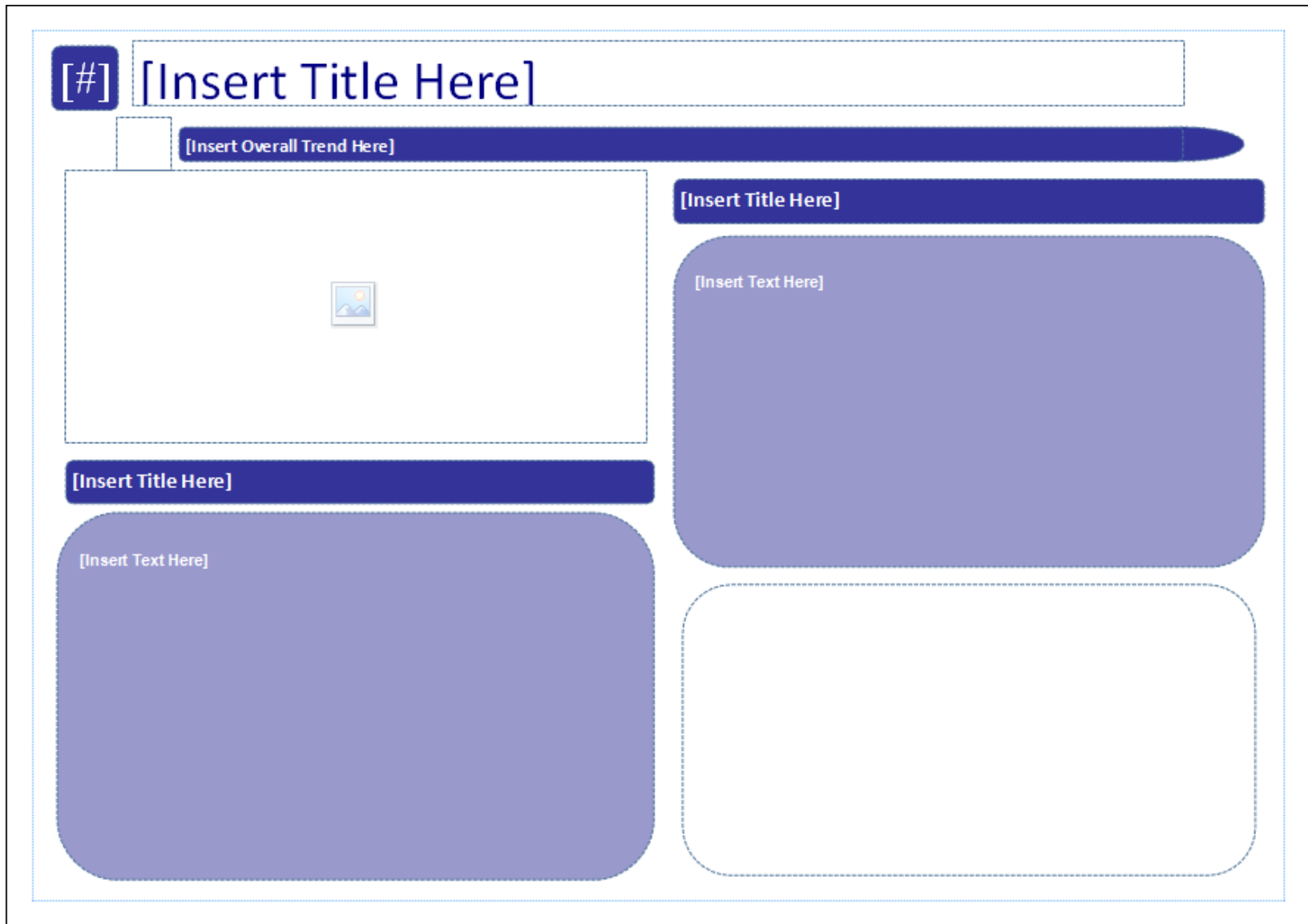
[Insert Text Here]

Figure 6: Page Template of the State of the Environment Report

Our Homes

[Insert "Reducing CO₂ Emissions from our Homes" Summary Here]

Our Air

[Insert "Transport and Air Quality" Summary Here]

Our Infrastructure

[Insert "Green Infrastructure and Climate Change" Summary Here]

Our Businesses

[Insert "Low Carbon Economy" Summary Here]

Our Streets

[Insert "Waste, Recycling and Street Cleanliness" Summary Here]

Our Climate

[Insert "Climate Change Adaptation" Summary Here]

Figure 7: Inside of the Pamphlet Template

The *Report* template created contains a generic form the Council can use every year. The new data and text easily inserts into the template, ultimately creating the *State of the Environment Report*. By using this template, the Sustainable Development Service would save time and money. Further the Council could distribute the pamphlet to interested members of the public, reaching a larger audience without the expense of excess paper. This separate pamphlet template provides an overview of the *State of the Environment Report* along with the link to the entire *Report* for those with further interest and is separate from the aforementioned *Report* template.

An instruction manual was created in order to bring the person making the *Report* through the steps to generate the *Report* from the templates provided. This manual begins with instructions on workbook setup and data collection. This then brings the reader through the process to transfer the information from the workbook into the correct template. This instruction manual can be seen in Appendix C.

6.0 Indicator Framework

The team analyzed and evaluated current frameworks. Data used by Croydon was also evaluated in order to develop a set of indicators. The documents that were reviewed included: *Croydon's State of Environment Report 2010*, *Croydon Climate Change Adaption Plan*, and the *Croydon Climate Change Mitigation Action Plan*. The team examined each indicator within the *State of the Environment Report 2010* and assessed the validity of the indicator by analyzing each page.

The team collected data from the different groups throughout Croydon and the Council stored it in the workbook and then evaluated the indicators and the pertaining text in the previous report. This determined whether the previous report contained any unnecessary information to be removed, thereby simplifying the final framework the team would present. Also the evaluation determined whether any information needed alteration or addition to provide further clarity for the selected audience of the *Report*.

Appendix D contains a summary of each page of the *State of the Environment Report 2010*. The team evaluated the titles and captions, the indicators themselves, the graph displaying the data, and the relating text and picture. A few titles of chapters and subsections did not fully communicate the topic to the reader. For example, many indicator titles were worded such that they appear similar to other titles. For example, within Chapter 1 two indicator titles were "Reducing CO_2 Emissions and Improving Quality of Life in Existing Private Housing" and "Reducing CO_2 Emissions and Improving Quality of Life in Existing Council Run Social Housing." The second title does not include anything that specifically separates it from the first title.

Scrutinizing the indicators occurred after receiving the e-mails from the different teams concerning the appropriate data. Due to the national government no longer requiring some indicator measurements, the indicators from the previous year's report that no longer had supporting data needed identification. When the Sustainable Development Service agreed that an indicator did not need reporting, the team removed it from the *Report*. Checking for readability, some graphs needed alteration because they displayed information in an inappropriate chart type, thus skewing the determination of trends. Some had misleading axis labels which made the graph difficult to understand. For example, on the "Percentage of Household Waste sent to Landfill"

page, the vertical axis was simply labeled "percentage" and the title of the graph failed to explain the origins of the percentage. Rather, the title of the page should have been the title of the graph and vice versa. The text examination revealed it properly explained the page and its importance in a way that the intended audience could understand. Text was examined to see if it was clear, concise, and explained technological terms. Pictures were evaluated for their quality and relevance to the indicator, borough, and page they were located on.

Indicators that met the necessary criteria were marked "keep" in Table 7. The team identified longevity as a criterion for keeping an indicator because the *State of the Environment Report* strives to show trends in data over time. For example, on page 10, "Carbon Dioxide Savings from Home Insulation Measures in Croydon" received a "keep" because the presence of available data and the government still mandates carbon dioxide indicators. Therefore, the indicator should endure time and governmental changes. Indicators were removed if the indicator failed to meet the stated criteria. For example, the "Energy Efficiency of Low Income Homes in Croydon" on page 12 of the *State of the Environment Report 2010* no longer has relatable data collected, moving it from consideration. For some sections in the *Report*, a removed indicator had a new one replace it if the council deemed the topic necessary to report. For example, "Carbon Reduction in the Croydon Council" indicator on page 17 needed replacement due to a new carbon reduction action plan set in place by the council. Also, some indicators, marked as partial, will have data available in the future, though outside the time frame which the team completed the project. For example, the waste management data will become available in the fall. Table 7 contains a summary of the decisions made for each indicator.

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Indicator	Page #	Kept	Partial	Removed	New
Reducing CO_2 Emissions and Improving Quality of Life in Existing Private Housing	10	X			
Reducing CO_2 Emissions and Improving Quality of Life in Existing Council Run Social Housing	11	X			
Tackling Fuel Poverty	12			X	
Reducing the Environmental Impact of Social Housing	13	X			
Reducing the Environmental Impact of New Built Homes – Private	14	X			
Reducing CO_2 Emissions from Croydon Council's Operations	17			X	
Croydon Council CO_2 Emissions	N/A				X
Working Towards Sustainable Schools	18	X			
Reducing CO_2 Emissions from Non-Residential Buildings	19	X			
Improving the Environmental Performance of Local Businesses	20			X	
Volume of Traffic on Croydon's Roads	23		X		
Sustainable Transport Options – Cycling	24	X			
Reducing Car Use – School Travel	25	X			
Air Pollution – NO_2	26	X			
Air Pollution – PM_{10}	27	X			
Amount of Household Waste Per Head	30		X		
Proportion of Household Waste Sent to Landfill	31		X		
Recycling and Composting Levels	32		X		
Proportion of the Borough with Unacceptable Levels of Litter and Detritus	33	X			
Green Infrastructure in Croydon	36	X			
Canopy Cover–Street Trees & Woodland	37	X			
Proportion of Green/Open Spaces Managed for Nature Conservation	38			X	
Proportion of Green/Open Spaces Managed for Nature Conservation	N/A				X
Green Roofs on New Developments	39			X	
Access to Nature	40	X			
Urban and Semi-Urban Food Growing	41	X			
Flood Risk	44		X		
Dealing with Heat Stress	45	X			
Water Management	46	X			
Global Climate Dimension	47	X			

7.0 Process and Indicator Evaluation

The team conducted interviews with six selected boroughs. The purpose of these interviews was to 1) determine how the budget cuts are affecting the borough, 2) determine the process which they produce environmental reports, and 3) compare the process used by boroughs to the process the team used to generate the *State of the Environment Report 2011*. By completing this, the team was able to determine if the process which they used was an accepted practice throughout borough environmental reporting.

The main method of gathering information involved semi-structured interviews. These interviews filled gaps in the team's knowledge and answered questions concerning the range of environmental reports. The team particularly focused on how other boroughs responded to new budget constraints and how they produced their environmental reports despite the newly imposed economic constraints. Further inquiries were addressed to determine how the boroughs collect and measure their data, and which indicators they present in their report. The team interviewed six boroughs throughout London and Great Britain. More specifically, the boroughs interviewed had either a state of the environment report or some corresponding document or policy. Through consulting with Croydon's Sustainable Development Service, the team identified specific individuals to contact. The team initially considered the following boroughs for interviewing and contacted them by telephone and through e-mail: the London boroughs of Islington, Sutton, Enfield, City of London, Merton, Southwark, Brent, Camden, as well as the Metropolitan Borough of Kirklees, a borough outside of London. From this potential list of boroughs, the team interviewed the London boroughs of Islington, Sutton, City of London, Merton, Brent and the Metropolitan Borough of Kirklees. Table 8, below, displays contacts for these boroughs, as well as the position held in their council. Transcripts for the interviews can be found in Appendix A.

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Borough Interviewed	Contact	Position
Islington	Doug McNab	Sustainability Officer in Planning
Sutton	Andrea França and Katrina Lloyd	Senior Environmental Sustainability Officer and Environmental Sustainability Officer
City of London	Simon Mills	Head of Sustainable Development
Merton	Confidential	
Brent	Helen Entwistle	Environmental Projects and Policy Officer
Kirklees	Katie Sutton and Kathryn Marshall	Environment Officers

The team interviewed the boroughs about their reactions to the budget cuts, state of environment reports, and methods of data collection, workbook if they had one, templates, and any future environmental reporting plans. The team learned through the interviews that, like Croydon, the other boroughs' environmental teams suffered under the recent budget cuts instituted by the central government. In each borough the team interviewed the environment and sustainability team which experienced cuts of anywhere from two to four positions. In some cases this cut over 50% of staff. In the City of London, the sustainable development team was reduced to a single person.

At Brent Council, choosing the indicators fell to the person creating the report. When producing an updated report, the author chose to keep those indicators that were still measured and were still relevant. Due to the budget cuts, the environment team stopped gathering data on indicators measured outside of the council, finding them difficult and time consuming to obtain. Brent organized its data in an e-mail folder and kept the text and pictures separate from the data. When sending the e-mails, in addition to asking for data, Brent asked the departments to send any interesting success stories that they would like included in the report. These stories make reading more interesting for residents of the borough. The budget cuts have affected the way Brent creates its environmental report as well. In the past, Brent gave their report to their design

team before publishing it online. Their previous report, however, lacked a design budget and the publication occurred solely online to save the expense of paper and to be more sustainable.

In Islington, the *State of the Environment Report* had been a priority of their environmental team in the years before the budget cuts. Recently, however, the *Report* has not received as much attention. For example, in previous years Islington usually began the data collection process for the *Report* in May. This year, however, by late May the Islington team had not received word on whether or not *Report* creation will commence again this year. Islington divided the compilation of the report between the people within the Sustainability team. Members of the team sent e-mails to various departments asking for new data which to place into the report. The members sending out the e-mails collected the answers from the e-mails and put these into Excel sheets with the graph, text, and picture relating to that indicator. Islington also included stories in their report. Stories from both boroughs often describe efforts by various groups helping the environment. Islington had used the same template for the past three reports. Also, Islington has used the "traffic light" (London Borough of Islington, 2009) method of displaying trends for the indicator, as mentioned in the discussion with Doug Fine. In Islington, the indicator selection occurred at the discretion of their environmental team in liaison with other teams across the Council, but before publishing the report, the indicators had to meet the approval of higher-ups in the council.

The London Borough of Merton found fame in 2003 for its Merton Rule which dealt with energy efficiency and renewable resources; however, Merton no longer uses a prescriptive renewable energy target. Like other boroughs, Merton shifted its focus to National Indicator 185 and carbon emissions. The government no longer mandates National Indicator 186 which related to the Per capita reduction in CO_2 emissions in the local authority area, and was thus affected by renewables installed as a result of the Merton Rule. The benefits of replacing NI 186 are questionable because it lacks reliability and often fails to provide useful information. Merton only measures required indicators and indicators gathered from external sources to limit spending. One member of the Merton council spends about seventeen percent of his time throughout the year putting together the *Annual Monitoring Report*. That person sends e-mails for data collection using a template for each e-mail.

Interviewing Simon Mills, Head of Sustainable Development for The City of London, revealed an intern compiled the data for their *Sustainability Review*. The intern worked on the

project for six months. He utilized an Excel spreadsheet for storing data, which he collected by contacting the appropriate data holders. The City of London used a meta-narrative approach to writing the report to instill "a sense of ownership by data holders" (Mills, 2011). For example, it included sections such as "Did you know" within the text. Indicator analysis resulted from an analysis of ease of updating, legal requirements, and availability from other departments.

Sutton uses the Eco-Management Audit Scheme (EMAS) which requires them to create an annual Environmental Statement (report). Environmental Statement Sutton follows the EMAS requirements. Katrina Lloyd, the woman who compiles the report, uses a template for the report and stores data collected from various departments in Excel spreadsheets. Data collection occurs soon after the end of the financial year, usually in May, and publication takes place as soon as the report is externally verified by the EMAS auditor. This is normally in July. The chosen environmental indicators satisfy the EMAS and national government requirements.

Kirklees formerly used the EMAS system; however it no longer meets the requirements of the Council which sub-sequentially abandoned it. When the borough did use EMAS, they also produced an annual *Environmental Statement*. One person would spend three to four months gathering the data and compiling the report. Kirklees uses Excel for data storage, finding it more user friendly than any other program (Sutton & Marshall, 2011). The borough has shifted focus to carbon reduction; and the final framework of 2011 indicators has yet to reach finalization.

In summary, most boroughs are mainly focusing on the CRC indicator which the government still mandates, and removing indicators where data collection has terminated. To save money, most councils are choosing indicators where data can be gathered externally. As shown in Table 9 below, sixty six percent of the interviewed boroughs use Excel for data storage, all use e-mails for data collection, fifty percent use a template, and sixty six percent have an EMS.

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Borough	Report	Data Storage	Data Collection	Template	EMS
Brent	Environment Report	Email Folders	E-mail	Yes	ISO 14001
City of London	Sustainability Review	Excel	E-mail	No	No
Islington	State of the Environment	Excel	E-mail	Yes	ISO 14001
Kirklees	Environmental Statement	Excel	E-mail	No	EMAS
Merton	Annual Monitoring Report	- - - - - - - - -	E-mail	Yes	No
Sutton	Spotlight on Environment	Excel	E-mail	No	EMAS

8.0 Conclusions

Due to budget cuts and the loss of the National Indicator Framework, the London borough of Croydon no longer has resources to devote to the *State of the Environment Report.* The team developed an easy, quick and inexpensive process that will enable Croydon's Sustainable Development Service to create this annual *Report*.

This project required the team to propose a new process for updating the *State of the Environment Report.* One method used to develop the process involved creating the newest edition, the *State of the Environment Report 2011*. A workbook generated by the team allowed easy data updates and contained all the necessary data and text for the *Report*. The workbook included macros driven by buttons within the workbook. The final workbook contained thirty-two worksheets of which twenty-five contain indicator data. Individualized Excel worksheets from the workbook were attached to e-mails to individuals responsible for data collection. The e-mails requested the data and provided explanation as to how to input data into the workbooks. Appendix C includes the templates for initial and follow-up e-mails sent to these individuals within the process instructions. The team also conducted an analysis of Croydon's environmental indicator framework, the team kept eighteen indicators, removed five indicators, added two indicators, and five indicators had incomplete data at the conclusion of the project.

After the data for each indicator was collated the team used Microsoft Publisher to create a template for the *Report*, into which all the data and text from the workbook was transferred. Once the pages contained all the required text, data, pictures, and a cover page, the *Report* was published as a PDF for viewing on the Croydon Council Website. The final piece of the process produced a pamphlet using the summary pages within the finished *Report*. Creating it required copying and pasting material out of the summary pages of the *Report* into the template for the pamphlet. By publishing and distributing the pamphlet, the Council can spark interest in the *Report* without wasting money and resources on printing copies of the entire report. Rather, the pamphlet contains a small portion of the data and encourages those interested to view the entire *Report* on the Council website.

The process used for creating the *State of the Environment Report 2011* was evaluated through discussions with other boroughs to determine common techniques in environmental reporting. Reducing costs and improving efficiency was a common theme in these discussions. All of these councils accounted for budget cuts by reducing the number of staff within their

environmental departments. Many of the boroughs have also condensed the environmental department's indicator framework, focusing attention to the government's Carbon Reduction Commitment (CRC). The environmental departments choose additional indicators and report features based on their target audiences. Politics also play a role in environmental reporting in that the selected indicator must meet the approval of the council. Furthermore, an Environmental Management System (EMS) can factor into indicator selection. Four councils the team interviewed have used an EMS, which requires the council to report certain internal environmental practices.

The team also observed similar techniques in the process of environmental reporting. To collect and organize all of the data, the team found that the majority of the boroughs use Microsoft Excel. The boroughs agree that Excel is widely known program and simple to use. Further, the boroughs all utilize e-mails for contacting individuals and asking for data. Most boroughs used a template or created their reports using a similar format every year. Some of the boroughs use council based design teams to design the report layout and prepare it for publishing. This comes with an expense; so many environmental departments have considered designing the reports themselves.

The team completed ninety-four percent of the report and the entire pamphlet in fewer than six weeks. Data collection via e-mail messages took three weeks. The report and pamphlet took two weeks to complete. It is estimated that utilizing the team's process will take a seventy-three working hours (this time does not include data collection). Since the Design team was by-passed for the aesthetic details of the report, the Sustainable Development Service will save between £10,000 and £20,000 pounds (approx. $16,000-$32,000) per year in publishing the *State of the Environment Report*.

9.0 Recommendations

The team proposes that the Croydon Council and the Sustainable Development Service utilize the same process used in creating this years' *State of the Environment Report 2011*, for which a detailed instruction manual has been provided to the Sustainable Development Service and can be found in Appendix C. In the short term, while still under harsh budget constraints, the most plausible course of action will be for the Sustainable Development Service to divide the responsibility for collating the data by chapter amongst the team members. In the future, one suggestion is to replace the process of collection via e-mail with a Web-based data collection technique. Furthermore, if it becomes fiscally possible, the team recommends the Council adopt Eco-Management Audit Scheme (EMAS). This system has worked well in Councils that desire to keep producing an environmental report annually as it mandates that the Council continue to collect, report, and audit the data.

10.0 References

Bell, S., & Morse, S. (2008). *Sustainability indicators – measuring the immeasurable? (2nd edition)* Earthscan.

Cerar, P. (2010, June 3). *Islington named as London's greenest borough*. Retrieved April 3, 2011, from London Evening Standard: http://www.thisislondon.co.uk/standard/article-23840820-islington-is-named-as-londons-greenest-borough.do

Croydon Council. (2011). *Sustainable development - an explanation*. Retrieved April 9, 2011, from Croydon: http://www.croydon.gov.uk/environment/sustainabledev/whatis/explanation

Croydon Environment and Climate Change Partnership. (2010). *Croydon Climate Change Adaption Action Plan.* London: Strategic Partnership Croydon.

Croydon Environment and Climate Change Partnership. (2010a). *Croydon Climate Change Mitigation Action Plan.* London: Strategic Partnership Croydon.

Dahl, R.L. (2007). In Hak T., Moldan B. (Eds.), *Sustainability indicators: A scientific assessment*. Washington, DC, USA: Island Press.

Department for Communities and Local Government. (2007). *The New Performance Framework for Local Authorities & Local Authority Partnerships: Single Set of National Indicators*. Retrieved from: http://www.communities.gov.uk/documents/localgovernment/pdf/505713.pdf

Department for Communities and Local Government. (2008). *National Indicators for Local Authorities and Local Authority Partnerships: Handbook of Definitions*. London: Communities and Local Government Publications.

Department for Communities and Local Government. (2008a). *National Indicators for Local Authorities and Local Authority Partnerships: Handbook of Definitions Annex #4*. London: Communities and Local Government Publications.

Department of Communities and Local Government. (2010, June 8). *Performance Frameworks, Partnerships, and Local Area Agreements*. Retrieved March 29, 2011, from Communities and Local Governemnt: http://webarchive.nationalarchives.gov.uk/+/http://www.communities.gov.uk/localgovernment/performanceframeworkpartnerships/

Department for Environment Food and Rural Affairs. (2009). *Local government performance framework and national indicators*. Retrieved from http://www.defra.gov.uk/corporate/about/with/localgov/index.htm

Department for Environment, Food, and Rural Affairs. (2010, April 6). *National Indicator 188: Adapting to Climate Change*. Retrieved March 29, 2011, from defra: Department for Environment, Food, and Rural Affairs: http://www.defra.gov.uk/corporate/about/with/localgov/indicators/ni188.htm

Jackson, Daniel & Eickman, Michele. (2007). *Enhancing Web-Based Data Collection using Excel Spreadsheets*. U.S. Bureau of Labor Statistics.

Kidd, C. V. (1992). The Evolution of Sustainability. *Journal of Agricultureal and Environmental Ethics* .

London Borough of Islington Council. (2009). *State of the Environment Report 2009.* London: Islington.

Making it Work. (2009). *Ways to Collect Data*. Retrieved June 18, 2011, from http://www.makingitwork-crpd.org/miw-toolkit/step-7-identify-and-collect-good-practices/ways-to-collect-data/

McManus, P. (2007). Sustainability. *Encyclopedia of Environment and Society* .

Meadows, D. H., Meadows, D. L., Randers, Jorgen, Behrens, W. W. III. (1972). *Limits to Growth*. Universe Books

Microsoft. (2011). *Create data sets with Microsoft Office Excel*. Retrieved June 18, 2011, from http://www.microsoft.com/education/datasets.aspx

Microsoft. (2011a). *Database Design Basics*. Retrieved April 3, 2011, from http://office.microsoft.com/en-us/access-help/database-design-basics HA001224247.aspx#_Toc270678226

NASA. (2008). *NASA Maps and Graph of Global Warming*. Retrieved from http://geology.com/nasa/nasa-maps-graphs-global-warming.shtml

Organization for Economic Co-Operation and Development. (2008). *Sustainable Development Strategies: A Resource Book*.

Oxford English Dictionary Online. (2011, March). *Sustainable*. Oxford University Press. Retrieved from http://www.oed.com/view/Entry/195210?redirectedFrom=sustainability#eid19473065

Pisani, Jacobus A. Du(2006) 'Sustainable development - historical roots of the concept', Journal of Integrative Environmental Sciences, 3: 2, 83 — 96.Retrived from http://dx.doi.org/10.1080/15693430600688831

Portney, K. E. (2003). *Taking Sustainable Cities Seriously: Economic Development, the Environment, and Quality of Life in American Cities.* Cambridge, MA: The MIT Press.

Strategic Partnership of Croydon. (2010). *We Are Croydon: This Is Our Vision.* London: Strategic Partnership of Croydon.

Strategic Partnership Croydon. (2010a). *State of the Environment Report 2010.* Croydon.

Sustainable Measures. (2010). *Characteristics of effective indicators*. Retrieved from http://www.sustainablemeasures.com/node/92

Sustainable Measures. (2010a). *Indicators of Sustainability*. Retrieved from http://www.sustainablemeasures.com/indicators

United Nations. (2007). *Indicators of Sustainable Development*. Retrieved from http://www.un.org/esa/sustdev/natlinfo/indicators/guidelines.pdf

United Nations (2007a). *Indicators of Sustainable Development: Guidelines and Methodologies-Third Edition Methodology Sheets.* Retrieved from http://www.un.org/esa/sustdev/natlinfo/indicators/methodology_sheets.pdf

University of Missouri. (2000). *Benchmarks & Indicators*. Retrieved from http://extension.missouri.edu/about/fy00-03/Benchmark.htm

U.S. Environmental Protection Agency. (2010, July 8). *Environmental Indicators Gateway*. Retrieved from http://www.epa.gov/igateway/whatIndicator.html

World Commission on Environment and Development (WCED). (1987). *Our common future.* Oxford: Oxford University Press.

11.0 Appendices

11.1 Appendix A: Interview Transcripts

11.1.1 Massachusetts Representative Doug Fine
Interview at WPI

April 14th 2011 at 11:00

Interviewed: Doug Fine, the Assistant Commissioner for Planning and Policy in the

   Massachusetts Department of Environmental Protection

Interviewers: TJ Liguori, Jennifer Ober, Aren Johansen, Emily Hartzell

Group: We are doing our project in Croydon and the title is developing state of the environment indicators in Croydon. So we are working with that and they also want us to create a data base so that people can input information and everyone can see everyone else's research and it is all in one confined place. But we really wanted to talk to you about the indicators and how that stuff works. Basically what is happening now in Croydon and London, they just cut a whole bunch of budget. The environment team that we are working with just had their budget cut by 50%. They are all over the place trying to figure out what they are going to do. What they had been using to do the environmental things is a national framework which is now no longer being recognized, so they are starting from scratch and calling us in.

Mr. Fine: Is Croydon a municipality or a county?

Group: It is a borough within London.

Mr. Fine: Do they have their own government?

Group: They have a Croydon Council which is 60 members. They have their own environmental department that is just Croydon. They have their own environment and sustainability team which is part of the council. In recent years the political side of things has been geared towards the environment. Now they had recent elections and that is not the focus. The 'party flip' occurred, now cutting all the money because they do not think they need that anymore. Clearly, the team that has been working on it for years still wants to continue to do the research because they still

think it is important. We have researched into the indicators and things of that nature. We have looked into a couple of sources; the UN has a set of 96 indicators, someone else's was a set of 30, but we were really wondering how they go about doing that? We don't know exactly what you do in terms of that, but that is really where we stand.

Mr. Fine: Can I ask a couple more background questions and then tell you what I do for the agency and then I will talk to you about indicator stuff that we do and have done in the past and then I will show you a couple things that you can find online too. Then you can make sure that the specific questions that you have get answered. So Croydon doesn't have a set of indicators right now? You guys are developing them from scratch basically?

Group: From scratch, they still have the old ones they are just not being recognized anymore.

Mr. Fine: So they had the old national framework that was England wide?

Group: Yes and what they did is they had an environmental report that they published in 2010 and they took kind of the key indicators from the national framework and incorporated them.

Mr. Fine: And I assume that you have seen those national reports.

Group: Yes, that one was just Croydon. We have also seen the national framework as well.

Mr. Fine: Alright, so they used to use a subset of the national but they are being asked not to anymore?

Group: Yeah, one thing that they also want to do is that they have a set of the indicators from the state of the environment report but with the budget cuts they want to find which ones are the most important and how to make those more cost effective.

Mr. Fine: Ok I see, because they used to put some resources into gathering the data from the old national set and they are looking to cut back.

Group: Yes, that is correct.

Mr. Fine: Ok I understand. Do you happen to have copies of these reports just so I can look at them? Once upon a time I looked upon what I think was a UK or England state of environment report and I think it was the best that I have ever seen internationally in terms of super lay friendly.

Group: We don't have it printed. The Croydon one was sixty pages or something.

Mr. Fine: So just if you remember, if this is the same one I am thinking of, England used to have, and I can't remember if it was England or the UK, I think it must have just been England because the UK is Whales and Scotland. It was a booklet format and I don't know what it looked like online, probably similar pages and it had simple indicators with sort of an a lot better, about the same, little bit worse, a lot worse with this simple thing like thumbs up, sideways, or down. Is that a format they were still using?

Group: Not that we have looked at. The national indicators were more data oriented except for one which was a climate change adaptation indicator and that was on a scale of 0-4 how adaptive they were. This was specific to adaptation.

Mr. Fine: Alright, well these were still data driven, but they sort of rolled it up to like, how did this compare to the last time we did it and is the trend getting better or worse? I thought that was a very useful lay-friendly thing and something that very few people do. If I can dig that thing out, I probably have it somewhere because I liked it so much, maybe I can find it online and send you a link. If I can't find it online I will just send you a photocopy and send it to you.

Group: That would be fantastic.

Mr. Fine: I am the assistant commissioner for planning and policy, I have been with the department for about 20 years, I started as an entry level person and have had the pleasure of working my way up as I have worked all over the agency. I have had the chance to have a very

broad jack of all trades master of none approach to my career at DEP. Before coming to DEP I was in environmental NGO for four and one half years and that has been my environmental career. You should know that my background is you know broad environmental studies; I am not a scientist, not an engineer. So I have had to look at the technical stuff and be able to take it up and explain it to anybody. So that is a lot of what I do, this kind of going up going down talking to different audiences to understand the details to them to make things to make things understandable to a broad group. The reason I tell you that specifically is because I think that is really important with indicators. As part of my job as the assistant commissioner for planning has been to… I am one of the few people who look cross agency. So we got the air and waste people, the water people, and I look across all of it. So when it is time to do any kind of, "how did we do?", or "where are we going?" as an agency, they look to me for that. Whenever our agency is trying to track our progress, I am the guy for that. Whenever our secretariat, which is the cabinet office that we report to… so the structure of the Massachusetts government is the governor, then you have a cabinet with secretaries and within the environment and energy cabinet you got a bunch of agencies and is the DEP is one of them. There is parks and recreation, hunting and fishing, endangered species, and there is some energy stuff in there and you get the point. So DEP is a regulatory environmental agency, so we set rules and we enforce them. Implement the federal statues: Clean air act, clean water act, resource conservation recovery act, and safe drinking water act. Then Massachusetts builds on those rules and has their own rules that are stronger, but it is very much so rule and enforcement driven; permits, inspections, enforcement. The reason why that is important is because that is kind of our universe of indicators. Things like, "has protected open space gone up or down?" is not us. We are really clean air, clean water, waste disposal, land. Our agency, since I can remember, has not had a DEP state of the environment. This isn't to say that we put our some annual reports and I will talk about those in a minute.

Most of the environmental stuff that I have seen has come out of the executive office of environment and energy affairs. Because it is at the cabinet level, these people are all appointed by the governor, they come and go with the governor and you are seeing this in Croydon. So this is a challenge and an issue with indicators, I mean you really want indicators that are long term, but you have got this crowd which generally shifts every four years. That presents a real issue because they come in and they toss the old indicators and you start from scratch and you end up

with these little four year looks at best that you can't tell anything from. That presents a time frame challenge and longevity of indicators challenge. Which would be one of my things that I would encourage you guys to think about to the extent that you can harvest from existing, and you can have some historical data that you can compare to because I think that generally the public wants to know is it cleaner and safer than it used to be. The want to know are things good or bad, are we ok. Most people are worried about themselves and their family. Then they want to know well is it cleaner and safer than it was and I think that is the key premise so I think indicators should ultimately answer that for people. It is remarkable how many state of the environment reports from other states and things we have done it is like, you read it and it is data you are like, well ok the ppm (parts per million) in the air is this… so what? Is it clean, is it safe; is it better or worse than it was last years or five years ago. It is remarkable how bad we are at that. I think that is actually part of the reason why so many environmental programs are being defunded now is because we have not done a good job telling our story, about what we have really done to clean things up, how much things are really better, and work that needs to continue to happen to keep it from backsliding. We just don't speak very well to the public.

I don't know how good Croydon has been I the past at telling their story to the public, that is why I loved that thing from England, I can't remember it was a red light green light or thumbs up or thumbs down, but it was so simple that you could flip through this thing and you could get a sense here are the places where things are better, here are the places where things have been the same for about twenty years, and here are the places where things have gotten much worse. That sort of directs public attention and emphasis saying that this is really important. To me, that is good government. Another thing is the audiences for your indicators and why you even do state of the environment reports. Do you guys already have marching orders on who the audience is?

Group: At this point it is very broad. They are still trying to figure everything out. We have gotten three separate emails of different descriptions of what they want.

Mr. Fine: I think what would help them the most is to first get them to focus on some key questions about who is the audience and why do you want to tell them what you want to tell them. Is the audience primarily the public? My guess is that it is multiple audiences and it usually is, so it is usually also the legislator, and the administrations… those are usually the key

ones for these things. But then sometimes there are other key stake holder groups, so there is the NGO crowd and business crowd. If you can get them clear on the audience, to me that is the first question. Then what is the objective of the report…. Is there a story you want to tell and why do you want to tell it? Do you want to tell it just because you think people should know, do you also want some bragging rights about good stuff you have done, do you also want to attract attention to things where you think problems are? You want to try to get some support for increased focus and resources on those problem areas. That is important for them to think about. As they start going forward with their indicator plan and state of environment report keep bringing them back to this question: Ok this indicator that you are thinking about, what story does it tell to this audience and does this meet your objectives that you laid out for wanting to tell your story. If it doesn't then maybe it isn't the best indicator. I know that is not very technical, but the fact is sometimes the people you are reporting/working for are technical.

It is going to be important for you to know the scope of the data, what is in what is out. That will be driven by the departments that they are trying to capture under the state of environment umbrella. Another thing to keep in mind about longevity of an indicator is that the environment doesn't change very quickly, it responds slowly to things. In part because the inputs change slowly, if you want any sense of improvement and any part of the message is, 'things are getting better' you need to look more than four years. It takes decades for surface waters to respond positively to change in the inputs. Air, same thing, takes a long time to see health trends. So this time horizon is really important. So you are going for messages that are on audience, on message, with the right time horizon… that is kind of your golden indicators. You are also going for ones that people can understand, so you got to have the technical stuff and you want to make sure that it is reliable data but then you have to be able to dumb it down and make it lay-friendly. If you can't speak to your mother then you are going to lose the legislator and the council, these people are not environmental experts. The other thing about indicators is…… well have you guys looked at the continuum of the different kinds of indicators where you have the output measures or activity measures on the left and the results on the right?

Group: No, we have not seen that, but seeing that and what I have seen that makes perfect sense.

Mr. Fine: Ok, so my guess is that you can find something like this and this would be a good framework to bring to your thinking about this. Generally the left (output measures) are better because they tell the story of what the audience really wants to know where as these (the right of the graph) are worse because these are like, how many did you do, but these are easy. So what you often see for government, and particularly environmental agency kind of stuff, is they will tell you how many inspections and how many permits the have issued, and… all bean counts. That is what government and bureaucracies do, they do these activities and they count them. Because that is easy and they got that, it often suffices… that is what these state of environment repots will have, at least the end of the year DEP report is like, how many activities did you do. Which at a snapshot of one year people look at that and go, ok I guess that looks like a lot, but it doesn't tell them anything about if it has worked because all these activities are done for a reason and these are the reasons (on the left). The worst case is to have one year snapshots of activities, and then it is a little bit better to say how many activities you did in 2000 and how many activities did you do in 2010. At least you can get a trend line of activities, but that is still going to tell you activities. Sometimes those beans, or activities, often don't tell you really if things are cleaner or dirtier. So let's say your enforcement actions, something a lot of people including DEP count, have gone up consistently for ten years. What does that tell you? More violations or maybe you got more staff and did more inspections. Arguably, fewer violations mean good for the environment, but again if the governor or council has changed the enforcement may have gone down and looks like fewer violations. Very hard to gleam the underlying, what does this really mean. Usually what ends up happening because these are the holy grail (on the left) and hard to get because of time horizon and because they are not free, they cost a lot of money. (elderly hospital admissions of asthma… could be because air quality or food stamp program devastated and people started eating junk and affected that, or people are living longer so you get more of them since living longer) This cause and effect, causality, makes these results or public health indicators a little confounding. (Another is vehicle miles traveled. Cleaner cars don't really do justice if you drive them more than you normally would and thus everything is the same. Many factors into why people are driving more, economy or drive farther to work now etc. etc.) Realistically, you are probably going to end up with a blend of indicators along the spectrum, but I do think these (on the left) are the best. Although if part of your goal and message is to show some sort term progress these (on left) are not going to be the best because

you could be doing really good programs and not see a change. (Another problem of measuring on the results side) is hard to measure prevention, how many spills didn't you have.

There are two primary, how are we doing reports that we do with any broad cross program. As I said before, the real high level state of the environment tends to come from the secretary's office. There was a report in 2001 and an update to the report in 2002 under the same secretary. There was a report in 2006 under a new administration and has been the same one since. I think that the two primary reasons that indicators aren't often measured over long term are the cost and the political wins. Here is the 2006 State of the Environment Report. It was created under Mitt Romney and this is the only one created under his administration. Governors will often publish these before elections to support their campaign. If you go to the website of the Executive Office of Energy and Environmental affairs, this report isn't available. The report is split into three categories, generally, air, water, and waste. If the intended audience for the report is the public, the public usually understands the concept of those three categories. Climate change is a bit more difficult to place and is often included with air. The political side of things comes in when you ask, what is the spin? Your sponsors will need to be telling you where the political side of things comes into play.

They brought me in to determine which indicators they should use. The data sources that we draw from were determined by an inventory and a couple interns created a list of the indicators. A good way to start is to take an inventory of your data. They created a spreadsheet and these links are mostly internal. They created the table to determine what the data sets are, where we can find them, and who owns the data. This is a good place to start and after you create this table, then you can roll the indicators into categories which will ultimately be the categories in your report. Then you analyze the data to figure out what it can tell you. What is the timeline? Is it continuous? Is it an activity or a result? How is the quality of the data? What is the causality? Is your sponsor looking for good news or bad news or both? Where is good news acceptable and where is bad news acceptable?

In Massachusetts, some of our programs, because they are federally delegated programs, ultimately come from Congress because of acts such as the Clean Air Act and the Clean Drinking Water Act. These acts started in the seventies and started to force data to start being collected. If you're looking for more data on the results side progress, you're looking for ambient environmental monitoring and sampling. Ambient meaning, what is in the field, for example, air

quality monitoring stations that just sit in one spot and collect data. Sometimes the science behind monitoring the data improves and the limits to detection get lower and where the area was fine before suddenly the detection rates increase and that can be very confounding. If you can find long term ambient collection in a couple places, that is really good. I think that people really want to know, how does this affect me? I think that the air they breathe and the water they drink are the two most important ones. You really have to think about what people might care about in Croydon. After people stop thinking about how it affects them, then they start wondering about the birds and the environment and things like endangered species and habitat. Indicators such as protected open space and the amount of wetlands are good indicators that are more concerned with the environment side of things. It's harder to measure things like the impact of hazardous waste and oil spills. Waste management indicators are harder to measure so the data often becomes activity based such as counting spills and counting reportable releases. You could also measure things such as how many sites are in the process of being cleaned up and sites that were cleaned up.

If you look at what the environment report did in 2006, I really pushed the trends idea. We can measure a variety of pollutants and I thought that we should avoid using numbers. Parts per million doesn't mean anything to people. I thought what people should know is, has it gone down a lot and are we meeting the standards. This tells a pretty good story. This doesn't do it in a very graphical snapshot way which is why I like the report that England did. You have to look at the graphs a little more closely. I wanted ozone to be in the report because Massachusetts isn't meeting the federal standard for ozone. For ozone we were trying to figure out a trend that would make sense to people because the data wasn't very clear or compelling. You have to look at the data measured and then find a way to convert it to something that people would understand. The way ozone is measured is through excedences. Two contributing factors to ozone are weather and emissions. So if you have a lot of hot muggy days, the number of excedences goes up and the data can be confounded. That goes back to the causality piece. CO_2 is the primary greenhouse gas and you don't see climate change or greenhouse gas anywhere. Under the Bush administration CO_2 wasn't recognized as an air pollutant. This shows that in terms of CO_2, we haven't done much. Again it's hard to measure the environmental changes from waste so we ended up measuring recycling numbers. We used the data we had and we had recycling rates and if you look, it's not a graph and if you look at the snapshot, what does that tell you.

Group: Not really anything.

Mr. Fine: Right it doesn't tell you anything. And that brings us back to what story do you want to tell? Do you want to tell the real story or do you want to spin it? But the real story here is that we haven't made a whole lot of progress. We've gone up a little on waste reduction and overall recycling but no more than 1%. In municipal solid waste, recycling has gone up 4% in 2 years which isn't bad. It a shame they don't have all the data and it's probably just because they can't get it. Then you get into jurisdictional issues, and we don't really measure recycling, we ask the municipalities report it. They don't have to report it.

Solid waste generation and recycling and disposal trends, I think I was the driver behind this chart too. If you look at it hopefully you'll be able to figure it out. And again, these aren't nearly as simple as they should be. But the take home message here is that this top line is waste generation and these two bottom lines are diversion and disposal; diversion being recycling or composting and disposal is burning or burying it. And they're both going up. So what this says is because the recycling rates are about the same percentage wise, we're recycling more because we're creating more waste. It's the same ratio so the bottom line is that we're still disposing and burying more than before. Not a great story but at least we haven't lost ground. If these were peeling off of each other where diversion was going down and disposal was going up, that would be a real problem. Here's site clean ups, this becomes more of an activity measure thing. This is actually a pretty cool chart because what this says is we've been tracking reportable releases. If you have a release of hazardous materials, you have to tell the department and you have to do a site clean-up process. Once you're in you're in and you have to do all this stuff we ask you to do until you're out. New sites are the sites that have been reported, get into the system, and then sites closed is they've done everything they needed to do and they're out, back to active use. And this shows that over time that the numbers of new sites have gone down and the numbers of closed sites have gone up. We're really gaining ground. So a good story, but again, would a lay – person at a glance be able to tell you that? No, I think you need a red light, green light or something, thumbs up, thumbs down. When you look at other states reports is the US you might look at those and say, "You know Massachusetts is looking pretty good." Others would have tables with numbers and you have to try and figure it out. So this is pretty good but nowhere near

where I think it needs to be. So looking at this without the data assuming that less is good, this is looking good, but sometimes the data is flat or is over such a short time horizon there's not enough data to determine a trend. This one starts in 1990 and goes to 2004. This is the from the toxic use reduction act in Massachusetts, which is kind of like our version of toxic release inventory. People have to report the toxics they use. This is not waste or emissions, this is use. Anyhow, this is a good sign right? Interestingly, we could take credit for that but if the economy continues to tank, you're going to have fewer manufacturers using fewer materials and you're going to have less toxics used. So is this our success or an economic tragedy? It's hard to know and trying to explain those is part of the challenge. For drinking water what does that tell you?

Group: Pretty much the same.

Mr. Fine: Right, pretty much the same. In this case the dark bar is good. At glance it's good, and it has stayed pretty good. This is who's meeting the federal drinking water standards in the public water suppliers. So Worcester gets its water from the Worcester Water Supply and they have to report excedences of drinking water standards. Basically we're up in the high 90's for public water suppliers that are meeting all the requirements. We looked at meeting all the standards, and to me, having 93% meeting all the standards and the rest not, is not exactly a warm and fuzzy feeling. 7% of all the cities and towns aren't meeting the drinking water standards? Well as I looked into this a little further I found that the majority of the ones that didn't meet the requirements over the course of a year didn't meet because they didn't report. And when we went back and got their data, they were fine. So I created a whole other color on this chart for people who care to look it says, who didn't meet overall, who didn't meet because of reporting and then who actually has an excedence of a water quality standard. That covers most of the DEP indicators. Let's just cover surface water for a minute. Wetlands are tricky because wetlands provide all kinds of benefits to the environment, such as habitat, they filter ground water and they provide flood storage, they're very important for flood storage. Wetlands make you more adaptable to climate change. We really don't have good data on wetlands, but we started doing these flyovers, and here's where technology has really come a long way. For river and lake health, the clean water act, like the clean air act, has these mandatory measures. And these measures and up to say is this meeting water quality standards or is this not. And what

makes it hard to graph is that basically none of our main stem rivers are meeting water quality standards. It's supposed to be fishable/ swimmable because that's what the standard says, but you don't want to swim or eat fish from most of the rivers. And what has happened over time is that the toxics used to be very high and since then have come way down. However, another thing that keeps you from meeting the water quality standards is nutrients. As toxics have gone down, all it's done is really reveal the nutrient problem we've got and we haven't made any progress on that. So if you look at the numbers of rivers that pass, it hasn't really changed. Different pollutants are causing it. We should be able to claim some success about toxics, but for nutrients we're nowhere. We tried to show this somehow but they might have tossed that out, actually.

So quickly I'm going to show you one more thing. In addition to these episodic, secretary-level state of the environment reports, our agency also does an annual report and we've been doing this for a number of years. But these reports are really driven by the grant delegation agreements given to us by the federal Environmental Protection Agency. The way environmental programs work in the US is that you have all these federal statutes and then the States can implement those statutes, and if they choose to implement them they get money to implement them. In exchange for that the states have to report back on progress. So this is our report on progress for a bunch of these grants. In Massachusetts we roll all these grants into one grant that we call the Performance Partnership Agreement. So you can see these on our website and historically, we've kept them all up. We've presented this a few ways. In past we tried to have a whole bunch of environmental data and all of it didn't even roll up to anything near as lay friendly as this. So what I ended up doing was I ditched all that and I came up with this, narrative accomplishment highlights. This is another thing that I think you want to consider for you client. Do they want to have some narrative way of telling their story in addition to numbers? In part it gets back to time horizon stuff. Just pick a few of them and read them at your leisure and you'll see that some of them are pretty cool stories. Does it tell them if things are getting better or worse? Not really, but if you look and see what they're doing, you can think, "well that must be helping." And there is some environmental trend stuff in here but not much. The whole first section is narrative. We don't really shop this to the general public, though it's on our website and I think it was referenced in our environmental e-newsletter. We never really hear anybody talk about it, in part because it's not really packaged for them. So that gets back to audience are if you're going to market this thing, that's something you have to consider too. So the whole first

part is narratives and I think that's something good to include, and there's more stories in boxes scattered throughout the document. It's good to have a blend, I think, of stories and data. And the bulk of the rest of this report contains specific commitments we made to EPA under our grant agreements and how we did by the end of the year. So EPA really wants to see this but nobody else does. We have to do it for EPA so we just blend it into one report. And then these are activity measures. And then these, which I just remembered are confidential, are the number of inspections we do; they are purely an activity measure, a bean count. So these are on the web. I've been talking at you forever here.

Group: You answered most of our questions, though.

Mr. Fine: Why don't I stop now, you can ask any other questions you have. You have my card, my e-mail, and my phone number so you can follow up with me if you have any other questions. So are there other things you wish I had spoken about?

Group: The only thing we were thinking of was, how you determine that yes this is a good measurement and how you determine if it's feasible, economical, cost-effective and all of that. Or do you not have to worry about that.

Mr. Fine: We definitely have to worry about that. My basic premise on selecting was, because I really had to select for my agency which ones went in here. One of my operating principles was if we don't collect the data now, then we're not going to collect it. There was no money to go out and start collecting new data. So do we already collect it, secondly, is do we trust it, is it scientifically sound? Third, is the stuff I talked to you about time horizon. Next is the story that it tells, does it tell a good story. Last is the level of complexity which brings you back to the audience question. A lot of these air quality and water quality measures got so complex that you can't draw any conclusions from it. And the stuff I was telling you about surface water quality with river health and how many are fishable/swimmable, the answer is none. If you talk to the people who actually collect that data, they usually won't tell you if it's healthy or not. That's another key criterion for selecting is; does it give you an answer? Sometimes you have to cheat to say that yes it's still bad but now it's only bad because of this and this as opposed to this, this,

and this. I think those are the key things that I look at. I think that it's better to have a few good ones, rather than a ton of bad ones. And I can't emphasize enough, if it doesn't tell a story, why include it? Oh and the other thing I think about is where it falls on the spectrum, activity based versus environmental measures. Every government has less money now, and you don't want to start collecting new data and if you're getting bad data, maybe it's time to disinvest. So it's everything that I talked about, is it clear to your audience? Does it stick to the message that your political entity wants to convey? All those things would be part of the selection process. And it would be interesting for you guys to make a table and rank them. You can have the indicators down one side and over here you can have some of your rating criteria, like audience, message, time horizon etc. From this you can see what indicators rise to the top. It might be an interesting way to look at it. And if you do that, send me a copy, in fact; send me your report when you're done. So did I answer all your questions?

Group: We were wondering, when you are choosing your indicators, if you ever look at what other states are doing and compare what they are doing. We were thinking about comparing them to other boroughs besides Croydon.

Mr. Fine: Definitely. It can be very valuable and you should definitely do it and we do it. Like I was saying before when I looked around at other states and EPAs, ours is better. Whereas that UK thing, I'm going to find that for you. I thought that was the best and the way to go with it. And you might find a stellar one out there. And I think that a question you should have for your clients is; do you want to have consistency across boroughs? Or do you want to have inability to look across? I would think that would be really important. Because someone looking city-wide might say, "This has gotten much better over here in this borough, but Croydon doesn't even measure it." So what does that mean? Maybe they intentionally don't want to do that. Okay?

Group: Thank you very much, that was fantastic.

Mr. Fine: Did you look by any chance at the Boston Foundation?

Group: We briefly looked at it.

Mr. Fine: They're really into measures and they're Boston specific. They measure environmental health, education, and went wild with the whole indicators thing. To me, they went so wild that, one, it became very hard to tell what the story was, and two, it didn't look sustainable. I wouldn't be surprised if they stopped. I don't know what you found.

Group: We didn't find too much.

Mr. Fine: I would imagine that you can find some of their indicator stuff. But I definitely think you should look city wide, at other boroughs and nationally. And you should probably look in the US and bring some of your best examples along. Even just to lay them out for your sponsors, to show them the range and ask generally what they're looking for. Alright?

Group: Yes, thank you. No further questions.

11.1.2 London Borough of Brent

Interview at the Borough of Brent

May 24th 2011 at 14:00

Interviewed: Helen Entwistle

Interviewers: TJ Liguori, Aren Johansen

- How is your council coping with the budget cuts and changes in government [with respect to Environment teams/sustainability teams]?

- How many resources did your council allocate to producing environmental reports?

- Do you use a template to make your report?

- What is your process for determining what topics are worth including in the report?

- How would you prioritize different aspects of indicators such as cost, reliability, longevity and ease of measuring?

- What environmental indicators were you previously measuring? Which indicators do you still use [in the light of recent changes to National Indicator Set/NIS]?

- How efficient do you think your current indicators are?

- How do you go about evaluating an indicator?

- How do you compile and organize your data?

- How do you determine the trends or the state of tends? How do you figure how something is improving or not?

In order to deal with the budget cuts, Brent Council's Environmental Team was cut from 7 positions to 5. In the past, their State of the Environment Report was given to a design team before publishing. The design team made the document aesthetically pleasing to read and made it fit for publishing. For the most recent report however, the design team was not used. The report was made available from the council's website via multiple links that made the report very accessible to anyone interested.

The report each year was created based on the format of the previous year's report. In this way the previous year's report became a template for the new one. Ms. Entwistle would update the previous year's report with new data, new stories, and new explanations. The new data and stories were obtained through email. Ms. Entwistle sent emails requesting the most recent data

from the organization, division, or team with the access to that data. In the email, she also asked for interesting stories about any successful endeavors to improve the environment that these groups may have undertaken. The data and stories she collected were organized in to email folders organized by the person who had provided the information. Ms. Entwistle favored this way of gathering the data because it resulted in only a small amount of work from those with the data, making it easier for them to respond. It was also relatively inexpensive in both time and money. Ms. Entwistle plans to use this method again the next time the report is made.

The indicators that were included in each report changed from one year to the next. The reason for this is the loss of the National Indicators. The only indicator still required is Indicator 185, about CO_2 emissions. The council decided to keep measuring Indicator 188, which was on climate change. Ms. Entwistle also removed indicators for which data was no longer being collected by the groups which were responsible for it in the past. Inside the council, the Environmental Team uses an Environmental Management System, ISO 14001. This is an external certification that measures the impact of the borough operations on the environment. The council uses the information gathered by the EMS in their report to show that the council is making an effort to be greener.

This transparency is important to the council because they are asking their residents to be more environmentally conscious. The purpose of the report was to bring the public's attention to the green movement and the importance of the impact of climate change on the borough. One way to direct residents' attention to the changing climate is to show trends in the data. Unfortunately, Ms. Entwistle had difficulty determining trends from the data in the report because the data in past years was not collected on a regular basis and there were gaps in the information.

11.1.3 London Borough of Islington

Interview in the Borough of Islington

May 26th 2011 at 16:30

Interviewed: Doug McNab

Interviewers: TJ Liguori and Aren Johansen

- How is your council coping with the budget cuts and changes in government [with respect to Environment teams/sustainability teams]?
- How many resources did your council allocate to producing environmental reports?
- Do you use a template to make your report?
- What is your process for determining what topics are worth including in the report?
- How would you prioritize different aspects of indicators such as cost, reliability, longevity and ease of measuring?
- What indicators were you previously measuring? Which indicators do you still use [in the light of recent changes to National Indicator Set/NIS]?
- How efficient do you think your current indicators are?
- How do you go about evaluating an indicator?
- How do you compile and organize your data?
- How do you determine the trends or the state of tends? How do you figure how something is improving or not?
- Do you use an Environmental Management System (EMS)?
- Are you aware that other boroughs are using your report as a guide?

The team started the discussion by asking how Islington was dealing with the budget cuts put in place by the central government. Islington received especially strict budget cuts as did many other inner London boroughs. The previous political party in Islington was focused on sustainability while the current party is more focused on housing. The Islington environment and sustainability team also received cuts to staff and their state of the environment report is no longer their department's priority.

The resources used to create Islington's State of the Environment Report changed from year to year. They have been making these reports since 2008 and their most recent report was their third one. The first report was the most difficult report to make because the environment

and sustainability team had to find the right contacts to gather the data for each indicator. This proved to be the most time consuming part of creating the first report. Also, they searched and asked for stories to include this report requiring even more contacts to be found.

The second report was created in a much shorter amount of time than the previous report. The report was split up among the department by chapter where each person was assigned the chapter most related to their line of work. A Microsoft Excel spreadsheet was created for each page in the report and the data collected through e-mails was then put into spreadsheets to be organized. The design team used their template from the previous year's report and was able to finish and publish the report in a shorter amount of time than the previous year.

The third and most recent report was the easiest to create. The Islington Environment and Sustainability Team created three tools to assist in the creation of the report. They created and contact and progress sheet to keep track of those people who were contacted for the data. Color codes were used to denote which contacts had responded. The next tool was the Excel sheets containing the data. The third tool was a timeline that showed when each piece of the report was accomplished. This way they could keep track of the dates and see how their progress compared to their progress from previous years.

Islington had a variety of inputs when determining the indicators to include in the report. The indicators are selected through management and with approval from the higher-ups in the Council. Indicators are selected that reflect key issues and give exposure to the council's efforts to improve the environment. The indicators chosen were indicators that appeared important to the borough's residents. Mr. McNab mentioned that while some innovation within the existing indicators is good, they should remain as static as possible to more easily determine trends. The indicators were dropped from the report if their corresponding data was no longer being collected or if priorities had changed and the indicator was no longer considered relevant. A proxy measure of the importance of an indicator is determining the cost and ease of collecting the data for the indicator.

Islington used icons in their report to clearly show the trend of an indicator and whether it was improving, staying the same, or getting worse. The icons were helpful to residents because they did not require much technical knowledge of the indicators to understand unlike some of the data in the graph. The trends were first determined by the environment and sustainability department and were reviewed by higher-ups for approval. The reason for this is that the trends

were often difficult to determine and could be interpreted in a variety of ways. The trends that were the most difficult to determine were those where the data appeared to be showing a pattern up until a certain year in which the data for that year pointed to an opposite pattern as before.

Stories are very important when trying to appeal to a wider audience, especially if the audience has little to no background in environmental reporting. The stories capture the resident's interests and help them to relate to the indicators and problems addressed in the report. The stories raise awareness of the council's activities and provide evidence of their efforts to be environmentally conscious. The stories usually came from other departments within the council although if groups outside the council were making good efforts then those would be included as well.

The Islington Council uses ISO 14001 as their EMS The process of starting to use an EMS takes a lot of work and is a very formal process.

The council put their state of the environment report on the environment section of their council website. In order to allow people to find it more easily or to catch their attention, links to the document were posted on the more popular pages of the site such as the page on recycling. The number of views of the document is measured. The council gives hard copies of the report to the local library and government offices.

Mr. McNab left the team with a few pieces of advice, saying that experience is important for creating the report. The experience helps when determining how to gather the data for the report as some of the data only becomes available after certain dates. Also, the trends should be determined as the last step only after gathering all of the data and making sure that it's organized and correct.

11.1.4 London Borough of Merton

Interview at the Borough of Merton

May 25th 2011 at 13:00

Interviewed: Wishes to Remain Confidential

Interviewers: Jennifer Ober, Emily Hartzell

- Has Merton completed any environmental reports that we were unable to find? If so do you use a template?
- How do you compile and organize your data?
- What is your process for determining what topics are worth reporting?
- How would you prioritize different aspects of indicators such as cost, reliability, longevity, and ease of measuring?
- What indicators were you previously measuring and which ones are you still using? (in light of recent changes to National Indicator Set)
- How effective do you think the Merton Rule has been?
- How efficient do you think your indicators are and how do you evaluate these indicators?
- How do you determine the trends or the state of trends? How do you figure something is improving or not?

Merton was nationally famous in environmental practices for the Merton Rule. The rule was created in 2003 and was concerned with energy efficiency and renewable energy sources. It stated that ten percent of energy usage must come from renewable resources. The rule is no longer in place because as it spread over time, it was found that it didn't really work because there were no resources to measure the energy uses. This is probably due to the change in government from Labour to Conservative. Also, the climate change team had not been growing or pushing its agenda because the Merton Rule had already made them famous.

The climate change team is directly responsible for reporting collected data, however, Corporate services deal with the practicalities of this reporting. This means that there is no clear ownership for environmental reporting. Energy and climate change teams used to be separate, however since they go hand in hand they have been combined.

National Indicator 185, which is involved in carbon emissions, was kept because it is still required by the government. It is also easy to measure and the council has control over it. NI 186 on the other hand, which is involved in renewable energy, is a nightmare to calculate. Also, it is no longer required by the government so no data is being collected for it. Battles must be chosen carefully when deciding on which indicators to keep. It is better to use resources to measure indicators which the council has an obligation to and funding.

In Merton's old policies, specific renewable energy sources were measured. Now that the council has cut back on funding and indicators, newer policies are only concerned with what the national government is assessed by bodies outside the council, such as Code for sustainable homes and BREEAM assessments.

It is better to measure indicators that the council has control over and can get information from national resources. The council's first obligation is to the national government and then to what the mayor wants for the borough.

The Annual Monitoring Report was presented as an example of an environmental document. One member of the council puts the report together. The indicators in the document are the ones the council has an obligation to report. Anything that is not required is removed. It took the person compiling the report about one sixth of their time throughout the whole year. This person would go around to the different teams and gather the data. There is a possibility that a template was used because there appears to be a standard format in the documents produced by Merton.

The possibility of a local authority renewable energy indicator was considered to replace NI 186. The council, however, is trying to reduce the burden of monitoring indicators as much as possible. There is no framework in place to measure such an indicator. The council already has statutory obligations which must be reported first. The council also needs to look at the availability of old data to shed as much unnecessary use of resources as possible. The renewable energy indicator does not give useful data. There are too many confounding variables that make it unreliable. An indicator is not useful when it cannot explain why certain trends are occurring. The recommendation is to not replace NI 186.

Croydon calculates its percentage of national carbon budget, which is something Merton should be doing. Croydon's policies are then built around its budget percentage so that the national goal of eighty percent carbon reduction by 2050 is reached.

In conclusion, measure success from sources within your own control. If you can, get data that the council does not have to pay for. This will save money, so that council resources are not wasted.

11.1.5 London Borough of the City of London

Interview Via E-mail with City of London

May 20th 2011 at 11:06

Interviewed: Simon Mills

Interviewers: TJ Liguori

- How are you responding to budget cuts and other related changes brought about by the new government?
- What is your process for determining which indicators to keep collecting data given the above concerns?
- What is your process for determining trends in indicators?
- How do you store your data? If you have a database storage system do you think it is easily manageable?

The budget cut has hit City of London's sustainable development unit very hard. It has been reduced from 3 staff to one (hence the crowded state of Mr. Mills's diary).

With respect to how the Council intends to maintain momentum on the Sustainability Review, the original review was put together by a (paid) intern, who was with the Unit for 6 months- the development of the review was one of the primary tasks.

The structure of the review was based on best practice for sustainability reporting, and the indicators chosen were specifically selected for ease of updating. Many of them are collected by statute (for example they have to collect data on air quality by law) others are used for departmental reporting, they just pulled them all into one place.

With respect to updates City of London holds a spreadsheet which identifies the data owners. When they want to do an update they contact the data owners. Then it is a simple question of report compilation and circulation (with multiple edits) to ensure that the principle stakeholders are satisfied that the report is a true and accurate representation. The intention is to recruit another paid intern later this year and task them with updating the review.

With respect to trend analysis, data holders for individual indicators will conduct appropriate analysis and report on trends as part of the update. One of the most powerful tools City of London used in the original report was meta-narrative, notably in the "did you know" sections as this enable the contextualizing of indicators and data sets, and served to reinforce the sense of ownership by data holders.

As to storing data, the report is a collation of existing indicators- individual data owners are responsible for the collection and storing of data.

The bottom line is that putting a sustainability review together is not rocket science. There is plenty of guidance out there as to how to do it. It is merely a question of selecting a menu of indicators based on the data that your organisation holds and ensuring that contributors feel a sense of ownership over the finished product.

Mr. Mills attached some of the planning spreadsheets used in the development of the review, to give the team an insight into the borough's thought processes

11.1.6 London Borough of Sutton

Interview at the Borough of Sutton

June 8th 2011 at 14:00

Interviewed: Katrina Lloyd, Andrea França

Interviewers: TJ Liguori, Aren Johansen

- How is your council coping with the budget cuts and changes in government [with respect to Environment teams/sustainability teams]?
- How many resources did your council allocate to producing environmental reports?
- Do you use a template to make your report?
- What is your process for determining what topics are worth including in the report?
- How would you prioritize different aspects of indicators such as cost, reliability, longevity and ease of measuring?
- What indicators were you previously measuring? Which indicators do you still use [in the light of recent changes to National Indicator Set/NIS]?
- How efficient do you think your current indicators are?
- How do you go about evaluating an indicator?
- How do you compile and organize your data?
- How do you determine the trends or the state of tends? How do you figure out if something is improving or not?
- Can you please explain your Environmental Management System?
- Can you please explain the One Planet concept?

The team asked Ms. Lloyd and Ms. Franca how Sutton Council was dealing with the budget cuts. The council has announced that all of the departments are required to make a 25% cut to their budgets but the Environmental Sustainability department does not yet know where those cuts will be coming from. The Environmental Sustainability department would like to deliver the same services on a smaller budget but could not confirm the detail at the time of the meeting. They are currently still creating a report as this is required in order to maintain the boroughs EMAS accreditation.

EMAS is an Environmental Management System (EMS) which includes environmental indicators which must be measured and reported to the public. Through this it sets up a framework that must be followed to maintain the boroughs EMAS accreditation.. It has an auditing requirement to ensure that the data is collected and correctly reported. This allows the environment report to have a little more credibility as the borough must publish the results of the audit even if it fails, thus the audit ensures that the data is honest. It drives performance and allows the borough to monitor its improvements in a much more objective way. Each indicator has a target that needs to be met. Sutton has been using EMAS since 1996. EMAS differs from ISO 14001 in that ISO 14001 does not require the publication of an annual public environment report and so organizations do not have to report failures if they so choose. There are over 127 teams in the council and those with a significant environmental impact have EMAS action plans. For Facilities Management teams these plans are often concerned with waste management and legal compliance and the communications teams are concerned with how well environmental messages are conveyed to the public. In addition to this all teams have a Workplace Good Practice Note which looks at their daily environmental impacts such as reducing waste and energy consumption, etc. Using EMAS makes it easier to maintain data collection as the system requires them to report on it annually.

Sutton makes their report based on the requirements of the EMAS regulation and on the Councils long term environmental targets. A template which was given to Ms. Lloyd when she came into post is used. This can be adapted but must adhere to the EMAS Regulation. Sutton also has another report called One Planet Sutton which sets out the boroughs long term goals for sustainability. The report is based on the idea that the human race is currently using resources at a rate 3 times the rate that the Earth can return and is therefore not sustaining the environment and human population. Sutton's goal is to be a completely sustainable suburb by 2025. The One Planet Sutton report was created as a public friendly document. The targets in this document are set by the borough in agreement with the BioRegional and WWF 'One Planet Program'. The borough is now looking at how they can best integrate One Planet Sutton and EMAS. Sutton must find a way to balance the requirements of EMAS with the One Planet Sutton report. One Planet Sutton is much shorter than the EMAS report: approximately 10 pages as opposed to 40 pages.

Sutton has chosen indicators based on those that were still required by the central government and those required by EMAS. The CRC or Carbon Reduction Commitment is an indicator put in place by the central government. When setting target for the indicators, the Environmental Sustainability team aims for realistic targets but is careful not to set them too low lest they sell themselves short.

The Environmental Sustainability team gathered the data through communicating with relevant offices across the council and store it in Excel spreadsheets. The data collection usually begins in May or June and the report is published as soon as possible after the end of the financial year. The report must be verified by the external EMAS auditors before it can be published. The data is collected in such a way to make it comparable to previous years. Not many copies of the report are printed and instead the report is made available on the council website.

11.1.7 Metropolitan Borough of Kirklees

Interview in the Borough of Kirklees

June 7th 2011 at 12:00

Interviewed: Kattie Sutton, Kathryn Marshall

Interviewers: Jennifer Ober, Emily Hartzell

- How is your Council coping with budget cuts and changes in government? (with respect to Environmental and Sustainability Teams)
- What amount of resources does your council allocate to producing environmental reports?
- What is EMAS in charge of? How much does it cost to implement this system?
- Do you use a template to make your report?
- What is your process for determining what topics are worth including in the report?
- How would you prioritize different aspects of indicators such as cost, reliability, longevity, and ease of measuring?
- What indicators were you previously measuring and which indicators do you still use? (In light of recent changes to National Indicator Set/NIS)
- How do you organize and compile your data?
- How do you determine the trends or state of trends? How do you figure if something is improving or not?
- Who is the audience of your 08/09 Environmental Statement? Do you produce any supplementary documents for the general public?

Introductions were made and the scope of the WPI project was defined. Both Ms. Sutton and Ms. Marshall were comfortable with being quoted.

The Kirklees environmental department receives European funding for their environmental work. The department originally had thirty members divided into different teams such as carbon reduction in businesses, domestic carbon reduction, and biodiversity. Despite the budget cuts the work pressure however has not diminished so the department is looking over where funding is coming from, and how it can be used more effectively and efficiently.

The borough of Kirklees does a variety of environmental reporting. The broad picture developed in Croydon's State of the Environment was found to be most similar with Kirklees' Environmental Statement. This document was mandated by EMAS, the Eco-Management and Audit Scheme. EMAS is not in place anymore but when it was, it consisted of three to four staff

members who completed audits across all of the services in the council. The statement itself was a large report which involves a lot of different teams to produce the report, one member was working full time for about three to four months. This person needed to collect the annual data and edit the text for the report to see if it was still relevant. Ms. Sutton and Ms. Marshall determined that for the depth of a report such as the State of the Environment, six months to finish the report was not unusual.

EMAS is no longer in place due to a variety of reasons. The system was expensive because it involved hiring external auditors. The system itself would work well for a small structured organization. Auditing all of the services throughout the Council, however, is a challenge, and EMAS was no longer meeting the Council's priorities. Political changes were the main source of the shift in priorities. National Indicator 185, which is concerned with carbon reduction, is now the main methodology of reporting. EMAS included NI 185 as a performance indicator, but met a different set of priorities. EMAS was good forward thinking for green policy in the council; however, since it no longer meets the needs of the council, the council is planning to redesign an internal system that is not formally accredited, thereby reducing cost and efficiency.

Ms. Sutton and Ms. Marshall did not have on hand a definitive list of the indicators still being measured by the Council besides carbon emissions. The council is still in the process of evaluating and redefining their list of indicators. NI 185 was replaced by the national government with greenhouse gas reporting (carbon emissions). The council is planning on keeping biodiversity indicators. Ms. Sutton and Ms. Marshall were not aware of any current waste indicator in place; however the waste team might have one. The council will also be developing some new services, such as the Service Delivery Plans which will contain the new list of indicators.

The Environmental Statement was mandated when the Council still had EMAS. It was difficult for the public to interpret; however, it is believed that some residents read the Statement, but the Council does not have a way to keep track of how many. The team presented their pamphlet idea of having a smaller, more accessible version of the report for the general public. Ms. Sutton and Ms. Marshall agreed that this would be useful and a good way of getting a greater number of the public aware of the report. The writers of the Environmental Statement

attempted to make the document understandable; however, with the amount of information within the report, it was difficult. In the end the document was produced purely to meet the EMAS requirements. Ms. Sutton and Ms. Marshall recommended that when condensing a broad report into a pamphlet, the team should keep in mind the bigger picture of what is important.

Kirklees' process for making environmental reports depends on which report it is and the data contained. For the Environmental Statement, no template existed. Instead the old report would be reviewed for improvements. Although there was no template, EMAS had guidelines for what needed to be included within the report. Data collection was dependent on the data involved. Raw data would be sent to the team and manipulation of the data was done within the team. All data was stored in Excel workbooks because it was the most practical solution at the time. Unlike Access, it is very user friendly and everyone knows how to use it. Ms. Sutton and Ms. Marshall offered to share their Excel sheet of indicators with the team.

Ms. Sutton and Ms. Marshall's last advice for indicator selection was to challenge everything and ask why things are being done and how it reflects on the council. This is to streamline the process Kirklees uses.

11.2 Appendix B: Sample Questions for Methods

Questions	Croydon Council	Other Boroughs
Objective 1		
What frameworks of environmental indicators are currently being used?	X	X
What types of indicators do these frameworks have in common?	X	X
What types of data are commonly used within these frameworks?	X	X
What are the differences in frameworks and data collection methods used?	X	X
How does one go about evaluating an indicator?	X	X
What indicators would they recommend in Croydon?	X	X
What factors should one look at in describing an indicator? Cost? Reliability? Ease of measuring?	X	X
Objective 2		
What is the budget available for indicator development?	X	X
What were the previous indicators? What data is available from these?	X	X
How efficient do they think current indicators are?	X	X
Who else in the field of indicators is available to talk to and could they help to make arrangements in meeting them?	X	X
How effective do they think other boroughs indicators are?	X	X
How would they rate relevant aspects of indicators? (Cost, reliability, ease of measuring)	X	X
What other data regarding the environment that could be relevant do we have access to and how can we get it?	X	
Did you see any challenges that Marina faced when creating the SoE report last year?	X	
Do you think the topics included in the last report cover what should be said? Any that should be added or subtracted from that list?	X	
What other departments go into the *Report*/ who in those departments should we be talking to?	X	
What do you see as the most important aspects of the *Report*?	X	
Who is the target audience of the SoE?	X	
What do you hope you're readers get out of the *Report*? Do you think you are successful with that? How do you determine that you are successful?	X	

How was the data organized currently?	X	
What do you think about having the SoE online and just print out pamphlets?	X	
Any ideas for what would work with a template and what to include?	X	
Do you use a template to make your report? If so, how did you determine what to incorporate in it?		X
What is your process for determining what topics are worth including in the report?		X
How do you compile your data? Organization of it?		X
How do you determine the trends or the state of the trends? How do you figure how something is improving or not?		X
How is your council coping with the budget cuts and changes in government?		X

LONDON BOROUGH OF CROYDON

Creating a State of the Environment Report

Table of Contents

1.0 Preparing the Excel Workbook

This workbook contains all the data and text from the previous State of the Environment Reports (SoE). It is designed so that the annual updates will build upon each other resulting in long-term trend identification. Each worksheet in the workbook corresponds to a page in the SoE. The worksheets must be prepared properly to ensure that they remain simple to update.

Note: When opening the workbook file, be sure to select the "Enable Macros" option when prompted

1.1 Preparing the graphs

The graphs within each worksheet correspond to the data tables also present. It is essential to maintain the integrity of the older data to ensure accurate reporting of trends over time.

Note: Some indicators may not have a graph or numerical data. If numerical data does arrive, please add a graph to the worksheet in the same format as the other worksheets.

Step 1: Add a column or row for the new year to the data table, maintaining the format of the table.

Step 2: Make the colour of the cell which requires the new data input grey so that it is obvious where data needs to be inserted.

Step 3: Right click within the graph area and select "Source Data"
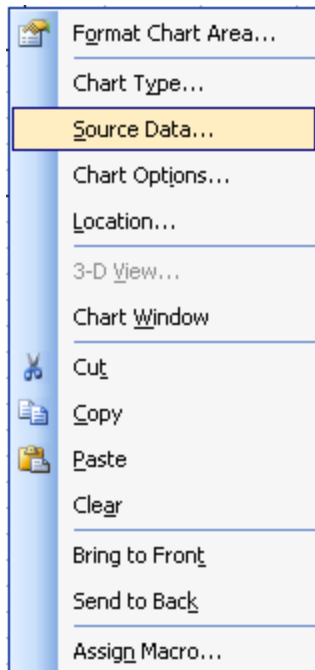
Step 4: The Source Data box will open and the data table will appear selected. Highlight this table again, including the space that you added in Step 1. This will make it so that when the new data is added, the graph will update automatically.

1.2 Preparing the text and text boxes

Most people who read the SoE are not environmental experts and rely on the text rather than the graph; therefore the text included is of the utmost importance. The workbook contains the text from the previous report, but the space for the new text needs to be made.

Step 1: Copy and paste the text from the previous year into the boxes from two years prior. And change the year labels in the boxes above.

Step 2: If it is not already, change the colour of the boxes for new text grey so they can be easily identified when updating. It is also helpful to indicate where text should be inserted with the words "Insert text here."

Step 3: Delete the text from the box prompting for trend analysis and again add "Insert text here."

1.3 Preparing the Buttons

As the worksheets are formatted, there are buttons for each box that, when clicked, causes the associated macro to copy and paste the previous text into the box for the new text. These are reliant on the location of boxes and will have to be recoded if the text boxes move, which will happen if any rows or columns are inserted to or deleted from the worksheet.
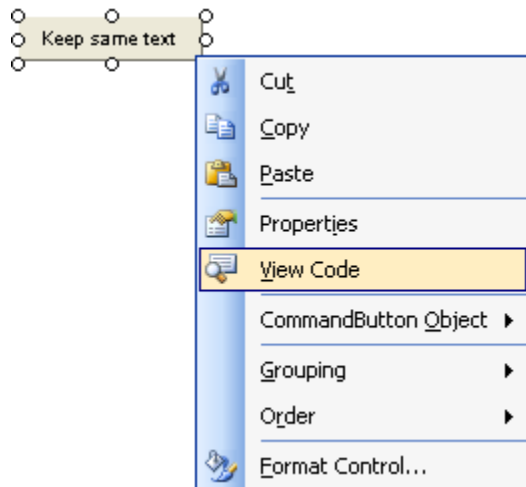
1.3.1 Editing Buttons

Step 1: Right click on the tool bar at the top of the screen and add the "Control Toolbox" toolbar if it is not already open.
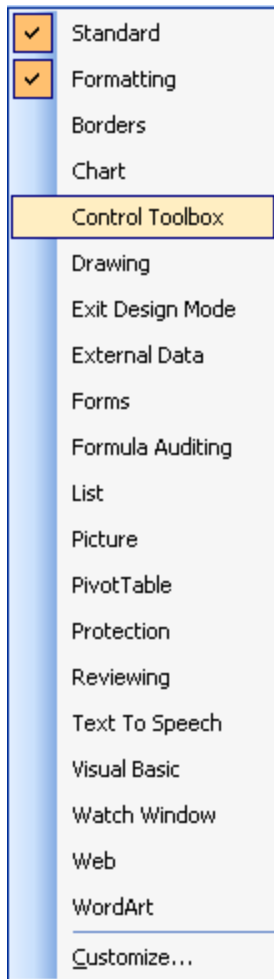
Step 2: Click the Design Mode button.

Step 3: Right click on one of the buttons and select "View Code."

Step 4: The Microsoft Visual Basic window will open as will the code for the buttons on the active worksheet. Change the cell labels in the code to the new cell labels (displayed with yellow highlight below). The labels are the letter of the column of the cell followed by the row.
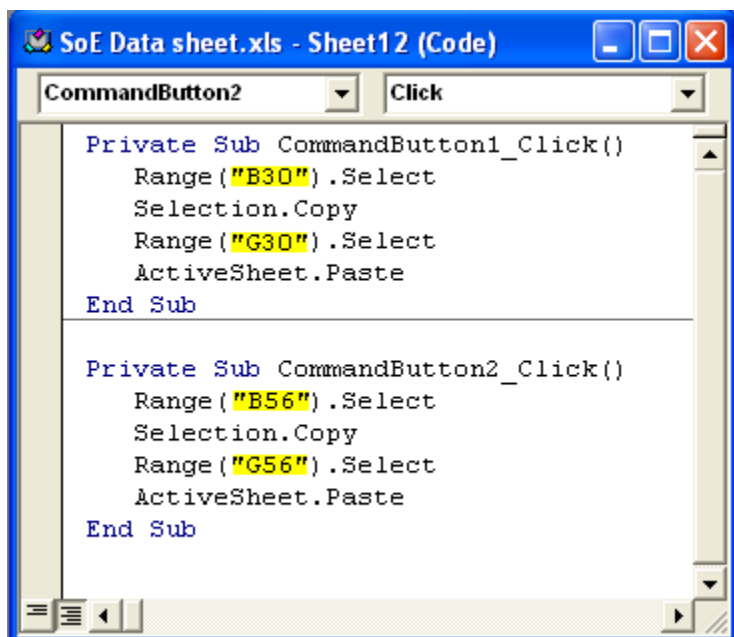
Step 5: Exit Visual Basic by selecting the "View Microsoft Excel" icon.

Step 6: Exit Design Mode by selecting the same icon as in Step 2.

Note: It is a good idea to verify that the buttons work, especially after altering the code.

1.3.2 Adding Buttons

If the sections within the page of the SoE change, altering the number of subsections, buttons may need to be added.
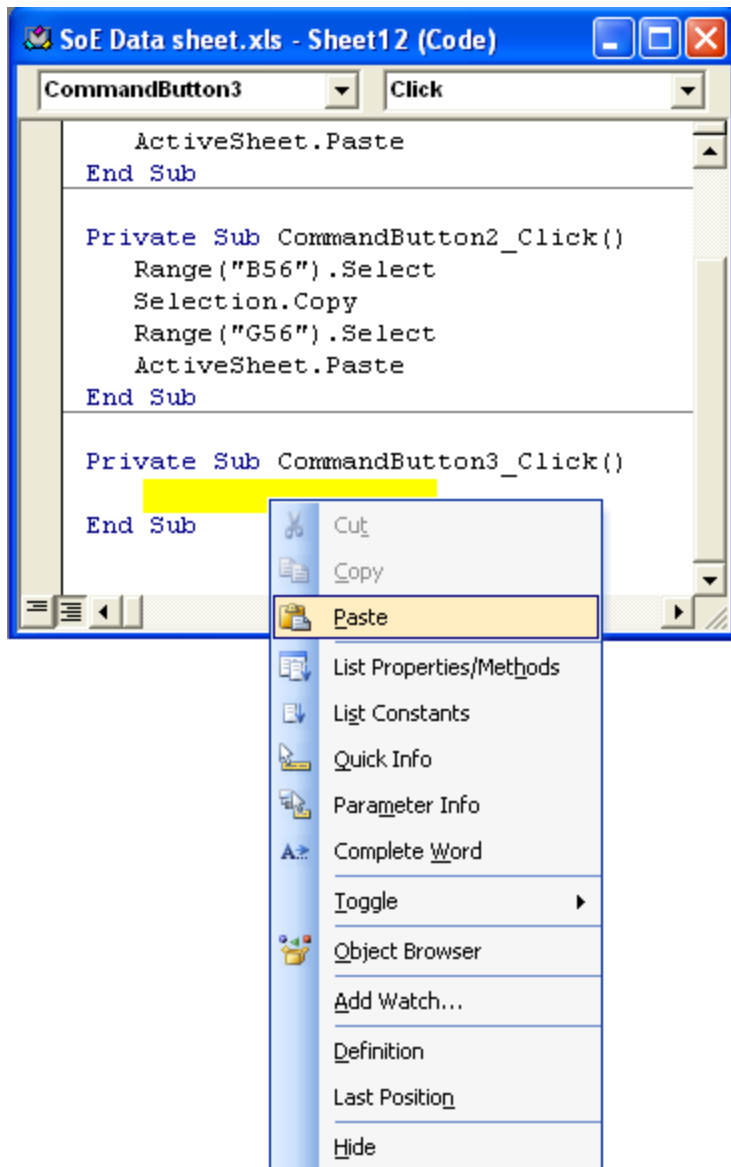
Step 1: Enter Design Mode by following the first two steps of 1.3.1.

Step 2: Copy one of the buttons on the worksheet and paste it in its desired location.

Step 3: Enter Microsoft Visual Basic following Step 3 of 1.3.1.

Step 4: Copy the code from another button on the active worksheet and paste it in the space provided for the code for the new button.
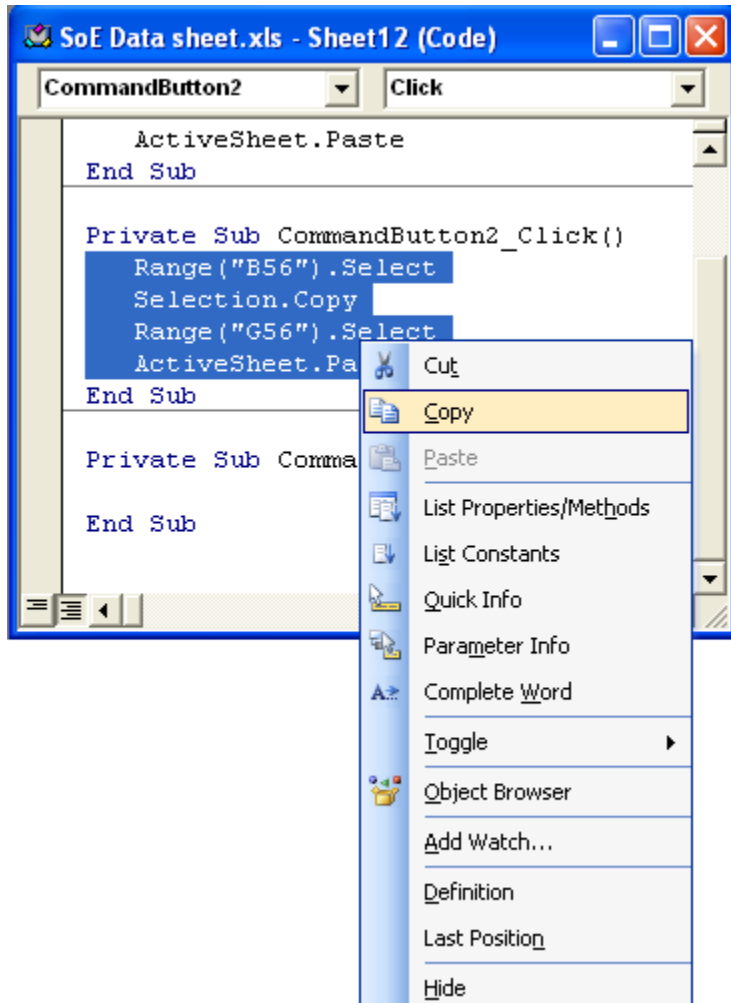
Step 5: Edit the code to reflect the cells necessary, as explained in Step 4 of 1.3.1.

Step 6: Exit Microsoft Visual Basic as explained in Steps 5 and 6 of 1.3.1.

1.3.3 Removing Buttons

Just as buttons may need to be added, sometimes they may need to be removed.

Step 1: Enter Design Mode by following the first two steps of 1.3.1.

Step 2: Delete the button by right clicking on the button and selecting "Cut."
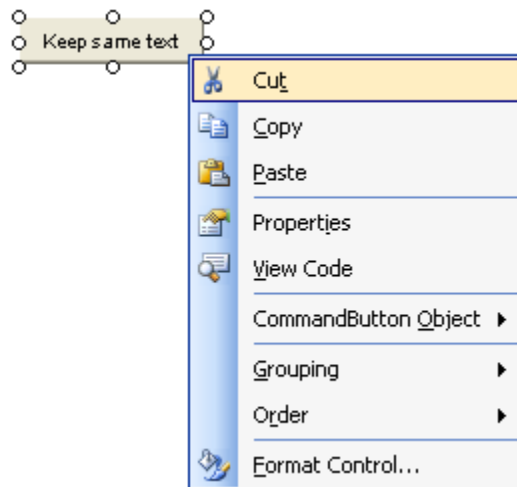
Step 3: Exit Design Mode as explained above.

2.0 Preparing Emails for Data Collection

The most important and time consuming step in this process is collecting the new data for the report. Data must be collected from different teams throughout the Council and even sources from outside the council. A contact sheet has been provided to help identify those who have the data. Email templates have also been developed to make data collection more efficient.

Note: The provided contact sheet has been constructed from information from the previous year. Expect for this information to change from year to year, and please update this information where appropriate.

2.1 Email Attachments

The easiest way to get the data updated is to send the relevant worksheets to the individuals with the data as an email attachment. To do this, a new workbook will need to be made for each individual, containing copies of the worksheets from the overall workbook.
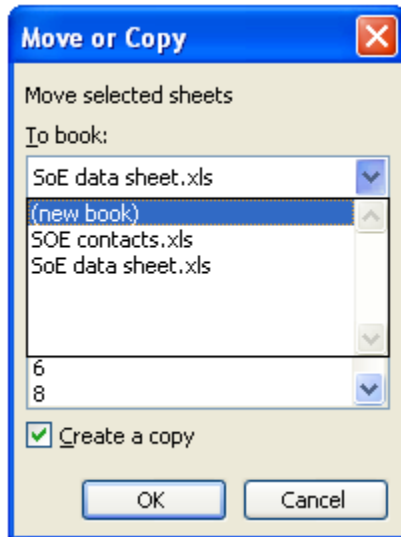
### 2.1.1 Creating New Workbooks

Step 1: Open the overall workbook.

Step 2: Right click on the tab correlating to the required sheet on the bottom of the window and select "Move or Copy..."
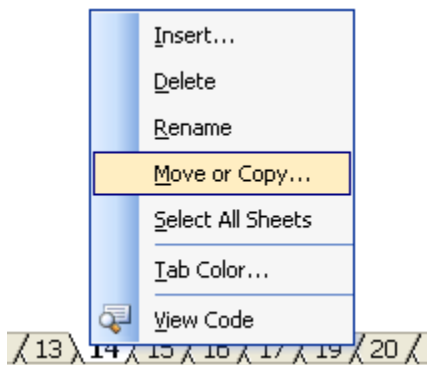
Step 3: Open the "To book" drop down menu and select "(new book)." Also, select the box labeled "Create a copy."

Step 4: A dialogue box will appear explaining that only 255 characters per cell will be copied. Select "OK," then proceed to manually copy any text that did not transfer already.
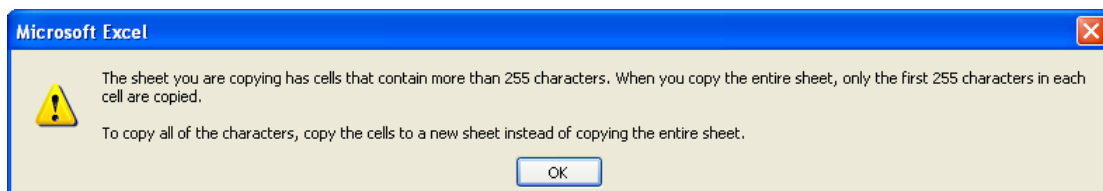
Step 5: If one contact requires multiple worksheets, repeats 1 through 4, but during Step 3, instead of creating a new book, select the book you just created.

Step 6: Save the book as something relevant, for example: State of the Environment Query 14.xls or Cycling in Croydon.xls.

2.2 Email Templates

2.2.1 Initial Email

Below is a template for the initial email to send to the individuals believed to have data relating to given indicators. The new Excel workbook created in 2.1.1 is an attachment to this e-mail.

Dear [Insert Name Here],

I am working with the Croydon Council's Sustainable Development Service to update the State of Environment Report for the year of [Insert Year Here]. The purpose of this Report is to give an annual snapshot of how the Borough of Croydon is reaching its environmental sustainability goals. I have been referred to you for data relating to [Insert Title of Relevant Graph]. If you are still collecting this data, can you please send the most recent data back to me or if you do not have the data collected at this moment, please provide a time frame in which the data will become available. If you are no longer collecting this data, this information will also be beneficial.

Please follow this link [Insert Link for the Past Year's State of Environment Report] and go to page [Insert Page of Relevant Data] if you are interested in looked at the data in last year's report. Attached please find an excel file relating to information you provided last year. When opening the file, please enable macros. Within the sheet there are grey areas for new information. You may also find the graph that contains the historical data as well as a summary of what the graph tells the reader. Please compare the new data to the historical data in the report and determine if the text relating to the graph is still valid. If there are any changes in the text please insert the new text in the designated grey box. Also, if you observe any discrepancies or you see a different and better way to display the information, do not hesitate to let me know.

Please have this information completed and e-mailed to me by [Insert Date and Time Here]. At any time, if you have any questions, comments, or concerns feel free to contact either myself or [Insert another Environmental Officer and E-mail Here].

Thank you for your time and I look forward to hearing from you soon,

[Insert Name and Credentials Here]

2.2.2 Follow-up Email

After following the initial email it is good practice to send a follow up reminder, a template for which is below.

Hello [Insert Name Here],

I just wanted to remind you about the State of the Environment Report data that was sent yesterday. If you could please fill out the sheet that I sent you by [Insert Date and Time Here] it would be greatly appreciated. At anytime if you have any questions or problems filling out the sheet, please let me know.

Thanks,

[Insert Name and Credentials Here]

Note: After sending a follow-up email, some contacts may require additional prodding. This will probably require making a few phone calls. Most of the phone numbers are available, especially if they work within the Council.

3.0 Inserting Data into the Template

After data is collected it should be copied and pasted back into the workbook containing all the indicators, and from here, the data can be placed into the SoE template to create the Report.

The template provided does not contain every page of the report, but contains the basic guide from which the Report can be generated. As the number of pages in each chapter will vary depending on the indicators, only one page for each chapter was provided, along with the table of contents and the title page for each chapter.

3.1 Preparing the Template

Within each chapter, duplicates of the provided pages will need to be made to have space for all the indicators. To do this, the pages will need to be duplicated as many times as is needed for each chapter, by right-clicking on the tab corresponding to the indicator page and selecting "Insert Duplicate Page."
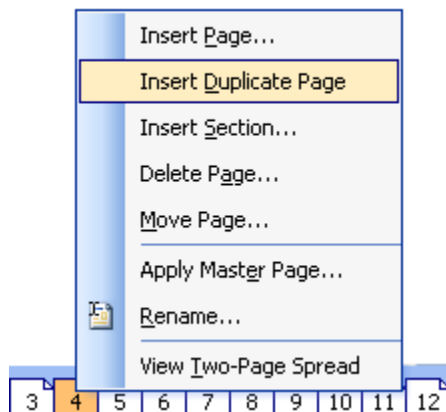
3.2 Inserting the Text/Graphs/Pictures/Trends

Once the pages have been set up, all that is left is to insert the text, graphs, pictures, and trend labels to create the final report.

3.2.1 Inserting Text

The text comes directly from the Excel workbook, it just needs to be copied and pasted into the template. Adjust the sizes of the boxes to fit as much of the text as possible, but sometimes the text may need to be edited. The first priority is to report the data, so if the picture needs to be removed from a page to fit the text, that is acceptable.

3.2.2 Inserting Graphs

The graphs can also be copied right out of the Excel workbook and pasted into the placeholder in the upper-left hand corner of each page. When prompted, select "Disable Macros." Double-clicking the graphs will allow them to be edited as they would be in Excel; this will primarily be helpful for resizing the graphs.

3.2.3 Inserting Pictures

Finding the right pictures to put in the Report can be tedious and annoying. There are many photos available at V:\E&S\SDS\Communications\Photos. Inserting the pictures into the report requires more than just copy and paste.

Step 1: Right click on the designated location for the picture, represented by dotted lines in the shape of a curved rectangle in the template, and select "Format AutoShape."
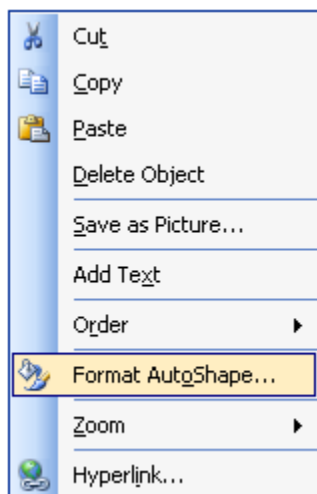
Step 2: In the "Fill" section, open the dropdown box and select "Fill Effects."
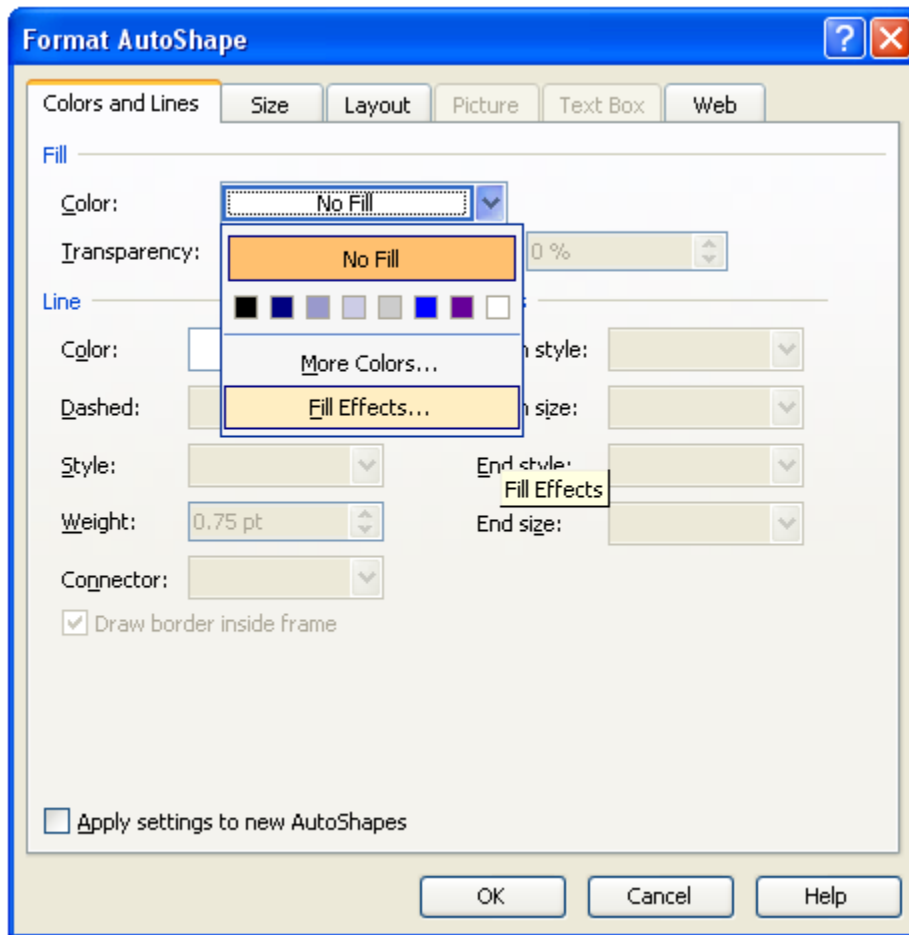
Step 3: Select the "Picture" tab at the top and then click the button "Select Picture."
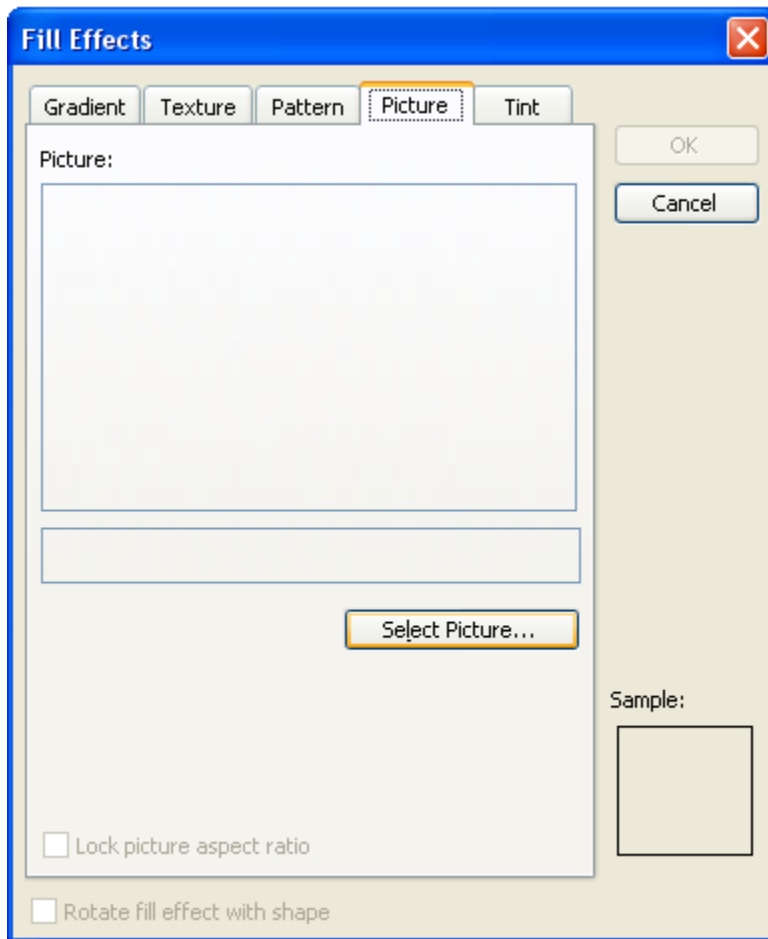
Step 4: A dialogue box will open from which you can navigate to any picture on your computer you would like to select.

Step 5: After selecting a picture, select the box labeled "Lock picture aspect ratio," then click "OK."

Step 6: Resize the image so that it looks good on the page with the text and graph(s).

3.2.4 Inserting Trend Labels

The overall trend of each indicator is very important. There are four images are provided within the template for displaying trends. The green circle with the upward arrow indicates an improvement. The orange circle with a double arrow to the left and right indicates no change. The red circle with the downward arrow indicates the data is getting worse. And the grey circle with a question mark indicates there is not enough data to determine a trend.

There is also a text box near the top of the page to insert a brief description of the overall trend. The trend label should be placed directly to the left of this text box.

4.0 The Pamphlet

Since the SoE is such a long document, and only available on-line, a supplementary pamphlet should be created that can be published and distributed. A pamphlet template, similar to the template for the SoE, has been provided. The best place to get information for the pamphlet is the chapter summary pages of the SoE. Pick a few highlights from each chapter summary and paste them into the designated text boxes within the template. Do the same with relevant graphs, pictures, or diagrams. Each chapter should be briefly represented in the pamphlet.

The pamphlet, like the SoE, highlights the overall trend of each chapter. The same four trend labels apply to the pamphlet, and are provided so they can be pasted in the necessary locations

11.4 Appendix D: Individual Indicator Analysis

Page	Titles/Captions	Indicator	Graph/Data	Text	Picture
CHAPTER 1					
10	Too long and similar to other titles, should be "Private Housing"	Keep	Raw cumulative data values, incorrect. In title, needs to be stated clearly it is cumulative data.	Good	Pictures are blurry and not clear. Black and white does not attract attention.
11	Too long and similar to other titles, should be "Council Run Social Housing"	Keep	2010 graph is misleading because the scale is too big. For the Y-axis label should be simpler like "Average Sap rating." The legend if unnecessary.	"Energy Champions" is not collected. Split up description sections by the graph and statistics.	Is not relevant anymore since "Energy Champions" is no longer applicable.
12	N/A	Data is no longer collected. Cannot use this.	N/A	N/A	N/A
13	Too long and similar to other titles, should be "Environmental Impact of Social Housing"	Keep	N/A	Good	More sustainable looking house.
14	Too long and similar to other titles, should be "Environmental Impact of Private Housing"	Keep	The y-axis label was wrong, should be "number of dwellings." The legend was also confusing, should be "Total completions" and "completions meeting very good or CSH level 3." Title of the graph should be direct and graph should contain percentages as well to emphasize the data.	Good	Very small, can't see the entire picture which ruins the impact of it.

Page	Titles/Captions	Indicator	Graph/Data	Text	Picture
CHAPTER 2					
17	Make it a bit more clear, should be "CO2 emissions from Croydon Council Operations"	Replaced by the new CMEEP 2010-2015 plan.	The new pie chart is the same as the old pie chart and does not need to be changed.	Too much text, needs to be shortened and to the point.	Pie chart showing the Council's emissions is fine, but the labels should be clearer/ explained more.
18	Make it shorter and clear, should be "Sustainable Schools"	Keep	Change pie chart to a bar graph, very confusing.	Some text is not relevant, but overall good. CSCCF could be explained a little bit more for the ease of the reader	Small and blurry.
19	Make it a bit more clear, should be "CO2 emissions from Non- Residential Buildings"	Keep	Legend needs to be simplified. The 2005/06 data does not need to be included in the graph since it is zero.	Good	Like the idea, but it needs a more inspiring picture.
20	Good	Possibility of not being included in the report.	With new data, an asterisk should be included since the data is not complete.	Should be a disclaimer saying that the 2010/11 data is not complete since collection had stopped in December 2010. In the Envibe text section, the description of their current company is not relevant anymore.	The current picture needs to be clearer. Like the fact the picture is of companies with their awards.

Page	Titles/Captions	Indicator	Graph/Data	Text	Picture
CHAPTER 3					
23	Good.	Keep but more data needed	The lines indicating the volume of traffic in Croydon as well as the average volume are unnecessary.	The "Council Car Pool" section and the "Car Clubs" section could be explained further.	Pie chart needs to be re-constructed so all of the smaller numbers are grouped together.
24	Shorten the title, should be "Cycling in Croydon"	Keep	Good	Too many sections within the text. Could be combined to make it more appealing to read	Rather one big picture than two small ones. Prefer picture from cycling instructor.
25	Shorten and make a bit clearer, should be "School Travel"	Keep	The graph displaying Croydon's travels compared to other boroughs is confusing and semi-unnecessary.	Good	Very small.
26	Good	Keep	The data in the report does not match the raw data. The line at 40 needs to be explained better.	Should explain what NO_2 is and how corresponding health effects.	Too Big
27	Title for graph is too long.	Keep	Good	Define what PM10 is. Don't just refer to a glossary.	Unnecessary to have an ad. Put a picture of the machine.

Page	Titles/Captions	Indicator	Graph/Data	Text	Picture
CHAPTER 4					
30	Could just be "Household and Municipal Waste"	This is really 2 separate indicators, may want to break them up	Not sure if these 2 graphs belong on the same page	Could use some more	Maybe something more Croydon specific
31	Misleading. Should be "Household Waste Management"	Keep	Good	Good	Get a non-iStock photo
32	Good	Keep	Good	Something needs to replace the ARC info and London rate needs to be explained	Needs a non-ARC picture
33	Too long, maybe just "Litter and Detritus"	Keep	Axes and title need to better reflect what the graph is about	Good	Good

Page	Titles/Captions	Indicator	Graph/Data	Text	Picture
CHAPTER 5					
36	Good	Basically a follow-up to the summary, needs a statistic to make it an indicator	None!!	Too much	Get rid of iStock
37	Good	Keep	Good	Good	We have a new picture for this year
38	Should just be "Green/Open Spaces for Nature Conservation"	May begin including just Croydon instead of comparing to others as others no longer report this data	Title does not reflect the content of the data in the graph	Good	Good
39	Good	Good indicator but needs time to develop so a trend can be shown	None!!	Good	Good
40	Good	Keep	Misleading, should display in terms of access to nature not deficiency in access to nature	Good	Good
41	Good	Good indicator but needs time to develop so a trend can be shown	None!!!	Good	Good

Page	Titles/Captions	Indicator	Graph/Data	Text	Picture
CHAPTER 6					
44	Good	Keep	Very misleading! Need to better show that these percentages are of a smaller portion of the whole of the borough	Good	Get pictures of Croydon, not other boroughs
45	Good	Not a great indicator for Croydon, not very applicable	The data is old and needs to be updated	Good	Good
46	Good	Keep	Labels need to be changed to reflect what the data actually means	Needs to explain what the new labels mean	Could be bigger
47	Good	Keep	Need to find newer data	New text on its way	Could be bigger

11.5 Appendix E: Flowchart