



Sustainability Curriculum Inventory

Executive summary

This document gives an overview of the work done by the sustainability curriculum inventory team as part of an environmental capstone project for the VCSAC during the spring semester 2009. The project involved two parts: (1) creating and carrying out a method for finding curriculum incorporating sustainability and (2) developing a framework to begin finding research incorporating sustainability at UNC. Much of this was done bearing in mind the AASHE (Association for the Advancement of Sustainability in Higher Education) Sustainability Tracking and Rating System (STARS), which includes curriculum and research components.

- (1) In order to find courses incorporating sustainability, we developed a description of sustainability based on selected definitions from authoritative sources and from reports published by the Proceedings of the National Academy of Sciences. We then identified the courses either related to or focused on sustainability using both manual and keyword searches of the undergraduate and graduate bulletins. After identifying courses and classifying them as sustainability-related or -focused, we developed a survey that was sent to the director of undergraduate studies in each department or another faculty member with a working knowledge of the departments' courses to get their input on our selections. With the input we received, we created a final spreadsheet, which included a final list of courses and their final classification as sustainability-focused or -related.
- (2) There was a large amount of information available to help us find research incorporating sustainability, and our main difficulty was in developing a method to search through the websites and resources in the best way possible. To this end, we developed a list of faculty members likely to be involved in sustainability research from several sources and began to search for awarded projects in which they were the principal investigator in the RAMSeS reporting software.

After accounting for survey responses, our curriculum search yielded 52 sustainability-focused courses and 167 sustainability-related undergraduate courses from 29 different departments, and 20 sustainability-focused courses and 68 sustainability-related graduate courses. Our results show that three departments account for over half of the focused and related undergraduate courses. The Economics department has very few courses, even though the economy is a key concern in our description of sustainability. The courses and information we have found have implications for the STARS rating that UNC will receive, but they could also be used to enhance the sustainability minor, add to a sustainability concentration, or help students find courses involving sustainability in a diverse set of departments.

Sustainability Curriculum Inventory Project Report

ENST 698: Environmental Capstone

Spring 2009

University of North Carolina at Chapel Hill (UNC)

Client: Vice Chancellor's Sustainability Advisory Committee (VCSAC)



Table of Contents

I.	Methods	5
	a. Description	5
	b. Core Traits	6
	c. Undergraduate Bulletin Search	7
	d. Keyword Search	8
	e. Graduate Bulletin Search	8
	f. Course Website Check	8
	g. Surveys	9
	h. Final Classification	11
	i. Research	12
II.	Results/Findings	14
III.	Recommendations/Suggestions	17
	a. UNC	17
	b. AASHE	17
IV.	Next Steps	19

a. Short Term	19
b. Long Term	20
V. Resources	22
a. Created during Capstone	22
b. Websites	24
c. Contacts	26
d. Works Cited	27

I. Methods

This project involved several major steps, as outlined below.

- a) **Description:** In creating a campus inventory of sustainability courses, the first step was to develop a working description of sustainability to use in our search. Using articles from the Proceedings of the National Academy of Sciences, previous definitions of sustainability (see Resources: Works Cited), and individual knowledge, we discussed different definitions and traits to help us build a working template for determining whether or not specific UNC courses or research involve sustainability. Sustainability is a framework of study that encompasses the environmental, economic, and social aspects of a certain issue. As noted by Clark (2007), “sustainability science is defined by the problems it addresses rather than the disciplines it employs.” Furthermore, Clark and Dickson (2003) wrote that the key to sustainability science is to consider: “how do social changes shape the environment, and how do environmental changes shape society?” The definition that the World Commission on Environment and Development (“Brundtland Commission,” 1987) provides is “sustainability is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” From this, we developed this working description to facilitate our course inventory search:

Sustainability is an interdisciplinary field focusing on the dynamic relationship between the environment, economy, and society. Sustainable systems are aimed towards preserving and advancing social equity, economic prosperity, and the use of natural resources for future generations.

- b) **Core Traits:** The next step was to determine the particular core traits we would look for when searching through the bulletins and creating our inventory. Courses are divided into two categories according to the Association for the Advancement of Sustainability in Higher Education's (AASHE) Sustainability Tracking and Rating System (STARS): sustainability-focused and -related. STARS defines these as:

Sustainability-focused courses concentrate on sustainability, including its social, economic, and environmental dimensions, or examine an issue or topic using sustainability as a lens. Sustainability-related courses include sustainability as a course component or module, or concentrate on a key sustainability principle or issue.

The task of determining focused or related for a specific course can be aided by looking at certain core traits. Core traits are a list of principles that have a high likelihood of being present if a course is considered to be a sustainability course. The following list of traits was developed with our working description in mind:

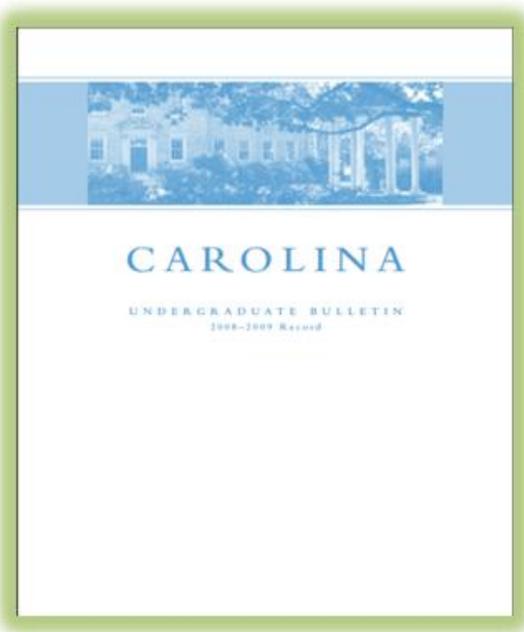
Core traits:

- Interdisciplinary: Social, environmental, and economical aspects
- Discusses nature/society systems
- Synthesis of basic and applied research
- Temporal component: discusses preservation of resources for future generations
- Emphasizes cyclical model of resource use

Another guiding principle that we noted was that a sustainability-focused course may cover the economic, environmental, and social aspects. A sustainability-related course may cover only one or two of these aspects. Also, a focused course may include all the core traits mentioned above, while a related course may include only one or two.

Keep in mind that the working description, core traits, and purposefully flexible definitions of focused and related given by STARS were all used together in the process of course classification. We were not able to figure out a precise definition of focused or related, just as we were not able to precisely define sustainability, but describing sustainability and describing what a course classified as sustainability-focused or -related might entail allowed us to develop a good sense of what exactly we were looking for before we went through the bulletins, even though we could not put it into precise words.

c) **Undergraduate Bulletin Search:** After developing our method of searching to



remove as much subjectivity as possible, we began to search the undergraduate and graduate bulletins. We split up the undergraduate course bulletin into four sections according to page number, with each team member covering one section; then we had the fifth member do

a keyword search as a double check. We divided these courses into focused and related using our description, core traits, and the definitions given by STARS.

- d) **Keyword Search:** Prior to the bulletin search, we came up with a list of keywords with which to search the course bulletin online as a way to double check for any missed courses. These keywords were: *global, environment, sustainability/sustainable (not sustain*), urbanization, biodiversity, footprint, renewable, and conserve*, and they were searched in that order. We prioritized these words according to their potential usefulness in finding sustainability courses, and the first three listed are the top keywords that led the search. The keywords were subject to change during the course of the online search due to inadequate results or further investigation.
- e) **Graduate Bulletin Search:** After searching through the undergraduate bulletin, we separated the graduate bulletin into sections and used both a manual and a keyword search to find sustainability-related and -focused courses in the same way as with the undergraduate bulletin.
- f) **Course Website Check:** After each bulletin was searched thoroughly, we then went to the official website for each department and checked the online course descriptions for the courses found in the bulletin search. This was done in order to see whether the online descriptions elaborated on any details that the bulletins did not include. The website search was a third way to confirm our search process, to decrease subjectivity.



Figure 1. Page of the survey showing our description of sustainability and other helpful information.

g) **Surveys:** In order to account for any classes we may have missed and as a fourth way to double check our work, surveys were sent out to the undergraduate and graduate studies advisors in all the departments searched (Fig. 1). The purpose of the surveys was to ask someone with an intimate knowledge of the department's curriculum whether they agreed with our course choices, knew of any courses we might have missed in the 2008-2009 bulletins, and if they knew of any sustainability-related courses offered in the previous year or any that will be offered in the upcoming year. In order to make sure that their concept of sustainability was aligned with ours, we provided them with our working description along with our list of core traits above the department-customized survey screen. By helping them to understand our working

description and the courses we chose using it, we reduced subjectivity. The surveys included the following general questions:

- We listed courses in a certain department that we determined to be sustainability focused and then asked whether or not they agreed with our decision, thought a particular class was sustainability-related instead of -focused, or whether that class had nothing to do with sustainability.
- We then listed sustainability-related courses in that department and offered the same set of options.
- We asked whether they knew of any classes we might have missed.
- We asked whether they knew of any classes offered in the previous year that they considered sustainability-related.
- We asked whether they knew of any classes that will be offered in the following year that they consider sustainability-related.
- Finally, we asked whether they had any suggestions concerning our definition or list of courses.

A major complication that arose in this process was the presence of special topics, freshman seminars, and other classes that offered content that varies each semester.

Unfortunately, there was no way to find out which topics were discussed for each course in a given semester. We listed these classes as sustainability-related in our surveys, and most people responded by considering them as neither sustainability-focused nor -related. These classes have been included as related in the final spreadsheet.

- h) **Final Classification:** Before sending out the surveys, we had discussed courses on which our manual and our keyword search disagreed. 18 out of the 25 faculty members to whom we sent the survey responded; after the responses to the surveys were received each group member reviewed the courses where there were disagreements between our classification and that made by the faculty member taking the survey. For more controversial courses, we decided as a group whether the response matched our description and AASHE's definition of sustainability-focused or -related, and made any appropriate changes to our final list. We also added any suggested classes that may have been missed in our initial search.

Each type of search had benefits and drawbacks. The most thorough type of search was the bulletin search. Sections to be searched by each group member were easy to define, but we ended up reading through a large number of courses that had nothing to do with sustainability. The keyword search captured a large percentage of the courses found in the bulletin search, but courses turned up repeatedly if several keywords were in the course description. Using a survey to get input from faculty yielded a number of changes to the courses listed in the spreadsheet as well as the classification of focused/related. However, many faculty members either did not respond to the survey or did not spend a sufficient amount of time to make the response very useful. Thus, each method of searching had benefits and drawbacks.

- i) **Research:** The next step in the project involved inventorying the research at UNC that incorporates sustainability. Our working description as well as other information from

the curriculum search might be reused in or tailored to this future portion. After discussing strategies for finding sustainability research with the capstone leaders and with Andy Johns (see Resources), we realized that there are multiple sources from which we can get information on UNC's research. The main issue was deciding which of these sources to look through and how.

We believe that the best way to begin the search is in the RAMSeS research database. Due to the set up of the database, there is no way to directly search for sustainability-related research. Much of the research at the university is department-specific and involves complex terminology. The possible search options include keywords, principle investigator, department, and sponsor of the research. To begin the search, we created a list of faculty most likely to have conducted sustainability-related research within the past three years using a list of faculty from Focus the Nation and authors in a Climate Change report from our campus, among other sources. For the first 15 faculty members, we searched for research in which they were the principal investigator, filtered out sustainability research using titles and abstracts, and then moved on to the next person. After this search is completed for all the faculty members on the list, trends regarding a certain department or sponsor with a high frequency of occurrence in the search can be recorded. Using departments or sponsors that showed up with a high frequency from the first search, a second search can be done. A similar process can be repeated with the findings of the second search. In the end, multiple searches involving the principal investigators, departments, and sponsors can be made, but each step that is taken needs to be made logically and with the end

goal in mind of capturing as much sustainability research as possible with the search. Deciding how to divide the work between group members can also be a challenging task, and lists make this easier.

Another good resource for finding research is a spreadsheet sent to us by Andy Johns. This spreadsheet includes answers to a survey that is completed before research is submitted to the database, with questions on topics related to sustainability. Sorting on this spreadsheet may make it possible to find a large portion of the research with very little work.

Our group did not have time to complete the research component of the project due to the time requirements needed to search each individual research proposal, but we have developed an initial plan and methodology that can be used in the future. More resources for finding research may be found in the Resources section of this report.

II. Results/Findings

From the data on focused/related courses in the final curriculum spreadsheet, we were able to count courses incorporating sustainability at the university. The total number of undergraduate and graduate courses found to be sustainability-focused and -related can be found in the table below:

	Undergraduate	Graduate	Total
Focused	52	20	72
Related	167	68	235
Total	219	88	307

Table 1: Number of undergraduate and graduate sustainability-focused and -related courses

These results show that UNC has a large number of courses focused on or relating to sustainability, with a large portion of the curriculum incorporating sustainability. Far more undergraduate courses were found than graduate courses, possibly because graduate courses tend to be more specific and detailed. These courses were found in a number of departments in schools, as shown in the table below:

Number of Departments Offering Sustainability Courses	29
Number of Schools Represented	5

Table 2: Sustainability courses offered in University schools and departments.

The majority of the courses were found in the College of Arts and Sciences, but courses were also found in the School of Public Health and the Kenan-Flagler Business School, among others. Almost half (~40%) of the departments at UNC had at least one sustainability-focused or

sustainability-related course, and several key departments had a large number of undergraduate courses incorporating sustainability, as shown in the table below:

Department	Number of Courses
Environmental Science and Studies	65
Anthropology	29
Public Policy	21
Communication Studies	10
City and Regional Planning	9
Biology	8
Public Health	7
Geography	7
Geology	7
Physics and Astronomy	7
Philosophy	7
Sociology	7
International Studies	6
Marine Sciences	6
Kenan-Flagler Business School	5
Political Science	5
Art	4
African and Afro-American Studies	3
Health Policy and Administration	2
English and Comparative Literature	2
Applied Sciences and Engineering	1
Chemistry	1
Chinese	1
Economics	1
Social Work	1
Statistics and Operations Research	1
Women’s Studies	1
Slavic Languages and Literatures	1

Table 3. Number of undergraduate courses (focused and related) by department

Environmental Sciences and Engineering, Anthropology, and Public Policy combined yielded over half of all courses incorporating sustainability. For other colleges with

characteristics similar to UNC who would like to conduct an inventory of sustainability curriculum, our data suggest that starting by searching through these departments would make the search more efficient. In addition, many courses were found in departments that might seem unlikely to have courses incorporating sustainability at first: African and Afro-American Studies, Art, Physics and Astronomy, and Philosophy, among others. Students pursuing a major in one of these departments who were interested in sustainability would be able to take a course incorporating some aspects without leaving their discipline.

One department stands out from all the others in the table above: Economics. Our description of sustainability emphasizes the environment, society, and economy, and the first two areas are well represented, as seen from our cataloguing of courses. However, the fact that we found only one course in the economics department incorporating sustainability suggests that UNC might find it helpful to expand courses in this department to include sustainability.

We had insufficient time or data to find certain data that would have been helpful in describing UNC's path toward sustainability in the classroom. First of all, finding the number of courses with a small or large number of students (for example, greater than and less than 30) would be helpful to see what kind of courses sustainability is normally making its way into. Large lecture courses with a sustainability component reach more students than small classroom courses. Also, knowing the number of introductory vs. advanced courses (a course may be advanced above some course number) would be helpful to determine whether incoming freshman or upper undergraduates are seeing more sustainability in the classroom.

III. Recommendations/Suggestions

III.a UNC

- Continue the research component of the project either with a new capstone group, an intern or a new hire to get a more complete grasp of UNC's standing in regards to sustainable curriculum
- Always have a SET FORMAT for spreadsheets. This makes compiling information into a final spreadsheet by copying and pasting a much smoother process. For example, when group members search through the bulletin, ensure that there is a set format for all spreadsheets so they are easier to compile into a master datasheet.
- Our group this semester seemed geared towards the environmental aspect of sustainability. In putting together groups for doing this in the future, it would be good to have a member of the group with a more social or economic background.
- Make sure that the job title of all responders is captured in the survey in addition to any other information deemed helpful

III.b AASHE's STARS

- Finding sustainability-related and focused curriculum in an objective way is a daunting task for a university the size of UNC. In addition, the



statistics necessary to obtain a score for STARS, such as number of sections, maximum enrollment, and other numbers, are very spotty and can be difficult to determine.

Therefore, STARS should provide guiding advice for how to go about completing this portion of the grading system since the time requirement may deter larger universities from participating.

- At the moment, STARS seems intended for colleges and smaller universities. However, the larger universities with more students and courses who would also like to obtain a rating may be unable to because of the time-intensive efforts involved in searching for and getting all the necessary information. This capstone group and the UNC faculty who assisted us put an estimated 550 hours of work into the capstone (5hrs per week per group member, 50 hours per instructor), which is a low estimate. If there was a standardized way of finding courses (say, first searching the bulletin and sending a survey to get confirmation as we have done) that would make the process smoother. If colleges were provided with resources such as suggested spreadsheets to fill out or template surveys, this might help.

IV. Next Steps

IV.a Short Term:

- *Contact AASHE:* AASHE should be contacted and provided with information concerning the methodology and results of the sustainability curriculum capstone and should be provided with recommendations for how to update STARS (see Suggestions above).
- *Conduct Research Inventory:* Use RAMSeS to finish searching through the faculty list. This process has already been started and the results saved as an Initial Research Search. After this initial search is done, look for trends in the output and continue to develop the research search based on these trends. Also, develop ways to use the other websites to look for research as well as methods for double checking what has been classified as sustainability-oriented research.
- *Keep curriculum inventory updated:* Develop a way to find which courses are added or removed from the bulletin each year. This ensures that the party responsible for continuing with this search does not have to look through all the courses each year, only those that are added or taken away. Do this for the 2009-10 school year.

Also, find a reasonable way to account for cross listed courses when counting sustainability-focused and -related courses at UNC. This would avoid double-counting courses and lead to more valid numbers. Consideration of first year seminars and special topics courses was of major concern while we were working on the spreadsheet, and we

classified all special topics courses as related. However, the content of these courses changes every year, making them difficult to deal with.

- *Find further information needed to complete STARS Education Component:* Continue to search for information based on the requirements put forth by STARS. Maximum enrollment, sections, and credits are required to assess UNC performance and to receive AASHE STARS credit. While this capstone made the best attempt to find this information for each course, it was often difficult or impossible to find, and time constraints did not permit us to do a long search. These sections of our spreadsheet, which are essential to getting further STARS credits, have gaps that need to be filled before this rating can be obtained.

With regards to research, STARS asks for the amount of funded research by faculty, department, etc. The next party working on this project should find a way to use what has been done so far to apply it to the above categories by contacting the registrar and ascertaining if he/she has the required information.

IV.b Long Term:

- *Complete the Curriculum and Research Components of STARS:* After finding all the courses and research incorporating sustainability at UNC, this information should be incorporated into the development of a rating for UNC through AASHE's STARS.

- *Determining focused vs. related:* Find out if there is a questionnaire or form that each faculty member fills out about the courses they are teaching and see if a question about sustainability can be added.
- *Other uses for courses:* The courses noted on the curriculum spreadsheet have uses in addition to being used in STARS. They could also be used to expand the range of courses offered by the sustainability minor or to develop a concentration in sustainability. If put online, this could be a valuable tool for students looking for courses incorporating sustainability.

V. Resources

V.a Created during Capstone

Curriculum Inventory: <File name: Complete Course List> This spreadsheet was given along with other documents noted in this write up in a file to Cindy Shea and Elizabeth Shay. The spreadsheet includes both undergraduate and graduate courses on separate pages. The information currently in the spreadsheet is based on what we could find using the bulletin, course search engine, websites, and other tools, and there are still many blank spaces, which we were unable to find the information to fill. The spreadsheet includes course department, number, name, professor, and credit hours; it also has columns noting sections and maximum enrollment from Fall 2008 to Fall 2009. This information, which is requested in the grading criteria noted by STARS, was virtually absent for many courses.

The spreadsheet then goes on to give the classification of focused/related made by our capstone group, that made by the faculty member taking the survey for each department, and the final classification. If the faculty member did not respond, we accepted our classification as the final classification. The spreadsheet then notes the name of the person we contacted, the date on which we sent them the survey and then the date they responded, if they responded.

Survey: This survey was sent out to the director of undergraduate studies in each department in an email. It was made using Qualtrics, and the Odum Institute made this software



available to the group. We made the text in the email and survey as concise and clear as possible, and the classification of courses as easy as possible. The survey has three pages: the first asks for information concerning the person taking the survey, the second gives information including our description that might be helpful in classifying courses, and the third lists the courses we classified as sustainability-focused or -related and, in matrix-format, asks the person to click on the preferred classification. People taking the survey can also suggest courses to add to the list.

Faculty List: <File Name: Faculty List> This is a list of 240 faculty members likely to conduct research incorporating sustainability. We would like to emphasize that this list is only one way to begin to look for research, but we judged it to be the best way because having a list makes dividing the work up between group members simpler and saves time in terms of clarity.

Initial Research Search: <Ben Faculty Search> As an initial trial, we looked through the first 15 faculty names in order to find research incorporating sustainability. This list could be a starting point to continue the faculty search and afterwards could be used to discern trends in sponsor, department, or other areas.

Research Questionnaire Spreadsheet: <RAMSeS Data> This spreadsheet includes answers to several questions that people answer before their research is put into the RAMSeS database along with information about that research. Several of these questions incorporate sustainability, and by using the sort function in Excel it may be possible to find a large amount of sustainability research with very little work.

Powerpoint: A powerpoint was created for our presentation to the VCSAC and to the UNC community. It gives an overview of our project, including objectives, methodology, results, suggestions, and future plans.

V.b Websites

Curriculum:

- <http://www.aashe.org/stars/index.php> - Online accessible version of AASHE's STARS. The specific portions which we focused on were Curriculum and Research, which can be found under Category 1: Education and Research.
- <http://regweb.oit.unc.edu/courses/index.php> - UNC registrar website. This has links to the academic course search engine, undergraduate bulletin, and online listing of courses. The graduate bulletin can be found at <http://www.unc.edu/gradrecord/>
- <http://college.unc.edu/undergraduateed/directors> - Lists the directors of undergraduate studies for each department at UNC. This was used to determine where to send the survey.
- www.qualtrics.com – This software was used to create the survey. Access to login to the website may be obtained from the Odum Institute.

Research:

- <https://cfx5.research.unc.edu/ramses/index.cfm> - RAMSeS UNC research database.

This tool records the grants that have been made to UNC faculty in a user-friendly format and is accessible to anyone with an Onyen. We used the Reporting tool and began the Research search with the list of faculty using Lead Investigator under Awards. The abstract for any project can be found by clicking on that project after searching for a faculty member and scrolling over until a link to the abstract comes into view.

- *Need snapshot of RAMSeS reporting tool
- <http://cfx.research.unc.edu/blue/> - UNC Tomorrow website
- <http://research.unc.edu/services/index.php> - Research at UNC.
- <http://www.institutionaldashboard.collexis.com/unc/index.asp> - Institutional Dashboard
 - Username: unc
 - Password: unc08

Other:

- <http://sustainability.unc.edu/> - UNC Sustainability Office

V.c Contacts

- Cindy Shea
 - Title: Director of UNC Sustainability Office
 - Role: Client who represented the VCSAC and helped to guide the project. She gave useful input during all phases of the project including developing the description, creating the survey, developing a final curriculum spreadsheet, and outlining a plan for research.

- Elizabeth Shay
 - Title: Research associate/lecturer, Institute for the Environment, UNC
 - Role: Coordinator of all environmental capstone groups. Provided guidance and advice through all parts of the project including developing the description, creating the survey, developing a final curriculum spreadsheet, and outlining a plan for research.

- Andy Johns
 - Title: ITS Research Database Specialist
 - Role: He taught the capstone group how to use the RAMSeS research funding software as well as the UNC Tomorrow and Institutional Dashboard websites mentioned above. He also provided us with a spreadsheet with the answers to several questions that people answer prior to submitting information about their research to the database which could be helpful.

V.d Works Cited / Discussed

- Abel, D.C. and McConnell, R.L. (2008) Principles of Sustainability. *Environmental Issues: An Introduction to Sustainability*. New Jersey: Prentice Hall.
- Association for the Advancement of Sustainability in Higher Education's Sustainability Tracking, Assessment and Rating System < <http://www.aashe.org/stars/index.php>>.
- Clark, W.C. (2007). Sustainability Science: A room of its own. *Proceedings of the National Academy of Scientists*, 104(6), 1737-1738.
- Clark, W.C. and Dickson, N.M. (2003). Sustainability science: The emerging research program. *Proceedings of the National Academy of Scientists*, 100(14), 8059-8061.
- Keating, M. (1993) Agenda for Change: A Plain Language Version of Agenda 21 and other Rio Agreements. Geneva: Centre for Our Common Future.
- Shellenberger, M. and Nordhaus, T. (2004) *The Death of Environmentalism: Global-Warming Politics in a Post-Environmental World*.