Green at Fifteen?

HOW 15-YEAR-OLDS PERFORM IN ENVIRONMENTAL SCIENCE AND GEOSCIENCE IN PISA 2006



Programme for International Student Assessment

OECD

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Programme for **I**nternational **S**tudent **A**ssessment



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Foreword

Never before have the stakes been so high for the role of science education in shaping how people interact with the environment. Human activities such as the generation of greenhouse gases, the accumulation of waste, the fragmentation or destruction of ecosystems, and the depletion of resources are having a substantial impact on the global environment. As a result, threats to the environment are prominently discussed in the media and citizens of every nation are increasingly faced with the need to understand complex environmental issues.

As environmental science generates ever more comprehensive and complex knowledge, the challenge for education is not just to produce more and better trained environmental scientists, but also to provide for informed and motivated citizens that will understand and interpret sophisticated scientific theory and evidence and act upon this knowledge.

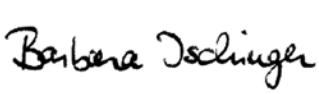
OECD's PISA 2006 assessment of the science competencies of 15-year-olds offers the first comprehensive internationally comparative knowledge base on what students know about the environment and environment-related problems, from where their knowledge was gained, what attitudes they hold about the environment issues, and how students' environmental science performance interrelates with their attitudes to the environment. This report presents findings from this analysis.

The report was drafted by David Baker, Juan León, and Maya Nehme from the Pennsylvania State University in collaboration with John Cresswell, Miyako Ikeda, Maciej Jakubowski, Soojin Park, Andreas Schleicher, Sophie Vayssettes and Pablo Zoido from the OECD Secretariat. The chair of the PISA science expert group, Rodger Bybee, also provided valuable input and advice. Nick Johnstone, Kumi Kitamori and Ysé Serret from the OECD Environment Directorate provided valuable comments and input on the OECD study on "Household Environmental Behaviour". Alastair Blyth, Christin Cave and Richard Yelland provided valuable input on the "The school building as a teacher" project. Wendy Whitham edited the report. Juliet Evans and Niccolina Clements provided administrative and editorial assistance. The work was steered by the PISA Governing Board, which is chaired by Ryo Watanabe (Japan). The preparation of the report was facilitated by a significant grant from the United States National Science Foundation (DRL-0829374). The opinions expressed and arguments employed in this report do not necessarily reflect the views of the United States National Science Foundation (NSF).

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Chair of the PISA Governing Board



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Director for Education, OECD

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Overview

The OECD's PISA 2006 assessment of the science competencies of 15-year-olds offers the first comprehensive international comparison of what students know about the environment and environment-related issues. This evidence comes at a time when global environmental challenges, such as climate change and biodiversity, have never been greater. Young people's knowledge, skills and attitudes in this area will be crucial in terms of the ability and willingness of a new generation to respond to these challenges.

PISA 2006 assessed the knowledge and skills of more than 400,000 students in 57 countries, and through questionnaires also collected a wealth of information about students and their views. The 2006 assessment focused on science and, as part of this, students were also given a range of tasks with an environmental context. The results can be used to consider the performance of students in environmental science and geoscience, alongside their attitudes to environmental issues and where their knowledge about these issues comes from. The survey also gives a rich profile of how students relate to various environmental issues, ranging from air pollution to water shortages.

Proficiency in environmental science and in geoscience were each rated at four levels. Students with the highest proficiency are at Level A; those with very basic proficiency are at Level D; some students do not show any measurable proficiency in these areas and are, therefore, below Level D.

BASIC PROFICIENCY AND ENVIRONMENTAL CITIZENSHIP

The number of students showing at least basic proficiency (Level D) indicates the extent to which education systems are giving young people at least some of the tools they will need as citizens to approach scientific and environmental issues. A basic understanding of such issues by voters, taxpayers and consumers would create crucial incentives for enterprises and public bodies to adopt environmentally-responsible behaviour.

Overall in OECD countries, the great majority of young people do have such proficiency, with an average of 84% reaching Level D in environmental science. Over 90% reach this level in Canada, Finland and in the partner countries and economies Chinese Taipei, Estonia, Hong Kong-China and Liechtenstein. However, in five OECD countries and most of the partner countries and economies, at least one in five students is below Level D.

While it is encouraging that the great majority of students in most countries are proficient at some level of environmental science and geoscience, proficiency is unevenly distributed across the population. Students from immigrant and more disadvantaged socio-economic backgrounds have, on average, significantly lower proficiency. Education systems need to do better if they wish to draw on the potential of all sections of society in relating to environmental questions as future citizens.

THE POOL OF HIGHLY PROFICIENT YOUNG PEOPLE

At the other end of the proficiency spectrum, 19% of students are proficient at Level A in environmental science and 14% in geoscience. This group of students can handle the most complex tasks and represents a pool of young people equipped with a high level of understanding of the environment, who may make a difference in helping to address environmental issues. While only a very small proportion of the population can be expected to become, specifically, environmental scientists, a much greater number will have jobs

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that interact with the environment, ranging from those involved in technological innovation to regulators and public officials. Ensuring that such knowledge workers and decision makers are proficient in addressing relevant scientific issues makes it more likely that environmental considerations are soundly addressed in the future.

The pool of highly proficient students varies significantly from one country to another. Most OECD countries have at least 15% of students proficient at Level A, but the figure is much higher, between one-quarter and just over one-third, in Canada, Finland, Japan, Korea and the partner countries and economies Chinese Taipei, Estonia, Hong Kong-China and Slovenia. This demonstrates to other countries that there is considerable scope for them to expand the pool of young people who are highly proficient in this area, and thus well positioned to contribute actively to the development of an environmentally sustainable economy.

There is also an indication in some countries that females are less likely to be active in this area than males, having lower levels of average performance in environmental science and thus being less likely to move towards environment-related careers. This is a potential pool of talent that could be tapped further.

ATTITUDES TO ENVIRONMENTAL CHALLENGES

Students across the world appear to be taking a strong interest in environmental issues, and to feel responsible for helping to improve environmental outcomes. All but a few say that they are familiar with basic issues such as pollution, while even on some more complex phenomena like the clearing of forests and its implications for land use, the great majority feel informed. Most students also say that they feel a strong sense of responsibility for the state of the environment, and that they would like others in their country to share such responsibility. An important reason for wanting such greater commitment is that most students are not at present optimistic about what the future will bring: only a minority forecast improvements in the environment in the next two decades.

High student interest in the environment reflects positively on education systems, especially considering that school is reported as the most common source of information about the environment. It appears that the importance of environmental issues to our future is being taken up by the next generation. However, students are not equally informed about all topics. For example, across OECD countries, only one student in three feels well informed about the use of genetically modified organisms. The PISA results allow each country to note which environmental issues its students appear to be engaged in, and which they may need to learn more about.

Student awareness of environmental issues tends to go hand in hand with their scientific knowledge and proficiency. Students who report the greatest familiarity with complex environmental phenomena tend also to have high levels of proficiency. The results do not prove that greater scientific knowledge directly leads to interest in the environment, or vice versa. However, an association between the two suggests that a joint emphasis of the curriculum on learning about why the environment matters and on building understanding of the scientific phenomena involved is possible. Moreover PISA also shows that students with lower performance in environmental science report greater optimism that the environment will improve in the future, suggesting that they may need more information about the environmental risks that lie ahead.

One encouraging finding is that students with more disadvantaged socio-economic status are no less likely to be committed to tackling environmental issues. This suggests that students from all backgrounds are taking an interest in environmental issues, and schools do not have to make extra efforts to persuade disadvantaged children that these issues are important, just to ensure that they do not fall behind in acquiring the knowledge and skills required to become proficient in addressing them.

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FROM WHERE DO STUDENTS GAIN THEIR KNOWLEDGE?

Students in PISA 2006 cite school as a place where they learn about the environment, more than any other source of such knowledge. The most common way in which they learn about the environment at school is in geography and science lessons which in the great majority of schools include environmentally-related topics. Many also include such topics in other subjects, and a minority have stand-alone lessons on environmental studies. Another source of environmental learning comes through trips and outdoor activities, but whereas these are common in some countries, they are relatively rare in others.

Outside school, the most common source of learning about the environment is through the media, followed by the Internet and books, and lastly family and friends. The evidence shows that higher performing students are more likely to combine information from school and the media, Internet and books to find out about the environment.

Thus, strong student interest and proficiency in addressing environmental issues is related with learning about science as well as with wide exposure to environmental questions across the curriculum and in extra-curricular activities, as well as through independent learning. Schools are well positioned to encourage this by incorporating environmental topics in various subject areas and in extra-curricular activities. They can also encourage students to take a wider interest in these topics outside school.

CREATING AN ENVIRONMENTALLY COMPETENT GENERATION

PISA 2006 shows a widespread level of engagement in environmental issues by 15-year-old students all over the world. The great majority can tackle environmental questions at least at some level, say they are familiar with and feel responsibility for key environmental issues and have had exposure to these issues in multiple ways at school and beyond. There remains, however, much scope for improving proficiency in this area, especially among students from disadvantaged backgrounds. The notion of competence in this area includes not just cognitive abilities but also motivational and behavioural factors. An environmentally competent generation of young people will need both to understand the science of the environment and to have the interest and willingness to address the problems that it raises. There is huge scope for education systems to help develop such competence.

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Reader's Guide

Data underlying the figures

The data referred to in Chapters 2 to 4 of this report are presented in Appendix A and, with additional detail, on the PISA website (*www.pisa.oecd.org*). Five symbols are used to denote missing data:

a The category does not apply in the country concerned. Data are therefore missing.

c There are too few observations to provide reliable estimates (*i.e.* there are fewer than 30 students or less than 3% of students for this cell or too few schools for valid inferences).

m Data are not available. These data were collected but subsequently removed from the publication for technical reasons.

w Data have been withdrawn at the request of the country concerned.

x Data are included in another category or column of the table.

Calculation of international averages

An OECD average was calculated for most indicators presented in this report. The OECD average corresponds to the arithmetic mean of the respective country estimates.

In the case of some countries, data may not be available for specific indicators, or specific categories may not apply. Readers should, therefore, keep in mind that the term OECD average refers to the OECD countries included in the respective comparisons.

Rounding of figures

Because of rounding, some figures in tables may not exactly add up to the totals. Totals, differences and averages are always calculated on the basis of exact numbers and are rounded only after calculation.

All standard errors in this publication have been rounded to two decimal places. Where the value 0.00 is shown, this does not imply that the standard error is zero, but that it is smaller than 0.005.

Reporting of student data

The report uses "15-year-olds" as shorthand for the PISA target population. PISA covers students who are aged between 15 years 3 months and 16 years 2 months at the time of assessment and who have completed at least 6 years of formal schooling, regardless of the type of institution in which they are enrolled and of whether they are in full-time or part-time education, of whether they attend academic or vocational programmes, and of whether they attend public or private schools or foreign schools within the country.

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Reporting of school data

The principals of the schools in which students were assessed provided information on their schools' characteristics by completing a school questionnaire. Where responses from school principals are presented in this publication, they are weighted so that they are proportionate to the number of 15-year-olds enrolled in the school.

Abbreviations used in this report

The following abbreviations are used in this report:

ISCED International Standard Classification of Education

SD Standard deviation

SE Standard error

Further documentation

For further information on the PISA assessment instruments and the methods used in PISA, see the *PISA 2006 Technical Report* (OECD, 2009c) and the PISA website (*www.pisa.oecd.org*).

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1

PISA 2006 and Students' Performance in Environmental Science and Geoscience

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INTRODUCTION

Never have the stakes been so high for the role of science education in shaping how people interact with the earth and its environment. The rising importance of the environment as a scientific and public policy topic over the past fifty years has been built around a framework stressing the functional interdependencies between human life and the natural environment. As science about the environment generates even more knowledge, increasingly large proportions of the world's population are challenged to understand and use this knowledge (Kastens and Turrin, 2006; NAS, 2007; Bybee, 2008).

Human activities such as the accumulation of waste, fragmentation or destruction of ecosystems, and depletion of resources have had a substantial impact on the global environment. The *OECD Environmental Outlook to 2030* (OECD, 2008a) identifies climate change, biodiversity loss, ensuring clean water and adequate sanitation for all, and reducing the health impacts of environmental degradation as some of the main global environmental challenges.

Estimates of the costs of inaction on air pollution, for example, are high and include significant impacts on human health (*e.g.* respiratory illnesses), economic productivity (reduced agricultural yields, polluted freshwater sources, loss of biodiversity) as well as material damages (*e.g.* heritage damage from acid rain). Species loss can also incur direct economic costs, as seen in the collapse of fish stocks in the North Atlantic (OECD, 2008b). Water shortages and lack of sanitation affect an important part of the world population. Out of the approximately 6.5 billion people on earth, 1.1 billion do not have access to potable water and 2.6 billion people do not have access to improved sanitation. By 2030, the number of people living under severe water stress is expected to increase by more than 1 billion to 3.9 billion people, nearly half the projected world population (OECD, 2009, OECD, 2008a).

In some areas progress has been achieved in recent years, but remaining challenges are a cause for concern. For example, OECD countries have made significant progress to "decouple" toxic air emissions from economic growth in recent decades. Despite the decrease in air emissions per unit of GDP, total emissions from transport remain high and air quality standards have not been met in many parts of the OECD, particularly in urban areas (OECD, 2008c). Good progress has also been made in establishing protected areas, which amount to nearly 17% of total area in OECD countries, up from 14% at the beginning of the decade. However, the share of plants and animals classified as endangered species continues to increase, and the total number of vertebrates in the wild continues to decline in almost all OECD countries (OECD, 2008c).

While discussions over accountability and solutions for major problems associated with environmental issues are ongoing, the role of educated communities in an effort to protect the environment is more straightforward to establish (NSF, 2000). Well-trained geoscientists, biologists, environmental scientists, and environmental policy-makers can play an important role in confronting environmental challenges in every country. Equally important are informed and motivated citizens that understand and can interpret sophisticated scientific theory and evidence and act upon this knowledge.

Of particular importance is learning at an early age, as it can shape the way people approach and interact with the environment that surrounds them. Furthermore, what students learn in school can also impact an entire household; for example, students who learn about recycling can change the habits of their family.

Therefore, those involved in the development of curriculum policy, teacher education, and science education can benefit from a better understanding of what students know about the environment and what their attitudes are towards environmental issues. How much do young adults, at 15 years of age – and therefore approaching the end of compulsory schooling – know about the earth's environment as they face a future in which



achieving planet-wide environmental sustainability is one of the biggest challenges for their generation? How much of what they have learned from school and elsewhere can be applied to this challenge? And what are their attitudes towards specific environmental topics and related socio-economic issues?

In 2006, the Programme for International Student Assessment (PISA) of the Organisation for Economic Co-operation and Development (OECD) conducted a major study on science knowledge and skills in nearly 60 countries. Focusing on young people's ability to use their knowledge and skills to meet real-life challenges, PISA tests students in three domains (reading, mathematics and science) and takes place every three years, with special attention being paid to one of the domains each time. The first study, which took place in 2000, focused on reading literacy. In 2003, PISA concentrated on mathematics literacy, while in 2006 the emphasis was on science. Its initial report, *PISA 2006 Science Competencies for Tomorrow's World* (OECD, 2007), summarised 15-year-old students' competencies across a wide range of scientific knowledge and skills.

This report examines the evidence in PISA 2006 on what 15-year-olds understand about those aspects of science most closely related to the earth's environment, including long-term environmental sustainability, as well as their interest in, awareness of, and opinions about specific environmental issues worldwide. It summarises what students know about the environment and environment-related issues, from where and how this knowledge is gained, the attitudes students have about environmental issues and how the answers to these questions vary according to the characteristics of students and schools.

THE PROGRAMME FOR INTERNATIONAL STUDENT ASSESSMENT (PISA)

PISA, an overview

PISA is a comprehensive and rigorous international programme that assesses student performance and collects data on student, family and institutional factors that can help explain variations in performance. Decisions about the scope and nature of the assessments and background information are made by leading experts in participating countries and steered jointly by governments on the basis of shared policy-driven interests. Substantial efforts and resources are devoted to achieving cultural and linguistic breadth and balance in the assessment materials. Stringent quality assurance mechanisms are applied in translation, sampling and data collection. As a consequence, the results of PISA have a high degree of validity and reliability, and can significantly improve understanding of the outcomes of education in the world's most economically developed countries, as well as in a growing number of countries in their earlier stages of economic development.

Key features of PISA are:

- *Policy orientation,* with the design and reporting methods determined by the goal of informing policy and practice.
- *Innovative approach to "literacy",* which is concerned with the capacity of students to use what they have learned and to analyse and reason as they pose, solve and interpret problems in a variety of situations.
- *Relevance to lifelong learning,* which allows PISA to not only assess students' knowledge and skills, but also understand students' motivations to learn, beliefs about themselves and attitudes towards what they are learning.
- *Regularity,* enabling countries to monitor improvements in educational outcomes in the light of other countries' performances.
- *Consideration of student performance alongside characteristics of students and schools,* in order to explore some of the main features associated with educational success.

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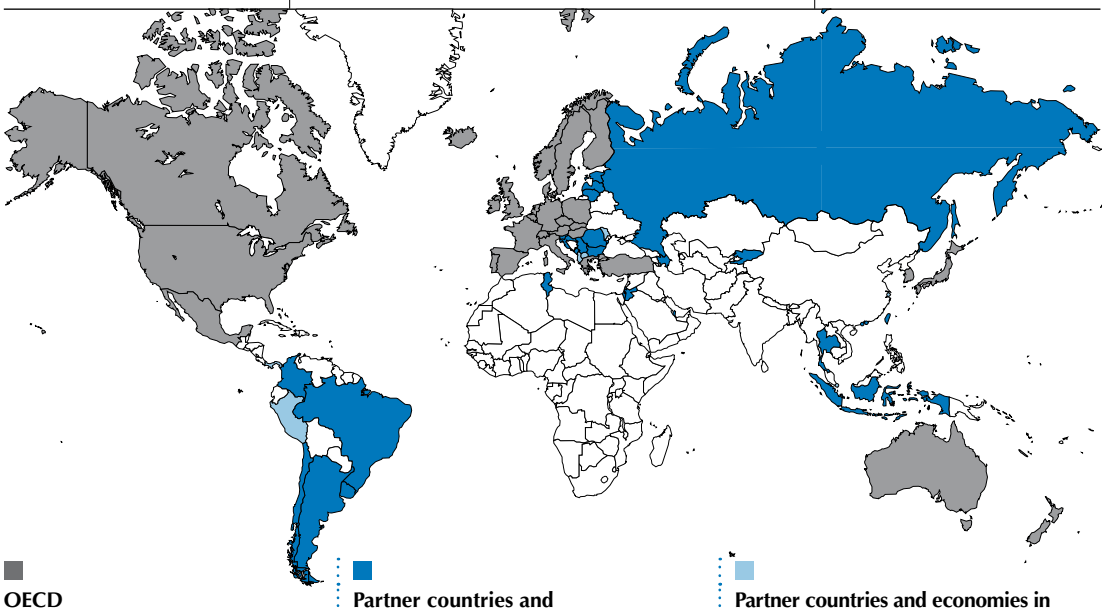
- *Breadth of geographical coverage,* with the 57 countries participating in the PISA 2006 assessment representing almost nine-tenths of the world economy. Nationally representative samples were drawn, representing 20 million 15-year-olds.

Three PISA surveys have taken place so far, in 2000, 2003 and 2006, focusing on reading, mathematics and science, respectively, but with each domain assessed to some extent in each turn. This sequence will be repeated with surveys in 2009, 2012 and 2015, allowing continuous and consistent monitoring of educational outcomes. Figure 1.1 shows the participating countries and economies in PISA.

Some key innovations of PISA 2006 are related to the environment:

- A profile of student performance in science including environmental science and geoscience.
- Measures of students' attitudes towards learning science and towards environmental issues.
- Measures of school contexts, instruction and activities that promote learning about environmental issues, and parental perceptions of environmental issues.

Figure 1.1
A map of PISA countries and economies



OECD countries

Australia
Austria
Belgium
Canada
Czech Republic
Denmark
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Italy
Japan
Korea
Luxembourg
Mexico
Netherlands
New Zealand
Norway
Poland
Portugal
Slovak Republic
Spain
Sweden
Switzerland
Turkey
United Kingdom
United States

Partner countries and economies in PISA 2006

Argentina
Azerbaijan
Brazil
Bulgaria
Chile
Colombia
Croatia
Estonia
Hong Kong-China
Indonesia
Israel
Jordan
Kyrgyzstan
Latvia
Liechtenstein
Lithuania
Macao-China
Montenegro
Qatar
Romania
Russian Federation
Serbia
Slovenia
Chinese Taipei
Thailand
Tunisia
Uruguay

Partner countries and economies in previous PISA surveys or in PISA 2009

Albania
Shanghai-China
Former Yugoslav Republic of Macedonia
Moldova
Panama
Peru
Singapore
Trinidad and Tobago

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The value of PISA in monitoring performance over time is growing, although it is not yet possible to assess to what extent the observed differences are indicative of longer-term trends. With science being the main assessment area for the first time, results in PISA 2006 provide the baseline for future measures of change in this subject.

Focus on students' science performance

With more than one half of the assessment time devoted to science, PISA 2006 can report in much greater detail on science performance than was the case in PISA 2000 and PISA 2003. As well as calculating overall performance scores, it is possible to report separately on different science competencies and establish for each performance scale conceptually grounded proficiency levels that relate student performance scores to what students are typically able to do. Students received scores for their capacity in each of the three science competencies (*identifying scientific issues, explaining phenomena scientifically* and *using scientific evidence*). Estimates were also obtained at the country level for students' *knowledge about science* (*i.e.* their knowledge of the processes of science as a form of enquiry) and *knowledge of science* (*i.e.* their capacity in the science content areas of "Earth and space systems", "Physical systems" and "Living systems").

ENVIRONMENTAL SCIENCE EDUCATION: A CONCEPTUAL FRAMEWORK

One of the main challenges of environmental discourses is to define environmental science and subsequently policies, programmes, and practices for environmental science education. People frequently use environmental education to describe what could also be designated as "environmental information". This includes information that can be acquired from the media, through advertisements, or even in simple story books. Science education, in some instances, can also provide environmental information without necessarily providing environmental education. This section presents a definition of environmental science education that serves as the conceptual basis for this report.

A well-established definition of environmental education was set by Hines, Hungerford and Tomera (1986-87), who stated that environmental education is more than just mere transfer of information. It involves four aspects: a working knowledge of environmental issues, a specific knowledge of approaches to address those issues, the competency to make appropriate decisions, and the possession of certain affective qualities and attitudes that make people care about and pay more attention to environmental conditions.

In 1994, the North American Association for Environmental Education provided a definition of environmental science education that expanded the four aspects used by Hines *et al.* into: environmental and socio-political knowledge, knowledge of environmental issues, cognitive skills and affective qualities, and environmentally responsible behaviour.

More recently, Coyle (2005) equated information to awareness and stated that environmental education "involves a sequenced series of steps that results in a thorough understanding of the subject and its dynamics, including developing skills and learning how to apply them in a real world setting". Coyle (2005) classified environmental awareness into three categories: simple awareness (just knowing of the existence of the issues); personal conduct knowledge (understanding the easy concepts and global ideas); and environmental science literacy (understanding the underlying scientific principles, the skills needed to investigate the subject, and how to use those principles and skills). In this definition, environmental science literacy is considered the highest level outcome of environmental education.

This report describes an empirical approach to measuring aspects of environmental science literacy through an index using PISA 2006 data. The report also includes an in-depth description of a relevant subfield of environmental sciences: Geoscience. A major component of environmental sciences, geoscience focuses



on the structures of earth systems (*e.g.* lithosphere, atmosphere, hydrosphere), energy in earth systems (*e.g.* sources, global climate), change in earth systems (*e.g.* plate tectonics, geochemical cycles, constructive and destructive forces), earth in space (*e.g.* gravity, solar systems), and earth's history (*e.g.* fossils, origin and evolution). The report presents an index of geoscience performance to provide a deeper understanding of environmental science education within a specific context for countries that participated in PISA 2006.

ENVIRONMENTAL SCIENCE PERFORMANCE IN PISA 2006

The development of the PISA 2006 science framework was guided by reference to what science knowledge and skills citizens require (OECD, 2006). Consistent with this guiding principle, the international group of science experts that was appointed by OECD governments decided to include aspects of environmental science and geoscience in the assessment framework. Science knowledge and skills in PISA 2006 are broadly defined in terms of competencies, contexts, knowledge and attitudes. While this framework did not identify environmental science as a subfield in itself, the content and contexts of some of the PISA tasks are drawn from environmental issues.

In terms of *knowledge of science*, the framework identified four categories: "Physical systems", "Living systems", "Earth and space systems" and "Technology systems". Table 1.1 sets out the contents of the four knowledge of science categories, highlighting examples relevant to the environment. For instance, conservation is mentioned in the "Physical systems" category while sustainability occurs within "Living systems" and global climate within "Earth and space systems".

Table 1.1
PISA 2006 knowledge of science categories

Physical systems
Structure of matter (*e.g.* particle model, bonds)
Properties of matter (*e.g.* changes of state, thermal and electrical conductivity)
Chemical changes of matter (*e.g.* reactions, energy transfer, acids/bases)
Motions and forces (*e.g.* velocity, friction)
Energy and its transformation (*e.g. conservation,* dissipation, chemical reactions)
Interactions of energy and matter (*e.g.* light and radio waves, sound and seismic waves)
Living systems
Cells (*e.g.* structures and function, *DNA,* plant and animal)
Humans (*e.g.* health, nutrition, subsystems [*i.e.* digestion, respiration, circulation, excretion, and their relationship], disease, reproduction)
Populations (*e.g.* species, evolution, *biodiversity, genetic variation*)
Ecosystems (*e.g.* food chains, matter and energy flow)
Biosphere (*e.g.* ecosystem services, *sustainability*)
Earth and space systems
Structures of the Earth systems (*e.g. lithosphere, atmosphere, hydrosphere*)
Energy in the Earth systems (*e.g.* sources, *global climate*)
Change in Earth systems (*e.g.* plate tectonics, geochemical cycles, constructive and destructive forces)
Earth's history (*e.g.* fossils, origin and evolution)
Earth in space (*e.g.* gravity, solar systems)
Technology systems
Role of science-based technology (*e.g.* solve problems, help humans meet needs and wants, design and conduct investigations)
Relationships between science and technology (*e.g.* technologies contribute to scientific advancement)
Concepts (*e.g.* optimisation, trade-offs, cost, risk, benefit)
Important principles (*e.g.* criteria, constraints, innovation, invention, problem solving)

Note: Examples of environment-related topics are in italics.

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In terms of contexts, Table 1.2 outlines the issues identified in the PISA 2006 science framework. These context areas were chosen because of their relevance to students' interests and lives.

Table 1.2
Contexts for the PISA 2006 science assessment

	Personal (self, family and peer groups)	**Social** (the community)	**Global** (life across the world)
Health	maintenance of health, accidents, nutrition	control of disease, social transmission, food choices, community health	*epidemics,* spread of infectious diseases
Natural resources	personal *consumption* of materials and energy	maintenance of human populations, quality of life, security, production and distribution of food, energy supply	renewable and non-renewable, *natural systems,* population growth, *sustainable use of species*
Environmental quality	*environmentally friendly behaviour, use and disposal of materials*	*population distribution, disposal of waste, environmental impact, local weather*	*biodiversity, ecological sustainability, control of pollution, production and loss of soil*
Hazard	natural and human-induced, decisions about housing	rapid changes [earthquakes, severe weather], slow and progressive changes (*coastal erosion, sedimentation*), risk assessment	*climate change,* impact of modern warfare
Frontiers of science and technology	interest in science's explanations of natural phenomena, science-based hobbies, sport and leisure, music and personal technology	new materials, devices and processes, *genetic modification,* weapons technology, transport	*extinction of species,* exploration of space, origin and structure of the universe

Note: Examples of environment-related topics are in italics.

This report focuses on how students performed in answering the PISA science questions that were related to environmental science and geoscience. While as noted above, a broad definition of environmental science education includes both knowledge and attitudes towards the environment, the latter are not used in the development of the environmental science or geoscience performance indices nor in any other of the established PISA performance scales. Only PISA science test assessment questions relating to environmental science and geoscience were included in the computation of these indices.

The PISA 2006 science framework did not identify an independent conceptual basis for analysing environmental science or geoscience with PISA data. Rather, the performance measures presented in this report were established *post-hoc* through additional analyses of the PISA data. To distinguish these performance measures from the established PISA science, reading and mathematics literacy scales that were established in the assessment and formally adopted by participating countries, the report uses the term index for the environmental science and geoscience performance measures.

ORGANISATION OF THIS REPORT

The report presents an assessment of students' performance on environmental science and geoscience as well as information on their attitudes toward the environment, using data from PISA 2006. It also reports on the sources of students' knowledge and on the factors associated with student performance.



Chapter 2 provides an overview of students' performance across the 57 countries that took part in PISA 2006 in both environmental science and geoscience. It also studies the relationships between performance and students' socio-economic and other family characteristics.

Chapter 3 analyses 15-year-olds' attitudes toward the environment and compares them across countries. It provides an overview of the relationship between students' and parents' attitudes toward environmental issues. The chapter also describes the association of attitudes and performance in environmental science.

The sources of environmental knowledge and ways this knowledge is delivered in schools are discussed in Chapter 4. The chapter also reviews the association of these variables and performance in environmental science.



2

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MEASURES OF PERFORMANCE IN ENVIRONMENTAL SCIENCE AND GEOSCIENCE

A solid education in environmental science and geoscience can help students in their future academic and professional careers. Equally important, it will help them become capable citizens ready to make personal and social decisions based on scientific evidence about future environmental challenges. It is therefore worth asking: What do students know about environmental science and geoscience? What can they do with this knowledge? How competent are they in explaining scientific evidence and using scientific evidence in environmental science and geoscience?

This chapter defines and reports performance on two indices within the context of PISA 2006: an environmental science performance index and a geoscience performance index. While the environmental science performance index refers to a broad concept, the geoscience performance index focuses on the composition, structure, and other physical aspects of the earth. As such, the geoscience index is based on a subset of the questions on which the broader environmental science performance index is constructed. The chapter also explores the relationship between environmental science performance and some student characteristics such as gender, immigrant background and socio-economic background.

MAIN RESULTS OF THIS CHAPTER

Results on the environmental science and geoscience performance indices are presented in terms of the percentage of students reaching different levels of proficiency, which describe what students generally know and can do, as well as in terms of mean country scores. Education systems need both to ensure that the general population has at least some proficiency in this area, and that some students reach a high level of proficiency. The results show that:

- A minority of students do not reach the most basic level of proficiency required of them in order to understand and respond to environmental issues as future citizens. In some countries almost all students reach a basic level of proficiency: only 10% of students or fewer are unable to provide the correct answer to the easiest environment-related questions in PISA in Canada, Finland and partner countries and economies Chinese Taipei, Estonia, Hong Kong-China and Liechtenstein. On the other hand, 20% or more are unable to answer such questions in five OECD countries and in most of the partner countries.
- Fewer than one in five students across OECD countries reach the highest level of proficiency. However, between a quarter and just over a third of students reach this level in Canada, Finland, Japan, Korea and partner countries and economies Chinese Taipei, Estonia, Hong Kong-China and Slovenia. In most OECD countries there is a pool of at least 15% of students proficient at this level.
- Some countries have small but significant gender differences in proficiency in both environmental science and geosciences, with all significant differences in OECD countries favouring males.

ENVIRONMENTAL SCIENCE AND GEOSCIENCE PERFORMANCE INDICES IN PISA 2006

A definition of performance in environmental science and geoscience within the PISA 2006 science framework

Following the PISA 2006 definition of scientific literacy (OECD, 2006), this report defines environmental science performance as:

- *Scientific knowledge and use of that knowledge to identify questions, to acquire new knowledge, to explain biological and geoscience phenomena related to the environment, and to draw evidence-based conclusions about the environment.* For example, when individuals read about global warming, can they separate *environmental scientific-related* from *non-scientific* aspects of the text, and can they apply knowledge and justify personal decisions?

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- *Understanding of the characteristic features of environmental science as a form of human knowledge and inquiry.* For example, do individuals know the difference between evidence-based explanations and personal opinions about the environment?
- *Awareness of how environmental science can shape our use of earth's resources, policies about environmental sustainability, and future responsibility towards environmental quality*. For example, are individuals aware of environmental changes and the effects of those changes on economic and social stability?
- *Willingness to engage with environmental science, and with the ideas of environmental science, as a reflective citizen and consumer of geological and biological resources*. This addresses the value students place on environmental science, both in terms of topics and in terms of the scientific approach to understanding the earth's environment and solving environmental issues.

Geoscience is a discipline within environmental sciences, one that focuses on earth systems (*e.g.* their structure, changes, history, and place in the solar system). As with environmental science, geoscience encompasses general and specific scientific knowledge and its use, awareness and engagement with the issues and uses of science.

While PISA was not designed to be an assessment specifically on environmental science and geoscience, out of the 108 questions used in the PISA 2006 science assessment, 24 were related to environmental science (of these 14 focus on geoscience). This report uses student responses to these questions to assess environmental science and geoscience performance. These environmental science questions span most of the aspects identified in the PISA 2006 framework for assessing scientific literacy. Table 2.1 displays these 24 questions within the contexts, knowledge areas, and competencies in the PISA 2006 science framework.

Table 2.1

The environmental science performance index within the PISA science framework

Context: Social (11 questions, 46%) — Competency: Explaining phenomena scientifically (16 questions, 67%)

Context: Global (13 questions, 54%) — Competency: Using scientific evidence (8 questions, 33%)

Knowledge/Area of application:	Health	Natural resources	Environment	Hazard	Frontiers of science and technology	Total (quesrions)	Total (%)
Of science: "Physical systems"		1 global		1 social/global		2	8%
Of science: "Living systems"		2 social	2 social	1 global	1 global, 1 global	7	29%
Of science: "Earth and space systems"		1 social, 1 global	1 social, 2 global	1 social, 1 global	1 global	8	33%
Of science: "Technology systems"		1 global				1	4%
About science: "Scientific enquiry"			1 social			1	4%
About science: "Scientific explanations"			1 social, 3 global	1 social		5	21%
Total (questions)	**0**	**6**	**10**	**5**	**3**	**24**	
Total (%)	**0%**	**25%**	**42%**	**21%**	**13%**		

StatLink http://dx.doi.org/10.1787/562200685357



These environment related questions were set within contexts that are both positive (potential solutions to specific issues) and negative (emerging environmental hazards). They include contexts such as the use of disposal materials, biodiversity, control of pollution, costal erosion or climate change (Table 1.2 in Chapter 1).

Within these contexts, these PISA science questions included biological and geological questions (see Table 1.1 in Chapter 1 for a full description of the knowledge of science categories included in the PISA 2006 science framework). In this report, the scientific knowledge categories included in the environmental science performance index are: structure, energy and change in earth systems, the history of the earth, earth in space, and populations, ecosystems, and the biosphere. Of these, the geoscience performance index focuses on those related to earth.

Of the three competencies identified in the PISA 2006 science framework, the science questions included in the environmental science and geoscience indices cover two: *explaining phenomena scientifically* and *using scientific evidence*. This represents a limitation of the performance concept utilised in this report when compared with PISA science literacy. As a concept of performance however it still captures many of the issues covered by PISA.

Constructing the environmental science and geoscience performance indices and proficiency levels

The PISA 2006 science units were constructed under the guidance of an international expert panel using expertise from participating countries to ensure coverage of the various aspects of the science framework: contexts, competencies and knowledge. The science units were based on material submitted by participating countries. In PISA, each assessment or test unit is made up of some type of stimulus, which is followed by a number of questions (also known as test items). Each PISA test item can be characterised by its context, the competency it demands, and the knowledge it assesses.

Using the techniques of item response modelling, a description of which can be found in Appendix B, two performance indices were constructed from these questions, one for environmental science and the other for geoscience. The environmental performance science index used all 24 questions while the geoscience performance index used only the 14 questions related to geoscience. Hence geoscience is a sub-index of the broader environmental science performance index. Twenty-four is a relatively small number of questions, but other indices have used similarly small numbers of items. In comparison, in PISA 2006 the science subscale with the lowest number of items, *identifying scientific issues*, was based on 24 questions and in PISA 2003, the mathematics subscale *problem solving* was based on 19 questions. Appendix B describes in detail the limitations of these measures of environmental science and geoscience performance.

Constructing adjusted proficiency levels for the environmental science and geoscience performance indices

For the purpose of describing what students know and can do in terms of environmental science and geoscience, four proficiency levels were also developed. Whenever possible, the design of these proficiency levels followed the techniques used to develop the proficiency levels for science in PISA 2006. There are, however, two important differences between the PISA 2006 science proficiency levels and the proficiency levels described in this report.



The environmental science and geoscience performance indices used fewer test items than the overall PISA 2006 science scale. In addition, the test items used to develop the new indices did not span the whole range of proficiency levels used in reporting science literacy in PISA 2006. For example, there were no environment-related questions in the lowest level of science proficiency (Level 1). The process resulted in four levels of proficiency for both environmental science and geoscience. To distinguish them from the proficiency levels in PISA 2006, this report refers to proficiency Levels A (the highest level) to D (the lowest).

Table 2.2

Proficiency levels on the environmental science and geoscience performance indices

General proficiencies students should have at each level	Tasks a student should be able to do	Examples from released questions
LEVEL A Item difficulty score greater than 1		
Student at this level are able to thoroughly explain environmental processes and phenomena. They demonstrate an ability to compare and differentiate among competing explanations by examining supporting evidence and drawing from their knowledge. They are able to synthesise answers from multiple sources.	▪ Read and interpret data on evolution. ▪ Given a set of data, test competing hypotheses and identify errors. ▪ Explain multi-trophic interactions and effect of biological and physical factors on organisms. ▪ Given an environmental problem, provide environmentally sound solutions.	**GREENHOUSE** Question 5 (S114 Q05t), **WIND FARMS** Question 4 (S529 Q04)
LEVEL B Item difficulty score between 0 and 1		
Students at this level are able to answer environment questions with little information provided. They are able to recognise various elements of the ecosystem and understand their interactions. They show knowledge and understanding of environmental concepts such as ecosystem balance, effect of human intervention on the environment, species distribution and survival, natural sources of energy, climate change, food chains, etc.	▪ Given a set of similar or closely related choices, determine the most adequate explanation to specific evidence. ▪ Given specific evidence, determine some causes and predictable effects. ▪ Given information on one element, identify other possibly related elements. ▪ Given different elements of the ecosystems, provide some possible interactions and consequences.	**GREENHOUSE** Question 4 (S114 Q04) **FIT FOR DRINKING** Question 1 (S409 Q01)
LEVEL C Item difficulty score between -0.7 and 0		
Students at this level show a fair understanding of environmental cycles (water, gases, energy, living organisms), energy sources and sources of pollution. They are able to link evidence to causes and explain basic biotic-abiotic interactions, when adequate information is provided.	▪ Locate relevant information in a body of text. ▪ Given specific information, choose between appropriate and inappropriate conclusions. ▪ Choose between a diverse set of approaches or phenomena based on basic knowledge in environment. ▪ Identify common sources of pollution and prevention strategies. ▪ Given adequate information, link different parts of environmental cycles.	**ACID RAIN** Question 2 (S485 Q02) **GREENHOUSE** Question 3 (S114 Q03)
LEVEL D Item difficulty score less than -0.7		
Students at this level are able to interpret a graph or figure when given appropriate cues. They show basic knowledge of common environmental processes.	▪ Given clear figures or graphs, describe differences and similarities between given environmental parameters. ▪ Given adequate and complete historical information, can extract causal relationship between environmental processes occurring at different times. ▪ Given specific evidence and a discrete set of environmental phenomena, link the causal phenomenon to the evidence using logic and basic knowledge of environmental processes.	**GRAND CANYON** Question 3 (S426 Q03) and Question 5 (S426 Q05)

StatLink http://dx.doi.org/10.1787/562200685357



Table 2.2 shows how competencies across the three criteria increase from Level D to Level A. For example, students proficient at Level D can correctly answer questions in which most of the information needed to give a correct answer is included within the question, but they generally do not have enough environmental science and geoscience knowledge to answer questions where little or not all necessary information is given. Nor can they generally answer questions that require an understanding of the interrelations of an ecosystem, or questions which require a significant synthesis of environmental or geoscience knowledge and its use in solving an unfamiliar problem. Students at Level D should be able to interpret a figure or graph representing an environmental issue or phenomenon, but are capable of understanding only the most common environmental processes.

Level D does not establish a threshold for environmental science or geoscience illiteracy. Rather, it defines a baseline level of proficiency at which students begin to demonstrate the environmental science and geoscience that will enable them to participate effectively and productively in life situations related to environmental science and geoscience.

Students scoring below Level D are unable to demonstrate science competencies in situations required by the easiest PISA tasks that relate to the environment. Students at this level are not able to interpret a graph or figure when given appropriate cues, nor are they able to show basic knowledge of common environmental processes. For example, they cannot describe differences and similarities between given environmental parameters, or give adequate and complete historical information, or extract causal relationships between environmental processes occurring at different times.

At the other end, students proficient at Level A can correctly answer more complex problem-solving questions by using considerable knowledge in environmental science and geoscience and being able to understand, explain and interpret complex environmental processes such as acid rain, population dynamics and species evolution. Levels B and C fall between Levels A and D.

Examples of tasks that students can do at each of the proficiency levels

Some of the questions used to build the environmental science and geoscience performance indices have been publicly released (see next pages). As well as illustrating the type of issues students confront in completing the PISA assessment, they show what students can do at different proficiency levels. For example, Questions 3 and 5 of the *GRAND CANYON* unit dealt with basic environmental issues, namely the degradation of rocks due to water freezing and fossil formation. Both questions tackled basic processes and were multiple-choice with a clear distinction between the choices. For all of this, they belong to Level D.

Another example of a PISA science question related to an environmental topic – in this case pertaining to geoscience – is the unit on the *GREENHOUSE EFFECT* of carbon dioxide emissions and the average temperature of the earth's atmosphere from 1860 to 1990. Question 3, classified as Level C, required students to read a graph and relate different phenomena to each other. Students had to understand that the increase in temperature and CO_2 are correlated and affect each other. Question 4, classified as Level B, challenged the capacity of students further, requiring an interpretation of scientific information. Question 5 was assigned to Level A since it required a deep understanding of the relationship between the different components of the environment, in this case the transfer of energy between the sun and the earth and the effect of pollutants and natural phenomena such as volcanic eruptions on the temperature of the earth.

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Figure A
GREENHOUSE

Read the texts and answer the questions that follow.

THE GREENHOUSE EFFECT: FACT OR FICTION?

Living things need energy to survive. The energy that sustains life on the Earth comes from the Sun, which radiates energy into space because it is so hot. A tiny proportion of this energy reaches the Earth.

The Earth's atmosphere acts like a protective blanket over the surface of our planet, preventing the variations in temperature that would exist in an airless world.

Most of the radiated energy coming from the Sun passes through the Earth's atmosphere. The Earth absorbs some of this energy, and some is reflected back from the Earth's surface. Part of this reflected energy is absorbed by the atmosphere.

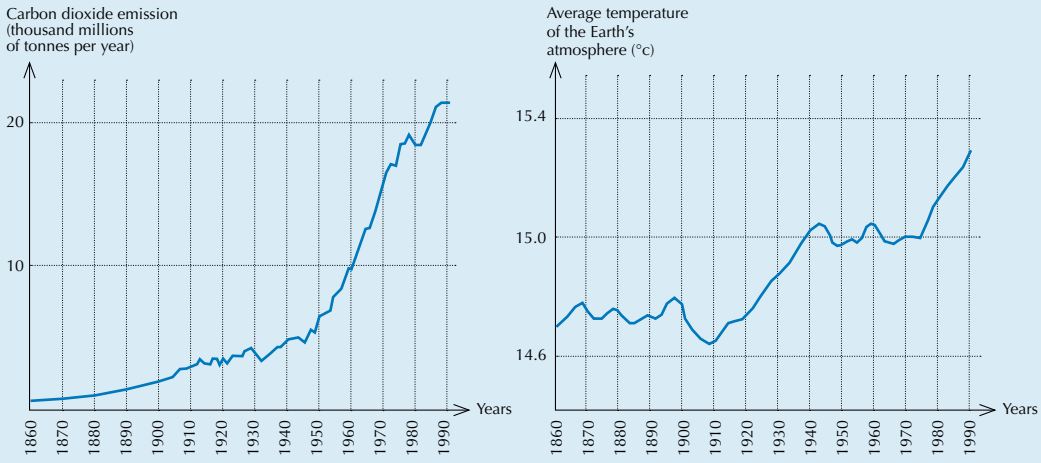
As a result of this the average temperature above the Earth's surface is higher than it would be if there were no atmosphere. The Earth's atmosphere has the same effect as a greenhouse, hence the term greenhouse effect.

The greenhouse effect is said to have become more pronounced during the twentieth century.

It is a fact that the average temperature of the Earth's atmosphere has increased. In newspapers and periodicals the increased carbon dioxide emission is often stated as the main source of the temperature rise in the twentieth century.

A student named André becomes interested in the possible relationship between the average temperature of the Earth's atmosphere and the carbon dioxide emission on the Earth.

In a library he comes across the following two graphs.



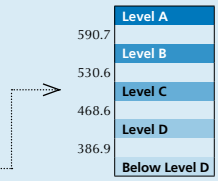
André concludes from these two graphs that it is certain that the increase in the average temperature of the Earth's atmosphere is due to the increase in the carbon dioxide emission.

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GREENHOUSE – *QUESTION 3 (S114Q)*

Question type: *Open-constructed response*
Competency: *Using scientific evidence*
Knowledge category: *"Scientific explanations" (knowledge about science)*
Application area: *"Environment"*
Setting: *Global*
Difficulty (on the environmental science index): *490*
Percentage of correct answers (OECD countries): *54.0%*



What is it about the graphs that supports André's conclusion?

.....

.....

Scoring

Full Credit:

Refers to the increase of both (average) temperature and carbon dioxide emission. For example:

- As the emissions increased the temperature increased.
- Both graphs are increasing.
- Because in 1910 both the graphs began to increase.
- Temperature is rising as CO_2 is emitted.
- The information lines on the graphs rise together.
- Everything is increasing.
- The more CO_2 emission, the higher the temperature.

Refers (in general terms) to a positive relationship between temperature and carbon dioxide emission. *[Note: This code is intended to capture students' use of terminology such as "positive relationship", "similar shape" or "directly proportional"; although the following sample response is not strictly correct, it shows sufficient understanding to be given credit here.]* For example:

- The amount of CO2 and average temperature of the Earth is directly proportional.
- They have a similar shape indicating a relationship.

Comment

For the competency using scientific evidence, the unit GREENHOUSE (Figure A) present good examples for Level C. In GREENHOUSE, question 3, students must interpret evidence, presented in graphical form, and deduce that the combined graphs support a conclusion that both average temperature and carbon dioxide emission are increasing. The student is required to judge the validity of a conclusion correlating the Earth's atmospheric temperature and the quantity of carbon dioxide emissions by comparing evidence from two graphs having a common time scale. The student must first gain an appreciation for the context by reading a number of descriptive lines of text. Credit is given for recognising that both graphs are rising with time or that there is a positive relationship between the two graphs, thus supporting the stated conclusion. The effects of this environmental issue are global which defines the setting. The skill required by students is to interpret the graphical data supplied so the question belongs in the "Scientific explanations" category.

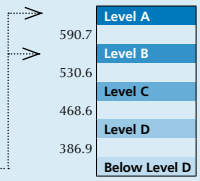
A student gaining credit for this Level C question is able to recognise the simple pattern in two graphical datasets and use this pattern in support of a conclusion.

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GREENHOUSE – *QUESTION 4 (S114Q04)*

Question type: *Open-constructed response*
Competency: *Using scientific evidence*
Knowledge category: *"Scientific explanations" (knowledge about science)*
Application area: *"Environment"*
Setting: *Global*
Difficulty (on the environmental science index): *Full credit 662; Partial credit 556*
Percentage of correct answers (OECD countries): *34.5%*



Another student, Jeanne, disagrees with André's conclusion. She compares the two graphs and says that some parts of the graphs do not support his conclusion.

Give an example of a part of the graphs that does not support André's conclusion. Explain your answer.

.....

.....

.....

Scoring

Full Credit:

Refers to one particular part of the graphs in which the curves are not both descending or both climbing and gives the corresponding explanation. For example:

- In 1900–1910 (about) CO_2 was increasing, whilst the temperature was going down.
- In 1980–1983 carbon dioxide went down and the temperature rose.
- The temperature in the 1800s is much the same but the first graph keeps climbing.
- Between 1950 and 1980 the temperature didn't increase but the CO_2 did.
- From 1940 until 1975 the temperature stays about the same but the carbon dioxide emission shows a sharp rise.
- In 1940 the temperature is a lot higher than in 1920 and they have similar carbon dioxide emissions.

Partial Credit:

Mentions a correct period, without any explanation. For example:

- 1930–1933.
- before 1910.

Mentions only one particular year (not a period of time), with an acceptable explanation. For example:

- In 1980 the emissions were down but the temperature still rose.

Gives an example that doesn't support André's conclusion but makes a mistake in mentioning the period. *[Note: There should be evidence of this mistake – e.g. an area clearly illustrating a correct answer is marked on the graph and then a mistake made in transferring this information to the text.]* For example:

- Between 1950 and 1960 the temperature decreased and the carbon dioxide emission increased.

Refers to differences between the two curves, without mentioning a specific period. For example:

- At some places the temperature rises even if the emission decreases.
- Earlier there was little emission but nevertheless high temperature.
- When there is a steady increase in graph 1, there isn't an increase in graph 2, it stays constant. *[Note: It stays constant "overall".]*
- Because at the start the temperature is still high where the carbon dioxide was very low.

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Refers to an irregularity in one of the graphs. For example:

- It is about 1910 when the temperature had dropped and went on for a certain period of time.
- In the second graph there is a decrease in temperature of the Earth's atmosphere just before 1910.

Indicates difference in the graphs, but explanation is poor. For example:

- In the 1940s the heat was very high but the carbon dioxide very low. *[Note: The explanation is very poor, but the difference that is indicated is clear.]*

Comment

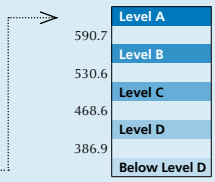
Another example from GREENHOUSE centres on the competency using scientific evidence and asks students to identify a portion of a graph that does not provide evidence supporting a conclusion. This question requires the student to look for specific differences that vary from positively correlated general trends in these two graphical datasets. Students must locate a portion where curves are not both ascending or descending and provide this finding as part of a justification for a conclusion. As a consequence it involves a greater amount of insight and analytical skill than is required for Q03. Rather than a generalisation about the relation between the graphs, the student is asked to accompany the nominated period of difference with an explanation of that difference in order to gain full credit.

The ability to effectively compare the detail of two datasets and give a critique of a given conclusion locates the full credit question at Level A of the scientific literacy scale. If the student understands what the question requires of them and correctly identifies a difference in the two graphs, but is unable to explain this difference, the student gains partial credit for the question and is identified at Level B of the environmental science and geoscience performance indices.

This environmental issue is global which defines the setting. The skill required by students is to interpret data graphically presented so the question belongs in the "Scientific explanations" category.

GREENHOUSE – *QUESTION 5 (S114Q)*

Question type: *Open-constructed response*
Competency: *Explaining phenomena scientifically*
Knowledge category: *"Earth and space systems" (knowledge of science)*
Application area: *"Environment"*
Setting: *Global*
Difficulty (on the environmental science index): *626*
Percentage of correct answers (OECD countries): *18.9%*



André persists in his conclusion that the average temperature rise of the Earth's atmosphere is caused by the increase in the carbon dioxide emission. But Jeanne thinks that his conclusion is premature. She says: "Before accepting this conclusion you must be sure that other factors that could influence the greenhouse effect are constant".
Name one of the factors that Jeanne means.

.....

.....

Scoring

Full Credit:

Gives a factor referring to the energy/radiation coming from the Sun. For example:

- The sun heating and maybe the earth changing position.
- Energy reflected back from Earth. *[Assuming that by "Earth" the student means "the ground".]*

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Gives a factor referring to a natural component or a potential pollutant. For example:

- Water vapour in the air.
- Clouds.
- The things such as volcanic eruptions.
- Atmospheric pollution (gas, fuel).
- The amount of exhaust gas.
- CFC's.
- The number of cars.
- Ozone (as a component of air). *[Note: for references to depletion, use Code 03.]*

Comment

Question 5 of GREENHOUSE (Figure A) is an example of Level A and of the competency explaining phenomena scientifically. In this question, students must analyse a conclusion to account for other factors that could influence the greenhouse effect. The student needs to understand the necessity of controlling factors outside the change and measured variables and to recognise those variables. The student must possess sufficient knowledge of "Earth systems" to be able to identify at least one of the factors that should be controlled. The latter criterion is considered the critical scientific skill involved so this question is categorised as explaining phenomena scientifically. The effects of this environmental issue are global which defines the setting.

As a first step in gaining credit for this question the student must be able to identify the change and measured variables and have sufficient understanding of methods of investigation to recognise the influence of other factors. However, the student also needs to recognise the scenario in context and identify its major components. This involves a number of abstract concepts and their relationships in determining what "other" factors might affect the relationship between the Earth's temperature and the amount of carbon dioxide emissions into the atmosphere.

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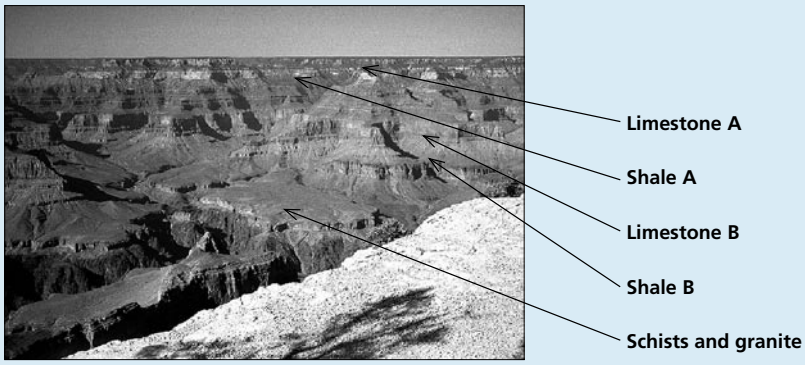


Figure B

GRAND CANYON

The Grand Canyon is located in a desert in the USA. It is a very large and deep canyon containing many layers of rock. Sometime in the past, movements in the Earth's crust lifted these layers up. The Grand Canyon is now 1.6 km deep in parts. The Colorado River runs through the bottom of the canyon.

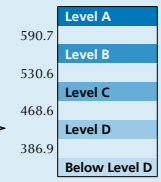
See the picture below of the Grand Canyon taken from its south rim. Several different layers of rock can be seen in the walls of the canyon.



GRAND CANYON (Figure B) is a question at Level D on the scale for the competency *Explaining phenomena scientifically*.

GRAND CANYON – *QUESTION 3 (S426Q03)*

***Question type*:** *Multiple choice*
Competency: *Explaining phenomena scientifically*
Knowledge category: *"Earth and space systems" (knowledge of science)*
***Application area*:** *"Environment"*
***Setting*:** *Social*
Difficulty (on the environmental science index): *437*
Percentage of correct answers (OECD countries): *67.6%*



The temperature in the Grand Canyon ranges from below 0 °C to over 40 °C. Although it is a desert area, cracks in the rocks sometimes contain water. How do these temperature changes and the water in rock cracks help to speed up the breakdown of rocks?

A. Freezing water dissolves warm rocks.

B. Water cements rocks together.

C. Ice smoothes the surface of rocks.

D. Freezing water expands in the rock cracks.

Scoring

Full Credit: D. Freezing water expands in the rock cracks.

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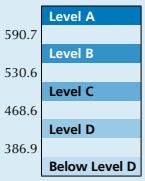
Comment

This is a multiple-choice question. Choosing the correct explanation for the weathering of rocks involves the student knowing that water freezes when the temperature falls below 0 °C and that water expands when becoming solid ice. The wording of this question does give some cues to the student as to what to eliminate, so its difficulty is lower.

The student needs to recall two tangible scientific facts and apply them in the context of the described conditions in the desert. This locates the question at Level D.

GRAND CANYON – *QUESTION 5 (S426Q05)*

Question type: *Multiple choice*
Competency: *Explaining phenomena scientifically*
Knowledge category: *"Earth and space systems" (knowledge of science)*
Application area: *"Natural resources"*
Setting: *Social*
Difficulty (on the environmental science index): *405*
Percentage of correct answers (OECD countries): *75.8%*



There are many fossils of marine animals, such as clams, fish and corals, in the Limestone A layer of the Grand Canyon. What happened millions of years ago that explains why such fossils are found there?

A. In ancient times, people brought seafood to the area from the ocean.

B. Oceans were once much rougher and sea life washed inland on giant waves.

C. An ocean covered this area at that time and then receded later.

D. Some sea animals once lived on land before migrating to the sea.

Scoring

Full Credit: C. An ocean covered this area at that time and then receded later.

Comment

The question requires the student to recall the fact that fossils are formed in water and that when the seas recede they may reveal fossils of organisms deposited at an earlier age and then to choose the correct explanation. Credible distractors means the recalled knowledge has to be applied in the context provided. The question is located at Level D.

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Figure C
ACID RAIN

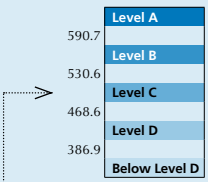
Below is a photo of statues called Caryatids that were built on the Acropolis in Athens more than 2500 years ago. The statues are made of a type of rock called marble. Marble is composed of calcium carbonate.



In 1980, the original statues were transferred inside the museum of the Acropolis and were replaced by replicas. The original statues were being eaten away by acid rain.

ACID RAIN – *QUESTION 2 (S485Q02)*

Question type: *Open-constructed response*
Competency: *Explaining phenomena scientifically*
Knowledge category: *"Physical systems" (knowledge of science)*
Application area: *"Hazards"*
Setting: *Social*
Difficulty (on the environmental science index): 474
Percentage of correct answers (OECD countries): *57.7%*



Normal rain is slightly acidic because it has absorbed some carbon dioxide from the air. Acid rain is more acidic than normal rain because it has absorbed gases like sulphur oxides and nitrogen oxides as well.

Where do these sulphur oxides and nitrogen oxides in the air come from?

.....

.....

Scoring

Full Credit:

Any one of car exhausts, factory emissions, burning fossil fuels such as oil and coal, gases from volcanoes or other similar things.

- Burning coal and gas.
- Oxides in the air come from pollution from factories and industries.
- Volcanoes.
- Fumes from power plants. *["Power plants" is taken to include power plants that burn fossil fuels.]*
- They come from the burning of materials that contain sulphur and nitrogen.

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Partial Credit:

Responses that include an incorrect as well as a correct source of the pollution. For example:

- Fossil fuel and nuclear power plants. *[Nuclear power plants are not a source of acid rain.]*
- The oxides come from the ozone, atmosphere and meteors coming toward Earth. Also the burning of fossil fuels.

Responses that refer to "pollution" but do not give a source of pollution that is a significant cause of acid rain. For example:

- Pollution.
- The environment in general, the atmosphere we live in – *e.g.* pollution.
- Gasification, pollution, fires, cigarettes. *[It is not clear what is meant by "gasification"; "fires" is not specific enough; cigarette smoke is not a significant cause of acid rain.]*
- Pollution such as from nuclear power plants.

Scoring Comment: *Just mentioning "pollution" is sufficient for Code 1.*

Comment

An example of a question in the middle of the scale is found in ACID RAIN – Question 2 (Figure C). This question requires students to explain the origin of sulphur and nitrogen oxides in the air. Correct responses require students to demonstrate an understanding of the chemicals as originating as car exhaust, factory emission, and burning fossil fuels. Students have to know that sulphur and nitrogen oxides are products of the oxidation of most fossil fuels or arise from volcanic activity.

Students gaining credit display a capacity to recall relevant facts and thus explain that the source of the gases contributing to acid rain was atmospheric pollutants. This locates the question at Level C. The awareness that oxidation results in the production of these gases places the question in the "Physical systems" content area. Since acid rain is a relatively localised hazard, its setting is social.

Attributing the gases to unspecified pollution is also an acceptable response. Analysis of student responses show little difference in the ability levels of students giving this response compared to those giving the more detailed response.



HOW DO STUDENTS PERFORM IN THE ENVIRONMENTAL SCIENCE AND GEOSCIENCE INDICES?

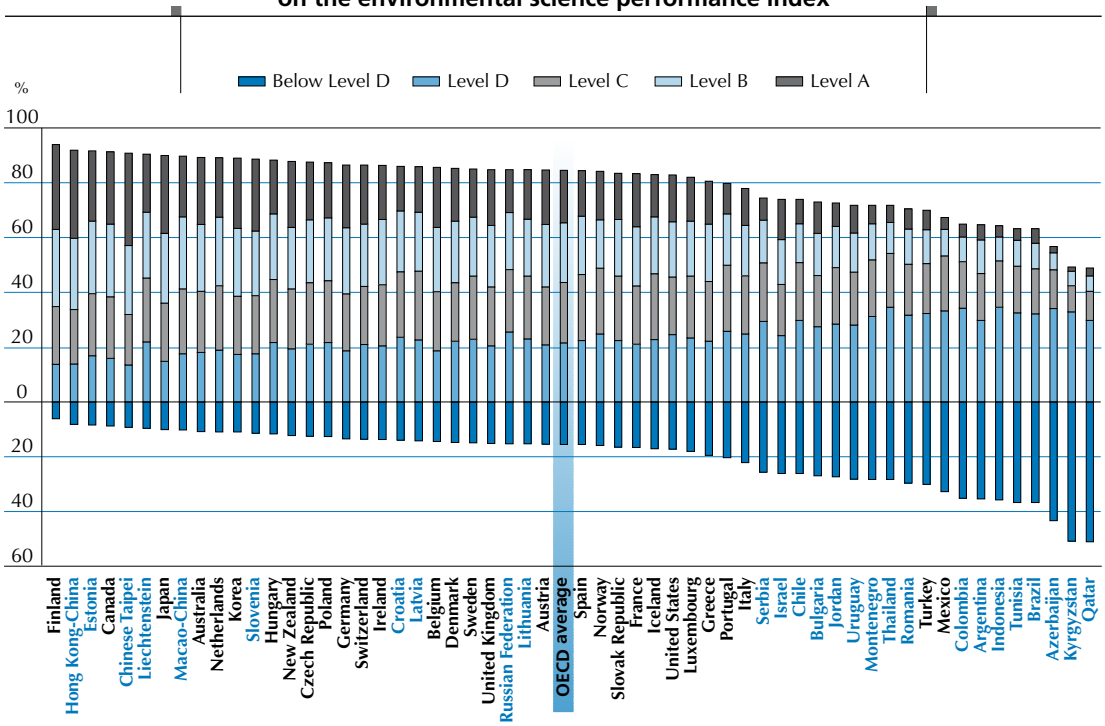
Analysing the proportion of students in each proficiency level for a particular index is a good way of summarising student performance data. Figure 2.1 displays the proportion of students in the four proficiency levels for environmental science in each country that participated in PISA 2006 (see also Table A2.1).

At the highest proficiency level are the students who may become part of the talent pool of future scientists working in a country's research centres, innovation laboratories, think-tanks and knowledge generation and accumulation centres (OECD, 2009). It is also important, however, to consider the bottom end of the distribution. A large pool of adequately educated citizens on environmental science is important for the adoption of new environmental technologies, such as new energy saving appliances, and to make personal and social decisions on environmental issues informed by scientific arguments.

Student performance at the highest level of environmental science proficiency

At the highest level of proficiency (Level A), students can consistently identify, explain and apply scientific knowledge to a variety of environmental topics. They can link different information sources and explanations and use evidence from those sources to justify decisions about environmental issues.

Figure 2.1
Percentage of students at each proficiency level on the environmental science performance index



Countries are ranked in ascending order of percentage of 15-year-olds below Level D.
Source: *OECD PISA 2006 Database,* Table A2.1.
StatLink http://dx.doi.org/10.1787/562200685357

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They clearly and consistently demonstrate advanced thinking and reasoning in science relevant to the environment. They can use this understanding to develop arguments in support of recommendations and decisions in both social and global situations. Further, these highly proficient students in environmental science represent a potential pool of well informed, knowledgeable and analytically capable citizens that are ready to engage in a scientific academic and professional career (OECD, 2009b).

On average across OECD countries, 19% of 15-year-olds perform at the highest proficiency level in environmental science, Level A (Figure 2.1 and Table A2.1). The partner economy Chinese Taipei has the highest proportion of students at this level (34%) followed by Hong Kong-China, Finland, Japan, Canada, Slovenia, Korea, and Estonia, all with over 25% at Level A. With few exceptions, OECD countries have between 15% and 31% of students performing at the highest level.

Student performance at the lowest level of environmental science proficiency

The proportion of a nation's 15-year-olds with low levels of performance in environmental science, below Level D, is also an important indicator – particularly in terms of citizens' competency to meet future environmental challenges. As described earlier, students with proficiency below Level D had difficulties in answering questions containing scientific information relevant to basic environmental phenomena or issues.

While most students possess an adequate level of performance in environmental science (that is Level D or above), the proportions of students below the baseline standard remain significant. Across OECD countries, on average, 16% of students performed below Level D, and four OECD countries have one-fifth or more of their students below this level. Two partner countries have more than half of their students below Level D.

In contrast, three OECD countries have 10% or fewer students below Level D (Table A2.1): Canada (9%), Finland (6%) and Japan (10%), as well as five partner countries and economies Chinese Taipei (9%), Estonia (8%), Hong Kong-China (8%), Liechtenstein (10%) and Macao-China (10%).

Student performance in geoscience

As with environmental science, countries vary widely in their geoscience performance (see Figure 2.2 and Table A2.2). In general, countries whose students performed well in environmental science also performed well in geoscience.

Students performing at Level A in geoscience can consistently identify, explain and apply knowledge to a variety of geoscience topics. For instance, these students understand the need to control for other factors when analysing the relationship between carbon dioxide emissions and the average temperature of the earth's atmosphere and they can identify at least one of the controls that have to be taken into account. Across OECD countries, an average of 14% of 15-year-old students reached this proficiency level, with two countries having more than one fifth of their students at this level: Finland (25%), and the Netherlands (21%). Three partner countries and economies have similar proportions of students at Level A (Table A2.2): Chinese Taipei, Hong Kong-China and Slovenia (all with 22%).

Among OECD countries on average, 15% of students did not reach even the lowest level of proficiency (Level D) in geoscience. For example, these students in general had difficulties in identifying the role that freezing water in rock cracks plays in the erosion of the Grand Canyon. In three OECD countries one fifth or more of students were not proficient at Level D while two partner countries had more than 45% of students not reaching Level D (Table A2.2).



Table 2.3 [Part 1/2]

Multiple comparisons of mean performance on the environmental science performance index

	Mean	S.E.	Finland	Chinese Taipei	Hong Kong-China	Japan	Canada	Estonia	Slovenia	Korea	Australia	Macao-China	New Zealand	Netherlands	Liechtenstein	Germany	Czech Republic	Hungary	Switzerland	Belgium	Poland	Ireland	United Kingdom	Austria	Denmark	France	Croatia	Sweden	Lithuania	Latvia	Spain
			543	541	540	529	528	528	523	522	519	518	516	514	514	513	509	509	508	508	507	506	504	502	502	498	498	497	497	497	495
			(1.5)	(3.1)	(2.0)	(2.5)	(1.5)	(2.3)	(1.3)	(2.5)	(1.8)	(1.2)	(2.0)	(2.5)	(3.9)	(2.7)	(2.6)	(2.3)	(2.6)	(1.9)	(2.0)	(2.5)	(1.5)	(3.2)	(2.7)	(2.6)	(2.1)	(2.1)	(2.2)	(2.4)	(2.1)
Finland	543	(1.5)		○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Chinese Taipei	541	(3.1)	○		○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Hong Kong-China	540	(2.0)	○	○		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Japan	529	(2.5)	▼	▼	▼		○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Canada	528	(1.5)	▼	▼	▼	○		○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Estonia	528	(2.3)	▼	▼	▼	○	○		○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Slovenia	523	(1.3)	▼	▼	▼	○	○	○		○	○	○	▲	▲	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Korea	522	(2.5)	▼	▼	▼	○	○	○	○		○	○	○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Australia	519	(1.8)	▼	▼	▼	▼	▼	▼	○	○		○	○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Macao-China	518	(1.2)	▼	▼	▼	▼	▼	▼	○	○	○		○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
New Zealand	516	(2.0)	▼	▼	▼	▼	▼	▼	▼	○	○	○		○	○	○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Netherlands	514	(2.5)	▼	▼	▼	▼	▼	▼	▼	○	○	○	○		○	○	○	○	○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲
Liechtenstein	514	(3.9)	▼	▼	▼	▼	▼	▼		○	○	○	○	○		○	○	○	○	○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲
Germany	513	(2.7)	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○		○	○	○	○	○	○	▲	○	▲	▲	▲	▲	▲	▲	▲
Czech Republic	509	(2.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○		○	○	○	○	○	○	○	○	▲	▲	▲	▲	▲	▲
Hungary	509	(2.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○		○	○	○	○	○	○	▲	▲	▲	▲	▲	▲	▲
Switzerland	508	(2.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○		○	○	○	○	○	○	○	▲	▲	▲	▲	▲
Belgium	508	(1.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○		○	○	○	○	○	○	▲	▲	▲	▲	▲
Poland	507	(2.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○	○		○	○	○	○	○	▲	▲	▲	▲	▲
Ireland	506	(2.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○	○	○		○	○	○	○	○	▲	▲	▲	▲
United Kingdom	504	(1.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○	○	○		○	○	○	○	○	▲	○	▲
Austria	502	(3.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○
Denmark	502	(2.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	▼	○	○	○	○	○	○		○	○	○	○	○	○
France	498	(2.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○		○	○	○	○	○
Croatia	498	(2.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○		○	○	○	○
Sweden	497	(2.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○		○	○	○
Lithuania	497	(2.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○	○		○	○
Latvia	497	(2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○	○	○		○
Spain	495	(2.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○	○	○	
Slovak Republic	494	(2.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○	○	○	○
Russian Federation	493	(2.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○	○	○	○
Norway	491	(2.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○	○
United States	491	(3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○	○	○	○
Iceland	490	(1.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	▼	▼	○	○	○	
Greece	487	(2.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	
Luxembourg	487	(1.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Italy	476	(1.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Portugal	475	(2.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Israel	469	(2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Bulgaria	461	(4.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Chile	458	(3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Serbia	458	(2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Uruguay	456	(2.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Jordan	455	(2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Montenegro	448	(1.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Romania	446	(3.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Turkey	444	(3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Thailand	444	(1.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Mexico	436	(1.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Argentina	435	(3.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Colombia	431	(2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Brazil	430	(2.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Indonesia	428	(4.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Tunisia	428	(2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Azerbaijan	411	(2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Qatar	399	(1.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Kyrgyzstan	396	(1.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	

Statistically significantly above the OECD average
Not statistically significantly different from the OECD average
Statistically significantly below the OECD average

▲ Mean performance statistically significantly higher than in comparison country
○ No statistically significant difference from comparison country
▼ Mean performance statistically significantly lower than in comparison country

Source: *OECD PISA 2006 Database.*
StatLink http://dx.doi.org/10.1787/562200685357



Table 2.3 [Part 2/2]

Multiple comparisons of mean performance on the environmental science performance index

Slovak Republic	Russian Federation	Norway	United States	Iceland	Greece	Luxembourg	Italy	Portugal	Israel	Bulgaria	Chile	Serbia	Uruguay	Jordan	Montenegro	Romania	Turkey	Thailand	Mexico	Argentina	Colombia	Brazil	Indonesia	Tunisia	Azerbaijan	Qatar	Kyrgyzstan	Mean	S.E.		
494	493	491	491	490	487	487	476	475	469	461	458	458	456	455	448	446	444	444	436	435	431	430	428	428	411	399	396				
(2.6)	(2.6)	(2.3)	(3.4)	(1.6)	(2.6)	(1.1)	(1.6)	(2.5)	(2.9)	(4.2)	(3.1)	(2.4)	(2.1)	(2.4)	(1.2)	(3.2)	(3.1)	(1.9)	(1.9)	(3.8)	(2.9)	(2.0)	(4.1)	(2.4)	(2.4)	(1.1)	(1.8)				
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(1.5)	543	Finland	
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(3.1)	541	Chinese Taipei	
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.0)	540	Hong Kong-China	
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.5)	529	Japan	
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(1.5)	528	Canada	
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.3)	528	Estonia	
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(1.3)	523	Slovenia	
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.5)	522	Korea	
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(1.8)	519	Australia	
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(1.2)	518	Macao-China	
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.0)	516	New Zealand	
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.5)	514	Netherlands	
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(3.9)	514	Liechtenstein	
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.7)	513	Germany	
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.6)	509	Czech Republic	
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.3)	509	Hungary	
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.6)	508	Switzerland	
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(1.9)	508	Belgium	
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.0)	507	Poland	
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.5)	506	Ireland	
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(1.5)	504	United Kingdom	
○	○	▲	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(3.2)	502	Austria	
○	○	▲	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.7)	502	Denmark	
○	○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.6)	498	France	
○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.1)	498	Croatia	
○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.1)	497	Sweden	
○	○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.2)	497	Lithuania	
○	○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.4)	497	Latvia	
○	○	○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.1)	495	Spain	
	○	○	○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.6)	494	Slovak Republic	
○		○	○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.6)	493	Russian Federation	
○	○		○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.3)	491	Norway	
○	○	○		○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(3.4)	491	United States	
○	○	○	○		○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(1.6)	490	Iceland	
○	○	○	○	○		○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.6)	487	Greece	
○	○	○	○	○	○		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(1.1)	487	Luxembourg	
▼	▼	▼	▼	▼	▼	▼		○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(1.6)	476	Italy	
▼	▼	▼	▼	▼	▼	▼	○		○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.5)	475	Portugal	
▼	▼	▼	▼	▼	▼	▼	▼	○		○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.9)	469	Israel	
▼	▼	▼	▼	▼	▼	▼	▼	▼	○		○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(4.2)	461	Bulgaria	
▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○		○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(3.1)	458	Chile	
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○		○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.4)	458	Serbia	
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○		○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.1)	456	Uruguay	
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○		▲	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	(2.4)	455	Jordan	
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	(1.2)	448	Montenegro	
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○		○	○	▲	○	▲	▲	▲	▲	▲	▲	▲	(3.2)	446	Romania	
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○		○	▲	○	▲	▲	▲	▲	▲	▲	▲	(3.1)	444	Turkey	
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○		▲	○	▲	▲	▲	▲	▲	▲	▲	(1.9)	444	Thailand	
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	▼		○	○	○	○	○	▲	▲	▲	(1.9)	436	Mexico	
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○		○	○	○	○	▲	▲	▲	(3.8)	435	Argentina	
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○		○	○	○	▲	▲	▲	(2.9)	431	Colombia	
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○		○	○	▲	▲	▲	(2.0)	430	Brazil	
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○		○	▲	▲	▲	(4.1)	428	Indonesia	
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○		▲	▲	▲	(2.4)	428	Tunisia	
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	(2.4)	411	Azerbaijan	
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		○	(1.1)	399	Qatar	
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○		(1.8)	396	Kyrgyzstan	

Statistically significantly above the OECD average
Not statistically significantly different from the OECD average
Statistically significantly below the OECD average

▲ Mean performance statistically significantly higher than in comparison country
○ No statistically significant difference from comparison country
▼ Mean performance statistically significantly lower than in comparison country

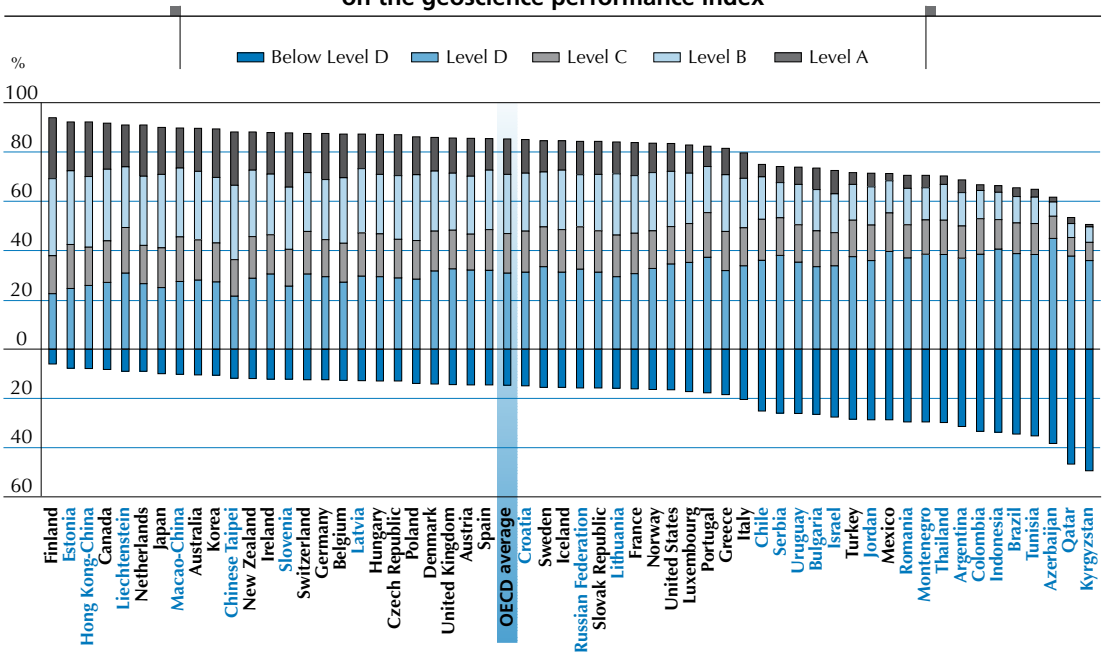
Source: *OECD PISA 2006 Database.*

StatLink http://dx.doi.org/10.1787/562200685357

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Figure 2.2
Percentage of students at each proficiency level on the geoscience performance index



Countries are ranked in ascending order of percentage of 15-year-olds below Level D.
Source: *OECD PISA 2006 Database,* Table A2.2.
StatLink http://dx.doi.org/10.1787/562200685357

Student average performance on the environmental science and the geoscience indices

Average performance is another useful way of summarising student performance. Both the environmental science and geoscience performance indices are on a scale with an international mean of 500 score points and a standard deviation of 100 score points. Table 2.3 gives a summary of overall performance of different countries on the environmental science index in terms of the mean scores achieved by students in each country and economy that participated in PISA 2006. It compares mean scores across countries and gives an approximation to relative performance rank of each country.

On the environmental science performance index, across OECD countries Finland has the highest average performance with 543, followed by Japan (529) and Canada (528). Six out of the 27 partner countries and economies scored over the OECD average (Table A2.3). These were Chinese Taipei (541), Hong Kong-China (540), Estonia (528), Slovenia (523), Macao-China (518), and Liechtenstein (514). These differences in mean scores are quite significant, as a score above 531 falls within proficiency Level B, whereas a score between 469 and 387 falls within proficiency Level D (see Appendix B for details about cutoff points).

On the geoscience performance index, among OECD countries Finland has the highest average score with 541, followed by the Netherlands, Japan and Canada with average scores of 524, 523, and 522 respectively (Table A2.3). Seven out of the 27 partner countries and economies have mean scores higher than the OECD average on the geoscience performance index, with Hong Kong-China again scoring second (mean geoscience score of 530). The remaining six partner countries and economies scoring over the OECD average were Estonia (528), Chinese Taipei (526), Slovenia (521), Macao-China (514), Liechtenstein (514), and Latvia (505).



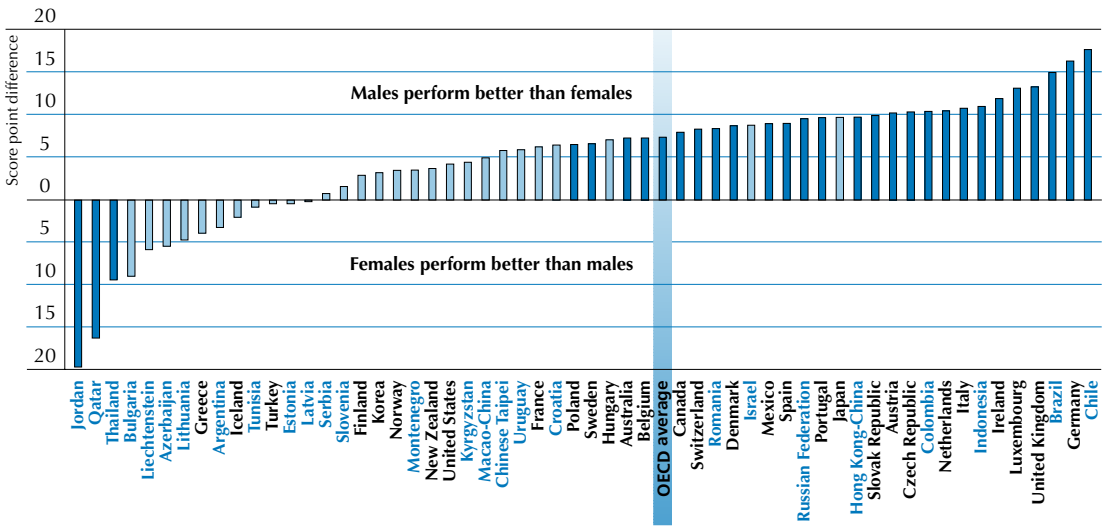
STUDENT CHARACTERISTICS AND PERFORMANCE IN ENVIRONMENTAL SCIENCE AND GEOSCIENCE

Gender

As more and more economies seek to fully capitalise on their human resources, the strife for gender equality in science, engineering and technical fields has intensified in many countries. At age 15, many students are approaching major transitions from school to work or to further education. Their performance at school and their motivation and attitudes towards science in general and environmental science specifically can have a significant influence on their future educational and occupational pathways.

Figure 2.3 ranks countries and economies by the size of the gender gap in performance on environmental science. There are 12 OECD countries where the differences were statistically significant and favoured males (see Table A2.3). Among the OECD countries, the largest significant differences in favour of males were in Germany (16 score points), the United Kingdom and Luxembourg (13 score points), Ireland (12 score points) and Italy (11 score points). Among partner countries and economies, there were significant differences in seven countries and economies, four in favour of males, and three in favour of females. The largest differences in favour of males were in Chile (18 score points), Brazil (15 score points) and Indonesia (11 score points). The largest differences in favour of females were in Jordan (20 score points), Qatar (16 score points) and Thailand (9 score points).

Figure 2.3
Gender differences in the environmental science performance index



Note: Gender differences that are statistically significant are marked in darker colour.
Source: *OECD PISA 2006 Database,* Table A2.3.
StatLink http://dx.doi.org/10.1787/562200685357

On the geoscience performance index, among the OECD countries, there were 13 countries with statistically significant differences and all favoured males (see Table A2.3). Among the OECD countries the gaps were in Luxembourg and the United Kingdom, each with a difference of 13 score points, Germany (12 score points), Austria (11 score points) and Denmark (10 score points). Among partner countries and economies, there were six significant differences in favour of males and three in favour of females. The largest differences in



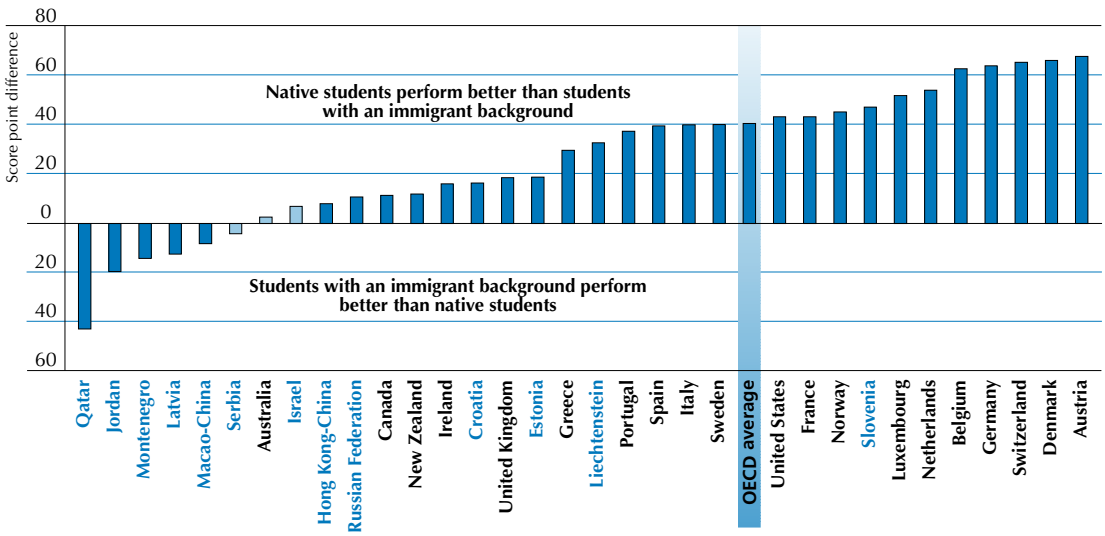
favour of males were in Brazil (13 score points) and Chile (10 score points). The largest differences in favour of females were in Jordan (13 score points) and Qatar (12 score points).

Immigrant background

Migrant students constitute a heterogeneous group with a diverse range of skills, backgrounds and motivations. The composition of immigrant populations is also shaped by immigration policies and practices and the criteria used to decide who will be admitted into a country vary considerably across countries. As a result, immigrant populations tend to have more advantaged backgrounds in some countries than in others (OECD, 2008d).

In OECD countries, native students outperform students with an immigrant background on the environmental science index in all countries with sufficient data, except Australia (Figure 2.4 and Table A2.4).[1] The differences are much larger than the gender differences described above. The average gap in OECD countries is around 41 score points. Reliable data, *i.e.* data based on more than 30 students representing at least 3% of the sample size, are only available in 20 OECD countries and 13 partner countries and economies. The gap is similar in these countries in general but it changes direction in some countries. For example, the gap in favour of native students in Slovenia is of 47 points, whereas the gap in favour of students with an immigrant background in Qatar is of 43 points.

Figure 2.4
Differences between native students and students with an immigrant background in the environmental science performance index



Note: Performance differences that are statistically significant are marked in darker colour.
Source: *OECD PISA 2006 Database,* Table A2.4.
StatLink http://dx.doi.org/10.1787/562200685357

On the geoscience performance index, the average gap in scores between natives and students with an immigrant background in OECD countries is around 34 points, again with native students generally performing better than students with an immigrant background (Table A2.4). Among partner countries and economies, there gaps are again similar and sometimes in favour of students with an immigrant background.



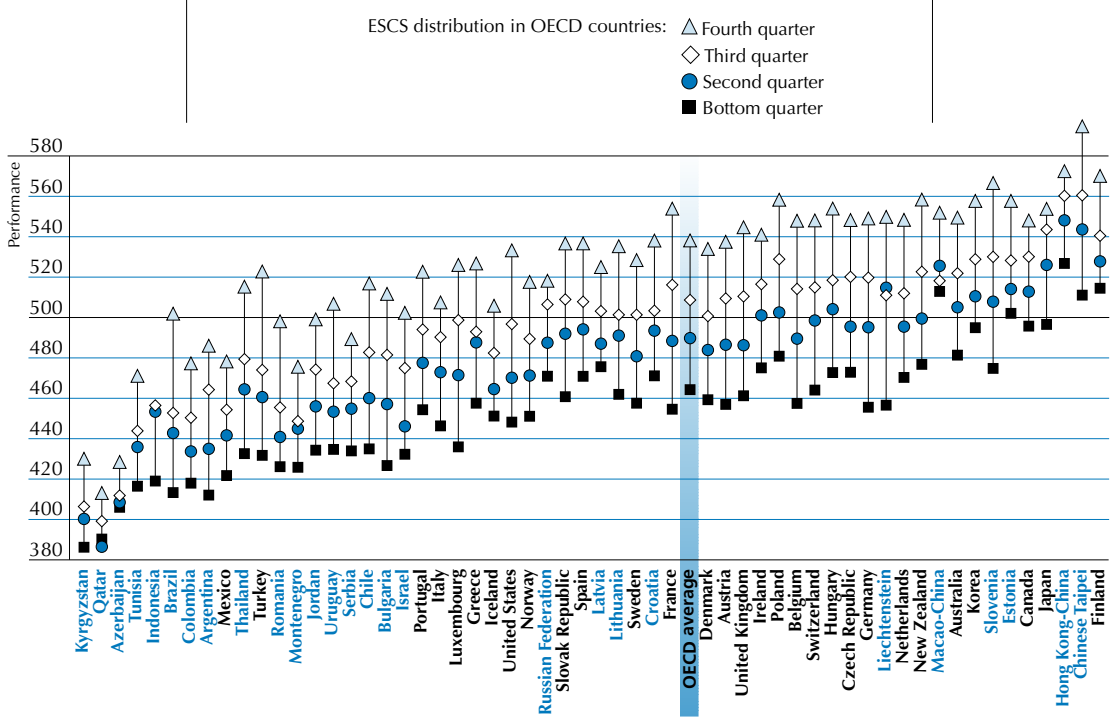
Socio-economic background

Socio-economic background is related to student performance, but the strength of this relationship varies from country to country. Analysing the distribution of student performance by socio-economic background can reveal areas of strengths and weaknesses in education systems. For example, a wide distribution of performance across different levels of socio-economic background points to areas where more effort is needed.

Within countries, student performance on the environmental science and geoscience performance indices varies widely across groups with different socio-economic backgrounds (Figure 2.5 and Table A 2.5). For example, as shown in Figure 2.5 in Canada, the performance gap in environmental science between the top and bottom quarters of socio-economic background distribution in OECD countries is close to half a standard deviation (52 points). By contrast, in Belgium, Luxembourg, Turkey, Germany and France, the gap is close to one standard deviation (more than 90 points).

Figure 2.5

Performance on the environmental science index by quarters of the PISA index of social, economic and cultural status (ESCS)



Countries ranked in ascending order of country average performance on the environmental science index.
Source: *OECD PISA 2006 Database,* Table A2.5.
StatLink http://dx.doi.org/10.1787/562200685357

STUDENT PERFORMANCE: CONCLUSIONS AND IMPLICATIONS

If one of the goals of education systems is to produce citizens that are well prepared to understand environmental issues, it is important to ensure that students from across the ability range acquire a sufficient level of knowledge and skills in environmental science. In some countries, we can say that the vast majority of young people are able at least to some degree to relate to environmental issues, in that fewer than one in



ten failed to reach a basic level of proficiency in addressing such issues. But in other countries, a significant number of students appear not to have the requisite skills to engage with environmental questions. While these students are still a relatively small minority in most countries, students from immigrant and low socio-economic backgrounds are at significantly higher risk than average of underperforming in this area. Thus, education systems can generally feel confident that most students have learned to think about the environment at some level, they need to ensure that certain groups do not miss out on this aspect of citizenship.

Moreover, there is also a need for some students to acquire much higher levels of understanding in environmental science and in geoscience, particularly those who might pursue careers as environmental scientists or go into knowledge-based industries in which environment factors need to be taken into account. It is encouraging that in most OECD countries, a significant minority of at least 15% of students reach the top level of proficiency in environmental science performance. But the fact that some countries reach over twice this level shows that there is considerable scope for many countries to expand the pool of young people who are highly proficient in this area and thus well positioned to contribute actively to the development of an environmentally sustainable economy. There is also an indication in some countries that females are less likely to be active in this area than males, having lower levels of average performance in environmental science and thus being less likely to move towards environment-related careers. This is a potential pool of talent that could be tapped further.

Notes

1. This report follows the definition in OECD (2006b) for native students and students with an immigrant background. That is, native students are students with at least one parent born in the country of assessment. Students born in the country who have one foreign-born parent (children of "combined" families) are included in the native category, as previous research indicates that these students perform similarly to native students. Students with an immigrant background include both first-generation and second-generation students. First-generation students are those born outside of the country of assessment whose parents are also foreign-born. Second-generation students are those born in the country of assessment with foreign-born parents.



3

Making Connections and Taking Responsibility

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STUDENT ATTITUDES AND LEARNING ABOUT THE ENVIRONMENT

While knowledge and scientific understanding of the environment and geoscience are essential, if youths cannot make connections between their cognitive skills and real issues, or if they see the future too optimistically or pessimistically to address issues, then they may not be able to fully capitalise on their academic training in these topics.

A student's attitudes, behaviours, and future engagement with the environment are likely the result of multiple factors including knowledge, awareness and social expectations (Bybee, 2005). Education can help students make connections between the science they learn in school and real world problems and develop realistic attitudes towards solution strategies.

The PISA 2006 sample represents 15-year-olds who have grown up in a world with greater focus on environmental issues. Widespread public discussion about environmental issues and solutions has been prominent over the last several decades. For example, The Eurobarometer 300 report, published in September 2008, places global warming/climate change as the second most important global concern of the European public after poverty and lack of food or drinking water. Additionally, 67% of 15-24 year-old citizens of the European Union and 69% of students in the European Union believe that global warming/climate change is a serious problem affecting the whole world (EU, 2008).

This chapter reviews student attitudes towards the environment. It describes how familiar, responsible and optimistic students are towards a set of environmental issues. It then presents how aware students are of more complex environmental issues. The chapter also reviews how different student characteristics, such as gender or socio-economic background, are associated with attitudes. Lastly, it analyses the relationship between attitudes and performance in environmental science.

A recent household study in OECD countries shows that environmental attitudes and behaviour are intertwined. It also shows an association between education and environmental attitudes and behaviour (see Box 3.1).

Box 3.1 The OECD Survey on Household Environmental Behaviour

In 2008, the OECD Environment Directorate implemented a web-based survey of 10 000 households in ten OECD countries (Australia, Canada, Czech Republic, France, Italy, Korea, Mexico, Netherlands, Norway, and Sweden) in which respondents were requested to provide information on their environmental attitudes, behaviour and expenditures. The purpose of the study is to assess the role of environmental policy design, market factors, environmental sensitivity and norms, as well as socio-demographic characteristics on households' environment-related behaviour (*e.g.* propensity to recycle, willingness to pay for renewable energy, organic food expenditures).

The preliminary results from this survey show some interesting links between education and environmental attitudes. More educated individuals tend to report higher levels of concern for environmental issues. While this correlation is certainly due in part to confounding factors (such as the high correlation between income and educational achievement), empirical work currently underway as part of the project supports the finding that the level of education has a significant and positive effect on environmentally-responsible behaviour, and sometimes stronger than income.

The OECD survey also analyses the relationship between education and behaviour. For example, the evidence suggests that recycling and water saving behaviour is positively associated with education. The results also indicate that the more educated are more likely to be willing to pay a premium to use only "green" electricity. Willingness to pay for organic food is also found to increase with education.

More information on this project can be found here: *www.oecd.org/env/cpe/consumption*

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MAIN RESULTS OF THIS CHAPTER

The vast majority of 15-year-olds in countries participating in PISA, regardless of family background, gender or immigrant background, report that:

- they are familiar with basic environmental issues;
- they feel a strong sense of responsibility for the state of the environment; and
- they would like others in their country to share such responsibility.

In contrast, only a minority of students report being optimistic about future improvements in the environment. As well as reporting familiarity with the most common environmental issues, many students also claim to have an understanding of more complex environmental challenges. This is more common with certain issues such as deforestation than with other such as genetically modified organisms.

Some aspects of attitudes towards the environment are associated with performance in environmental science:

- students' sense of responsibility for environmental issues appears to have no association with performance;
- students with lower performance tend to be more optimistic about the future of the environment; and
- students with higher performance tend to report greater awareness of complex environmental issues.

The associations with performance noted here do not tell us whether having certain attitudes help students understand environmental issues and hence perform well on environment-related questions; or whether conversely, high performance/understanding creates certain attitudes; or whether some other factors have a joint effect on performance and attitudes.

PISA AND STUDENT ATTITUDES TOWARDS ENVIRONMENTAL ISSUES

The PISA 2006 survey asked students and their parents about their attitudes towards the environment. Box 3.2 presents the actual questions. Questions 23, 24 and 25 in the student questionnaire, and questions 7 and 8 in the parent questionnaire relate to six selected environmental issues: *i)* Air pollution, *ii)* Energy shortages, *iii)* Extinction of plants and animals, *iv)* Clearing of forests for other land use, *v)* Water shortages, and *vi)* Nuclear waste.

First, students were asked from which source they had learned about these issues (Box 3.2, question 23). The question allowed students to respond that they were not sure what these issues are. This part of the question can be used to measure the proportion of students who feel informed and familiar with these environmental issues (those that did not mark this option but rather reported learning something about these issues from some of the proposed sources). Chapter 4 explores in detail students' answers to the whole question on the sources of student knowledge about environmental issues.

Additionally, students and parents were asked whether they felt responsibility for these issues (Box 3.2, question 24 for students and question 7 for parents) and how optimistic (Box 3.2, question 25 for students and question 8 for parents) they were that solutions would yield improvements over the next 20 years. Four indices (two for parents and two for students) are produced for these questions: the *index of student' (parents') sense of responsibility for environmental issues* and the *index of students' (parents') optimism regarding environmental issues.*[1]

To gauge students' awareness and perceived understanding of some specific complex environmental challenges, students were asked how informed they felt and how much they could explain about the following five complex environmental challenges: *i)* The increase of greenhouse gases in the atmosphere, *ii)* Use of genetically modified organisms (GMO), *iii)* Acid rain, *iv)* Nuclear waste, and *v)* The consequences of clearing forests for other land use (Box 3.2, question 22). This index is referred to as the *index of student awareness of complex environmental issues.*



Box 3.2 Actual questions towards environmental issues

PISA 2006 Student Questionnaire

Q22 – How informed are you about the following environmental issues?
(Please tick only one box in each row)

		I have never heard of this	I have heard about this but I would not be able to explain what it is really about	I know something about this and could explain the general issue	I am familiar with this and I would be able to explain this well
ST22Q01	a) The increase of greenhouse gases in the atmosphere	☐1	☐2	☐3	☐4
ST22Q02	b) Use of genetically modified organisms (<GMO>)	☐1	☐2	☐3	☐4
ST22Q03	c) Acid rain	☐1	☐2	☐3	☐4
ST22Q04	d) Nuclear waste	☐1	☐2	☐3	☐4
ST22Q05	e) The consequences of clearing forests for other land use	☐1	☐2	☐3	☐4

Q23 – From which source(s) did you mainly learn about each of these environmental issues?
(Please tick as many boxes as apply in each row)

		None of these, I am not sure what this is	My school	The TV, radio, newspaper or magazines	My friends	My family	The Internet or books
ST23QA1 to ST23QA6	a) Air pollution	☐1 (ST23QA1)	☐1 (ST23QA2)	☐1 (ST23QA3)	☐1 (ST23QA4)	☐1 (ST23QA5)	☐1 (ST23QA6)
ST23QB1 to ST23QB6	b) Energy shortages	☐1 (ST23QB1)	☐1 (ST23QB2))	☐1 (ST23QB3)	☐1 (ST23QB4)	☐1 (ST23QB5)	☐1 (ST23QB6)
ST23QC1 to ST23QC6	c) Extinction of plants and animals	☐1 (ST23QC1)	☐1 (ST23QC2)	☐1 (ST23QC3)	☐1 (ST23QC4)	☐1 (ST23QC5)	☐1 (ST23QC6)
ST23QD1 to ST23QD6	d) Clearing of forests for other land use	☐1 (ST23QD1)	☐1 (ST23QD2)	☐1 (ST23QD3)	☐1 (ST23QD4)	☐1 (ST23QD5)	☐1 (ST23QD6)
ST23QE1 to ST23QE6	e) Water shortages	☐1 (ST23QE1)	☐1 (ST23QE2)	☐1 (ST23QE3)	☐1 (ST23QE4)	☐1 (ST23QE5)	☐1 (ST23QE6)
ST23QF1 to ST23QF6	f) Nuclear waste	☐1 (ST23QF1)	☐1 (ST23QF2)	☐1 (ST23QF3)	☐1 (ST23QF4)	☐1 (ST23QF5)	☐1 (ST23QF6)

Q24 – Do you see the environmental issues below as a serious concern for yourself and/or others?
(Please tick only one box in each row)

		This is a serious concern for me personally as well as others	This is a serious concern for other people in my country but not me personally	This is a serious concern only for people in other countries	This is not a serious concern to anyone
ST24Q01	a) Air pollution	☐1	☐2	☐3	☐4
ST24Q02	b) Energy shortages	☐1	☐2	☐3	☐4
ST24Q03	c) Extinction of plants and animals	☐1	☐2	☐3	☐4
ST24Q04	d) Clearing of forests for other land use	☐1	☐2	☐3	☐4
ST24Q05	e) Water shortages	☐1	☐2	☐3	☐4
ST24Q06	f) Nuclear waste	☐1	☐2	☐3	☐4

Q25 – Do you think problems associated with the environmental issues below will improve or get worse over the next 20 years?
(Please tick only one box in each row)

		Improve	Stay about the same	Get worse
ST25Q01	a) Air pollution	☐1	☐2	☐3
ST25Q02	b) Energy shortages	☐1	☐2	☐3
ST25Q03	c) Extinction of plants and animals	☐1	☐2	☐3
ST25Q04	d) Clearing of forests for other land use	☐1	☐2	☐3
ST25Q05	e) Water shortages	☐1	☐2	☐3
ST25Q06	f) Nuclear waste	☐1	☐2	☐3

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PISA 2006 Parent Questionnaire

Q7 – Do you see the environmental issues below as a serious concern for yourself and/or others?
(Please tick only one box in each row)

		This is a serious concern for me personally as well as others	This is a serious concern for other people in my country but not me personally	This is a serious concern only for people in other countries	This is not a serious concern for anyone
PA07Q01	a) Air pollution	☐1	☐2	☐3	☐4
PA07Q02	b) Energy shortages	☐1	☐2	☐3	☐4
PA07Q03	c) Extinction of plants and animals	☐1	☐2	☐3	☐4
PA07Q04	d) Clearing of forests for other land use	☐1	☐2	☐3	☐4
PA07Q05	e) Water shortages	☐1	☐2	☐3	☐4
PA07Q06	f) Nuclear waste	☐1	☐2	☐3	☐4

Q8 – Do you think problems associated with the environmental issues below will improve or get worse over the next 20 years?
(Please tick only one box in each row)

		Improve	Stay about the same	Get worse
PA08Q01	a) Air pollution	☐1	☐2	☐3
PA08Q02	b) Energy shortages	☐1	☐2	☐3
PA08Q03	c) Extinction of plants and animals	☐1	☐2	☐3
PA08Q04	d) Clearing of forests for other land use	☐1	☐2	☐3
PA08Q05	e) Water shortages	☐1	☐2	☐3
PA08Q06	f) Nuclear waste	☐1	☐2	☐3

To distinguish between the different set of issues and to take into the account the stronger wording of question 22, the report emphasises that awareness measures whether students feel capable of explaining what these issues are and not just whether they have heard of them.

STUDENTS' FAMILIARITY WITH, RESPONSIBILITY FOR, AND OPTIMISM TOWARD GENERAL ENVIRONMENTAL ISSUES

Overall results

The following comparisons across countries should be interpreted with caution since students in different countries may not mean the same thing when they answer questions on attitudinal matters (see Box 3.3).

The vast majority of 15-year-old students report they know or have learnt something about environmental issues. Across OECD countries, on average less than 3% of students report they are not sure what "Air pollution" or "Extinction of plants and animals" is, around 5% report not being sure what "Water shortages" and "Clearing of forests for other land use" is, less than 10% do so for "Energy shortages", and 11% for "Nuclear waste" (Figure 3.1). Across OECD countries, a substantial proportion of students report a very high sense of personal and social responsibility towards these environmental issues (Figure 3.2). On the other hand, most students are not optimistic about improvements occurring over the next two decades (Figure 3.3). Only a minority of students (on average between 13 and 21%) believed that problems associated with environmental issues will improve in the next 20 years.



Box 3.3 **Interpreting PISA attitudinal data**

Most of the measures presented in this chapter summarise student responses to a series of related questions. Students' responses are reported in two ways, first in terms of percentages of students responding in a particular way, and second in the form of indices calculated from the responses.

In describing students in terms of their attitudes (*e.g.* awareness, optimism, or responsibility), indices were constructed on which the average OECD student (*e.g.* the student with an average level of awareness) was given an index value of zero and on which about two-thirds of the OECD student population were between the values of -1 and 1 (*i.e.* the index has a standard deviation of 1). Therefore, if countries have negative mean index values this does not necessarily imply that students responded negatively to the underlying questions. Rather in these countries, students responded less positively than students on average across OECD countries. Likewise, in countries with positive mean index values students responded more positively than on average in the OECD area.

Care must be taken when comparing both the percentages and the index values across countries as students may not always mean the same thing when answering questions about attitudes.

It is also important to bear in mind that in some of the participating countries where comparatively high percentages of students reported familiarity with environmental issues, significant proportions of 15-year-olds were not enrolled in formal education. In these countries, these higher percentages may be an inaccurate reflection of the 15-year-old population as a whole.

Air Pollution

As would be expected given its ubiquitous nature, air pollution is widely recognised as an environmental issue by 15-year-old students. On average, across OECD countries 98% of students are familiar with air pollution as an environmental issue. This varies little from 91% in the Netherlands to 99.5% in Finland. Among partner countries and economies, the range widens but in half of them or more at least 98% are familiar with air pollution.

Similarly, most 15-year-olds report feeling responsible for the issue of air pollution and view it as a threat to a healthy environment. On average across OECD countries, 92% of students say that they and others in their country must take responsibility for air pollution. This attitude is fairly consistent across countries, with the proportion ranging from 82% in New Zealand to 98% in the Czech Republic. In all but two (Kyrgyztan and Romania) partner countries and economies over 90% of students felt a responsibility for themselves and/or other people for problems associated with this environmental issue.

Less than one fifth of students, however, are optimistic that air quality will improve over the next 20 years. On average among OECD countries, only 16% are optimistic, while in partner country Montenegro a full 44% of students are optimistic and in Liechtenstein only 12% are optimistic.

Energy shortages

Most 15-year-old students are well aware of the issue of energy shortages. On average, 91% of students in OECD countries report to be familiar with energy as an environmental issue. Again, there is very little variation among OECD countries, and the same is true among partner countries and economies. But in this case the range is wider for OECD countries because in France 72% of students report being familiar with energy shortages, while the lowest proportion among partner countries is 84% in Brazil.



Figure 3.1
Students' familiarity with environmental issues

A	Air pollution
B	Energy shortages
C	Extinction of plants and animals
D	Clearing of forests for other land use
E	Water shortages
F	Nuclear waste

Percentage of students who report that they are familiar with or know something about the following environmental issues through different sources

	A	B	C	D	E	F
Australia	99	94	99	98	98	92
Austria	99	90	99	98	94	90
Belgium	98	81	96	94	89	84
Canada	99	90	98	97	94	89
Czech Republic	99	97	99	98	97	98
Denmark	97	91	98	97	92	90
Finland	99	92	100	97	96	94
France	97	72	95	91	84	80
Germany	98	92	99	97	93	87
Greece	95	89	96	79	95	88
Hungary	99	98	99	97	97	90
Iceland	98	87	97	96	96	90
Ireland	98	95	98	97	97	93
Italy	97	94	98	96	97	84
Japan	99	93	98	97	95	84
Korea	99	97	98	87	99	87
Luxembourg	97	80	97	94	87	81
Mexico	98	81	98	97	98	82
Netherlands	91	88	97	97	90	89
New Zealand	98	95	98	96	95	87
Norway	96	94	98	96	96	88
Poland	99	98	99	99	96	83
Portugal	99	93	99	98	96	93
Slovak Republic	99	98	98	95	98	96
Spain	99	96	99	96	99	92
Sweden	96	89	97	76	93	89
Switzerland	98	81	97	94	90	81
Turkey	98	97	98	97	96	97
United Kingdom	99	97	99	96	97	94
United States	98	95	98	97	95	91
OECD average	98	91	98	95	95	89
Argentina	97	87	97	93	93	76
Azerbaijan	91	90	95	92	92	85
Brazil	98	84	98	95	88	85
Bulgaria	96	96	97	97	96	91
Chile	97	93	96	89	94	80
Colombia	56	87	97	94	95	79
Croatia	99	98	100	98	99	98
Estonia	99	93	99	98	96	93
Hong Kong-China	99	99	99	99	96	85
Indonesia	97	97	98	96	97	70
Israel	92	88	93	87	95	73
Jordan	94	95	96	93	97	90
Kyrgyzstan	91	89	91	85	88	81
Latvia	99	91	99	99	93	92
Liechtenstein	99	88	99	97	93	81
Lithuania	99	94	100	97	93	87
Macao-China	99	99	99	98	99	80
Montenegro	93	91	93	92	94	85
Qatar	85	85	90	87	89	74
Romania	98	86	98	95	91	91
Russian Federation	99	96	98	99	95	96
Serbia	99	96	98	97	98	94
Slovenia	98	98	99	98	99	97
Chinese Taipei	100	99	99	99	100	96
Thailand	98	98	99	96	98	71
Tunisia	90	90	89	88	90	71
Uruguay	98	92	96	94	97	77

Source: *OECD PISA 2006 Database*, Table A3.1.
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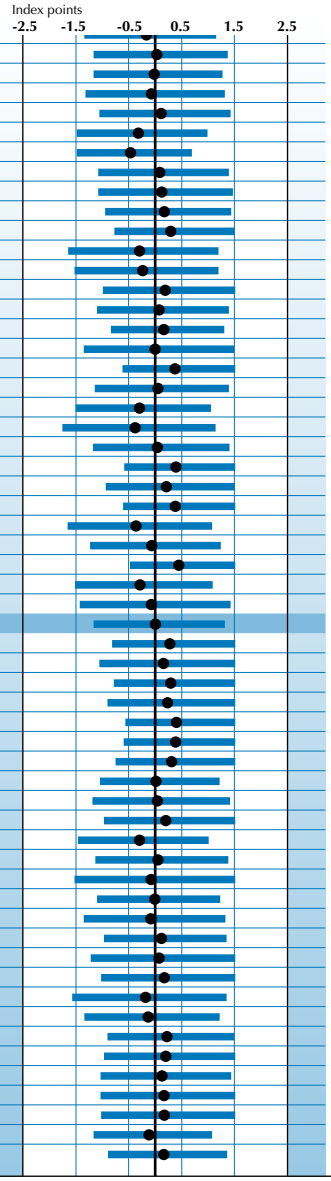
Figure 3.2
Index of students' sense of responsibility for environmental issues

A Air pollution
B Energy shortages
C Extinction of plants and animals
D Clearing of forests for other land use
E Water shortages
F Nuclear waste

Percentage of students who believe the following environmental issues to be a serious concern for themselves or other people in their country

Range between top and bottom quarter of students
Average index

	A	B	C	D	E	F
Australia	88	81	85	87	92	75
Austria	95	78	87	82	68	71
Belgium	95	80	82	76	68	83
Canada	93	80	85	89	76	79
Czech Republic	98	77	84	85	66	85
Denmark	86	75	78	78	67	73
Finland	88	67	74	76	45	74
France	95	80	82	81	78	84
Germany	94	86	87	84	74	85
Greece	96	88	86	84	87	80
Hungary	97	93	94	91	87	84
Iceland	84	62	69	67	49	52
Ireland	89	79	74	75	67	74
Italy	97	86	79	78	80	72
Japan	95	92	92	92	86	88
Korea	98	97	93	93	97	89
Luxembourg	92	78	81	78	73	74
Mexico	97	89	95	94	96	84
Netherlands	93	83	85	75	66	82
New Zealand	82	84	82	81	80	60
Norway	83	64	78	74	55	66
Poland	93	89	83	88	87	72
Portugal	97	94	94	95	96	83
Slovak Republic	97	86	90	83	83	80
Spain	97	94	95	93	95	88
Sweden	83	67	76	74	52	74
Switzerland	93	75	84	80	66	78
Turkey	97	94	94	95	92	92
United Kingdom	89	84	77	74	76	79
United States	91	84	85	87	81	83
OECD average	92	82	84	83	76	78
Argentina	97	91	91	90	92	84
Azerbaijan	95	89	86	84	88	79
Brazil	97	91	93	93	92	87
Bulgaria	97	91	91	92	91	86
Chile	98	96	95	94	95	85
Colombia	94	95	93	94	95	85
Croatia	96	92	93	91	90	87
Estonia	96	86	88	91	75	69
Hong Kong-China	95	86	81	75	78	61
Indonesia	95	93	90	91	92	75
Israel	92	83	86	80	91	73
Jordan	94	90	84	83	92	70
Kyrgyzstan	87	83	82	80	81	75
Latvia	94	82	77	87	75	75
Liechtenstein	93	72	86	79	60	69
Lithuania	96	87	91	91	80	83
Macao-China	93	87	81	81	88	63
Montenegro	95	89	88	86	89	77
Qatar	91	82	77	70	83	69
Romania	88	81	83	84	82	75
Russian Federation	95	91	92	93	90	89
Serbia	95	91	88	89	92	81
Slovenia	94	86	89	86	86	84
Chinese Taipei	95	94	91	92	94	91
Thailand	93	91	88	86	91	73
Tunisia	92	83	75	76	87	56
Uruguay	96	93	91	91	91	75



Source: *OECD PISA 2006 Database*, Table A3.2.

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Figure 3.3
Index of students' optimism regarding environmental issues

A Air pollution
B Energy shortages
C Extinction of plants and animals
D Clearing of forests for other land use
E Water shortages
F Nuclear waste

Percentage of students who believe the problems associated with the environmental issues below will improve over the next 20 years

Range between top and bottom quarter of students
Average index

Index points
-2.5 -1.5 -0.5 0.5 1.5 2.5

	A	B	C	D	E	F
Australia	14	21	12	11	18	12
Austria	10	16	7	5	10	8
Belgium	12	14	10	11	13	14
Canada	13	17	10	10	12	13
Czech Republic	17	33	13	11	20	14
Denmark	13	19	10	10	16	15
Finland	9	14	11	6	16	8
France	11	14	12	12	13	14
Germany	14	16	8	7	13	13
Greece	19	26	14	14	21	15
Hungary	13	13	12	12	18	13
Iceland	13	21	13	11	20	20
Ireland	20	26	16	15	27	17
Italy	14	18	14	12	17	16
Japan	20	22	16	16	20	17
Korea	29	49	22	29	23	32
Luxembourg	13	15	10	8	11	10
Mexico	17	12	20	17	16	10
Netherlands	18	19	13	15	23	17
New Zealand	10	20	12	8	14	10
Norway	30	33	19	15	28	25
Poland	22	18	20	17	18	23
Portugal	18	18	16	15	14	15
Slovak Republic	11	25	12	9	19	11
Spain	17	28	19	15	24	15
Sweden	19	25	14	12	25	23
Switzerland	12	17	10	8	13	11
Turkey	23	23	18	18	22	16
United Kingdom	17	18	13	13	22	13
United States	21	26	18	15	22	17
OECD average	16	21	14	13	18	15
Argentina	22	28	22	18	24	16
Azerbaijan	37	42	32	43	43	26
Brazil	21	23	22	18	20	18
Bulgaria	39	41	30	32	43	32
Chile	22	33	22	19	31	14
Colombia	28	38	28	23	30	19
Croatia	13	21	13	12	12	12
Estonia	12	21	13	11	20	17
Hong Kong-China	23	24	23	18	27	20
Indonesia	24	30	20	16	27	16
Israel	30	33	27	23	40	21
Jordan	36	31	26	25	32	21
Kyrgyzstan	36	44	37	40	45	31
Latvia	15	34	15	10	24	16
Liechtenstein	12	16	7	6	8	7
Lithuania	19	32	17	16	26	17
Macao-China	28	26	26	25	27	21
Montenegro	30	37	30	28	41	23
Qatar	44	41	36	36	45	30
Romania	33	33	22	24	35	23
Russian Federation	26	45	25	20	37	25
Serbia	24	32	23	21	31	18
Slovenia	12	20	11	10	12	12
Chinese Taipei	19	18	21	21	19	16
Thailand	32	36	28	34	41	25
Tunisia	31	29	30	28	32	20
Uruguay	21	18	20	17	21	12

Source: *OECD PISA 2006 Database*, Table A3.3.

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A lower proportion of students felt responsibility towards energy shortages although the proportions are also high. On average in OECD countries, 82% of students claim responsibility for energy shortages. OECD countries with the highest proportion of students with a strong sense of responsibility for this environmental issue are Korea with 97%, and Portugal, Spain and Turkey, all with 94%. Similar proportions of students in partner countries and economies also feel responsible for this issue.

As with the issue of air pollution, relatively small proportions of students are optimistic about possible improvements in the energy supply over the next 20 years. Overall in OECD countries about one fifth of students are optimistic, though there is considerable variation across countries, from nearly one half (49%) of Korean students to only 12% in Mexico and 14% of students in each of Belgium, Finland and France. A similar range of optimism is evident among partner countries.

Extinction of plants and animals

Most students claim to be familiar with the extinction of species. On average among OECD countries 98% were familiar with this issue. Among OECD countries, country averages range from 95% in France to 100% in Finland. Among partner countries and economies, the range goes from 89% in Tunisia to 100% in Croatia and Lithuania.

Some 84% of students, on average across OECD countries, feel responsibility for the extinction of species, second only to the proportion feeling responsibility for air pollution. There is, however, a considerable range across countries from 95% of students in Mexico and Spain to 74% in Finland and Ireland feeling this way. Similar results and patterns occur among partner countries and economies.

On average only 14% of 15-year-olds in OECD countries are optimistic about improvements in the extinction of species over the next two decades, though the figures vary quite a lot across countries. At the high end, 22% of Korean student are optimistic, while only 7 and 8% of Austrian and German students respectively expressed optimism.

Clearing of forests for other land use

Nearly all 15-year-olds in both OECD countries and partner countries and economies report to be familiar with deforestation. Across OECD countries, 95% of students report being familiar with this topic. The lowest proportion among OECD countries is in Sweden, with 76% of students, and among partner countries and economies in Kyrgyzstan with 85%.

In addition, a substantial majority of students in OECD countries (83%) feel that they or others in their country should be responsible about deforestation. Partner countries and economies range from 94% of Chilean students expressing responsibility to 70% of students in Qatar.

Out of these six selected environmental issues, students are least optimistic about declines in deforestation over the next two decades. Only 13% of students on average across OECD countries are optimistic about improvements. In partner countries and economies, however, students are generally more optimistic than their OECD peers that deforestation will decline.

Water shortage

Out of the six selected environmental issues, water shortage is the issue that OECD students are least likely to feel responsibility towards. The proportion of students who are familiar is still very high (95% across the OECD), with a range between 99% in Korea and Spain and 84% in France. The range is similar among partner countries and economies, between 100% in Chinese Taipei and 88% in Kyrgyzstan and Brazil.

On average, three-quarters of students in OECD countries feel that they and others in their country should be responsible for water resources. In some countries, such as Korea, Mexico, Portugal, Spain, Turkey, and



Australia over 90% of students feel responsible, while only 45% of Finnish students report feeling that way. Students responding that they feel responsible in partner countries and economies range from 95% in Chile and Columbia to 60% in Liechtenstein and 75% in Estonia and Latvia.

On average, only 18% of students in OECD countries are optimistic about future improvements in water resources. This optimism ranges from 10% of students in Austria to 28% in Norway, while in partner countries and economies it ranges from 8% in Liechtenstein to 45% in Kyrgyzstan and Qatar.

Nuclear waste

Out of the six selected environmental issues, nuclear waste is the issue that OECD students report to be least familiar with. On average, 89% of students in OECD countries report to be familiar with nuclear waste as an environmental issue, ranging from 80% in France to 98% in the Czech Republic. Among partner countries and economies, the proportions are similar, ranging from 70% in Indonesia to 98% in Croatia.

A smaller proportion (78% on average) feels that they and others in their country need to take responsibility for this issue and the proportion varies widely across countries, from 52% in Island to 92% in Turkey. Among partner countries and economies, the proportions are equally lower, ranging from 56% in Tunisia and Latvia to 91% in Chinese Taipei.

Student optimism about future improvements in the disposal of nuclear waste is similar to those for the other environmental issues. On average 15% of students in OECD countries are optimistic about this issue, ranging from about one third of Korean students to only 8% of Austrian students, while in partner countries and economies the range is from 32% in Bulgaria to 7% in Liechtenstein.

STUDENTS' AWARENESS AND SELF-PERCEPTION OF THEIR ABILITY TO UNDERSTAND COMPLEX ENVIRONMENTAL CHALLENGES

While environmental science and geoscience can assist students in understanding the environment at its most basic level, these fields of study should also help students apply their knowledge to the more complex issues created by the dynamic interaction between human society and the environment.

In addition to the six selected general environmental issues examined above, PISA 2006 asked students about their awareness and understanding of five complex environmental challenges (Box 3.2, question 22). These challenges involve a deeper appreciation for environmental issues and the science involved. The five complex issues were: *i)* The increase of greenhouse gases in the atmosphere, *ii)* Use of genetically modified organisms (GMO), *iii)* Acid rain, *iv)* Nuclear waste, *v)* Consequences of clearing forests for other land use. Again, results were summarised in an *index of students' awareness of complex environmental issues*.

Students' awareness of these complex environmental challenges varies significantly from challenge to challenge (Figure 3.4). The majority of students (73% on average) reported being aware of the consequences of the clearing of forests for other land use, the proportion being 80% or more in Poland, Turkey, Ireland, Canada, Australia, the Netherlands, Austria and Germany, as well as in the partner countries and economies Hong Kong-China, Chinese Taipei, Macao-China, Latvia, the Russian Federation, Estonia, Lithuania and Liechtenstein. Conversely, in Korea, Sweden and Greece only 42 to 50% of students were aware of these consequences.

On average, around 60% of students were aware of the acid rain and greenhouse gas challenges. In France, Iceland, Mexico, Switzerland and Turkey, and partner countries Argentina, Azerbaijan, Chile, Indonesia, Israel, Kyrgyzstan, Qatar, Romania and Tunisia, students were less aware of these challenges with fewer than 40% of students reporting awareness of one or both of these issues. In contrast, at least 80% of students were aware of acid rain in Greece, Ireland and Poland, and in the partner countries and economies Hong Kong-China, Croatia, Chinese Taipei and Slovenia (Figure 3.4).

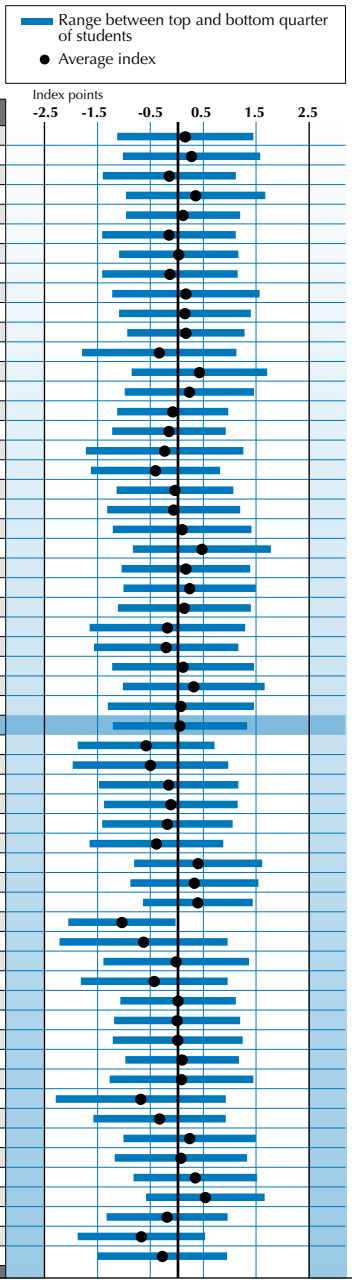
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Figure 3.4
Index of students' awareness of more complex environmental issues

A The consequences of clearing forests for other land use
B Acid rain
C The increase of greenhouse gases in the atmosphere
D Nuclear waste
E Use of genetically modified organisms (GMO)

	Percentage of students who report that they are familiar with or know something about the following environmental issues				
	A	B	C	D	E
Australia	80	48	72	53	38
Austria	80	66	61	65	43
Belgium	73	48	60	47	29
Canada	81	66	73	52	43
Czech Republic	79	70	60	69	27
Denmark	72	50	54	49	24
Finland	75	60	65	63	22
France	66	28	58	38	56
Germany	80	65	60	61	38
Greece	50	84	58	58	45
Hungary	77	76	64	52	25
Iceland	73	37	36	45	29
Ireland	82	83	75	64	26
Italy	75	64	68	49	61
Japan	68	75	54	33	33
Korea	42	75	53	42	27
Luxembourg	70	41	48	51	34
Mexico	73	46	29	35	19
Netherlands	80	62	69	53	24
New Zealand	71	44	54	40	48
Norway	77	71	58	57	32
Poland	86	81	54	60	48
Portugal	77	69	67	47	36
Slovak Republic	71	74	63	62	30
Spain	76	58	66	45	37
Sweden	47	48	66	55	28
Switzerland	75	33	53	54	37
Turkey	84	53	32	74	35
United Kingdom	74	71	71	59	37
United States	73	54	53	51	39
OECD average	73	60	58	53	35
Argentina	66	42	28	31	15
Azerbaijan	59	41	32	41	28
Brazil	66	40	51	37	33
Bulgaria	75	59	54	53	29
Chile	64	56	37	35	30
Colombia	62	49	41	33	21
Croatia	77	84	44	66	64
Estonia	84	73	63	58	43
Hong Kong-China	91	88	80	48	31
Indonesia	54	12	11	9	11
Israel	61	33	31	39	27
Jordan	69	71	41	50	37
Kyrgyzstan	58	45	39	44	29
Latvia	87	64	43	59	30
Liechtenstein	80	55	60	56	34
Lithuania	80	67	46	49	32
Macao-China	87	71	65	32	37
Montenegro	73	69	51	51	31
Qatar	55	45	22	37	19
Romania	58	49	35	45	30
Russian Federation	86	61	54	64	36
Serbia	72	66	56	55	26
Slovenia	79	81	57	65	52
Chinese Taipei	90	84	80	56	54
Thailand	68	53	58	29	59
Tunisia	64	27	19	32	20
Uruguay	68	57	41	36	19



Source: *OECD PISA 2006 Database*, Table A3.4.

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In general, fewer students were aware of nuclear waste as an environmental challenge, with an average of 53% across the OECD. This contrasts with the 89% of students discussed earlier who were familiar with nuclear waste as one of the six environmental issues. The difference in the wording of questions in the two parts of the questionnaire helps explain these results. The 53% who indicated that they were aware of nuclear waste as an environmental challenge were indicating that they know about and could explain nuclear waste, while the 89% were indicating that they know about and had learned something about nuclear waste. Students in Turkey, the Czech Republic and Austria, and in partner countries Croatia and Slovenia, had the highest awareness of the nuclear waste challenge, with at least 65% of students aware of this issue (Figure 3.4).

A minority of students were aware of the genetically modified organisms (GMO) challenge: on average, 35% of students were aware of GMO. However the proportion was over 50% in Italy and France, as well as in the partner countries and economies Croatia, Thailand, Chinese Taipei and Slovenia (Figure 3.4).

ARE STUDENTS' CHARACTERISTICS RELATED TO THEIR ATTITUDES TOWARDS THE ENVIRONMENT?

Parents' attitudes towards the environment

As part of the PISA 2006 assessment, 16 countries complemented the perspectives of students with data collected from parents and environment-related parent indices are available for 15 countries.[2] Parents were asked about their sense of responsibility for and optimism about progress with the six selected environmental issues (Box 3.2, questions 7 and 8).

Like their 15-year-old children, parents felt that these six issues were their responsibility. In all 15 countries over 90% of parents reported this. Parents also had levels of optimism similar to those of their children (Figure 3.5 and Figure 3.6).

Figure 3.5
Parents' sense of responsibility for environmental issues

A	Air pollution
B	Energy shortages
C	Extinction of plants and animals
D	Clearing of forests for other land use
E	Water shortages
F	Nuclear waste

Percentage of parents who believe the following environmental issues to be a serious concern for themselves or other people in their country

	A	B	C	D	E	F
Bulgaria	99	95	96	98	95	95
Colombia	98	97	97	97	98	90
Croatia	99	98	98	97	95	97
Denmark	96	90	92	89	86	86
Germany	99	96	97	94	87	97
Hong Kong-China	97	87	75	75	81	70
Iceland	94	66	81	78	64	78
Italy	99	95	91	89	91	90
Korea	99	98	95	95	96	95
Luxemburg	98	95	94	92	91	92
Macao-China	96	91	83	84	92	75
New Zealand	95	97	95	92	93	80
Portugal	98	98	97	97	98	93
Qatar	94	88	84	68	90	77
Turkey	99	95	96	97	94	95

Source: *OECD PISA 2006 Database*, Table A3.5.
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Figure 3.6
Parents' optimism regarding environmental issues

A Air pollution
B Energy shortages
C Extinction of plants and animals
D Clearing of forests for other land use
E Water shortages
F Nuclear waste

Percentage of parents who believe the problems associated with the environmental issues below will improve over the next 20 years

	A	B	C	D	E	F
Bulgaria	24	29	16	18	21	24
Colombia	20	30	20	19	21	15
Croatia	10	11	8	9	6	9
Denmark	10	7	4	8	4	13
Germany	15	6	4	5	4	9
Hong Kong-China	22	20	20	17	23	20
Iceland	3	7	3	6	3	8
Italy	9	10	8	8	7	8
Korea	28	28	20	26	18	27
Luxemburg	12	9	7	7	6	7
Macao-China	31	26	26	26	29	25
New Zealand	12	9	7	6	6	9
Portugal	11	12	13	12	10	9
Qatar	37	43	32	28	40	26
Turkey	22	28	12	14	19	12

Source: *OECD PISA 2006 Database*, Table A3.6.
StatLink http://dx.doi.org/10.1787/562201383324

Not surprisingly, students' and parents' perceived responsibility and optimism for the six selected environmental issues are generally correlated, although in some countries more than in others (Table A3.7).

Gender differences in attitudes towards resources and the environment

In general, male and female students had similar attitudes toward the environment, although there were some gender differences in particular countries (Table A3.8). In OECD countries, males tended to be more aware of and more optimistic about environmental issues than females.

Females tended to report a higher sense of responsibility towards the environment than males, though differences were generally small. The greatest differences in this regard were in Finland, Poland, Sweden and Turkey. In 16 OECD countries and 9 partner countries and economies, females reported a higher sense of responsibility for environmental issues (Table A3.8).

Socio-economic background and attitudes towards resources and the environment

Students' optimism about future improvements and awareness and understanding of the five complex environmental challenges are both related to the socio-economic background of students (Table A3.9). In contrast, the sense of student responsibility for the six selected environmental issues is generally not related to the socio-economic background of students, as measured by the ESCS index (index of Economic, Social and Cultural Status).

In all OECD countries and most of the partner countries and economies, students of families with a more advantaged socio-economic background are more likely to report being aware and having some understanding of the complex environmental challenges (greenhouse gases, GMO, acid rain, nuclear waste and deforestation). Very large differences in awareness among socio-economic groups occur in Belgium,



France, Luxembourg and Portugal, as well as in the partner country Chile. Although the differences were not as large as those related to awareness, students from more advantaged socio-economic backgrounds also tended to be more pessimistic about future improvements in the six selected environmental issues (air pollution, energy shortage, species extinction, deforestation, water shortage and nuclear waste).

Immigrant background and attitudes towards resources and the environment

Even without accounting for socio-economic background, there are only small to moderate differences in attitudes towards the environment between native students and students with an immigrant background among the 33 countries (including 20 OECD countries) with reliable data for 15-year-olds with an immigrant background (based on more than 30 students and more than 3% of the sampled students) (Table A3.10). In ten OECD countries native students reported higher levels of awareness and understanding of the five complex environmental challenges than students with an immigrant background. Similarly, there are 10 OECD countries where natives are less optimistic. There are almost no differences in terms of students' sense of responsibility for environmental issues.

ARE ATTITUDES RELATED TO THE ENVIRONMENTAL SCIENCE PERFORMANCE INDEX?

The relationship between attitudes and performance is a topic that is taken up by a number of reports based on PISA data. Chapter 3 of the PISA 2006 initial report for example presents evidence on attitudes and performance in science. The report, *Top of the Class: High Performing Learners in PISA 2006* (OECD, 2009b), shows that top performing students on the PISA science scale tend to be engaged learners who care about and enjoy learning science. An earlier report, *Student Engagement At School, a Sense Of Belonging And Participation* (Willms, 2003), showed that student engagement is closely associated with performance in reading, which for example, helps to explain the performance advantage of females over males in reading.

This section investigates whether variability in student attitudes to environmental issues is associated with variability in student performance on the environmental science performance index (see Table A3.11 for simple correlations).[3] For each attitudinal index and country, this section presents two sets of results. First, it presents the observed relationship between the environmental science performance index and student attitudes. The model shows the score point change on the environmental science performance index that is associated with a change of one standard deviation in the value of the attitudinal index. Second, the section discusses the relationship between attitudes and performance after accounting for student and school demographic and socio-economic background (Table A3.14).[4] A summary of the background model is in Table A3.12 and Table A3.13.

Figure 3.7 indicates the score point change on the environmental science performance index that is associated with a change of one unit on the standard deviation on the attitudinal index (responsibility, optimism, and awareness) after accounting for student and school background. Separate graphs are provided for each of the three attitudinal indices.

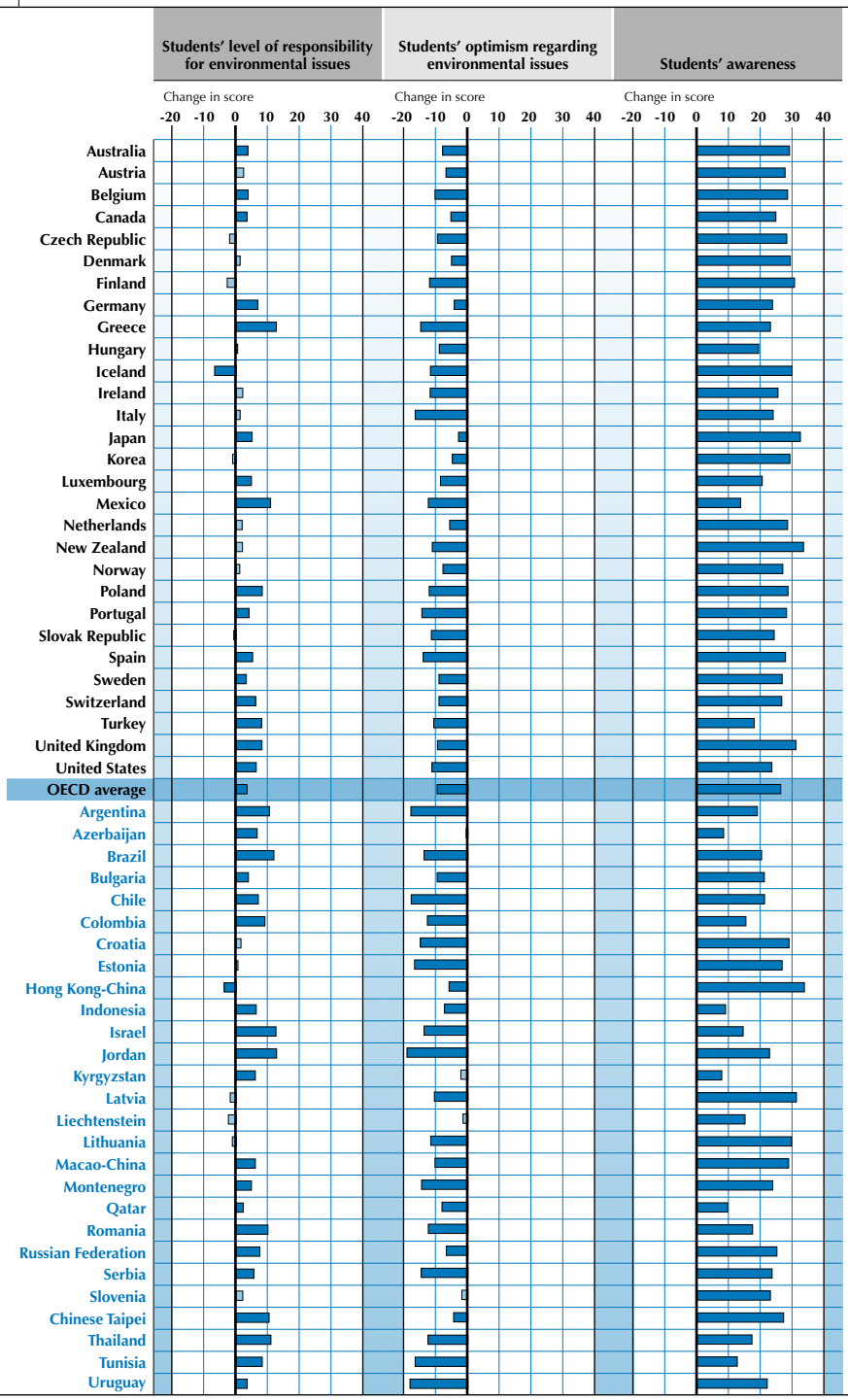
Students' sense of responsibility towards environmental issues

For most countries there is no strong association between the *index of students' sense of responsibility for environmental issues* and their environmental science performance index, after accounting for student and school characteristics (Figure 3.7 and Table A3.14). When there is a relationship, its direction varies from country to country. In some, for example France and Greece, *students' sense of responsibility for environmental issues* is positively associated with the environmental science performance index, while in others, such as the Czech Republic and Iceland, the relationship is negative. The results suggest that, in most countries, feeling responsible about environmental issues is not necessarily related to having knowledge about them.



Figure 3.7

Relationship between students' attitudes and environmental science performance after accounting for student and school background



Note: Statistically significant values are marked in darker colour.
Source: *OECD PISA 2006 Database*, Tables A3.14.
StatLink http://dx.doi.org/10.1787/562201383324

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Students' optimism regarding environmental issues

Students' optimism regarding environmental issues is negatively related to the environmental science performance index (Figure 3.7 and Table A3.14). The lower students perform in environmental science, the more optimistic they are that the situation will improve over the next two decades. The association, however, does not distinguish if lack of knowledge leads to optimism, or if it is the other way around, or if there are other factors driving this relationship. On average in OECD countries, an increase of one unit on the index corresponds to a decrease of around 14 score points on the environmental science performance index. Once student and school characteristics are considered the estimated effect is smaller (on average in OECD countries 10 score points) but still significant in most countries.

Among OECD countries a strongly negative relationship was found in France and Italy and this was also the case in partner countries Chile and Argentina. Among OECD countries the relationship is weakest in Japan, Korea and Canada. Again, these results should be interpreted with caution as questions asking students about optimism could be answered differently in different countries.

Students' awareness of complex environmental issues

The index of *students' awareness of complex environmental issues* is positively related to the environmental science performance index in all countries involved in PISA 2006 (Figure 3.7 and Table A3.14). This association does not show whether this is because students' awareness of complex environmental issues influences their performance on the environmental science index, whether higher performing students tend to be more aware, or whether there are third factors influencing the relationship. Taking into account student and school characteristics leads to a less pronounced relationship but the association does not disappear.

On average in the OECD countries an increase of one unit of the awareness index is associated with an increase in the environmental science performance index of 35 points when none of the background variables are accounted for, and an increase of 26 points after accounting for the background variables. This suggests that individual and school factors play an important role in the relationship between students' awareness and performance.

The strength of the relationship between awareness and the environmental science performance index varies across countries. Among OECD countries the relationship is weakest in Canada, Mexico and Turkey, and strongest in Belgium, France, Japan, the Netherlands and New Zealand. Such comparisons should be interpreted cautiously, however, because they may simply reflect cross-cultural differences in the way students from different countries answer attitudinal questions.

STUDENT ATTITUDES: CONCLUSIONS AND IMPLICATIONS

Students across the world appear to be taking a strong interest in environmental issues, and accept they need to take responsibility for environmental outcomes.

However, it is also clear that awareness of environmental issues varies considerably from one issue to another. While almost all students report familiarity with some basic environmental issues such as air pollution, and the majority with some more complex issues like the consequences of forest clearing for land use, only about one in three say that they are familiar with issues around genetically modified organisms. The PISA results allow each country to note which environmental issues its students appear to be engaged in, and which they may need to learn more about.



It is hard to draw firm conclusions about associations between environmental attitudes and performance in PISA, because the survey does not demonstrate cause and effect. However, it is worth noting that high levels of student awareness of the environment and high levels of proficiency in environmental science do go together, suggesting that an effective curriculum puts joint emphasis on learning about why the environment matters and on building understanding of the scientific phenomena involved. The negative association between performance and student optimism may point to the need for schools to give students with lower performance more information than they are now getting on the environmental risks that lie ahead.

The lack of association between socio-economic background and student attitudes shows that students from all backgrounds are taking an interest in environmental issues, and schools do not have to make extra efforts to persuade disadvantaged children that these issues are important, just to ensure that they do not fall behind in acquiring the knowledge and skills required to become proficient in addressing these issues.



Notes

1. Note that in the report *PISA 2006: Science Competencies for Tomorrow's World* (OECD, 2007) the same index was referred to as the *index of students' level of concern for environmental issues.*

2. These countries were Denmark, Germany, Iceland, Italy, Korea, Luxembourg, New Zealand, Poland, Portugal, and Turkey, as well as the partner countries and economies Bulgaria, Colombia, Croatia, Hong Kong-China, Macao-China, and Qatar. This report analyses data from all these countries except Poland, for which parent environment-related indices were not estimated due to data problems. In examining the results from the PISA parent questionnaire, it should be noted that in some countries non-response was considerable. Countries with considerable missing data in the parent questionnaire are as follows (the proportion of missing data is shown in brackets): Portugal (11%), Italy (14%), Germany (20%), Luxembourg (24%), New Zealand (32%), Iceland (36%) and Qatar (40%).

3. These indices were also analysed in the main PISA report (OECD, 2007, chapter 3). However, "students' sense of responsibility for environmental issues" was previously called "students' level of concern for environmental issues". The name of this index was changed but the measures remain the same.

4. The first model reflects a simple regression model that predicts the environmental science performance index based on the attitudinal index alone. The linear regression model was applied with survey weights rescaled giving equal weight to each country. Thus, each country's sample contributes similarly to final estimates regardless of the actual number of students tested. The background model includes variables at both the individual and the school level. At the individual level, it includes six student level variables that are already known from PISA 2006 to relate to student science performance: age, gender, immigrant status, language spoken at home, whether either parent has a science-related career, and socio-economic background. At the school level, the background model includes school size, whether the school is located in a rural area or small town or alternatively in a city, and the average socio-economic background of the students attending the school. This model builds on the analysis presented in Chapter 5 of *PISA 2006: Science Competencies for Tomorrow's World* (OECD, 2007). Note, however, that age and whether either parent has a science-related career or not were not included in the background model analysed in chapter 5 of the PISA 2006 initial report. The following four factors are all dummy variables as follows: student gender (equals 1 for females), immigrant status (equals 1 for native students), and language spoken at home (equals 1 if the language differs from the language of the test), and parent career (equals 1 if either of parents has science related career). ESCS and ESCS squared were both included in the model to adjust for possible non-linearities in the relationship between student socio-economic background and student performance. Student age was expressed in years (with months reflected as decimals). The missing values for student level variables were replaced by the school average of the missing variable. If school average was also missing, then country average was imputed. In the final regression dummy variables indicating all imputed missing observations were also included. This simple solution for missing data problem was employed in the analysis for the initial report and seems to be sufficient because of very small number of missing observations. Both location factors are dummy variables: rural equals one for schools located in villages or small towns (with fewer than 15 000 people), city equals one for schools in cities with more than 100 000 people. The control group is other towns and cities of medium size. No data is available for France in the school variables. France is therefore not included in any analysis that considers these variables.



4

Learning About Environmental Science and Geoscience

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SCHOOLS AND ENVIRONMENTAL SCIENCE EDUCATION

With the intensification of public concern over the environment, many nations are engaged in extensive public debates. 15-year-olds in OECD countries have access to large amounts of information on the environment and its scientific study. Not only schools, but the media and Internet as well, have become rich sources of material from which students can learn and apply their scientific literacy.

At the same time, science evolves from new discoveries and new theoretical perspectives. Over the past several decades there have been significant advances in scientific understanding of the earth's environment and geoscience (Russell, 2008).

As environmental science and geoscience topics evolve, they present new educational challenges. If environmental science and geoscience education is to keep up with the emerging science, science educators will have to find the most appropriate location for these topics within the overall science curriculum. For example, the United States has witnessed an intense policy discussion about ways to increase the prominence of environmental science and geoscience material within the school curriculum. The National Research Council has included these scientific topics in the nation's standards for teaching science:

> *… the NRC Standards show not only geoscientists, but also physicists, chemists and life scientists all calling for a strong and fully equal earth science presence in the curriculum. This attention to earth science is driven, in part, by the increased focus on the usefulness of science and the recognition that earth science contributes significantly to how we utilise our resources, manage our land and mitigate the effects of natural disasters. Moreover, scientists from other disciplines recognise how the earth sciences provide important context and meaning for acquiring fundamental understandings in their disciplines (Ridky, 2002).*

In addition to the curricular placement of environmental science and geoscience, there is also a lively debate on how to teach this material. Besides classroom lectures and laboratory experiments, there are a number of other activities that school science teachers around the world are using to engage students. Activities such as outdoor education, museum and science centre trips, and extracurricular research offer students opportunities to apply their environmental science and geoscience knowledge to actual problems associated with environmental issues.

Through its school and student questionnaires PISA 2006 asked about the curricular placement of environmental science in schools, about the ways schools used outside-of-classroom activities to teach this material, and about the sources of information used by young people to learn about environmental issues. This chapter reviews the evidence from these data and, for some of these variables, it illustrates their relationship with student performance on environmental science.

MAIN RESULTS OF THIS CHAPTER

Almost all students in the OECD attend schools that teach environmental topics. However, they appear in the curriculum in several different ways. Most commonly, they are part of natural science courses; most schools also include them in geography lessons, and they are frequently parts of other courses too. Only a minority of students in most countries attend schools with stand-alone environmental studies courses.

According to school principals most 15-year-old students attend schools that use at least one out-of-classroom learning activity to teach students about environmental science. Outdoor education is the activity most commonly reported, followed by trips to museums and science centres. There are a few OECD countries in which these activities are not very common, and a number of other countries in which nearly all students enjoy them.



Students learn about the environment from a number of sources: most commonly from schools, followed by the media, the Internet and books, and lastly family and friends. The evidence shows that students using several sources of information about environmental issues tend to be among the higher performers in this field, and in particular that higher performers are more likely to use schools and the media, Internet and books to find out about the environment.

ENVIRONMENTAL SCIENCE AND GEOSCIENCE IN THE SCHOOL SCIENCE CURRICULUM

Environmental science and geoscience are developing dynamically as intellectual fields, and their placement in the science curriculum differs between countries, and often between schools in the same country. PISA 2006 asked school principals about the curricular placement of environmental science material. Box 4.1 contains the actual questions addressed to them. This material was defined as all topics that are related to environmental science including issues such as pollution, degradation of the environment, relationships between organisms, biodiversity and conservation of resources.

Specifically, school principals were asked if any environmental science material was taught in the following four curricular arrangements (Box 4.1, question 21): *i)* As a separate course fully dedicated to this topic, *ii)* As part of a natural sciences courses or within an integrated science course, *iii)* As part of a geography course, and *iv)* As part of another course. Principals were allowed to select as many responses as were appropriate for their school.

Box 4.1 Environmental questions

PISA 2006 School Questionnaire

Q21 – Where do topics on the environment sit in the curriculum received by students in <national modal grade for 15-year-olds> at your school?

Environmental topics include all topics related to environmental science. These may include environmental issues such as pollution or the degradation of the environment. Relationships between organisms, biodiversity and conservation of resources would also be examples of environmental topics.

(Please tick one box in each row. If there are no topics on the environment in the curriculum received by students in <national modal grade for 15-year-olds> please tick "No" in all four rows)

		Yes	No
SC21Q01	a) In a specific environmental studies course	☐1	☐2
SC21Q02	b) In the natural sciences courses – for example as part of biology, chemistry, physics, earth science or within an integrated science course	☐1	☐2
SC21Q03	c) As part of a geography course	☐1	☐2
SC21Q04	d) As part of another course	☐1	☐2

Q22 – Does your school organise any of the following activities to provide opportunities to students in <national modal grade for 15-year-olds> to learn about environmental topics?

(Please tick one box in each row)

		Yes	No
SC22Q01	a) <Outdoor education>	☐1	☐2
SC22Q02	b) Trips to museums	☐1	☐2
SC22Q03	c) Trips to science and/or technology centres	☐1	☐2
SC22Q04	d) Extracurricular environmental projects (including research)	☐1	☐2
SC22Q05	e) Lectures and/or seminars (*e.g.* guest speakers)	☐1	☐2

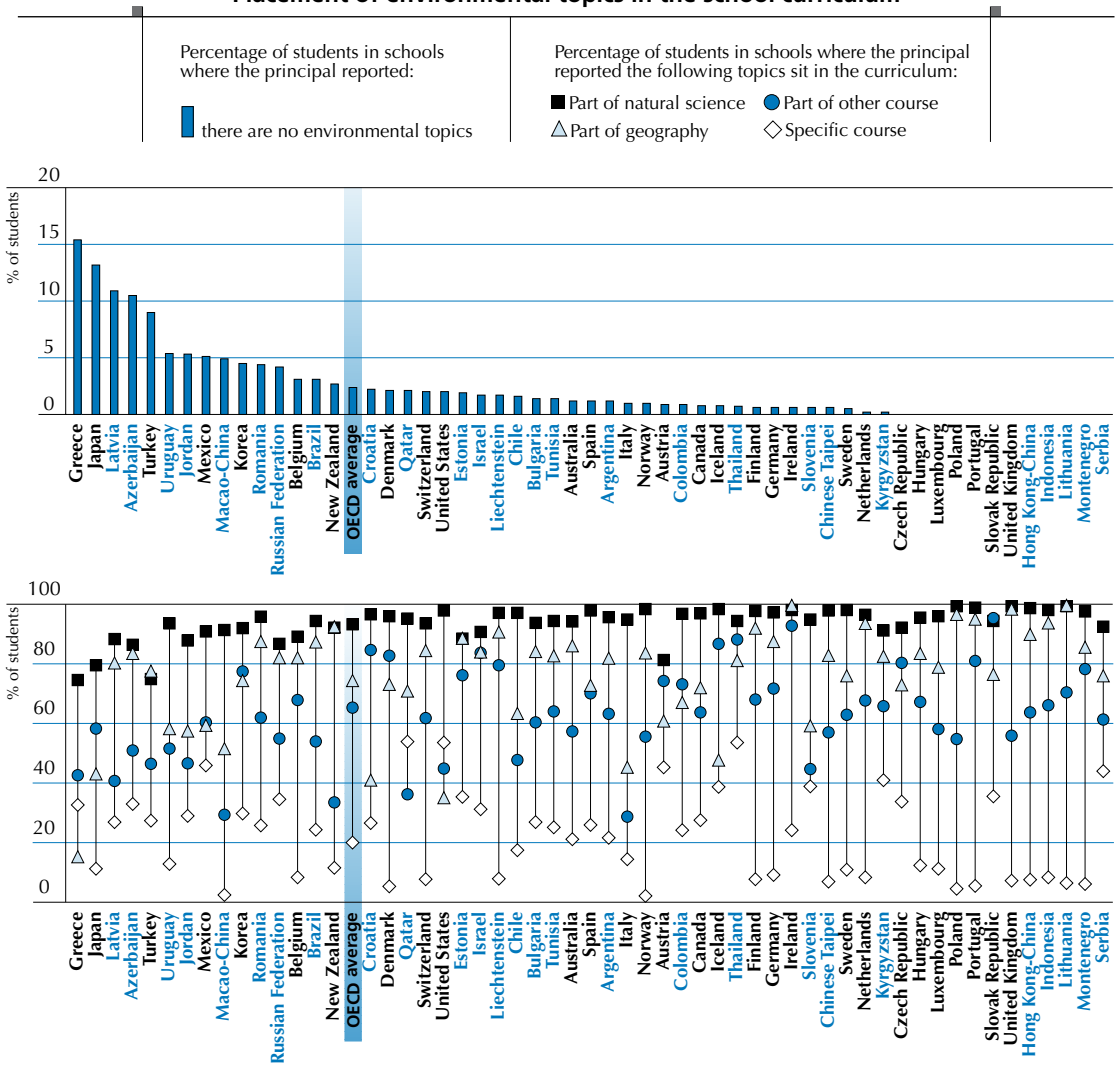
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As the upper chart in Figure 4.1 shows, most students in OECD and partner countries and economies are taught environmental topics somewhere in the curriculum. Across OECD countries, for example, only 2% of students on average are in schools that do not include environmental science in their curriculum. Greece and Japan are notable exceptions to this general pattern, having 15 and 13% of students respectively in schools whose principals report that there is no environmental science in the curriculum (Table A4.1).

In most OECD countries, environmental science material is found in several courses. An overwhelming proportion of the schools include environmental science somewhere in the science curriculum. Many schools teach parts of the topic in a variety of science courses, in geography, and in other (non-specified) courses. At the same time a significant proportion of schools offer a stand-alone course on environmental science. Given that answers were not mutually exclusive, the results, reported in Figure 4.1, include percentages that add to more than 100%.

Figure 4.1
Placement of environmental topics in the school curriculum



Source: *OECD PISA 2006 Database*, Table A4.1.
StatLink http://dx.doi.org/10.1787/562235784260

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By far, most curricular material about environmental science is taught as part of natural science courses, for example as part of biology, chemistry, physics, earth science, or within an integrated science course. Among OECD countries, on average, 94% of students attend schools that teach environmental science this way, according to the reports of school principals (Table A4.1). Partner countries and economies use this approach just as often.

Environmental science is also frequently taught as part of a geography course. About three quarters of students in OECD countries, on average, are in schools that teach material about the environment in a geography course. All Irish students are in schools that do this compared with only 16% of students in Greece and 35% in the United States. Also, on average 63% of students in OECD countries are at schools that teach environmental material in other (non-specified) courses.

The least common way of including environmental science material in the science curriculum is as a stand-alone course fully dedicated to this topic. Across the OECD, on average, one-fifth of students are in schools that have a course dedicated to environmental science, and there is significant variation among countries. The United States has the highest proportion among OECD countries, with 55% of students being in schools reporting such a course. On the other hand, in Norway and Poland 5% of students or less are in schools with stand-alone courses. In partner countries and economies, the proportion of students receiving this type of course is about the same as for OECD countries, with similar amounts of variation among countries.

These results mirror the state of the debate on curriculum placement for environmental science and geoscience. In most countries, there appears to be no consensus on this issue. In some countries, the situation might have changed recently and 15-year-olds might not have experienced a particular way of teaching for a long time. As with other questions from the school principals' questionnaire, generalising from a single source of information for each school is not straightforward. Most importantly, students' performance usually relates to the work of many teachers in various subject areas. It is therefore not surprising that no clear-cut association exists between these measures and student performance in environmental science (Table A4.2).

OUT-OF-CLASSROOM ACTIVITIES TO PROMOTE LEARNING OF ENVIRONMENTAL SCIENCE IN SCHOOLS

Environmental sciences are generally far from being theoretical or abstract. To a large extent they involve learning about humans, their impact on other co-existing organisms, the natural resources they utilise for survival, and all elements of nature that humans employ for their own purposes. This quality makes the teaching of environmental science and geoscience particularly well suited for "hands-on learning" and other approaches that augment the usual in-classroom activities.

One approach in science instruction is to have students actively learn through experiments and projects (*e.g.* Rehorek, 2004; Stamp and O'Brien, 2005). While this overall approach has received much attention in the science education literature, not all studies find it an effective approach (*e.g.* Kirschner, Sweller, and Clark, 2006). PISA 2006 asked principals about their school's use of five different out-of-classroom and extracurricular learning activities to teach 15-year-olds about environmental issues (Box 4.1, question 22): *i)* Outdoor education, *ii)* Trips to museums, *iii)* Trips to science and/or technology centres, *iv)* Extracurricular environmental research projects, and *v)* Lectures and/or seminars.

As shown in the upper chart of Figure 4.2, across the OECD and partner countries and economies most students are in schools that report using at least one of these activities to teach students about environmental science. On average, only 6% of students in OECD countries are in schools that do not organise out-of-classroom or extracurricular activities to teach environmental science. In Japan, though, 55% of students are

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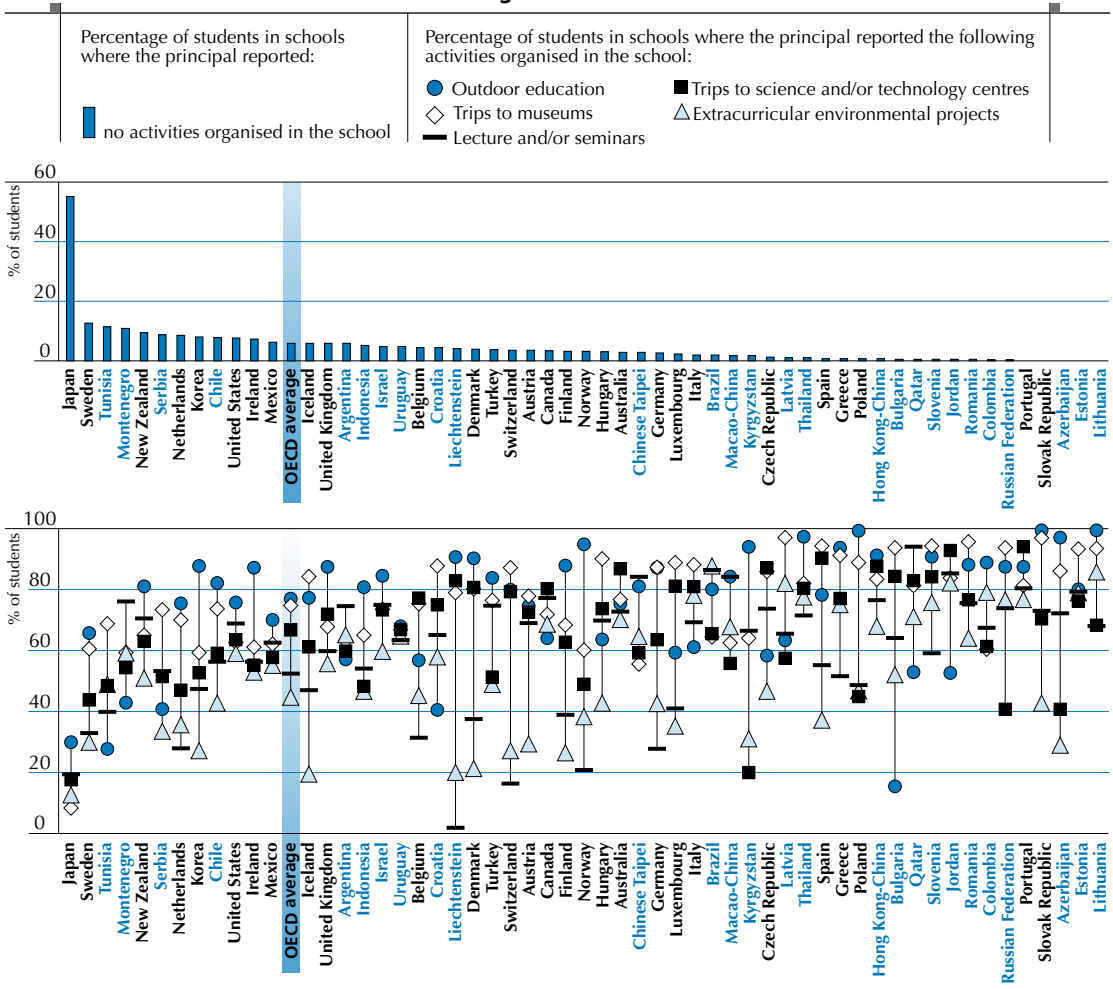


in schools whose principal report organising none of these. In Portugal and the Slovak Republic all schools use at least one of these activities. In partner countries and economies, according to school principals, these activities are if anything even more common than among OECD countries.

The most commonly used outside classroom learning activity for teaching about environmental science is outdoor education: almost eight out of ten students in OECD countries on average attend schools that use this approach. In Greece, Poland and the Slovak Republic, and in partner countries Azerbaijan, Colombia, Kyrgyzstan, Lithuania, Slovenia and Thailand, 90% or more of students attend schools that use outdoor education.

The next most frequently used activities outside of the classroom to learn about environmental science, according to school principals, is trips to museums. On average 77 and 75% of students in the OECD attend schools that report using these activities. In Poland and the Slovak Republic 99% of student enjoy outdoor education to learn about environmental science. In Hungary, Greece, Slovak Republic, and Spain 90% of

Figure 4.2
Outside classroom learning activities for environmental science



Source: *OECD PISA 2006 Database,* Table A4.3.
StatLink http://dx.doi.org/10.1787/562235784260

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students or more enjoy trips to museums to gain knowledge about environmental science. Compared to other OECD countries, Japan has a considerably lower proportion of students at schools reporting the use of museum trips (8%) and outdoor education (30%). Outdoor education is similarly popular in partner countries and economies and the proportion of students enjoying them to learn about environmental science ranges from 16% in Bulgaria to 99% in Lithuania. Trips to museums are also very common activities among students in partner countries and economies, as the proportions range from 56% in Chinese Taipei to 97% in Latvia. Trips to science and/or technology centres are reported somewhat less among OECD countries with an average of 67% of students in schools using this activity, with similar variation across countries. The same is true for partner countries and economies, where the range is between 93% of students in Jordan to 20% in Kyrgyzstan.

Guest lectures and seminars are used even less frequent: 52% of students on average attend schools in OECD countries that report using guest lectures or seminars. In Portugal (80%), Canada (77%) and Turkey (75%) more students are in schools that report this approach. Switzerland (16%) and Japan (19%) have the lowest proportion of students at schools that report using guest lectures and seminars. Among partner countries and economies, there is a large range in the proportion of students that enjoy these outside-the-classroom lectures with 94% of students in Qatar receiving them to 40% in Tunisia and just under 2% in Liechtenstein.

Extracurricular environmental projects tend to involve the lowest proportion of students among these outside-the-classroom learning approaches, and they are reported less frequently than any of the activities apart from environmental projects. On average across OECD countries, about 45% of students are in schools reporting this activity, and slightly fewer in the partner countries and economies (Table A4.2). Among OECD countries the use of projects is most common among schools in Greece, Portugal, and Italy all with 75% of students or more enjoying this type of activity. In Japan, at the other end, only 13% of students do so.

Finally, opportunities for environmental education also arise from the school infrastructure, with the school building itself seen as a source and environment for learning about the environment (see Box 4.2).

As with the curriculum placement question, there is no apparent association between student performance in environmental science and school activities to promote environmental science (Table A4.4). It could be that these types of activities are not effective in promoting learning or simply that school principals interpreted this question very differently across and even within countries.

SOURCES FOR LEARNING ABOUT ENVIRONMENTAL ISSUES

Unlike more abstract scientific topics, the environment is widely covered in the media, on the Internet, and is a topic of everyday discussion to which youth have wide access. PISA therefore asked students about the information sources from which they "mainly learned" about each of the six selected environmental issues described in Chapter 3 (Box 3.2, question 23). Students were given five sources and they could tick as many as they wished: *i)* School, *ii)* Media (TV, radio, newspapers, magazines), *iii)* Friends, *iv)* Family, and *v)* Internet or books, for each of the environmental issues.

Schools appear to play a central role as a source for learning about environmental issues. As shown in Figure 4.3, 15-year-olds report that they mainly learn about the environment from schools, followed by the media, then the Internet and books, and lastly family and friends. This pattern is common across all six of the issues. The average proportion of students in OECD countries responding that they mainly learn from school ranges from 58% for "nuclear waste" to 76% depending for "air pollution" (Table A4.5).



Box 4.2 The school building as a teacher

Schools buildings are more than just a backdrop for teaching students about the environment, more and more the buildings and landscapes are becoming teachers too. Jamieson *et al.* (2005) have found that curriculum and facility design are related; their findings demonstrate that the physical learning environment has an influence on students' social and scholastic behaviour. Safe, comfortable school facilities can motivate students to learn and create an atmosphere where children enjoy attending school (Rudd *et al.,* 2008). Environmental education tends to focus on a textbook approach, adapting curriculum to teach students about current issues surrounding environmental sustainability. However, the physical environment has a role to play in raising students' environmental awareness and knowledge. Findings from an online survey on sustainable school buildings showed that students were more eager to participate and performed better under the direction of school leaders committed to sustainable development practices (Wilkinson, 2008). The building can serve as a tool for instruction, in which students can learn from doing, seeing and experiencing, thus gaining a greater perspective of environmental issues.

Recycled construction materials, alternative energy sources, rainwater collection for irrigation and sanitary flushing, and maintenance and management of local nature preserves surrounding grounds are all modern responses that address pressing environmental dilemmas by changing how the school facility interacts with the environment. From newly-constructed to retrofitted construction choices, the varied possibilities demonstrate how education and relevant facilities can develop and expand students' environmental knowledge and its application.

Schools have taken various approaches to systematically incorporate environmental education via the facilities. There exists a range of potential approaches that are being used by schools to propel environmental education in the classroom, from one-time initiatives to larger scale. Some projects have started out as grassroots initiatives, in which a simple idea to implement recycling or to clean the forest behind the school has spiralled into whole-school adoption of sustainability concepts. This method engages students and staff to become more involved in 'greening' the school and increases consciousness of environmental issues. Schools can shape strategies to the existing space and facility. At the other end of the spectrum is an approach implemented from the conception of the school, where schools are designed and built to include as many sustainable features as are available and affordable. Increasingly, students are being included in the design process and contributing ideas which the architects are able to incorporate into the plan. This collaboration stimulates students' engagement and encourages broader thinking.

Case Study: Evolving environmental responsibility

Esquimalt High School, British Columbia, Canada

Environmental awareness started with a 'Waste Weigh-in' that displayed the amount of refuse produced within the school and cafeteria that could be recycled rather than thrown away. This prompted a new commitment to recycling and composting, thus creating an atmosphere of zero waste in the cafeteria as well as a more long-term commitment to the concept for the entire school. The compost is used in the school for food production and has reduced dependence on petroleum-based fertilisers. School educators and administrators believe that this effort has resulted in increased awareness of climate change among students, and that they are more mindful of the consequences of increased CO_2 emissions due to dumping refuse as opposed to recycling and reducing waste.



Canning Vale College, Perth, Australia

The school grounds and buildings are designed to be environmentally friendly in a way that exposes students and teachers to new environmental technologies. The recently constructed lower and upper secondary school incorporate exemplary features, including a wetland 'living stream' learning resource and 'solar chimney' passive ventilating elements. The school was built to be environmentally sustainable, but the commitment to these values has extended beyond construction features. As part of the school's philosophy, environmental responsibility has been given a high priority. The school aims to ensure that all students are aware, respectful and reactive to environmental issues. Drawing upon the adjoining wetlands and bush area, academic studies are augmented through the maintenance and monitoring of this natural area.

As the Canning Vale College example demonstrates, the exterior can provide an invaluable supplement to the curriculum. Gardens, forests, lagoons, parks, coastal zones and farms encourage students to move outside and experience nature and ecology firsthand. Gardens demonstrate ecosystem complexity and introduce students to local sustainable food sources and extensive recycling through composting (Blair, 2009). Engagement in the local environment and outdoor surroundings prompts encourages interactive learning beyond the classroom walls. Furthermore, Vaske and Kobrin (2001) found that individuals' exposure to and interaction with the natural environment through recycling, garden maintenance and discussion of related issues culminated in environmentally responsible attitudes and behaviours.

Case study: Biodiversity preservation and tending gardens

Williamstown High School and Sixth Form, Victoria, Australia

The school has adopted a whole school approach to sustainability and environmental education, including specific programmes within the curriculum, recycling, and student environmental groups, each of which encourages students to learn through action. The school website includes a downloadable chart of daily energy consumption, thus permitting students to monitor the amount of energy expended (*www.willihigh.vic.edu.au/).* The use of the infrastructure and the nearby marina are integral components of the school's environmental emphasis, which encourages students to engage in scientific experiments in water quality and coastal degradation and also preserve biodiversity through indigenous planting and composting. The school believes that direct student involvement in local concerns has raised overall awareness of environmental issues.

Buildings provide an opportunity for students to learn by examining the details of the design and construction. In this sense, the building becomes an interactive, animated textbook used to supplement traditional activities, offering students another perspective into environmental subjects and topics.

Case Study : Sustainable construction

Lycée Emmanuel HÉRÉ, Lorraine, France

The primary architectural aim of this secondary school is to reconstruct the building using innovative environmentally sustainable techniques and features. Currently still under construction, this facility will include solar panels, a green roof for improved insulation and acoustics, rainwater collection and photovoltaic panelling to supply sufficient electricity for the needs of the establishment. However, it is not just the materials and design of the building but also the construction process itself that is of notable educational value, especially since the students at this school are pursuing studies leading to future careers in the construction professions. Throughout the construction process, students can



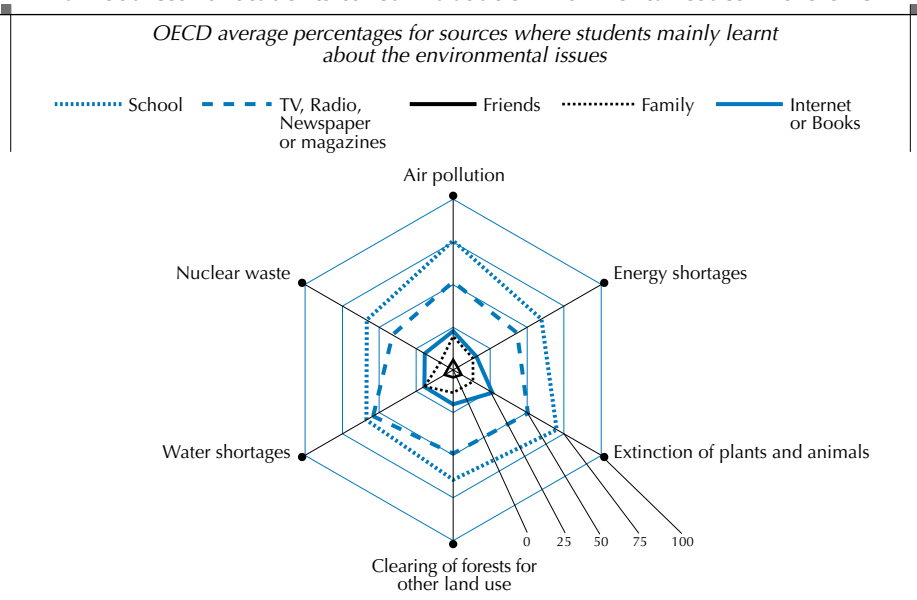
visit the site and survey the installation of the environmental technologies, greatly contributing to their understanding of how such technologies can be used, as well as about the industry many of them hope to enter. In addition, students can monitor the progress online through a webcam.[1]

These examples offer an insight into how secondary schools are developing students' relationships with the environment, also suggesting strategies for engaging students with these issues. The examples also show how students interact with the physical environment by doing, seeing, and experiencing. The case studies described above have not collected quantitative data elucidating the link between school facilities and environmental education outcomes. However, in each of the examples, observations from educators and teachers predict a positive influence between the school spaces and environmental knowledge. Repeated exposure to and interaction with the natural environment seems to generate greater comprehension and awareness of the environmental issues that continue to affect the planet.

For further information on the work of the OECD's Centre for Effective Learning Environments (CELE) on sustainable education facilities see *www.oecd.org/edu/facilities.*

The next most frequently cited source is print and electronic media. From 41% for "nuclear waste" to just over 52% of students for "air pollution" say they learn about environmental issues from TV, radio, newspapers and magazines. Although the Internet was less widely used in 2006 than it is now, between 19 and 27% of youth on average in OECD countries report using it and books to learn about environmental issues. On average between 9 and 20% of young people in OECD countries claim to learn about environmental issues from their family, while between 3 and 6% learn about these issues from their friends. The cross-country variation on these patterns is remarkably low.

Figure 4.3
Main sources for students to learn about environmental issues in the OECD



Source: *OECD PISA 2006 Database,* Table A4.5.
StatLink http://dx.doi.org/10.1787/562235784260

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Sources of knowledge and performance in the environmental science index

The variation in students' sources of knowledge is associated with student performance in environmental science and geoscience. In general, using additional sources is associated with higher performance. This section presents two sets of results. First, the unadjusted association between student's source of knowledge and performance. Second, the same relationship adjusted for student and school demographic and socioeconomic characteristics, using the same model as for the attitudinal indices (Figure 4.4). Detailed results are provided in Table A4.6.[2]

The strength of the relationship between sources of knowledge on environmental issues and performance varies across sources. In general, the best performing students are those that use not just one but several sources to learn about environmental sciences. These students rely on the school, media, and the Internet and books. The results suggest that they are combining information from all these sources.

Compared with students who did not check any source of knowledge or reported mainly learning from family or friends, across OECD countries, using solely the media or Internet and books as the main sources of knowledge is associated with an increase of 57 score points on the environmental science performance index before background variables are considered and 41 score points when the background variables are taken into account. The corresponding results for relaying solely on schools as the main source of knowledge is 27 score points before background variables are considered and 17 score points when the background variables are taken into account. Students claiming that they combine these sources of knowledge, namely schools, media, Internet and books, score 71 score points higher before accounting for background variables and 51 score points after accounting for background variables (Table A 4.6).

LEARNING ABOUT THE ENVIRONMENT: CONCLUSIONS AND IMPLICATIONS

The above evidence makes it clear that there is no single way in which students learn about the environment. While school is the most common source of such learning, many students are also using the the media and, to a lesser extent, other sources such as books and the Internet, to gain such knowledge.

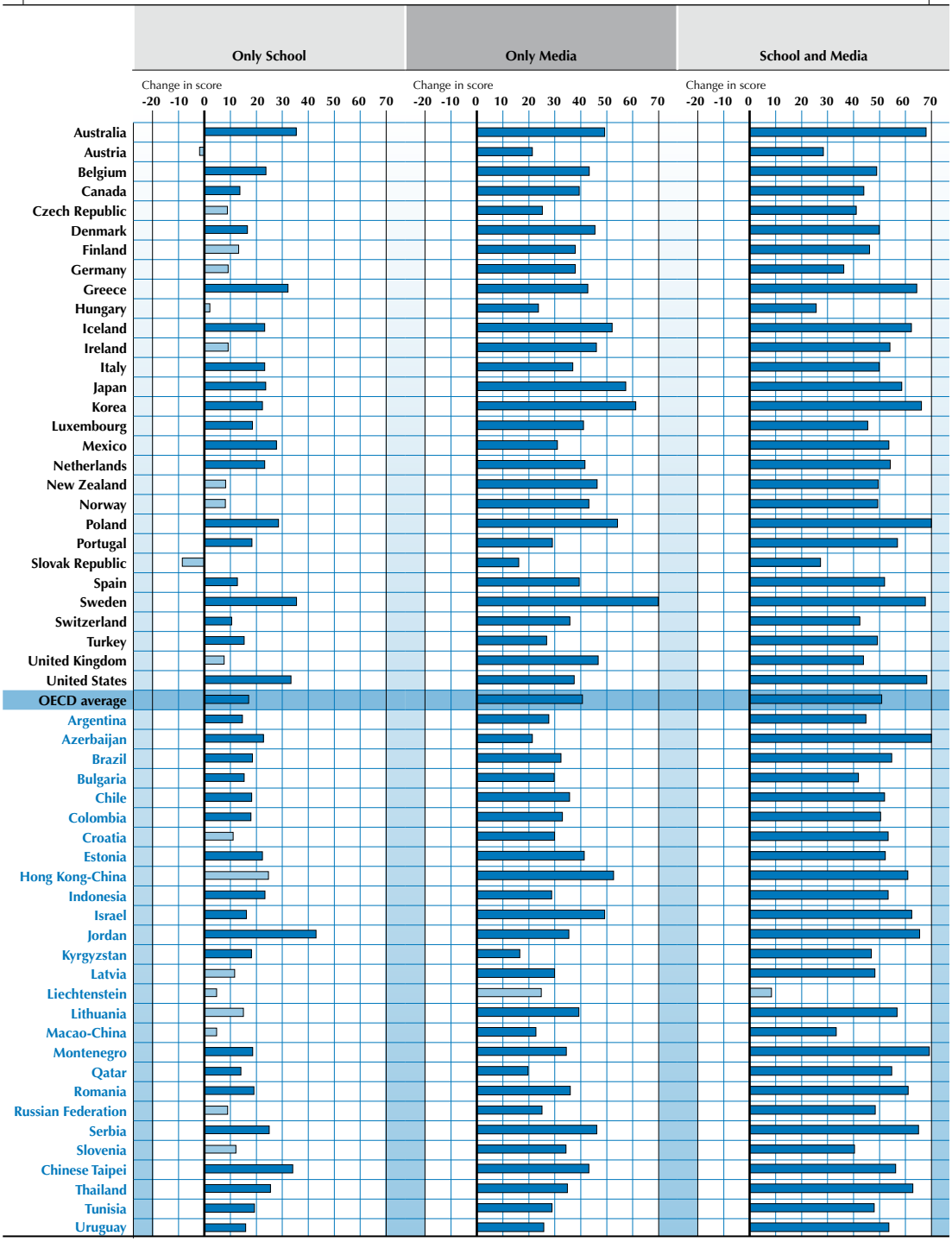
A strengthening of student attitudes and performance in environmental science is likely to come from multiple sources of learning. Students who have the interest and initiative to learn about the environment through the media and through the Internet tend to be the students with higher environmental science proficiency. While this does not show directly that such extracurricular learning has contributed to this proficiency, it does suggest that encouraging students to take a wider interest is an important part of environment education.

The evidence points to the important role that schools play in teaching environmental science. Within school, such learning can occur in many parts of the curriculum and there are notable variations in the extent to which environmental education pervades school curricula. While schools typically address the environment in both science and geography, there is greater variability in whether it appears elsewhere in the curriculum, and particularly strong difference across countries in the extent to which it is addressed through outdoor activities and school trips. Countries with fewer students enjoying a wide range of such activities should consider whether they need to widen young people's exposure to environmental issues.



Figure 4.4

Relationship between sources of students' knowledge about extinction of plants and animals and environmental science performance after accounting for background variables



Note: Statistically significant values are marked in darker colour.
Source: *OECD PISA 2006 Database*, Tables A4.6.
StatLink http://dx.doi.org/10.1787/562235784260

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Notes

1. The webcam is available here: *http://www3.ac-nancy-metz.fr/lyc-emanuel-here-laxou/articles.php?lng=fr&pg=120*

2. The analysis of the association between sources of information and the environmental science performance index focuses on one of the six environmental issues. The issue selected was the extinction of plants and animals, because it is the issue most students claimed to be familiar with (less than 3% of all students were unfamiliar with it). Three dummy (0/1) variables were constructed based on student responses. The first variable equals 1 when the student reported that is mainly learning from schools, but not from media or Internet and books. The second variable equals 1 when the student claimed that is learning mainly from media and/or Internet and books, but not from schools. The third variable equals 1 for students who learn mainly from schools but also from the media and/or Internet and books. This way we could separate the different effects on environmental science performance for students relying solely on schools, students relying solely on the media, Internet, or books, and students combining information from these two broadly defined sources. These three dummy variables were included in the model at the same time, so estimated associations are net of their effects on the environmental science performance index. The reference category is a student who claimed that is using none of the sources mentioned in the question or is learning mainly from family and friends. The small number of missing data was coded as zeroes. Similar analysis was then conducted for the other five environmental issues. Analogous results were found and are not reported here. It could, however, be legitimately assumed that the findings presented in the chapter could be generalised to other environmental problems.



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Appendix A

DATA TABLES

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[Part 1/1]

Table A2.1 Percentage of students by proficiency level in the environmental science performance index

		Below Level D		Level D		Level C		Level B		Level A	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
OECD	Australia	10.9	(0.4)	18.0	(0.4)	22.2	(0.4)	24.5	(0.5)	24.3	(0.6)
	Austria	15.4	(1.0)	20.7	(0.7)	21.2	(0.8)	22.8	(0.7)	19.9	(1.0)
	Belgium	14.4	(0.6)	18.6	(0.6)	21.5	(0.5)	23.5	(0.6)	21.9	(0.6)
	Canada	8.8	(0.4)	15.8	(0.5)	22.4	(0.5)	26.6	(0.5)	26.3	(0.6)
	Czech Republic	12.5	(0.8)	21.0	(0.7)	22.4	(0.7)	23.0	(0.8)	21.1	(0.9)
	Denmark	14.8	(0.9)	22.1	(0.6)	21.3	(0.6)	22.4	(0.7)	19.3	(0.8)
	Finland	6.2	(0.3)	13.7	(0.5)	21.1	(0.6)	28.1	(0.8)	30.9	(0.8)
	France	16.7	(0.8)	21.0	(0.7)	21.3	(0.7)	21.6	(0.6)	19.5	(0.8)
	Germany	13.6	(0.8)	18.6	(0.7)	20.7	(0.7)	24.3	(0.7)	22.9	(0.8)
	Greece	19.5	(0.9)	22.1	(0.6)	21.8	(0.7)	20.9	(0.7)	15.6	(0.7)
	Hungary	11.8	(0.6)	21.6	(0.8)	23.1	(0.6)	23.9	(0.7)	19.7	(0.8)
	Iceland	17.1	(0.7)	22.7	(0.7)	24.0	(0.7)	20.8	(0.6)	15.4	(0.6)
	Ireland	13.7	(0.7)	20.4	(0.7)	22.3	(0.6)	23.9	(0.7)	19.7	(0.8)
	Italy	22.2	(0.5)	24.8	(0.5)	21.1	(0.5)	18.4	(0.6)	13.4	(0.4)
	Japan	10.1	(0.6)	14.8	(0.5)	21.1	(0.5)	25.5	(0.7)	28.4	(0.9)
	Korea	11.1	(0.7)	17.3	(0.6)	21.2	(0.6)	24.7	(0.5)	25.7	(1.0)
	Luxembourg	18.1	(0.5)	23.4	(0.6)	22.5	(0.6)	20.1	(0.6)	15.9	(0.4)
	Mexico	32.7	(1.0)	33.2	(0.5)	19.9	(0.6)	9.8	(0.4)	4.3	(0.3)
	Netherlands	11.0	(0.8)	18.8	(0.8)	23.6	(0.7)	25.0	(0.9)	21.6	(0.7)
	New Zealand	12.3	(0.5)	19.3	(0.7)	21.8	(0.7)	22.6	(0.7)	24.0	(0.7)
	Norway	16.0	(0.8)	24.8	(0.6)	23.9	(0.7)	17.8	(0.7)	17.6	(0.7)
	Poland	12.7	(0.5)	21.7	(0.7)	22.5	(0.6)	23.0	(0.7)	20.1	(0.7)
	Portugal	20.4	(1.0)	25.8	(0.6)	24.0	(0.7)	18.8	(0.7)	11.1	(0.5)
	Slovak Republic	16.6	(0.9)	22.4	(0.8)	23.5	(0.6)	20.7	(0.7)	16.9	(0.8)
	Spain	15.6	(0.6)	22.4	(0.5)	24.0	(0.4)	21.3	(0.5)	16.7	(0.6)
	Sweden	15.0	(0.6)	22.8	(0.8)	23.1	(0.5)	21.5	(0.6)	17.6	(0.7)
	Switzerland	13.6	(0.7)	20.8	(0.6)	21.3	(0.4)	22.7	(0.7)	21.6	(0.8)
	Turkey	30.1	(1.0)	32.2	(0.9)	18.3	(0.6)	12.4	(0.7)	7.1	(0.8)
	United Kingdom	15.3	(0.5)	20.4	(0.5)	21.5	(0.5)	22.5	(0.6)	20.4	(0.5)
	United States	17.3	(1.0)	24.6	(0.7)	20.9	(0.7)	20.1	(0.7)	17.1	(0.9)
	OECD average	15.5	(0.1)	21.5	(0.1)	22.0	(0.1)	21.8	(0.1)	19.2	(0.1)
Partners	Argentina	35.5	(1.7)	29.7	(0.8)	17.1	(0.8)	12.3	(1.0)	5.4	(0.5)
	Azerbaijan	43.3	(1.2)	34.1	(0.8)	14.0	(0.7)	6.3	(0.5)	2.3	(0.3)
	Brazil	36.8	(0.9)	32.2	(0.7)	16.4	(0.6)	9.3	(0.4)	5.4	(0.5)
	Bulgaria	27.1	(1.4)	27.4	(1.0)	18.7	(0.8)	15.3	(0.8)	11.5	(1.0)
	Chile	26.2	(1.2)	29.7	(1.0)	21.0	(0.8)	14.2	(0.7)	8.8	(0.7)
	Colombia	35.2	(1.4)	34.2	(0.8)	16.9	(0.8)	9.1	(0.6)	4.6	(0.6)
	Croatia	14.1	(0.7)	23.6	(0.8)	23.9	(0.7)	22.2	(0.7)	16.3	(0.7)
	Estonia	8.4	(0.7)	16.9	(0.6)	22.6	(0.6)	26.5	(0.7)	25.6	(0.9)
	Hong Kong-China	8.2	(0.5)	13.8	(0.6)	19.8	(0.6)	26.0	(0.6)	32.1	(0.7)
	Indonesia	35.8	(1.3)	34.5	(0.8)	16.8	(0.8)	8.9	(0.7)	4.0	(0.7)
	Israel	26.1	(1.0)	24.2	(0.7)	18.7	(0.6)	16.3	(0.7)	14.7	(0.7)
	Jordan	27.4	(0.9)	28.4	(0.7)	20.6	(0.6)	15.1	(0.6)	8.6	(0.6)
	Kyrgyzstan	50.9	(1.0)	32.9	(0.6)	9.4	(0.5)	5.3	(0.4)	1.5	(0.2)
	Latvia	14.3	(0.8)	22.6	(0.8)	25.0	(0.8)	21.5	(0.9)	16.6	(0.6)
	Liechtenstein	9.8	(1.2)	21.8	(1.9)	23.1	(2.5)	24.1	(2.2)	21.1	(2.1)
	Lithuania	15.3	(0.6)	23.0	(0.7)	22.9	(0.6)	20.9	(0.7)	18.0	(0.8)
	Macao-China	10.3	(0.4)	17.5	(0.6)	23.6	(0.7)	26.4	(0.8)	22.2	(0.7)
	Montenegro	28.3	(0.7)	31.2	(0.8)	20.5	(0.7)	13.2	(0.6)	6.8	(0.4)
	Qatar	51.1	(0.7)	29.6	(0.7)	10.6	(0.4)	5.6	(0.3)	3.0	(0.2)
	Romania	29.7	(1.2)	31.6	(1.0)	18.6	(1.0)	12.9	(0.8)	7.2	(0.6)
	Russian Federation	15.3	(0.7)	25.5	(0.9)	22.7	(0.7)	20.9	(0.7)	15.7	(0.8)
	Serbia	25.6	(1.0)	29.3	(0.7)	21.4	(0.6)	15.6	(0.6)	8.1	(0.5)
	Slovenia	11.4	(0.4)	17.6	(0.5)	21.2	(0.6)	23.6	(0.7)	26.2	(0.7)
	Chinese Taipei	9.3	(0.6)	13.4	(0.7)	18.5	(0.6)	25.1	(0.6)	33.7	(1.1)
	Thailand	28.3	(0.8)	34.5	(0.7)	19.7	(0.5)	11.3	(0.5)	6.2	(0.4)
	Tunisia	36.8	(1.0)	32.5	(0.9)	16.9	(0.7)	9.6	(0.6)	4.2	(0.4)
	Uruguay	28.3	(0.8)	27.9	(0.7)	19.3	(0.7)	14.3	(0.5)	10.2	(0.5)

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[Part 1/1]

Table A2.2 Percentage of students by proficiency level in the geoscience performance index

		Below Level D		Level D		Level C		Level B		Level A	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
OECD	Australia	10.5	(0.4)	28.0	(0.5)	16.2	(0.3)	27.8	(0.4)	17.4	(0.5)
	Austria	14.6	(0.8)	32.1	(0.6)	14.5	(0.7)	23.5	(0.7)	15.3	(0.8)
	Belgium	12.8	(0.5)	27.2	(0.5)	15.7	(0.5)	26.6	(0.6)	17.8	(0.5)
	Canada	8.4	(0.3)	27.0	(0.6)	16.9	(0.4)	29.0	(0.6)	18.8	(0.4)
	Czech Republic	13.0	(0.7)	28.9	(0.8)	15.6	(0.7)	25.8	(0.7)	16.7	(0.8)
	Denmark	14.2	(0.8)	31.7	(0.7)	16.2	(0.6)	24.4	(0.7)	13.6	(0.5)
	Finland	6.1	(0.3)	22.5	(0.6)	15.4	(0.5)	31.2	(0.7)	24.8	(0.7)
	France	16.2	(0.8)	30.6	(0.6)	16.4	(0.6)	23.3	(0.7)	13.5	(0.6)
	Germany	12.6	(0.7)	29.3	(0.7)	15.0	(0.5)	24.4	(0.7)	18.7	(0.6)
	Greece	18.5	(0.7)	31.8	(0.7)	15.9	(0.5)	23.0	(0.7)	10.8	(0.6)
	Hungary	12.9	(0.7)	29.4	(0.7)	17.3	(0.6)	24.1	(0.6)	16.2	(0.7)
	Iceland	15.6	(0.6)	31.2	(0.7)	17.2	(0.7)	24.1	(0.8)	11.9	(0.5)
	Ireland	12.2	(0.6)	30.5	(0.8)	15.8	(0.5)	24.7	(0.7)	16.8	(0.7)
	Italy	20.4	(0.5)	33.8	(0.5)	15.4	(0.4)	20.1	(0.4)	10.4	(0.4)
	Japan	10.0	(0.7)	25.0	(0.6)	16.0	(0.5)	29.9	(0.6)	19.1	(0.6)
	Korea	10.7	(0.6)	27.3	(0.6)	15.8	(0.6)	26.5	(0.6)	19.7	(0.8)
	Luxembourg	17.3	(0.5)	35.2	(0.7)	15.7	(0.5)	20.5	(0.6)	11.4	(0.5)
	Mexico	28.8	(0.9)	39.6	(0.5)	15.6	(0.6)	13.1	(0.5)	3.0	(0.2)
	Netherlands	9.1	(0.7)	26.6	(0.9)	15.5	(0.5)	28.0	(0.9)	20.8	(0.7)
	New Zealand	12.0	(0.5)	28.7	(0.7)	16.9	(0.5)	27.0	(0.6)	15.4	(0.6)
	Norway	16.5	(0.8)	32.7	(0.7)	15.3	(0.6)	23.6	(0.7)	12.0	(0.6)
	Poland	13.9	(0.6)	28.4	(0.7)	15.6	(0.5)	26.7	(0.6)	15.4	(0.6)
	Portugal	17.8	(0.9)	37.2	(0.8)	18.1	(0.7)	18.8	(0.7)	8.2	(0.4)
	Slovak Republic	15.8	(0.7)	31.1	(0.7)	16.8	(0.5)	22.8	(0.7)	13.4	(0.6)
	Spain	14.6	(0.6)	31.9	(0.6)	16.5	(0.4)	24.1	(0.6)	12.9	(0.5)
	Sweden	15.5	(0.7)	33.4	(0.7)	16.2	(0.5)	22.3	(0.6)	12.6	(0.5)
	Switzerland	12.5	(0.5)	30.5	(0.6)	17.2	(0.4)	23.9	(0.7)	15.9	(0.7)
	Turkey	28.4	(1.0)	37.4	(0.8)	14.8	(0.5)	14.5	(0.7)	4.8	(0.6)
	United Kingdom	14.4	(0.5)	32.5	(0.6)	15.7	(0.4)	23.2	(0.5)	14.2	(0.4)
	United States	16.6	(1.0)	34.6	(0.7)	15.1	(0.6)	22.4	(0.7)	11.4	(0.7)
	OECD average	14.7	(0.1)	30.9	(0.1)	16.0	(0.1)	24.0	(0.1)	14.4	(0.1)
Partners	Argentina	31.4	(1.5)	36.8	(0.7)	13.1	(0.5)	13.6	(0.8)	5.1	(0.7)
	Azerbaijan	38.4	(1.0)	44.8	(0.7)	9.1	(0.5)	5.7	(0.5)	2.0	(0.3)
	Brazil	34.5	(0.8)	38.7	(0.6)	12.4	(0.5)	10.8	(0.5)	3.6	(0.3)
	Bulgaria	26.5	(1.3)	33.4	(1.0)	14.6	(0.7)	16.7	(0.9)	8.8	(0.7)
	Chile	25.1	(0.9)	36.0	(0.9)	16.6	(0.6)	17.3	(0.8)	5.0	(0.5)
	Colombia	33.4	(1.3)	38.5	(1.1)	14.4	(0.8)	11.4	(0.7)	2.3	(0.3)
	Croatia	15.0	(0.7)	31.2	(0.7)	16.7	(0.5)	23.5	(0.8)	13.6	(0.6)
	Estonia	7.8	(0.5)	24.6	(0.6)	17.8	(0.7)	30.0	(0.6)	19.8	(0.7)
	Hong Kong-China	7.9	(0.5)	25.7	(0.6)	15.5	(0.5)	28.7	(0.7)	22.1	(0.6)
	Indonesia	33.8	(1.4)	40.5	(1.1)	12.0	(0.9)	11.1	(1.0)	2.6	(0.5)
	Israel	27.6	(1.0)	33.8	(0.6)	13.4	(0.4)	15.8	(0.7)	9.4	(0.5)
	Jordan	28.7	(0.9)	35.8	(0.8)	14.5	(0.5)	15.5	(0.7)	5.5	(0.4)
	Kyrgyzstan	49.4	(0.9)	35.9	(0.7)	7.4	(0.4)	6.2	(0.4)	1.1	(0.2)
	Latvia	12.8	(0.7)	29.6	(0.9)	17.5	(0.6)	26.1	(0.8)	14.0	(0.6)
	Liechtenstein	9.2	(1.4)	30.8	(2.4)	18.3	(2.2)	24.7	(2.4)	17.1	(1.8)
	Lithuania	16.0	(0.7)	29.4	(0.8)	16.8	(0.5)	24.9	(0.7)	12.9	(0.6)
	Macao-China	10.3	(0.4)	27.4	(0.7)	18.1	(0.7)	27.8	(0.7)	16.3	(0.6)
	Montenegro	29.6	(0.6)	38.5	(0.7)	13.9	(0.6)	13.0	(0.5)	5.0	(0.4)
	Qatar	46.7	(0.7)	37.7	(0.6)	7.5	(0.4)	5.7	(0.3)	2.4	(0.2)
	Romania	29.6	(1.2)	36.9	(0.9)	13.5	(0.6)	14.8	(0.8)	5.3	(0.6)
	Russian Federation	15.8	(0.7)	32.4	(0.7)	17.1	(0.4)	21.3	(0.7)	13.4	(0.6)
	Serbia	26.0	(0.9)	38.0	(0.6)	15.2	(0.5)	14.2	(0.6)	6.5	(0.4)
	Slovenia	12.3	(0.4)	25.5	(0.7)	14.9	(0.5)	25.3	(0.7)	22.0	(0.6)
	Chinese Taipei	11.9	(0.6)	21.4	(0.7)	14.8	(0.4)	30.1	(0.6)	21.7	(0.8)
	Thailand	29.8	(0.8)	38.3	(0.7)	13.9	(0.6)	14.5	(0.5)	3.4	(0.3)
	Tunisia	35.2	(1.0)	38.4	(0.9)	12.5	(0.6)	10.6	(0.5)	3.2	(0.4)
	Uruguay	26.2	(0.8)	35.3	(0.7)	15.2	(0.6)	16.3	(0.6)	7.1	(0.4)

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[Part 1/1]

Table A2.3 Mean score on the environmental science performance index and on the geoscience performance index, by gender

		Environmental science performance index								Geoscience performance index							
		All students		Gender Differences						All students		Gender Differences					
				Females		Males		Difference (M – F)				Females		Males		Difference (M – F)	
		Mean	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.	Mean	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.
OECD	Australia	519	(1.8)	515	(2.1)	523	(2.6)	**7**	(3.1)	516	(1.5)	514	(1.9)	518	(2.4)	4	(3.0)
	Austria	502	(3.2)	497	(3.9)	507	(3.7)	**10**	(4.3)	501	(2.8)	495	(3.4)	506	(3.4)	**11**	(4.0)
	Belgium	508	(1.9)	504	(2.7)	511	(2.5)	**7**	(3.5)	512	(1.8)	508	(2.6)	515	(2.4)	7	(3.4)
	Canada	528	(1.5)	524	(1.7)	532	(1.9)	**8**	(1.9)	522	(1.3)	520	(1.6)	525	(1.7)	**5**	(2.2)
	Czech Republic	509	(2.6)	503	(3.6)	514	(3.4)	**10**	(4.7)	509	(2.4)	505	(3.3)	512	(3.2)	7	(4.4)
	Denmark	502	(2.7)	497	(3.0)	506	(3.1)	**9**	(3.0)	499	(2.1)	494	(2.6)	504	(2.4)	**10**	(2.7)
	Finland	543	(1.5)	541	(2.2)	544	(2.0)	3	(2.9)	541	(1.6)	540	(2.4)	542	(2.1)	3	(3.2)
	France	498	(2.6)	495	(3.0)	501	(3.5)	6	(3.8)	496	(2.4)	494	(2.9)	497	(3.0)	3	(3.4)
	Germany	513	(2.7)	505	(2.8)	521	(3.5)	**16**	(3.3)	513	(2.4)	507	(2.8)	518	(3.3)	**12**	(3.6)
	Greece	487	(2.6)	489	(2.9)	485	(3.5)	-4	(3.8)	487	(2.3)	490	(2.7)	483	(3.1)	-6	(3.6)
	Hungary	509	(2.3)	505	(3.2)	512	(3.0)	7	(4.0)	508	(2.1)	505	(3.1)	510	(2.8)	5	(4.0)
	Iceland	490	(1.6)	491	(2.1)	489	(2.3)	-2	(3.1)	494	(1.7)	494	(2.1)	494	(2.4)	0	(3.0)
	Ireland	506	(2.5)	500	(2.8)	512	(3.5)	**12**	(3.7)	508	(2.2)	505	(2.6)	512	(2.9)	**7**	(3.3)
	Italy	476	(1.6)	471	(2.0)	482	(2.2)	**11**	(2.8)	480	(1.4)	477	(2.0)	483	(2.1)	**7**	(2.9)
	Japan	529	(2.5)	525	(4.0)	534	(3.3)	10	(5.6)	523	(2.1)	518	(3.2)	527	(3.0)	9	(4.7)
	Korea	522	(2.5)	520	(3.2)	523	(4.0)	3	(5.1)	519	(2.2)	518	(2.7)	519	(3.5)	1	(4.3)
	Luxembourg	487	(1.1)	480	(1.9)	493	(2.0)	**13**	(3.2)	486	(1.2)	479	(2.0)	492	(2.1)	**13**	(3.3)
	Mexico	436	(1.9)	431	(2.1)	440	(2.3)	**9**	(2.2)	448	(1.8)	446	(2.0)	451	(2.2)	**5**	(1.9)
	Netherlands	514	(2.5)	509	(2.9)	519	(2.8)	**10**	(2.9)	524	(2.4)	521	(2.9)	528	(3.0)	**7**	(3.3)
	New Zealand	516	(2.0)	514	(2.6)	517	(3.1)	4	(4.1)	510	(1.8)	510	(2.5)	509	(2.7)	-1	(3.8)
	Norway	491	(2.3)	490	(2.5)	493	(2.8)	4	(2.8)	492	(2.2)	491	(2.5)	493	(2.7)	2	(2.8)
	Poland	507	(2.0)	503	(2.5)	510	(2.5)	**7**	(2.8)	506	(2.0)	504	(2.4)	508	(2.5)	4	(2.9)
	Portugal	475	(2.5)	470	(2.6)	480	(3.2)	**10**	(3.0)	478	(2.0)	474	(2.3)	483	(2.9)	**9**	(3.1)
	Slovak Republic	494	(2.6)	489	(2.7)	499	(3.8)	**10**	(4.1)	496	(2.2)	493	(2.4)	498	(3.3)	6	(3.7)
	Spain	495	(2.1)	491	(2.4)	500	(2.3)	**9**	(2.3)	497	(2.0)	493	(2.3)	501	(2.3)	**8**	(2.4)
	Sweden	497	(2.1)	494	(2.6)	501	(2.5)	**7**	(3.0)	493	(1.8)	492	(2.3)	495	(2.6)	3	(3.5)
	Switzerland	508	(2.6)	504	(2.9)	512	(2.8)	**8**	(2.4)	507	(2.1)	504	(2.3)	510	(2.4)	**6**	(2.3)
	Turkey	444	(3.1)	444	(3.6)	444	(3.5)	0	(3.5)	450	(2.7)	450	(3.2)	451	(3.2)	1	(3.3)
	United Kingdom	504	(1.5)	498	(2.2)	511	(2.0)	**13**	(2.9)	499	(1.4)	492	(1.9)	505	(1.8)	**13**	(2.4)
	United States	491	(3.4)	488	(3.4)	493	(4.0)	4	(3.2)	488	(3.0)	487	(3.2)	489	(3.7)	1	(3.5)
	OECD average	500	(0.4)	496	(0.5)	504	(0.5)	**7**	(0.6)	500	(0.4)	497	(0.5)	503	(0.5)	**5**	(0.6)
Partners	Argentina	435	(3.8)	437	(4.3)	434	(4.4)	-3	(4.4)	448	(3.6)	450	(4.5)	446	(3.7)	-4	(4.1)
	Azerbaijan	411	(2.4)	414	(2.6)	409	(3.0)	-5	(3.0)	421	(2.0)	421	(2.2)	420	(2.5)	-1	(2.5)
	Brazil	430	(2.0)	423	(2.1)	438	(2.6)	**15**	(2.3)	437	(1.7)	431	(2.1)	444	(2.4)	**13**	(2.9)
	Bulgaria	461	(4.2)	466	(5.0)	457	(4.9)	-9	(5.2)	466	(3.7)	469	(4.6)	463	(4.4)	-5	(5.1)
	Chile	458	(3.1)	448	(3.4)	466	(3.9)	**18**	(3.8)	461	(2.8)	456	(2.8)	466	(3.6)	**10**	(3.4)
	Colombia	431	(2.9)	426	(4.4)	436	(3.0)	**10**	(4.7)	441	(2.7)	438	(3.9)	444	(3.3)	6	(4.6)
	Croatia	498	(2.1)	494	(2.8)	501	(2.9)	6	(3.9)	499	(2.1)	497	(2.9)	500	(2.6)	3	(3.6)
	Estonia	528	(2.3)	528	(2.6)	527	(2.7)	0	(2.8)	528	(1.8)	527	(2.6)	528	(2.3)	1	(3.2)
	Hong Kong-China	540	(2.0)	536	(3.1)	545	(2.9)	**10**	(4.5)	530	(1.8)	527	(2.8)	532	(2.5)	6	(4.0)
	Indonesia	428	(4.1)	422	(2.9)	433	(5.7)	**11**	(4.3)	436	(4.2)	432	(3.0)	440	(5.5)	**8**	(3.6)
	Israel	469	(2.9)	465	(3.5)	473	(4.4)	9	(5.3)	465	(2.7)	460	(3.5)	469	(3.9)	9	(5.0)
	Jordan	455	(2.4)	465	(2.9)	445	(3.4)	**-20**	(4.1)	454	(2.3)	461	(2.7)	448	(3.1)	**-13**	(3.7)
	Kyrgyzstan	396	(1.8)	394	(1.8)	398	(2.7)	4	(2.8)	409	(1.7)	407	(1.8)	410	(2.6)	3	(2.9)
	Latvia	497	(2.4)	497	(2.7)	497	(2.9)	0	(3.1)	505	(2.3)	505	(2.7)	506	(2.9)	1	(3.2)
	Liechtenstein	514	(3.9)	517	(6.1)	511	(7.3)	-6	(10.9)	514	(4.3)	521	(6.4)	506	(7.0)	-14	(10.2)
	Lithuania	497	(2.2)	500	(2.9)	495	(2.4)	-5	(3.1)	497	(2.1)	499	(2.7)	495	(2.4)	-3	(3.2)
	Macao-China	518	(1.2)	516	(1.9)	520	(2.1)	5	(3.1)	514	(1.3)	514	(2.2)	515	(2.0)	2	(3.3)
	Montenegro	448	(1.2)	446	(1.8)	449	(1.9)	4	(2.8)	448	(1.4)	445	(1.8)	452	(2.3)	**8**	(3.1)
	Qatar	399	(1.1)	407	(1.5)	391	(1.5)	**-16**	(2.0)	410	(1.2)	416	(1.7)	404	(1.5)	**-12**	(2.3)
	Romania	446	(3.2)	441	(3.9)	450	(3.8)	**8**	(4.2)	451	(3.1)	449	(3.2)	452	(3.6)	3	(3.0)
	Russian Federation	493	(2.6)	489	(2.6)	498	(3.3)	10	(2.7)	496	(2.0)	493	(2.4)	499	(2.8)	6	(3.1)
	Serbia	458	(2.4)	457	(3.1)	458	(2.5)	1	(3.0)	459	(2.1)	458	(2.7)	460	(2.3)	2	(2.8)
	Slovenia	523	(1.3)	522	(2.3)	523	(2.2)	2	(3.6)	521	(1.4)	520	(2.4)	522	(2.4)	2	(3.9)
	Chinese Taipei	541	(3.1)	538	(4.4)	544	(3.5)	6	(4.8)	526	(2.5)	524	(3.5)	528	(3.0)	5	(4.3)
	Thailand	444	(1.9)	448	(2.3)	439	(2.7)	**-9**	(3.3)	447	(1.7)	451	(2.1)	442	(2.6)	**-9**	(3.0)
	Tunisia	428	(2.4)	428	(3.2)	427	(2.6)	-1	(3.2)	435	(2.2)	436	(2.8)	435	(2.7)	0	(3.2)
	Uruguay	456	(2.1)	453	(2.5)	459	(2.9)	6	(3.3)	462	(1.9)	462	(2.4)	463	(2.5)	1	(3.0)

Note: Values that are statistically significant are indicated in bold.

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[Part 1/1]

Table A2.4 Mean score on the environmental science performance index and on the geoscience performance index, by students' immigrant background

		Environmental science performance index								Geoscience performance index							
				Students' immigrant background								Students' immigrant background					
		All students		Native students		Students with an immigrant background (first- and second-generation)		Difference in performance between native students and student with an immigrant background		All students		Native students		Students with an immigrant background (first- and second-generation)		Difference in performance between native students and student with an immigrant background	
		Mean	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.	Mean	S.E.	Mean score	S.E.	Mean score	S.E.	Score dif.	S.E.
OECD	Australia	519	(1.8)	521	(1.5)	518	(4.3)	3	(4.1)	516	(1.5)	517	(1.4)	515	(3.8)	3	(3.8)
	Austria	502	(3.2)	512	(2.8)	444	(8.5)	**68**	(8.6)	501	(2.8)	508	(2.6)	453	(7.2)	**55**	(7.3)
	Belgium	508	(1.9)	516	(1.9)	453	(5.3)	**63**	(5.5)	512	(1.8)	519	(1.9)	463	(5.3)	**57**	(5.5)
	Canada	528	(1.5)	532	(1.6)	521	(3.8)	**11**	(4.1)	522	(1.3)	525	(1.3)	519	(3.1)	7	(3.4)
	Czech Republic	509	(2.6)	510	(2.6)	c	c	c	c	509	(2.4)	510	(2.4)	c	c	c	c
	Denmark	502	(2.7)	507	(2.5)	441	(7.0)	**66**	(6.8)	499	(2.1)	504	(1.9)	447	(6.3)	**56**	(6.1)
	Finland	543	(1.5)	545	(1.5)	c	c	c	c	541	(1.6)	542	(1.5)	c	c	c	c
	France	498	(2.6)	505	(2.7)	462	(7.1)	**43**	(7.8)	496	(2.4)	502	(2.5)	466	(6.9)	**36**	(7.6)
	Germany	513	(2.7)	525	(2.3)	461	(6.6)	**64**	(6.3)	513	(2.4)	522	(2.1)	470	(5.8)	**52**	(5.6)
	Greece	487	(2.6)	490	(2.6)	461	(9.3)	**30**	(9.2)	487	(2.3)	489	(2.3)	466	(8.4)	**23**	(8.4)
	Hungary	508	(2.3)	509	(2.3)	c	c	c	c	508	(2.1)	508	(2.1)	c	c	c	c
	Iceland	490	(1.6)	493	(1.6)	c	c	c	c	494	(1.7)	496	(1.7)	c	c	c	c
	Ireland	506	(2.5)	508	(2.4)	492	(9.7)	16	(9.7)	508	(2.2)	511	(2.2)	494	(8.5)	**17**	(8.5)
	Italy	476	(1.6)	479	(1.6)	439	(5.2)	**40**	(5.4)	480	(1.4)	482	(1.4)	447	(5.5)	**35**	(5.4)
	Japan	529	(2.5)	530	(2.5)	c	c	c	c	523	(2.1)	523	(2.1)	c	c	c	c
	Korea	522	(2.5)	523	(2.5)	c	c	c	c	519	(2.2)	519	(2.2)	c	c	c	c
	Luxembourg	487	(1.1)	506	(1.6)	454	(2.3)	**52**	(3.1)	486	(1.2)	501	(1.7)	460	(2.3)	**42**	(3.0)
	Mexico	436	(1.9)	439	(1.8)	c	c	c	c	448	(1.8)	451	(1.8)	c	c	c	c
	Netherlands	514	(2.5)	521	(2.1)	466	(7.9)	**54**	(7.8)	524	(2.4)	530	(2.1)	482	(6.8)	**48**	(6.7)
	New Zealand	515	(2.0)	519	(2.0)	507	(4.2)	**12**	(4.3)	510	(1.8)	512	(1.7)	505	(3.8)	**7**	(3.7)
	Norway	491	(2.3)	496	(2.1)	451	(7.9)	**45**	(7.5)	492	(2.2)	495	(2.1)	461	(7.0)	**34**	(6.7)
	Poland	507	(2.0)	508	(2.1)	c	c	c	c	506	(2.0)	507	(2.0)	c	c	c	c
	Portugal	475	(2.5)	478	(2.3)	441	(9.0)	**37**	(8.7)	478	(2.0)	481	(1.9)	446	(8.6)	**35**	(8.5)
	Slovak Republic	494	(2.6)	495	(2.6)	c	c	c	c	496	(2.2)	496	(2.2)	c	c	c	c
	Spain	495	(2.1)	499	(2.0)	459	(6.1)	**40**	(6.2)	497	(2.0)	500	(2.0)	463	(5.6)	**37**	(5.7)
	Sweden	497	(2.1)	503	(2.0)	463	(5.6)	**40**	(5.5)	493	(1.8)	498	(1.7)	464	(5.0)	**34**	(4.9)
	Switzerland	508	(2.6)	523	(2.4)	458	(4.0)	**65**	(3.6)	507	(2.1)	520	(2.0)	467	(3.3)	**53**	(2.9)
	Turkey	444	(3.1)	445	(3.1)	c	c	c	c	450	(2.7)	451	(2.8)	c	c	c	c
	United Kingdom	504	(1.5)	507	(1.4)	488	(7.6)	**19**	(7.7)	499	(1.4)	501	(1.4)	482	(6.5)	**19**	(6.7)
	United States	491	(3.4)	499	(3.4)	456	(5.5)	**43**	(5.3)	488	(3.0)	495	(3.1)	460	(5.2)	**35**	(5.3)
	OECD average	500	(0.4)	505	(0.4)	467	(1.5)	**41**	(1.5)	500	(0.4)	504	(0.4)	471	(1.3)	**34**	(1.4)
Partners	Argentina	435	(3.8)	435	(3.8)	c	c	c	c	448	(3.6)	448	(3.6)	c	c	c	c
	Azerbaijan	411	(2.4)	412	(2.5)	c	c	c	c	421	(2.0)	421	(2.1)	c	c	c	c
	Brazil	430	(2.0)	432	(2.1)	c	c	c	c	437	(1.7)	439	(1.8)	c	c	c	c
	Bulgaria	461	(4.2)	462	(4.2)	c	c	c	c	466	(3.7)	467	(3.7)	c	c	c	c
	Chile	458	(3.1)	458	(3.3)	c	c	c	c	461	(2.8)	462	(2.9)	c	c	c	c
	Colombia	431	(2.9)	432	(2.8)	c	c	c	c	441	(2.7)	442	(2.8)	c	c	c	c
	Croatia	498	(2.1)	500	(2.3)	484	(3.9)	**16**	(4.2)	499	(2.1)	501	(2.2)	489	(4.2)	**12**	(4.5)
	Estonia	528	(2.3)	531	(2.5)	512	(4.3)	**19**	(4.6)	528	(1.8)	531	(2.1)	508	(4.1)	**23**	(4.6)
	Hong Kong-China	540	(2.0)	544	(2.5)	536	(2.9)	**8**	(3.7)	530	(1.8)	534	(2.1)	525	(2.7)	**9**	(3.3)
	Indonesia	428	(4.1)	429	(4.0)	c	c	c	c	436	(4.2)	436	(4.1)	c	c	c	c
	Israel	469	(2.9)	475	(3.1)	468	(4.6)	**7**	(4.2)	465	(2.7)	469	(3.1)	468	(4.2)	1	(4.4)
	Jordan	455	(2.4)	454	(2.4)	474	(4.1)	**-19**	(4.1)	454	(2.3)	454	(2.5)	471	(3.5)	**-17**	(3.9)
	Kyrgyzstan	396	(1.8)	396	(1.8)	c	c	c	c	409	(1.7)	409	(1.7)	c	c	c	c
	Latvia	497	(2.4)	497	(2.5)	510	(4.5)	**-12**	(5.1)	505	(2.3)	506	(2.4)	512	(4.9)	-6	(5.0)
	Liechtenstein	514	(3.9)	526	(5.1)	493	(7.5)	**33**	(10.0)	514	(4.3)	523	(6.2)	499	(8.3)	**24**	(11.4)
	Lithuania	497	(2.2)	499	(2.2)	c	c	c	c	497	(2.1)	498	(2.1)	c	c	c	c
	Macao-China	518	(1.2)	513	(2.6)	521	(1.4)	**-8**	(3.0)	514	(1.3)	510	(2.7)	517	(1.6)	-6	(3.3)
	Montenegro	448	(1.2)	447	(1.2)	461	(6.1)	**-14**	(6.2)	448	(1.4)	447	(1.4)	469	(6.8)	**-22**	(6.8)
	Qatar	399	(1.1)	384	(1.2)	427	(2.2)	**-43**	(2.4)	410	(1.2)	397	(1.4)	434	(2.2)	**-37**	(2.6)
	Romania	446	(3.2)	445	(3.2)	c	c	c	c	451	(3.1)	451	(3.1)	c	c	c	c
	Russian Federation	493	(2.6)	495	(2.7)	484	(5.4)	**11**	(5.5)	496	(2.0)	497	(2.1)	488	(4.8)	9	(4.7)
	Serbia	458	(2.4)	458	(2.4)	462	(4.4)	-4	(4.4)	459	(2.1)	460	(2.1)	461	(4.3)	-1	(4.5)
	Slovenia	523	(1.3)	528	(1.4)	481	(5.0)	**47**	(5.4)	521	(1.4)	525	(1.5)	485	(6.6)	**41**	(6.9)
	Chinese Taipei	541	(3.1)	543	(3.0)	c	c	c	c	526	(2.5)	527	(2.4)	c	c	c	c
	Thailand	444	(1.9)	445	(1.9)	c	c	c	c	447	(1.7)	448	(1.7)	c	c	c	c
	Tunisia	428	(2.4)	429	(2.5)	c	c	c	c	435	(2.2)	436	(2.3)	c	c	c	c
	Uruguay	456	(2.1)	458	(2.1)	c	c	c	c	462	(1.9)	464	(1.9)	c	c	c	c

Note: Values that are statistically significant are indicated in bold. Countries with less than 30 students with an immigrant background and those where students constitute less than 3% of the population were not considered for the analysis.

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[Part 1/2]

Table A2.5 Performance on the environmental science index and on the geoscience index, adjusted by the PISA index of economic, social and cultural status (ESCS) and by quarters of the distribution of the index of ESCS in OECD countries

		Environmental science performance index											
		Unadjusted score		Score if ESCS equal to OECD average		Bottom quarter of ESCS distribution in OECD countries		Second quarter of ESCS distribution in OECD countries		Third quarter of ESCS distribution in OECD countries		Top quarter of ESCS distribution in OECD countries	
		Mean	S.E.	Adjusted Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.
OECD	Australia	519	(1.8)	513	(1.4)	481	(2.6)	505	(1.9)	523	(2.2)	550	(2.3)
	Austria	502	(3.2)	496	(3.1)	457	(7.0)	487	(4.0)	510	(3.5)	538	(3.1)
	Belgium	508	(1.9)	501	(1.9)	457	(4.1)	490	(2.9)	515	(2.7)	548	(1.9)
	Canada	528	(1.5)	521	(1.5)	496	(3.2)	513	(2.3)	531	(2.0)	548	(1.9)
	Czech Republic	509	(2.6)	507	(2.4)	473	(3.6)	496	(3.2)	521	(3.3)	549	(4.3)
	Denmark	502	(2.7)	493	(2.1)	459	(4.5)	484	(3.3)	502	(3.3)	534	(3.6)
	Finland	543	(1.5)	537	(1.5)	515	(3.9)	528	(3.0)	542	(2.5)	570	(2.6)
	France	498	(2.6)	503	(2.0)	455	(3.5)	489	(3.2)	517	(4.4)	554	(3.5)
	Germany	513	(2.7)	503	(2.4)	456	(5.6)	495	(3.6)	521	(2.9)	549	(2.6)
	Greece	487	(2.6)	492	(2.1)	458	(3.8)	488	(3.5)	494	(3.0)	527	(3.5)
	Hungary	509	(2.3)	512	(2.0)	473	(3.1)	504	(3.2)	520	(3.2)	554	(3.9)
	Iceland	490	(1.6)	474	(2.0)	451	(6.7)	465	(3.7)	483	(2.7)	506	(2.4)
	Ireland	506	(2.5)	508	(2.0)	475	(4.1)	501	(2.9)	518	(2.9)	541	(3.4)
	Italy	476	(1.6)	478	(1.5)	446	(1.8)	473	(2.3)	491	(2.6)	508	(3.6)
	Japan	529	(2.5)	531	(2.4)	497	(4.5)	526	(2.7)	545	(3.3)	554	(4.0)
	Korea	522	(2.5)	522	(2.2)	495	(4.5)	511	(3.0)	530	(3.0)	558	(4.7)
	Luxembourg	487	(1.1)	484	(1.2)	436	(2.3)	472	(3.5)	500	(2.6)	526	(2.1)
	Mexico	436	(1.9)	452	(2.2)	422	(1.9)	442	(2.4)	455	(2.4)	478	(4.7)
	Netherlands	514	(2.5)	505	(2.4)	470	(6.2)	496	(3.8)	513	(2.8)	549	(2.1)
	New Zealand	516	(2.0)	513	(1.7)	477	(3.4)	500	(2.6)	524	(3.0)	559	(3.0)
	Norway	491	(2.3)	481	(2.2)	451	(6.6)	471	(3.2)	490	(3.3)	518	(2.9)
	Poland	507	(2.0)	517	(1.8)	481	(2.5)	503	(2.5)	530	(3.4)	559	(3.5)
	Portugal	475	(2.5)	488	(1.8)	454	(3.1)	478	(3.0)	495	(4.3)	523	(3.2)
	Slovak Republic	494	(2.6)	498	(2.3)	461	(3.8)	492	(3.3)	510	(4.4)	537	(4.2)
	Spain	495	(2.1)	503	(1.6)	471	(2.4)	494	(3.0)	509	(3.0)	537	(3.0)
	Sweden	497	(2.1)	491	(1.8)	458	(3.9)	481	(3.0)	502	(2.7)	529	(4.2)
	Switzerland	508	(2.6)	505	(2.1)	464	(2.5)	499	(2.9)	516	(2.9)	548	(3.2)
	Turkey	444	(3.1)	470	(5.5)	432	(2.3)	461	(5.2)	475	(7.7)	523	(11.4)
	United Kingdom	504	(1.5)	499	(1.3)	461	(3.3)	486	(2.5)	511	(2.6)	545	(2.7)
	United States	491	(3.4)	486	(2.6)	448	(4.0)	470	(4.3)	498	(3.3)	534	(3.6)
	OECD average	500	(0.4)	499	(0.4)	464	(0.7)	490	(0.6)	510	(0.6)	538	(0.7)
Partners	Argentina	435	(3.8)	451	(3.0)	412	(3.0)	435	(4.4)	465	(5.8)	486	(5.0)
	Azerbaijan	411	(2.4)	414	(2.4)	406	(3.4)	409	(3.2)	413	(2.9)	429	(4.0)
	Brazil	430	(2.0)	452	(2.8)	413	(1.9)	443	(4.3)	454	(3.5)	502	(9.1)
	Bulgaria	461	(4.2)	469	(3.2)	427	(3.9)	457	(4.7)	482	(5.3)	512	(6.0)
	Chile	458	(3.1)	476	(2.8)	435	(2.3)	460	(4.0)	484	(5.0)	517	(4.9)
	Colombia	431	(2.9)	446	(2.9)	418	(3.0)	434	(5.5)	451	(5.3)	477	(6.0)
	Croatia	498	(2.1)	501	(1.9)	471	(3.4)	494	(2.9)	504	(3.0)	538	(3.4)
	Estonia	528	(2.3)	524	(2.3)	502	(4.3)	514	(3.6)	529	(3.0)	558	(3.2)
	Hong Kong-China	540	(2.0)	554	(2.2)	527	(2.7)	548	(2.9)	561	(4.4)	573	(6.2)
	Indonesia	428	(4.1)	451	(6.1)	419	(3.0)	453	(10.0)	457	(5.3)	c	c
	Israel	469	(2.9)	464	(2.9)	432	(5.4)	446	(5.4)	476	(3.6)	503	(3.9)
	Jordan	455	(2.4)	468	(2.4)	434	(2.1)	456	(3.6)	475	(3.4)	499	(5.7)
	Kyrgyzstan	396	(1.8)	405	(2.3)	386	(1.8)	400	(2.7)	407	(3.2)	430	(6.4)
	Latvia	497	(2.4)	497	(2.2)	476	(4.5)	487	(3.4)	504	(3.4)	525	(4.0)
	Liechtenstein	514	(3.9)	507	(4.2)	457	(8.9)	515	(8.7)	512	(9.5)	550	(8.7)
	Lithuania	497	(2.2)	496	(1.9)	462	(2.6)	491	(3.5)	502	(3.2)	536	(4.0)
	Macao-China	518	(1.2)	529	(2.2)	513	(1.4)	526	(3.0)	519	(5.5)	552	(7.3)
	Montenegro	448	(1.2)	448	(1.2)	426	(2.6)	445	(2.9)	450	(3.2)	476	(3.1)
	Qatar	399	(1.1)	398	(1.2)	390	(2.4)	387	(2.2)	400	(2.1)	413	(2.1)
	Romania	446	(3.2)	456	(3.3)	426	(4.0)	441	(3.6)	456	(6.3)	498	(6.4)
	Russian Federation	493	(2.6)	496	(2.3)	471	(3.6)	488	(3.5)	507	(3.2)	518	(4.5)
	Serbia	458	(2.4)	461	(2.0)	434	(3.1)	455	(2.9)	469	(3.6)	490	(3.0)
	Slovenia	523	(1.3)	518	(1.3)	475	(3.8)	508	(2.4)	531	(2.9)	567	(2.9)
	Chinese Taipei	541	(3.1)	553	(2.4)	511	(4.0)	544	(3.0)	562	(3.0)	595	(3.6)
	Thailand	444	(1.9)	474	(2.7)	433	(1.8)	465	(5.2)	480	(4.9)	516	(5.9)
	Tunisia	428	(2.4)	443	(3.9)	416	(2.0)	436	(5.7)	445	(5.4)	471	(8.0)
	Uruguay	456	(2.1)	468	(2.0)	435	(2.5)	453	(3.5)	468	(4.3)	507	(3.9)

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[Part 2/2]

Table A2.5 Performance on the environmental science index and on the geoscience index, adjusted by the PISA index of economic, social and cultural status (ESCS) and by quarters of the distribution of the index of ESCS in OECD countries

		Geoscience performance index											
		Unadjusted score		Score if ESCS equal to OECD average		Bottom quarter of ESCS distribution in OECD countries		Second quarter of ESCS distribution in OECD countries		Third quarter of ESCS distribution in OECD countries		Top quarter of ESCS distribution in OECD countries	
		Mean	S.E.	Adjusted Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.
OECD	Australia	516	(1.5)	511	(1.3)	486	(2.8)	503	(1.9)	519	(2.1)	541	(2.1)
	Austria	501	(2.8)	495	(2.7)	460	(5.8)	488	(3.6)	509	(3.6)	529	(3.3)
	Belgium	512	(1.8)	506	(1.8)	468	(4.0)	497	(3.2)	517	(2.3)	547	(1.8)
	Canada	522	(1.3)	516	(1.2)	497	(2.8)	511	(2.3)	525	(2.0)	538	(1.8)
	Czech Republic	509	(2.4)	507	(2.2)	479	(3.5)	497	(3.3)	518	(3.0)	542	(4.1)
	Denmark	499	(2.1)	492	(1.8)	464	(4.3)	486	(3.3)	500	(2.9)	524	(3.0)
	Finland	541	(1.6)	536	(1.6)	518	(3.9)	530	(2.9)	539	(2.6)	563	(2.9)
	France	496	(2.4)	500	(1.8)	460	(3.3)	490	(3.0)	510	(4.2)	540	(3.3)
	Germany	513	(2.4)	505	(2.2)	466	(5.1)	503	(3.2)	519	(3.0)	540	(2.6)
	Greece	487	(2.3)	490	(1.9)	462	(3.3)	486	(3.0)	492	(2.9)	520	(3.5)
	Hungary	508	(2.1)	510	(2.0)	477	(2.9)	508	(2.9)	515	(4.1)	545	(3.7)
	Iceland	494	(1.7)	480	(2.1)	457	(7.3)	472	(3.8)	489	(3.1)	508	(2.2)
	Ireland	508	(2.2)	509	(1.9)	482	(4.3)	504	(2.8)	518	(3.0)	537	(3.2)
	Italy	480	(1.4)	481	(1.4)	455	(2.0)	477	(2.1)	493	(2.2)	505	(3.0)
	Japan	523	(2.1)	524	(2.0)	495	(4.6)	520	(2.7)	535	(3.2)	544	(3.2)
	Korea	519	(2.2)	519	(2.0)	498	(3.8)	509	(3.0)	527	(3.0)	546	(4.1)
	Luxembourg	486	(1.2)	483	(1.2)	445	(2.5)	470	(3.2)	497	(2.5)	520	(2.5)
	Mexico	448	(1.8)	463	(1.8)	436	(2.0)	457	(2.5)	464	(2.5)	484	(3.6)
	Netherlands	524	(2.4)	517	(2.2)	488	(5.2)	509	(3.8)	523	(3.5)	554	(2.3)
	New Zealand	510	(1.8)	508	(1.6)	480	(3.3)	497	(2.9)	515	(3.1)	544	(3.0)
	Norway	492	(2.2)	484	(2.2)	464	(6.0)	474	(3.0)	491	(3.2)	513	(2.7)
	Poland	506	(2.0)	515	(1.8)	484	(2.8)	504	(2.7)	523	(3.5)	552	(3.4)
	Portugal	478	(2.0)	488	(1.7)	462	(2.6)	482	(3.0)	496	(4.3)	511	(3.5)
	Slovak Republic	496	(2.2)	499	(2.0)	468	(3.4)	493	(2.9)	509	(4.0)	532	(4.2)
	Spain	497	(2.0)	504	(1.5)	475	(2.4)	498	(2.7)	510	(3.0)	533	(2.3)
	Sweden	493	(1.8)	488	(1.7)	462	(3.4)	479	(2.9)	497	(2.4)	520	(3.2)
	Switzerland	507	(2.1)	505	(1.7)	475	(2.2)	503	(2.7)	511	(2.8)	538	(3.0)
	Turkey	450	(2.7)	473	(4.6)	440	(2.2)	467	(5.8)	477	(6.9)	513	(10.1)
	United Kingdom	499	(1.4)	494	(1.2)	465	(3.4)	484	(2.3)	505	(2.0)	531	(2.8)
	United States	488	(3.0)	484	(2.3)	454	(4.5)	467	(3.9)	496	(3.1)	524	(3.1)
	OECD average	500	(0.4)	500	(0.4)	471	(0.7)	492	(0.6)	508	(0.6)	531	(0.6)
Partners	Argentina	448	(3.6)	461	(3.1)	427	(2.9)	449	(5.0)	474	(5.5)	489	(4.7)
	Azerbaijan	421	(2.0)	423	(2.0)	418	(2.7)	417	(3.2)	420	(2.6)	433	(3.6)
	Brazil	437	(1.7)	455	(2.2)	424	(1.9)	449	(4.0)	455	(3.4)	492	(7.5)
	Bulgaria	466	(3.7)	473	(2.8)	435	(3.5)	464	(4.3)	485	(5.1)	511	(4.9)
	Chile	461	(2.8)	477	(2.5)	442	(2.3)	465	(3.4)	480	(4.8)	514	(4.9)
	Colombia	441	(2.7)	454	(2.8)	430	(2.6)	445	(6.2)	455	(5.5)	482	(6.6)
	Croatia	499	(2.1)	501	(2.0)	480	(3.2)	496	(3.0)	503	(3.5)	528	(3.4)
	Estonia	528	(1.8)	525	(1.9)	510	(3.6)	515	(3.3)	530	(2.9)	551	(2.8)
	Hong Kong-China	530	(1.8)	542	(2.0)	517	(2.4)	538	(2.7)	546	(4.8)	561	(6.5)
	Indonesia	436	(4.2)	453	(5.7)	429	(3.4)	455	(9.3)	458	(5.6)	c	c
	Israel	465	(2.7)	461	(2.7)	436	(5.1)	443	(5.1)	472	(3.3)	492	(4.1)
	Jordan	454	(2.3)	465	(2.2)	437	(2.3)	453	(3.6)	473	(3.3)	494	(5.0)
	Kyrgyzstan	409	(1.7)	416	(2.0)	400	(1.7)	411	(2.7)	421	(3.0)	439	(5.6)
	Latvia	505	(2.3)	506	(2.1)	485	(4.2)	500	(3.6)	514	(4.1)	528	(3.6)
	Liechtenstein	514	(4.3)	510	(4.5)	474	(12.4)	526	(9.1)	509	(9.9)	532	(9.4)
	Lithuania	497	(2.1)	496	(1.8)	466	(2.7)	493	(3.3)	503	(3.0)	528	(3.8)
	Macao-China	514	(1.3)	523	(2.4)	511	(1.7)	518	(3.5)	518	(5.5)	545	(7.9)
	Montenegro	448	(1.4)	449	(1.4)	431	(2.6)	446	(2.8)	447	(3.3)	475	(3.1)
	Qatar	410	(1.2)	409	(1.2)	402	(2.7)	398	(2.2)	411	(2.0)	421	(2.1)
	Romania	451	(3.1)	460	(3.1)	433	(4.8)	446	(3.5)	463	(5.5)	495	(5.7)
	Russian Federation	496	(2.0)	498	(1.8)	476	(3.2)	492	(2.9)	508	(3.2)	519	(3.5)
	Serbia	459	(2.1)	462	(1.8)	438	(2.7)	456	(2.7)	468	(3.0)	488	(3.3)
	Slovenia	521	(1.4)	517	(1.5)	483	(3.9)	508	(2.4)	530	(3.2)	554	(3.2)
	Chinese Taipei	526	(2.5)	535	(1.9)	501	(3.6)	529	(2.6)	542	(2.9)	570	(3.7)
	Thailand	447	(1.7)	472	(2.5)	438	(1.6)	465	(4.3)	476	(4.6)	509	(6.1)
	Tunisia	435	(2.2)	449	(3.5)	425	(2.1)	442	(4.7)	454	(5.4)	472	(7.3)
	Uruguay	462	(1.9)	472	(1.7)	443	(2.8)	459	(3.3)	475	(3.6)	503	(3.5)

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[Part 1/1]

Table A3.1 Students' familiarity with environmental issues

		Percentage of students who report that they are familiar with or know something about the following environmental issues through different sources											
		Air pollution		Energy shortages		Extinction of plants and animals		Clearing of forests for other land use		Water shortages		Nuclear waste	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
OECD	Australia	99	(0.15)	94	(0.24)	99	(0.11)	98	(0.14)	98	(0.10)	92	(0.32)
	Austria	99	(0.19)	90	(0.67)	99	(0.17)	98	(0.25)	94	(0.53)	90	(0.55)
	Belgium	98	(0.23)	81	(0.63)	96	(0.24)	94	(0.28)	89	(0.36)	84	(0.51)
	Canada	99	(0.10)	90	(0.34)	98	(0.12)	97	(0.15)	94	(0.22)	89	(0.35)
	Czech Republic	99	(0.16)	97	(0.26)	99	(0.17)	98	(0.25)	97	(0.30)	98	(0.25)
	Denmark	97	(0.33)	91	(0.48)	98	(0.29)	97	(0.29)	92	(0.46)	90	(0.56)
	Finland	99	(0.12)	92	(0.50)	100	(0.10)	97	(0.48)	96	(0.26)	94	(0.41)
	France	97	(0.33)	72	(0.74)	95	(0.30)	91	(0.40)	84	(0.69)	80	(0.59)
	Germany	98	(0.28)	92	(0.41)	99	(0.23)	97	(0.29)	93	(0.44)	87	(0.59)
	Greece	95	(0.52)	89	(0.57)	96	(0.39)	79	(0.71)	95	(0.40)	88	(0.57)
	Hungary	99	(0.21)	98	(0.25)	99	(0.17)	97	(0.24)	97	(0.29)	90	(0.53)
	Iceland	98	(0.21)	87	(0.50)	97	(0.28)	96	(0.32)	96	(0.37)	90	(0.44)
	Ireland	98	(0.24)	95	(0.39)	98	(0.27)	97	(0.30)	97	(0.28)	93	(0.40)
	Italy	97	(0.22)	94	(0.27)	98	(0.16)	96	(0.24)	97	(0.15)	84	(0.47)
	Japan	99	(0.14)	93	(0.38)	98	(0.23)	97	(0.29)	95	(0.33)	84	(0.59)
	Korea	99	(0.13)	97	(0.22)	98	(0.19)	87	(0.56)	99	(0.14)	87	(0.61)
	Luxembourg	97	(0.29)	80	(0.58)	97	(0.24)	94	(0.33)	87	(0.43)	81	(0.59)
	Mexico	98	(0.37)	81	(0.57)	98	(0.27)	97	(0.25)	98	(0.25)	82	(0.54)
	Netherlands	91	(0.56)	88	(0.61)	97	(0.31)	97	(0.37)	90	(0.58)	89	(0.52)
	New Zealand	98	(0.22)	95	(0.28)	98	(0.17)	96	(0.35)	95	(0.32)	87	(0.53)
	Norway	96	(0.25)	94	(0.33)	98	(0.24)	96	(0.32)	96	(0.31)	88	(0.74)
	Poland	99	(0.14)	98	(0.19)	99	(0.11)	99	(0.11)	96	(0.26)	83	(0.66)
	Portugal	99	(0.20)	93	(0.57)	99	(0.25)	98	(0.25)	96	(0.48)	93	(0.57)
	Slovak Republic	99	(0.18)	98	(0.23)	98	(0.20)	95	(0.34)	98	(0.25)	96	(0.36)
	Spain	99	(0.16)	96	(0.27)	99	(0.12)	96	(0.28)	99	(0.13)	92	(0.36)
	Sweden	96	(0.32)	89	(0.51)	97	(0.37)	76	(0.68)	93	(0.46)	89	(0.64)
	Switzerland	98	(0.20)	81	(0.54)	97	(0.20)	94	(0.29)	90	(0.39)	81	(0.46)
	Turkey	98	(0.19)	97	(0.29)	98	(0.43)	97	(0.26)	96	(0.32)	97	(0.50)
	United Kingdom	99	(0.14)	97	(0.24)	99	(0.15)	96	(0.28)	97	(0.30)	94	(0.37)
	United States	98	(0.27)	95	(0.38)	98	(0.24)	97	(0.28)	95	(0.38)	91	(0.43)
	OECD average	98	(0.05)	91	(0.07)	98	(0.04)	95	(0.06)	95	(0.06)	89	(0.09)
Partners	Argentina	97	(0.59)	87	(0.80)	97	(0.39)	93	(0.60)	93	(0.65)	76	(0.92)
	Azerbaijan	91	(0.57)	90	(0.47)	95	(0.38)	92	(0.50)	92	(0.48)	85	(0.71)
	Brazil	98	(0.22)	84	(0.82)	98	(0.23)	95	(0.39)	88	(0.72)	85	(0.55)
	Bulgaria	96	(0.56)	96	(0.34)	97	(0.34)	97	(0.42)	96	(0.42)	91	(0.57)
	Chile	97	(0.37)	93	(0.49)	96	(0.36)	89	(0.70)	94	(0.40)	80	(0.66)
	Colombia	100	(0.11)	99	(0.16)	99	(0.12)	99	(0.10)	100	(0.08)	96	(0.23)
	Croatia	56	(0.97)	87	(0.67)	97	(0.49)	94	(0.77)	95	(0.66)	79	(0.84)
	Estonia	99	(0.17)	98	(0.21)	100	(0.12)	98	(0.22)	99	(0.15)	98	(0.25)
	Hong Kong-China	99	(0.13)	93	(0.45)	99	(0.15)	98	(0.23)	96	(0.33)	93	(0.34)
	Indonesia	99	(0.10)	99	(0.21)	99	(0.16)	99	(0.20)	96	(0.31)	85	(0.71)
	Israel	97	(0.31)	97	(0.27)	98	(0.27)	96	(0.42)	97	(0.26)	70	(0.84)
	Jordan	92	(0.55)	88	(0.61)	93	(0.52)	87	(0.59)	95	(0.41)	73	(0.72)
	Kyrgyzstan	94	(0.50)	95	(0.41)	96	(0.42)	93	(0.47)	97	(0.32)	90	(0.49)
	Latvia	91	(0.54)	89	(0.58)	91	(0.50)	85	(0.65)	88	(0.61)	81	(0.65)
	Liechtenstein	99	(0.14)	91	(0.54)	99	(0.15)	99	(0.24)	93	(0.48)	92	(0.54)
	Lithuania	99	(0.42)	88	(1.44)	99	(0.58)	97	(0.76)	93	(1.03)	81	(2.04)
	Macao-China	99	(0.12)	94	(0.40)	100	(0.10)	97	(0.34)	93	(0.47)	87	(0.53)
	Montenegro	99	(0.11)	99	(0.19)	99	(0.14)	98	(0.22)	99	(0.17)	80	(0.68)
	Qatar	93	(0.38)	91	(0.44)	93	(0.36)	92	(0.43)	94	(0.38)	85	(0.58)
	Romania	85	(0.38)	85	(0.48)	90	(0.38)	87	(0.42)	89	(0.45)	74	(0.59)
	Russian Federation	98	(0.42)	86	(0.68)	98	(0.22)	95	(0.43)	91	(0.52)	91	(0.55)
	Serbia	99	(0.17)	96	(0.31)	98	(0.24)	99	(0.17)	95	(0.36)	96	(0.26)
	Slovenia	99	(0.19)	96	(0.28)	98	(0.21)	97	(0.30)	98	(0.21)	94	(0.36)
	Chinese Taipei	98	(0.24)	98	(0.26)	99	(0.17)	98	(0.28)	99	(0.20)	97	(0.28)
	Thailand	98	(0.27)	98	(0.30)	99	(0.22)	96	(0.30)	98	(0.22)	71	(0.77)
	Tunisia	90	(0.55)	90	(0.47)	89	(0.61)	88	(0.63)	90	(0.52)	71	(0.85)
	Uruguay	98	(0.23)	92	(0.51)	96	(0.31)	94	(0.45)	97	(0.27)	77	(0.66)

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[Part 1/1]

Index of students' sense of responsibility for environmental issues

Table A3.2 *Results based on students' self-reports*

		Index of students' sense of responsibility for environmental issues															
		All students		Males		Females		Gender difference (M – F)		Bottom quarter		Second quarter		Third quarter		Top quarter	
		Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.
OECD	Australia	-0.19	(0.01)	-0.29	(0.01)	-0.07	(0.01)	**-0.22**	(0.02)	-1.31	(0.02)	-0.48	(0.00)	0.01	(0.00)	1.03	(0.01)
	Austria	-0.03	(0.02)	-0.16	(0.02)	0.10	(0.02)	**-0.26**	(0.03)	-1.13	(0.02)	-0.42	(0.01)	0.18	(0.01)	1.25	(0.01)
	Belgium	-0.09	(0.02)	-0.15	(0.02)	-0.01	(0.02)	**-0.14**	(0.03)	-1.14	(0.03)	-0.44	(0.00)	0.08	(0.00)	1.15	(0.01)
	Canada	-0.10	(0.01)	-0.21	(0.02)	0.01	(0.02)	**-0.22**	(0.02)	-1.29	(0.02)	-0.45	(0.00)	0.13	(0.00)	1.20	(0.01)
	Czech Republic	0.02	(0.02)	-0.05	(0.02)	0.12	(0.02)	**-0.17**	(0.03)	-1.03	(0.02)	-0.40	(0.01)	0.21	(0.01)	1.31	(0.01)
	Denmark	-0.35	(0.02)	-0.44	(0.02)	-0.27	(0.02)	**-0.17**	(0.03)	-1.46	(0.02)	-0.66	(0.00)	-0.16	(0.00)	0.87	(0.02)
	Finland	-0.52	(0.01)	-0.65	(0.02)	-0.38	(0.02)	**-0.27**	(0.03)	-1.46	(0.01)	-0.81	(0.00)	-0.38	(0.01)	0.58	(0.02)
	France	0.04	(0.02)	-0.01	(0.02)	0.09	(0.02)	**-0.10**	(0.03)	-1.05	(0.02)	-0.31	(0.00)	0.24	(0.01)	1.27	(0.01)
	Germany	0.08	(0.02)	-0.04	(0.02)	0.20	(0.02)	**-0.24**	(0.03)	-1.05	(0.02)	-0.28	(0.00)	0.30	(0.01)	1.35	(0.00)
	Greece	0.14	(0.02)	0.05	(0.02)	0.23	(0.02)	**-0.18**	(0.03)	-0.91	(0.02)	-0.20	(0.00)	0.35	(0.01)	1.32	(0.01)
	Hungary	0.26	(0.02)	0.17	(0.02)	0.34	(0.02)	**-0.17**	(0.03)	-0.75	(0.02)	-0.06	(0.01)	0.44	(0.01)	1.39	(0.00)
	Iceland	-0.42	(0.02)	-0.47	(0.02)	-0.36	(0.02)	**-0.11**	(0.03)	-1.62	(0.01)	-0.88	(0.01)	-0.24	(0.01)	1.08	(0.01)
	Ireland	-0.26	(0.02)	-0.37	(0.03)	-0.16	(0.02)	**-0.20**	(0.03)	-1.50	(0.02)	-0.59	(0.00)	-0.04	(0.01)	1.08	(0.01)
	Italy	0.14	(0.01)	0.06	(0.02)	0.22	(0.01)	**-0.16**	(0.02)	-0.96	(0.01)	-0.26	(0.00)	0.40	(0.01)	1.39	(0.00)
	Japan	0.01	(0.01)	-0.07	(0.02)	0.09	(0.02)	**-0.16**	(0.03)	-1.07	(0.02)	-0.35	(0.00)	0.20	(0.01)	1.28	(0.01)
	Korea	0.07	(0.01)	0.08	(0.02)	0.07	(0.02)	0.01	(0.02)	-0.81	(0.02)	-0.25	(0.00)	0.16	(0.01)	1.19	(0.01)
	Luxembourg	-0.02	(0.02)	-0.12	(0.02)	0.09	(0.02)	**-0.21**	(0.03)	-1.32	(0.02)	-0.40	(0.01)	0.28	(0.01)	1.38	(0.00)
	Mexico	0.57	(0.02)	0.47	(0.02)	0.66	(0.02)	**-0.19**	(0.03)	-0.59	(0.02)	0.29	(0.00)	1.20	(0.01)	1.39	(0.00)
	Netherlands	-0.01	(0.02)	-0.10	(0.02)	0.08	(0.02)	**-0.19**	(0.03)	-1.11	(0.01)	-0.40	(0.00)	0.18	(0.01)	1.28	(0.01)
	New Zealand	-0.31	(0.01)	-0.42	(0.02)	-0.22	(0.02)	**-0.19**	(0.03)	-1.47	(0.02)	-0.62	(0.00)	-0.10	(0.01)	0.94	(0.01)
	Norway	-0.40	(0.02)	-0.54	(0.03)	-0.25	(0.02)	**-0.30**	(0.03)	-1.72	(0.03)	-0.75	(0.00)	-0.15	(0.01)	1.03	(0.01)
	Poland	0.01	(0.02)	-0.13	(0.02)	0.16	(0.02)	**-0.29**	(0.02)	-1.15	(0.02)	-0.33	(0.01)	0.25	(0.01)	1.29	(0.01)
	Portugal	0.60	(0.01)	0.53	(0.02)	0.66	(0.02)	**-0.13**	(0.03)	-0.56	(0.02)	0.32	(0.01)	1.24	(0.01)	1.40	(0.00)
	Slovak Republic	0.18	(0.02)	0.13	(0.02)	0.23	(0.02)	**-0.10**	(0.03)	-0.91	(0.02)	-0.19	(0.01)	0.41	(0.01)	1.39	(0.00)
	Spain	0.58	(0.01)	0.47	(0.01)	0.70	(0.01)	**-0.23**	(0.02)	-0.57	(0.01)	0.29	(0.01)	1.22	(0.01)	1.40	(0.00)
	Sweden	-0.43	(0.02)	-0.57	(0.02)	-0.27	(0.02)	**-0.30**	(0.03)	-1.63	(0.02)	-0.78	(0.00)	-0.25	(0.01)	0.96	(0.02)
	Switzerland	-0.12	(0.01)	-0.21	(0.02)	-0.04	(0.02)	**-0.17**	(0.02)	-1.20	(0.01)	-0.47	(0.00)	0.05	(0.00)	1.13	(0.01)
	Turkey	0.88	(0.02)	0.76	(0.03)	1.03	(0.02)	**-0.27**	(0.03)	-0.45	(0.04)	1.19	(0.01)	1.39	(0.00)	1.40	(0.00)
	United Kingdom	-0.30	(0.01)	-0.35	(0.02)	-0.25	(0.02)	**-0.10**	(0.02)	-1.48	(0.02)	-0.60	(0.00)	-0.09	(0.01)	0.97	(0.01)
	United States	-0.08	(0.02)	-0.21	(0.03)	0.06	(0.02)	**-0.27**	(0.04)	-1.40	(0.03)	-0.44	(0.01)	0.21	(0.01)	1.30	(0.01)
	OECD average	0.00	(0.00)	-0.10	(0.00)	0.10	(0.00)	**-0.19**	(0.01)	-1.14	(0.00)	-0.32	(0.00)	0.26	(0.00)	1.20	(0.00)
Partners	Argentina	0.42	(0.02)	0.33	(0.03)	0.51	(0.02)	**-0.18**	(0.03)	-0.78	(0.02)	0.08	(0.01)	1.00	(0.01)	1.39	(0.00)
	Azerbaijan	0.29	(0.03)	0.21	(0.03)	0.36	(0.03)	**-0.15**	(0.03)	-1.03	(0.02)	-0.11	(0.01)	0.89	(0.02)	1.39	(0.00)
	Brazil	0.52	(0.02)	0.38	(0.02)	0.64	(0.02)	**-0.26**	(0.03)	-0.75	(0.02)	0.22	(0.01)	1.21	(0.01)	1.39	(0.00)
	Bulgaria	0.37	(0.02)	0.24	(0.03)	0.50	(0.03)	**-0.27**	(0.04)	-0.87	(0.02)	0.01	(0.00)	0.94	(0.01)	1.39	(0.00)
	Chile	0.52	(0.01)	0.45	(0.02)	0.60	(0.02)	**-0.15**	(0.03)	-0.54	(0.01)	0.19	(0.01)	1.03	(0.01)	1.39	(0.00)
	Colombia	0.71	(0.03)	0.60	(0.04)	0.80	(0.03)	**-0.20**	(0.04)	-0.57	(0.03)	0.62	(0.02)	1.39	(0.00)	1.40	(0.00)
	Croatia	0.44	(0.02)	0.35	(0.02)	0.53	(0.02)	**-0.19**	(0.02)	-0.72	(0.02)	0.07	(0.00)	1.01	(0.01)	1.39	(0.00)
	Estonia	-0.04	(0.01)	-0.10	(0.02)	0.03	(0.02)	**-0.12**	(0.03)	-1.01	(0.01)	-0.35	(0.00)	0.11	(0.01)	1.10	(0.01)
	Hong Kong-China	-0.02	(0.02)	-0.04	(0.02)	0.00	(0.02)	-0.04	(0.03)	-1.16	(0.02)	-0.43	(0.01)	0.21	(0.01)	1.30	(0.01)
	Indonesia	0.38	(0.02)	0.24	(0.03)	0.52	(0.02)	**-0.28**	(0.03)	-0.94	(0.02)	0.04	(0.01)	1.02	(0.01)	1.39	(0.00)
	Israel	-0.26	(0.02)	-0.32	(0.03)	-0.20	(0.03)	**-0.11**	(0.04)	-1.43	(0.04)	-0.48	(0.00)	-0.02	(0.01)	0.90	(0.02)
	Jordan	-0.01	(0.02)	-0.09	(0.02)	0.08	(0.02)	**-0.18**	(0.03)	-1.10	(0.02)	-0.38	(0.01)	0.20	(0.01)	1.27	(0.01)
	Kyrgyzstan	0.01	(0.02)	-0.13	(0.03)	0.12	(0.03)	**-0.26**	(0.04)	-1.50	(0.03)	-0.36	(0.01)	0.49	(0.01)	1.39	(0.00)
	Latvia	-0.06	(0.01)	-0.16	(0.02)	0.03	(0.02)	**-0.19**	(0.03)	-1.07	(0.01)	-0.40	(0.01)	0.11	(0.01)	1.11	(0.01)
	Liechtenstein	-0.13	(0.06)	-0.15	(0.09)	-0.12	(0.07)	-0.03	(0.12)	-1.32	(0.08)	-0.51	(0.02)	0.08	(0.02)	1.21	(0.04)
	Lithuania	0.06	(0.01)	0.00	(0.02)	0.13	(0.02)	**-0.13**	(0.03)	-0.94	(0.02)	-0.27	(0.00)	0.22	(0.01)	1.23	(0.01)
	Macao-China	0.11	(0.02)	0.01	(0.02)	0.22	(0.02)	**-0.20**	(0.03)	-1.19	(0.02)	-0.25	(0.01)	0.50	(0.01)	1.39	(0.00)
	Montenegro	0.22	(0.02)	0.17	(0.02)	0.28	(0.02)	**-0.12**	(0.03)	-1.00	(0.02)	-0.14	(0.01)	0.64	(0.02)	1.39	(0.00)
	Qatar	-0.23	(0.01)	-0.28	(0.02)	-0.18	(0.02)	**-0.10**	(0.03)	-1.54	(0.02)	-0.60	(0.00)	0.00	(0.01)	1.23	(0.01)
	Romania	-0.16	(0.02)	-0.24	(0.03)	-0.08	(0.03)	**-0.16**	(0.05)	-1.31	(0.03)	-0.47	(0.01)	0.04	(0.01)	1.11	(0.01)
	Russian Federation	0.17	(0.02)	0.09	(0.03)	0.25	(0.03)	**-0.16**	(0.02)	-0.88	(0.02)	-0.15	(0.00)	0.34	(0.00)	1.37	(0.00)
	Serbia	0.25	(0.02)	0.20	(0.02)	0.31	(0.02)	**-0.11**	(0.03)	-0.94	(0.02)	-0.09	(0.00)	0.66	(0.01)	1.39	(0.00)
	Slovenia	0.11	(0.01)	0.05	(0.02)	0.17	(0.02)	**-0.13**	(0.03)	-1.01	(0.02)	-0.23	(0.01)	0.36	(0.01)	1.33	(0.01)
	Chinese Taipei	0.52	(0.02)	0.45	(0.02)	0.59	(0.02)	**-0.14**	(0.02)	-1.01	(0.03)	0.30	(0.01)	1.39	(0.00)	1.40	(0.00)
	Thailand	0.29	(0.02)	0.09	(0.03)	0.43	(0.02)	**-0.34**	(0.04)	-0.99	(0.03)	-0.06	(0.01)	0.81	(0.01)	1.39	(0.00)
	Tunisia	-0.16	(0.02)	-0.19	(0.02)	-0.14	(0.02)	-0.05	(0.03)	-1.14	(0.02)	-0.47	(0.01)	0.00	(0.01)	0.96	(0.02)
	Uruguay	0.15	(0.02)	0.10	(0.02)	0.19	(0.02)	**-0.09**	(0.03)	-0.87	(0.02)	-0.14	(0.00)	0.37	(0.01)	1.24	(0.01)

Note: Values that are statistically significant are indicated in bold.

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[Part 1/1]

Index of students' optimism regarding environmental issues

Table A3.3 *Results based on students' self-reports*

		Index of students' optimism regarding environmental issues															
		All students		Males		Females		Gender difference (M – F)		Bottom quarter		Second quarter		Third quarter		Top quarter	
		Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.
OECD	Australia	-0.13	(0.01)	-0.03	(0.02)	-0.24	(0.02)	**0.21**	(0.02)	-1.43	(0.01)	-0.42	(0.00)	0.20	(0.00)	1.13	(0.01)
	Austria	-0.21	(0.02)	-0.12	(0.02)	-0.31	(0.02)	**0.20**	(0.02)	-1.29	(0.01)	-0.40	(0.01)	0.08	(0.00)	0.76	(0.01)
	Belgium	-0.17	(0.01)	-0.11	(0.02)	-0.23	(0.02)	**0.12**	(0.02)	-1.41	(0.01)	-0.40	(0.01)	0.15	(0.00)	0.98	(0.02)
	Canada	-0.22	(0.01)	-0.07	(0.01)	-0.37	(0.02)	**0.30**	(0.02)	-1.54	(0.00)	-0.49	(0.00)	0.15	(0.00)	1.02	(0.01)
	Czech Republic	0.06	(0.02)	0.14	(0.02)	-0.04	(0.02)	**0.18**	(0.03)	-1.14	(0.02)	-0.15	(0.00)	0.36	(0.01)	1.17	(0.02)
	Denmark	0.07	(0.02)	0.16	(0.02)	-0.01	(0.02)	**0.17**	(0.03)	-1.01	(0.02)	-0.11	(0.01)	0.36	(0.00)	1.06	(0.02)
	Finland	0.00	(0.01)	0.10	(0.02)	-0.10	(0.02)	**0.20**	(0.02)	-1.13	(0.01)	-0.15	(0.00)	0.30	(0.00)	0.98	(0.02)
	France	-0.11	(0.02)	-0.09	(0.02)	-0.13	(0.02)	0.03	(0.03)	-1.30	(0.01)	-0.36	(0.01)	0.18	(0.00)	1.04	(0.02)
	Germany	-0.10	(0.01)	-0.01	(0.02)	-0.20	(0.02)	**0.19**	(0.03)	-1.25	(0.01)	-0.28	(0.01)	0.19	(0.00)	0.92	(0.02)
	Greece	0.06	(0.02)	0.20	(0.02)	-0.08	(0.02)	**0.29**	(0.03)	-1.25	(0.02)	-0.19	(0.00)	0.40	(0.01)	1.28	(0.02)
	Hungary	-0.05	(0.02)	-0.02	(0.02)	-0.09	(0.02)	**0.07**	(0.03)	-1.30	(0.01)	-0.24	(0.01)	0.25	(0.01)	1.09	(0.02)
	Iceland	0.03	(0.01)	0.09	(0.02)	-0.02	(0.02)	**0.12**	(0.03)	-1.17	(0.01)	-0.15	(0.00)	0.35	(0.00)	1.10	(0.02)
	Ireland	0.12	(0.02)	0.24	(0.02)	0.01	(0.02)	**0.23**	(0.03)	-1.10	(0.01)	-0.10	(0.01)	0.43	(0.01)	1.26	(0.02)
	Italy	0.03	(0.01)	0.11	(0.02)	-0.04	(0.02)	**0.15**	(0.02)	-1.15	(0.01)	-0.17	(0.00)	0.33	(0.00)	1.14	(0.01)
	Japan	0.10	(0.02)	0.16	(0.03)	0.04	(0.02)	**0.12**	(0.03)	-1.30	(0.01)	-0.09	(0.01)	0.48	(0.00)	1.32	(0.02)
	Korea	0.37	(0.02)	0.42	(0.03)	0.31	(0.02)	**0.11**	(0.03)	-1.08	(0.01)	0.11	(0.01)	0.68	(0.00)	1.76	(0.02)
	Luxembourg	-0.18	(0.01)	-0.09	(0.02)	-0.26	(0.02)	**0.17**	(0.02)	-1.43	(0.01)	-0.41	(0.01)	0.13	(0.00)	0.99	(0.02)
	Mexico	-0.14	(0.02)	-0.14	(0.03)	-0.14	(0.03)	0.00	(0.03)	-1.55	(0.00)	-0.52	(0.00)	0.14	(0.01)	1.35	(0.02)
	Netherlands	0.09	(0.02)	0.16	(0.03)	0.02	(0.02)	**0.15**	(0.04)	-1.15	(0.01)	-0.12	(0.01)	0.42	(0.01)	1.22	(0.02)
	New Zealand	-0.22	(0.02)	-0.14	(0.02)	-0.30	(0.02)	**0.15**	(0.03)	-1.53	(0.01)	-0.49	(0.01)	0.13	(0.00)	1.01	(0.02)
	Norway	0.42	(0.02)	0.54	(0.02)	0.30	(0.02)	**0.24**	(0.03)	-0.80	(0.02)	0.19	(0.01)	0.67	(0.00)	1.64	(0.02)
	Poland	0.19	(0.02)	0.26	(0.02)	0.12	(0.02)	**0.15**	(0.03)	-1.10	(0.02)	-0.06	(0.01)	0.50	(0.00)	1.42	(0.02)
	Portugal	-0.20	(0.02)	-0.09	(0.03)	-0.30	(0.03)	**0.21**	(0.03)	-1.59	(0.00)	-0.57	(0.01)	0.04	(0.01)	1.32	(0.02)
	Slovak Republic	-0.08	(0.02)	-0.02	(0.02)	-0.15	(0.02)	**0.12**	(0.03)	-1.34	(0.01)	-0.33	(0.01)	0.24	(0.00)	1.10	(0.02)
	Spain	0.17	(0.01)	0.24	(0.02)	0.10	(0.02)	**0.14**	(0.03)	-1.12	(0.01)	-0.07	(0.00)	0.50	(0.00)	1.38	(0.01)
	Sweden	0.19	(0.02)	0.29	(0.02)	0.10	(0.02)	**0.19**	(0.03)	-1.06	(0.01)	-0.01	(0.01)	0.51	(0.00)	1.33	(0.02)
	Switzerland	-0.10	(0.01)	-0.02	(0.01)	-0.18	(0.01)	**0.16**	(0.02)	-1.26	(0.01)	-0.29	(0.00)	0.18	(0.00)	0.98	(0.01)
	Turkey	-0.08	(0.03)	0.04	(0.03)	-0.22	(0.04)	**0.25**	(0.05)	-1.61	(0.00)	-0.61	(0.01)	0.31	(0.01)	1.60	(0.03)
	United Kingdom	-0.07	(0.01)	0.05	(0.02)	-0.19	(0.02)	**0.24**	(0.03)	-1.45	(0.01)	-0.36	(0.01)	0.27	(0.00)	1.25	(0.02)
	United States	0.14	(0.03)	0.32	(0.03)	-0.04	(0.03)	**0.36**	(0.03)	-1.33	(0.01)	-0.11	(0.00)	0.49	(0.01)	1.50	(0.02)
	OECD average	0.00	(0.00)	0.09	(0.00)	-0.09	(0.00)	**0.17**	(0.01)	-1.27	(0.00)	-0.25	(0.00)	0.31	(0.00)	1.20	(0.00)
Partners	Argentina	0.15	(0.03)	0.12	(0.03)	0.19	(0.04)	-0.07	(0.04)	-1.34	(0.01)	-0.15	(0.01)	0.55	(0.01)	1.57	(0.02)
	Azerbaijan	0.63	(0.04)	0.54	(0.04)	0.72	(0.04)	**-0.18**	(0.04)	-1.01	(0.03)	0.33	(0.01)	1.01	(0.01)	2.19	(0.02)
	Brazil	0.01	(0.02)	0.01	(0.03)	0.01	(0.02)	0.00	(0.03)	-1.60	(0.00)	-0.43	(0.01)	0.41	(0.01)	1.66	(0.02)
	Bulgaria	0.68	(0.03)	0.82	(0.03)	0.54	(0.03)	**0.28**	(0.04)	-0.89	(0.02)	0.39	(0.01)	1.02	(0.01)	2.22	(0.02)
	Chile	0.29	(0.03)	0.31	(0.03)	0.27	(0.03)	0.04	(0.04)	-1.08	(0.01)	0.03	(0.01)	0.64	(0.01)	1.58	(0.02)
	Colombia	0.30	(0.06)	0.35	(0.04)	0.26	(0.08)	0.09	(0.06)	-1.29	(0.02)	-0.10	(0.01)	0.68	(0.01)	1.91	(0.02)
	Croatia	-0.29	(0.02)	-0.20	(0.02)	-0.38	(0.03)	**0.18**	(0.03)	-1.61	(0.00)	-0.62	(0.01)	0.00	(0.01)	1.06	(0.02)
	Estonia	0.02	(0.02)	0.09	(0.02)	-0.06	(0.02)	**0.15**	(0.03)	-1.18	(0.01)	-0.20	(0.01)	0.29	(0.01)	1.18	(0.02)
	Hong Kong-China	0.33	(0.02)	0.36	(0.02)	0.30	(0.02)	0.05	(0.03)	-0.94	(0.02)	0.09	(0.01)	0.65	(0.00)	1.52	(0.02)
	Indonesia	0.16	(0.02)	0.18	(0.03)	0.13	(0.02)	0.05	(0.03)	-1.26	(0.01)	-0.09	(0.01)	0.50	(0.00)	1.49	(0.02)
	Israel	0.48	(0.02)	0.55	(0.03)	0.42	(0.03)	**0.13**	(0.05)	-0.98	(0.02)	0.22	(0.01)	0.82	(0.01)	1.86	(0.02)
	Jordan	0.24	(0.03)	0.32	(0.04)	0.17	(0.04)	**0.15**	(0.05)	-1.39	(0.01)	-0.13	(0.01)	0.66	(0.01)	1.82	(0.02)
	Kyrgyzstan	0.72	(0.03)	0.65	(0.03)	0.79	(0.03)	**-0.15**	(0.04)	-0.83	(0.02)	0.50	(0.01)	1.10	(0.01)	2.12	(0.02)
	Latvia	0.16	(0.02)	0.22	(0.03)	0.10	(0.02)	**0.11**	(0.03)	-0.86	(0.02)	-0.07	(0.01)	0.40	(0.00)	1.18	(0.02)
	Liechtenstein	-0.26	(0.05)	-0.24	(0.09)	-0.28	(0.07)	0.05	(0.12)	-1.50	(0.03)	-0.48	(0.02)	0.07	(0.02)	0.89	(0.06)
	Lithuania	0.18	(0.02)	0.21	(0.03)	0.15	(0.02)	0.06	(0.03)	-1.07	(0.02)	-0.08	(0.01)	0.47	(0.01)	1.42	(0.02)
	Macao-China	0.36	(0.02)	0.46	(0.03)	0.25	(0.02)	**0.21**	(0.04)	-0.99	(0.02)	0.06	(0.01)	0.66	(0.01)	1.70	(0.02)
	Montenegro	0.60	(0.02)	0.64	(0.03)	0.56	(0.03)	**0.08**	(0.04)	-0.79	(0.02)	0.31	(0.01)	0.88	(0.01)	1.99	(0.02)
	Qatar	0.73	(0.02)	0.75	(0.02)	0.72	(0.02)	0.03	(0.03)	-0.78	(0.02)	0.46	(0.01)	1.01	(0.01)	2.24	(0.02)
	Romania	0.51	(0.02)	0.58	(0.03)	0.45	(0.02)	**0.13**	(0.04)	-0.76	(0.02)	0.23	(0.01)	0.78	(0.01)	1.80	(0.04)
	Russian Federation	0.57	(0.01)	0.60	(0.02)	0.55	(0.02)	**0.06**	(0.03)	-0.56	(0.02)	0.29	(0.00)	0.80	(0.00)	1.76	(0.02)
	Serbia	0.28	(0.02)	0.37	(0.03)	0.19	(0.03)	**0.19**	(0.04)	-1.19	(0.02)	-0.05	(0.01)	0.61	(0.01)	1.75	(0.02)
	Slovenia	-0.12	(0.02)	0.00	(0.02)	-0.24	(0.02)	**0.24**	(0.03)	-1.34	(0.01)	-0.37	(0.01)	0.19	(0.01)	1.04	(0.02)
	Chinese Taipei	0.03	(0.02)	0.06	(0.02)	-0.01	(0.03)	0.07	(0.04)	-1.44	(0.01)	-0.32	(0.01)	0.40	(0.01)	1.48	(0.02)
	Thailand	0.58	(0.02)	0.61	(0.03)	0.56	(0.03)	0.05	(0.04)	-1.02	(0.02)	0.26	(0.01)	0.94	(0.01)	2.12	(0.02)
	Tunisia	0.30	(0.03)	0.29	(0.03)	0.31	(0.03)	-0.02	(0.04)	-1.13	(0.02)	0.11	(0.01)	0.72	(0.00)	1.49	(0.02)
	Uruguay	-0.03	(0.02)	-0.04	(0.03)	-0.01	(0.03)	-0.03	(0.05)	-1.49	(0.01)	-0.40	(0.01)	0.34	(0.01)	1.44	(0.02)

Note: Values that are statistically significant are indicated in bold.

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[Part 1/1]

Index of students' awareness of more complex environmental issues

Table A3.4 *Results based on students' self-reports*

		Index of students' awareness of more complex environmental issues															
		All students		Males		Females		Gender difference (M – F)		Bottom quarter		Second quarter		Third quarter		Top quarter	
		Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.	Mean index	S.E.
OECD	Australia	0.10	(0.02)	0.19	(0.02)	0.01	(0.02)	**0.18**	(0.03)	-1.10	(0.01)	-0.19	(0.00)	0.37	(0.00)	1.33	(0.02)
	Austria	0.23	(0.02)	0.32	(0.03)	0.14	(0.03)	**0.18**	(0.04)	-0.99	(0.02)	-0.05	(0.01)	0.52	(0.01)	1.46	(0.02)
	Belgium	-0.16	(0.02)	-0.06	(0.02)	-0.27	(0.02)	**0.21**	(0.03)	-1.37	(0.02)	-0.42	(0.00)	0.14	(0.00)	1.00	(0.02)
	Canada	0.27	(0.01)	0.36	(0.02)	0.18	(0.02)	**0.18**	(0.02)	-0.93	(0.01)	-0.05	(0.00)	0.52	(0.00)	1.55	(0.02)
	Czech Republic	0.07	(0.02)	0.14	(0.02)	-0.02	(0.03)	**0.16**	(0.03)	-0.94	(0.02)	-0.18	(0.00)	0.30	(0.00)	1.08	(0.02)
	Denmark	-0.21	(0.02)	-0.06	(0.03)	-0.35	(0.03)	**0.29**	(0.03)	-1.39	(0.02)	-0.51	(0.01)	0.08	(0.00)	1.00	(0.02)
	Finland	-0.02	(0.02)	0.08	(0.02)	-0.12	(0.02)	**0.20**	(0.03)	-1.06	(0.01)	-0.26	(0.01)	0.21	(0.01)	1.04	(0.02)
	France	-0.16	(0.02)	-0.02	(0.03)	-0.30	(0.02)	**0.28**	(0.03)	-1.38	(0.02)	-0.44	(0.01)	0.12	(0.01)	1.04	(0.02)
	Germany	0.15	(0.02)	0.31	(0.04)	-0.01	(0.03)	**0.32**	(0.04)	-1.19	(0.03)	-0.12	(0.01)	0.47	(0.01)	1.44	(0.02)
	Greece	0.09	(0.02)	0.13	(0.03)	0.05	(0.03)	**0.08**	(0.04)	-1.07	(0.02)	-0.21	(0.00)	0.35	(0.00)	1.28	(0.01)
	Hungary	0.10	(0.01)	0.13	(0.02)	0.08	(0.02)	0.05	(0.03)	-0.91	(0.02)	-0.18	(0.00)	0.33	(0.00)	1.16	(0.02)
	Iceland	-0.39	(0.02)	-0.18	(0.03)	-0.61	(0.02)	**0.43**	(0.04)	-1.77	(0.02)	-0.73	(0.01)	-0.08	(0.01)	1.01	(0.03)
	Ireland	0.38	(0.02)	0.44	(0.04)	0.32	(0.03)	**0.12**	(0.04)	-0.83	(0.02)	0.08	(0.00)	0.66	(0.00)	1.59	(0.02)
	Italy	0.18	(0.02)	0.25	(0.02)	0.12	(0.02)	**0.12**	(0.03)	-0.96	(0.01)	-0.08	(0.00)	0.44	(0.00)	1.34	(0.01)
	Japan	-0.13	(0.02)	-0.07	(0.03)	-0.19	(0.02)	**0.13**	(0.03)	-1.10	(0.02)	-0.37	(0.00)	0.08	(0.00)	0.86	(0.02)
	Korea	-0.22	(0.02)	-0.19	(0.03)	-0.26	(0.03)	0.08	(0.04)	-1.20	(0.02)	-0.50	(0.00)	0.00	(0.01)	0.80	(0.02)
	Luxembourg	-0.26	(0.02)	-0.08	(0.02)	-0.44	(0.02)	**0.36**	(0.03)	-1.69	(0.02)	-0.60	(0.01)	0.12	(0.01)	1.14	(0.02)
	Mexico	-0.45	(0.02)	-0.44	(0.02)	-0.47	(0.02)	0.03	(0.02)	-1.60	(0.01)	-0.74	(0.01)	-0.16	(0.00)	0.70	(0.01)
	Netherlands	-0.08	(0.02)	0.02	(0.02)	-0.17	(0.02)	**0.19**	(0.02)	-1.12	(0.02)	-0.30	(0.01)	0.16	(0.01)	0.95	(0.02)
	New Zealand	-0.12	(0.02)	-0.02	(0.02)	-0.21	(0.02)	**0.19**	(0.03)	-1.30	(0.02)	-0.41	(0.01)	0.15	(0.01)	1.08	(0.02)
	Norway	0.06	(0.02)	0.19	(0.03)	-0.07	(0.02)	**0.26**	(0.03)	-1.18	(0.02)	-0.20	(0.00)	0.35	(0.00)	1.29	(0.02)
	Poland	0.37	(0.02)	0.38	(0.02)	0.37	(0.02)	0.01	(0.03)	-0.81	(0.02)	0.06	(0.00)	0.59	(0.01)	1.66	(0.02)
	Portugal	0.12	(0.02)	0.18	(0.03)	0.05	(0.02)	**0.13**	(0.03)	-1.02	(0.02)	-0.17	(0.01)	0.38	(0.00)	1.27	(0.02)
	Slovak Republic	0.15	(0.02)	0.21	(0.03)	0.09	(0.03)	**0.12**	(0.04)	-0.98	(0.02)	-0.16	(0.01)	0.38	(0.00)	1.37	(0.02)
	Spain	0.06	(0.02)	0.13	(0.02)	-0.01	(0.02)	**0.15**	(0.02)	-1.09	(0.01)	-0.24	(0.00)	0.30	(0.00)	1.27	(0.02)
	Sweden	-0.24	(0.02)	-0.08	(0.03)	-0.41	(0.03)	**0.33**	(0.04)	-1.62	(0.02)	-0.60	(0.01)	0.09	(0.01)	1.17	(0.02)
	Switzerland	-0.22	(0.02)	-0.04	(0.02)	-0.41	(0.03)	**0.37**	(0.03)	-1.54	(0.02)	-0.50	(0.01)	0.13	(0.00)	1.04	(0.01)
	Turkey	0.07	(0.03)	-0.01	(0.04)	0.17	(0.03)	**-0.17**	(0.04)	-1.19	(0.02)	-0.23	(0.01)	0.37	(0.00)	1.34	(0.02)
	United Kingdom	0.25	(0.01)	0.40	(0.02)	0.11	(0.02)	**0.29**	(0.03)	-1.00	(0.02)	-0.06	(0.01)	0.51	(0.01)	1.54	(0.02)
	United States	0.01	(0.03)	0.11	(0.03)	-0.10	(0.03)	**0.21**	(0.03)	-1.28	(0.02)	-0.32	(0.01)	0.29	(0.01)	1.34	(0.02)
	OECD average	0.00	(0.00)	0.09	(0.00)	-0.09	(0.00)	**0.18**	(0.01)	-1.19	(0.00)	-0.29	(0.00)	0.27	(0.00)	1.21	(0.00)
Partners	Argentina	-0.63	(0.04)	-0.62	(0.04)	-0.63	(0.04)	0.01	(0.04)	-1.85	(0.02)	-0.93	(0.01)	-0.32	(0.01)	0.59	(0.02)
	Azerbaijan	-0.56	(0.03)	-0.56	(0.03)	-0.55	(0.03)	-0.01	(0.04)	-1.94	(0.02)	-0.89	(0.01)	-0.24	(0.01)	0.86	(0.02)
	Brazil	-0.26	(0.02)	-0.24	(0.03)	-0.28	(0.03)	0.03	(0.03)	-1.45	(0.02)	-0.62	(0.01)	-0.01	(0.01)	1.04	(0.02)
	Bulgaria	-0.10	(0.03)	-0.19	(0.04)	-0.02	(0.03)	**-0.17**	(0.04)	-1.35	(0.03)	-0.32	(0.01)	0.22	(0.01)	1.03	(0.02)
	Chile	-0.27	(0.03)	-0.19	(0.03)	-0.36	(0.03)	**0.17**	(0.03)	-1.39	(0.02)	-0.59	(0.01)	-0.03	(0.01)	0.93	(0.02)
	Colombia	-0.43	(0.03)	-0.44	(0.04)	-0.43	(0.04)	-0.01	(0.04)	-1.62	(0.02)	-0.74	(0.01)	-0.12	(0.01)	0.76	(0.02)
	Croatia	0.32	(0.02)	0.32	(0.03)	0.33	(0.02)	0.00	(0.03)	-0.78	(0.02)	0.05	(0.00)	0.54	(0.01)	1.49	(0.02)
	Estonia	0.24	(0.02)	0.24	(0.02)	0.24	(0.02)	0.00	(0.03)	-0.85	(0.02)	-0.06	(0.01)	0.45	(0.01)	1.42	(0.02)
	Hong Kong-China	0.34	(0.02)	0.38	(0.02)	0.31	(0.02)	**0.07**	(0.03)	-0.62	(0.02)	0.11	(0.00)	0.56	(0.01)	1.31	(0.01)
	Indonesia	-1.09	(0.02)	-1.12	(0.03)	-1.04	(0.02)	**-0.08**	(0.03)	-2.03	(0.02)	-1.32	(0.00)	-0.85	(0.00)	-0.14	(0.02)
	Israel	-0.66	(0.03)	-0.57	(0.04)	-0.74	(0.04)	**0.17**	(0.06)	-2.19	(0.02)	-0.97	(0.01)	-0.31	(0.01)	0.84	(0.03)
	Jordan	-0.04	(0.02)	-0.25	(0.03)	0.17	(0.03)	**-0.41**	(0.04)	-1.36	(0.02)	-0.32	(0.01)	0.28	(0.01)	1.25	(0.02)
	Kyrgyzstan	-0.45	(0.02)	-0.57	(0.03)	-0.35	(0.03)	**-0.22**	(0.04)	-1.79	(0.02)	-0.74	(0.01)	-0.12	(0.01)	0.84	(0.02)
	Latvia	-0.02	(0.02)	0.01	(0.03)	-0.04	(0.03)	0.04	(0.03)	-1.04	(0.02)	-0.25	(0.01)	0.23	(0.01)	0.99	(0.01)
	Liechtenstein	0.01	(0.05)	0.16	(0.07)	-0.12	(0.07)	**0.27**	(0.10)	-1.17	(0.07)	-0.19	(0.01)	0.33	(0.02)	1.07	(0.05)
	Lithuania	-0.02	(0.02)	0.00	(0.03)	-0.05	(0.03)	0.06	(0.03)	-1.18	(0.02)	-0.31	(0.01)	0.27	(0.01)	1.13	(0.02)
	Macao-China	0.06	(0.01)	0.08	(0.02)	0.03	(0.02)	0.05	(0.03)	-0.95	(0.02)	-0.17	(0.00)	0.29	(0.01)	1.05	(0.02)
	Montenegro	0.03	(0.02)	-0.02	(0.02)	0.09	(0.02)	**-0.12**	(0.03)	-1.25	(0.03)	-0.27	(0.01)	0.33	(0.01)	1.32	(0.02)
	Qatar	-0.72	(0.02)	-0.68	(0.02)	-0.76	(0.02)	**0.08**	(0.03)	-2.26	(0.02)	-1.05	(0.00)	-0.38	(0.01)	0.81	(0.02)
	Romania	-0.37	(0.03)	-0.40	(0.04)	-0.34	(0.03)	-0.06	(0.04)	-1.55	(0.02)	-0.64	(0.01)	-0.08	(0.01)	0.81	(0.02)
	Russian Federation	0.18	(0.03)	0.18	(0.03)	0.18	(0.03)	0.00	(0.03)	-0.99	(0.02)	-0.09	(0.01)	0.42	(0.01)	1.38	(0.02)
	Serbia	0.02	(0.02)	-0.03	(0.03)	0.06	(0.02)	**-0.09**	(0.03)	-1.15	(0.02)	-0.27	(0.01)	0.28	(0.01)	1.20	(0.02)
	Slovenia	0.30	(0.01)	0.33	(0.03)	0.27	(0.02)	0.06	(0.04)	-0.80	(0.02)	0.07	(0.00)	0.52	(0.01)	1.40	(0.02)
	Chinese Taipei	0.46	(0.02)	0.51	(0.02)	0.40	(0.02)	**0.11**	(0.03)	-0.55	(0.02)	0.22	(0.00)	0.61	(0.00)	1.54	(0.02)
	Thailand	-0.20	(0.02)	-0.31	(0.03)	-0.11	(0.02)	**-0.21**	(0.03)	-1.30	(0.02)	-0.44	(0.01)	0.11	(0.01)	0.85	(0.01)
	Tunisia	-0.73	(0.02)	-0.68	(0.03)	-0.78	(0.03)	**0.10**	(0.03)	-1.85	(0.02)	-1.01	(0.01)	-0.47	(0.01)	0.41	(0.02)
	Uruguay	-0.34	(0.02)	-0.32	(0.03)	-0.35	(0.02)	0.03	(0.03)	-1.46	(0.02)	-0.64	(0.01)	-0.08	(0.01)	0.83	(0.02)

Note: Values that are statistically significant are indicated in bold.

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[Part 1/1]

Table A3.5 Parents' sense of responsibility for environmental issues

	Percentage of parents who believe the following environmental issues to be a serious concern for themselves or other people in their country:												Percentage of missing data
	Air pollution		Energy shortages		Extinction of plants and animals		Clearing of forests for other land use		Water shortages		Nuclear waste		
	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	
Bulgaria	99	(0.3)	95	(0.4)	96	(0.5)	98	(0.3)	95	(0.4)	95	(0.4)	7%
Colombia	98	(0.3)	97	(0.4)	97	(0.5)	97	(0.3)	98	(0.3)	90	(0.6)	7%
Croatia	99	(0.1)	98	(0.2)	98	(0.2)	97	(0.3)	95	(0.3)	97	(0.3)	4%
Denmark	96	(0.4)	90	(0.6)	92	(0.6)	89	(0.6)	86	(0.7)	87	(0.6)	39%
Germany	99	(0.2)	96	(0.3)	97	(0.3)	94	(0.4)	87	(0.5)	97	(0.3)	19%
Hong Kong-China	97	(0.3)	87	(0.5)	75	(0.6)	75	(0.7)	81	(0.6)	70	(0.7)	3%
Iceland	94	(0.5)	67	(0.9)	81	(0.7)	78	(0.8)	64	(0.8)	78	(0.9)	36%
Italy	99	(0.1)	95	(0.3)	91	(0.3)	90	(0.3)	91	(0.3)	90	(0.3)	14%
Korea	98	(0.2)	98	(0.2)	95	(0.4)	95	(0.3)	96	(0.3)	95	(0.3)	1%
Luxembourg	98	(0.2)	95	(0.3)	94	(0.4)	92	(0.5)	91	(0.5)	92	(0.5)	24%
Macao-China	96	(0.3)	91	(0.5)	83	(0.5)	85	(0.6)	92	(0.5)	76	(0.7)	1%
New Zealand	95	(0.4)	97	(0.3)	95	(0.4)	92	(0.4)	93	(0.4)	80	(0.6)	32%
Portugal	98	(0.2)	98	(0.3)	97	(0.3)	97	(0.2)	98	(0.2)	94	(0.4)	13%
Qatar	94	(0.3)	88	(0.4)	84	(0.6)	68	(0.7)	91	(0.4)	77	(0.7)	39%
Turkey	99	(0.3)	95	(0.5)	95	(0.4)	97	(0.3)	94	(0.4)	94	(0.4)	2%

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Table A3.6 Parents' optimism regarding environmental issues

	Percentage of parents who believe the problems associated with the environmental issues below will improve over the next 20 years											
	Air pollution		Energy shortages		Extinction of plants and animals		Clearing of forests for other land use		Water shortages		Nuclear waste	
	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
Bulgaria	25	(1.1)	30	(0.9)	17	(1.1)	19	(0.9)	22	(1.1)	25	(1.1)
Colombia	21	(0.8)	31	(1.1)	20	(0.9)	20	(0.8)	22	(1.1)	16	(0.8)
Croatia	10	(0.4)	11	(0.4)	8	(0.3)	9	(0.4)	6	(0.4)	9	(0.4)
Denmark	10	(0.6)	7	(0.5)	4	(0.4)	8	(0.5)	4	(0.4)	13	(0.7)
Germany	15	(0.6)	6	(0.4)	4	(0.3)	5	(0.4)	4	(0.4)	9	(0.4)
Hong Kong-China	22	(0.7)	21	(0.7)	20	(0.5)	17	(0.6)	23	(0.7)	20	(0.6)
Iceland	3	(0.4)	7	(0.6)	3	(0.4)	6	(0.5)	3	(0.4)	8	(0.6)
Italy	9	(0.3)	11	(0.3)	8	(0.4)	8	(0.4)	8	(0.3)	9	(0.4)
Korea	28	(0.7)	27	(0.6)	20	(0.7)	25	(0.7)	18	(0.5)	27	(0.6)
Luxembourg	12	(0.5)	9	(0.5)	7	(0.4)	7	(0.4)	6	(0.4)	8	(0.4)
Macao-China	32	(0.8)	27	(0.8)	26	(0.8)	26	(0.8)	30	(0.8)	26	(0.8)
New Zealand	12	(0.7)	9	(0.6)	7	(0.4)	6	(0.5)	6	(0.5)	9	(0.6)
Portugal	12	(0.5)	13	(0.5)	13	(0.5)	12	(0.5)	11	(0.5)	9	(0.4)
Qatar	37	(0.8)	44	(1.0)	32	(0.8)	28	(0.7)	39	(0.8)	26	(0.8)
Turkey	22	(0.7)	28	(0.9)	13	(0.6)	14	(0.5)	19	(0.7)	12	(0.6)

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[Part 1/1]

Table A3.7 Relationship between parents' and students' attitude towards environmental issues

	Students' and parents' sense of responsibility for environmental issues		Students' and parents' optimism regarding environmental issues	
	Correlation coefficient	S.E.	Correlation coefficient	S.E.
Bulgaria	0.15	(0.02)	0.27	(0.02)
Colombia	0.28	(0.02)	0.41	(0.02)
Croatia	0.14	(0.02)	0.22	(0.02)
Denmark	0.04	(0.02)	0.07	(0.02)
Germany	0.10	(0.02)	0.15	(0.01)
Hong Kong-China	0.24	(0.02)	0.27	(0.01)
Iceland	0.08	(0.02)	0.07	(0.02)
Italy	0.20	(0.01)	0.18	(0.01)
Korea	0.16	(0.02)	0.15	(0.01)
Luxembourg	0.11	(0.01)	0.15	(0.02)
Macao-China	0.23	(0.02)	0.30	(0.02)
New Zealand	0.15	(0.02)	0.14	(0.02)
Portugal	0.17	(0.02)	0.34	(0.02)
Qatar	0.23	(0.02)	0.34	(0.02)
Turkey	0.37	(0.03)	0.54	(0.02)

Note: Correlation coefficients are calcluated at the student level.
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[Part 1/1]

Table A3.8 Effect sizes for gender differences (males minus females) in environmental science attitude indices

Results based on students' self-reports

Effect size in favour of females:

- from –0.2 to –0.5
- from –0.5 to –0.8
- equal or greater than –0.8

Effect size in favour of males:

- from 0.2 to 0.5
- from 0.5 to 0.8
- equal or greater than 0.8

		Sense of responsibility for environmental issues		Optimism regarding environmental issues		Awareness of environmental issues	
		Effect size[1]	S.E.	Effect size[1]	S.E.	Effect size[1]	S.E.
OECD	Australia	**-0.22**	(0.09)	**0.21**	(0.08)	**0.18**	(0.08)
	Austria	**-0.28**	(0.11)	**0.25**	(0.10)	**0.18**	(0.08)
	Belgium	**-0.15**	(0.06)	**0.13**	(0.05)	**0.22**	(0.09)
	Canada	**-0.22**	(0.08)	**0.31**	(0.12)	**0.18**	(0.07)
	Czech Republic	**-0.19**	(0.08)	**0.20**	(0.08)	**0.19**	(0.08)
	Denmark	**-0.18**	(0.07)	**0.20**	(0.09)	**0.31**	(0.13)
	Finland	**-0.33**	(0.13)	**0.24**	(0.10)	**0.23**	(0.10)
	France	**-0.11**	(0.04)	0.04	(0.03)	**0.29**	(0.12)
	Germany	**-0.26**	(0.11)	**0.22**	(0.09)	**0.30**	(0.13)
	Greece	**-0.21**	(0.09)	**0.29**	(0.11)	0.08	(0.05)
	Hungary	**-0.21**	(0.09)	**0.08**	(0.04)	0.06	(0.04)
	Iceland	**-0.11**	(0.05)	**0.13**	(0.06)	**0.39**	(0.16)
	Ireland	**-0.20**	(0.07)	**0.25**	(0.09)	**0.12**	(0.06)
	Italy	**-0.18**	(0.07)	**0.17**	(0.07)	**0.13**	(0.06)
	Japan	**-0.17**	(0.07)	**0.12**	(0.05)	**0.15**	(0.07)
	Korea	0.01	(0.02)	**0.10**	(0.05)	0.09	(0.05)
	Luxembourg	**-0.20**	(0.08)	**0.18**	(0.08)	**0.32**	(0.13)
	Mexico	**-0.23**	(0.09)	0.00	(0.02)	0.03	(0.03)
	Netherlands	**-0.20**	(0.08)	**0.16**	(0.07)	**0.22**	(0.09)
	New Zealand	**-0.20**	(0.08)	**0.15**	(0.07)	**0.19**	(0.08)
	Norway	**-0.27**	(0.12)	**0.25**	(0.11)	**0.26**	(0.11)
	Poland	**-0.30**	(0.12)	**0.14**	(0.06)	0.01	(0.02)
	Portugal	**-0.16**	(0.07)	**0.18**	(0.08)	**0.14**	(0.06)
	Slovak Republic	**-0.11**	(0.05)	**0.13**	(0.06)	**0.12**	(0.06)
	Spain	**-0.27**	(0.11)	**0.14**	(0.06)	**0.15**	(0.06)
	Sweden	**-0.29**	(0.12)	**0.20**	(0.08)	**0.30**	(0.12)
	Switzerland	**-0.19**	(0.08)	**0.19**	(0.08)	**0.35**	(0.14)
	Turkey	**-0.32**	(0.15)	**0.20**	(0.08)	**-0.17**	(0.08)
	United Kingdom	**-0.10**	(0.04)	**0.23**	(0.09)	**0.28**	(0.12)
	United States	**-0.25**	(0.10)	**0.33**	(0.13)	**0.20**	(0.08)
	OECD average	**-0.20**	(0.02)	**0.18**	(0.01)	**0.18**	(0.02)
Partners	Argentina	**-0.20**	(0.09)	-0.06	(0.03)	0.01	(0.03)
	Azerbaijan	**-0.15**	(0.06)	**-0.15**	(0.06)	-0.01	(0.03)
	Brazil	**-0.28**	(0.12)	0.00	(0.02)	0.03	(0.03)
	Bulgaria	**-0.28**	(0.12)	**0.23**	(0.09)	**-0.17**	(0.08)
	Chile	**-0.19**	(0.08)	0.04	(0.03)	**0.19**	(0.08)
	Colombia	**-0.22**	(0.09)	0.07	(0.05)	-0.01	(0.04)
	Croatia	**-0.21**	(0.09)	**0.18**	(0.07)	0.00	(0.03)
	Estonia	**-0.15**	(0.07)	**0.16**	(0.07)	-0.00	(0.02)
	Hong Kong-China	-0.04	(0.03)	0.05	(0.03)	0.09	(0.05)
	Indonesia	**-0.28**	(0.11)	0.05	(0.03)	**-0.10**	(0.05)
	Israel	**-0.11**	(0.06)	**0.12**	(0.06)	**0.14**	(0.07)
	Jordan	**-0.19**	(0.08)	**0.12**	(0.06)	**-0.40**	(0.17)
	Kyrgyzstan	**-0.22**	(0.09)	**-0.13**	(0.05)	**-0.21**	(0.09)
	Latvia	**-0.22**	(0.10)	**0.14**	(0.06)	0.05	(0.04)
	Liechtenstein	-0.03	(0.10)	0.05	(0.10)	0.30	(0.15)
	Lithuania	**-0.15**	(0.07)	0.06	(0.03)	0.06	(0.04)
	Macao-China	**-0.20**	(0.08)	**0.20**	(0.08)	0.06	(0.04)
	Montenegro	**-0.12**	(0.05)	0.07	(0.04)	**-0.11**	(0.05)
	Qatar	**-0.09**	(0.04)	0.02	(0.02)	0.06	(0.03)
	Romania	**-0.17**	(0.08)	**0.13**	(0.06)	-0.06	(0.04)
	Russian Federation	**-0.18**	(0.07)	0.06	(0.03)	0.00	(0.02)
	Serbia	**-0.12**	(0.05)	**0.16**	(0.07)	**-0.09**	(0.05)
	Slovenia	**-0.14**	(0.06)	**0.26**	(0.11)	0.06	(0.04)
	Chinese Taipei	**-0.12**	(0.05)	0.06	(0.03)	**0.13**	(0.06)
	Thailand	**-0.34**	(0.14)	0.04	(0.03)	**-0.23**	(0.10)
	Tunisia	-0.05	(0.04)	-0.02	(0.03)	**0.11**	(0.05)
	Uruguay	**-0.11**	(0.05)	-0.02	(0.03)	0.03	(0.03)

1. See Appendix B, technical notes for the definition and formula of effect size.
Note: Values that are statistically significant are indicated in bold.
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[Part 1/1]

Effect sizes for the difference between the top and bottom quarters of the PISA index of economic, social and cultural status (ESCS) for environmental science attitude indices

Table A3.9 *Results based on students' self-reports*

Effect size in favour of students from more advantaged backgrounds:
from 0.2 to 0.5
from 0.5 to 0.8
equal or greater than 0.8

Effect size in favour of students from less advantaged backgrounds:
from –0.2 to –0.5
from –0.5 to –0.8
equal or greater than –0.8

		Sense of responsiblity for environmental issues		Optimism regarding environmental issues		Awareness of environmental issues	
		Effect size[1]	S.E.	Effect size[1]	S.E.	Effect size[1]	S.E.
OECD	Australia	**0.12**	(0.04)	**-0.07**	(0.03)	**0.68**	(0.24)
	Austria	0.05	(0.04)	**-0.25**	(0.09)	**0.69**	(0.25)
	Belgium	0.03	(0.03)	**-0.28**	(0.10)	**0.83**	(0.27)
	Canada	0.05	(0.03)	**-0.08**	(0.04)	**0.60**	(0.22)
	Czech Republic	**-0.20**	(0.08)	**-0.11**	(0.06)	**0.49**	(0.19)
	Denmark	0.04	(0.05)	**-0.10**	(0.05)	**0.68**	(0.24)
	Finland	0.02	(0.04)	**-0.14**	(0.06)	**0.52**	(0.20)
	France	**0.33**	(0.12)	**-0.52**	(0.18)	**0.91**	(0.29)
	Germany	0.08	(0.05)	-0.10	(0.06)	**0.74**	(0.25)
	Greece	**0.20**	(0.08)	**-0.38**	(0.14)	**0.62**	(0.24)
	Hungary	-0.02	(0.04)	**-0.31**	(0.11)	**0.63**	(0.22)
	Iceland	**-0.15**	(0.06)	**-0.15**	(0.06)	**0.63**	(0.24)
	Ireland	0.00	(0.04)	**-0.15**	(0.08)	**0.63**	(0.22)
	Italy	**0.07**	(0.03)	**-0.29**	(0.11)	**0.57**	(0.20)
	Japan	0.08	(0.04)	0.03	(0.04)	**0.52**	(0.20)
	Korea	0.06	(0.04)	-0.02	(0.04)	**0.61**	(0.23)
	Luxembourg	**0.11**	(0.05)	**-0.37**	(0.14)	**0.88**	(0.29)
	Mexico	**0.17**	(0.07)	**-0.36**	(0.13)	**0.54**	(0.19)
	Netherlands	-0.01	(0.04)	**-0.12**	(0.05)	**0.78**	(0.28)
	New Zealand	0.00	(0.04)	**-0.19**	(0.07)	**0.75**	(0.27)
	Norway	0.03	(0.03)	-0.05	(0.04)	**0.51**	(0.19)
	Poland	0.06	(0.04)	**-0.10**	(0.05)	**0.54**	(0.21)
	Portugal	-0.10	(0.05)	**-0.35**	(0.12)	**0.86**	(0.30)
	Slovak Republic	-0.04	(0.04)	**-0.20**	(0.08)	**0.59**	(0.23)
	Spain	-0.03	(0.04)	**-0.16**	(0.06)	**0.71**	(0.26)
	Sweden	0.04	(0.05)	**-0.14**	(0.06)	**0.65**	(0.24)
	Switzerland	**0.07**	(0.03)	**-0.21**	(0.08)	**0.74**	(0.23)
	Turkey	**0.17**	(0.07)	**-0.40**	(0.15)	**0.57**	(0.21)
	United Kingdom	**0.09**	(0.04)	**-0.18**	(0.07)	**0.75**	(0.27)
	United States	**0.16**	(0.06)	**-0.23**	(0.10)	**0.73**	(0.26)
	OECD average	**0.05**	(0.01)	**-0.20**	(0.02)	**0.66**	(0.04)
Partners	Argentina	**0.14**	(0.07)	**-0.43**	(0.15)	**0.79**	(0.29)
	Azerbaijan	0.06	(0.05)	-0.10	(0.06)	**0.35**	(0.13)
	Brazil	**0.12**	(0.06)	**-0.34**	(0.12)	**0.75**	(0.30)
	Bulgaria	0.06	(0.05)	**-0.26**	(0.11)	**0.72**	(0.23)
	Chile	0.09	(0.04)	**-0.44**	(0.16)	**0.88**	(0.33)
	Colombia	-0.02	(0.05)	**-0.45**	(0.16)	**0.64**	(0.21)
	Croatia	**-0.10**	(0.05)	**-0.26**	(0.09)	**0.61**	(0.23)
	Estonia	**-0.10**	(0.05)	**-0.11**	(0.06)	**0.43**	(0.16)
	Hong Kong-China	-0.02	(0.04)	0.01	(0.03)	**0.53**	(0.20)
	Indonesia	**0.18**	(0.07)	-0.05	(0.04)	**0.59**	(0.23)
	Israel	**0.17**	(0.07)	**-0.35**	(0.13)	**0.40**	(0.14)
	Jordan	**0.11**	(0.05)	**-0.34**	(0.13)	**0.46**	(0.17)
	Kyrgyzstan	0.09	(0.05)	0.03	(0.05)	**0.24**	(0.10)
	Latvia	-0.05	(0.04)	**-0.13**	(0.06)	**0.54**	(0.23)
	Liechtenstein	-0.12	(0.12)	-0.02	(0.13)	**0.44**	(0.20)
	Lithuania	**-0.12**	(0.06)	-0.09	(0.05)	**0.64**	(0.24)
	Macao-China	-0.02	(0.04)	0.02	(0.04)	**0.47**	(0.18)
	Montenegro	0.03	(0.04)	**-0.24**	(0.10)	**0.59**	(0.23)
	Qatar	m	m	m	m	m	m
	Romania	-0.10	(0.06)	**-0.19**	(0.08)	**0.54**	(0.21)
	Russian Federation	0.04	(0.04)	-0.07	(0.05)	**0.55**	(0.21)
	Serbia	-0.06	(0.04)	**-0.34**	(0.12)	**0.55**	(0.21)
	Slovenia	**-0.12**	(0.05)	-0.04	(0.04)	**0.62**	(0.24)
	Chinese Taipei	**0.29**	(0.10)	**-0.17**	(0.06)	**0.64**	(0.24)
	Thailand	**0.15**	(0.06)	**-0.33**	(0.13)	**0.45**	(0.17)
	Tunisia	0.00	(0.03)	**-0.47**	(0.19)	**0.43**	(0.17)
	Uruguay	**-0.13**	(0.06)	**-0.21**	(0.08)	**0.64**	(0.23)

1. See Appendix B, technical notes for the definition and formula of effect size.

Note: Values that are statistically significant are indicated in bold.

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[Part 1/1]

Effect sizes for the difference between students with an immigrant background and native students for environmental science attitude indices

Table A3.10 *Results based on students' self-reports*

Effect size in favour of native students:
- from –0.2 to –0.5
- from –0.5 to –0.8
- equal or greater than –0.8

Effect size in favour of students with an immigrant background:
- from 0.2 to 0.5
- from 0.5 to 0.8
- equal or greater than 0.8

		Percentage of students with an immigrant background	Sense of responsiblity for environmental issues		Optimism regarding environmental issues		Awareness of environmental issues	
			Effect size[1]	S.E.	Effect size[1]	S.E.	Effect size[1]	S.E.
OECD	Australia	21.9	-0.02	(0.02)	**0.14**	(0.05)	**0.13**	(0.06)
	Austria	13.2	-0.10	(0.06)	**0.29**	(0.11)	**-0.40**	(0.16)
	Belgium	13.3	0.01	(0.04)	**0.25**	(0.10)	**-0.43**	(0.17)
	Canada	21.1	-0.05	(0.03)	**0.11**	(0.05)	0.06	(0.04)
	Czech Republic	1.9	c	c	c	c	c	c
	Denmark	7.6	-0.09	(0.06)	**0.34**	(0.14)	**-0.17**	(0.09)
	Finland	1.5	c	c	c	c	c	c
	France	13.0	**-0.18**	(0.08)	**0.32**	(0.13)	**-0.19**	(0.09)
	Germany	14.2	-0.07	(0.05)	**0.19**	(0.09)	**-0.53**	(0.21)
	Greece	7.6	-0.01	(0.05)	**0.24**	(0.12)	**-0.25**	(0.12)
	Hungary	1.7	c	c	c	c	c	c
	Iceland	1.8	c	c	c	c	c	c
	Ireland	5.6	0.03	(0.06)	0.16	(0.08)	-0.08	(0.07)
	Italy	3.8	**-0.26**	(0.11)	**0.34**	(0.14)	**-0.47**	(0.20)
	Japan	0.4	c	c	c	c	c	c
	Korea	0.0	c	c	c	c	c	c
	Luxembourg	36.1	**-0.12**	(0.06)	**0.24**	(0.10)	**-0.34**	(0.14)
	Mexico	2.4	c	c	c	c	c	c
	Netherlands	11.3	-0.06	(0.05)	0.09	(0.07)	**-0.31**	(0.14)
	New Zealand	21.3	0.08	(0.05)	**0.20**	(0.08)	**0.11**	(0.05)
	Norway	6.1	-0.07	(0.07)	0.15	(0.08)	-0.08	(0.06)
	Poland	0.2	c	c	c	c	c	c
	Portugal	5.9	**-0.20**	(0.09)	**0.23**	(0.10)	**-0.29**	(0.12)
	Slovak Republic	0.5	c	c	c	c	c	c
	Spain	6.9	**-0.22**	(0.09)	**0.18**	(0.07)	**-0.24**	(0.12)
	Sweden	10.8	0.07	(0.05)	**0.20**	(0.08)	**-0.16**	(0.07)
	Switzerland	22.4	**-0.13**	(0.07)	**0.30**	(0.12)	**-0.37**	(0.16)
	Turkey	1.5	c	c	c	c	c	c
	United Kingdom	8.6	0.06	(0.05)	0.10	(0.06)	**0.12**	(0.06)
	United States	15.2	0.06	(0.04)	0.10	(0.05)	**-0.23**	(0.10)
	OECD average	9.3	**-0.06**	(0.01)	**0.21**	(0.02)	**-0.21**	(0.03)
Partners	Argentina	2.7	c	c	c	c	c	c
	Azerbaijan	2.4	c	c	c	c	c	c
	Brazil	2.4	c	c	c	c	c	c
	Bulgaria	0.2	c	c	c	c	c	c
	Chile	0.6	c	c	c	c	c	c
	Colombia	0.4	c	c	c	c	c	c
	Croatia	12.0	0.04	(0.03)	**0.18**	(0.08)	**-0.15**	(0.07)
	Estonia	11.6	**-0.15**	(0.07)	**0.52**	(0.21)	-0.05	(0.05)
	Hong Kong-China	43.8	-0.01	(0.03)	0.03	(0.04)	0.01	(0.03)
	Indonesia	0.2	c	c	c	c	c	c
	Israel	23.0	-0.08	(0.05)	0.05	(0.04)	-0.03	(0.04)
	Jordan	16.8	**0.09**	(0.04)	**-0.14**	(0.06)	0.08	(0.05)
	Kyrgyzstan	2.6	c	c	c	c	c	c
	Latvia	7.1	**-0.24**	(0.11)	**0.23**	(0.11)	0.02	(0.05)
	Liechtenstein	36.8	0.00	(0.09)	**0.33**	(0.15)	-0.16	(0.12)
	Lithuania	2.1	c	c	c	c	c	c
	Macao-China	73.6	0.07	(0.04)	-0.05	(0.03)	0.02	(0.03)
	Montenegro	7.2	0.01	(0.05)	**-0.29**	(0.12)	**0.32**	(0.14)
	Qatar	40.5	**0.15**	(0.05)	**-0.30**	(0.11)	**0.28**	(0.10)
	Romania	0.1	c	c	c	c	c	c
	Russian Federation	8.7	0.01	(0.05)	-0.07	(0.05)	-0.06	(0.05)
	Serbia	9.0	-0.09	(0.06)	-0.08	(0.06)	-0.05	(0.04)
	Slovenia	10.3	-0.10	(0.05)	0.05	(0.04)	**-0.38**	(0.15)
	Chinese Taipei	0.6	c	c	c	c	c	c
	Thailand	0.3	c	c	c	c	c	c
	Tunisia	0.8	c	c	c	c	c	c
	Uruguay	0.4	c	c	c	c	c	c

1. See Appendix B, technical notes for the definition and formula of effect size.
Note: Values that are statistically significant are indicated in bold.
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[Part 1/1]

Table A3.11 Correlation between performance, attitudes and socio-economic background indices

		1	2	3	4	5	6	7	8	9
1	Environmental science performance index									
2	Geoscience performance index	0.80								
		(0.00)								
3	Students' awareness of environmental issues	0.35	0.29							
		(0.00)	(0.00)							
4	Students' optimism regarding environmental issues	-0.19	-0.16	-0.15						
		(0.00)	(0.00)	(0.00)						
5	Students' level of responsibility for environmental issues	0.01	0.01	0.09	-0.07					
		(0.00)	(0.00)	(0.00)	(0.00)					
6	Students' support for actions for sustainable development	0.14	0.11	0.22	-0.07	0.31				
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)				
7	Index of school activities for learning of environmental topics	0.04	0.04	0.07	-0.02	0.04	0.04			
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)			
8	Parents' level of responsibility for environmental issues	-0.02	-0.02	0.05	-0.10	0.25	0.08	0.00		
		(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)		
9	Parents' optimism regarding environmental issues	-0.10	-0.08	-0.10	0.32	-0.05	-0.01	0.00	-0.18	
		(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)	(0.00)	
10	Student's PISA index of economic, social and cultural status	0.31	0.26	0.25	-0.10	-0.08	0.03	0.04	0.00	-0.15
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)

Note: Table contains correlation coefficients with standard errors given in parentheses.
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[Part 1/1]

Table A3.12 Relationship between student and school background factors and the environmental science performance index

Linear regression background model

		Change in score	S.E.
Intercept		342.2	(11.9)
Student is female	1 = yes; 0 = no	-6.6	(0.5)
Student has no immigration background (student and parents were born in the country of assessment)	1 = yes; 0 = no	1.1	(0.9)
Student speaks the test language or other national language most of the time or always at home	1 = yes; 0 = no	-8.6	(0.9)
Age of student	1 additional year	9.2	(0.8)
Student's PISA index of economic, social and cultural status	1 = OECD S.D	12.1	(0.3)
Student's PISA index of economic, social and cultural status squared		1.7	(0.1)
Student's either parent has a science-related career	1 = yes; 0 = no	9.5	(0.6)
School located in a small town or village (fewer than 15 000 people)	1 = yes; 0 = no	2.1	(0.9)
School located in a city (with over 100 000 people)	1 = yes; 0 = no	3.9	(0.9)
School average index of economic, social and cultural status	1 = OECD S.D	36.0	(0.5)
School size	100 additional students	0.9	(0.1)
Variance explained (R-squared)		**15%**	
N		**391 954**	

Note: For brevity dummy variables for imputed missing data were omitted from the tables, but were present in all regressions.
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[Part 1/2]

Table A3.13 Relationship between student and school demographic and socio-economic background factors and the environmental science performance index, by country

		Student background variables													
		Student is a female		Student has no immigration background		Student's language at home is the same as language that the test was taken in		Student's age (1 additional year)		PISA index of economic, social and cultural status (1 unit increase)		PISA index of economic, social and cultural status (squared)		Student's either parent has a science-related career	
		Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.
OECD	Australia	**-7.4**	(2.1)	**-1.1**	(3.2)	**-10.0**	(4.6)	**15.7**	(3.8)	**19.0**	(1.4)	**-1.7**	(1.0)	**7.3**	(2.5)
	Austria	**-13.1**	(3.9)	33.1	(6.9)	**-11.6**	(9.1)	**19.5**	(5.5)	**4.5**	(2.1)	**-2.1**	(1.5)	2.4	(4.0)
	Belgium	**-9.2**	(2.7)	19.9	(4.6)	**12.9**	(3.7)	**15.5**	(3.6)	**14.7**	(1.4)	**-1.6**	(1.1)	**6.9**	(3.0)
	Canada	**-9.1**	(1.9)	**6.5**	(3.8)	**-12.4**	(4.1)	**18.6**	(3.2)	**12.8**	(1.5)	**-1.9**	(0.9)	**12.2**	(2.3)
	Czech Republic	**-16.3**	(4.0)	20.7	(11.5)	-19.0	(14.6)	**14.3**	(6.8)	**14.2**	(2.1)	-3.6	(2.0)	**11.8**	(4.3)
	Denmark	**-8.5**	(2.9)	25.5	(7.6)	**-18.1**	(8.4)	**12.7**	(4.4)	**22.5**	(2.2)	**-0.3**	(1.1)	**11.3**	(3.9)
	Finland	-3.6	(2.8)	54.5	(14.3)	**-28.2**	(13.2)	**10.0**	(4.9)	**19.5**	(2.0)	3.6	(1.8)	**10.3**	(3.1)
	France	w	w	w	w	w	w	w	w	w	w	w	w	w	w
	Germany	**-19.0**	(2.3)	20.5	(5.4)	**-24.2**	(6.4)	**22.7**	(4.3)	**7.6**	(2.0)	-0.2	(1.2)	**11.7**	(3.7)
	Greece	1.1	(3.2)	**3.1**	(8.3)	-14.9	(10.4)	**13.6**	(4.6)	**9.5**	(2.2)	-2.7	(1.5)	**10.0**	(3.3)
	Hungary	**-17.7**	(2.9)	18.4	(11.0)	-3.5	(15.0)	5.9	(4.5)	2.6	(1.7)	-1.2	(1.3)	3.9	(3.5)
	Iceland	2.8	(2.8)	15.1	(17.8)	**-40.7**	(13.6)	**11.3**	(5.5)	**20.5**	(2.8)	**-0.9**	(1.5)	**15.9**	(4.4)
	Ireland	**-12.4**	(3.2)	4.0	(7.0)	-38.6	(11.0)	**18.0**	(4.9)	**18.8**	(2.0)	-1.8	(1.4)	**9.0**	(3.7)
	Italy	**-16.7**	(2.4)	28.0	(4.9)	**-1.7**	(3.4)	2.8	(2.6)	**4.1**	(1.4)	-3.2	(1.0)	**5.2**	(2.5)
	Japan	**-10.9**	(4.0)	-14.9	(27.2)	**-80.3**	(22.1)	5.9	(4.1)	**6.0**	(2.3)	**-3.2**	(2.5)	-7.3	(5.8)
	Korea	-2.2	(3.7)	**-55.8**	(8.1)	**-18.4**	(42.6)	**20.7**	(4.4)	**8.3**	(2.0)	0.5	(1.6)	2.4	(5.4)
	Luxembourg	**-10.1**	(3.0)	29.3	(3.4)	**-14.1**	(5.6)	**15.1**	(4.1)	**11.6**	(1.4)	-2.2	(0.7)	**12.2**	(3.9)
	Mexico	**-10.9**	(2.2)	35.0	(5.6)	-20.3	(12.7)	6.4	(4.0)	**8.4**	(1.3)	2.4	(0.6)	2.4	(3.5)
	Netherlands	**-13.1**	(2.8)	17.5	(4.7)	**-5.2**	(6.4)	**14.8**	(4.0)	**6.0**	(1.7)	1.6	(1.2)	**9.6**	(2.9)
	New Zealand	-5.6	(3.2)	**4.7**	(4.0)	**-27.7**	(6.0)	**21.7**	(5.5)	**26.6**	(2.1)	**3.3**	(1.2)	**9.3**	(4.1)
	Norway	-3.6	(2.7)	10.5	(8.2)	**-26.8**	(8.6)	3.3	(4.7)	**19.6**	(2.4)	-1.2	(1.6)	**13.4**	(3.0)
	Poland	-4.2	(2.8)	28.0	(29.0)	-8.7	(19.9)	**12.2**	(5.0)	**29.0**	(1.5)	**2.2**	(1.1)	**7.5**	(3.8)
	Portugal	**-8.9**	(2.7)	34.0	(6.8)	**-0.3**	(8.9)	2.8	(4.4)	**13.5**	(1.6)	1.2	(0.7)	7.7	(5.0)
	Slovak Republic	**-12.4**	(3.4)	26.5	(16.6)	-9.4	(6.8)	6.9	(5.2)	**13.6**	(1.9)	-3.7	(1.7)	**11.0**	(3.8)
	Spain	**-8.5**	(2.3)	28.4	(4.7)	**-7.7**	(4.0)	**12.2**	(3.7)	**17.0**	(1.5)	-2.2	(0.9)	3.5	(3.8)
	Sweden	**-6.2**	(2.8)	**15.1**	(6.8)	**-15.5**	(8.0)	2.5	(4.7)	**22.6**	(2.7)	**-0.1**	(1.3)	**9.8**	(4.1)
	Switzerland	**-11.0**	(2.2)	37.4	(4.3)	**-20.0**	(5.4)	**10.0**	(3.9)	**11.6**	(1.8)	**2.2**	(1.0)	**7.0**	(3.0)
	Turkey	-5.2	(3.2)	12.2	(14.0)	15.2	(10.9)	2.7	(4.6)	**13.6**	(3.1)	4.5	(1.0)	**14.6**	(6.9)
	United Kingdom	**-12.4**	(2.4)	1.8	(5.2)	-11.1	(7.7)	**11.4**	(4.2)	**23.1**	(2.1)	**-0.5**	(1.4)	**13.9**	(3.0)
	United States	**-5.8**	(2.7)	**6.7**	(5.5)	**-12.7**	(5.1)	4.7	(5.7)	**21.2**	(1.7)	2.8	(1.2)	**10.4**	(3.8)
	OECD average	**-9.0**	(0.5)	16.0	(2.1)	**-16.3**	(2.4)	**11.5**	(0.9)	**14.6**	(0.4)	-0.3	(0.2)	**8.5**	(0.7)
Partners	Argentina	3.1	(3.7)	-21.0	(10.1)	-38.7	(14.1)	11.8	(6.8)	**14.8**	(2.6)	3.7	(1.2)	-13.6	(8.3)
	Azerbaijan	5.1	(2.9)	-4.3	(10.0)	**3.9**	(4.7)	4.9	(3.6)	**7.2**	(1.8)	2.8	(1.3)	1.5	(3.5)
	Brazil	**-14.7**	(2.3)	23.7	(6.8)	35.7	(15.0)	8.8	(5.0)	**12.2**	(2.9)	3.9	(1.0)	**13.1**	(6.2)
	Bulgaria	-3.7	(3.8)	**74.6**	(19.3)	-12.3	(5.9)	**15.2**	(5.3)	**6.5**	(2.1)	3.7	(1.4)	**16.5**	(3.8)
	Chile	**-17.6**	(3.0)	52.1	(16.2)	-9.2	(21.2)	**11.1**	(4.9)	**7.9**	(2.0)	1.1	(1.0)	7.8	(5.6)
	Colombia	**-13.3**	(3.5)	14.3	(43.0)	-18.1	(13.7)	**13.5**	(3.7)	**11.5**	(2.1)	2.0	(0.8)	-1.4	(5.2)
	Croatia	**-15.1**	(3.6)	**7.0**	(4.4)	-15.8	(10.3)	**9.4**	(3.9)	**8.9**	(1.5)	-0.7	(1.3)	**11.5**	(3.2)
	Estonia	1.0	(2.7)	**8.7**	(4.2)	**-7.0**	(6.5)	9.9	(5.8)	**17.0**	(2.4)	3.8	(2.4)	5.7	(4.4)
	Hong Kong-China	**-19.9**	(3.8)	-8.9	(3.3)	-34.0	(9.1)	**14.6**	(4.7)	**5.6**	(2.3)	-2.1	(1.1)	6.0	(6.2)
	Indonesia	**-12.1**	(2.9)	37.0	(9.3)	8.8	(3.9)	3.3	(4.3)	**9.7**	(3.0)	2.7	(0.9)	7.6	(8.8)
	Israel	-6.0	(4.4)	**-0.6**	(4.4)	**-6.7**	(5.9)	7.9	(5.2)	**17.7**	(2.2)	0.0	(1.7)	**24.8**	(4.8)
	Jordan	**19.2**	(2.9)	**-7.5**	(3.5)	**-13.3**	(6.3)	**10.3**	(4.5)	**19.0**	(2.2)	2.5	(0.9)	**13.6**	(4.9)
	Kyrgyzstan	-4.7	(2.8)	**-17.1**	(6.9)	**-15.5**	(4.0)	**8.3**	(3.5)	**5.5**	(2.1)	1.8	(1.0)	4.3	(3.8)
	Latvia	0.9	(2.7)	**-8.0**	(4.8)	**-21.6**	(7.7)	**14.3**	(6.0)	**14.1**	(2.3)	-0.6	(1.6)	4.3	(3.4)
	Liechtenstein	-5.9	(7.7)	9.4	(7.6)	-21.4	(12.4)	-5.8	(13.7)	4.8	(4.9)	-5.5	(3.6)	**22.3**	(10.7)
	Lithuania	2.7	(3.3)	**0.9**	(10.1)	**-14.8**	(9.0)	8.2	(6.2)	**21.3**	(1.8)	-3.3	(1.5)	7.3	(4.2)
	Macao-China	**-7.3**	(3.1)	**-17.6**	(3.2)	9.9	(17.8)	**19.6**	(4.8)	3.8	(3.4)	-2.1	(1.3)	1.8	(8.2)
	Montenegro	**-5.7**	(2.8)	-7.1	(6.2)	**-10.7**	(3.5)	5.3	(5.5)	**6.5**	(1.9)	-2.2	(1.4)	**12.7**	(4.0)
	Qatar	**18.2**	(2.0)	**-38.2**	(2.4)	**-14.0**	(2.9)	-4.6	(3.7)	1.0	(1.2)	**1.6**	(0.8)	**24.7**	(4.4)
	Romania	**-12.8**	(3.7)	**-134.2**	(17.6)	-12.0	(7.5)	-5.6	(4.9)	**8.0**	(3.1)	0.2	(1.5)	11.8	(6.3)
	Russian Federation	**-10.2**	(2.6)	**10.2**	(4.6)	-24.7	(7.4)	**13.3**	(4.4)	**12.9**	(1.9)	2.3	(2.1)	**12.1**	(4.2)
	Serbia	**-9.6**	(2.6)	**1.5**	(3.8)	**18.1**	(9.7)	7.5	(4.6)	**4.9**	(1.5)	-1.8	(1.2)	**8.3**	(3.5)
	Slovenia	**-18.5**	(2.9)	24.3	(5.9)	**-14.0**	(7.1)	-1.0	(4.9)	2.2	(1.9)	**1.5**	(1.5)	5.8	(3.3)
	Chinese Taipei	**-7.0**	(2.9)	41.7	(15.2)	**-8.1**	(3.8)	**12.0**	(5.7)	**13.1**	(1.8)	**0.8**	(1.9)	1.2	(3.2)
	Thailand	5.3	(2.8)	47.7	(19.5)	**6.3**	(3.0)	**15.9**	(3.9)	**14.3**	(2.4)	4.0	(0.9)	**21.8**	(7.4)
	Tunisia	-2.6	(3.0)	41.3	(12.9)	-21.4	(5.9)	**8.7**	(4.3)	**6.5**	(2.3)	1.9	(0.8)	**14.6**	(5.4)
	Uruguay	**-7.9**	(3.1)	16.8	(34.0)	7.1	(12.7)	**16.1**	(4.6)	**7.5**	(2.0)	0.1	(0.8)	7.9	(5.6)

Note: Values that are statistically significant are indicated in bold.

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[Part 2/2]

Table A3.13 Relationship between student and school demographic and socio-economic background factors and the environmental science performance index, by country

		School background variables									
		School in a small town or village (15 000 or less people)		School in city (100 000 or more people)		School average PISA index of economic, social and cultural status (1 unit increase)		School size (per 100 students)		Explained variance in student performance (r-squared)	N
		Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.		
OECD	Australia	-0.6	(5.0)	-7.5	(3.1)	**44.5**	(4.4)	0.0	(0.4)	0.10	14 135
	Austria	8.4	(8.1)	6.3	(7.2)	**75.4**	(5.8)	**1.8**	(0.9)	0.22	4 908
	Belgium	4.7	(5.1)	**-7.6**	(5.5)	**77.1**	(4.8)	-0.2	(0.7)	0.23	8 678
	Canada	6.2	(3.5)	1.9	(3.0)	**36.9**	(4.1)	0.4	(0.3)	0.08	22 591
	Czech Republic	6.5	(7.3)	-7.2	(7.4)	**89.3**	(7.2)	0.5	(1.5)	0.16	5 808
	Denmark	2.5	(4.6)	0.3	(7.4)	**25.9**	(5.9)	0.0	(1.2)	0.11	4 528
	Finland	5.7	(3.7)	1.3	(3.9)	**12.9**	(5.9)	1.0	(1.1)	0.07	4 712
	France	w	w	w	w	w	w	w	w	w	w
	Germany	-3.0	(4.8)	**-2.7**	(5.7)	**79.5**	(5.2)	0.0	(0.6)	0.26	4 722
	Greece	**16.4**	(7.3)	**3.8**	(6.2)	**48.7**	(4.6)	1.1	(2.2)	0.13	4 866
	Hungary	5.1	(7.2)	-19.5	(4.6)	**74.1**	(4.6)	1.0	(0.9)	0.23	4 489
	Iceland	0.7	(4.1)	-2.4	(4.1)	6.0	(5.4)	**-5.2**	(1.0)	0.07	3 777
	Ireland	**14.3**	(4.9)	3.0	(4.9)	**39.1**	(5.3)	-0.5	(0.8)	0.10	4 580
	Italy	-6.2	(5.5)	-3.3	(3.6)	**62.5**	(3.9)	**0.9**	(0.4)	0.17	21 742
	Japan	10.0	(10.2)	-13.7	(6.1)	**88.1**	(7.8)	**1.3**	(0.7)	0.14	5 938
	Korea	-3.6	(16.4)	-10.3	(7.9)	**74.6**	(7.4)	-0.6	(0.7)	0.13	5 173
	Luxembourg	-0.3	(2.6)	-7.0	(3.6)	**52.7**	(2.8)	**0.7**	(0.2)	0.23	4 565
	Mexico	1.9	(4.1)	-3.6	(3.1)	**19.9**	(2.0)	**1.0**	(0.1)	0.13	30 836
	Netherlands	-0.2	(9.1)	-1.0	(5.2)	**79.6**	(5.1)	**1.8**	(0.7)	0.24	4 765
	New Zealand	-0.4	(5.4)	-11.6	(4.1)	**37.9**	(4.7)	**0.6**	(0.3)	0.15	4 812
	Norway	7.7	(4.7)	6.6	(6.5)	**32.0**	(7.3)	**-3.4**	(1.5)	0.08	4 683
	Poland	7.3	(4.8)	0.6	(5.9)	**15.1**	(6.8)	-0.3	(0.9)	0.10	5 547
	Portugal	**13.8**	(5.2)	**-9.5**	(6.9)	**25.3**	(3.4)	**2.4**	(0.4)	0.14	5 106
	Slovak Republic	**11.9**	(5.7)	**-15.2**	(8.1)	**65.5**	(5.1)	0.8	(1.1)	0.17	4 688
	Spain	**8.1**	(3.7)	4.0	(3.4)	**20.9**	(2.7)	-0.2	(0.4)	0.11	19 565
	Sweden	**13.1**	(4.2)	12.3	(4.8)	**27.4**	(6.3)	1.1	(1.1)	0.10	4 432
	Switzerland	4.3	(4.7)	-9.4	(8.5)	**61.8**	(5.2)	**0.9**	(0.3)	0.21	12 186
	Turkey	-1.8	(9.4)	-11.1	(7.7)	**50.7**	(5.4)	-0.1	(0.5)	0.14	4 939
	United Kingdom	4.8	(3.3)	5.1	(3.9)	**48.1**	(4.1)	-0.2	(0.4)	0.14	13 087
	United States	7.4	(6.4)	-15.9	(6.1)	**36.8**	(6.0)	0.1	(0.3)	0.16	5 609
	OECD average	**5.0**	(1.2)	-3.9	(1.1)	**48.6**	(1.0)	0.2	(0.2)	0.15	8 464
Partners	Argentina	-0.6	(6.4)	-1.2	(5.7)	**36.0**	(3.6)	1.2	(0.7)	0.16	4 247
	Azerbaijan	7.0	(6.3)	0.7	(6.6)	6.7	(5.4)	0.0	(0.4)	0.02	5 184
	Brazil	4.6	(4.4)	-6.1	(3.7)	**34.0**	(2.7)	**0.4**	(0.2)	0.15	9 246
	Bulgaria	3.2	(7.1)	**-12.7**	(6.6)	**56.3**	(5.5)	**2.7**	(1.3)	0.22	4 476
	Chile	2.2	(5.9)	-3.4	(5.6)	**33.6**	(2.9)	0.5	(0.4)	0.17	5 200
	Colombia	-10.6	(6.4)	**-19.7**	(6.7)	**22.8**	(2.9)	0.0	(0.2)	0.10	4 436
	Croatia	7.3	(6.3)	-12.7	(5.3)	**69.0**	(5.3)	**2.8**	(0.6)	0.15	5 213
	Estonia	**20.5**	(4.7)	-0.1	(5.2)	**34.8**	(9.9)	1.2	(1.0)	0.08	4 865
	Hong Kong-China	0.0	(0.0)	0.0	(0.0)	**38.9**	(6.0)	**8.9**	(1.9)	0.12	4 574
	Indonesia	-1.8	(8.4)	6.3	(10.3)	**31.3**	(4.1)	0.6	(0.6)	0.10	10 625
	Israel	**17.8**	(7.7)	**9.8**	(6.7)	**26.8**	(7.4)	0.8	(0.6)	0.10	4 498
	Jordan	-7.3	(5.4)	1.9	(6.3)	**16.0**	(4.4)	-0.4	(0.6)	0.12	6 494
	Kyrgyzstan	-9.5	(5.4)	**7.9**	(6.7)	**30.3**	(5.0)	-0.1	(0.4)	0.07	5 781
	Latvia	8.0	(6.7)	5.4	(5.6)	**29.6**	(8.1)	0.6	(1.0)	0.08	4 711
	Liechtenstein	-2.1	(11.2)	0.0	(0.0)	**70.6**	(14.7)	**11.1**	(2.2)	0.41	339
	Lithuania	2.8	(5.7)	-11.1	(5.1)	**44.7**	(7.4)	**-1.4**	(0.6)	0.12	4 740
	Macao-China	-9.0	(5.3)	3.8	(4.4)	**28.4**	(4.0)	0.1	(0.1)	0.04	4 756
	Montenegro	6.5	(3.7)	-14.7	(3.9)	**57.8**	(4.5)	**1.9**	(0.5)	0.11	4 452
	Qatar	**16.3**	(2.4)	22.8	(3.0)	**31.6**	(2.6)	0.1	(0.8)	0.14	6 157
	Romania	0.6	(7.6)	-4.1	(5.1)	**56.5**	(7.1)	-1.0	(0.8)	0.15	5 116
	Russian Federation	0.8	(6.2)	0.5	(5.8)	**30.6**	(8.8)	0.2	(0.8)	0.07	5 790
	Serbia	-0.9	(6.6)	-7.4	(5.0)	**60.8**	(4.2)	0.0	(0.6)	0.13	4 792
	Slovenia	5.5	(6.0)	**-17.3**	(2.5)	**99.3**	(4.6)	**5.1**	(0.5)	0.31	6 378
	Chinese Taipei	-19.4	(11.3)	-10.9	(6.6)	**85.6**	(6.9)	**-0.4**	(0.2)	0.18	8 813
	Thailand	-1.9	(4.1)	3.4	(5.5)	**26.3**	(3.0)	0.2	(0.2)	0.12	6 185
	Tunisia	-1.2	(6.2)	-11.6	(8.1)	**25.5**	(4.3)	1.1	(0.7)	0.09	4 620
	Uruguay	**12.9**	(5.9)	**-4.2**	(4.4)	**36.2**	(3.4)	**2.0**	(0.8)	0.13	4 799

Note: Values that are statistically significant are indicated in bold.

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[Part 1/1]

Table A3.14 Relationship between students' attitudes towards environmental issues and the environmental science performance index, by country

		Increase in the environmental science performance index associated with 1 S.D. increase of student attitude index											
		Students' sense of responsibility for environmental issues index (regression slope)				Students' optimism regarding environmental issues index (regression slope)				Students' awareness of complex environmental issues index (regression slope)			
		Before accounting for background variables		After accounting for background variables		Before accounting for background variables		After accounting for background variables		Before accounting for background variables		After accounting for background variables	
		Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.
OECD	Australia	**4.7**	(0.9)	**3.7**	(0.9)	**-8.9**	(1.0)	**-7.9**	(0.8)	**34.8**	(0.9)	**29.1**	(0.9)
	Austria	2.7	(1.6)	2.4	(1.3)	**-13.9**	(2.4)	**-6.9**	(1.8)	**39.6**	(1.7)	**27.7**	(1.5)
	Belgium	**4.8**	(2.0)	**3.8**	(1.4)	**-17.6**	(1.5)	**-10.3**	(1.2)	**43.4**	(1.8)	**28.5**	(1.9)
	Canada	**3.2**	(1.1)	**3.5**	(1.0)	**-5.9**	(1.0)	**-5.4**	(1.0)	**29.0**	(1.0)	**24.8**	(1.1)
	Czech Republic	**-7.5**	(2.1)	-2.0	(2.0)	**-11.3**	(1.8)	**-9.5**	(1.5)	**36.8**	(2.3)	**28.2**	(2.0)
	Denmark	1.7	(2.0)	1.2	(1.8)	**-7.4**	(2.1)	**-5.1**	(1.9)	**35.6**	(1.8)	**29.3**	(1.9)
	Finland	**-3.2**	(1.6)	-2.8	(1.4)	**-13.3**	(1.6)	**-12.1**	(1.5)	**34.5**	(1.5)	**30.6**	(1.4)
	France	**17.7**	(1.7)	w	w	**-28.6**	(1.6)	w	w	**41.3**	(1.6)	w	w
	Germany	**8.4**	(1.9)	**6.8**	(1.4)	**-7.2**	(2.0)	**-4.2**	(1.8)	**36.9**	(1.3)	**23.8**	(1.5)
	Greece	**16.8**	(2.1)	**12.6**	(1.8)	**-20.9**	(1.4)	**-14.8**	(1.4)	**30.6**	(1.8)	**23.1**	(1.5)
	Hungary	0.6	(1.9)	0.5	(1.4)	**-15.8**	(1.9)	**-9.0**	(1.6)	**32.4**	(1.7)	**19.4**	(1.7)
	Iceland	**-7.3**	(1.4)	**-6.7**	(1.3)	**-13.9**	(1.5)	**-11.7**	(1.4)	**31.7**	(1.4)	**29.9**	(1.4)
	Ireland	1.5	(1.5)	2.1	(1.3)	**-13.3**	(1.6)	**-11.9**	(1.3)	**32.4**	(1.5)	**25.4**	(1.4)
	Italy	**2.7**	(1.3)	1.2	(1.2)	**-24.7**	(1.2)	**-16.6**	(1.1)	**34.8**	(1.2)	**23.9**	(1.1)
	Japan	**7.1**	(1.4)	**5.1**	(1.3)	**-4.1**	(1.4)	**-3.0**	(1.2)	**42.9**	(2.0)	**32.5**	(1.8)
	Korea	-0.1	(1.9)	-1.1	(1.5)	**-5.3**	(1.4)	**-4.9**	(1.2)	**38.4**	(1.8)	**29.2**	(2.0)
	Luxembourg	**6.2**	(1.4)	**4.9**	(1.2)	**-16.8**	(1.1)	**-8.6**	(1.1)	**32.0**	(1.1)	**20.5**	(1.1)
	Mexico	**14.9**	(1.5)	**10.8**	(1.3)	**-17.8**	(1.0)	**-12.4**	(0.8)	**20.1**	(1.3)	**13.7**	(1.1)
	Netherlands	-0.3	(1.6)	1.9	(1.3)	**-8.0**	(1.7)	**-5.7**	(1.5)	**44.5**	(1.8)	**28.5**	(1.6)
	New Zealand	0.4	(1.7)	2.0	(1.4)	**-14.6**	(1.2)	**-11.1**	(1.1)	**40.9**	(1.4)	**33.4**	(1.5)
	Norway	1.7	(1.3)	1.2	(1.2)	**-8.3**	(1.4)	**-7.8**	(1.3)	**30.5**	(1.8)	**27.0**	(1.8)
	Poland	**9.1**	(1.3)	**8.2**	(1.3)	**-12.8**	(1.4)	**-12.1**	(1.4)	**34.0**	(1.5)	**28.6**	(1.4)
	Portugal	2.7	(1.8)	**4.1**	(1.6)	**-18.9**	(1.2)	**-14.4**	(1.0)	**36.5**	(1.6)	**28.1**	(1.6)
	Slovak Republic	-1.8	(2.1)	-0.7	(1.9)	**-15.5**	(1.9)	**-11.4**	(1.7)	**34.0**	(1.6)	**24.2**	(1.3)
	Spain	**4.5**	(1.3)	**5.2**	(1.3)	**-16.2**	(0.9)	**-14.0**	(0.8)	**34.8**	(1.5)	**27.8**	(1.4)
	Sweden	2.6	(1.5)	**3.2**	(1.5)	**-9.9**	(1.6)	**-9.1**	(1.7)	**30.7**	(1.4)	**26.7**	(1.3)
	Switzerland	**8.8**	(1.6)	**6.2**	(1.4)	**-16.2**	(1.5)	**-9.1**	(1.5)	**37.7**	(1.1)	**26.7**	(1.1)
	Turkey	**12.6**	(2.2)	**8.1**	(2.0)	**-16.1**	(1.5)	**-10.7**	(1.1)	**25.6**	(2.2)	**18.0**	(1.8)
	United Kingdom	**9.2**	(1.5)	**8.2**	(1.2)	**-11.6**	(1.3)	**-9.6**	(1.2)	**38.2**	(1.1)	**31.1**	(1.2)
	United States	**6.8**	(1.1)	**6.3**	(0.9)	**-14.5**	(1.8)	**-11.3**	(1.3)	**31.5**	(1.4)	**23.5**	(1.4)
	OECD average	**4.4**	(0.3)	**3.4**	(0.3)	**-13.6**	(0.3)	**-9.7**	(0.3)	**34.9**	(0.3)	**26.3**	(0.3)
Partners	Argentina	**14.8**	(2.1)	**10.4**	(1.7)	**-23.6**	(1.5)	**-17.9**	(1.5)	**28.5**	(1.7)	**19.0**	(1.4)
	Azerbaijan	**7.0**	(1.4)	**6.6**	(1.5)	-0.7	(1.0)	-0.5	(1.0)	**9.5**	(1.7)	**8.4**	(1.7)
	Brazil	**15.0**	(1.4)	**11.9**	(1.3)	**-18.5**	(0.9)	**-13.7**	(1.0)	**29.2**	(1.7)	**20.3**	(1.4)
	Bulgaria	**6.6**	(2.3)	**3.9**	(1.7)	**-15.3**	(1.9)	**-9.7**	(1.3)	**35.0**	(2.0)	**21.1**	(1.7)
	Chile	**7.7**	(1.8)	**7.0**	(1.3)	**-23.9**	(1.5)	**-17.8**	(1.4)	**32.1**	(1.5)	**21.3**	(1.2)
	Colombia	**14.8**	(1.4)	**10.4**	(1.3)	**-7.7**	(1.5)	**-4.4**	(1.1)	**40.2**	(2.1)	**27.2**	(1.5)
	Croatia	**10.6**	(2.2)	**9.1**	(2.0)	**-16.9**	(1.6)	**-12.7**	(1.6)	**21.6**	(1.8)	**15.4**	(2.0)
	Estonia	-1.6	(1.5)	1.5	(1.3)	**-18.7**	(1.3)	**-14.9**	(1.2)	**36.8**	(1.7)	**28.9**	(1.7)
	Hong Kong-China	-0.1	(1.9)	0.6	(1.6)	**-20.4**	(1.8)	**-16.7**	(1.7)	**30.7**	(2.2)	**26.8**	(2.1)
	Indonesia	**-5.2**	(1.7)	**-3.8**	(1.5)	**-7.8**	(1.5)	**-5.9**	(1.4)	**42.5**	(1.7)	**33.7**	(1.5)
	Israel	**9.1**	(1.1)	**6.4**	(1.0)	**-9.2**	(1.3)	**-7.4**	(1.2)	**16.1**	(2.1)	**9.0**	(1.7)
	Jordan	**14.6**	(1.9)	**12.6**	(1.6)	**-18.0**	(1.8)	**-13.8**	(1.7)	**18.3**	(1.2)	**14.5**	(1.2)
	Kyrgyzstan	**16.5**	(1.6)	**12.7**	(1.5)	**-23.0**	(1.3)	**-19.2**	(1.1)	**28.4**	(1.5)	**22.8**	(1.4)
	Latvia	**6.6**	(1.1)	**6.0**	(1.1)	**-2.4**	(1.2)	-2.2	(1.1)	**8.7**	(1.3)	**7.8**	(1.2)
	Liechtenstein	-3.5	(2.0)	-1.8	(1.9)	**-11.8**	(2.0)	**-10.5**	(2.1)	**35.8**	(1.9)	**31.3**	(1.9)
	Lithuania	-1.9	(4.3)	-2.4	(4.1)	-7.3	(5.3)	-1.5	(4.3)	**26.9**	(6.5)	**15.1**	(4.6)
	Macao-China	-2.8	(2.0)	-1.1	(1.9)	**-13.2**	(1.4)	**-11.7**	(1.4)	**37.0**	(1.8)	**29.7**	(1.7)
	Montenegro	**5.8**	(1.5)	**6.1**	(1.5)	**-10.6**	(1.5)	**-10.3**	(1.6)	**32.0**	(1.4)	**28.8**	(1.5)
	Qatar	**5.1**	(1.4)	**4.9**	(1.5)	**-18.3**	(1.3)	**-14.5**	(1.2)	**28.2**	(1.5)	**23.8**	(1.3)
	Romania	**3.8**	(1.0)	**2.3**	(1.0)	**-12.6**	(1.1)	**-8.1**	(1.0)	**13.8**	(0.9)	**9.6**	(0.9)
	Russian Federation	**10.6**	(2.5)	**10.0**	(2.7)	**-15.2**	(1.5)	**-12.4**	(1.5)	**25.2**	(2.0)	**17.5**	(2.1)
	Serbia	**7.0**	(2.1)	**7.4**	(1.7)	**-7.9**	(1.4)	**-6.8**	(1.4)	**29.2**	(1.5)	**25.1**	(1.4)
	Slovenia	**4.5**	(1.3)	**5.6**	(1.3)	**-19.2**	(1.2)	**-14.6**	(1.1)	**30.5**	(1.4)	**23.6**	(1.4)
	Chinese Taipei	0.0	(1.8)	2.1	(1.4)	**-5.6**	(2.0)	-1.8	(1.7)	**40.2**	(1.7)	**23.1**	(1.4)
	Thailand	**14.6**	(1.1)	**10.9**	(1.2)	**-16.8**	(1.3)	**-12.5**	(1.3)	**24.1**	(1.5)	**17.3**	(1.5)
	Tunisia	**11.1**	(1.7)	**8.3**	(1.7)	**-22.5**	(1.7)	**-16.6**	(1.5)	**16.6**	(2.7)	**12.7**	(2.3)
	Uruguay	0.9	(1.8)	**3.5**	(1.6)	**-21.9**	(1.4)	**-18.1**	(1.2)	**29.6**	(1.5)	**22.1**	(1.4)

Note: Values that are statistically significant are indicated in bold.

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Table A4.1 Placement of environmental topics in the school curriculum

		Without environmental curriculum		Specific course		Part of: Natural science		Geography		Other course	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
OECD	Australia	1.2	(0.5)	22.1	(2.7)	94.9	(1.3)	86.4	(2.0)	55.5	(3.2)
	Austria	0.9	(0.9)	46.2	(3.6)	81.9	(2.7)	61.2	(3.7)	72.4	(3.6)
	Belgium	3.1	(1.2)	9.2	(2.1)	89.8	(1.8)	82.4	(2.4)	65.9	(3.1)
	Canada	0.8	(0.3)	28.5	(2.1)	97.6	(0.6)	72.4	(2.0)	61.8	(2.7)
	Czech Republic	0.0	(0.0)	34.6	(3.7)	92.8	(1.6)	73.3	(3.9)	81.2	(3.5)
	Denmark	2.1	(1.1)	6.2	(2.1)	96.6	(1.4)	73.5	(3.6)	80.8	(3.0)
	Finland	0.6	(0.6)	8.7	(1.9)	98.4	(1.0)	92.3	(2.0)	66.1	(3.7)
	France	w	w	w	w	w	w	w	w	w	w
	Germany	0.6	(0.6)	10.0	(2.1)	98.0	(0.9)	87.8	(2.1)	69.8	(3.1)
	Greece	15.4	(2.8)	33.5	(3.9)	75.2	(3.1)	15.7	(2.5)	40.7	(4.1)
	Hungary	0.0	(0.0)	13.2	(2.8)	96.1	(1.9)	83.8	(3.4)	68.0	(4.3)
	Iceland	0.8	(0.0)	39.6	(0.3)	99.0	(0.1)	48.1	(0.3)	84.8	(0.2)
	Ireland	0.6	(0.6)	25.1	(3.7)	98.7	(0.9)	100.0	(0.0)	93.6	(1.8)
	Italy	1.0	(0.3)	15.4	(1.9)	95.6	(0.9)	45.7	(2.8)	26.8	(2.5)
	Japan	13.2	(2.4)	12.1	(2.9)	80.2	(2.9)	43.4	(3.9)	56.4	(3.7)
	Korea	4.5	(1.4)	30.7	(4.1)	92.7	(1.9)	74.7	(3.2)	75.6	(3.2)
	Luxembourg	0.0	(0.0)	12.2	(0.1)	96.7	(0.0)	79.3	(0.0)	58.9	(0.1)
	Mexico	5.1	(1.4)	46.8	(3.2)	91.5	(1.4)	59.8	(2.5)	58.5	(2.8)
	Netherlands	0.2	(0.2)	9.2	(2.6)	97.1	(1.2)	93.9	(1.9)	68.6	(3.4)
	New Zealand	2.7	(1.0)	12.5	(2.4)	92.8	(1.9)	92.8	(1.8)	31.7	(3.7)
	Norway	1.0	(0.8)	3.0	(1.4)	99.0	(0.8)	84.1	(2.7)	53.7	(4.0)
	Poland	0.0	(0.0)	5.4	(1.9)	100.0	(0.0)	96.9	(1.4)	55.6	(4.1)
	Portugal	0.0	(0.0)	6.4	(2.3)	99.6	(0.4)	95.4	(1.9)	81.8	(3.0)
	Slovak Republic	0.0	(0.0)	36.5	(3.5)	95.1	(2.3)	76.9	(3.5)	96.1	(1.3)
	Spain	1.2	(0.3)	26.9	(2.5)	98.5	(0.5)	73.2	(2.7)	68.2	(3.2)
	Sweden	0.5	(0.5)	11.9	(2.6)	98.7	(0.8)	76.3	(3.4)	63.7	(3.6)
	Switzerland	2.0	(0.7)	8.6	(1.8)	94.2	(1.1)	84.8	(2.2)	59.9	(2.8)
	Turkey	9.0	(2.3)	28.3	(4.1)	75.5	(3.7)	78.0	(3.6)	44.6	(4.4)
	United Kingdom	0.0	(0.0)	8.1	(1.8)	100.0	(0.0)	98.7	(0.9)	56.7	(3.4)
	United States	2.0	(1.2)	54.5	(4.0)	98.6	(0.9)	35.4	(4.2)	42.9	(4.0)
	OECD average	2.4	(0.2)	20.9	(0.6)	94.0	(0.3)	74.7	(0.5)	63.5	(0.6)
Partners	Argentina	1.2	(0.6)	22.5	(3.3)	96.4	(1.3)	82.2	(3.3)	61.4	(3.6)
	Azerbaijan	10.5	(2.5)	33.9	(4.0)	87.0	(2.4)	83.8	(3.0)	49.0	(4.3)
	Brazil	3.1	(1.0)	25.3	(2.2)	95.0	(1.4)	87.7	(1.6)	52.1	(2.8)
	Bulgaria	1.4	(0.8)	27.8	(4.2)	94.4	(2.0)	84.5	(3.5)	58.4	(4.5)
	Chile	1.6	(1.2)	18.4	(3.5)	97.8	(1.4)	63.8	(5.0)	45.8	(4.7)
	Colombia	0.9	(0.6)	25.1	(3.1)	97.4	(1.2)	67.4	(3.1)	71.3	(3.4)
	Croatia	2.2	(1.6)	27.5	(4.6)	97.3	(1.7)	41.3	(5.1)	82.7	(3.4)
	Estonia	1.9	(1.0)	36.2	(3.3)	89.1	(2.3)	88.9	(2.1)	74.3	(3.7)
	Hong Kong-China	0.0	(0.0)	8.4	(2.2)	99.3	(0.9)	90.3	(2.4)	64.5	(3.4)
	Indonesia	0.0	(0.0)	9.3	(2.2)	98.7	(0.9)	94.1	(1.9)	66.9	(4.2)
	Israel	1.7	(0.9)	32.1	(3.7)	91.3	(1.8)	84.3	(2.4)	81.8	(3.1)
	Jordan	5.3	(2.1)	29.9	(3.7)	88.5	(2.6)	57.8	(4.1)	44.8	(4.8)
	Kyrgyzstan	0.2	(0.0)	41.8	(4.0)	91.8	(2.4)	82.9	(3.1)	66.6	(4.7)
	Latvia	10.9	(2.4)	27.8	(3.9)	88.9	(2.2)	80.6	(3.1)	38.8	(3.9)
	Liechtenstein	1.7	(0.9)	8.8	(2.1)	97.8	(1.1)	91.0	(2.2)	77.6	(3.4)
	Lithuania	0.0	(0.0)	7.3	(0.6)	100.0	(0.0)	100.0	(0.0)	71.2	(0.7)
	Macao-China	4.9	(1.7)	3.3	(1.4)	92.0	(2.0)	51.9	(3.9)	27.5	(3.3)
	Montenegro	0.0	(0.0)	7.0	(0.0)	98.2	(0.0)	85.9	(0.0)	79.0	(0.1)
	Qatar	2.1	(0.0)	54.8	(0.2)	95.9	(0.0)	71.2	(0.2)	34.3	(0.1)
	Romania	4.4	(0.0)	26.6	(0.1)	96.5	(0.0)	87.8	(0.1)	60.0	(0.1)
	Russian Federation	4.2	(1.6)	35.4	(5.0)	87.4	(2.7)	82.5	(3.1)	53.1	(4.6)
	Serbia	0.0	(0.0)	44.9	(4.0)	93.1	(2.2)	76.4	(3.2)	62.2	(3.8)
	Slovenia	0.6	(0.6)	39.8	(3.4)	95.6	(1.7)	59.6	(4.2)	45.5	(4.6)
	Chinese Taipei	0.6	(0.0)	7.9	(0.3)	98.5	(0.0)	83.3	(0.2)	57.9	(0.5)
	Thailand	0.7	(0.7)	54.4	(4.0)	95.1	(1.4)	81.4	(2.9)	86.2	(2.6)
	Tunisia	1.4	(1.0)	26.0	(4.2)	95.0	(1.9)	83.0	(3.6)	62.1	(4.5)
	Uruguay	5.4	(1.2)	13.8	(2.5)	94.2	(1.3)	58.6	(2.9)	49.7	(3.5)

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[Part 1/1]

Table A4.2 Relationship between curriculum placement of environmental issues and environmental science performance, by country

		Curriculum placement of environmental issues													
		In a specific environmental studies course				In the natural sciences courses				As part of a geography course				As part of another course			
		Before accounting for background variables		After accounting for background variables		Before accounting for background variables		After accounting for background variables		Before accounting for background variables		After accounting for background variables		Before accounting for background variables		After accounting for background variables	
		Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.
OECD	Australia	-3.6	(4.2)	-5.0	(3.4)	10.6	(8.1)	**15.1**	(7.5)	**24.1**	(4.9)	**10.4**	(4.3)	3.3	(4.2)	**6.8**	(2.8)
	Austria	**-15.3**	(7.8)	-0.4	(5.4)	**35.5**	(7.1)	**20.3**	(4.4)	**35.7**	(7.5)	**14.9**	(5.8)	**-21.7**	(7.4)	-3.8	(5.8)
	Belgium	**-22.4**	(10.1)	-2.5	(6.9)	**26.0**	(9.7)	2.0	(7.8)	13.7	(10.4)	-0.4	(6.4)	-7.6	(7.4)	-2.6	(4.0)
	Canada	-0.3	(4.6)	2.2	(3.5)	**22.0**	(7.0)	14.0	(8.2)	**-6.8**	(2.9)	**-4.9**	(2.4)	-0.1	(3.5)	-1.5	(2.9)
	Czech Republic	**-25.5**	(6.9)	-7.5	(6.6)	-1.3	(11.4)	-6.5	(8.2)	11.5	(8.6)	5.8	(6.9)	-6.2	(9.3)	-1.4	(6.6)
	Denmark	2.7	(9.8)	5.1	(6.3)	4.0	(7.7)	14.5	(20.7)	-2.5	(5.1)	-3.9	(4.4)	-1.8	(4.9)	-3.4	(3.9)
	Finland	-0.8	(6.2)	-0.7	(5.2)	1.2	(9.7)	0.9	(8.4)	4.8	(5.2)	2.3	(4.3)	-3.7	(3.5)	-2.0	(2.9)
	France	w	w	w	w	w	w	w	w	w	w	w	w	w	w	w	w
	Germany	10.6	(11.0)	0.1	(5.7)	1.6	(16.5)	-3.0	(24.1)	**18.3**	(9.3)	4.0	(6.1)	-14.4	(7.6)	2.1	(4.3)
	Greece	1.1	(6.8)	3.5	(5.4)	8.6	(7.4)	2.3	(5.1)	-26.4	(13.9)	-16.4	(8.6)	-2.0	(7.4)	-3.7	(5.0)
	Hungary	-16.8	(13.4)	4.6	(7.2)	12.0	(19.1)	8.9	(13.4)	15.8	(9.5)	**12.4**	(5.9)	3.1	(8.3)	**11.0**	(4.8)
	Iceland	**-11.7**	(3.4)	-6.7	(3.6)	-9.2	(5.6)	-7.0	(8.1)	-5.2	(3.1)	-2.6	(3.0)	-5.0	(3.0)	-4.8	(3.3)
	Ireland	-4.7	(5.9)	-0.3	(3.7)	-12.6	(9.8)	-3.0	(5.3)	0.5	(9.4)	-10.5	(6.1)	**-15.0**	(6.7)	-4.2	(3.9)
	Italy	**-13.3**	(6.5)	-5.8	(5.4)	-4.6	(10.8)	-6.4	(5.5)	**10.5**	(5.3)	1.6	(3.9)	**-17.2**	(5.5)	-5.1	(4.2)
	Japan	-9.6	(15.8)	3.9	(10.4)	4.1	(10.4)	4.5	(7.4)	2.1	(7.7)	3.5	(5.6)	9.1	(8.2)	11.0	(6.2)
	Korea	7.2	(8.5)	4.6	(5.3)	**42.2**	(12.6)	11.6	(10.0)	**25.3**	(7.6)	2.5	(5.8)	**18.1**	(7.1)	2.1	(5.3)
	Luxembourg	**-11.1**	(3.5)	-2.8	(3.7)	**-59.9**	(6.5)	**-17.6**	(6.7)	**26.4**	(3.3)	0.2	(3.8)	**13.6**	(2.5)	-1.9	(2.9)
	Mexico	5.9	(5.1)	-3.6	(2.4)	**19.1**	(6.3)	**10.7**	(4.0)	**-9.4**	(4.1)	-6.4	(3.3)	**14.6**	(4.2)	4.5	(3.4)
	Netherlands	-14.8	(14.0)	1.0	(10.6)	**52.6**	(17.4)	21.8	(15.6)	23.5	(22.1)	7.2	(13.1)	**-41.0**	(7.9)	**-13.5**	(6.0)
	New Zealand	**13.8**	(6.5)	**7.4**	(3.6)	**21.3**	(9.6)	5.6	(7.2)	**20.4**	(5.9)	7.6	(4.7)	1.8	(5.6)	2.7	(3.1)
	Norway	2.3	(21.5)	0.9	(14.9)	-2.5	(12.3)	13.2	(7.9)	2.4	(5.8)	2.0	(5.2)	-3.3	(4.2)	-2.6	(3.1)
	Poland	1.6	(7.0)	-1.3	(5.5)	5.4	(5.4)	-19.0	(18.0)	-6.8	(8.0)	-2.1	(7.1)	-4.2	(4.4)	-1.4	(3.9)
	Portugal	-2.6	(11.4)	1.6	(8.6)	**63.6**	(2.5)	**28.4**	(3.9)	0.5	(11.9)	-12.9	(8.8)	-4.6	(8.2)	-6.1	(6.0)
	Slovak Republic	-7.2	(7.9)	1.4	(5.6)	-0.8	(21.6)	-5.6	(12.4)	17.1	(8.9)	3.1	(6.9)	**-33.6**	(12.7)	**-24.4**	(6.1)
	Spain	-7.8	(4.4)	-5.5	(3.6)	-2.7	(12.9)	-5.5	(8.1)	0.2	(3.3)	-1.2	(2.7)	1.0	(3.6)	1.9	(2.7)
	Sweden	2.3	(4.2)	-0.5	(4.3)	-6.9	(7.5)	-11.0	(8.5)	1.0	(4.6)	-1.1	(3.8)	1.8	(4.5)	-2.0	(3.4)
	Switzerland	1.1	(8.8)	3.8	(4.1)	7.6	(10.2)	12.6	(7.3)	4.3	(7.1)	5.5	(4.8)	-8.7	(5.5)	-2.9	(3.5)
	Turkey	3.7	(9.2)	1.4	(6.6)	15.5	(8.8)	7.1	(7.0)	8.7	(8.7)	1.0	(5.8)	-8.3	(8.7)	-3.3	(6.1)
	United Kingdom	-10.1	(6.9)	-5.2	(6.0)	**21.5**	(7.8)	10.1	(6.1)	**21.4**	(6.3)	**17.4**	(8.0)	6.3	(5.3)	1.3	(3.4)
	United States	6.7	(7.3)	-2.4	(4.7)	29.8	(25.3)	**26.7**	(7.8)	-10.6	(7.9)	-6.8	(5.7)	-2.3	(8.0)	-0.3	(4.2)
	OECD average	**-4.1**	(1.7)	-0.3	(1.2)	**10.5**	(2.2)	**5.0**	(1.9)	**7.6**	(1.6)	1.1	(1.1)	**-4.4**	(1.2)	**-1.6**	(0.8)
Partners	Argentina	7.5	(8.2)	3.2	(3.5)	**28.6**	(10.8)	1.4	(9.1)	**23.8**	(9.5)	9.1	(5.9)	-5.0	(8.6)	-6.8	(4.9)
	Azerbaijan	2.3	(5.4)	-1.4	(5.0)	3.3	(6.1)	2.3	(6.2)	-0.4	(5.7)	-2.5	(5.6)	2.0	(5.5)	2.1	(5.1)
	Brazil	-4.7	(5.8)	-3.2	(4.4)	**27.9**	(9.9)	**16.9**	(6.9)	**15.6**	(5.6)	7.4	(4.5)	-2.5	(5.3)	-4.3	(3.4)
	Bulgaria	22.6	(12.7)	5.5	(6.4)	**26.5**	(10.9)	-15.5	(8.3)	10.3	(12.4)	-2.9	(7.3)	-0.3	(10.6)	1.4	(5.9)
	Chile	12.7	(8.6)	5.6	(4.2)	**37.5**	(14.2)	**22.2**	(8.5)	**15.7**	(6.2)	4.1	(4.0)	**15.5**	(7.3)	**8.8**	(3.8)
	Colombia	-9.9	(6.9)	-4.5	(5.3)	0.4	(12.5)	-8.7	(6.4)	-8.5	(6.2)	**-8.1**	(3.7)	0.4	(5.0)	-3.6	(3.7)
	Croatia	**-14.0**	(5.4)	0.0	(4.9)	**27.7**	(10.3)	**15.1**	(6.5)	**35.8**	(6.5)	**16.4**	(5.9)	2.6	(6.7)	0.3	(4.3)
	Estonia	4.2	(6.7)	9.1	(6.3)	8.0	(20.2)	2.5	(18.3)	-1.1	(8.5)	-10.6	(5.4)	-1.7	(6.0)	-2.8	(4.6)
	Hong Kong-China	4.1	(12.6)	4.2	(10.6)	**-45.4**	(5.7)	**-39.6**	(7.4)	**71.0**	(11.6)	**38.4**	(8.3)	-5.6	(8.9)	-7.8	(6.2)
	Indonesia	-6.7	(7.6)	2.0	(4.8)	-3.4	(12.0)	0.3	(8.6)	5.8	(7.3)	2.2	(6.3)	**-17.1**	(8.6)	-2.3	(5.6)
	Israel	-0.7	(8.4)	4.2	(7.2)	2.3	(7.4)	-0.4	(8.2)	**14.4**	(6.4)	6.9	(6.0)	10.0	(7.5)	10.5	(6.5)
	Jordan	1.3	(6.2)	-1.9	(4.8)	-1.5	(8.2)	-5.2	(5.9)	2.3	(5.8)	5.6	(4.1)	-8.1	(7.0)	-3.9	(4.2)
	Kyrgyzstan	-4.4	(4.6)	-5.2	(3.5)	1.2	(4.9)	-2.0	(4.1)	3.6	(4.3)	-1.8	(2.9)	5.9	(4.6)	0.4	(3.2)
	Latvia	10.4	(5.9)	-3.2	(4.4)	-1.9	(10.0)	-14.1	(10.4)	-0.9	(7.0)	-2.9	(9.2)	-3.5	(5.5)	-1.3	(4.7)
	Liechtenstein	**-82.8**	(14.8)	-19.5	(16.5)	0.0	(0.0)	0.0	(0.0)	**62.3**	(23.6)	21.5	(25.0)	**77.2**	(9.7)	16.1	(13.2)
	Lithuania	-5.3	(19.4)	-10.3	(11.1)	5.3	(10.9)	3.0	(9.4)	-9.0	(5.8)	-4.2	(4.3)	1.7	(7.6)	4.9	(4.6)
	Macao-China	**26.4**	(5.0)	**23.2**	(5.4)	**-15.4**	(7.0)	**-25.1**	(7.4)	**9.0**	(3.7)	-0.6	(3.8)	**-6.9**	(2.8)	5.8	(3.0)
	Montenegro	**-38.2**	(2.7)	**-19.9**	(3.0)	**18.6**	(4.2)	-3.9	(4.5)	**14.6**	(2.7)	**11.4**	(2.8)	-4.7	(3.2)	-1.5	(3.2)
	Qatar	**10.8**	(2.6)	-2.9	(2.5)	**16.8**	(2.8)	3.6	(3.4)	**6.8**	(2.4)	**-9.0**	(2.8)	-2.7	(2.1)	**-7.2**	(2.5)
	Romania	-9.0	(7.4)	-7.4	(5.8)	**20.3**	(8.4)	9.0	(8.7)	15.7	(10.7)	3.6	(8.1)	-7.7	(9.4)	-10.0	(6.0)
	Russian Federation	**15.3**	(5.1)	**11.6**	(4.0)	-5.5	(10.3)	-2.9	(8.8)	-5.1	(5.7)	-6.7	(5.2)	6.0	(4.9)	2.8	(3.9)
	Serbia	**-22.6**	(5.7)	-1.7	(4.9)	-2.1	(13.6)	-2.8	(8.7)	**15.0**	(6.1)	0.3	(4.8)	-2.5	(7.5)	-4.3	(4.3)
	Slovenia	-8.9	(5.7)	-2.4	(5.3)	**12.6**	(6.2)	1.0	(6.7)	**43.8**	(3.2)	**12.9**	(3.4)	**-34.1**	(3.1)	**-6.2**	(2.7)
	Chinese Taipei	-7.2	(9.7)	-6.8	(5.3)	9.4	(21.3)	-12.2	(7.2)	**27.8**	(8.6)	4.5	(5.3)	**24.5**	(10.5)	4.4	(6.2)
	Thailand	**15.6**	(5.7)	**7.8**	(3.3)	18.6	(11.3)	7.3	(7.8)	8.5	(6.2)	4.1	(4.2)	-9.1	(8.3)	-0.7	(6.0)
	Tunisia	3.3	(8.9)	4.9	(6.9)	13.1	(11.8)	8.8	(8.6)	**15.9**	(7.2)	**14.4**	(6.5)	12.0	(6.9)	**11.3**	(5.6)
	Uruguay	13.7	(7.9)	-0.8	(5.3)	8.2	(11.0)	11.1	(7.3)	**-17.0**	(5.8)	**-9.5**	(4.5)	-2.0	(6.1)	-2.2	(4.2)

Note: Values that are statistically significant are indicated in bold.

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Table A4.3 Outside classroom learning activities for environmental science

		Without environmental activities		Ways to deliver environmental issues in the school: Outdoor education		Trips to museums		Trips to science and/or technology centres		Extracurricular environmental projects		Lectures and/or seminars	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
OECD	Australia	2.9	(1.0)	75.3	(2.8)	76.8	(2.5)	86.7	(1.8)	70.2	(2.7)	72.7	(2.6)
	Austria	3.5	(1.3)	74.6	(2.6)	77.9	(3.2)	72.5	(3.6)	29.4	(3.5)	69.0	(3.9)
	Belgium	4.5	(1.1)	56.8	(2.8)	75.4	(2.5)	77.1	(2.6)	45.2	(3.1)	31.3	(2.7)
	Canada	3.4	(0.7)	64.0	(2.5)	71.9	(2.0)	80.2	(1.9)	68.7	(2.1)	77.2	(1.9)
	Czech Republic	1.3	(0.8)	58.4	(3.6)	85.9	(3.3)	87.0	(2.5)	46.6	(3.7)	73.7	(3.1)
	Denmark	3.9	(1.4)	90.3	(2.3)	80.2	(3.2)	80.7	(3.1)	21.3	(3.1)	37.4	(3.9)
	Finland	3.2	(1.4)	87.9	(2.8)	68.4	(4.1)	62.7	(3.5)	26.4	(3.8)	38.9	(3.8)
	France	w	w	w	w	w	w	w	w	w	w	w	w
	Germany	2.6	(1.3)	87.2	(2.5)	87.3	(2.5)	63.5	(3.3)	42.6	(3.3)	27.7	(2.8)
	Greece	0.7	(0.6)	93.8	(2.0)	91.2	(2.0)	77.0	(3.2)	75.1	(3.6)	51.6	(4.3)
	Hungary	3.0	(1.3)	63.6	(4.1)	90.1	(2.2)	73.7	(3.6)	42.8	(4.2)	69.8	(3.6)
	Iceland	5.9	(0.1)	77.3	(0.1)	84.3	(0.2)	61.2	(0.3)	19.5	(0.3)	47.0	(0.2)
	Ireland	7.3	(2.1)	87.2	(2.7)	61.1	(3.8)	55.2	(3.8)	52.9	(3.8)	56.3	(3.8)
	Italy	2.0	(0.8)	61.2	(2.8)	88.2	(1.7)	80.9	(2.4)	78.1	(2.4)	69.2	(2.4)
	Japan	55.2	(3.6)	29.9	(3.6)	8.4	(2.2)	17.6	(3.2)	12.7	(2.6)	19.4	(3.2)
	Korea	8.0	(1.9)	87.8	(2.4)	59.4	(3.8)	52.7	(3.7)	27.1	(3.7)	47.3	(4.0)
	Luxembourg	2.4	(0.0)	59.3	(0.1)	88.9	(0.0)	81.0	(0.0)	35.2	(0.0)	41.0	(0.0)
	Mexico	6.3	(1.3)	70.1	(2.8)	62.1	(2.6)	57.6	(2.6)	55.1	(2.8)	62.6	(2.6)
	Netherlands	8.6	(2.2)	75.5	(3.5)	70.0	(3.8)	47.0	(4.4)	35.7	(3.8)	27.8	(4.0)
	New Zealand	9.4	(1.8)	81.0	(2.7)	65.0	(3.4)	62.9	(3.4)	51.0	(3.4)	70.5	(2.9)
	Norway	3.2	(1.3)	94.8	(1.7)	60.1	(3.6)	48.9	(3.5)	38.3	(4.0)	20.7	(3.1)
	Poland	0.7	(0.7)	99.3	(0.7)	88.8	(2.3)	44.8	(3.4)	46.8	(3.7)	48.6	(4.2)
	Portugal	0.0	(0.0)	87.5	(2.6)	81.3	(3.5)	94.0	(2.0)	76.7	(3.4)	80.3	(2.7)
	Slovak Republic	0.0	(0.0)	99.4	(0.6)	97.0	(1.4)	70.4	(3.8)	42.7	(3.8)	73.0	(3.6)
	Spain	0.8	(0.4)	78.3	(2.1)	94.3	(1.2)	90.3	(1.9)	37.2	(3.2)	55.2	(3.0)
	Sweden	12.6	(2.6)	65.7	(4.0)	60.6	(3.2)	43.8	(3.6)	30.0	(3.8)	32.9	(3.1)
	Switzerland	3.6	(1.0)	79.9	(2.2)	87.2	(2.1)	79.2	(2.3)	27.2	(2.6)	16.3	(1.9)
	Turkey	3.7	(1.3)	83.9	(3.0)	76.5	(2.8)	51.2	(4.4)	48.9	(4.2)	74.7	(3.7)
	United Kingdom	5.9	(1.7)	87.5	(2.0)	67.8	(3.2)	71.8	(3.1)	55.7	(3.2)	59.7	(3.7)
	United States	7.7	(2.3)	75.7	(3.6)	62.7	(4.2)	63.5	(4.3)	59.1	(4.2)	68.8	(3.7)
	OECD average	5.9	(0.3)	77.0	(0.5)	74.8	(0.5)	66.7	(0.6)	44.8	(0.6)	52.4	(0.6)
Partners	Argentina	5.9	(1.5)	57.1	(4.3)	63.3	(4.0)	59.7	(4.2)	65.2	(4.0)	74.5	(2.7)
	Azerbaijan	0.0	(0.0)	97.1	(1.4)	86.1	(2.9)	40.6	(3.9)	29.0	(4.2)	72.1	(3.8)
	Brazil	2.0	(0.9)	80.1	(2.5)	64.5	(2.5)	65.4	(2.9)	87.7	(1.9)	86.3	(2.3)
	Bulgaria	0.6	(0.5)	15.5	(3.1)	93.7	(2.0)	84.2	(3.3)	52.1	(4.5)	64.0	(4.2)
	Chile	7.8	(3.0)	82.2	(3.5)	73.7	(3.9)	59.0	(4.9)	42.7	(4.0)	56.2	(4.7)
	Colombia	0.3	(0.3)	88.8	(2.6)	60.4	(5.6)	61.3	(5.4)	79.1	(4.5)	67.4	(4.5)
	Croatia	4.5	(1.7)	40.5	(4.0)	87.8	(2.3)	74.9	(3.6)	58.0	(3.8)	65.0	(3.6)
	Estonia	0.0	(0.0)	80.1	(2.9)	93.3	(1.9)	76.2	(3.0)	78.9	(3.4)	79.3	(2.9)
	Hong Kong-China	0.7	(0.7)	91.2	(2.4)	83.4	(3.0)	87.6	(2.8)	67.9	(4.3)	76.4	(3.8)
	Indonesia	5.2	(1.4)	80.8	(3.6)	65.0	(3.9)	48.2	(4.6)	46.6	(3.8)	54.1	(3.6)
	Israel	4.8	(2.0)	84.5	(3.0)	73.5	(3.8)	73.3	(3.6)	59.8	(4.5)	74.9	(4.0)
	Jordan	0.5	(0.0)	52.6	(4.0)	83.9	(3.2)	92.8	(1.8)	82.2	(3.1)	85.2	(2.9)
	Kyrgyzstan	1.7	(1.0)	94.0	(1.9)	64.1	(3.4)	19.9	(2.9)	31.1	(3.0)	66.5	(3.7)
	Latvia	1.1	(0.7)	63.4	(3.7)	97.1	(1.5)	57.4	(3.8)	82.0	(2.8)	65.5	(3.5)
	Liechtenstein	4.1	(0.4)	90.6	(0.4)	78.9	(0.4)	82.9	(0.7)	20.0	(0.7)	1.8	(0.4)
	Lithuania	0.0	(0.0)	99.4	(0.4)	93.4	(1.8)	68.2	(3.1)	85.8	(2.5)	68.0	(3.2)
	Macao-China	1.8	(0.0)	84.2	(0.1)	62.6	(0.1)	55.7	(0.1)	67.8	(0.1)	84.1	(0.1)
	Montenegro	10.9	(0.1)	42.9	(0.2)	59.3	(0.1)	54.3	(0.2)	59.2	(0.1)	76.0	(0.2)
	Qatar	0.6	(0.0)	52.9	(0.2)	81.3	(0.1)	82.9	(0.1)	71.2	(0.1)	94.0	(0.1)
	Romania	0.5	(0.5)	88.1	(3.1)	95.7	(1.5)	76.6	(3.8)	64.1	(4.3)	75.5	(3.8)
	Russian Federation	0.3	(0.4)	87.5	(1.9)	93.8	(1.4)	40.7	(4.6)	76.6	(3.3)	73.8	(4.5)
	Serbia	8.8	(2.1)	40.8	(4.3)	73.4	(3.1)	51.4	(3.8)	33.6	(3.2)	53.2	(3.9)
	Slovenia	0.6	(0.2)	90.8	(0.2)	94.3	(0.2)	84.1	(0.1)	75.8	(0.3)	59.0	(0.5)
	Chinese Taipei	2.8	(1.1)	81.1	(3.3)	55.6	(3.4)	59.2	(3.4)	64.6	(3.6)	84.1	(2.7)
	Thailand	1.0	(1.0)	97.4	(1.5)	82.0	(3.2)	80.4	(2.6)	77.6	(3.8)	71.5	(3.4)
	Tunisia	11.4	(2.8)	27.7	(4.0)	68.8	(4.1)	48.4	(4.4)	48.9	(4.3)	39.8	(4.2)
	Uruguay	4.8	(0.9)	68.0	(2.2)	66.9	(2.8)	66.8	(2.3)	64.7	(2.7)	63.4	(3.0)

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[Part 1/2]

Table A4.4 Relationship between school activities for learning of environmental topics and environmental science performance, by country

		Increase in the environmental science performance index associated with 1 S.D. increase of the index of school activities for learning of environmental topics				School activities for learning of environmental topics							
						Outdoor education				Trips to museum			
		Before accounting for background variables		After accounting for background variables		Before accounting for background variables		After accounting for background variables		Before accounting for background variables		After accounting for background variables	
		Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.
OECD	Australia	3.3	(2.2)	1.5	(1.7)	7.4	(3.8)	2.0	(3.4)	2.1	(4.2)	1.1	(3.2)
	Austria	**18.8**	(3.6)	**10.6**	(2.8)	**17.6**	(8.8)	**14.8**	(5.7)	**29.3**	(8.4)	**16.4**	(6.0)
	Belgium	-0.6	(4.3)	-1.1	(2.8)	**18.9**	(6.9)	**10.5**	(4.3)	**-17.2**	(7.9)	**-12.8**	(4.8)
	Canada	**5.2**	(1.3)	**3.2**	(1.0)	**9.7**	(3.0)	4.5	(2.6)	**8.4**	(3.0)	**5.2**	(2.3)
	Czech Republic	4.8	(3.7)	-1.9	(3.5)	-6.0	(6.8)	-4.2	(5.3)	6.1	(10.6)	-5.5	(9.9)
	Denmark	4.1	(3.6)	3.4	(2.8)	-1.7	(6.0)	-0.5	(5.7)	4.3	(6.2)	7.4	(6.3)
	Finland	0.5	(2.0)	0.4	(2.1)	-1.9	(4.1)	0.5	(3.8)	3.2	(3.8)	2.1	(3.2)
	France	w	w	w	w	w	w	w	w	w	w	w	w
	Germany	**13.6**	(5.0)	3.9	(2.4)	14.1	(11.0)	3.7	(5.7)	4.2	(13.2)	-4.1	(8.0)
	Greece	2.4	(4.2)	-2.2	(3.5)	-16.6	(10.2)	-3.8	(7.8)	8.5	(8.8)	5.1	(6.0)
	Hungary	**14.9**	(3.8)	**7.6**	(2.4)	-2.6	(7.6)	3.8	(4.5)	7.9	(13.4)	**16.5**	(7.3)
	Iceland	1.8	(1.8)	0.3	(1.7)	-2.5	(3.3)	-3.2	(3.6)	1.2	(3.9)	4.5	(4.2)
	Ireland	-2.6	(2.8)	-0.5	(1.9)	6.0	(8.1)	3.6	(5.5)	-0.6	(5.6)	1.8	(3.8)
	Italy	2.2	(3.0)	-1.9	(2.3)	7.7	(6.1)	-1.8	(4.3)	3.5	(8.7)	-3.4	(6.3)
	Japan	**13.5**	(3.4)	**9.7**	(2.7)	7.4	(10.3)	9.3	(6.8)	23.6	(13.7)	11.6	(11.2)
	Korea	5.8	(3.8)	0.8	(2.0)	-1.5	(7.6)	-8.5	(6.4)	1.2	(7.1)	0.5	(4.3)
	Luxembourg	0.9	(1.2)	**-4.9**	(1.3)	-2.3	(2.4)	**-6.0**	(2.5)	**-13.3**	(3.8)	-4.5	(3.8)
	Mexico	**11.6**	(2.2)	2.8	(1.6)	**9.1**	(4.3)	**6.6**	(2.9)	**18.5**	(4.3)	2.1	(3.1)
	Netherlands	2.8	(4.3)	-1.7	(2.3)	4.8	(10.1)	2.3	(5.4)	-11.7	(9.1)	**-12.5**	(5.2)
	New Zealand	0.9	(1.9)	-1.2	(1.3)	-2.4	(5.6)	-3.0	(3.9)	3.5	(5.1)	-1.7	(3.1)
	Norway	-3.3	(2.8)	-4.3	(2.3)	-3.2	(9.5)	-4.4	(6.6)	-7.5	(4.5)	**-11.9**	(3.6)
	Poland	**13.2**	(2.8)	**6.4**	(2.3)	**26.4**	(12.7)	6.8	(13.7)	**19.4**	(6.6)	5.7	(6.3)
	Portugal	**8.6**	(4.0)	2.5	(3.0)	**32.2**	(11.9)	**16.5**	(7.2)	5.4	(7.5)	-5.6	(5.4)
	Slovak Republic	**16.8**	(4.8)	**7.9**	(3.0)	**-67.3**	(8.2)	**-31.3**	(8.3)	-17.7	(27.7)	-15.5	(16.4)
	Spain	0.7	(2.2)	0.4	(1.6)	-6.1	(4.6)	-4.4	(3.8)	3.7	(5.5)	0.9	(4.6)
	Sweden	1.3	(1.8)	0.5	(1.6)	0.2	(4.6)	3.2	(3.6)	3.4	(4.2)	3.4	(4.1)
	Switzerland	7.9	(4.1)	-0.9	(2.4)	-1.8	(6.8)	-2.0	(3.9)	-12.0	(7.8)	**-10.9**	(4.8)
	Turkey	**16.3**	(3.7)	-0.5	(2.9)	**28.1**	(5.9)	7.1	(6.1)	**23.8**	(6.9)	2.0	(5.6)
	United Kingdom	-0.5	(2.0)	-1.0	(1.2)	6.6	(5.4)	1.5	(4.2)	0.9	(4.7)	-3.5	(2.6)
	United States	-4.6	(3.0)	-3.4	(2.5)	16.0	(8.4)	5.0	(5.3)	-0.5	(7.5)	-3.6	(5.0)
	OECD average	**5.5**	(0.6)	**1.3**	(0.4)	**3.3**	(1.4)	1.0	(1.1)	**3.5**	(1.7)	-0.3	(1.2)
Partners	Argentina	**10.7**	(3.4)	2.7	(2.6)	10.4	(8.1)	2.8	(5.1)	**18.3**	(8.3)	4.2	(6.4)
	Azerbaijan	4.0	(3.5)	1.6	(3.9)	-4.1	(8.5)	0.4	(6.0)	2.9	(8.2)	-2.1	(8.5)
	Brazil	**12.7**	(2.4)	1.9	(2.0)	13.7	(7.1)	5.7	(4.9)	**21.2**	(4.3)	4.1	(3.3)
	Bulgaria	**26.9**	(6.8)	7.2	(4.2)	9.1	(9.9)	-8.3	(7.0)	11.0	(13.6)	**-21.9**	(8.5)
	Chile	**11.8**	(3.2)	2.1	(2.3)	**18.6**	(7.8)	6.2	(5.5)	**19.5**	(7.6)	6.4	(4.2)
	Colombia	**8.7**	(2.8)	0.8	(2.4)	0.5	(5.8)	-8.0	(4.1)	**13.1**	(6.7)	2.1	(3.3)
	Croatia	**13.5**	(2.7)	3.2	(2.4)	6.6	(5.8)	1.2	(4.0)	**23.6**	(10.3)	6.8	(8.3)
	Estonia	4.6	(3.3)	-0.7	(2.4)	-8.5	(7.0)	-3.8	(4.8)	**-20.2**	(9.9)	**-24.5**	(6.6)
	Hong Kong-China	-0.3	(3.9)	-3.0	(2.9)	-0.2	(13.5)	-4.6	(8.5)	**-16.5**	(8.0)	**-11.5**	(5.7)
	Indonesia	**17.1**	(3.6)	**9.4**	(2.4)	9.2	(6.9)	8.1	(5.1)	12.8	(7.2)	5.3	(3.8)
	Israel	0.6	(3.3)	-0.1	(3.1)	1.4	(8.8)	-7.4	(8.1)	10.7	(6.2)	7.2	(6.1)
	Jordan	5.2	(3.8)	0.4	(2.7)	1.1	(5.7)	0.3	(3.6)	0.6	(6.9)	-0.8	(5.8)
	Kyrgyzstan	**6.1**	(2.8)	-2.6	(2.0)	-18.3	(9.7)	-10.4	(8.2)	**8.6**	(4.3)	-5.5	(3.5)
	Latvia	4.9	(2.8)	-1.4	(2.2)	-1.2	(5.8)	-1.1	(4.3)	**30.4**	(10.4)	5.5	(8.9)
	Liechtenstein	9.6	(5.9)	-10.2	(8.1)	15.3	(14.9)	12.9	(19.3)	20.5	(11.1)	-3.5	(12.3)
	Lithuania	**8.4**	(3.5)	-1.3	(2.6)	**57.3**	(5.4)	**55.8**	(20.3)	3.0	(16.0)	-0.5	(10.9)
	Macao-China	**6.8**	(1.3)	**10.9**	(1.2)	**7.0**	(3.1)	**13.4**	(3.4)	2.7	(2.6)	**7.9**	(2.3)
	Montenegro	-2.5	(1.4)	-0.3	(1.4)	**9.3**	(2.7)	**11.3**	(2.8)	**-9.2**	(3.0)	-0.7	(2.9)
	Qatar	-1.3	(1.7)	**-3.5**	(1.6)	3.5	(2.1)	-1.0	(2.2)	**17.7**	(2.1)	2.5	(2.3)
	Romania	**10.1**	(4.2)	0.8	(3.5)	-13.6	(14.9)	-7.9	(7.1)	**32.8**	(13.8)	1.7	(8.0)
	Russian Federation	**14.0**	(2.8)	**7.2**	(2.9)	10.4	(7.8)	9.9	(6.2)	16.8	(9.4)	5.4	(9.6)
	Serbia	**12.4**	(3.0)	4.2	(2.3)	4.0	(6.6)	8.9	(5.1)	**13.9**	(6.5)	-1.5	(4.6)
	Slovenia	**16.1**	(1.8)	-0.8	(1.6)	**12.4**	(5.4)	**11.5**	(4.5)	**17.3**	(5.9)	-10.5	(6.0)
	Chinese Taipei	5.0	(3.8)	1.9	(2.6)	-11.6	(9.8)	-6.2	(7.0)	11.3	(7.8)	2.7	(5.5)
	Thailand	**12.3**	(2.5)	**4.6**	(2.3)	23.7	(17.3)	24.3	(19.2)	**21.1**	(4.8)	8.2	(5.4)
	Tunisia	**12.4**	(3.8)	**6.9**	(2.8)	11.2	(7.4)	**11.0**	(5.3)	**17.4**	(6.5)	9.0	(5.6)
	Uruguay	1.2	(2.7)	-1.1	(1.7)	**-18.0**	(5.8)	**-9.8**	(4.4)	-4.8	(6.1)	-6.8	(4.9)

Note: Values that are statistically significant are indicated in bold.

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[Part 2/2]

Table A4.4 Relationship between school activities for learning of environmental topics and environmental science performance, by country

		School activities for learning of environmental topics											
		Trips to science and/or technology centres				Extracurricular environmental projects (including research)				Lectures and/or seminars (*e.g.* guest speakers)			
		Before accounting for background variables		After accounting for background variables		Before accounting for background variables		After accounting for background variables		Before accounting for background variables		After accounting for background variables	
		Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.
OECD	Australia	-4.2	(5.7)	-1.8	(3.6)	4.6	(4.7)	3.8	(3.2)	6.0	(4.0)	3.6	(3.2)
	Austria	**21.7**	(8.8)	**14.5**	(5.7)	**37.8**	(8.8)	**16.9**	(7.0)	**21.6**	(8.3)	**10.7**	(4.7)
	Belgium	**-16.2**	(7.8)	-5.0	(5.4)	4.7	(7.0)	5.2	(4.2)	1.8	(8.4)	-2.8	(5.0)
	Canada	**11.9**	(4.2)	5.6	(3.5)	**6.8**	(3.0)	3.7	(2.8)	**11.3**	(3.3)	**6.8**	(3.1)
	Czech Republic	-1.9	(10.3)	-6.0	(6.4)	**22.1**	(7.1)	8.7	(5.1)	-1.4	(8.1)	-1.8	(7.0)
	Denmark	-0.4	(5.3)	-2.4	(3.5)	5.8	(6.8)	4.2	(5.2)	**13.2**	(4.7)	**10.4**	(4.5)
	Finland	**7.0**	(3.3)	3.6	(3.2)	-4.0	(3.9)	-3.1	(3.7)	-0.1	(3.4)	1.7	(3.2)
	France	w	w	w	w	w	w	w	w	w	w	w	w
	Germany	13.3	(8.9)	4.3	(4.8)	**19.4**	(7.4)	3.5	(3.9)	**21.3**	(7.3)	8.1	(4.9)
	Greece	8.0	(6.3)	2.8	(5.2)	-3.2	(6.7)	-3.3	(5.9)	4.2	(6.7)	-1.0	(4.7)
	Hungary	**23.5**	(8.3)	8.3	(4.7)	**24.5**	(7.2)	2.3	(5.4)	**27.3**	(8.7)	**15.5**	(4.7)
	Iceland	0.9	(3.2)	-0.2	(3.1)	-0.8	(4.6)	0.0	(4.5)	-3.8	(2.9)	-4.8	(2.8)
	Ireland	-4.6	(5.4)	-4.5	(3.8)	-9.8	(5.3)	-3.6	(4.1)	-7.2	(5.9)	1.6	(4.1)
	Italy	3.6	(7.6)	-3.2	(3.8)	-5.4	(7.0)	-6.4	(4.8)	5.8	(6.1)	-3.2	(4.2)
	Japan	13.6	(9.4)	**14.8**	(6.3)	**37.5**	(9.9)	**25.3**	(5.6)	**35.7**	(7.6)	**18.1**	(6.8)
	Korea	7.5	(7.0)	1.1	(4.6)	**21.5**	(8.4)	9.6	(5.0)	12.9	(7.5)	4.1	(4.8)
	Luxembourg	**-33.5**	(3.3)	-7.3	(4.0)	**18.2**	(2.6)	**-7.9**	(3.5)	3.5	(2.4)	**-10.1**	(2.5)
	Mexico	**20.8**	(4.3)	5.4	(3.0)	**21.1**	(4.1)	**9.5**	(2.8)	**22.1**	(4.7)	3.6	(3.7)
	Netherlands	15.0	(8.1)	-3.6	(5.5)	-5.1	(8.3)	-7.1	(5.6)	5.5	(10.4)	-5.1	(6.1)
	New Zealand	0.9	(5.0)	-4.7	(3.7)	**11.0**	(4.8)	3.0	(2.7)	-2.2	(4.1)	-5.3	(3.3)
	Norway	-1.2	(4.8)	-3.7	(4.0)	-7.6	(5.2)	-3.6	(4.1)	1.1	(6.3)	3.0	(4.3)
	Poland	**13.3**	(4.7)	2.0	(3.9)	**10.9**	(4.7)	**8.6**	(3.7)	4.6	(4.6)	4.3	(3.7)
	Portugal	7.4	(14.8)	7.8	(8.6)	-11.6	(6.8)	-2.2	(4.7)	**22.4**	(7.4)	6.2	(5.4)
	Slovak Republic	18.7	(9.7)	8.3	(5.8)	13.6	(7.9)	4.5	(5.1)	13.9	(10.0)	6.5	(5.6)
	Spain	-2.7	(7.2)	-2.9	(5.4)	3.5	(3.8)	3.2	(2.3)	5.8	(4.6)	4.4	(3.0)
	Sweden	1.0	(4.5)	-3.8	(3.2)	-3.9	(4.6)	-2.1	(3.5)	3.5	(4.2)	-0.9	(3.4)
	Switzerland	9.2	(5.7)	0.7	(4.1)	4.4	(6.7)	3.8	(3.9)	**24.7**	(8.4)	1.3	(5.6)
	Turkey	**24.6**	(7.8)	0.4	(6.4)	**22.8**	(8.6)	0.4	(6.9)	**23.2**	(8.6)	4.4	(6.1)
	United Kingdom	0.6	(5.3)	-4.9	(3.2)	2.5	(4.5)	0.8	(2.7)	5.2	(4.5)	-0.2	(3.1)
	United States	-5.4	(6.7)	-5.9	(4.5)	-4.0	(8.2)	-0.7	(5.1)	6.2	(6.5)	-3.6	(4.4)
	OECD average	**5.2**	(1.3)	0.7	(0.9)	**8.2**	(1.2)	**2.7**	(0.8)	**9.9**	(1.2)	**2.6**	(0.8)
Partners	Argentina	**32.2**	(6.5)	**10.0**	(4.7)	2.2	(8.8)	0.3	(5.3)	-0.2	(9.1)	-10.2	(6.1)
	Azerbaijan	7.1	(4.7)	3.5	(4.8)	7.9	(6.1)	3.6	(6.1)	8.4	(4.4)	8.2	(4.8)
	Brazil	**25.6**	(4.7)	3.0	(3.4)	12.3	(6.6)	1.1	(4.8)	10.6	(6.5)	3.9	(5.1)
	Bulgaria	**47.2**	(9.8)	6.0	(6.8)	**44.7**	(8.9)	9.9	(5.5)	**25.8**	(10.1)	9.4	(6.0)
	Chile	**31.7**	(6.4)	**10.6**	(4.9)	**27.9**	(7.1)	6.8	(4.4)	**19.1**	(6.4)	8.1	(4.7)
	Colombia	12.8	(6.8)	1.9	(3.7)	**12.4**	(5.4)	-0.9	(4.0)	**14.2**	(6.5)	1.5	(5.0)
	Croatia	15.2	(7.8)	1.8	(5.1)	**17.1**	(6.1)	0.9	(4.7)	**23.2**	(6.6)	7.3	(5.5)
	Estonia	11.2	(6.2)	-5.9	(5.6)	**19.4**	(7.1)	**11.2**	(4.9)	2.8	(4.5)	0.7	(4.6)
	Hong Kong-China	**-21.9**	(9.2)	-7.1	(7.2)	2.9	(8.5)	-1.0	(6.5)	13.4	(10.0)	-3.1	(6.4)
	Indonesia	**24.8**	(6.6)	**15.5**	(3.9)	**31.8**	(6.1)	**16.7**	(4.0)	**18.9**	(7.7)	6.0	(4.9)
	Israel	2.0	(6.9)	3.4	(7.6)	-6.2	(8.2)	-5.9	(7.0)	4.7	(8.0)	-4.3	(7.0)
	Jordan	**15.1**	(7.2)	2.1	(6.3)	**12.0**	(6.0)	8.3	(4.4)	12.0	(9.3)	-0.2	(5.0)
	Kyrgyzstan	**19.9**	(5.5)	4.3	(3.2)	**11.1**	(5.0)	-1.6	(3.7)	4.0	(4.9)	-0.8	(3.3)
	Latvia	8.6	(5.0)	-4.3	(4.6)	10.6	(6.3)	0.7	(5.4)	4.7	(6.6)	-4.9	(4.7)
	Liechtenstein	**44.1**	(9.6)	-9.5	(11.9)	**-47.4**	(9.7)	-26.4	(17.3)	**-43.3**	(5.6)	-16.8	(11.3)
	Lithuania	10.5	(6.0)	0.0	(4.0)	**25.8**	(4.9)	8.3	(6.5)	9.6	(5.8)	0.8	(4.9)
	Macao-China	**11.8**	(2.6)	**16.8**	(2.4)	**14.9**	(3.2)	**24.6**	(3.0)	**11.0**	(3.7)	**16.5**	(3.9)
	Montenegro	**-9.9**	(2.7)	**-8.8**	(2.8)	**9.7**	(3.0)	0.9	(3.3)	-5.4	(3.1)	-2.9	(3.0)
	Qatar	-2.1	(2.2)	**-10.6**	(2.6)	**4.1**	(1.8)	-0.6	(2.2)	1.7	(2.5)	**-12.6**	(3.2)
	Romania	9.1	(8.3)	-3.6	(7.0)	**16.5**	(8.1)	5.4	(5.2)	**18.7**	(9.3)	-0.1	(6.0)
	Russian Federation	**20.0**	(4.8)	7.2	(4.9)	**19.2**	(4.7)	9.1	(5.3)	2.3	(6.1)	-4.2	(4.9)
	Serbia	6.6	(6.4)	2.3	(4.2)	**31.8**	(6.0)	**10.4**	(4.6)	13.2	(7.1)	0.6	(4.4)
	Slovenia	**22.4**	(3.3)	-2.8	(4.1)	**27.1**	(3.1)	0.3	(3.0)	**21.7**	(3.2)	-1.7	(2.7)
	Chinese Taipei	8.6	(8.8)	6.9	(5.1)	6.9	(7.6)	-1.3	(4.9)	13.3	(10.1)	14.7	(7.8)
	Thailand	**17.5**	(4.8)	3.4	(4.3)	**19.2**	(5.3)	3.8	(4.9)	**18.7**	(6.1)	**10.3**	(4.4)
	Tunisia	**18.5**	(6.5)	3.6	(5.1)	**16.6**	(6.6)	**11.3**	(4.4)	**15.4**	(7.6)	7.7	(6.1)
	Uruguay	**12.8**	(6.0)	4.5	(4.3)	9.7	(6.9)	2.1	(5.1)	4.3	(6.1)	3.6	(4.6)

Note: Values that are statistically significant are indicated in bold.

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[Part 1/6]

Table A4.5 Main sources for students to learn about environmental issues

		Air pollution									
		Sources where they mainly learnt about the environmental issue:									
		School		TV, Radio, Newspaper or Magazines		Friends		Family		Internet or Books	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
OECD	Australia	84.0	(0.4)	42.2	(0.6)	5.1	(0.3)	18.8	(0.5)	25.2	(0.5)
	Austria	80.6	(0.7)	47.6	(0.9)	4.0	(0.3)	26.4	(0.6)	16.5	(0.5)
	Belgium	68.7	(0.7)	59.1	(0.7)	5.3	(0.2)	20.8	(0.6)	18.4	(0.4)
	Canada	77.9	(0.5)	55.2	(0.6)	9.9	(0.3)	28.0	(0.5)	27.7	(0.6)
	Czech Republic	71.1	(0.9)	64.2	(0.9)	4.4	(0.4)	13.8	(0.6)	32.1	(0.7)
	Denmark	86.1	(0.8)	45.9	(0.9)	3.5	(0.3)	17.3	(0.7)	23.8	(0.7)
	Finland	82.7	(0.7)	60.8	(0.8)	6.2	(0.4)	18.8	(0.6)	21.3	(0.7)
	France	62.9	(0.9)	64.9	(1.1)	8.6	(0.4)	28.9	(0.8)	20.2	(0.7)
	Germany	69.3	(0.7)	58.7	(1.1)	5.8	(0.4)	28.6	(0.8)	24.2	(0.7)
	Greece	65.2	(0.9)	52.1	(1.0)	6.0	(0.4)	21.6	(0.8)	27.0	(0.8)
	Hungary	70.1	(0.9)	72.6	(0.9)	8.2	(0.5)	22.8	(0.8)	29.6	(0.8)
	Iceland	71.3	(0.7)	58.5	(0.8)	5.4	(0.3)	19.8	(0.6)	16.0	(0.6)
	Ireland	85.5	(0.6)	37.6	(1.0)	2.8	(0.3)	15.6	(0.5)	13.7	(0.5)
	Italy	69.3	(0.6)	53.7	(0.7)	2.5	(0.2)	14.8	(0.5)	17.6	(0.4)
	Japan	80.1	(0.6)	43.7	(0.8)	1.2	(0.2)	4.7	(0.3)	12.6	(0.4)
	Korea	59.8	(0.8)	56.0	(1.1)	2.5	(0.2)	5.8	(0.3)	29.6	(0.9)
	Luxembourg	66.5	(0.7)	58.1	(0.8)	8.4	(0.4)	29.7	(0.7)	23.5	(0.7)
	Mexico	80.1	(0.9)	34.5	(0.8)	3.8	(0.2)	12.3	(0.5)	23.0	(0.7)
	Netherlands	64.1	(0.8)	45.2	(1.0)	2.9	(0.3)	13.7	(0.6)	13.8	(0.6)
	New Zealand	81.2	(0.6)	43.4	(0.8)	5.4	(0.3)	21.0	(0.8)	21.4	(0.6)
	Norway	83.5	(0.7)	44.2	(0.8)	6.6	(0.3)	20.4	(0.6)	24.0	(0.7)
	Poland	84.1	(0.6)	43.7	(0.9)	4.7	(0.3)	18.1	(0.5)	25.7	(0.7)
	Portugal	86.8	(0.6)	57.9	(1.0)	10.2	(0.5)	19.4	(0.7)	41.1	(1.0)
	Slovak Republic	83.3	(0.7)	60.1	(1.0)	10.6	(0.6)	16.6	(0.8)	33.3	(1.0)
	Spain	86.6	(0.4)	52.9	(0.8)	5.7	(0.3)	19.3	(0.6)	24.2	(0.7)
	Sweden	80.2	(0.7)	40.6	(0.9)	3.4	(0.3)	16.9	(0.6)	13.2	(0.6)
	Switzerland	62.7	(1.0)	59.2	(0.9)	7.7	(0.3)	32.9	(0.7)	17.4	(0.6)
	Turkey	58.9	(0.9)	53.9	(1.2)	12.3	(0.7)	23.2	(0.8)	21.7	(1.1)
	United Kingdom	88.8	(0.4)	34.4	(0.7)	4.0	(0.3)	15.0	(0.5)	18.7	(0.6)
	United States	80.2	(0.8)	46.1	(1.1)	8.6	(0.4)	22.9	(0.8)	28.3	(0.8)
	OECD average	75.7	(0.1)	51.6	(0.2)	5.9	(0.1)	19.6	(0.1)	22.8	(0.1)
Partners	Argentina	75.7	(1.3)	34.5	(1.2)	4.3	(0.4)	12.1	(0.9)	30.3	(1.3)
	Azerbaijan	56.9	(1.3)	26.3	(1.0)	1.4	(0.2)	3.2	(0.3)	5.3	(0.5)
	Brazil	78.7	(0.6)	52.7	(0.9)	11.5	(0.4)	14.7	(0.5)	26.4	(0.8)
	Bulgaria	56.5	(1.1)	49.7	(1.3)	14.2	(1.8)	24.3	(1.6)	24.7	(1.8)
	Chile	70.7	(0.8)	40.4	(1.2)	4.5	(0.3)	15.4	(0.8)	23.1	(0.8)
	Colombia	42.0	(1.1)	12.4	(0.7)	2.1	(0.3)	3.0	(0.4)	14.4	(0.7)
	Croatia	79.8	(0.6)	59.3	(0.9)	6.7	(0.4)	24.8	(0.7)	24.9	(0.7)
	Estonia	79.4	(0.6)	62.7	(0.8)	9.5	(0.5)	20.6	(0.7)	29.3	(0.7)
	Hong Kong-China	86.1	(0.6)	68.6	(0.9)	8.0	(0.5)	17.7	(0.8)	35.7	(0.9)
	Indonesia	70.5	(1.0)	40.4	(1.8)	10.6	(1.3)	10.1	(1.0)	16.5	(1.4)
	Israel	54.9	(1.1)	37.7	(0.9)	5.3	(0.4)	12.2	(0.5)	19.8	(0.7)
	Jordan	74.8	(0.9)	25.7	(1.0)	5.1	(0.5)	11.3	(0.7)	11.3	(0.8)
	Kyrgyzstan	62.7	(0.9)	27.5	(0.9)	4.3	(0.3)	6.1	(0.7)	6.8	(0.5)
	Latvia	77.0	(0.7)	67.8	(1.1)	11.9	(0.5)	28.3	(0.8)	34.1	(1.1)
	Liechtenstein	73.2	(2.4)	50.9	(2.7)	5.0	(1.2)	32.1	(2.3)	15.8	(1.9)
	Lithuania	80.8	(0.7)	55.2	(0.9)	6.7	(0.4)	17.0	(0.6)	24.2	(0.7)
	Macao-China	79.8	(0.7)	68.5	(0.7)	9.6	(0.5)	16.8	(0.7)	32.3	(0.7)
	Montenegro	75.8	(0.8)	38.0	(0.8)	8.6	(0.4)	22.2	(0.7)	18.9	(0.7)
	Qatar	61.7	(0.6)	21.3	(0.5)	4.7	(0.2)	10.3	(0.4)	13.4	(0.4)
	Romania	76.6	(1.0)	35.7	(1.5)	5.4	(0.5)	16.3	(0.8)	17.9	(0.8)
	Russian Federation	74.1	(0.7)	57.9	(1.0)	12.5	(0.6)	23.2	(0.8)	23.2	(0.7)
	Serbia	80.3	(0.6)	38.7	(1.1)	6.8	(0.4)	19.2	(0.8)	14.1	(0.6)
	Slovenia	73.6	(0.6)	55.7	(0.6)	6.3	(0.4)	20.1	(0.6)	25.5	(0.6)
	Chinese Taipei	61.7	(0.7)	49.5	(0.7)	4.6	(0.3)	11.7	(0.4)	16.9	(0.4)
	Thailand	65.9	(0.7)	54.6	(0.9)	12.7	(0.6)	18.6	(0.7)	28.9	(0.7)
	Tunisia	65.9	(0.9)	31.7	(1.0)	6.0	(0.5)	8.8	(0.4)	15.8	(0.8)
	Uruguay	78.2	(0.7)	44.9	(0.8)	5.8	(0.3)	15.8	(0.5)	37.5	(0.9)

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[Part 2/6]

Table A4.5 Main sources for students to learn about environmental issues

		Energy shortages									
		Sources where they mainly learnt about the environmental issue:									
		School		TV, Radio, Newspaper or Magazines		Friends		Family		Internet or Books	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
OECD	Australia	69.1	(0.6)	36.8	(0.5)	2.8	(0.2)	17.8	(0.4)	16.1	(0.4)
	Austria	59.3	(0.9)	40.0	(0.9)	2.1	(0.2)	15.6	(0.6)	9.8	(0.4)
	Belgium	46.0	(0.6)	43.4	(0.8)	1.8	(0.2)	11.5	(0.4)	9.9	(0.4)
	Canada	58.2	(0.7)	43.2	(0.6)	4.2	(0.2)	21.2	(0.6)	15.9	(0.4)
	Czech Republic	54.3	(1.2)	56.5	(1.0)	3.3	(0.3)	11.7	(0.5)	26.8	(0.7)
	Denmark	75.3	(0.9)	31.4	(0.8)	1.9	(0.2)	12.5	(0.5)	16.0	(0.6)
	Finland	59.7	(1.1)	48.6	(0.7)	1.7	(0.2)	9.6	(0.5)	10.8	(0.5)
	France	31.7	(0.7)	42.6	(0.9)	2.3	(0.2)	12.2	(0.6)	10.5	(0.5)
	Germany	50.2	(1.1)	50.2	(1.1)	3.6	(0.3)	23.1	(0.7)	16.0	(0.6)
	Greece	45.7	(0.9)	44.7	(0.9)	3.8	(0.3)	9.6	(0.4)	22.9	(0.9)
	Hungary	58.6	(0.9)	65.9	(0.9)	3.6	(0.3)	11.7	(0.5)	23.5	(0.7)
	Iceland	60.4	(0.8)	37.5	(0.8)	2.2	(0.2)	8.6	(0.4)	9.4	(0.5)
	Ireland	74.6	(0.7)	34.1	(0.8)	1.9	(0.2)	13.7	(0.6)	9.8	(0.4)
	Italy	47.1	(0.6)	51.6	(0.6)	2.3	(0.2)	14.1	(0.4)	11.9	(0.4)
	Japan	71.1	(0.8)	35.2	(0.9)	0.6	(0.1)	3.3	(0.2)	6.9	(0.3)
	Korea	59.0	(0.9)	48.9	(1.0)	1.4	(0.2)	4.0	(0.3)	23.6	(0.7)
	Luxembourg	40.6	(0.7)	43.8	(0.6)	3.7	(0.3)	17.1	(0.5)	13.9	(0.5)
	Mexico	51.9	(0.7)	24.6	(0.6)	1.8	(0.2)	4.4	(0.3)	15.7	(0.5)
	Netherlands	49.2	(1.0)	43.6	(0.8)	1.8	(0.2)	11.9	(0.6)	9.4	(0.5)
	New Zealand	59.5	(0.8)	49.1	(0.7)	3.9	(0.3)	23.9	(0.8)	12.4	(0.5)
	Norway	78.0	(0.7)	31.3	(0.8)	4.3	(0.3)	16.0	(0.5)	15.3	(0.6)
	Poland	75.8	(0.6)	38.1	(0.7)	2.0	(0.2)	7.7	(0.4)	20.9	(0.6)
	Portugal	72.7	(0.8)	45.3	(1.0)	4.2	(0.3)	12.2	(0.6)	29.4	(0.9)
	Slovak Republic	62.2	(1.0)	59.7	(1.0)	5.6	(0.4)	11.3	(0.5)	23.3	(0.8)
	Spain	75.1	(0.6)	48.7	(0.7)	2.9	(0.2)	15.0	(0.6)	17.8	(0.5)
	Sweden	67.7	(0.8)	27.1	(0.8)	2.9	(0.4)	15.3	(0.6)	8.9	(0.5)
	Switzerland	42.4	(0.8)	40.9	(0.7)	2.8	(0.2)	16.6	(0.5)	9.3	(0.3)
	Turkey	47.5	(0.9)	55.6	(1.2)	6.7	(0.5)	12.9	(0.6)	19.7	(0.9)
	United Kingdom	79.6	(0.6)	36.4	(0.7)	2.9	(0.2)	15.0	(0.5)	14.7	(0.5)
	United States	63.7	(0.9)	40.8	(1.1)	5.0	(0.3)	20.9	(0.7)	20.0	(0.6)
	OECD average	59.6	(0.2)	43.2	(0.2)	3.0	(0.1)	13.3	(0.1)	15.7	(0.1)
Partners	Argentina	52.9	(1.4)	33.6	(1.1)	2.1	(0.3)	7.3	(0.6)	20.3	(1.0)
	Azerbaijan	45.6	(1.0)	30.6	(1.0)	2.3	(0.2)	4.5	(0.4)	5.5	(0.4)
	Brazil	48.6	(0.9)	45.7	(0.9)	4.3	(0.3)	8.9	(0.4)	17.7	(0.7)
	Bulgaria	48.3	(1.1)	46.3	(1.2)	11.7	(1.9)	17.7	(1.8)	19.8	(1.8)
	Chile	55.5	(1.0)	40.3	(1.2)	2.0	(0.2)	9.9	(0.5)	18.7	(0.7)
	Colombia	58.3	(1.2)	29.5	(1.1)	2.9	(0.3)	9.1	(0.6)	18.1	(0.7)
	Croatia	67.4	(0.7)	51.7	(0.7)	3.1	(0.3)	12.6	(0.5)	17.4	(0.6)
	Estonia	53.9	(0.9)	52.7	(0.9)	6.2	(0.4)	15.3	(0.5)	18.9	(0.7)
	Hong Kong-China	84.1	(0.8)	56.7	(0.8)	2.9	(0.2)	10.1	(0.5)	26.9	(0.8)
	Indonesia	67.8	(1.0)	33.1	(1.9)	6.8	(0.6)	9.5	(0.6)	15.3	(1.2)
	Israel	53.7	(1.0)	24.3	(0.7)	3.6	(0.3)	7.1	(0.4)	12.9	(0.6)
	Jordan	67.3	(0.9)	26.5	(0.9)	3.3	(0.3)	5.7	(0.4)	12.1	(0.7)
	Kyrgyzstan	47.8	(0.9)	33.6	(0.8)	2.7	(0.2)	4.1	(0.3)	6.5	(0.5)
	Latvia	38.6	(1.0)	61.1	(1.0)	5.9	(0.3)	23.9	(0.7)	17.7	(0.7)
	Liechtenstein	50.5	(2.8)	37.1	(2.4)	3.9	(1.1)	19.7	(2.2)	9.2	(1.6)
	Lithuania	64.9	(0.9)	41.1	(0.8)	3.2	(0.3)	9.8	(0.5)	13.3	(0.6)
	Macao-China	72.1	(0.9)	63.4	(0.7)	4.5	(0.3)	10.9	(0.5)	25.0	(0.7)
	Montenegro	54.4	(0.9)	35.7	(0.8)	5.8	(0.4)	13.4	(0.6)	16.5	(0.6)
	Qatar	55.6	(0.6)	18.2	(0.5)	3.2	(0.2)	5.7	(0.3)	10.3	(0.4)
	Romania	52.9	(1.3)	30.4	(1.7)	3.1	(0.4)	5.8	(0.4)	11.0	(0.7)
	Russian Federation	25.6	(0.8)	62.1	(0.9)	12.0	(0.5)	30.4	(0.7)	11.2	(0.6)
	Serbia	59.7	(0.7)	38.8	(0.9)	4.2	(0.3)	10.9	(0.4)	10.2	(0.4)
	Slovenia	61.6	(0.7)	49.0	(0.8)	3.4	(0.2)	11.9	(0.5)	19.8	(0.6)
	Chinese Taipei	56.0	(0.6)	50.3	(0.6)	2.3	(0.2)	8.1	(0.3)	15.0	(0.4)
	Thailand	61.4	(0.9)	51.0	(0.9)	6.6	(0.4)	9.7	(0.5)	29.1	(0.9)
	Tunisia	39.5	(0.9)	48.0	(1.0)	4.1	(0.3)	8.2	(0.6)	14.7	(0.7)
	Uruguay	32.6	(0.8)	59.8	(0.8)	5.1	(0.4)	19.0	(0.7)	21.2	(0.7)

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[Part 3/6]

Table A4.5 Main sources for students to learn about environmental issues

		Extinction of plants and animals									
		Sources where they mainly learnt about the environmental issue:									
		School		TV, Radio, Newspaper or Magazines		Friends		Family		Internet or Books	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
OECD	Australia	84.2	(0.4)	38.0	(0.6)	5.0	(0.2)	16.1	(0.4)	30.0	(0.5)
	Austria	76.5	(0.8)	46.8	(0.9)	5.3	(0.4)	17.4	(0.6)	20.8	(0.6)
	Belgium	58.6	(0.8)	56.3	(0.7)	4.6	(0.3)	12.9	(0.5)	24.5	(0.5)
	Canada	76.8	(0.5)	47.1	(0.6)	7.2	(0.3)	16.8	(0.4)	31.9	(0.6)
	Czech Republic	64.4	(0.8)	63.1	(0.9)	5.8	(0.3)	11.0	(0.5)	36.8	(0.9)
	Denmark	82.4	(0.7)	40.4	(0.8)	3.0	(0.3)	10.4	(0.6)	24.2	(0.8)
	Finland	80.7	(0.7)	58.0	(0.9)	7.0	(0.4)	13.1	(0.5)	26.5	(0.8)
	France	52.9	(0.9)	59.3	(1.1)	5.4	(0.4)	16.6	(0.7)	23.5	(0.7)
	Germany	65.0	(0.7)	56.3	(1.0)	6.1	(0.4)	19.4	(0.7)	27.0	(0.8)
	Greece	47.9	(0.9)	56.2	(0.9)	5.5	(0.4)	11.6	(0.5)	33.5	(0.9)
	Hungary	64.0	(0.9)	68.8	(0.8)	7.4	(0.4)	14.6	(0.6)	35.6	(0.9)
	Iceland	79.0	(0.7)	39.4	(0.8)	2.9	(0.3)	8.5	(0.4)	16.4	(0.6)
	Ireland	72.0	(0.7)	41.0	(0.8)	3.3	(0.3)	11.9	(0.5)	21.1	(0.7)
	Italy	63.9	(0.7)	51.3	(0.6)	3.2	(0.2)	9.9	(0.4)	21.0	(0.4)
	Japan	66.0	(0.7)	51.0	(0.9)	1.5	(0.2)	3.8	(0.2)	13.5	(0.5)
	Korea	42.7	(0.8)	59.0	(0.9)	1.6	(0.2)	2.5	(0.2)	33.3	(0.8)
	Luxembourg	66.3	(0.7)	55.6	(0.7)	8.0	(0.4)	19.0	(0.5)	27.7	(0.7)
	Mexico	73.6	(0.7)	39.0	(0.9)	4.7	(0.2)	11.3	(0.4)	27.8	(0.8)
	Netherlands	66.3	(0.8)	51.2	(0.9)	4.2	(0.4)	11.5	(0.6)	19.8	(0.6)
	New Zealand	80.8	(0.6)	40.4	(0.7)	5.9	(0.4)	18.0	(0.6)	30.2	(0.7)
	Norway	73.5	(0.9)	51.6	(1.0)	9.1	(0.5)	16.6	(0.6)	29.0	(0.9)
	Poland	76.6	(0.7)	45.5	(0.8)	3.6	(0.2)	10.1	(0.5)	26.3	(0.7)
	Portugal	82.9	(0.7)	55.6	(0.9)	9.1	(0.5)	14.5	(0.5)	39.9	(0.9)
	Slovak Republic	73.1	(1.0)	57.3	(1.0)	7.3	(0.5)	10.6	(0.6)	28.9	(0.8)
	Spain	79.3	(0.5)	57.2	(0.7)	6.6	(0.3)	17.7	(0.5)	26.7	(0.7)
	Sweden	73.7	(0.8)	44.1	(0.9)	3.3	(0.3)	13.1	(0.6)	17.8	(0.6)
	Switzerland	58.6	(0.8)	59.1	(0.8)	7.3	(0.3)	22.7	(0.5)	23.6	(0.7)
	Turkey	52.2	(0.9)	58.4	(1.1)	10.1	(0.5)	13.5	(0.6)	25.1	(1.1)
	United Kingdom	83.8	(0.5)	36.1	(0.7)	4.2	(0.3)	13.9	(0.4)	22.9	(0.5)
	United States	85.4	(0.6)	34.7	(0.8)	6.7	(0.3)	14.0	(0.6)	29.9	(0.9)
	OECD average	70.1	(0.1)	50.6	(0.1)	5.5	(0.1)	13.4	(0.1)	26.5	(0.1)
Partners	Argentina	67.7	(1.1)	40.3	(1.3)	3.7	(0.4)	10.0	(0.5)	27.3	(1.3)
	Azerbaijan	65.2	(1.3)	17.7	(0.9)	2.2	(0.2)	2.7	(0.3)	8.8	(0.5)
	Brazil	69.1	(0.7)	54.6	(0.8)	9.5	(0.5)	10.2	(0.4)	24.1	(0.8)
	Bulgaria	60.8	(1.3)	43.8	(1.4)	13.0	(1.8)	17.5	(1.7)	27.6	(1.8)
	Chile	61.4	(0.9)	41.4	(1.0)	4.6	(0.4)	11.3	(0.5)	24.6	(0.9)
	Colombia	70.2	(1.0)	36.1	(1.6)	7.1	(0.6)	12.2	(0.8)	25.9	(1.4)
	Croatia	82.1	(0.6)	53.4	(0.8)	5.2	(0.3)	14.8	(0.6)	25.5	(0.7)
	Estonia	77.7	(0.8)	62.5	(0.9)	9.0	(0.5)	15.7	(0.6)	36.2	(0.8)
	Hong Kong-China	76.2	(0.9)	67.1	(0.8)	5.5	(0.4)	10.0	(0.6)	34.9	(0.9)
	Indonesia	67.5	(1.1)	40.7	(2.5)	5.5	(0.5)	4.2	(0.5)	18.9	(1.5)
	Israel	47.3	(1.0)	37.1	(0.9)	6.1	(0.5)	9.8	(0.5)	22.1	(0.8)
	Jordan	69.0	(1.1)	27.0	(0.9)	5.4	(0.4)	8.1	(0.5)	13.0	(0.8)
	Kyrgyzstan	54.4	(0.8)	32.1	(0.9)	4.7	(0.4)	4.0	(0.3)	9.6	(0.5)
	Latvia	74.5	(0.9)	64.8	(0.9)	9.4	(0.6)	15.9	(0.8)	36.8	(1.1)
	Liechtenstein	71.6	(2.4)	51.0	(2.9)	10.4	(1.5)	22.7	(2.4)	22.5	(1.8)
	Lithuania	80.4	(0.7)	55.5	(0.9)	6.5	(0.4)	12.3	(0.5)	29.1	(0.7)
	Macao-China	66.7	(0.8)	67.5	(0.7)	6.7	(0.4)	7.6	(0.4)	31.3	(0.7)
	Montenegro	67.6	(0.8)	37.4	(0.8)	7.2	(0.4)	12.2	(0.5)	22.1	(0.8)
	Qatar	50.4	(0.6)	30.7	(0.6)	5.0	(0.3)	8.7	(0.4)	14.4	(0.4)
	Romania	62.9	(1.0)	46.7	(1.1)	6.6	(0.5)	10.3	(0.6)	20.2	(0.9)
	Russian Federation	64.9	(0.9)	57.2	(0.9)	10.6	(0.5)	14.6	(0.6)	28.5	(0.9)
	Serbia	69.8	(0.6)	43.7	(1.0)	5.0	(0.3)	9.3	(0.5)	18.3	(0.7)
	Slovenia	75.7	(0.7)	49.0	(0.7)	4.7	(0.3)	12.0	(0.5)	27.0	(0.7)
	Chinese Taipei	59.9	(0.7)	45.2	(0.5)	2.7	(0.2)	4.7	(0.3)	20.6	(0.6)
	Thailand	68.4	(0.9)	44.5	(0.8)	8.3	(0.4)	9.4	(0.4)	31.9	(0.8)
	Tunisia	50.0	(0.8)	35.2	(1.1)	6.1	(0.5)	6.3	(0.4)	20.7	(0.9)
	Uruguay	62.4	(0.7)	51.8	(0.8)	5.4	(0.4)	13.8	(0.6)	34.6	(0.9)

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[Part 4/6]

Table A4.5 Main sources for students to learn about environmental issues

		Clearing of forests for other land use									
		Sources where they mainly learnt about the environmental issue:									
		School		TV, Radio, Newspaper or Magazines		Friends		Family		Internet or Books	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
OECD	Australia	77.8	(0.6)	41.9	(0.5)	4.1	(0.2)	15.0	(0.4)	23.8	(0.5)
	Austria	75.4	(0.7)	44.2	(1.0)	3.9	(0.3)	17.0	(0.6)	16.4	(0.7)
	Belgium	63.4	(0.8)	48.1	(0.8)	3.4	(0.2)	11.2	(0.4)	16.5	(0.4)
	Canada	73.4	(0.7)	46.8	(0.5)	5.8	(0.3)	17.5	(0.4)	23.0	(0.5)
	Czech Republic	59.8	(1.0)	60.7	(1.0)	4.1	(0.3)	9.5	(0.6)	28.8	(0.7)
	Denmark	79.4	(0.8)	46.6	(0.9)	3.8	(0.3)	13.7	(0.5)	23.8	(0.7)
	Finland	75.9	(0.9)	47.2	(0.8)	3.1	(0.3)	12.7	(0.5)	13.5	(0.6)
	France	42.6	(0.9)	61.0	(1.1)	4.4	(0.3)	15.6	(0.6)	18.9	(0.8)
	Germany	67.5	(0.9)	52.3	(1.0)	4.7	(0.4)	17.9	(0.7)	21.9	(0.7)
	Greece	36.4	(0.8)	40.2	(0.9)	4.1	(0.4)	9.8	(0.4)	20.7	(0.7)
	Hungary	50.7	(1.0)	69.1	(0.8)	6.1	(0.4)	15.0	(0.6)	27.1	(0.8)
	Iceland	67.1	(0.7)	51.9	(0.8)	3.8	(0.3)	12.2	(0.6)	14.6	(0.6)
	Ireland	77.3	(0.7)	37.8	(0.9)	2.6	(0.3)	10.7	(0.5)	14.1	(0.6)
	Italy	62.5	(0.7)	47.6	(0.7)	2.5	(0.2)	10.1	(0.3)	16.7	(0.4)
	Japan	72.0	(0.8)	43.8	(0.9)	0.5	(0.1)	2.8	(0.2)	9.1	(0.4)
	Korea	38.0	(0.9)	49.7	(0.9)	0.5	(0.1)	2.9	(0.3)	19.0	(0.7)
	Luxembourg	60.7	(0.7)	53.2	(0.7)	5.8	(0.3)	17.1	(0.5)	21.9	(0.6)
	Mexico	60.8	(0.9)	46.4	(0.9)	3.9	(0.2)	10.9	(0.4)	22.3	(0.6)
	Netherlands	59.7	(1.1)	54.6	(0.9)	2.7	(0.2)	9.8	(0.5)	15.3	(0.5)
	New Zealand	67.9	(0.9)	44.6	(0.7)	3.8	(0.3)	16.8	(0.6)	20.0	(0.6)
	Norway	70.3	(0.8)	49.5	(0.9)	7.6	(0.5)	17.7	(0.6)	24.3	(0.8)
	Poland	71.6	(0.8)	48.1	(0.9)	4.6	(0.3)	16.7	(0.6)	24.0	(0.7)
	Portugal	73.4	(0.7)	56.2	(0.9)	7.8	(0.4)	18.3	(0.7)	32.9	(0.8)
	Slovak Republic	61.3	(1.0)	59.9	(1.0)	7.0	(0.5)	10.7	(0.5)	24.9	(0.7)
	Spain	72.5	(0.7)	53.3	(0.6)	4.7	(0.3)	14.2	(0.4)	19.6	(0.7)
	Sweden	51.7	(1.0)	28.2	(0.8)	1.8	(0.2)	11.1	(0.7)	8.6	(0.5)
	Switzerland	56.4	(1.0)	54.5	(0.8)	5.9	(0.3)	21.3	(0.6)	17.6	(0.5)
	Turkey	52.0	(1.1)	54.7	(0.9)	10.8	(0.5)	19.5	(0.8)	22.9	(0.9)
	United Kingdom	81.3	(0.7)	33.7	(0.7)	3.2	(0.3)	8.9	(0.4)	17.0	(0.6)
	United States	73.8	(0.9)	43.8	(1.0)	7.8	(0.4)	16.7	(0.7)	26.7	(0.8)
	OECD average	64.4	(0.1)	49.0	(0.1)	4.5	(0.1)	13.4	(0.1)	20.2	(0.1)
Partners	Argentina	56.4	(1.5)	43.5	(1.4)	4.0	(0.4)	10.7	(0.8)	23.8	(1.1)
	Azerbaijan	53.2	(1.1)	23.2	(0.9)	3.4	(0.3)	5.1	(0.4)	5.8	(0.4)
	Brazil	60.9	(0.6)	57.3	(0.9)	7.6	(0.4)	10.6	(0.5)	21.5	(0.7)
	Bulgaria	44.7	(1.0)	52.5	(1.4)	14.8	(1.7)	22.8	(1.5)	23.1	(1.8)
	Chile	45.9	(1.1)	43.1	(1.1)	3.6	(0.3)	12.2	(0.5)	21.1	(0.7)
	Colombia	61.3	(2.2)	41.1	(1.7)	7.8	(0.6)	13.7	(1.2)	24.5	(1.3)
	Croatia	74.1	(0.7)	49.6	(0.9)	3.6	(0.3)	13.5	(0.5)	17.4	(0.6)
	Estonia	71.1	(0.9)	62.3	(0.9)	7.6	(0.4)	18.0	(0.6)	28.4	(0.8)
	Hong Kong-China	86.8	(1.1)	43.3	(0.9)	2.6	(0.3)	5.2	(0.5)	24.1	(0.7)
	Indonesia	53.0	(1.1)	52.7	(1.5)	5.7	(0.5)	6.2	(0.5)	14.3	(0.9)
	Israel	39.5	(0.9)	35.8	(0.9)	5.7	(0.5)	9.2	(0.5)	18.1	(0.8)
	Jordan	59.8	(1.0)	28.6	(0.8)	6.8	(0.5)	9.1	(0.5)	12.7	(0.7)
	Kyrgyzstan	34.4	(0.8)	36.3	(0.9)	5.1	(0.3)	7.5	(0.5)	6.9	(0.4)
	Latvia	59.2	(1.1)	70.2	(1.0)	12.4	(0.6)	30.3	(1.0)	30.7	(1.0)
	Liechtenstein	68.9	(2.2)	47.5	(2.7)	5.4	(1.2)	19.8	(2.0)	16.3	(1.7)
	Lithuania	67.4	(0.9)	53.7	(1.0)	5.7	(0.4)	17.7	(0.6)	21.4	(0.7)
	Macao-China	75.4	(0.7)	57.4	(0.8)	3.5	(0.3)	6.7	(0.4)	24.3	(0.7)
	Montenegro	57.7	(0.8)	38.7	(0.9)	8.7	(0.5)	15.8	(0.6)	17.3	(0.6)
	Qatar	49.9	(0.7)	26.2	(0.5)	6.3	(0.3)	7.6	(0.3)	13.0	(0.4)
	Romania	50.5	(1.3)	47.8	(1.1)	4.6	(0.4)	12.2	(0.8)	15.1	(0.7)
	Russian Federation	59.4	(0.9)	63.0	(0.8)	13.0	(0.7)	23.2	(0.8)	23.2	(0.8)
	Serbia	63.8	(0.7)	43.6	(0.8)	4.9	(0.3)	8.9	(0.4)	14.2	(0.6)
	Slovenia	68.1	(0.8)	47.1	(0.8)	4.5	(0.4)	15.8	(0.5)	20.9	(0.6)
	Chinese Taipei	59.4	(0.6)	49.2	(0.6)	2.3	(0.2)	5.9	(0.3)	15.5	(0.4)
	Thailand	58.3	(0.8)	45.9	(0.7)	9.0	(0.4)	17.9	(0.6)	24.5	(0.7)
	Tunisia	45.5	(1.1)	38.4	(0.9)	7.1	(0.4)	10.2	(0.5)	13.5	(0.7)
	Uruguay	55.0	(0.8)	52.9	(0.8)	5.4	(0.3)	15.6	(0.6)	30.4	(0.8)

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[Part 5/6]

Table A4.5 Main sources for students to learn about environmental issues

		Water shortages									
		Sources where they mainly learnt about the environmental issue:									
		School		TV, Radio, Newspaper or Magazines		Friends		Family		Internet or Books	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
OECD	Australia	64.3	(0.6)	60.6	(0.6)	9.6	(0.3)	32.4	(0.6)	21.3	(0.4)
	Austria	62.8	(0.8)	45.0	(0.9)	3.9	(0.3)	20.1	(0.6)	12.6	(0.6)
	Belgium	56.3	(0.7)	48.8	(0.7)	2.8	(0.2)	11.9	(0.4)	13.4	(0.4)
	Canada	62.0	(0.6)	49.1	(0.6)	5.9	(0.3)	22.7	(0.5)	19.2	(0.5)
	Czech Republic	55.9	(1.0)	62.4	(1.0)	4.3	(0.4)	13.0	(0.5)	30.7	(0.7)
	Denmark	70.0	(0.7)	41.1	(0.9)	2.4	(0.2)	12.8	(0.6)	17.4	(0.7)
	Finland	62.6	(0.9)	59.0	(0.8)	5.1	(0.3)	15.7	(0.7)	16.3	(0.7)
	France	48.9	(1.1)	53.7	(1.1)	5.0	(0.3)	19.5	(0.8)	16.9	(0.7)
	Germany	54.8	(0.9)	50.4	(1.0)	4.0	(0.3)	20.9	(0.8)	17.7	(0.6)
	Greece	40.9	(0.8)	58.3	(1.0)	6.5	(0.4)	22.8	(0.9)	26.6	(0.8)
	Hungary	46.9	(1.0)	70.5	(0.7)	5.3	(0.3)	17.2	(0.7)	25.1	(0.8)
	Iceland	62.0	(0.8)	60.2	(0.8)	5.8	(0.4)	17.9	(0.7)	16.5	(0.6)
	Ireland	71.9	(0.7)	40.0	(0.9)	3.3	(0.3)	18.4	(0.6)	11.7	(0.5)
	Italy	51.7	(0.6)	59.7	(0.7)	3.5	(0.2)	20.1	(0.6)	15.9	(0.5)
	Japan	55.8	(0.8)	52.8	(0.9)	1.2	(0.2)	6.6	(0.4)	7.5	(0.4)
	Korea	42.5	(0.8)	70.7	(0.9)	4.9	(0.3)	11.6	(0.5)	31.5	(0.9)
	Luxembourg	52.6	(0.7)	48.7	(0.7)	5.2	(0.3)	21.8	(0.5)	18.6	(0.6)
	Mexico	57.6	(0.8)	54.8	(1.0)	9.1	(0.4)	23.0	(0.6)	24.2	(0.7)
	Netherlands	50.3	(0.8)	49.0	(0.8)	2.2	(0.2)	10.6	(0.5)	11.3	(0.4)
	New Zealand	54.5	(0.9)	52.6	(0.8)	4.5	(0.3)	26.0	(0.9)	14.4	(0.5)
	Norway	72.6	(0.8)	48.5	(0.9)	7.1	(0.4)	19.1	(0.6)	24.3	(0.7)
	Poland	71.8	(0.7)	42.0	(0.8)	2.7	(0.2)	11.3	(0.5)	21.7	(0.6)
	Portugal	75.0	(0.7)	62.0	(1.1)	13.8	(0.5)	30.5	(1.0)	36.8	(0.9)
	Slovak Republic	60.7	(1.2)	67.8	(1.1)	9.6	(0.7)	15.5	(0.7)	27.4	(1.0)
	Spain	70.6	(0.7)	67.9	(0.7)	12.6	(0.5)	36.0	(0.7)	23.5	(0.7)
	Sweden	65.0	(0.9)	42.3	(0.9)	4.0	(0.3)	16.6	(0.6)	13.7	(0.6)
	Switzerland	47.0	(0.9)	53.6	(0.7)	5.7	(0.3)	24.6	(0.7)	13.5	(0.5)
	Turkey	40.4	(0.8)	58.7	(0.8)	8.8	(0.5)	20.3	(0.7)	20.3	(0.9)
	United Kingdom	67.4	(0.8)	47.3	(0.8)	4.5	(0.3)	19.1	(0.6)	15.1	(0.5)
	United States	64.2	(0.9)	41.9	(1.0)	6.4	(0.4)	21.5	(0.8)	21.2	(0.6)
	OECD average	58.6	(0.2)	54.0	(0.2)	5.7	(0.1)	19.3	(0.1)	19.5	(0.1)
Partners	Argentina	56.2	(1.3)	45.4	(1.5)	5.3	(0.4)	15.2	(0.9)	21.5	(1.0)
	Azerbaijan	43.4	(1.1)	29.7	(1.0)	3.3	(0.3)	8.9	(0.8)	5.6	(0.5)
	Brazil	58.9	(0.8)	51.0	(1.0)	11.0	(0.5)	17.1	(0.6)	22.1	(0.8)
	Bulgaria	43.4	(1.0)	52.6	(1.3)	13.4	(1.8)	21.1	(1.4)	21.4	(1.8)
	Chile	54.9	(0.9)	43.4	(0.9)	4.1	(0.3)	14.8	(0.6)	19.9	(0.8)
	Colombia	59.4	(1.5)	43.9	(1.7)	9.8	(0.7)	22.7	(1.1)	22.1	(1.4)
	Croatia	68.3	(0.7)	62.2	(0.8)	8.1	(0.4)	26.9	(0.7)	25.0	(0.7)
	Estonia	57.8	(0.9)	63.0	(0.9)	9.4	(0.4)	21.3	(0.6)	26.8	(0.8)
	Hong Kong-China	74.7	(1.1)	51.1	(0.9)	2.1	(0.3)	9.4	(0.5)	21.1	(0.7)
	Indonesia	46.2	(1.1)	53.1	(1.2)	7.6	(0.7)	14.5	(0.7)	13.2	(0.9)
	Israel	46.6	(1.0)	47.2	(0.8)	8.6	(0.5)	20.6	(0.8)	19.8	(0.7)
	Jordan	54.2	(1.0)	38.0	(1.0)	7.4	(0.6)	21.7	(0.9)	11.8	(0.8)
	Kyrgyzstan	37.8	(0.8)	38.9	(1.0)	5.0	(0.4)	8.4	(0.4)	5.7	(0.4)
	Latvia	50.7	(1.3)	64.5	(0.9)	9.5	(0.4)	21.4	(0.6)	27.2	(0.8)
	Liechtenstein	57.8	(2.5)	48.1	(2.5)	5.9	(1.2)	26.5	(2.1)	14.8	(1.6)
	Lithuania	65.1	(0.8)	50.2	(0.9)	4.8	(0.3)	13.3	(0.5)	18.9	(0.7)
	Macao-China	69.7	(0.8)	62.3	(0.8)	5.5	(0.4)	16.0	(0.6)	22.4	(0.6)
	Montenegro	55.6	(0.9)	43.7	(0.8)	11.0	(0.6)	23.4	(0.6)	19.2	(0.6)
	Qatar	48.4	(0.7)	27.3	(0.5)	6.2	(0.3)	14.4	(0.5)	12.2	(0.4)
	Romania	52.4	(1.1)	38.7	(1.2)	3.6	(0.5)	9.3	(0.5)	12.1	(0.6)
	Russian Federation	24.8	(0.7)	60.5	(1.0)	12.2	(0.6)	28.9	(0.9)	11.0	(0.6)
	Serbia	48.4	(0.8)	55.2	(1.0)	8.9	(0.5)	21.9	(0.7)	12.0	(0.6)
	Slovenia	65.6	(0.8)	57.0	(0.8)	8.4	(0.4)	24.9	(0.6)	26.2	(0.5)
	Chinese Taipei	51.1	(0.7)	55.9	(0.7)	2.9	(0.2)	11.3	(0.4)	13.8	(0.4)
	Thailand	55.1	(0.9)	56.1	(0.8)	9.4	(0.6)	18.3	(0.6)	25.8	(0.9)
	Tunisia	46.6	(1.1)	40.7	(0.9)	7.9	(0.5)	17.0	(0.7)	14.6	(0.7)
	Uruguay	57.1	(0.9)	60.8	(0.7)	9.4	(0.5)	24.6	(0.8)	32.2	(0.7)

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[Part 6/6]

Table A4.5 Main sources for students to learn about environmental issues

		Nuclear waste									
		Sources where they mainly learnt about the environmental issue:									
		School		TV, Radio, Newspaper or Magazines		Friends		Family		Internet or Books	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
OECD	Australia	71.0	(0.6)	32.9	(0.5)	2.7	(0.2)	8.7	(0.3)	19.1	(0.5)
	Austria	63.2	(0.9)	38.6	(0.9)	2.9	(0.2)	11.6	(0.5)	16.7	(0.6)
	Belgium	43.9	(0.8)	45.9	(0.7)	2.7	(0.2)	9.2	(0.4)	15.2	(0.4)
	Canada	66.7	(0.6)	33.2	(0.6)	2.8	(0.2)	8.3	(0.3)	18.0	(0.4)
	Czech Republic	61.4	(1.0)	60.3	(0.9)	4.7	(0.3)	8.7	(0.4)	35.0	(0.9)
	Denmark	76.5	(1.0)	31.3	(0.8)	3.3	(0.3)	8.6	(0.5)	19.9	(0.8)
	Finland	69.3	(1.0)	46.0	(0.8)	3.1	(0.2)	8.2	(0.5)	15.2	(0.6)
	France	36.0	(0.8)	48.5	(0.9)	3.2	(0.3)	13.2	(0.6)	15.7	(0.6)
	Germany	47.4	(1.1)	47.2	(0.9)	4.3	(0.4)	15.8	(0.7)	20.9	(0.7)
	Greece	42.1	(1.0)	45.3	(0.7)	3.4	(0.3)	8.8	(0.4)	30.7	(0.9)
	Hungary	42.2	(0.9)	56.5	(0.8)	4.2	(0.3)	8.5	(0.5)	26.1	(0.8)
	Iceland	61.5	(0.7)	44.3	(0.7)	3.5	(0.3)	6.5	(0.4)	14.4	(0.5)
	Ireland	73.7	(0.8)	33.6	(0.8)	2.3	(0.2)	9.1	(0.5)	12.1	(0.5)
	Italy	50.1	(0.6)	40.0	(0.7)	2.3	(0.2)	7.8	(0.3)	16.1	(0.4)
	Japan	55.9	(1.0)	36.9	(0.9)	0.5	(0.1)	2.3	(0.2)	6.9	(0.4)
	Korea	40.2	(1.1)	49.3	(1.0)	1.1	(0.2)	2.9	(0.3)	22.0	(0.8)
	Luxembourg	38.6	(0.7)	46.0	(0.7)	3.8	(0.3)	14.4	(0.5)	18.2	(0.6)
	Mexico	50.7	(0.9)	26.8	(0.7)	2.0	(0.2)	3.2	(0.2)	21.7	(0.6)
	Netherlands	57.1	(0.9)	39.1	(0.9)	1.8	(0.2)	7.6	(0.4)	12.7	(0.5)
	New Zealand	62.1	(0.9)	35.3	(0.7)	2.7	(0.3)	9.5	(0.5)	16.8	(0.6)
	Norway	71.7	(1.2)	30.1	(0.8)	3.6	(0.3)	9.9	(0.5)	18.6	(0.7)
	Poland	55.0	(0.9)	30.4	(0.7)	1.4	(0.1)	3.3	(0.3)	18.6	(0.6)
	Portugal	69.5	(0.9)	43.1	(0.9)	3.6	(0.3)	7.6	(0.4)	32.1	(0.8)
	Slovak Republic	63.6	(1.1)	55.9	(1.0)	5.7	(0.5)	7.9	(0.5)	27.8	(0.9)
	Spain	71.3	(0.7)	42.9	(0.7)	2.6	(0.2)	7.7	(0.4)	18.6	(0.6)
	Sweden	71.6	(1.0)	29.0	(0.9)	3.1	(0.3)	11.1	(0.5)	13.4	(0.6)
	Switzerland	41.1	(0.9)	44.1	(0.7)	4.1	(0.3)	15.6	(0.5)	14.5	(0.5)
	Turkey	48.7	(1.1)	56.1	(1.0)	6.9	(0.4)	9.5	(0.6)	25.0	(1.0)
	United Kingdom	80.1	(0.6)	26.5	(0.6)	2.1	(0.2)	7.1	(0.4)	15.6	(0.5)
	United States	70.6	(1.0)	30.9	(0.7)	3.6	(0.3)	9.2	(0.5)	22.0	(0.7)
	OECD average	58.4	(0.2)	40.9	(0.2)	3.1	(0.0)	8.7	(0.1)	19.3	(0.1)
Partners	Argentina	42.0	(1.2)	29.9	(0.9)	1.9	(0.2)	5.5	(0.5)	20.0	(1.0)
	Azerbaijan	44.7	(1.2)	25.4	(0.8)	2.1	(0.2)	2.2	(0.2)	7.8	(0.6)
	Brazil	55.2	(0.7)	36.6	(0.8)	3.6	(0.3)	4.2	(0.3)	20.3	(0.7)
	Bulgaria	44.0	(1.0)	45.1	(1.2)	11.9	(1.9)	15.9	(1.8)	22.9	(1.8)
	Chile	47.0	(0.9)	29.2	(0.7)	2.1	(0.3)	4.4	(0.3)	20.4	(0.6)
	Colombia	47.7	(1.1)	26.1	(0.9)	2.8	(0.4)	3.1	(0.3)	21.5	(0.9)
	Croatia	64.2	(0.8)	54.9	(0.8)	3.9	(0.3)	10.9	(0.5)	23.2	(0.7)
	Estonia	58.0	(1.1)	52.3	(0.9)	5.0	(0.3)	9.4	(0.5)	25.2	(0.7)
	Hong Kong-China	62.8	(1.3)	34.7	(0.9)	1.5	(0.2)	2.5	(0.2)	18.4	(0.6)
	Indonesia	34.2	(1.0)	32.4	(0.8)	2.8	(0.4)	1.8	(0.2)	12.1	(1.0)
	Israel	35.2	(0.8)	23.3	(0.7)	3.5	(0.3)	6.7	(0.4)	15.4	(0.7)
	Jordan	46.6	(0.9)	34.4	(0.9)	4.2	(0.3)	5.3	(0.4)	19.1	(0.8)
	Kyrgyzstan	39.9	(0.9)	29.4	(0.8)	3.8	(0.3)	3.5	(0.3)	7.5	(0.4)
	Latvia	49.9	(1.0)	59.6	(0.9)	6.9	(0.5)	13.1	(0.5)	30.7	(1.0)
	Liechtenstein	50.2	(2.4)	37.8	(2.8)	2.7	(0.9)	11.2	(1.8)	9.5	(1.5)
	Lithuania	56.9	(0.8)	42.2	(1.0)	2.9	(0.2)	5.6	(0.3)	17.8	(0.7)
	Macao-China	47.2	(0.8)	38.7	(0.7)	1.8	(0.2)	2.5	(0.3)	17.6	(0.6)
	Montenegro	42.6	(0.9)	40.1	(0.8)	5.6	(0.4)	10.1	(0.5)	21.3	(0.7)
	Qatar	37.5	(0.6)	19.0	(0.6)	4.2	(0.3)	6.1	(0.3)	15.2	(0.5)
	Romania	53.2	(1.4)	37.7	(1.7)	2.5	(0.4)	5.0	(0.5)	17.3	(0.7)
	Russian Federation	47.3	(0.8)	61.2	(1.0)	9.1	(0.7)	14.7	(0.7)	22.9	(0.8)
	Serbia	49.3	(1.0)	47.3	(0.9)	4.7	(0.3)	8.2	(0.5)	16.2	(0.6)
	Slovenia	56.5	(0.9)	50.5	(0.9)	4.1	(0.3)	11.7	(0.5)	24.3	(0.6)
	Chinese Taipei	54.1	(0.7)	47.7	(0.5)	1.4	(0.1)	3.8	(0.2)	14.5	(0.4)
	Thailand	41.0	(0.8)	27.5	(0.7)	3.5	(0.3)	2.5	(0.3)	21.8	(0.7)
	Tunisia	16.7	(0.6)	36.1	(0.8)	4.9	(0.4)	5.3	(0.4)	21.9	(0.9)
	Uruguay	34.3	(0.8)	37.5	(0.7)	2.9	(0.3)	5.8	(0.4)	27.6	(0.9)

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[Part 1/1]

Table A4.6 Relationship between sources of students' knowledge about the extinction of plants and animals and the environmental science performance index, by country

		Sources of students' knowledge about the extinction of plants and animals											
		Relying mainly on School				Relaying mainly on School and Media (TV, Radio, Newspapers or Magazines, Internet, and Books)				Relaying mainly on Media (TV, Radio, Newspapers or Magazines, Internet, and Books)			
		Before accounting for background variables		After accounting for background variables		Before accounting for background variables		After accounting for background variables		Before accounting for background variables		After accounting for background variables	
		Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.
OECD	Australia	**46.7**	(4.9)	**35.3**	(4.6)	**85.9**	(4.7)	**68.0**	(4.6)	**64.7**	(5.5)	**49.2**	(5.1)
	Austria	-0.6	(8.3)	-1.9	(7.2)	**49.1**	(8.6)	**28.5**	(7.1)	**40.6**	(9.4)	**21.4**	(8.3)
	Belgium	**48.5**	(6.1)	**23.7**	(4.9)	**84.8**	(6.5)	**48.9**	(5.0)	**74.4**	(5.7)	**43.3**	(4.5)
	Canada	**18.9**	(4.9)	**13.6**	(5.7)	**52.6**	(4.9)	**43.9**	(5.6)	**47.1**	(5.5)	**39.4**	(5.7)
	Czech Republic	15.8	(8.2)	8.8	(6.6)	**52.5**	(7.6)	**41.1**	(6.0)	**33.8**	(8.0)	**25.3**	(6.3)
	Denmark	**26.9**	(8.3)	**16.6**	(7.4)	**68.6**	(8.1)	**50.0**	(7.7)	**59.6**	(8.8)	**45.5**	(8.3)
	Finland	16.1	(11.5)	13.2	(11.2)	**53.5**	(11.1)	**46.2**	(10.8)	**44.2**	(12.0)	**37.9**	(11.6)
	France	w	w	w	w	w	w	w	w	w	w	w	w
	Germany	**19.4**	(6.8)	9.1	(6.3)	**65.5**	(6.4)	**36.2**	(6.2)	**62.7**	(6.5)	**37.9**	(6.4)
	Greece	**44.7**	(6.8)	**32.2**	(5.9)	**88.4**	(6.4)	**64.4**	(5.6)	**58.1**	(6.0)	**42.7**	(5.6)
	Hungary	**20.8**	(10.3)	2.1	(8.0)	**57.2**	(10.1)	**25.6**	(7.9)	**49.7**	(9.7)	**23.7**	(7.5)
	Iceland	**34.7**	(7.3)	**23.2**	(7.7)	**78.3**	(7.3)	**62.4**	(7.7)	**65.3**	(8.2)	**52.2**	(8.6)
	Ireland	**16.2**	(5.3)	9.2	(5.1)	**69.0**	(5.5)	**54.1**	(5.2)	**61.3**	(6.0)	**46.0**	(5.9)
	Italy	**35.0**	(5.3)	**23.2**	(4.5)	**72.6**	(6.0)	**49.9**	(5.3)	**56.1**	(5.4)	**37.0**	(4.7)
	Japan	**27.5**	(8.6)	**23.5**	(7.8)	**69.4**	(10.1)	**58.6**	(8.5)	**72.0**	(8.8)	**57.3**	(7.7)
	Korea	**28.2**	(11.0)	**22.3**	(9.8)	**84.7**	(11.9)	**66.2**	(10.2)	**76.9**	(10.8)	**61.2**	(9.5)
	Luxembourg	**28.6**	(5.1)	**18.4**	(4.6)	**71.0**	(5.5)	**45.5**	(5.0)	**63.2**	(5.3)	**41.1**	(5.0)
	Mexico	**42.7**	(7.0)	**27.7**	(6.4)	**79.6**	(7.2)	**53.6**	(6.4)	**47.2**	(6.9)	**31.0**	(6.4)
	Netherlands	**33.6**	(9.6)	**23.2**	(8.5)	**84.3**	(10.4)	**54.1**	(9.1)	**65.4**	(9.9)	**41.6**	(8.8)
	New Zealand	**32.9**	(6.9)	8.1	(7.3)	**84.3**	(7.2)	**49.5**	(7.6)	**78.7**	(7.6)	**46.3**	(7.9)
	Norway	**29.8**	(5.4)	8.1	(6.3)	**73.5**	(5.7)	**49.4**	(5.9)	**66.3**	(6.6)	**43.1**	(7.0)
	Poland	**26.5**	(7.5)	**28.5**	(7.2)	**73.0**	(7.4)	**71.4**	(7.2)	**57.1**	(8.3)	**54.2**	(7.9)
	Portugal	**29.0**	(8.6)	**18.2**	(7.8)	**77.3**	(8.6)	**57.0**	(7.6)	**46.0**	(7.9)	**29.1**	(7.0)
	Slovak Republic	-8.4	(8.8)	-8.6	(7.5)	**42.7**	(9.5)	**27.3**	(7.8)	**28.0**	(9.3)	**16.2**	(8.0)
	Spain	**16.5**	(5.5)	**12.7**	(5.6)	**60.7**	(5.8)	**51.9**	(5.9)	**46.7**	(5.8)	**39.4**	(5.9)
	Sweden	**42.5**	(8.1)	**35.4**	(9.5)	**78.6**	(7.8)	**67.7**	(9.2)	**82.8**	(8.8)	**69.8**	(10.1)
	Switzerland	**13.4**	(4.9)	**10.5**	(4.4)	**61.9**	(5.2)	**42.5**	(4.3)	**48.9**	(4.9)	**35.9**	(3.9)
	Turkey	**26.4**	(8.1)	**15.3**	(6.1)	**75.9**	(8.9)	**49.2**	(6.4)	**45.4**	(8.5)	**26.8**	(6.4)
	United Kingdom	**15.9**	(5.8)	7.6	(5.4)	**64.0**	(6.1)	**43.9**	(5.8)	**69.3**	(6.5)	**46.7**	(6.3)
	United States	**47.5**	(6.5)	**33.3**	(5.7)	**91.5**	(6.8)	**68.2**	(5.9)	**53.4**	(6.2)	**37.5**	(6.5)
	OECD average	**26.8**	(1.4)	**17.0**	(1.3)	**70.7**	(1.4)	**50.9**	(1.3)	**57.4**	(1.4)	**40.6**	(1.3)
Partners	Argentina	**23.7**	(5.9)	**14.6**	(7.3)	**70.6**	(7.1)	**44.8**	(8.8)	**40.9**	(6.9)	**27.7**	(8.9)
	Azerbaijan	**26.0**	(3.5)	**22.8**	(3.6)	**79.5**	(9.6)	**72.6**	(9.7)	**25.6**	(3.8)	**21.4**	(3.8)
	Brazil	**21.4**	(4.8)	**18.5**	(5.1)	**73.9**	(5.1)	**54.7**	(5.3)	**41.9**	(5.1)	**32.5**	(5.2)
	Bulgaria	**27.4**	(9.1)	**15.3**	(6.9)	**79.8**	(10.2)	**41.9**	(7.4)	**58.5**	(10.1)	**29.7**	(6.7)
	Chile	**15.5**	(6.4)	**18.2**	(4.0)	**63.8**	(7.4)	**51.9**	(5.2)	**42.7**	(6.7)	**35.7**	(4.3)
	Colombia	**26.8**	(5.2)	**17.9**	(5.7)	**67.7**	(5.2)	**50.5**	(5.7)	**46.1**	(5.4)	**33.0**	(5.7)
	Croatia	7.7	(9.7)	11.1	(9.2)	**58.4**	(10.1)	**53.3**	(9.4)	**36.4**	(9.7)	**30.0**	(9.4)
	Estonia	**27.2**	(9.7)	**22.4**	(9.6)	**63.4**	(9.7)	**52.2**	(9.7)	**50.8**	(9.8)	**41.3**	(9.7)
	Hong Kong-China	**35.1**	(15.4)	24.7	(13.9)	**81.3**	(14.7)	**60.9**	(12.8)	**67.1**	(15.2)	**52.7**	(13.1)
	Indonesia	**31.1**	(4.9)	**23.3**	(4.3)	**76.2**	(6.7)	**53.4**	(5.1)	**43.3**	(6.6)	**28.8**	(4.9)
	Israel	**20.4**	(5.3)	**16.2**	(4.6)	**76.4**	(6.3)	**62.4**	(6.1)	**62.8**	(5.0)	**49.2**	(4.8)
	Jordan	**54.8**	(4.8)	**43.0**	(4.1)	**86.7**	(6.1)	**65.4**	(5.1)	**46.1**	(5.0)	**35.4**	(4.4)
	Kyrgyzstan	**21.9**	(3.1)	**18.1**	(3.1)	**63.4**	(6.5)	**46.8**	(4.6)	**22.5**	(3.5)	**16.5**	(3.3)
	Latvia	14.4	(9.4)	11.7	(9.7)	**53.3**	(9.1)	**48.2**	(9.2)	**37.5**	(11.2)	**30.0**	(10.5)
	Liechtenstein	2.6	(17.9)	4.7	(17.4)	32.8	(18.5)	8.4	(17.0)	32.6	(20.1)	24.7	(18.3)
	Lithuania	21.1	(12.5)	15.0	(11.4)	**71.0**	(12.4)	**56.8**	(11.3)	**50.0**	(12.5)	**39.3**	(11.4)
	Macao-China	10.0	(7.5)	4.7	(7.8)	**38.4**	(7.6)	**33.4**	(7.9)	**27.6**	(8.0)	**22.7**	(8.1)
	Montenegro	**26.2**	(4.7)	**18.6**	(4.7)	**85.8**	(4.6)	**69.2**	(4.6)	**46.5**	(6.2)	**34.4**	(5.9)
	Qatar	**25.9**	(2.8)	**14.1**	(2.8)	**80.8**	(4.7)	**54.7**	(4.5)	**29.1**	(3.1)	**19.7**	(2.9)
	Romania	**22.5**	(6.2)	**19.1**	(6.0)	**78.5**	(7.7)	**61.0**	(7.7)	**48.6**	(7.5)	**36.0**	(7.3)
	Russian Federation	14.0	(7.7)	8.9	(7.4)	**57.6**	(6.5)	**48.4**	(5.3)	**32.9**	(6.3)	**25.1**	(6.1)
	Serbia	**32.6**	(5.7)	**24.9**	(5.4)	**84.5**	(5.8)	**65.0**	(5.4)	**63.9**	(6.2)	**46.2**	(5.7)
	Slovenia	10.4	(9.1)	12.1	(7.8)	**61.2**	(8.6)	**40.4**	(8.2)	**58.6**	(9.2)	**34.3**	(7.8)
	Chinese Taipei	**43.7**	(10.6)	**34.0**	(9.3)	**79.2**	(11.3)	**56.2**	(9.6)	**53.4**	(10.8)	**43.2**	(9.4)
	Thailand	**30.3**	(5.4)	**25.4**	(5.7)	**80.8**	(5.7)	**62.8**	(5.8)	**41.8**	(5.8)	**34.9**	(5.9)
	Tunisia	**24.8**	(4.1)	**19.3**	(3.8)	**66.2**	(5.3)	**48.0**	(5.7)	**38.1**	(4.4)	**28.9**	(4.0)
	Uruguay	**23.8**	(6.5)	**15.8**	(5.9)	**72.5**	(6.6)	**53.6**	(6.2)	**35.8**	(6.1)	**25.7**	(5.5)

Note: Values that are statistically significant are indicated in bold.

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Appendix B

TECHNICAL NOTES

This appendix is available online at
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Green at Fifteen?

HOW 15-YEAR-OLDS PERFORM IN ENVIRONMENTAL SCIENCE AND GEOSCIENCE IN PISA 2006

Never before have the stakes been so high for the role of science education in shaping how people interact with the environment. Human activities responsible for the production of greenhouse gases, the accumulation of waste, the fragmentation or destruction of ecosystems and the depletion of resources are having a substantial impact on the environment. As a result, threats to the environment are prominently discussed in the media, and citizens world wide are increasingly faced with the need to understand complex environmental issues.

Environmental science and geoscience continue to generate comprehensive and complex knowledge. Therefore, the challenge for education is not only to produce more and better trained environmental scientists, but also to support informed and motivated citizens who are capable of understanding, interpreting and acting upon sophisticated scientific theory and evidence. The OECD's PISA 2006 assessment of the science competencies of 15-year-olds offers the first comprehensive and internationally comparative database of students' knowledge about the environment and environment-related issues. *Green at Fifteen?* presents an analysis of this knowledge base, including information on the sources of students' awareness of environmental science, their attitudes towards the environment and how these attitudes interrelate with their performance in environmental science.

FURTHER READING

PISA 2006: Science Competencies for Tomorrow's World
Costs of Inaction on Key Environmental Challenges
OECD Environmental Outlook to 2030

THE OECD PROGRAMME FOR INTERNATIONAL STUDENT ASSESSMENT (PISA)

PISA is a collaborative process among the 30 member countries of the OECD and nearly 30 partner countries and economies. It brings together expertise from the participating countries and economies and is steered by their governments on the basis of shared, policy-driven interests. Its unique features include:

- *The literacy approach:* PISA defines each assessment area (science, reading and mathematics) not mainly in terms of mastery of the school curriculum, but in terms of the knowledge and skills needed for full participation in society.
- *A long-term commitment:* It enables countries to monitor regularly and predictably their progress in meeting key learning objectives.
- *The age-group covered:* By assessing 15-year-olds, *i.e.* young people near the end of their compulsory education, PISA provides a significant indication of the overall performance of school systems.
- *The relevance to lifelong learning:* PISA does not limit itself to assessing students' knowledge and skills but also asks them to report on their own motivation to learn, their beliefs about themselves and their learning strategies, as well as on their goals for future study and careers.

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