



Appendix B

TECHNICAL NOTES

This appendix is available online at
www.pisa.oecd.org



Table of contents

FOREWORD	3
OVERVIEW	9
READER'S GUIDE	13
CHAPTER 1 PISA 2006 AND STUDENTS' PERFORMANCE IN ENVIRONMENTAL SCIENCE AND GEOSCIENCE	15
Introduction	16
The Programme for International Student Assessment (PISA)	17
▪ PISA, an overview	17
▪ Focus on students' science performance	19
Environmental science education: A conceptual framework	19
Environmental science performance in PISA 2006	20
Organisation of this report	21
CHAPTER 2 A PROFILE OF STUDENT PERFORMANCE IN ENVIRONMENTAL SCIENCE AND GEOSCIENCE	23
Measures of performance in environmental science and geoscience	24
Main results of this chapter	24
Environmental science and geoscience performance indices in PISA 2006	24
▪ A definition of performance in environmental science and geoscience within the PISA 2006 science framework	24
▪ Constructing the environmental science and geoscience performance indices and proficiency levels	26
▪ Constructing adjusted proficiency levels for the environmental science and geoscience performance indices	26
▪ Examples of tasks that students can do at each of the proficiency levels	28
How do students perform in the environmental science and geoscience indices?	38
▪ Student performance at the highest level of environmental science proficiency	38
▪ Student performance at the lowest level of environmental science proficiency	39
▪ Student performance in geoscience	39
▪ Student average performance on the environmental science and the geoscience indices	42
Student characteristics and performance in environmental science and geoscience	43
▪ Gender	43
▪ Immigrant background	44
▪ Socio-economic background	45
Student performance: conclusions and implications	45



CHAPTER 3 MAKING CONNECTIONS AND TAKING RESPONSIBILITY	47
Student attitudes and learning about the environment	48
Main results of this chapter	49
PISA and student attitudes towards environmental issues	49
Students' familiarity with, responsibility for, and optimism toward general environmental issues	51
▪ Overall results.....	51
▪ Air Pollution.....	52
▪ Energy shortages.....	52
▪ Extinction of plants and animals.....	56
▪ Clearing of forests for other land use.....	56
▪ Water shortage.....	56
▪ Nuclear waste.....	57
Students' awareness and self-perception of their ability to understand complex environmental challenges	57
Are students' characteristics related to their attitudes towards the environment?	59
▪ Parents' attitudes towards the environment.....	59
▪ Gender differences in attitudes towards resources and the environment.....	60
▪ Socio-economic background and attitudes towards resources and the environment.....	60
▪ Immigrant background and attitudes towards resources and the environment.....	61
Are attitudes related to the environmental science performance index?	61
▪ Students' sense of responsibility towards environmental issues.....	61
▪ Students' optimism regarding environmental issues.....	63
▪ Students' awareness of complex environmental issues.....	63
Student attitudes: conclusions and implications	63
CHAPTER 4 LEARNING ABOUT ENVIRONMENTAL SCIENCE AND GEOSCIENCE	67
Schools and environmental science education	68
Main results of this chapter	68
Environmental science and geoscience in the school science curriculum	69
Out-of-classroom activities to promote learning of environmental science in schools	71
Sources for learning about environmental issues	73
▪ Sources of knowledge and performance in the environmental science index.....	77
Learning about the environment: conclusions and implications	77
REFERENCES	81
APPENDIX A DATA TABLES	83
APPENDIX B TECHNICAL NOTES	115



LIST OF BOXES

Box 3.1	The OECD Survey on Household Environmental Behaviour	48
Box 3.2	Actual questions towards environmental issues.....	50
Box 3.3	Interpreting PISA attitudinal data.....	52
Box 4.1	Environmental questions	69
Box 4.2	The school building as a teacher	74

LIST OF FIGURES

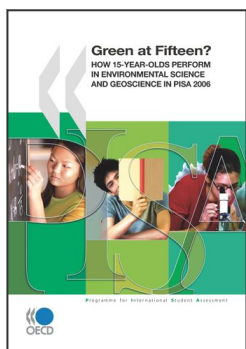
Figure 1.1	A map of PISA countries and economies.....	18
Figure A	Greenhouse.....	29
Figure B	Grand Canyon.....	34
Figure C	Acid Rain	36
Figure 2.1	Percentage of students at each proficiency level on the environmental science performance index.....	38
Figure 2.2	Percentage of students at each proficiency level on the geoscience performance index	42
Figure 2.3	Gender differences in the environmental science performance index	43
Figure 2.4	Differences between native students and students with an immigrant background in the environmental science performance index	44
Figure 2.5	Performance on the environmental science index by quarters of the PISA index of social, economic and cultural status (ESCS).....	45
Figure 3.1	Students' familiarity with environmental issues.....	53
Figure 3.2	Index of students' sense of responsibility for environmental issues	54
Figure 3.3	Index of students' optimism regarding environmental issues.....	55
Figure 3.4	Index of students' awareness of more complex environmental issues.....	58
Figure 3.5	Parents' sense of responsibility for environmental issues.....	59
Figure 3.6	Parents' optimism regarding environmental issues.....	60
Figure 3.7	Relationship between students' attitudes and environmental science performance after accounting for student and school background.....	62
Figure 4.1	Placement of environmental topics in the school curriculum	70
Figure 4.2	Outside classroom learning activities for environmental science.....	72
Figure 4.3	Main sources for students to learn about environmental issues in the OECD.....	76
Figure 4.4	Relationship between sources of students' knowledge about extinction of plants and animals and environmental science performance after accounting for background variables.....	78

LIST OF TABLES

Table 1.1	PISA 2006 knowledge of science categories.....	20
Table 1.2	Contexts for the PISA 2006 science assessment	21
Table 2.1	The environmental science performance index within the PISA science framework.....	25
Table 2.2	Proficiency levels on the environmental science and geoscience performance indices.....	27
Table 2.3	Multiple comparisons of mean performance on the environmental science performance index.....	40



Table A2.1	Percentage of students by proficiency level in the environmental science performance index.....	84
Table A2.2	Percentage of students by proficiency level in the geoscience performance index	85
Table A2.3	Mean score on the environmental science performance index and on the geoscience performance index, by gender.....	86
Table A2.4	Mean score on the environmental science performance index and on the geoscience performance index, by students' immigrant background.....	87
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 index of ESCS.....	88
<hr/>		
Table A3.1	Students' familiarity with environmental issues.....	90
Table A3.2	Index of students' sense of responsibility for environmental issues	91
Table A3.3	Index of students' optimism regarding environmental issues.....	92
Table A3.4	Index of students' awareness of more complex environmental issues.....	93
Table A3.5	Parents' sense of responsibility for environmental issues.....	94
Table A3.6	Parents' optimism regarding environmental issues.....	94
Table A3.7	Relationship between parents' and students' attitude towards environmental issues	94
Table A3.8	Effect sizes for gender differences (females minus males) in environmental science attitude indices.....	95
Table A3.9	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	96
Table A3.10	Effect sizes for the difference between students with an immigrant background and native students for environmental science attitude indices.....	97
Table A3.11	Correlation between performance, attitudes and socio-economic background indices.....	98
Table A3.12	Relationship between student and school background factors and the environmental science performance index.....	98
Table A3.13	Relationship between student and school demographic and socio-economic background factors and the environmental science performance index, by country	99
Table A3.14	Relationship between students' attitudes towards environmental issues and the environmental science performance index, by country	101
<hr/>		
Table A4.1	Placement of environmental topics in the school curriculum	102
Table A4.2	Relationship between curriculum placement of environmental issues and environmental science performance, by country.....	103
Table A4.3	Outside classroom learning activities for environmental science.....	104
Table A4.4	Relationship between school activities for learning of environmental topics and environmental science performance, by country	105
Table A4.5	Main sources for students to learn about environmental issues.....	107
Table A4.6	Relationship between sources of students' knowledge about the extinction of plants and animals and the environmental science performance index, by country	113



From:

Green at Fifteen?

How 15-Year-Olds Perform in Environmental Science and Geoscience in PISA 2006

Access the complete publication at:

<https://doi.org/10.1787/9789264063600-en>

Please cite this chapter as:

OECD (2009), "Appendix B: Technical notes", in *Green at Fifteen?: How 15-Year-Olds Perform in Environmental Science and Geoscience in PISA 2006*, OECD Publishing, Paris.

DOI: <https://doi.org/10.1787/9789264063600-10-en>

This work is published under the responsibility of the Secretary-General of the OECD. The opinions expressed and arguments employed herein do not necessarily reflect the official views of OECD member countries.

This document, as well as any data and map included herein, are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area. Extracts from publications may be subject to additional disclaimers, which are set out in the complete version of the publication, available at the link provided.

The use of this work, whether digital or print, is governed by the Terms and Conditions to be found at <http://www.oecd.org/termsandconditions>.