

# PROJECT FINAL REPORT

**Grant Agreement number: 217551**

**Project acronym: CarboSchools+**

**Project title:**

**European network of regional projects for school partnerships on climate change research**

**Funding Scheme: CSA (coordination)**

**Period covered: from January 1<sup>st</sup>, 2008 to December 31<sup>st</sup>, 2010**

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## Declaration by the scientific representative of the project coordinator<sup>5</sup>

I, as scientific representative of the coordinator<sup>5</sup> of this project and in line with the obligations as stated in Article II.2.3 of the Grant Agreement declare that:

- The attached periodic report represents an accurate description of the work carried out in this project for this reporting period;
- The project (tick as appropriate):
  - has fully achieved its objectives and technical goals for the period;
  - has achieved most of its objectives and technical goals for the period with relatively minor deviations<sup>7</sup>;
  - has failed to achieve critical objectives and/or is not at all on schedule<sup>8</sup>.
- The public website is up to date, if applicable.
- To my best knowledge, the financial statements which are being submitted as part of this report are in line with the actual work carried out and are consistent with the report on the resources used for the project (section 3.6) and if applicable with the certificate on financial statement.
- All beneficiaries, in particular non-profit public bodies, secondary and higher education establishments, research organisations and SMEs, have declared to have verified their legal status. Any changes have been reported under section 5 (Project Management) in accordance with Article II.3.f of the Grant Agreement.

Name of scientific representative of the Coordinator<sup>5</sup>: Philippe SAUGIER

Date: 15 / 1 / 2011

Signature of scientific representative of the Coordinator<sup>5</sup>: 

<sup>7</sup> If either of these boxes is ticked, the report should reflect these and any remedial actions taken.

<sup>8</sup> If either of these boxes is ticked, the report should reflect these and any remedial actions taken.

## 1. Final publishable summary report

- *executive summary (not exceeding 1 page).*

CarboSchools is a contribution to equipping EU education systems with new tools, methods and resources for promoting inquiry-based and society-based science education in a perspective of sustainable development, through the challenge of climate change.

Initiated by research projects on the carbon cycle, CarboSchools links researchers from several leading carbon science laboratories with secondary schools. In these partnerships, young Europeans conduct experiments on the impact of greenhouse gases and learn about climate research and the reduction of emissions. Scientists and teachers co-operate over several months to give young people practical experience of research through true investigations, interactions with real scientists and public presentations.

From January 2008 to December 2010, nine research institutes in seven countries explored how they can best motivate, initiate and support such partnerships at the regional level across a wide variety of contexts, topics and age-groups. European co-operation made it possible to compare results, learn from each other and develop replicable good practice. In total, more than 90 schools have been involved in this "educational laboratory", exploring a whole range of experiments & project activities, evaluating them and publishing them on the project's on-line library of resources.

An in-depth evaluation study gave a very interesting and challenging picture of the projects' impact on participating students. Students were very positive about the CarboSchools projects, which made them more interested in science careers (in particular girls) and more aware of the importance of climate change research for society. In the same time, in the surveyed groups CarboSchools activities did not counteract the natural decline observed with students attitudes towards science and school science at teenage. This contrasting picture between participants' satisfaction and prevailing declining attitudes suggests that activities like CarboSchools, which teachers report as heavily constrained and limited by timetables, curricula and other structural factors, would need more emphasis in order to impact attitudes.

A final publication "Global Change: from research to the classroom" coupled with the [carboschools.org](http://carboschools.org) website are the legacy of this educational experiment to the broader educational community in Europe and beyond. The book and an on-line library of resources (experiments, activities, and project ideas) give interested teachers concrete ideas and advice to make science learning more engaging, challenging and attractive, and to encourage pupils to experience their global impact on the Earth system and how they can help restore the balance.

- *summary description of project context and objectives (not exceeding 4 pages).*

### **Motivation & origin**

Climate change, the “greatest uncontrolled scientific experiment of human history”, and one of the biggest scientific challenges of the 21<sup>st</sup> century, is on the frontline daily. People directly feel and widely recognize it. It has become one of the most widespread societal issues where progressing our understanding through scientific research is critical to our children’s future. CarboSchools wants to inspire the generation that will be most affected by our choices and actions.

CarboSchools is an initiative of European climate change scientists to fulfil their moral and contractual obligation to convey their research results to the public, in particular young people. It has been initiated in 2004 as a pilot educational network by CarboEurope & CARBOOCEAN, two large FP6 integrated research projects investigating the carbon cycle on land and ocean respectively<sup>1</sup>. After three years of progress leading to a well-defined concept, a first set of educational resources and an active network of enthusiastic scientists and teachers, CarboSchools became ready in 2007 for a new phase of structured development which became the purpose of this FP7 project funded by Science in Society.

In a rather original way compared to a majority of international climate change education projects mostly based on delivering facts & data through the internet, CarboSchools is first and foremost based on *human contact* and on placing scientific issues in their wider social & citizenship context. Young people are overwhelmed with information about climate change and many are alarmed by the shock-tactics of media – but they are not overwhelmed with offers of meaningful activities in their school education, nor with personal connections with real scientists working on a topic which remains fascinating and tremendously concerning, and graphically illustrates first-hand the uncertainty of science.

### **Concept & educational objectives**

**The basic idea of CarboSchools is to promote *direct partnerships* between secondary school teachers and global change scientists** for young people to learn about climate change, gain a positive experience of scientific research and act locally to reduce emissions of greenhouse gases. The two main goals are (i) to re-activate students’ interest for science & scientific studies and (ii) to equip them with basic understanding of this major scientific challenge and its interaction with the society.

The strength of partnership projects is to involve pupils in a process over several weeks or months, or even years, built on a *direct relationship* between scientists and teachers to enable young people to gain *practical experience of research*. The stakes here are no longer only to inform or transfer knowledge, but also to *encourage questioning* among young people and to increase *their desire for understanding* and *their will to build a future* which will enable us to manage the challenge of global change.

Partnership projects can feature different activities, such as real-time experiments (in lab, field or at school), site visits, topical lectures, debates, access to research results, follow-up communication by e-mail, etc. CarboSchools projects are coordinated by teachers, and the partner scientist is usually involved in two or three activities within the duration of the whole project. A final output, such as an article, an exhibition, a conference, a webpage, a set of measurements and their interpretation, concludes the students’ work by sharing the findings with a wider audience (parents, friends, local community, city...), giving additional meaning, visibility and recognition to the schools’ efforts as well as greater social impact for the scientists’ contributions.

Climate change research is highly international, systemic and interdisciplinary, exciting and exotic, full of unknowns, and will more and more influence decision-making at every political & economical level. School science is often perceived as boring, purely theoretical, disconnected from social issues and real life and not related to real science - a world run by stereotypical ‘old men with glasses surrounded by explosions’.

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<sup>1</sup> [www.carboeurope.org](http://www.carboeurope.org) - 16,3 million €FP6 funding in 2004-2008; 65 partners from 17 countries  
[www.CARBOOCEAN.org](http://www.CARBOOCEAN.org) - 14,5 million €FP6 funding in 2005-2009, 40 partners from 14 countries

Grounded on this contrast CarboSchools aims to connect school education with authentic scientific learning based upon:

- questioning and experimenting rather than on transmitting pure knowledge,
- addressing a complex issue that affects all of society,
- developing close personal contact with researchers to discover how they work to challenge the stereotype and see scientists as real people.

An important parallel objective of CarboSchools is to investigate the actual impact of innovative activities of that kind on the pupils. This led to a dedicated workpackage measuring the project's educational impact through classical internal evaluation indicators (activity reports, questionnaires) but also through an in-depth study conducted by a researcher in science communication. The goal of this evaluation study is to understand how knowledge and perception of science and global change is evolving (in part as a consequence of our work), and to better understand the level of effectiveness of this novel form of project-based interactive learning in a real world research context, bringing a significant contribution to the broader educational debate and evolution of science teaching in Europe.

### *Needs of scientists involved in school projects*

The first 3 years of piloting CarboSchools within CarboEurope and CarboOcean demonstrated that European integrated research projects can be a powerful channel to promote the involvement of scientists in school projects. However, it also highlighted two very clear needs for those scientists interested in such projects. These scientists need

- (i) reinforced co-ordination, visibility, networking & sharing of resources and good practice at the European level and
- (ii) organizational & educational support at the local level to be able to make the best use of limited availability of time for educational outreach within highly pressured research agendas.

Whatever the level of enthusiasm and goodwill may be, leaving these needs unattended basically leaves the status-quo where it is: a few scientists individually motivated (and in any case working with schools by themselves), a few definitely against (who won't get involved whatever support is offered), while many think it would be good to do something and just don't take the initiative due to restrictions imposed by lack of confidence, time, contacts, methodology, resources etc.

### *Operational objectives: coordinating a European network of regional projects*

CarboSchools in FP7 has been primarily designed to address these two levels of need. After the time of pilot projects run by motivated individuals, **the main operational goal was to consolidate and coordinate a European network of structured regional CarboSchools projects run by research institutes towards schools of their region.** The objectives of regional projects are:

- to stimulate & support scientists & teachers willing to get involved in partnership projects;
- to demonstrate the value & management model of educational initiatives integrated with research institutions;
- to invest in lasting relationships and impact on partner schools, and as far as possible document how partner schools send more & better prepared students to university science studies;
- to activate and involve key local players such as school authorities, teacher associations, parents associations, teacher training institutes, science museums etc.;
- to create a climate for cooperation, co-production and exchange of tools, know-how, materials, methodologies at a European level and reach a critical mass of players able to stimulate & take inspiration from each other;
- beyond school projects themselves, to reach families & local communities, and larger numbers of teachers through the dissemination of project materials; and ultimately contribute to the advancement of science teaching & a science closer to society within the EU.

Nine regional CarboSchools projects in France, Germany, Holland, Italy, Norway, Spain and the UK have thus been developed as part of the project, all based on existing experience in school partnerships (recent for some, well rooted for others), and under a clear principle of diversity and cooperation: rather than trying to streamline the projects to be more or less similar to each other, we decided to use a wide variety of

approaches in methods, topics and target-groups (eg. young & older students, marine & terrestrial carbon science, science & language-communication teachers etc.), to find out which tools are best suitable to better link scientific research and school education. Close cooperation between this wide range of approaches to a same overall aim became an important parallel objective, to allow us to compare results, learn from each other to refine the strategies, and publish exemplar materials of best practice.

One of the objectives of CarboSchools is also to encourage pupils & teachers to experience themselves the benefits and constraints (eg language) of international cooperation that scientists practice daily. This lead to:

- a common “school CO<sub>2</sub>-web” activity undertaken by most regional projects, where schools perform CO<sub>2</sub> measurements on their own and compare their data with each other. This activity resulted from a first year of piloting with 3 schools in the Netherlands, benefiting from a fully field-tested set of activities with CO<sub>2</sub> sensors & weather stations.
- encouraging to schools to set-up Comenius partnerships projects, as a way to finance teachers meetings and students linguistic exchanges.

Last but not least, in terms of final outputs CarboSchools aimed at:

- producing and widely disseminating new materials, resources & methodologies for promoting hands-on experimental learning about climate change science
- presenting the lessons learned at a final conference, transferring this model of regional projects to more research institutes and science education organisations, by demonstrating working examples and good practices.

- *A description of the main S&T results/foregrounds (not exceeding 25 pages),*

CarboSchools links researchers from several leading carbon science laboratories in Europe with secondary schools. In these partnerships, young Europeans conduct experiments on the impact of greenhouse gases and learn about climate research and the reduction of emissions. Scientists and teachers co-operate over several months to give young people practical experience of research through true investigations and interactions with real scientists. The pupils also have the opportunity to inform the wider community about climate change by producing a final output of articles, exhibitions, conferences etc.

Piloted in 2004-2007 by [CarboEurope](#) and [CARBOOCEAN](#), two major research projects on the carbon cycle, in the frame of FP7 Science in Society CarboSchools involved nine research institute in seven countries from January 2008 to December 2010 to explore how they could best motivate and support such partnerships at the regional level across a wide variety of contexts, topics and age-groups.

**In the beginning of 2008 nine regional coordinators (RC) were appointed by the CarboSchools partners** and all attended a kick-off meeting and training workshop hosted in Norwich (UK) by the Teacher Scientist Network (TSN) in March. The training workshop generated a "Regional coordinator's handbook" including a brief but readily accessible guide '12 steps to a successful partnership' based on the groups collective experience but guided by discussions with a long-established TSN-partnership.

**Regional projects have been further developed and networked** through team-building in project meetings and European cooperation (e-mails, visits, phone etc.). The cooperation was open to associated partners in Cluj Napoca, Romania and from TSP, a Comenius-funded teacher-training sister project: Heidelberg, Germany and Uppsala, Sweden. An interim project meeting in Pistoia, Italy, 25-30 April 2009 gathered up to 100 participants in the first day in common with the TSP final conference. Locally, day after day, regional coordinators visited schools, initiated activities and partnerships, organised training sessions, produced materials and local websites and arranged special days with public presentation of project results.

Over the two school years covered by the project (2008-2009 and 2009-2010) a total of ca. 90 school projects involving 221 scientists, 232 teachers and 2475 pupils demonstrated the vitality of the project with a great variety of approaches and projects of all topics, ages, duration etc. By active involvement in designing experiments and project ideas, planning Comenius activities, contributing to the final publication, teachers involved in CarboSchools formed a very dynamic group of active partners, both locally and at the European level.

**The "schoolCO2web", a common CO2 measurement activity has been developed.** During the first half of the project, a lot of resources and energy have been used to set-up the technical infrastructure. Local support labs purchased CO2 sensors & weather stations and installed them in schools, while the central lab:

- provided them with all information needed for installing & calibrating sensors and sending data, including through a manual for support labs and schools with instructions how to set up their station(s), available in the SchoolCO2web page of the CarboSchools website.
- supported them with technical difficulties occurring during set-up & installation
- developed the software needed to set up the visual interface showing data on the web

A total of 17 stations have been made operational out of 20 planned initially. All operational stations produce and send data to the database which is made available at [www.carboschools.org/schoolsweb.php](http://www.carboschools.org/schoolsweb.php) graphically as well as in tabular form by means of a simple web tool. Schools can use this tool to see long term trends, seasonal variations, compare and interpret local situations from a place to another etc.

Several regional coordinators have helped teachers and students to work with the measurements - e.g. analysing CO<sub>2</sub> levels and weather parameters within a long period and in one day of different seasons. During the meeting in Pistoia in April 2009, teachers involved in the activity were offered a dedicated group session and a workshop about working with the measurements.

Unexpectedly, the chosen Vaisala CO<sub>2</sub> sensor revealed calibration problems which required developing new software with the functionality to perform a calibration in a simple way, in order for schools to do this by

themselves. Calibration problems - which form a large part of the typical difficulties met in atmospheric science - prevented from comparing/combining data between different stations, but not from using the sensors and working with the data locally.

A new document describing the educational benefits of the project has been released in September 2010. It contains a list of topics related to CO<sub>2</sub>-measurements, which could be used in the classroom and/or individual pupil projects. These topics are divided into technical and scientific studies. For each topic, background information, learning aims, activities, required time and options for interactions with other CarboSchools partners are listed. The document contains appendices to facilitate the use of the SchoolCO<sub>2</sub>web, such as download & usage of data, possibilities for reporting and examples of interesting data series which can be used directly in the classroom.

**An in-depth educational research evaluated the regional projects and measured attitude changes of participating students.** Three instruments have been developed and implemented:

- Self-evaluation tools (SET),
- Attitude questionnaire,
- Interviews.

*Self-evaluation tools (SET)* were used to evaluate school projects, implemented either by regional coordinators or by teachers. SET is a short questionnaire asking for students' personal information and opinions, giving information on the perception by students of projects. Further, SET provides information on how students perceive science and school science and whether they would like a career in science. SET makes it possible to correlate students' answers to their characteristics, like sex, school level, grades for science subjects etc. SET have been filled in by a total number of 1500 students from 8 regions.

*Questionnaires on students' personal attitudes* have been developed to measure students' attitude changes towards school science, social implications of science, scientists, a career in science, the urgency of climate change, and environmental awareness. A knowledge test on climate change is also part of this questionnaire, to see whether knowledge influences attitudes. The attitude instrument has been administered twice to selected groups as pre-test and post-test, covering a total of 670 students in 5 regions. This questionnaire is only implemented in projects that meet some criteria on student age and duration of the project.

The results show in the same time a huge success of the projects in terms of participants' appreciation, and the limits of peripheral activities of this kind compared to mainstream school culture in terms of impact on students. The main findings are introduced as follows in the project's final publication:

*"It appeared that the students were very positive about the CarboSchools projects. An even more important result is that CarboSchools achieved two of its most important aims: the students were more interested in science careers and they became more aware of the importance of climate change research for society. It is interesting that girls in particular benefited from the projects. Interview data supported the positive evaluation results and highlighted some of the specific benefits and constraints of the projects.*

*The evaluations reflect personal opinions on the projects. To collect more objective information on the impact of projects we used attitude questionnaires. This way, we measured changes in the students' feelings towards several aspects of science and the environment during the period that they worked on the projects. Because it is well-known that students' attitudes towards science decline during high school, we were interested to find out if we could positively influence this trend. We found that we did not succeed in achieving this. Attitudes did not change significantly or even declined in some cases. This does not necessarily mean that our initial assumptions on the positive effects of CarboSchools activities on attitudes are wrong. The contrast between the very positive opinions of participating students and this lack of effect on the usual decline in attitudes rather suggests that other experiences, mostly from science lessons in schools, have a more dominant influence on the students' attitudes; compared to CarboSchools projects, which most teachers describe as heavily constrained and limited by timetables, curricula and other structural factors. Nevertheless, although the students' environmental awareness remained unchanged, we found that students improved their knowledge on climate change significantly. Finally, our results show how collaboration between research institutes and schools opens up novel ways to teach science."*

CarboSchools produced educational materials both for project participants and the broader teaching



community:

**1) teaching materials:** although a multitude of websites offer information on various aspects of climate change, very little is existing in the concrete work with schools on the marine carbon cycle, the CO<sub>2</sub> exchange as a part of agricultural methods or the CO<sub>2</sub> uptake of forests. At the first meeting in Norwich the partners contributed the materials they had available locally, but these required adaptation for use in schools and testing in the classroom. On this ground regional projects developed several experiments and procedures suitable for schools, and their application in actual teaching situations. The meeting in Pistoia (April 2009) provided a platform for presentations of these materials by and to the school teachers involved in the project. Feedback from teachers allowed identifying priority directions for the design of new materials.

The production of materials made considerable progress during the second half of the CarboSchools project. As the project ends, 24 pdf-instruction sheets in English produced and tested in CarboSchools are available for download in the Library section of the project's website:

- 14 in the section "Indoor Hands-On", concentrating on the role of the greenhouse effect, on the air-sea exchange of CO<sub>2</sub> and its uptake by the ocean.
- 7 in "Outdoor Hands-On", with an emphasis on concentrations of atmospheric CO<sub>2</sub> and photosynthetic uptake by plants.
- 3 in "Using scientific data", in which Excel worksheets allow analysis of observed CO<sub>2</sub> concentrations.

These materials describe experiments suitable for different age ranges, topics and time frames at school, as well as activities that can be carried out as collaboration between schools and research institutions. All of the instruction sheets underwent a thorough review process during the Jena spring meeting 2010, where the teachers present at the workshop critically evaluated these materials for their applicability in school. All materials have been sent to the Scientix platform, where they are now part of the database of resources accessible to any interested teachers and subject to be translated on demand.

**2) "Global Change: from research to the classroom":** a crucial instrument in guiding teachers to the content offered in the Library is this CarboSchools 3d booklet & final publication of the project, released on 29 November 2010. This 70-page illustrated book has been a tremendous collective effort by all project partners, through a progressive writing process initiated in April 2009 at the project meeting in Pistoia where the book structure and chapter lead authors had been agreed. The quality of its contents reflects the diversity of author profiles (teachers, scientists, science educators & educational researchers). The book primarily hopes to inspire teachers to integrate authentic climate change science into their teaching, based on the essential components learned through the CarboSchools experience:

- chapter 1 describes the critical role of education when responding to the climate crisis and the paramount need to move Education for sustainable development from the margin to the centre of school systems and curricula worldwide;
- chapter 2 gives practical ideas and examples of how to design and run a school project on the topic: how to organise student groups, how to assemble a coherent series of activities under a common issue towards an end-product etc.
- chapter 3 provides practical advice and case studies on the fundamental specificity of CarboSchools: how to partner schools with scientists and research institutions, and what this brings;
- chapter 4 offers examples of experiments illustrating the carbon cycle in the atmosphere, soils and oceans as an introduction to the CarboSchools library;
- chapter 5 illustrates what we have learned through in-depth evaluation on the success of these activities with pupils and their actual educational impact.

This structure reflects one of the most stringent challenges of the Climate Change science educator: how to combine learning scientific facts in an exciting and efficient way – through inquiry-based learning – with fully addressing the meaning of this science to society – i.e. solving the climate problem and genuinely achieving sustainability. The first is essentially a matter of acquiring knowledge, where experiments (chapter 4) and teacher-scientist partnerships (chapter 3) will contribute in a novel way; the latter is rather a matter of working on values, representations and action competencies, where working within the broader frame of long-term interdisciplinary projects (chapter 2) will make a huge difference.

A publication announcement circulated in November lead to an impressive total of 2300 requests for

hardcopies from all regions of the world - which for a publication of this nature is quite unexpected and illustrate the great need faced by teachers worldwide for resources on the topic. A French version will be edited in January 2011 and hardcopies will be distributed to French teachers.

**3) the central website of the project** was launched on 30 September 2008 at [www.carboschools.org](http://www.carboschools.org), providing a multi-language overview over the whole project and the regional projects, a teacher-friendly library with tested & commented resources (experiments, project ideas etc.), data from SchoolCO2web and links to the individual websites of the regional projects. The structure of the website, particularly the library, was critically reviewed at a mid-term project meeting in Italy in April 2009, and a number of issues have been identified that should help to make it more user-friendly particularly for teachers. As a result, the structure of the on-line Library was re-designed in the first half of 2010 to adapt it to the teachers' way of looking for information relevant to their teaching. Since May 2010 a new slide-show (also available on YouTube) welcomes the visitor on the main page, illustrating the various ways in which CarboSchools works and the topics it addresses.

**To continue to involve and stimulate the broader scientific community**, CarboSchools sessions have been organized at all CarboEurope, CarboOcean, and EPOCA project meetings, mixing oral & poster presentations by scientists, teachers, pupils and CarboSchools members. In November 2008 CarboOcean PhDs were trained in communication of their research results to schools in a dedicated session. In September 2010 more than 200 scientists followed a plenary session on education & outreach at the joint EPOCA/UKOARP/BIOACID project meeting on ocean acidification.

**The project's final meeting** took the form of a Spring School involving pupils and teachers from all regional projects, coupled with a public "Global Change Science Festival" and an open conference on "Teacher-scientist partnerships for climate change education: Results & perspectives". These three combined events have been hosted by MPI-BGC in Jena, Germany from 10 to 16 April 2010.

The conference showed achievements from the nine regional projects in partnership between scientists and secondary school teachers; discussed the educational impact of these projects; and offered new inspiration, tools and resources for climate change education to the broader educational community in Europe and beyond, and to research institutes willing to develop their education & outreach activities. This included sharing experience with other climate change science education initiatives, such as *Globe* and *La main à la pâte* which responded positively to our invitation to Jena.

The Spring School gathered 45 students and 15 teachers from all partners and an associated project in Cluj (Romania). Three thematic workshops (ocean, ecosystems, and atmosphere) have been offered with science presentations by pupils, scientists and CarboSchools regional coordinators. Group work focused on producing joint outputs illustrating an aspect of the carbon issue to be presented at the science festival, e.g. a video, game, poster, newspaper, webpage, new experiment etc.

The Global Change Science festival, in common between the Spring School and the conference and open to schools from Jena, families & the general public, consisted in an open day in the main hall of the MPI building in Jena where CarboSchools participants: students, teachers, scientists & regional coordinators presented experiments, games, posters, videos etc. developed within the project - and invited everyone to try & take part. It culminated in a "flash mob" event in the streets of Jena; these combined events have been a huge success and key momentum in the project life.

The main dissemination activity at the regional project level took the form of **'final' regional events** where participants presented their results to a wider community of educators, scientists, research and educational institutions interested in climate change science education.

**External communication** with all stakeholders interested in climate change science education lead to an impressive list of press releases, public talks, conferences, publications, movies etc. at all geographical scales - including a key contribution to the UNESCO World conference on Education for Sustainable Development in Bonn in March 2009.

- *The potential impact (including the socio-economic impact and the wider societal implications of the project so far) and the main dissemination activities and exploitation of results (not exceeding 10 pages).*

## 1) Impact on participating students, teachers and scientists

CarboSchools includes an integrated component of educational research measuring the projects' impact on participating students. As mentioned above, this study revealed a contrasting picture between the two instruments used: self-evaluation questionnaires (filled by pupils just once at the end of project) expressed a very high level of satisfaction while attitude questionnaires (where pre-project & post-project questionnaires attempt to detect attitude changes through the duration of the project) showed that our students followed the natural decline in attitudes towards science generally observed as teenagers get older, regardless of their participation in CarboSchools. The meaning of these contrasting results meaning is discussed in the chapter 5 of the 3d CarboSchools booklet, and more extensively in the full evaluation report (Deliverable 4.3).

It should additionally be stressed from past experience that exceptional activities during school time like CarboSchools may actually impact pupils deeply, but in a way that may take years to become visible; by measuring attitude change between just before and just after a project, we simply fail to see any longer term impact.

The second important level of impact of CarboSchools is the impact on the participating teachers and scientists. Chapter 3 in our final publication - cooperation between schools and research - discusses this impact thoroughly.

## 2) Dissemination

The carboschools.org website will remain open during the coming years as the central access source for the many materials developed during the course of the project. We expect to see these materials used beyond the project end at various levels:

- at the school level: experience from past teacher-scientist partnerships shows that once such collaborations are set, they generally remain active for many years. The investment into human networking between scientists and teachers will continue to bring its fruits during several years beyond the end of the project, benefiting many more pupils than those involved during the funded phase.

- at the country level: through dissemination events, networking, regular communication with school authorities and interested teachers' networks, most CarboSchools partners have reached a significant level of visibility ensuring that the on-line library is well known

- at the international level, three main dissemination channels can be mentioned:

- \* the Scientix platform where all CarboSchools materials have also been made available, and where we hope to see some of them progressively translated

- \* the Unesco networks for Climate change education, and generally the growing demand for climate change science education materials worldwide, which we expect to generate many downloads.

- \* the carbon-related research projects & networks, which will continue to spread the development of CarboSchools activities and materials in the coming years. The GHG-Europe project meeting in March 2011 and the EPOCA project meeting in May 2011 have already set a slot in their agenda to highlight results & resources which participating scientists can bring back to their home institutions in support to their education and outreach activities.

In support to that, the impressive number of booklet orders (a total exceeding 2300 copies) raised by the announcement of our final publication "Global Change: from research to the classroom" gives us high hopes that this book will be widely disseminated in interested educational networks and further translated in the coming years.

- *Project public website: [www.carboschools.org](http://www.carboschools.org)*

This website provides the list of all beneficiaries with contact names, as well as a slide-show, several pictures and access to all materials produced in the project. The next pages describe and comment the statistics of the project's website use.

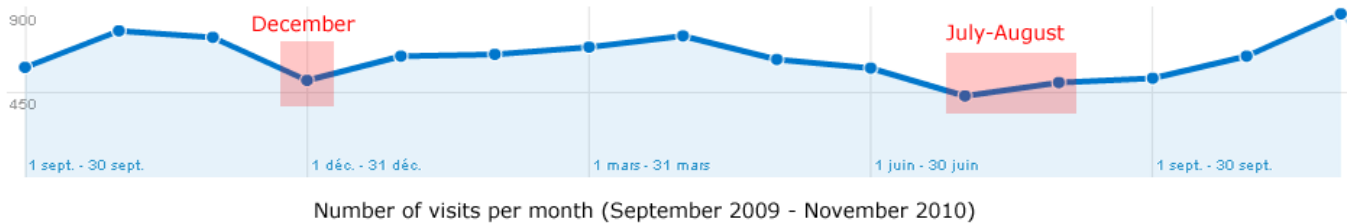
## CarboSchools website: some statistics about visitors December 7, 2010

Results are coming from Google analytics. All pages were analysed but we do not have statistics about files downloaded. As all resources of the library exist as pdf files, we strongly think that these results underevaluate the number of visits of the CarboSchools website.

Statistics were provided since September 7, 2009, even if the website exists since September 2008.

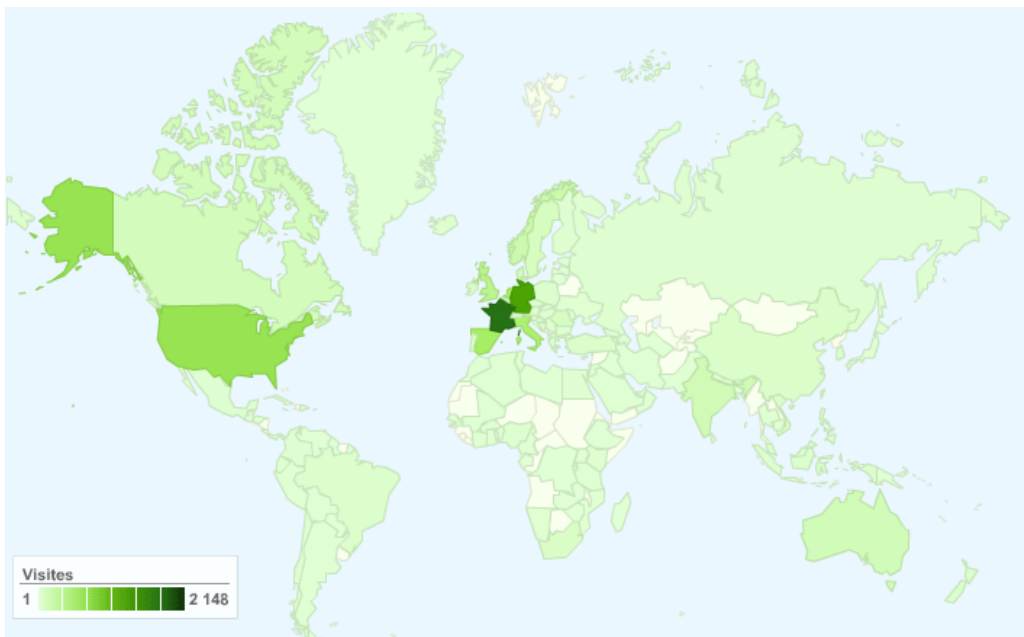
### Results for visits since September 2009

#### Number of visits



*Number of CarboSchools website visits per week (top) and per month (bellow). CarboSchools website receives between 150 and 200 visits per week and between 450 and 640 visits per month. Since November 14, 2010, number of visits has significantly increased: 14-20 November received 314 visits and November 2010 is the most visited month (869 visits). Schools holydays have also an influence: number of visits strongly decreases at the end of civil year and during summer.*

### Geographical origin













*Origin of visitors: greener are the countries, more visitors they have. Almost all countries have visitors and a large part of visitors are coming from Europe.*

1.	France	2 148
2.	Germany	1 504
3.	United States	833
4.	Spain	698
5.	Netherlands	627
6.	Italy	620
7.	United Kingdom	434
8.	Norway	248
9.	India	181
10.	Australia	171

*Top ten of countries classified by the number of visitors: France and Germany are far away from other countries.*

### Which pages are visited?

1.	 <a href="/education/">/education/</a>	8 233	30,48 %
2.	 <a href="/education/libraryHome.php">/education/libraryHome.php</a>	3 093	11,45 %
3.	 <a href="/education/schoolsweb.php">/education/schoolsweb.php</a>	2 138	7,91 %
4.	 <a href="/education/index.php?lang=en">/education/index.php?lang=en</a>	1 251	4,63 %
5.	 <a href="/education/indoorhands.php">/education/indoorhands.php</a>	913	3,38 %
6.	 <a href="/education/contact.php">/education/contact.php</a>	866	3,21 %
7.	 <a href="/education/experiments.php">/education/experiments.php</a>	857	3,17 %
8.	 <a href="/education/index.php">/education/index.php</a>	651	2,41 %
9.	 <a href="/education/resources.php">/education/resources.php</a>	415	1,54 %
10.	 <a href="/education/actReports.php">/education/actReports.php</a>	401	1,48 %

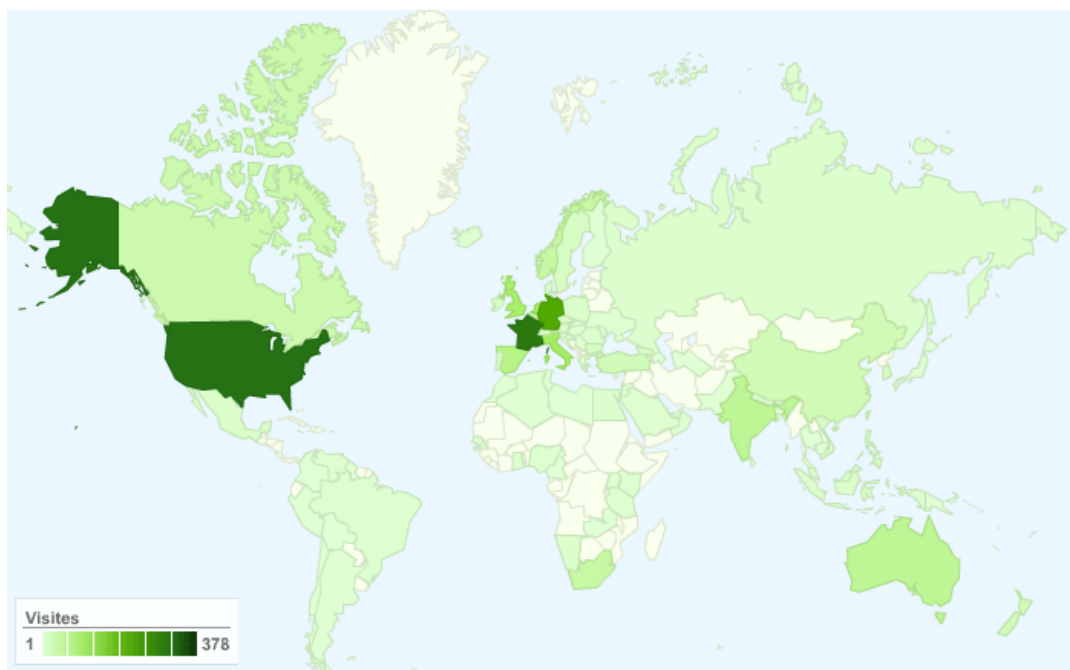
*Top ten of pages visited. **Home pages** are the most visited ([/education](/education/) and [education/index.php](/education/index.php), >30% of pages visited) but **library pages** (red covered) are also well visited (around 20% of pages visited, about 1 page/5). **SchoolCO2web page** ([education/schoolsweb.php](/education/schoolsweb.php)) is also a frequent choice for visitors (7.91% of pages visited).*

## Results for visits since September 2010

It is interesting to present results since September 2010 because the library was updated in spring 2010 and last September was the first beginning of scholar year since this updating.

Results for a shorter recent period could also show trends of the website for visitors' origin and interest of pages; since new pages are proposed (for example library pages are more or less 6 months old).











### Geographical origin of visitors



Origin of visitors for the last three months (September, 1<sup>st</sup> to December 6<sup>th</sup>): greener are the countries, more visitors they have. Almost all countries have visitors. Visitors from the USA became predominant.

1.	United States	378
2.	France	361
3.	Germany	251
4.	Netherlands	128
5.	Italy	127
6.	United Kingdom	115
7.	Spain	86
8.	Australia	70
9.	India	69
10.	Norway	54

Top ten of countries classified by the number of visitors for the last three months: visitors from USA became first, not far from French and German ones. If we do not consider the change for visitors from USA, we do not observe significant change between the last three months and the whole duration of our analyse.

1.	 <a href="/education/">/education/</a>	<b>1 497</b>	27,35 %
2.	 <a href="/education/libraryHome.php">/education/libraryHome.php</a>	<b>831</b>	15,18 %
3.	 <a href="/education/schoolsweb.php">/education/schoolsweb.php</a>	<b>464</b>	8,48 %
4.	 <a href="/education/indoorhands.php">/education/indoorhands.php</a>	<b>431</b>	7,87 %
5.	 <a href="/education/index.php?lang=en">/education/index.php?lang=en</a>	<b>235</b>	4,29 %
6.	 <a href="/education/contact.php">/education/contact.php</a>	<b>174</b>	3,18 %
7.	 <a href="/education/outdoorhands.php">/education/outdoorhands.php</a>	<b>161</b>	2,94 %
8.	 <a href="/education/booklet3.php">/education/booklet3.php</a>	<b>148</b>	2,70 %
9.	 <a href="/education/index.php">/education/index.php</a>	<b>126</b>	2,30 %
10.	 <a href="/education/actReports.php">/education/actReports.php</a>	<b>123</b>	2,25 %

Top ten of pages visited for the last three months. **Home pages** stays the most visited (*/education* and *education/index.php*, >30% of pages visited) but **library pages** (red covered) become more visited than before (around 25% of pages visited, about 1 page/4). **SchoolCO2web page** (*education/schoolsweb.php*) does not change significantly (8.48% of pages visited).

**The library is then becoming a more important choice for CarboSchools' visitors.**

## **2. Use and dissemination of foreground**

This section doesn't apply to CarboSchools+ which is not a R&D project. The dissemination of results is described in section 1.