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NitroEurope IP

The nitrogen cycle and its influence on the European greenhouse gas balance.

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Global Change and Ecosystems

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Report on the YSF conference science communications workshop

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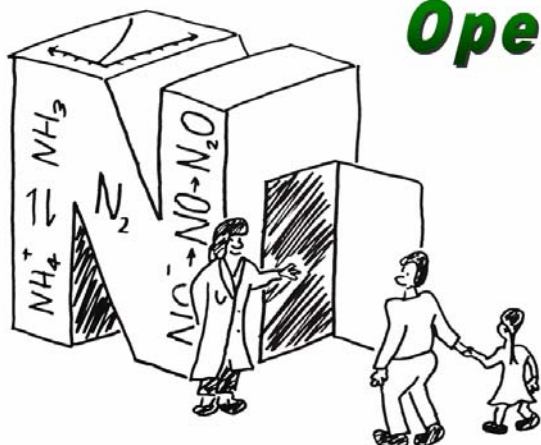
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Opening Nitrogen Science to the People

Madrid, Spain, 6-10 Oct 2008

EUROPEAN
SCIENCE
FOUNDATION
SETTING SCIENCE AGENDAS FOR EUROPE



Workshop Summary

Currently public awareness and involvement in the science linking different forms of nitrogen and their effects on the environment is low. Is this the fault of the scientists? Not necessarily. Of course, scientists need to be willing to engage with the public but even if they are willing; they may not have the time to devote to these activities. Another problem nitrogen scientists face is the complexity of the system that they are trying to study. This can be contrasted with the issue of climate change, which is an easier concept to communicate leading to a higher level of public comprehension. Climate change is just one of the many environmental impacts associated with nitrogen, and therefore there is a large communication challenge ahead of us. To improve the situation a workshop entitled "Opening Nitrogen Science to the People" was held in Cercedilla (Madrid) for 19 participants, with the objective to develop tools and methods to increase public involvement in nitrogen research.

The workshop was held over 5 days combining presentations by invited speakers, discussions, group project work and related excursions. Following an inauguration by the Vice-Rectorate of Research of the Technical University of Madrid (workshop hosts) and the General Secretary of Technological and Scientific Policy of the Spanish Ministry of Science and Innovation, Mark Theobald (workshop co-organiser) gave an overview of nitrogen research and the challenges of engaging the public with this work. Next came the professionals, five experts in the field of science communication who each presented their ideas and experiences of successful communication methods followed by a discussion of how these techniques could be applied to nitrogen research. The morning of the workshop's second day was devoted to discussions of the target audiences we should be trying to reach, how each target audience could be engaged with the research and projects that could be completed within the timeframe of the workshop. Six project 'themes' were developed, each focussing on a different target audience or communication method. The workshop attendees divided themselves into groups, one group per theme, and worked on developing a 'prototype' communication tool until the afternoon of day 4, when each group presented their ideas. The tools developed ranged from school lesson plans, information leaflets, rap songs, role plays, games, videos and a website.

Since the end of the workshop, many of the attendees have been working on refining the prototype tools to provide something that is ready to use (or be adapted) by any scientists interested in engaging the public with their science. These refined ideas will be presented at the next NitroEurope IP meeting in Gothenburg in January 2009.

Workshop Description

A workshop entitled “Opening Nitrogen Science to the People” was held in Cercedilla (Madrid), to develop tools and methods to increase public involvement in nitrogen research. The main aim of the workshop was to provide time for enthusiastic nitrogen scientists to discuss and develop their communication ideas, aided by the advice and experience of people working in the field of science communication. The stated objectives of the workshop were:

- An increase in the participants’ understanding of effective methods to engage the public with scientific research;
- A discussion of how these methods could be applied to nitrogen research and whether certain techniques would succeed or fail. This discussion should also give rise to novel methods of public engagement that can be developed further;
- The group work will produce ‘prototype’ tools and techniques for various target audiences, which can be refined following the workshop. These are referred to as prototypes in the acknowledgement that resources (both time and materials) will be limited during the event. These prototypes will be reported to the group in the plenary session to get feedback in the ideas presented. It is expected that the ideas presented will be further developed and applied following the workshop;
- An increase in the participants’ understanding of practical applications of science communication through the excursions on Day 5;
- A workshop report will be produced following the event giving details of the discussions and the ideas developed during the event. The experiences of the participants and the tools and techniques that are developed can also be presented at relevant forums.

Day 1: Workshop Inauguration and Invited Speakers

The workshop convenors were proud to have the attendance of the Vice-Rectorate of Research from the Technical University of Madrid (Ms. Inés Mínguez Tudela) and the General Secretary of Technological and Scientific Policy of the Spanish Ministry of Science and Innovation (Mr. J. Fernández de Labastida). Following an introduction to the workshop by Alberto Sanz Cobeña (workshop co-organiser), Ms. Mínguez Tudela talked about the history of the Technical University of Madrid and its current research. Mr. Fernández de Labastida stressed the importance of public engagement for Spanish science and highlighted the support that the Spanish government provides for science communication activities. The following presentation was given by Mark Theobald (workshop co-organiser) on the subject of nitrogen science and the communication challenge. The aim of this presentation was to give a brief overview of nitrogen research (for those present who were not familiar with the topic) and to get the nitrogen scientists present to start thinking about how the subject could be communicated effectively. Mark began by looking at the way the global nitrogen cycle has changed (Figure 1) due to the industrial production of reactive nitrogen (through the Haber-Bosch process and the burning of large quantities of fossil fuels). These changes have had a significant negative impact on the environment leading to increased greenhouse gas emissions, acidification of soils, eutrophication of surface waters, loss of biodiversity and decreases in air quality. However, Mark stressed that we should not view all reactive nitrogen as bad; in fact we need it to produce sufficient food for everyone, although a reduction in meat consumption would reduce this need. In the final section of his presentation, Mark highlighted current research into the impacts of nitrogen with reference to the NinE programme of the ESF

and the European integrated project NitroEurope and ended by showing some recent examples of the communication of nitrogen research.

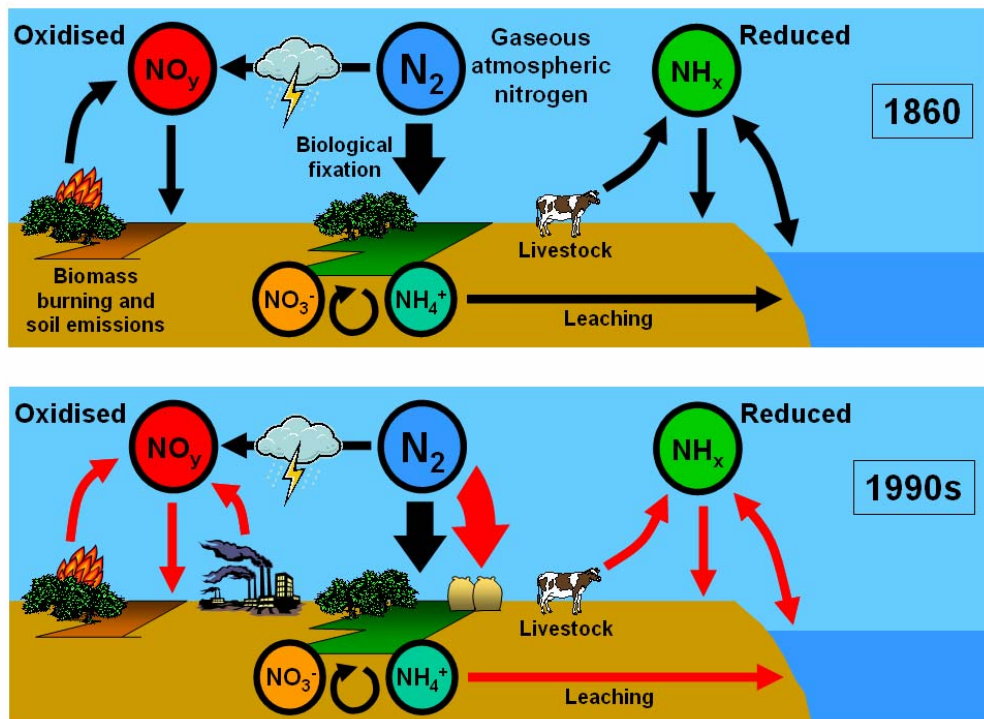


Figure 1: A conceptual view of how the nitrogen cycle has changed from 1860 to 1990s (i.e. before and after the industrial production of reactive nitrogen). In the bottom diagram the red arrows signify processes not present in 1860 or those that have been substantially intensified.

The subsequent presentations were given by experts working in the field of science communication.

The first of these was given by Dr. Nigel Eady (The British Association for the Advancement of Science) with the title: Engaging people with science - finding common language. Nigel's message was that discussing science with the so-called general public raises a whole range of issues. If you can decide why you're doing it and what you aim to achieve you are much more likely to have a successful and enjoyable experience. Always have your audience in your mind and don't be afraid to focus on specific groups, rather than trying to do something that will work for everyone - if you do that you'll probably please no one!

The presentation given by Dr. Anna Frey from Science&Media (Germany) had the title: How to get the message heard? It aimed to give the audience of the workshop an idea about the principles of science communication and to provide some practical advice to bring "Nitrogen to the people". In the first part of the presentation the process of communication was highlighted by means of four key questions: Who is the sender? What is the message? Who is the recipient? How should the message reach the recipient? Anna pointed out how important it is to differentiate the target group and the form of the message according to the topic. To make this clear, the audience were involved in the second part of the presentation: They were asked to find suitable formulations of a message for three different prototypical target audiences (house wife, politician, and pupil). The participation was very good and the audience got a tool kit as reward at the end of the presentation. In there: a magnifying glass, (as a symbol to analyse the target group carefully), a painters palette (to remember to make a message interesting and exciting) and cup of coffee (communication needs patience and continuity.)

The presentation by Dr. Antonio Raschi (CNR, Florence, Italy) presented an overview of the problems we meet in communicating global change in secondary schools, both from the point of view of the interaction with teachers and students, and from the point of view of the political prejudices and mass media misinformation that often affect the way the problem is perceived by students. On this basis, the ongoing project Carboschool+ was presented. The project originated from two EU projects, CarboEurope and CarboOcean, aiming to disseminate to schools the results obtained, and to foster a deeper understanding of scientific research in the field of global change, by involving high school students in experiments and measurements. The ongoing activities were presented, in particular those run by the Italian contractor CNR -IBIMET, trying to adapt the information to the different kinds of schools (scientific, humanistic, technical, vocational) in order to cope with the future professional activity of the students.

The presentation by Prof. Dr. Hans-Martin Haase (Schwäbisch Gmünd University of Education, Germany) on the subject of developing training programmes also highlighted the importance of having a clear 'take home message' and a definite idea of the audience we are targeting. Hans-Martin also stressed that the means of communicating the message must be specifically adapted to the target audience. He ended his session with some actual examples of 'hands-on' science communication activities.

Arjan Hensen (ECN, Netherlands) presented two Nitrogen dissemination tools that were developed in the Netherlands. The first one is Nitrogenious, a computer game played with 4 roles: government, industry, agriculture and society. The players play each role for four game turns covering a total timespan of 2000-2016. They decide which Nitrogen emission control measures to implement which is of course linked to the available budget. This tool was developed for the 2000 N conference in Washington and is now used 2-3 times each year both at Wageningen University and in the US to inform students of the Nitrogen issues. The second part of the presentation covered the Nitrogen visualization tool that was developed for the 2007 N conference in Brazil. This system has two parts; the first part is a set of animations on the history of Nitrogen issue. The second part is a 'cockpit' where the participant can decide on 7 N related questions that change the 2030 world wide N levels. Factors involved are biomass use, N efficiency, nature development etc. The presentation covered the two different dissemination systems, their use thus far and future plans, like the development of a new visualization instrument that focuses on the interaction between climate and air quality

Day 2: Discussions and the start of group projects

Leading on from the key advice provided by the invited speakers on Day 1 of the importance of identifying the target audience and specifying the message that is to be communicated, a discussion on the **target audiences** for nitrogen science was held. The list generated was long and it became clear that the science could potentially be communicated to any audience. The target groups in the list were and then those with the highest priority were distilled into 3 target groups: 1) Interested adults; 2) Education (teachers, schoolchildren) and 3) Policy makers, NGOs.

Different **key messages** were discussed for each target group. The key messages (with the related target groups in parentheses) were:

- What Nitrogen is (Target groups: 1, 2)
- Nitrogen is important to everyone (1, 2)
- We need nitrogen but its use is linked to various environmental problems (1, 2, 3)
- Good/Bad nitrogen (1, 2, 3)
- Eat less meat, it's healthier (1, 2, 3)
- Healthcare costs would be lower (1, 2, 3)

- Nitrogen need to be managed in an integrated way (3)
- Could save farmers money (3)

Having agreed on the target audiences and key messages, the workshop participants devised a number of projects to produce 'prototype' tools to deliver the key messages to the target audiences and each participant assigned themselves to one project.

Project list:

1) Website introducing nitrogen science

The aim of the group was to design a website as a first point of call for the public for information on nitrogen, its effects and possible solutions.

2) Information/activities for mass-media, policy makers, NGOs etc.

The aim of the group was to develop information (flyers, presentations etc) that could attract the attention of policy makers and NGOs to get the key messages across.

3) Films/Adverts/Books/Comics etc.

This group looked at how to raise awareness of the issues through attention grabbing media.

4) School activities (ages 7-11)

The aim of this group was to develop a way to introduce basic nitrogen science to young school children allowing a discussion of the environmental problems and their possible solutions.

5) School activities (ages 11-16)

The aim of this group was to develop a way to introduce more complex nitrogen science to older school children through simple experiments and games.

6) Nitrogen at home

The aim of the group was to reach households in order to:

- i). Reduce nitrogen emissions without compromising life quality
- ii). Improving life quality in a sustainable manner

Days 3-4: Continuation and completion of group projects and feedback session

The groups worked on their respective projects during 2 days before presenting their 'prototype' tools to the rest of the workshop participants. These are presented and discussed in the following section: "Assessment of results and future impacts".

Day 5: Excursions

On the final day of the workshop, participants were taken on two excursions. The first was a visit to a local science museum "CosmoCaixa" specifically directed at young children. First a presentation by Mr. Antonio García Fernández (Educational activities department of CosmoCaixa) introduced the aims of the museum and demonstrated how scientific concepts can be explained through eye-catching experiments. The workshop participants were then allowed to explore the museum to see how it communicates science in a fun and visual way. The second excursion was to a field experiment funded by the NitroEurope IP as an example of the nitrogen science being carried out by the Technical University of Madrid.

Assessment of results and future impacts

The principal results of the workshop are the 'prototype' science communication tools developed by each of the group projects.

1) Website introducing nitrogen science

The main objective of this group was to design a web page focussing on the communication of different issues and tools related to N science. The result was a web page structured in 3 main sections: 1) General information on N; 2) Research on N; 3) N communication platform. According to the original idea, researchers and teachers can upload different communication tools and share their experiences. Once a tool is completed, it will be available for the public and included in a specific section depending on the target group of the tool (e.g. children, teachers, adults/students, policy makers, media). The researchers will be encouraged to send reports of their advances in N research. This web site could also be a good platform to promote N science and to provide contact between researchers, teachers, students and policy makers.

2) Information/activities for mass-media, policy makers, NGOs etc.

The work of the group was mainly orientated to mass-media-professionals, politicians and NGOs. The goals originally proposed were to draw the attention of these groups to the problem (attract) and give them solutions through scientific information (explain). Two communication tools were developed within the workshop. The first one was a presentation oriented to mass-media and the general public; it was considered a friendly and emotive way to reach the mentioned target groups. The presentation focussed on the impacts of increasing reactive N in the environment and the social causes of this problem (e.g. eating too much meat). The style used tried to increase social concern making N a newsworthy issue. The second tool was a leaflet created to address stakeholders, politician, journalists and NGOs; it was considered a more formal way to get the message to the target groups. Emphasis was on economic and health impacts of increasing reactive N in the environment, as well as possible solutions to mitigate these problems (e.g. administrative initiatives and the introduction to international scientific research groups and programmes)

3) Films/Adverts/Books/Comics etc.

This group looked at how to raise awareness of the issues through attention grabbing media. The key message that this group wanted to get over to their target audiences (children, interested adults, media etc.) was the environmental impacts of using too much reactive nitrogen to grow the world's food. The main output of the group was two short films highlighting the dangers of too much reactive nitrogen. The first film showed high impact images of the environmental impacts of reactive nitrogen, whilst the second film also highlighted the dangers but in a more light-hearted 'burlesque' style. Both 'prototype' films have been subsequently placed on www.youtube.com (with film titles "Reactive Nitrogen Threats" and "Nitrogen Science for People" respectively).

4) School activities (ages 7-11)

The aim of this group was to develop a way to introduce basic nitrogen science to young school children allowing a discussion of the environmental problems and their possible solutions. The approach taken by the group to inform and educate young school children about the issues was to develop personalities around each form of nitrogen. For example nitrogen gas was portrayed as very sensible and a bit boring, whilst ammonia was a smelly character who lived on a farm and was sometimes good (helped to grow crops) and sometimes bad (made some plants disappear). The characters were introduced in a short

video and then the idea was followed through to a group therapy session where the different forms of nitrogen were seeking solutions to their own (environmental) problems. As an introduction to the project, a short poem about nitrogen was written. The project has also been adapted for use as a museum exhibition for children. A 'bagatelle' demonstration was also developed which simulates the fate of nitrogen fertiliser by a cascade of balls. Some of the 'nitrogen balls' end up in the food or back in the atmosphere as nitrogen gas but the majority end up as ammonia, nitrous oxide or nitrate. This demonstration could be developed into a nitrogen pinball game where the objective is to get as many balls in the 'food' or 'nitrogen gas' targets.

5) School activities (ages 11-16)

The aim of this group was to develop a way to introduce more complex nitrogen science to older school children through simple experiments and games. The group developed a lesson programme introducing each form of nitrogen a lesson at a time. During each lesson simple experiments are conducted on the chosen form of nitrogen along with games and information on the environmental impacts. In addition to the classroom activities a wall chart was developed which builds up the nitrogen cycle stage by stage as the children learn about the different forms. An outdoor game was also developed where the children hunt for the different forms of nitrogen in the forest. This is designed to teach the children where the different forms of nitrogen can be found (e.g. in the air, soil, plants etc).

6) Nitrogen at home

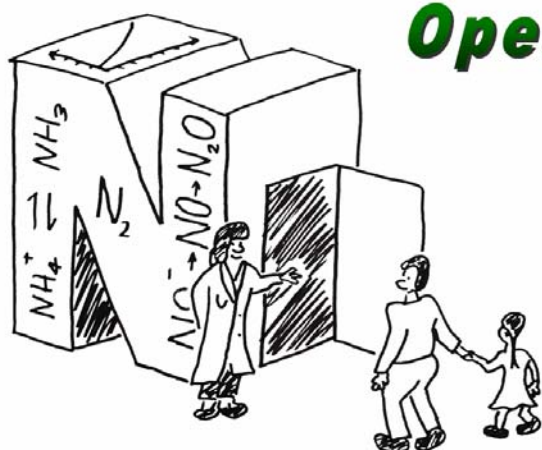
The aim of the group was to reach households in order to:

- iii). Reduce nitrogen emissions without compromising life quality
- iv). Improving life quality in a sustainable manner

The group designed a range of resources to educate and entertain. These resources ranged from designs for rulers/screensavers/posters highlighting the nitrogen cycle, through a fun nitrogen cycle for children, a board game based on the nitrogen cycle and even a nitrogen 'rap' song.

Future Impacts

The results of the workshop were in the form of 'prototype' communication tools; that is, communication tool designs developed to highlight the concept of the tool and its potential. The feedback session on Day 4 gave the participants the opportunity to state their commitment to the future development of these tools. Members from each project group offered their commitment to completing the development of their 'prototype' ideas into finished products in the near future. A temporary home has been found for the website (on the ESF-NinE server), which will allow the design and testing of a working website that can be released in 2009. The outputs from the other projects will be stored on the website as well, providing a set of communication tools that can be copied and modified by anybody who finds them useful. The 4th General Assembly of the NitroEurope IP (Gothenburg, Sweden; 23-26 January 2009) will be used as a 'showcase' of the workshop outputs through a series of posters, presentations and demonstrations. The 'prototype' communications tools, along with the website, will be under continuous development through the commitment of the workshop participants. A follow-up workshop (2010) could be arranged to finalise the development and testing of the ideas, which would include participation by members of the public. A longer-term plan is to hold a series of nitrogen science-related activities for the public to coincide with the release of the "European Nitrogen Assessment" in 2011.



Opening Nitrogen Science to the People

Madrid, Spain, 6-10 Oct 2008



Workshop Programme (Final)

Sun 5 Oct 2008 Workshop delegates arrive (dinner at the venue)

Mon 6 Oct 2008

10:15	<p style="text-align: center;">Workshop Inauguration with welcome addresses from:</p> <p>Mr. Alberto Sanz Cobeña. Co-organizer of the Workshop: Introduction, background and aims of the workshop.</p> <p>Mr. J. Fernández de Labastida. General Secretary of Technological and Scientific Policy. Ministry of Science and Innovation. Spanish Government.</p> <p>Ms. Inés Mínguez Tudela. Responsible of Research and Technological Development in the Vice-Rectorate of Research. Technical University of Madrid (UPM).</p>	
11:00 – 11:15 Coffee		
	Speaker	Title
11:15	Mark Theobald (Coordinator of the <i>Young Scientist Forum</i> , NitroEurope)	Nitrogen science and the communication challenge
12:00	Dr. Nigel Eady (The British Association for the Advancement of Science)	Engaging people with science - finding common language
12:45	Dr. Anna Frey (Science&Media)	Science communication: How to get the message heard?
13:30 – 14:30 Lunch		
14:30	Dr. Antonio Raschi	Bringing climate change science to the

	(Consiglio Nazionale delle Ricerche)	classroom: The Carboschools experience
15:15	Prof. Dr. Hans-Martin Haase (Schwäbisch Gmünd University of Education)	Developing training programmes: principles and examples
16:00 – 16:15 Coffee		
16:15	Arjan Hensen (Energy Research Centre of the Netherlands)	NitroGenius and Nitrogen Visualisation: Examples of successful communication of nitrogen science
17:00 – 18:00 Discussion of how the presented ideas could be applied to nitrogen research		

19:30 – 21:00 Dinner

Tue 7 Oct 2008

09:00	Audience targeting: How can we engage different audiences?
09:45	Brainstorming session: Potential communication methods for different audiences
10:30 – 11:00 Coffee	
11:00	Suggestions of possible group projects targeting different audiences. Selection of projects, formation of groups and the beginning of group project work
12:30 – 13:30 Lunch	
13:30	Project work continues
15:30 – 15:45 Coffee	
15:45	Project work continues
16:30	Reporting of project progress

Weds 8 Oct 2008

Project work all day (This includes a short afternoon mountain walk to “Fuenfría” Peak.)

Thurs 9 Oct 2008

09:00	Project work continues
12:30 – 13:30 Lunch	
13:30	Presentation of group prototype ideas

15:30 – 15:45 Coffee	
15:45	Discussion and feedback on presented ideas
16:30	Plans for the implementation of the groups' ideas following the workshop

17:30 Transfer to Madrid hotel and dinner in restaurant

Fri 10 Oct 2008

9:45-15:00	Visit to 'CosmoCaixa': A privately funded interactive science museum for all ages, founded by La Caixa Foundation. Presentation by Mr. Antonio García Fernández. (Educational activities department of CosmoCaixa)
	Visit to the NitroEurope-Experimental Field Station "el Encín" where measurements of Greenhouse gases, Reactive Nitrogen and Organic Carbon in both soil and groundwater are being carried out. Lunch will be served in the countryside at 14:00.

16:00 End of workshop and transport to the Airport and the city directly from the field.



Attendees of the workshop

Event hosted by: Technical School of Agronomy, Technical University of Madrid

