

Arved Fuchs

International Ice-Climate Education 2017



International Competition for Schools



I.C.E Competition 2017

© Arved Fuchs 2017

P r e f a c e

Global Warming

Scientists around the world have come to the conclusion that the global warming of the climate is an established fact. International scientific studies like the Arctic Climate Impact Assessment (ACIA, 2004) and the recent publications of the UN Inter-governmental Panel on Climate Change (**IPCC**, 2007, 2013, 2014, **2015 Dubrovnik**, **2016 Nairobi**) underline these findings and re-emphasise the increasing speed of the global climate change caused by the emission of evermore quantities of **CO₂**, **CH₄** and other greenhouse gases.

Facing a wide variety of predominantly negative consequences like rising ocean levels, flooding, droughts, storms, tornadoes and health problems, politicians worldwide are trying to come to terms with the advancing economic and social disturbances. International agreements to reduce the emission of **CO₂** on a global level were only the beginning (Rio 1992, **Kyoto 1997**, Bali 2007, Copenhagen 2009, Cancun 2011, Durban 2011, Doha 2012, Warsaw 2013, Lima 2014, Paris 2015) and did not stop the emissions of greenhouse gases to rise by 25% since 1990.

Climatic processes are immensely complicated and interrelated. A variety of contradicting political and economic lobbies is taking advantage of the situation and thus the general public often lacks unbiased, trustworthy and statistically firm information in the first place. Hence many people in industrial as well as in developing countries react with confusion and alarm, with disbelief, indifference or even with resignation.

Competition Aims

Pupils and students attending our schools today will be the first generation to fully experience the consequences of the present global warming caused by human activity. It is them who need to be informed as early as possible in order to make them understand these climatic processes. They will have to face the consequences and they will have to look for solutions. Much in demand at present are unbiased opinion, curiosity, imagination and a positive approach to problems. Qualities which generally abound in young people of any nation. The **I.C.E. Project-Competition**, launched by **Arved Fuchs** in 2007 aims at exactly these qualities, asking for creative approaches to well defined scenarios related to the present climatic changes in the Arctic and the situation at home. The international competition, now repeated for the **10th** time, also encourages participants to use modern information technologies and to utilize the enormous resources which are provided and made accessible via the WORLD WIDE WEB for the first time in human history.

International Youth Camp

Personal impressions and hands on experience are priceless instructors and invaluable assistants when learning from books and lectures. This is where the International **I.C.E. Youth Camp** comes in. Based on his knowledge and insight gained during many expeditions in the Arctic **Arved Fuchs** decided to organize international youth camps in polar or semi-Arctic climate regions in order to facilitate first hand experience and personal encounters with climate changes where they actually happen. These processes continue to take place in a much more dramatic way in the Arctic and in glacial areas than anywhere else. Guided and assisted by scientists (meteorologists, biologists, historians) students from many different nations will personally collect data on the spot and samples in the field. They will then analyse and discuss their findings and personally experience their own group as a sort of global community facing a common global issue.



Introduction

The polar and glacial regions are more severely affected by global warming than most other regions on our planet, and the ongoing changes are already affecting a number of plant and animal species in the Arctic and around the globe. They might bring to an end the century-old traditional life style of indigenous communities around the Arctic Sea.

Arved Fuchs, a German expedition leader and polar explorer knows the polar regions better than most, having carried out a great number of expeditions in the high latitudes. Arved Fuchs started his latest expedition „**Ocean Change**“ at the harbor of Hamburg in 2015 and successfully completed his journey exactly one year later.

The 85-year old cutter „**Dagmar Aaen**“ covered 21.000 sea miles, taking Fuchs and his crew around Cape Horn and into the Antarctic. Apart from collecting documentary materials „**Ocean Change**“ focussed on industrial overfishing, the fate of small scale coastal fishery in various countries, a penguin monitoring experiment and the growing pollution of the sea by plastic garbage.

As during previous expeditions, he interacted with pupils from around the world via the internet and by means of a newly installed INMARSAT FleetBroadband technology capable of video transmission (<http://www.arved-fuchs.de/>). However, to raise awareness of the ongoing threat not only to polar regions owing to climate change, there will again be a school competition and an **International Youth Camp** in 2017 as organized in Svalbard, Iceland, Norway and Austria during previous years.

This year´s competition will focus on a contest of ideas concerning not only the effects of global warming on the environment, especially in Arctic regions, on sea-ice, glaciers and the impact on freshwater resources, it also attracts attention to the growing problem of plastic pollution of the seas.

The concept of this year´s competition has been developed as openly as possible, in order to give pupils and teachers the possibility of developing activities which coincide or correlate with individual subjects and their school´s curriculum. This concept also allows the integration of school projects which have taken place in the past or which are already underway. A further goal of this contest is to foster new long-term projects dealing with global warming and the reduction of **CO²** emission. It is hoped that this will allow for a connection to the daily lives of the pupils and for the development of strategies of action.

For the 2017 competition, three main subjects are envisaged:

- 1) The present situation : **Melting Glaciers**
- 2) The future : **Global Freshwater Resources**
- 3) Biotope protection: **Microplastic Litter in European Seas**



Further information about these subjects can be found on the following pages. The contest is intended mostly for pupils who are at least **16 years** old. Participants are expected to have sufficient command of the English language and **to be able to actively participate in lessons given in English during the Ice-Climate Youth Camp.**

topic 1

present situation

Running empty

Melting glaciers threaten ecology & economy

Today some 10% of the earth's land surface are permanently covered by snow, ice caps, continental ice sheets and glaciers. They represent about three quarters of the world's freshwater reserve. They are a very important source of freshwater for human activities such as agriculture, industry and domestic purposes. Glacier run offs are sometimes vital for shipping and hydro-electric power



production various economic activities such as tourism. Entire ecosystems depend on the constant supply of freshwater from glaciers and ice caps.

The latest IPCC reports outline a spectacular shrinking of mountain glaciers on a global scale. It is the most visible sign of the present global warming that is changing the earth's climate since the middle of the 19th century. Melting glaciers are the chief indicators of this process as regards speed and extent. The consequences are equally dramatic: global freshwater reserves disappear with astonishing speed -sometimes causing floodings and destruction in the process.

In Central Europe almost two-thirds of the permanent surface ice cover is to be found in Alpine regions. Alpine glaciers such as the **Aletsch Glacier** are in fact water towers for many countries, sending their melt water down many rivers such as the Rhine or the Rhone. However, they are melting fast: The **Vernagtferner Glacier** in Austria lost two thirds of its mass within the last 150 years. Since the year 2000 all Alpine glaciers lost between 2 and 3 percent of their volume annually. Between 1970 and 2000 it used to be 1 percent only. Scientists (glaciologists) predict losses definitely exceeding 50% of all Alpine glaciers by 2050. Of the present 5000 Alpine glaciers just 2500 will be left. Some glaciologists even predict the complete disappearance of Alpine glaciers within this century.

The melting of entire glaciers has a variety of negative consequences. Additional melt water creates huge new lakes, causes floodings and destroys roads and bridges. Mountain flanks are laid bare thus increasing the speed of rainwater moving downwards. Heavy rainfalls may cause cold lahars and landslides threatening dales and rural communities with avalanches of mud and debris. Once the glacier is gone the drinking water supply is endangered or breaks down completely. Since about 7 % of the Rhine water in the Netherlands stems from Alpine glaciers today, future low water levels in big rivers like the Rhine or the Rhone will no doubt affect shipping or lead to entire standstill.

This in turn will cause enormous supply problems for industries in various countries.



As ground and surface temperatures have risen by 0.5 degrees Celsius in Alpine regions during the last 50 years the permafrost base was moved upwards between 100 and 300 meters. Thawing grounds are already

p.t.

topic 1

Melting glaciers threaten ecology & economy

destabilizing huge areas of frozen rubble and entire mountain flanks have moved downwards. To prevent further damages to roads and traffic installations local communities face enormous expenditures and investments for protective barriers, emergency installations and disaster control.

As a sort of model or prime example the Tyrolean area of **Kaunertal** is one of the Austrian areas which will have to face those negative effects of glacier meltdowns in the near future. The extremely beautiful dale has become a hotspot of tourism. It is a center of mountaineering and skiing and a protected nature reserve in parts.

The area's economic rise began in the 50s and 60s with the construction of a huge waterreservoir, the **Gepatschstausee**, which sends its waters down a 13, 2 km pressurized pipeline to produce electricity at a powerstation at **Prutz**. When in 1982 a serpentine road was built which made the nearby **Weißseeferner glacier** accessible, the still booming era of tourism began. Today Kaunertal and the surrounding mountains are a top ski resort in winter and one of the most famous targets for climbers in Austria. Tyrol counts up to 10.100 overnight stays a month, with the tourist industry offering jobs to more than 34.000 people in the area. Something worth protecting.

Task:

Considering the present glacier melting you are asked to develop transferable concepts and ideas to protect the Kaunertal area against the effects of global warming.

Try to keep in mind the people living near the glacier. The entire area will inevitably suffer from the negative impacts mentioned above. What could be done to slow down the melting process? What measures should administrators take against floodings, lahars and later against water shortages and the disappearance of those beautiful skiing slopes?


Form:

It is up to you to decide how you want to deal with the task. Write a report to a local newspaper, create a comic, a short movie, a storyboard, a funny game or a computer programme visualizing the melting glacier's effect on the landscape. However, stick to the question ! Methods or techniques you use aren't quite as important as your own unique approach to the problems. Try to find new perspectives and trust your own creativity.

The form is up to you, **the focus on the task is not.**

In any case add a short personal statement informing us why exactly you chose this topic from the three available ones.

Sources of Information:

You will be provided with pictures, maps and relevant information. As regards the effects of ocean acidification you will find a collection of internet addresses, recent publications and satellite data at the end of this document. You may also refer to Arved Fuchs' homepage or get into e-mail contact with other students via Arved Fuchs' web presence on [FACEBOOK](#)  Do not hesitate to ask questions.



topic 2

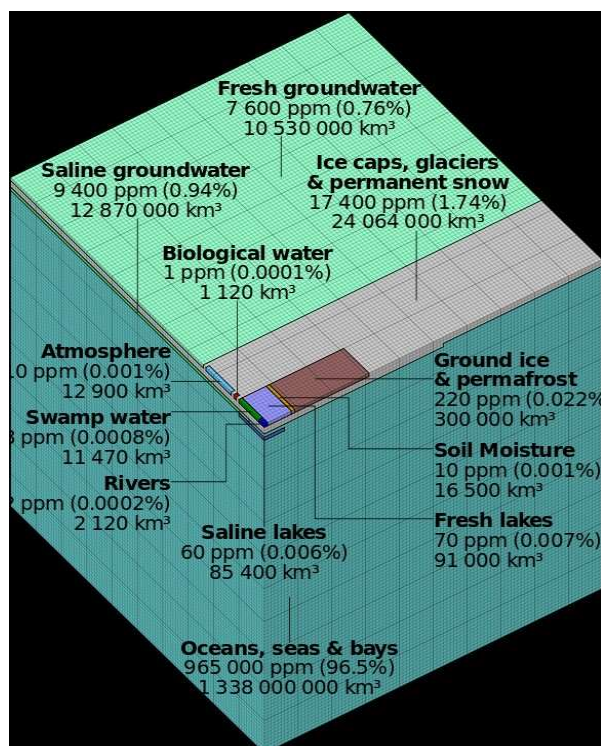
the future

Virtual Water going the wrong way

Threats to global freshwater resources

Global freshwater resources are the only raw material on this planet that cannot be substituted by anything. We find it in rivers and streams, in ponds and lakes, in bogs, in the atmosphere, in the ground as groundwater and also frozen in snow, in glaciers, ice sheets and in the ground frozen solid by permafrost. However, the supply is limited. Only about **2,5 %** of the global water resources consist of freshwater, even less is potable water, fit for drinking.

Human activities on this planet became increasingly dependent on fresh water in recent decades. Since the 1950s the world's population tripled, but our freshwater consumption went up six times! Although access to water has been declared a human right by the UN in 2010 more than a billion people are only getting contaminated water and about 2,5 billion people are still affected by water shortage.



There is a very uneven distribution of freshwater resources on our planet. Although the population of India is 30 times larger than that of Canada, India has only 10% of the world's freshwater supply, while Canada got 20% of it.

The uneven distribution may be the result of differences in climate, however in many areas shortages were and still are caused by human activities related to industrial activities and agriculture.

In Brazil for example communities in the south-east are fighting against the worst drought in 80 years although the country owns the greatest freshwater resources in the entire world. Tropical forests have been cut down, rivers have been reduced to sewage ducts, full of junk and excrement. The planning of municipal sewage plants is usually shelved in favour of building more profitable water reservoirs and the extensive waste of available freshwater resources seems to be common practice throughout the social stratus.

Equally wasteful appears the freshwater consumption in agricultural regions of Spain. Despite the hot and dry climate 2000 hectares of forest were cut down near the city of Huelva where 20 million m³ of fresh water is pumped into strawberry fields every year. The

Spanish ministry of agriculture estimates half a million wells to illegally irrigate several hundred thousand hectares of vegetable gardening throughout the country, which represents the water-consumption of about 60 million people.



However, the Spanish government seems to favour agriculture as against nature protection and intends to build canals draining the already low running river Guadalquivir even more. Spain is exporting most of its agricultural p.t.

topic 2

Threats to global freshwater resources

produce to other EU countries like Germany and the UK and this also means that Spain is in fact exporting water. Food trade, exporting foodstuffs means exporting water ! This idea goes back to **John Anthony Allan**, British geographer, who developed the concept of „virtual water“ in 1993 and was awarded the 2008 Stockholm Water Prize for his work. According to Allan´s theory, exporting one kilogram of Spanish almonds means exporting 8047 litres of water which had been used up to produce these almonds. One glass of wine would need 109 l to make, one litre of milk would require 1020 l of fresh water, one kilogram of beef would “cost” 15.000 litres of precious Spanish fresh water. The term „**virtual water**“ is closely related to **water footprint** which means the total of fresh water used to produce the goods and services consumed by an individual or community. There are however different categories of water footprints, since they may be related to consumers, particular products, communities or even entire countries. One has also to keep in mind that there are different sources of fresh water like surface water and ground water, also rainwater stored in the soil as soil moisture. Whether the amount of virtual water contained in a product´s footprint is harmful or not, depends on where it has been produced. It might be harmless in humid areas but dangerous in arid areas already suffering from a shortage of fresh water.

As the **World Economic Forum´s** Global Risks 2015 report stated, global water crises – from drought in the world´s most productive farmlands to the hundreds of millions of people without access to safe drinking water – are **the biggest threat facing the planet over the next decade**. It is the first time that water has moved into the top position for impact: Water crises are a top global risk.

Task:

How is the expected water crisis going to affect your country within the next 20 years? Try to find out about the water footprint situation in your family, community or in your country. Try to identify the amount of virtual water that is being used, where it comes from. How could the situation be improved, facing the ongoing global warming and the use of freshwater in your country?

Form:

It is up to you to decide how you want to deal with the task. Create a report, a comic, a short movie, a storyboard, a funny game or a computer programme visualizing fresh water consumption. Methods or techniques you use aren´t quite as important as your own unique approach to the problems. Try to find new perspectives and trust your own creativity.

The form is up to you, **the focus on the task is not**.

In any case add a short personal statement informing us why exactly you chose this topic from the three available ones.

Sources of Information:

You will be provided with pictures, maps and relevant information. As regards the effects of ocean acidification you will find a collection of internet addresses, recent publications and satellite data at the end of this document. You may also refer to Arved Fuchs´ homepage or get into e-mail contact with other students via Arved Fuchs´ web presence on

FACEBOOK



Do not hesitate to ask questions.

topic 3

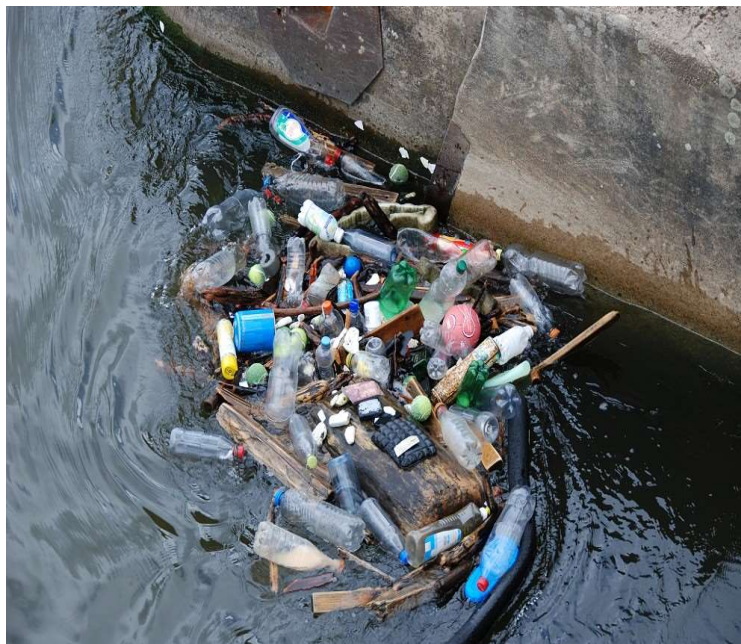
biotope protection

Isopods on plastic diet

Impact of microplastic litter on aquatic habitats

Plastic litter has become a common sight on beaches and in coastal waters all over the world. Today huge amounts of plastic material are drifting in every ocean as well as in polar regions. According to scientific estimations, more than 5 billion plastic pieces with a total weight of 268,000 metric tons are presently afloat.

And they are there to stay. With the world-wide plastic-production still rising (299 million tons in 2013), estimates are that an additional 30 million tons of plastic litter will end up in our oceans every year.



source: BfG Umweltbundesamt

Since plastic material will only deteriorate very slowly („Plastic doesn't rot - it only weathers“) we have to face an enormous pollution problem which already seriously affects marine life (ingestion of plastic parts by sea-birds, fish and turtles). Already 633 species are affected, 50% of which either swallow plastic material as food or get entangled by drifting plastic junk.

However, this is only half the story. Apart from plastic objects breaking up into smaller and smaller particles under the mechanical influence of waves, currents and the disintegrating effects of sunlight, there are countless tiny plastic particles being washed into rivers and seas by human activities every day.

These microplastic particles originate from washing powders and blasting abrasives, cosmetics, toothpastes (microbeads), microcrystalline waxes and chemical fibres washed out of clothing or textiles, tyre abrasion and abrasive particles originating from processing or recycling raw plastic pellets.

US researchers estimated that "8 trillion microbeads per day are being emitted into aquatic habitats in the United States. The other 99 percent of the microbeads end up in sludge from sewage plants, which is often spread over areas of land. Many of those microbeads can then make their way into streams and oceans through runoff".*

Microplastics are items smaller than 5mm in diameter, mostly between 1 micrometer to 1 millimeter. They have become of environmental concern because they are accidentally ingested not only by sea-birds and other marine vertebrates, but also actively by zooplankton. These very tiny objects tend to stockpile persistent toxic contaminants in organic tissues, thus causing physical harm to marine organisms.



As a matter of fact minute plastic particles have become ubiquitous in seawater, sea-ice, freshwater and even in drinking water. Scientists recently counted 3 to 10 particles per m³ in North-Sea water and up to 1 million particles per m³ in Arctic Sea-Ice. p.t.

*Chelsea M. Rochman [et al.], in: *Environmental Science and Technology* , 49:18, September 2015, 3 p.

topic 3

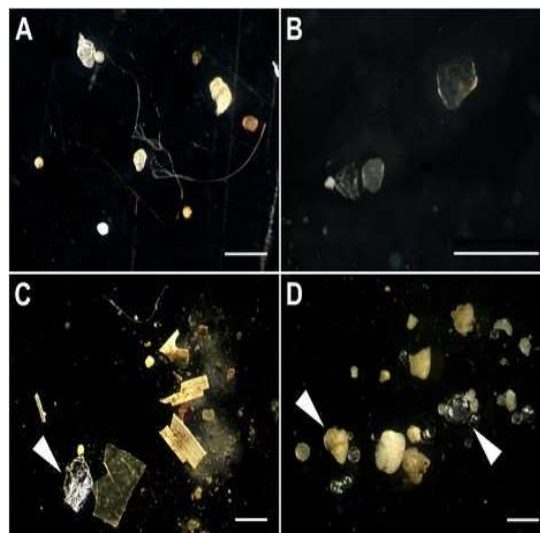
biotope protection

Impact of microplastic litter on aquatic habitats

Any serious attempt to react to this growing pollution will have to establish what exactly these small particles consist of and how they affect the marine ecosystem.

Chemical analysis (FTIR) has become the preferred scientific method because it proved to be far more accurate compared to optical methods. Plankton samples taken from the open sea and river estuaries are then dissolved by nitric acid, caustic soda and special enzymes. The resulting spectrometer data render individual chemical fingerprints of for example polypropylen or polyethylene.

Among others scientists at the Germany based Alfred Wegener-Institute are presently trying to evaluate the precise impact of microplastics on individual marine organisms such as isopods, bivalves, crustaceans, jellyfish, edible fish and nautilus. Recent research findings indicate very diverse reactions among species affected.



source: Wikimedia Common, Martin Wagner et al.

The predominant scientific requirement is the development of standards for sampling, extraction, purification and identification approaches. An interdisciplinary and international collaborative research project called BASEMAN (Defining the baselines and standards for microplastics analyses in European waters) aims to overcome these problems.

Task:

As a representative of your country you will be sent to the next The UN Environment Assembly (UNEA) at its second universal session, following resolution 1/6 on Marine Plastic Debris and Microplastics in October 2017.

Prepare and present information about the present situation in your country as regards plastic litter affecting the environment focussing on micro plastic particles and their origin. Also try to establish information about activities of national institutions concerned with micro plastic particles found in sea waters, rivers and in drinking water and perhaps develop a catalogue of national demands.

Form:

It is up to you to decide how you want to deal with the task. You may create a powerpoint presentation, a short movie or write a computer programme which demonstrates particular problems. Methods or techniques you use aren't quite as important as your own unique approach to the problems. Try to find new perspectives and trust your own creativity. The form is up to you, **the focus on the task is not.**

In any case add a short personal statement informing us why exactly you chose this topic from the three available ones!



Sources of Information: You will be provided with pictures, maps and relevant information. You will find a collection of internet addresses, recent publications and satellite data at the end of this document. You may also refer to Arved Fuchs' homepage or get into e-mail contact with other students via Arved Fuchs' web presence on [FACEBOOK](#)  Do not hesitate to ask questions.

Application Form

International Ice-Climate Education 2017

Surname: _____

First name: _____

Address: _____

Postal code: _____

City: _____

Country: _____

Telephone number: _____

E-Mail: _____

Date of birth: _____

Nationality: _____

School: _____

Address: _____

Postal code: _____

City: _____

Country: _____

Telephone number: _____

Fax number: _____

Homepage: _____

Signature of parents or legal guardian:

City : _____ Date : _____

To be sent to:



I.C.E Competition 2017

**Arved Fuchs,
Reiherstieg 2,
D-24576 BAD BRAMSTEDT,
GERMANY**

Terms of the Contest

The contest is part of the project:

Ice-Climate-Education 2017 (I.C.E. 2017)

Participants:

Participants of the contest can be all pupils of schools that have signed up for the project.

The pupils must be at least **16 years old**.

Participants are expected to show a general interest in environmental questions and in the impact of global warming in the Arctic. They must have sufficient command of the English language.

Members of the expedition, the project development members, teachers involved or members of their families are excluded from participating in the competition.

Each participant can submit only **one** entry.

Form:

Entries must be developed independently and produced by the participants themselves in their native language. Written entries should amount to 5 pages, but not be longer than **10 A4 pages** in normal printing size (10-12 pt). Each entry should include a short summary or description of its content (max. 1 page).

Prize-winning entries must be translated into English.

Registration:	Applicants must register before February 6th 2017
Deadline:	Entries must be handed in to the teachers before April 10th 2017
Jury:	The entries are being judged by one or more teachers of the participating schools. Their judgement is final.
Identification:	Each entry must be accompanied by an entry form that has been filled out completely. Each entry must have the same personal data written legibly as on the entry form.
Winner:	The winners will be announced by the teachers and reported to Arved Fuchs' office before May 8th 2017
Whereabouts and return of the entries:	The winning entries will be kept in Arved Fuchs' office and will eventually be published.



Prizes

The best entry of each participating school wins a 1st prize. All **1st prize winners** will receive funding to participate in the **International Youth Camp** in Northern Germany and Denmark. This youth camp will take place in **June 2017 (10th - 16th)** and be based onboard the saillogger **RYVAR** travelling in Danish waters and the Baltic Sea. The programme will include lectures and excursions, deal with the general topics of global warming and its regional impact on Northern Europe as well as the Arctic.

It is expected that the participants of this international youth camp will return to their schools as climate change experts and "ambassadors" of the endangered hemispheres.

The **1st prize** is an invitation to the 2017 International Ice -Climate-Education Youth Camp. This includes a return flight to Hamburg and all subsequent transfers. It also covers meals and accommodation during the entire youth camp as well as all costs for excursions. and tours.

The participants will, however, not be provided with pocket money and must provide themselves with the necessary clothing (tourist standard).

The prizes cannot be transferred to another person and cannot be offset with anything else or paid out. If a winner steps back, the next best winner in line will take his or her place.

Insurance:

Participants of the youth camp or of the sailing trip must provide their own travel insurance, accident insurance and health insurance.

Travel papers:

Participants require valid travel documents in order to participate in the I.C.E-Youth camp in the EU and if necessary a valid travel permit.

Declaration of Consent:

The winners and as such participants of the youth camp must provide a declaration of consent by their **parents or legal guardians** in order to participate.



This declaration of consent must be sent separately.



<http://www.arved-fuchs.de>

Arved Fuchs on "facebook"

<http://www.facebook.com/pages/Arved-Fuchs-Expeditionen/248247028523296?sk=wall>



postal address:

Arved Fuchs

Reiherstieg 2

D-24576 BAD BRAMSTEDT

GERMANY



I.C.E Competition 2017