



**Measuring the ecological footprint of the Fuchs
Foundation Antarctic Expedition 2007**



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Executive Summary

To celebrate the 50th anniversary of the Commonwealth Trans Antarctic Expedition in 1957/8, the Fuchs Foundation supported four teachers on a scientific research expedition to Antarctica during November/December 2007. Each teacher conducted their own research with the aim of inspiring students and future geography and science teachers. The team spent 40 days in Antarctica. Ruth Hollinger, one of the Fuchs Foundation team, working with Danny Chivers at Best Foot Forward investigated the ecological footprint of the expedition. An ecological footprint is the measure of consumption of resources. It is calculated in terms of the total land area required per person to meet their food, energy, raw material, water and wastewater disposal needs and is measured in global hectares. The results incorporated in the footprint were from departure at London Heathrow to return to London Heathrow. It is made up of the footprint of four teachers, three guides and a cameraman. The total footprint for the expedition equated to 21.26 global hectares (gha). This equates to 0.078gha per person per day. The average ecological footprint person per day in the UK is 0.015gha. Almost 81% of the footprint of the expedition was as a result of passenger travel resulting from flights. This leaves the difficult question, how could future Fuchs expeditions reduce their ecological footprint?

Introduction and Methodology

The Fuchs Foundation Antarctic Expedition team comprising of four teachers, three guides and a cameraman from Teachers TV travelled to Antarctica in November and December 2007. The aims of the expedition were that each teacher would conduct their own scientific research with a view to inspiring more young people to take an interest in science and geography. The teachers (two science and two geography) spend time in schools educating young people about their environment, the impact they have on it and about issues such as global warming, climate change and sustainability. Therefore, the team felt it was important to monitor their own environmental impact and so Ruth Hollinger, a Geography teacher from Sheffield decided to measure the ecological footprint of the expedition. Furthermore, Antarctica is a pristine environment and anything taken into Antarctica has to be brought out again. This includes all toilet waste. An ecological footprint (EF) is the measure of consumption of resources. It is calculated in terms of the total land area required per person to meet their food, energy, raw material, water and wastewater disposal needs. It was decided to measure the ecological footprint of the expedition from the moment the team left London Heathrow until they returned to London Heathrow again. Other data could have been included such as travel to training weekends, travel to the Norway training, resources associated with fundraising but practically it would have proved very difficult to do this. The components recorded were transport, energy, waste, equipment/materials and



food/water. Before and during the expedition, Ruth Hollinger recorded weights of equipment, materials that were used in the equipment, travel distances and mode of transport, weights of waste etc. as much as was practically possible. Where data was unavailable, the impact was noted so that Best Foot Forward, experts in ecological footprint analysis, could use standard figures to make the results as accurate as possible. The data was put into an Excel spreadsheet and forwarded to Best Foot Forward who used the EcoIndex™ methodology to calculate the footprint.

Results

The following are the main components of the ecological footprint for the expedition

- Travel
- Air freight
- Food
- Fuel
- Equipment

The tables below show the breakdown of the ecological footprint.

TRAVEL

Journey	Distance (passenger-km)	EF (gha)	% of Travel EF
Return from London to Madrid	19,926	1.53	9%
Return from Madrid to Santiago	171,249	10.40	61%
Return from Santiago to Punta Arenas	34,883	2.12	12%
Return flight from Punta Arenas to Patriot Hills	48,930	2.97	17%
Twin Otter flight from Patriot Hills to Henderson Glacier	887	0.13	1%
TOTAL TRAVEL	275,875	17.14	100%



¹AIR FREIGHT

Material Freighted	Tonne-km Flown ¹	EF (gha)	% of Freight EF
Equipment to Antarctica	4,502	1.41	41%
Food to Antarctica	6,055	1.89	55%
Waste from Antarctica Including toilet waste	450	0.14	4%
TOTAL AIR FREIGHT	11,007	3.44	100%

1 A tonne-km represents the transport of 1 tonne of material 1 km. It is calculated using tonnes of material x distance travelled

FOOD

	Weight Used (kg)	EF (gha)	% of Food EF
Dried Rations	67.7	0.06	12%
Sweets and Chocolate	146.6	0.12	24%
Hot Drinks	57.1	0.09	18%
Cereal	27.2	0.06	12%
Food from Punta	26.9	0.12	24%
Eating out	26.8	0.05	9%
TOTAL FOOD	352.3	0.49	100%

FUEL

	Litres Used	kgCO ₂	EF (gha)
Coleman Combustible Fuel	68.0	182.1	0.05



Equipment

Material	Weight used (kg)	Total EF (gha)	² Lifespan used	EF (gha) for this trip	% of Equipment EF
Cardboard	10	0.025	100%	0.0247	17.2%
Medical supplies	4	0.014	50%	0.0072	5%
Cleaning materials	4	0.002	100%	0.0020	1.4%
Plastics	62	0.053	10%	0.0053	3.7%
Nylon	69	0.112	10%	0.0112	7.8%
Steel	143	0.078	10%	0.0078	5.4%
Batteries	2	0.007	100%	0.0067	4.7%
Paper	11	0.027	5%	0.0013	0.9%
Wood	1	0.001	5%	0.00005	0.03%
Textiles	189	1.046	5%	0.0523	36.4%
Ceramics	2	0.000	5%	0.0000	0.01%
Technical equipment	57	0.130	5%	0.0065	4.5%
Generator	15	0.035	5%	0.0017	1.2%
Solar panels	4	0.010	5%	0.0005	0.4%
Polypropylene	9	0.004	10%	0.0004	0.3%
Aluminum	62	0.159	10%	0.0157	11.1%
Total Equipment	643	1.703		0.1438	100%

2 Most equipment will presumably be used again after the trip, so the "lifespan used" column attempts to correct this and avoid overestimation.

Overall totals

	³ EF (gha)	% EF
Passenger transport (air travel)	17.14	80.6%
Air Freight	3.44	16.2%
Equipment	0.14	0.7%
Food	0.49	2.3%
Fuel	0.05	0.2%
TOTAL	21.26	100.0%



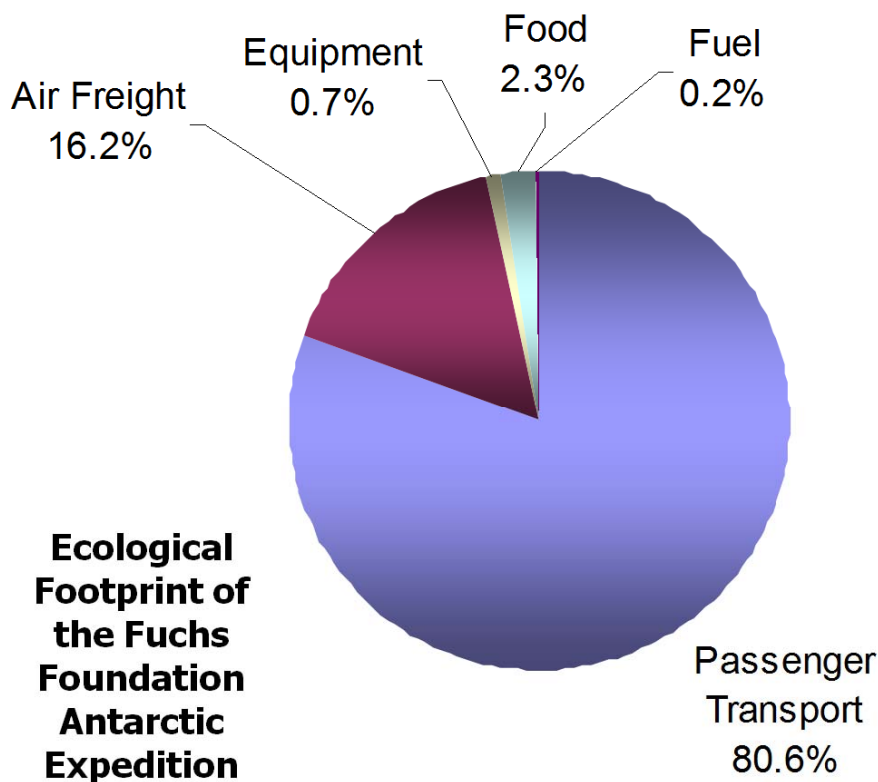
3 The vast majority of the Ecological Footprint is from CO_2 emissions. However, a significant amount of the food and equipment footprints are from the land needed to grow crops, trees, cotton etc.

This footprint is made up of the footprint of four teachers, three guides and a cameraman. The total footprint for the expedition equated to 21.26 global hectares (gha). This equates to 0.078gha per person per day.



Data Presentation

This pie chart shows the different components that make up the ecological footprint of the Fuchs Foundation Antarctic Expedition 2007. It is clear that the majority of the footprint is as a result of passenger transport (80.6%) which included the flights from the UK to Chile, the flight on the Ilyshian into Antarctica from Punta Arenas and the flight on the Twin Otter onto the Henderson Glacier where much of the scientific research was conducted. The second largest component of the expedition footprint is from air freight (16.2%). This included the environmental impact of the food and equipment that was sent to Chile by air in advance of the expedition. It included items such as sleeping bags, boots, tents and a large quantity of food. The remaining 2.2% of the ecological footprint of the expedition is made up of the fuel which was used for the stoves while in Antarctica, the land area required to grow the food in the first instance and the resources required to make the equipment.



Analysis and Conclusions

This ecological footprint is made up of the footprint of four teachers, three guides and a cameraman from Teachers TV who documented the expedition. The total footprint for the expedition equated to 21.26 global hectares (gha). This equates to 0.078gha per person per day. (Although one guide and the cameraman only stayed for part of the expedition, this has been factored into the calculations). The average ecological footprint person per day in the UK is 0.015gha. This suggests that an expedition such as this has a large environmental impact. It should be pointed out that almost 81% of the footprint of the expedition was as a result of passenger travel resulting from flights. This suggests that an expedition such as this has a large impact on the *global* environment in terms of CO² emissions from aircraft emissions. The impact on the local environment in Antarctica was minimal. All waste, including toilet waste was taken out of Antarctica.

According to Best Foot Forward, a sustainable earthshare equates to 0.005 gha per person per day. The figure of 0.015 gha per person per day for the average UK resident suggests that UK residents are living beyond a sustainable level. Furthermore, figures for the Fuchs Foundation expedition suggest that expeditions of this nature need to look at ways to reduce their ecological footprint and ensure that the benefits of the expedition outweigh any adverse impacts on the environment. The intention is to travel to the Polar Regions (Arctic and Antarctic) in the future to further the aims of the Fuchs Foundation. A second Fuchs Foundation Expedition is planned for 2009 and will take four teachers to the Arctic. The environmental impact of that expedition should be considered carefully and ways sought to minimize its impact. It is anticipated that the footprint will be less because of the distance involved, but one major way of reducing the footprint would be to look at alternatives to air travel where it is practically possible.

It is hoped that the results of the ecological footprint analysis will encourage students to think about their own ecological footprint and that of their school so that they can develop ways to reduce it. Resources relating to the ecological footprint of the expedition have been developed for use in secondary schools and are available on the Fuchs Foundation website - www.fuchsfoundation.org. Also included are figures for different countries and different regions within the UK so that ecological footprints can be compared on a global and national basis.

Bibliography

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- www.bestfootforward.com
- www.fuchsfoundation.org

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