

The Carbon Footprint of Ice Watch
Exhibited at the UN Climate Change Summit (COP21)
Paris, December 2015

Ice Watch is an artwork by Olafur Eliasson and Minik Rosing
produced by Studio Olafur Eliasson

Julie's Bicycle
SUSTAINING CREATIVITY

The Carbon Footprint of Ice Watch was prepared by Julie's Bicycle
Author: Catherine Bottrill

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Executive Summary

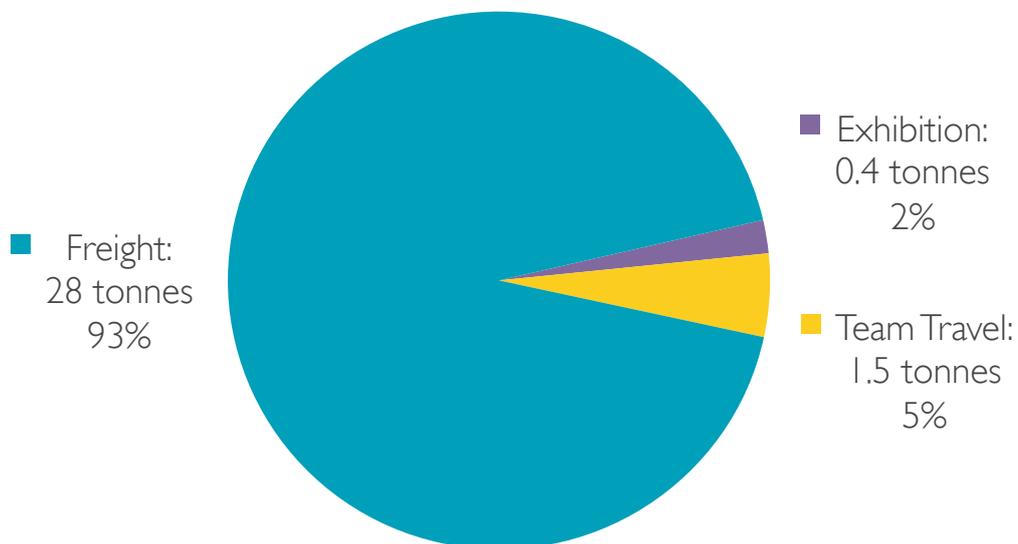
The carbon footprint resulting from the exhibition of Ice Watch during the UN Climate Change Summit (COP21) in Paris is **30 tonnes CO₂e**.

The transportation of the 12 blocks of ice, weighing 80 tonnes, from the Nuup Kangerlua fjord outside Nuuk in Greenland to Paris accounts for the majority of the emissions – 28.03 tonnes CO₂e (93%). The exhibition of Ice Watch at the Place du Panthéon will result in 0.45 tonnes CO₂e (2%). The remaining 1.53 tonnes CO₂e (5%) are from the travel undertaken by the team from Olafur Eliasson Studios and Julie's Bicycle travelling to Paris for the exhibit.

The carbon footprint of Ice Watch would be equivalent to 30 people flying return from Paris, France to Nuuk, Greenland.

Ice Watch is made up of blocks of ice 'harvested' from the sea and already 'lost' from the Greenland ice sheet, which is losing the equivalent of 1,000 such blocks of ice per second throughout the year.

The Carbon Footprint of Ice Watch, 2015



Total: 30 tonnes CO₂e

Introduction to Ice Watch

Acclaimed visual artist Olafur Eliasson in collaboration with distinguished geologist Minik Rosing will display Ice Watch during the UN Climate Summit (COP21) in Paris. The ice installation will showcase 80 tonnes of ice from a fjord outside Nuuk, Greenland with the aim of inspiring public action against climate change. During the conference, the ice will be allowed to melt in the square, offering the general public a glimpse at climate change on our planet.

Public art has the potential to spur dialogue in unique ways around civic issues. Ice Watch is a core project of the initiative Artists4ParisClimate2015, which not only aims to mobilize public opinion around climate change, through interventions in public space by major international artists, but also inspire action for climate.

Twelve blocks of ice, harvested from free-floating icebergs in a fjord outside Nuuk, Greenland, are arranged in clock formation on the Place du Pantheon, where they will melt away during COP21. The blocks of ice included in Ice Watch each weigh about 10 tonnes. Fished out of the sea in the Nuuk fjord, they had already been lost from the Greenland ice sheet and were rapidly melting into the ocean before being 'harvested' for the artwork. This means obtaining the ice did not affect the Greenland ice sheet, which is losing the equivalent of 1,000 such blocks of ice per second throughout the year.

Ice Watch will be on exhibit from the 3rd to the 11th December.

The ice has been transported by Group Greenland / Greenland Glacier Ice, the ice was collected by divers and dockworkers from the Royal Arctic Line and then transported in six refrigerated containers from Nuuk to Aalborg, Denmark by container ship and to Paris by truck.

What was measured to calculate the carbon footprint

The carbon footprint has calculated the emissions resulting from:

- Collection of 100.5 tonnes of the icebergs near Nuuk, Greenland
- Refrigerated sea freighting of six 40 foot containers from Nuuk to Aalborg, Denmark
- Trucking of the containers from Aalborg to Paris, France
- Crane, forklift and cherry-picker equipment used to set-up and breakdown the installation
- Lighting used to display the installation during COP21
- Travel of the Studio team and the carbon footprint researcher to COP21.

Information was gathered about each area from activity type, energy source, quantity of equipment, power demand and distance travelled. The UK Department of Energy, Food and Rural Affairs 2015 published greenhouse gas emission factors were used to calculate the carbon emissions from each area.

The carbon footprint calculations do not include because of a lack of data availability:

- Olafur Eliasson Studio building
- Ice Watch launch event

Carbon Footprint Results

The total calculated carbon emissions will be 30 tonnes CO₂e or 30,037 kg CO₂e .

FREIGHTING	Description	Quantity	Emissions Factor	Kilograms Carbon (CO ₂ e)
Motor boat	A boat was used to collect 100.5 tonnes of ice from the sea. It is assumed the boat had a 100 kW engine.	1 boat was used for 20 hours.	0.87 Kg CO ₂ e per kWh	696
Crane	A crane was used to move the ice off the boat. It is assumed the crane used 18.8 kW.	1 crane for 12 hours.	2.67614 Kg CO ₂ e per litre of diesel	202
Forklift	A forklift was used to load the ice into the shipping containers. It is assumed the forklift had an efficiency of 3 litres of diesel per hour.	1 forklift for 12 hours.	2.67614 Kg CO ₂ e per litre of diesel	96
Ship	The ship transported the ice from Nuuk, Greenland to Aalborg, Denmark. It is assumed the ship was fit for refrigerated cargo.	1 container ship travelling 3,320 km.	0.013004 Kg CO ₂ e per tonne.km	4,324
Truck	Articulated trucks were used to transport the ice from Aalborg to Pars. It was assumed the HGV was more than 33 tonnes and suitable for refrigerated cargo.	6 trucks driving 1,332 km.	0.802754 Kg CO ₂ e per km	6,416
Container refrigeration	Refrigerated containers were used to ship and store the ice. On the boat the containers were diesel power and in Aalborg were plugged in the mains. It is assumed the average power demand of each container was 7 kW. Shipping was 10 days and then 20-30 days storage in Aalborg.	6 40 feet reefer containers refrigeration for 2,568 hours. Estimated 25,200 kWh of diesel was used to power refrigeration during shipping.	2.67614 Kg CO ₂ e per litre of diesel 0.29304 Kg CO ₂ e per kWh of main Danish electricity	16,295
TOTAL				28,029

EXHIBITION	Description	Quantity	Emissions Factor	Kilograms Carbon (CO ₂ e)
Crane	A crane is used to move the ice into position. It is assumed the crane used 18.8 kW.	2 cranes for 8 hours each to set-up the installation.	2.67614 Kg CO ₂ e per litre of diesel	268
Cherry-picker	A cherry-picker is used to move the ice into position. It is assumed the forklift had an efficiency of 3 litres of diesel per hour.	1 cherry-picker used for 8 hours to set-up the installation and 4 hours to breakdown site.	2.67614 Kg CO ₂ e per litre of diesel	96
Forklift	A forklift is used to move the ice into position. It is assumed the forklift had an efficiency of 3 litres of diesel per hour.	1 forklife used for 8 hours to set-up the installation.	2.67614 Kg CO ₂ e per litre of diesel	64
Lighting	Lights are used to present the installation.	4 lights totalling 6000 W for 240 hours during COP21.	0.05864 Kg CO ₂ e per kWh of French mains electricity	49
TOTAL				477

TEAM TRAVEL	Description	Quantity	Emissions Factor	Kilograms Carbon (CO ₂ e)
Flights	4 people travelled from Berlin to Paris.	4 short-haul flights - 1,810 km return.	0.16634 Kg CO ₂ e per km	1,204
Train	1 person travelling via Eurostar.	1 person travelling 688 km return.	Eurostar	11
Hotel accommodation	5 people staying at hotels in Paris. 4 from the Studio and 1 from Julie's Bicycle.	Five people staying 2 nights	31.62 per person night	316
TOTAL				1,531

Recommendations

- We recommend that Olafur Eliasson Studio disclose its Environmental Policy and Action Plan.
- There are limited opportunities for reducing the freighting carbon footprint of Ice Watch, but areas where there might be energy efficiency opportunities are in the use of highly efficient refrigeration and trucking equipment, and reducing the length of time ice is stored between the collection of the ice and its exhibition to reduce refrigeration energy demand.
- Carbon savings can be achieved by using train travel within Europe and selecting hotel accommodation with strong sustainability credentials.
- Finally, carbon savings can be achieved during the exhibition of Ice Watch by using LED technologies.

References

- Boat emission conversion factors:
http://uk-air.defra.gov.uk/assets/documents/reports/cat07/1106231031_IP_Task_25_Inland_Waterways_Issue_1.pdf
- DEFRA 2015 published emission conversion factors:
<http://www.ukconversionfactorscarbonsmart.co.uk>
- Eurostar website for train carbon emissions impact:
<http://www.eurostar.com/uk-en/about-eurostar/press-office/press-releases/2006/london-paris-and-london-brussels-flights-generate>
- Julie's Bicycle for hotel accommodation emissions factor:
www.juliesbicycle.com

Acknowledgements

We would like to thank Olafur Eliasson Studio for supplying the necessary information for calculating the carbon footprint; and Royal Arctic Line for providing additional information about the sea freighting.

About Julie's Bicycle

Julie's Bicycle is a London based global charity bridging the gap between environmental sustainability and the creative industries. Founded in 2007, its vision is a progressive, efficient and sustainable creative community. It works with over 1,000 arts organisations across the UK and internationally to measure, manage and reduce environmental impacts. Over the past two years, the charity has helped the arts save 16,784 tonnes of CO₂ emissions, equivalent to over £3 million. For more information go to www.juliesbicycle.com.