ETH
Eidgenössische Technische Hochschule Zürich
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IED
Institut für Umweltentscheidungen
Institute for Environmental Decision

The Economics of Climate Change

Lecture 12: Voluntary Approaches to Climate Change Mitigation

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Previous lecture:

- The effects of emissions trading and taxes on innovation
- Interactions between different instruments
- Multiple policy goals/multiple instruments (Tinbergen rule)

In this lecture:

- Role of voluntary approaches in climate change mitigation

Some voices on COP 19 in Warsaw

- „Green groups walk out of UN climate talks“

  (Headline, The Guardian, 21 Nov 2013)

- "Warsaw (...) is on track to deliver virtually nothing. We feel that governments have given up on the process.“

  (A WWF spokesman)

- "Governments here have delivered a slap in the face to those suffering as a result of dangerous climate change.“

  (Kumi Naidoo, Director Greenpeace International)

- Results are „poor and unsatisfactory“

  (Communication of Federal Office for the Environment, Switzerland, 23 Nov 2013)

Defining Voluntary Approaches

Voluntary approaches = GHG emission reductions that are not driven by a legal obligation

- Player: Companies – Individuals
- Government involvement/
  Regulatory control: High – Low
- Level: Local – National - International
- Type: Market-based – Non market-based

Group Work

Questions

Discuss in groups of 2-3 students

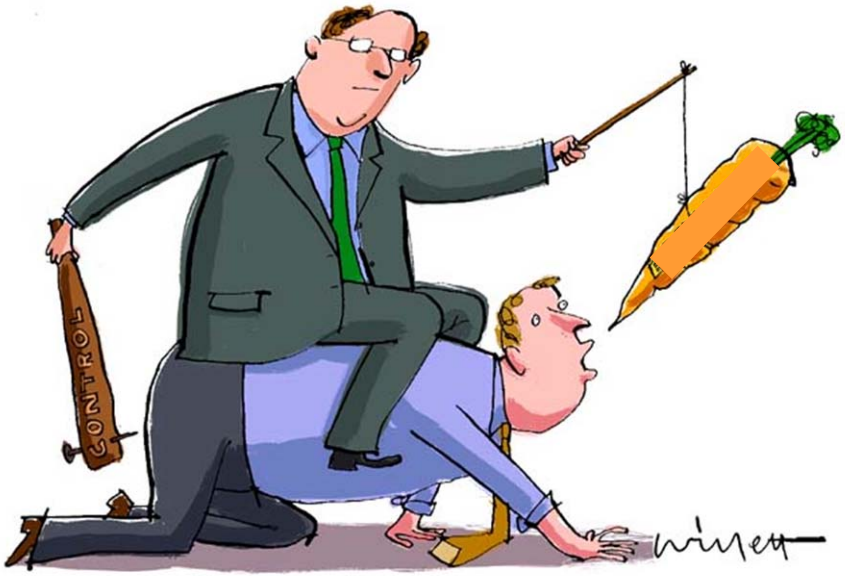
- Why does the German government opt for a voluntary agreement with industry?
- Why does the industry comply with the voluntary agreement?

Voluntary Approaches by Companies

	Market-based	Non-market-based
Supported by governmt/ High regulatory control	• Voluntary self-regulation (e.g. “Klimarappen” in CH until 2012; now “Foundation for Climate Protection and Carbon Offset “ (KliK))	• Choice of different options within mandatory regulation (e.g. voluntary emission reductions of companies exempted from CO_2 levy in CH)
Not supported by governmt/ Low regulatory control	• Purchase and trade of voluntary carbon offsets	• Sustainability Reporting (e.g. Global Reporting Initiative) • Carbon Accounting (e.g. Carbon Disclosure Project) • Product labeling (e.g. Climatop)

Voluntary Approaches by Companies: Motivations (1)

- Background legislative threat
- Positive incentives by government



Voluntary Approaches by Companies: Motivations (1)

- Condition for voluntary action:

$$p \; C_M(a_M) > C_V(a_V) - S$$

  - p – probability of legislation
  - $C_M(a_M)$ – abatement cost in case of legislation (mandatory abatement)
  - $C_V(a_V)$ – abatement cost in case of voluntary approach
  - S – subsidy/incentive

$$p \, c_M \, a_M > c_V \, a_V - S$$

$$a_V^{max} = p \, (c_M / c_V) \, a_M + S/c_V$$

Example: Foundation for Climate Protection and Carbon Offset (KliK)

- Voluntary measure implemented by Swiss Petroleum Association to avoid mandatory CO_2 tax on motor fuels
- Established by the mineral oil industry in 2013 to fulfill requirements laid out in Swiss CO_2 Law
- Mandate to offset on average 5% of CO_2 emissions resulting from the energetic use of motor fuels from 2013 to 2020
- Funds are invested in emission reduction projects in Switzerland

Advantages of Voluntary Agreements and Self-Regulation

- Pro-active role of industry
- Reduced conflicts between regulator and industry
- Flexibility in finding cost-effective solutions tailored to industry-specific conditions (compared to C&C)
- (potentially) lower transaction costs
- High level of acceptance and compliance
- (potentially) fast implementation due to reduced negotiation time lags

Voluntary Approaches by Companies: Motivations (2)

- Reaction to change in consumers' preferences
- Reaction to pressure groups (NGOs, consumers)
- Building up a «green» reputation through Corporate Social Responsibility (CSR) / Public relations (PR) measures

Example: Carbon Disclosure Project

- CDP asks companies on a regular basis about their
  - Corporate climate risks and opportunities
  - Systematic accounting of GHG emissions (Carbon Accounting)
  - Carbon management strategies
  - Corporate governance with respect to climate change
- Information about corporate GHG emissions is published on CDP website → Climate Disclosure Score is annually calculated for more than 3,200 companies

Example: Voluntary Carbon Markets

- Credit-based carbon trading on a voluntary basis
- 90% of credits in voluntary carbon markets are purchased by private sector/companies
- No regulatory control of voluntary carbon markets
- Third-party standards aim at ensuring quality of carbon credits

Voluntary Carbon Markets: Market volume and value

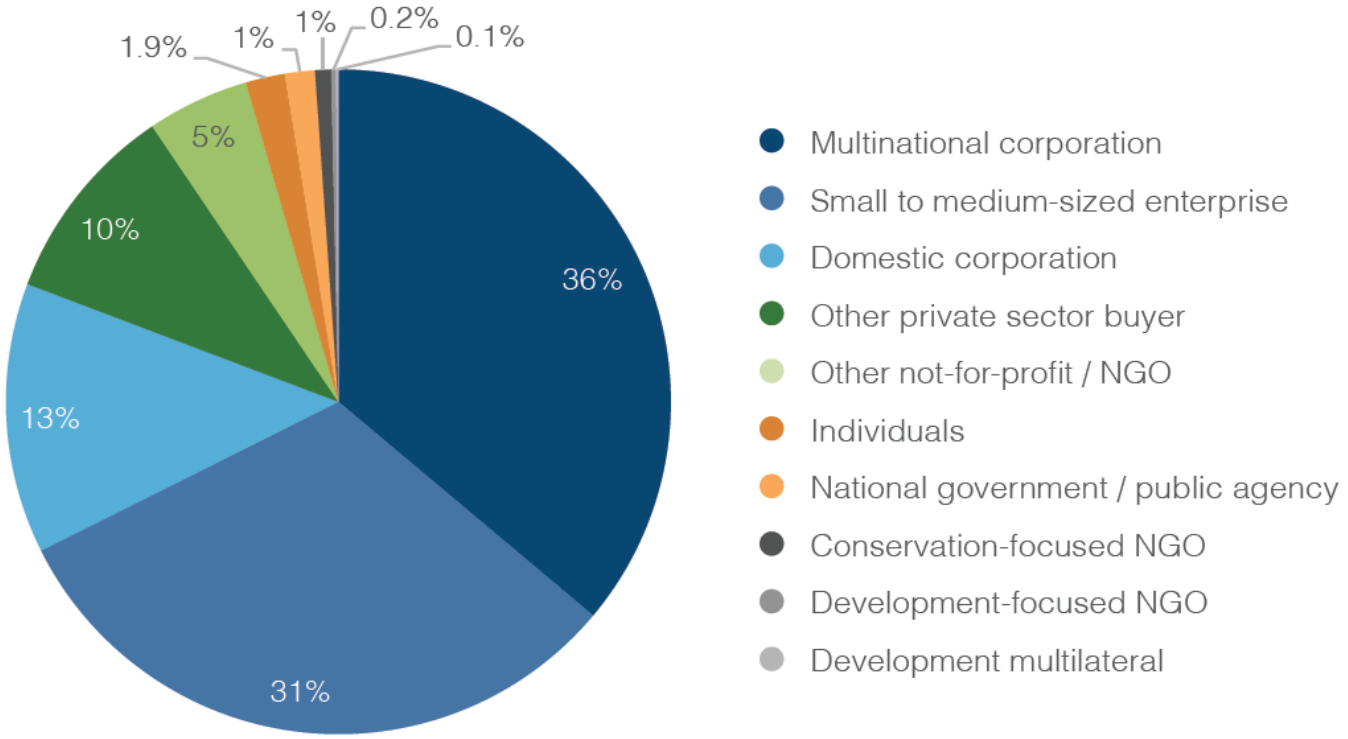
Transactions in VCMs are only a small share of the transactions within the compliance carbon market (CDM)

Table 1: Historical Transaction Volumes, All Voluntary Carbon Markets

	Volume ($MtCO_2e$)		Value ($ Million)		Average Price (Volume-Weighted $/$tCO_2e$)	
	2011	2012	2011	2012	2011	2012
Voluntary Offsets Contracted Over-the-Counter	93	98.5	$572	$515.7	$6.2/t	$5.9/t
Voluntary Offsets Traded on an Exchange	2	2.3	$4.2	$6.3	–	–
Historical Transactions Tracked and Added in 2012	1.8	–	$10.9	–	–	–
Voluntary Carbon Markets Total	97	101	$586.5	$523	$6.2/t	$5.9/t

Source: Forest Trends' Ecosystem Marketplace. *State of the Voluntary Carbon Markets 2013.*

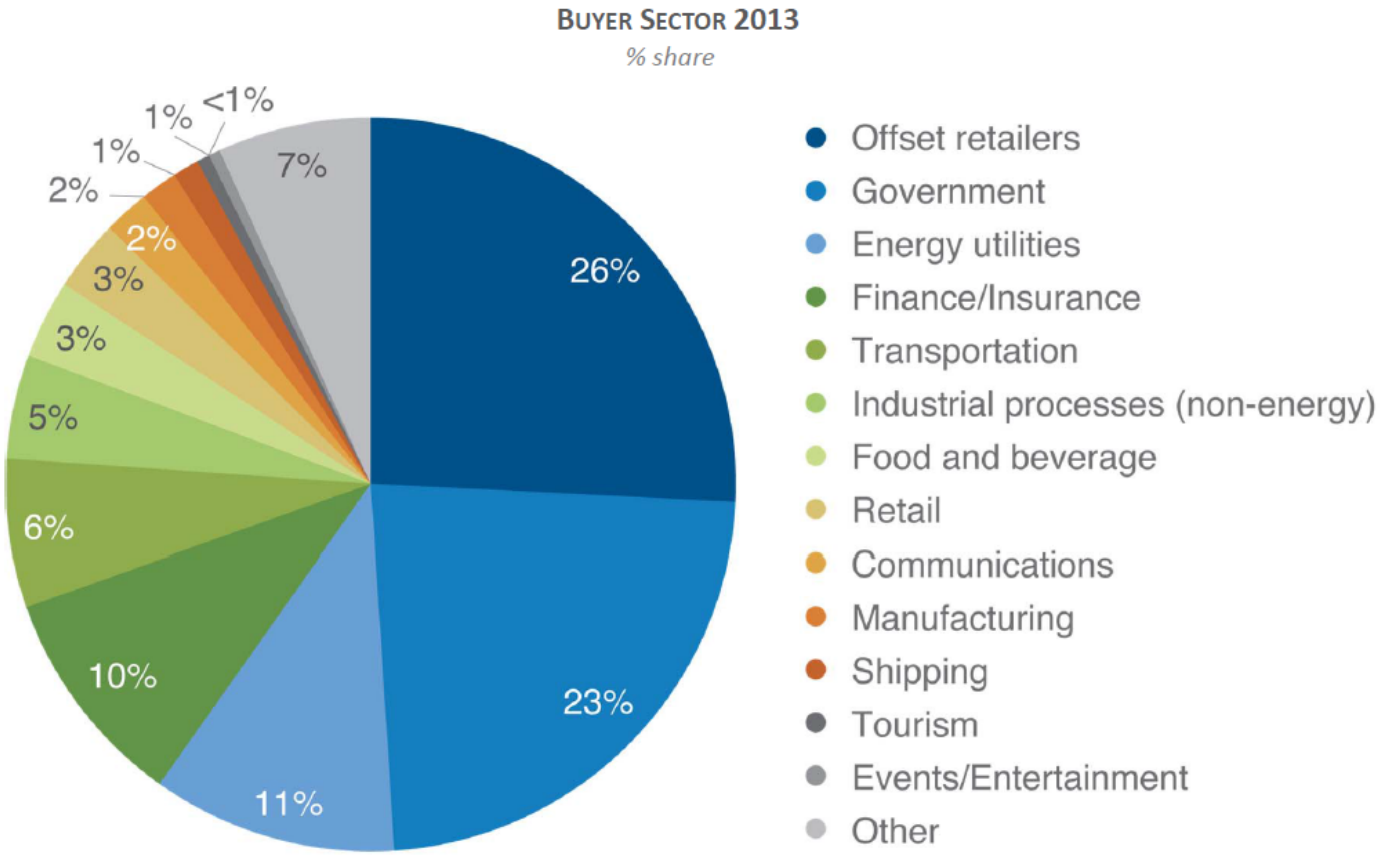
Voluntary Carbon Markets: Share of buyers by type



Notes: Based on 75 $MtCO_2e$ associated with a buyer organization type.

Source: Forest Trends' Ecosystem Marketplace. *State of the Voluntary Carbon Markets 2013*.

Voluntary Carbon Markets: Buyers by sector



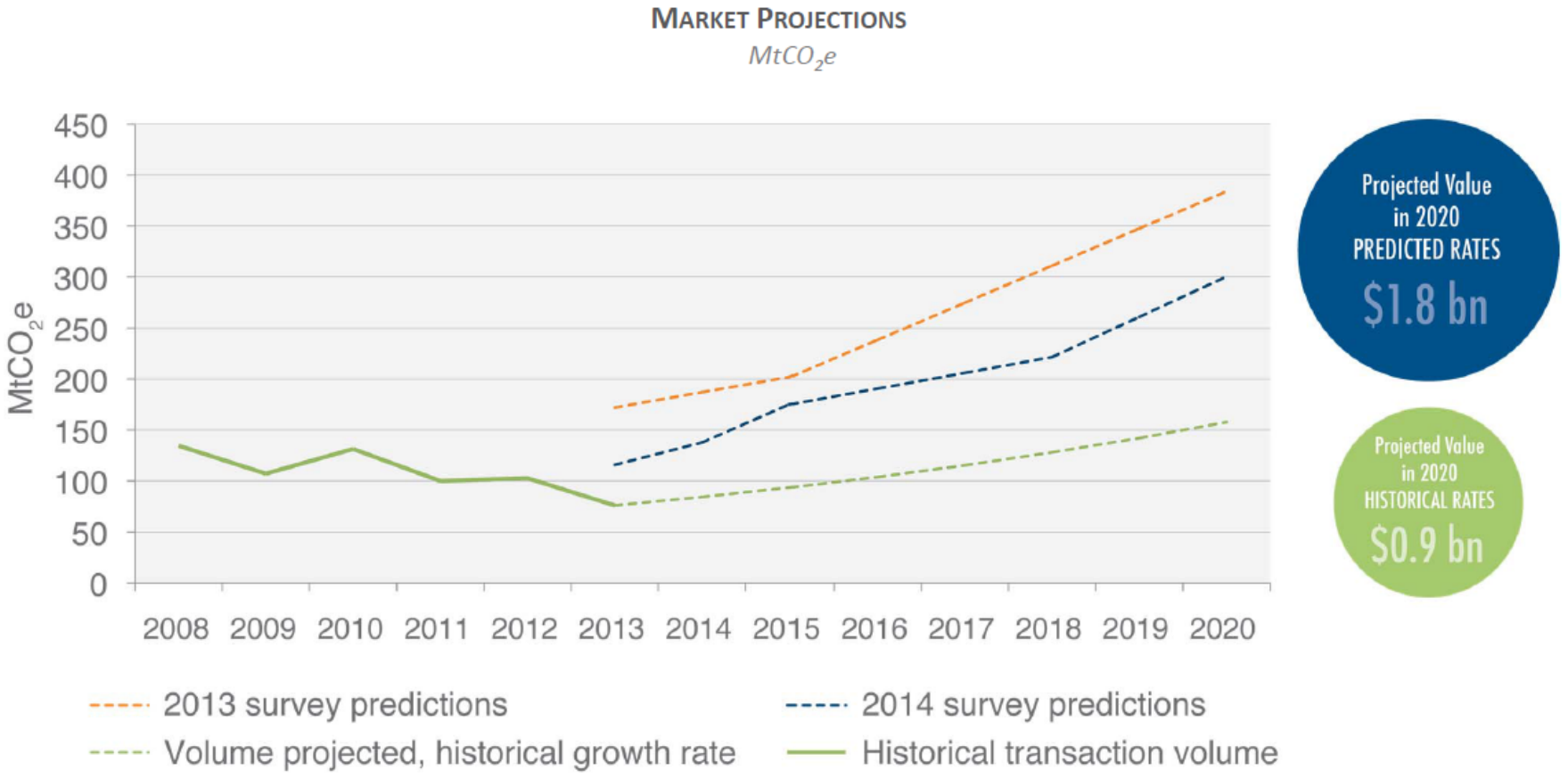
SOURCE: Forest Trends' Ecosystem Marketplace. State of the Voluntary Carbon Markets 2014.

Voluntary Carbon Markets: Motivations

Motivation	Ranking by % Share
CSR	34%
Demonstrating climate leadership	26%
Pre-compliance	19%
PR / branding	10%
Climate-driven mission / philanthropy	9%

Source: Forest Trends' Ecosystem Marketplace. *State of the Voluntary Carbon Markets 2013.*

Voluntary Carbon Markets: Projections



SOURCE: Forest Trends' Ecosystem Marketplace. State of the Voluntary Carbon Markets 2014.

Voluntary Approaches by Individuals

	Market-based	Non-market-based
Supported by governmt/ High regulatory control	-	• Government subsidized activities (e.g. projects supported by “energie schweiz” such as Eco-Drive courses)
Not supported by governmt/ Low regulatory control	• Voluntary carbon offsets	• Individual lifestyle changes • Collective lifestyle changes in organized programmes (e.g. Bike to work)

Choice situation: Long-distance flight

Imagine you have booked a long-distance flight, e.g. from Zurich to Bangkok, Cape Town, Hong Kong or Rio de Janeiro. The ticket costs you CHF 1,200 (economy class/round-trip).

While booking your flight you get the information that your flight causes some 3.6 tons of CO_2 emissions per passenger. You are given a choice to offset the CO_2 emissions from your trip.

Imagine you may choose among the following four options:

	Option A full offset	**Option B** full offset	**Option C** full offset	**Option D** no offset
Type of project	Re-/Afforestation	Renewable energy	Energy efficiency	I would choose not to offset emissions in this situation under the given conditions.
Project host country	Newly industrializing country (e.g. China, India, Brazil)	Developing country (e.g. Bangladesh, Burkina Faso, Haiti)	Developing country (e.g. Bangladesh, Burkina Faso, Haiti)	
Type of offset provider	Non-profit provider	For-profit provider	Non-profit provider	
Third-party certification	by the United Nations (UN)	by the Swiss Federal Department of the Environment, Transport, Energy and Communication (UVEK)	not specified	
Amount payable	CHF 18.00 (CHF 5/tCO_2)	CHF 104.40 (CHF 29/tCO_2)	CHF 82.80 (CHF 23/tCO_2)	

Which option would you choose in this situation?

○ Option A ○ Option B ○ Option C ○ Option D

Theory of the Private Provision of Public Goods (1)

Assume: x_i – private consumer good; G – public good

- Homo oeconomicus: $U_i(x_i,G)$ → individual derives utility from his/her own access to the private and the public good
- Pure altruism: $U_i(x_i,G)$ → individual derives utility from the private good and from society's access to the public good
- Impure altruism: $U_i(x_i,G,g_i)$ → individual derives utility from the private good, from society's access to the public good and from his/her own contribution g_i («warm glow of giving»)

Theory of the Private Provision of Public Goods (2)

More explanations for impure altruism:

- Internalized norms/Keeping up a positive self-image
  → enforced internally, e.g. by feelings of guilt or bad conscience
- Social norms → enforced externally, e.g. by social (dis)approval, ostracism
- Fairness/Conditional cooperation → individual contribution is dependent on others' contributions

Theory of the Private Provision of Public Goods (3)

- More than one motivation may drive an individuals decision to contribute to climate change mitigation (Blasch and Ohndorf, 2013)

$$U(x_i, y_i, b_i) = \underbrace{u(x_i, y_i)}_{\text{Utility from private consumption}} - \underbrace{q(B_{-i} + b_i; \gamma_i)}_{\text{Disutility from pollution per se}} - \underbrace{v(b_i; \psi_i, \gamma_i)}_{\text{Disutility from internalized norm}} - \underbrace{\theta_i z(b_i)}_{\text{Disutility from social disapproval}}$$

- x_i, y_i – private consumer goods (with x_i as polluting consumer good)
- b_i – individual i's pollution
- B_{-i} – aggregate pollution (except individual i)
- γ_i – individual i's awareness of damages from pollution
- ψ_i – individual i's internalized norm to avoid pollution
- θ_i – individual i's sensitivity to social disapproval

Results from a Choice Experiment on Voluntary Carbon Offsetting (Blasch and Farsi, 2013)

- Analysis based on an online survey in the German speaking part of Switzerland (respondents aged 14 to 88)
- Sampling conducted by a marketing research firm
- 1,010 completed questionnaires (response rate: 40%)
- Sample is roughly representative for the German speaking part of Switzerland with respect to age, gender, marital status and income
- Respondents received a credit coupon of 6 CHF for participation

Elements of the Survey Questionnaire

- Decision to donate part of the participation remuneration to a mitigation project in Switzerland
- Questions on consumption habits → rough indicator of CO_2 footprint
- Brief introduction to the concept of offsetting
- Choice experiment: 8 choice tasks in 4 different contexts
- Questions on environmental attitudes and behavior
- Questions on sociodemographic characteristics

Attributes Used in the Choice Experiment

Offset attributes	Levels			
Context	Air travel	Space heating	Hotel stay	Car rental
CO_2 emissions	3.6 tCO_2	1.6 tCO_2	0.25 tCO_2	0.25 tCO_2
Cost of activity	1200 CHF	520 CHF	1200 CHF	520 CHF
Type of offset project	Renewable energy, Re-/afforestation, Energy efficiency, Methane reduction			
Project's host country	Developing country, Newly industrializing country			
Type of provider	For-profit, Non-profit			
Certification	by Swiss government, by an NGO, by the UN, no certification			
Price (CHF/tCO_2)	5,11,17,23,29,35			

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Result of Latent Class Analysis

Class	Share	Description
LC 0	15%	Never offset in DCE ⇒ highly unlikely to offset
LC 1	16%	Offset in DCE, but generally reluctant to offset
LC 2	25%	Group of potential offsetters with highest WTP
LC 3	17%	High willingness to offset but undefined WTP
LC 4	27%	Low probability to offset and low WTP

Results of Latent Class Analysis

	LC 1	LC 2	LC 3	LC 4
Average class probabilities in model	0.19	0.29	0.21	0.31
Share (%) of all respondents (n=1010)	16	25	17	27
Cost (in CHF) air travel	-0.022***	-0.005***	-0.052***	-0.021***
	(0.006)	*(0.001)*	*(0.004)*	*(0.002)*
Cost (in CHF) heating	-0.038**	-0.003	-0.101***	-0.031***
	(0.016)	*(0.002)*	*(0.006)*	*(0.002)*
Cost (in CHF) hotel	-0.154	0.087***	-0.071***	-0.129***
	(0.118)	*(0.013)*	*(0.015)*	*(0.013)*
Cost (in CHF) rental car	-0.205	0.053***	-0.086***	-0.070***
	(0.125)	*(0.013)*	*(0.016)*	*(0.012)*
Emissions reduced (in tCO_2)	0.463***	0.391***	-0.007	0.144***
	(0.168)	*(0.087)*	*(0.078)*	*(0.035)*
Afforestation project	0.738***	0.110***	0.423***	0.329***
	(0.218)	*(0.030)*	*(0.048)*	*(0.039)*
Renewable energy project	-0.062	0.285***	0.068	0.426***
	(0.292)	*(0.029)*	*(0.054)*	*(0.041)*
Methane reduction project	-0.484*	-0.331***	-0.468***	-0.656***
	(0.279)	*(0.033)*	*(0.056)*	*(0.053)*
Project in developing country	0.263*	0.088***	0.027	0.056**
	(0.140)	*(0.017)*	*(0.028)*	*(0.024)*
For-profit provider	-0.526***	-0.263***	-0.420***	-0.403***
	(0.172)	*(0.018)*	*(0.032)*	*(0.025)*
Certified by government agency	0.701***	0.255***	0.658***	0.428***
	(0.231)	*(0.031)*	*(0.056)*	*(0.042)*
Certified by UN body	-0.256	-0.007	0.390***	0.056
	(0.260)	*(0.030)*	*(0.047)*	*(0.041)*
Certified by NGO	0.011	0.003	-0.253***	-0.074
	(0.234)	*(0.034)*	*(0.056)*	*(0.045)*
Status quo (no offset)	3.593***	-1.700***	-2.336***	0.515***
	(0.474)	*(0.143)*	*(0.163)*	*(0.071)*

Characterization of offsetters

Table: Ordered probit regression

Number of obs.:	N=871
Log Likelihood:	-1036.3421
Pseudo R^2:	0.1725
LR $\chi^2(11)$:	431.95
Prob ¿ χ^2:	0.0000

Dep. var.: General willingness to offset	**Parameter**	**Standard error**
Age group (10y-intervals)	-0.084***	0.031
Female	0.025	0.088
Married	0.026	0.094
With children	-0.111	0.099
Academic degree	-0.112	0.083
Monthly gross income (in 7 income groups)	0.095***	0.028
Carbon footprint	-1.050***	0.319
Ascribed responsibility	0.659***	0.051
Adherence to social norms	0.394***	0.047
Expected cooperation	1.196***	0.260
Knowledge of offsetting	0.100	0.081