Donald Bren School of Environmental Science and Management
University of California, Santa Barbara

Strategies for Measurement and Reduction of the Carbon Footprint of Zurich Financial Services

A Group Project Report submitted in partial satisfaction of the requirements for the degree of Master in Environmental Science and Management

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March 2009

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As authors of this Group Project report, we are proud to archive this report on the Bren School's website such that the results of our research are available for all to read. Our signatures on the document signify our joint responsibility to fulfill the archiving standards set by the Bren School of Environmental Science & Management.

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The mission of the Bren School of Environmental Science & Management is to produce professionals with unrivaled training in environmental science and management who will devote their unique skills to the diagnosis, assessment, mitigation, prevention, and remedy of the environmental problems of today and the future. A guiding principal of the School is that the analysis of environmental problems requires quantitative training in more than one discipline and an awareness of the physical, biological, social, political, and economic consequences that arise from scientific or technological decisions.

The Group Project is required of all students in the Master's of Environmental Science and Management (MESM) Program. It is a three-quarter activity in which small groups of students conduct focused, interdisciplinary research on the scientific, management, and policy dimensions of a specific environmental issue. This Final Group Project Report is authored by MESM students and has been reviewed and approved by:

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March 2009

ABSTRACT

Zurich Financial Services is a multinational primary insurance provider. Zurich seeks to measure and reduce its group-wide carbon footprint in response to: (1) interests of upper management and employees, (2) industry pressure, and (3) customer expectations.

Our group measured Zurich's footprint for the baseline year (2007).[1] We calculated CO_2 emissions of seven target countries, comprising 74% of Zurich's full-time employees, and projected emissions from 27 additional countries to increase footprint accuracy.[2,3,4] The U.S. is the highest emitter, contributing 58% to the total; therefore, we targeted it for the largest reductions. To achieve considerable reductions, Zurich must focus on its facilities, which account for 63% of emissions.

We researched Zurich's competitors and country-specific Kyoto goals to develop a 15% group-wide reduction target by 2012. To achieve reductions, we proposed mitigation strategies for Zurich's facilities (owned and leased), business travel, and leased vehicles. We combined strategies to model short-, intermediate-, and long-term options to achieve the 15% reduction. Because Zurich may wish to further reduce emissions in the future, we developed additional group-wide reduction targets: 30% by 2016 and 50% by 2020. Final recommendations reflect analysis of institutional and organizational barriers, cost-effectiveness, environmental benefits, and feasibility of implementation.

Employing our recommendations will enable Zurich to: (1) satisfy its public commitments, (2) pre-empt future climate change regulation, (3) increase its competitiveness within the industry, (4) and enhance its brand value.[5]

[1] The methodology was based on the World Resource Institute/World Business Council for Sustainable Development's (WRI/WBCSD) GHG Protocol.

[2] The seven target countries include: Australia, Germany, Italy, Spain, Switzerland, the U.K., and the U.S.

[3] We analyzed the activities of Farmers Insurance Group, a wholly-owned subsidiary of Zurich North America, separately from operations in the seven target countries.

[4] The 27 other countries include: Argentina, Austria, Belgium, Bermudas, Bolivia, Brazil, Canada, Chile, China, Finland, France, Guam, Hong Kong, India, Indonesia, Ireland, Isle of Man, Japan, Mexico, Morocco, the Netherlands, Portugal, Russia, South Africa, Sweden, Taiwan, and Venezuela.

[5] The information, views, results, and conclusions presented in this report reflect the work of the student team and may not necessarily coincide with those of Zurich. The release of any official information on Zurich's carbon footprint remains within Zurich's responsibility.

EXECUTIVE SUMMARY

Due to the enhanced effects of climate change, management of greenhouse gas (GHG) emissions is becoming an important public policy issue. Businesses and corporations are responding to climate change as they face related risks and opportunities. Our client, Zurich Financial Services, sought to assess its carbon footprint and evaluate opportunities to reduce group-wide GHG emissions. Carbon mitigation strategies will enable Zurich to: (1) satisfy its public commitments, (2) pre-empt future climate change regulation, (3) increase its competitiveness within the financial services sector, (4) and enhance its brand value.

Zurich is a multinational primary insurance provider whose core business is general and life insurance. Zurich has physical operations in 63 countries, employs approximately 58,000 people, and serves customers in over 170 nations. Zurich is publicly committed to reducing its contribution to climate change by quantifying its carbon footprint and implementing strategies to reduce its emissions. This carbon management approach is intended to build upon the environmental programs already established as part of Zurich's 2008 Climate Initiative.

Zurich faces numerous barriers to both measuring and reducing its carbon footprint, including:

- Limited data availability restricting the use of standard carbon footprint calculation tools
- A large, decentralized business structure hindering data collection and information transfer
- Varied national frameworks impeding a "one-size-fits-all" global GHG reduction policy
- Institutional and organizational factors limiting the degree to which Zurich can modify its core business model
- Regulatory and rating restrictions on investments[6]
- Corporate duties to shareholders to maximize economic returns

Our project attempts to overcome these barriers using a three-phase approach:

1. Calculation of Zurich's carbon footprint using the World Resources Institute/World Business Council for Sustainable Development's (WRI/WBCSD) GHG Protocol to determine the emissions breakdown by source and country
2. Assessment of the institutional and organizational frameworks influencing carbon management, and
3. Development of cost-effective and feasible mitigation strategies.

[6] Regulatory and rating restrictions include: (1) limits on the difference between the highest and lowest premiums an insurer can charge its group members and (2) the need to maintain a set level of monetary reserves for claims that must be paid.

Phase 1
We based our carbon footprint analysis on emissions generated by Zurich's facilities in seven target countries, which together compose 74% of Zurich's operations with respect to number of full-time employees (FTEs). We estimated emissions generated by facilities in an additional 27 countries/regions, based on FTE data, to more accurately represent Zurich's group-wide footprint.[2]

The WRI/WBCSD GHG Protocol splits emissions sources into three scopes. As a service-oriented company, Zurich's GHG emissions stem primarily from use of the company's corporate jet and leased vehicle fleet (Scope I), indirect energy consumption in owned and leased facilities (Scopes II and III, respectively), and business travel (i.e., air travel and rental cars) (Scope III). The majority of group-wide emissions (63%) are generated from energy consumption within owned and leased facilities. Splitting emissions by country reveals that the U.S. contributes the most to group-wide emissions (58%), followed by the other 27 countries (16%).

Energy consumption from leased buildings is the largest source of CO_2 emissions, contributing 36% to the total. Air travel is the next largest source, contributing 21% to the total. With respect to air travel, the biggest contributors are Zurich's U.S. operations, which are responsible for 61% of emissions, while 13% and 10% of emissions are generated from operations in Switzerland and the U.K., respectively. Zurich also utilizes a leased vehicle fleet in three of the seven key countries considered. Approximately 79% of group-wide vehicle fleet emissions are generated by the U.S. (Zurich North America (ZNA) and Farmers Management Group), while 17% are generated by the U.K., and only 1% are generated by Switzerland. Rental cars are utilized by all seven target countries for business travel. Within each country, however, emissions from rental cars contribute less than 4% of total emissions.

Based on our results, we concluded that Zurich's mitigation strategies must target the largest absolute emitters (i.e., the U.S., other 27 countries, and the U.K.) and the largest emissions source (i.e., leased facilities). Zurich will not be able to achieve substantial emissions reductions without dramatically reducing CO_2 emitted from energy consumption in leased buildings, particularly from its U.S. operations.

Phase 2
To develop the most effective emissions reduction strategies, we examined institutional and organizational factors within each of the seven countries targeted in our footprint analysis. We used a two-sample t-test to assess how institutional factors explain differences in Zurich's implementation of environmental initiatives in 50 of its national business units (including the seven key countries for which the carbon footprint was calculated, as well as several of the additional 27 countries for which emissions were estimated). Results of the analysis, along with qualitative information collected from our client, helped us tailor recommendations to Zurich, as well as: (1) determine underlying national differences in corporate culture and (2) differentiate our recommended mitigation strategies by country/region to ensure opportunities are maximized in all business units.

In addition to this Zurich-specific analysis, we assessed reduction targets of some of Zurich's 18 identified competitors, as well as country-specific Kyoto goals. These analyses helped us set appropriate emission reduction targets for Zurich.

For our competitors' analysis, we analyzed only those 13 companies that report emissions. Ranking was based on emissions reported in competitors' annual reports and most recent Carbon Disclosure Project responses. Zurich ranks 10th out of 14 companies in terms of absolute emissions and is, therefore, slightly below average within the industry. However, when compared in terms of emissions per employee, Zurich ranks 7th out of 14, placing it about average within the industry. Our mitigation strategies aim to position Zurich in the top tier of the financial services sector.

Phase 3

After analyzing institutional and organizational frameworks, we compiled a set of Zurich-specific mitigation measures.

We conducted scenario analyses to determine potential emissions reductions from transportation-based initiatives. Changes to Zurich's rented and leased fleet may be easily implemented in the short-term, as they require minimal behavioral changes and operational changes.

In contrast, facility-based carbon management strategies are more challenging to implement. Because Zurich has less control over leased than owned sites, it will be more difficult for it to make significant structural changes (e.g., installing new HVAC and lighting systems) to increase energy efficiency, at least in the short-term. This is particularly pertinent, because 87% of Zurich's buildings within the seven target countries are leased.

However, in countries (e.g., Switzerland and the U.S.) where Zurich occupies more than 90% of its leased space on average, it can use its position as a prominent tenant to persuade landlords to incorporate energy efficiency upgrades. Additionally, given that 88% of Zurich's leases in the U.S. will expire by 2012, Zurich may have an opportunity to renegotiate the terms of its leases with property managers in the short-term. Negotiations should include discussions of increasing the portion of renewable energy used to power buildings, as well as the need to conduct energy audits in buildings to inventory energy efficiency opportunities.

We developed a group-wide emission reduction goal of 15% by 2012 for Zurich. To achieve the 15% target, we proposed mitigation strategies for Zurich's facilities (owned and leased), business travel, and leased vehicles. We combined these strategies to model three emissions reduction options: a short-term option, which maximizes reductions from business travel; a long-term option, which emphasizes facility-based reductions; and an intermediate-term option, which combines short- and long-term strategies. Zurich may choose to implement the option which best aligns with its corporate strategy and financial capabilities. If Zurich seeks to pursue a more aggressive carbon management plan in the future, it may consider implementing one of the additional targets we established: 30% by 2016 and 50% by 2020.

ACKNOWLEDGEMENTS

We would like to thank the following individuals from Zurich Financial Services, Inc., for their contributions and assistance throughout the Group Project process: our client, Elpida Constantinou, Climate Program Officer; Lindene Patton, Climate Product Officer; Michael Kerner, Global Chief Underwriting Officer; and all Zurich employees who responded to our data requests and clarified questions.

We would also like to thank the following people from the Donald Bren School of Environmental Science and Management at the University of California, Santa Barbara: Doug Cerf, Visiting Lecturer, Corporate Environmental Management; Roland Geyer, Assistant Professor, Industrial Ecology, Production & Operations Management; Maria Gordon, Office Manager, Program on Governance for Sustainable Development; Tam Hunt, Visiting Lecturer, Energy Program Director/Attorney, Community Environmental Council; Bruce Kendall, Associate Professor, Applied Ecology; Janet Martorana, User Instructor Coordinator; Catherine Ramus, Assistant Professor, Organizational and Environmental Management; Christina Tague, Assistant Professor, Hydrology; and the entire Bren administrative staff.

Finally, we would like to extend a special thank you to our faculty advisors, Oran Young, Professor, Institutional and International Governance, Environmental Institutions, and Matthew Kotchen, Assistant Professor, Economics, for their continued support and encouragement.

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ACEEE:	American Council for an Energy-Efficient Economy
AEA:	American Electronics Association
AR:	Annual Report
ATS:	Area- and Time-Specific
BWEA:	British Wind Energy Association
CAFÉ:	Corporate Average Fuel Economy
CANA:	Climate Action Network Australia
CARB:	California Air Resources Board
CBA:	Cost-Benefit Analysis
CCA:	Climate Change Act (in the U.K.)
CCAR:	California Climate Action Registry
CCX:	Chicago Climate Exchange
CDM:	Clean Development Mechanism
CDP:	Carbon Disclosure Project
CEA:	Cost-Effectiveness Analysis
CEC:	California Energy Commission
CEEC:	Central and Eastern European Countries
CERs:	Certified Emission Reductions
CERT:	Carbon Emission Reduction Target
CFC:	Chlorofluorocarbon
CFL:	Compact Florescent Light
CHP:	Combined Heat and Power
CPI:	Consumer Price Index
CR:	Corporate Responsibility
CSR:	Corporate Social Responsibility
DJSI:	Dow Jones Sustainability Index
DOE:	Department of Energy
EAP:	Energy Action Plan
EECCEL:	Spanish Strategy for Clean Energy and Climate Change
EEP:	European Energy Policy
EFC:	Emission factor at Consumption
EFG:	Emission Factor at Generation
EIA:	Energy Information Administration
EMS:	Environmental Management System
EPA:	Environmental Protection Agency
ETS:	Emissions Trading Scheme
EU ETS:	European Union Emissions Trading Scheme
FTE:	Full-time Employee
FIG:	Farmers Insurance Group
FYP:	Flex Your Power
GHG:	Greenhouse Gas
GREET:	Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation
GRI:	Global Reporting Initiative

GtC: Gigatons of Carbon
GJ: Giga Joule
HEV: Hybrid-Electric Vehicles
HFCs: Hydrofluorocarbons
HVAC: Heating, Ventilation, & Air Conditioning
IBD: International Businesses Division
ICE: Internal Combustion Engine
IEA: International Energy Agency
IEE: Institute of Electrical Engineers
IPCC: Intergovernmental Panel on Climate Change
ISO: International Organization for Standardization
IT: Information Technology
JI: Joint Implementation
kWh: Kilowatt Hour
LPG: Liquid Petroleum Gas
LEED: Leadership in Energy and Environmental Design
M & V: Measurement and Verification
MEA: Millennium Ecosystem Assessment
MESM: Master of Environmental Science and Management
MFD: Multi-functional Device
MMORPG: Massively Multi-Player Online Role-Playing Game
OB: Organizational Behavior
PER: Renewable Energy Plan (in Spanish)
PFCs: Perfluorocarbons
PG&E: Pacific Gas and Electric
PIR: Passive Infra-red Sensors
PM: Particulate Matter
RET: Renewable Energy Target
ROI: Return on Investment
SCE: Southern California Edison
SEDO: Sustainable Energy Development Office (for the Government of W. Australia)
SDG&E: San Diego Gas and Electric
SUV: Sport Utility Vehicle
TAR: Third Assessment Report
UCS: Union of Concerned Scientists
UNEP United Nations Environment Programme
UNFCCC: United Nations Framework Convention on Climate Change
VERs: Verified Emissions Reductions
VfU: (English Translation: Association for Environmental Management in Banks)
VOC: Volatile Organic Compound
WBCSD: World Business Council for Sustainable Development
WRI: World Resources Institute
ZNA: Zurich North America

Chapter 1: Project Background

1.1 INTRODUCTION

Zurich's carbon footprint spans the globe, as Zurich is a multinational company serving customers in over 170 countries. Like most service-oriented businesses, Zurich primarily generates *indirect* emissions from energy consumption at buildings and transportation.[7] In contrast, product-oriented companies generate mainly *direct* emissions from stationary combustion associated with manufacturing (WBCSD 2007).

With the launch of its January 2008 Climate Initiative, Zurich pledged to address climate change by developing new products and services that integrate the risks associated with climate change and global warming. Zurich is also committed to establishing a long-term carbon management strategy (Zurich 2008).

By establishing itself as an environmental leader, Zurich has the potential to develop efficient operating and investment practices. A March 2008 publication by the World Business Council for Sustainable Development, the Meridian Institute, and the World Resources Institute, encourages businesses to develop new products and services and invest in products that improve resource efficiency (Hanson et al. 2008). Zurich has the opportunity to identify and design new markets, products, and services, as well as benefit from new revenue streams from project investments. By managing its carbon footprint, Zurich will demonstrate public leadership, create shared value for business and society, and position itself to work collaboratively to advocate effective policy (Jenkins 2007).

1.2 PROBLEM STATEMENT

Zurich Financial Services has identified the need to assess its carbon footprint and implement emission reduction strategies as a result of employee, analyst, non-governmental organization, and customer interest, reinforced by ongoing public discourse about climate change.

Our first objective, therefore, was to develop a verifiable methodology to enable Zurich to measure and manage its carbon footprint. In order to determine the most appropriate steps to reduce Zurich's GHG emissions, we first identified the organizational challenges impacting Zurich, which partially result from the global expanse of its operations. As a multinational company, Zurich's offices are characterized by varying corporate cultures and operate relatively independently under the general umbrella of Zurich Financial Services. When integrating climate change strategies into company policy, Zurich will need to consider three critical issues:

1. Regulatory and rating restrictions on investments.[6]
2. Corporate duties to shareholders to maximize economic returns.
3. Institutional and organizational barriers limiting modification of its core business model.

[7] Examples of service-oriented companies are insurance companies, banks, law firms, and real estate agencies.

In addition to these barriers, Zurich's corporate policy requires consideration of specific project selection criteria. As stated in Zurich's 2007 Financial Report, the company selects projects based on each initiative's potential impact on its business operations (both positive and negative), the level of societal concern for the issue, and the ability of the project to make a significant difference (Zurich 2007). Therefore, it is our challenge to demonstrate that the mitigation measures we propose meet these criteria.

1.3 RESEARCH QUESTIONS AND OBJECTIVES

Our research objectives align with the three phases of our project methodology:

1. Carbon Footprint: How do we define the carbon footprint of a multinational financial services provider? How do we quantify this with respect to Zurich's operations in the countries we plan to target? Will the footprint include any subsidiaries, owned or partially owned by Zurich, and/or any suppliers? If so, which ones? Which year will serve as the baseline year for calculation purposes?

2. Institutional & Organizational Frameworks: How do we implement effective and efficient short- and long-term carbon management strategies without reducing Zurich's profitability and significantly altering its internal operations? How do we determine feasible changes given Zurich's corporate culture, organizational structure, and multinational presence? What legal and institutional limitations restrict our choice of mitigation options in each of the countries we plan to target?

3. Carbon Mitigation Strategies:

    a. Emission Reduction Scenarios: How do we model group-wide emission reduction scenarios for Zurich? Should these scenarios mirror the targets set by Zurich's main competitors? How do we determine by how much each of the countries we plan to target should reduce their emissions to achieve the group-wide goal(s)? By how much should each source of emissions within each country be reduced to achieve the group-wide emission reduction target(s)?

    b. Mitigation Options: What mitigation strategies could Zurich implement irrespective of location? Which mitigation strategies are best suited for each of the countries we plan to target? Which countries should we target with the most stringent mitigation options? If cost can be calculated, what combinations of mitigation options offer Zurich the most emissions reductions at least cost?

1.4 SIGNIFICANCE

Business risks and regulatory uncertainty associated with climate change necessitate the measurement and management of Zurich's GHG emissions. An EcoTech Research survey of 600 banks and insurance companies indicates that 65.8% are concerned about the possibility of climate change. Additionally, survey results suggest that a proactive corporate environmental stance offers numerous benefits.

By conducting a baseline GHG inventory and implementing emissions reduction measures worldwide, Zurich may expect to benefit in the following ways:

1) Conducting a consistent and transparent GHG inventory will preempt emerging regulations at the state, national, and international levels;

2) Identifying areas for improvement may yield cost-savings from improved energy management and operational efficiency. This may help Zurich establish a competitive advantage in the financial services industry;

3) Calculating and managing GHG emissions and establishing a reduction target will help focus Zurich's efforts to improve its environmental performance and address shareholder concerns regarding corporate social responsibility;

4) Implementing economically and socially optimal methods of managing and reducing emissions will position Zurich as a leader in the financial services industry;

5) Taking early action is an effective risk-management strategy to protect Zurich's business interests and promote corporate sustainability; and

6) Establishing a methodology for measurement, verification, and reporting may facilitate implementation of a future emissions trading system.

Our Group Project will assist Zurich by calculating the company's carbon footprint, recommending emissions mitigation strategies, and providing the necessary tools to refine and improve its future response to climate change.

1.5 PROJECT APPROACH

We used a three-phase approach to calculate Zurich's carbon footprint and identify effective mitigation strategies. The three phases included:

1. The calculation of Zurich's carbon footprint to determine group-wide emissions breakdown by source and country;
2. An assessment of institutional and organizational frameworks that potentially influence the implementation of carbon management initiatives; and
3. The development of emissions mitigation strategies (short- and long-term), including group-wide reduction targets and deadlines relevant to competitor benchmarks and industry trends.

We quantified emissions from seven countries for which raw data was available for footprint calculations. Together, these seven countries compose 74% of Zurich's operations with respect to number of full-time employees (FTE).[8] We then projected emissions from an additional 27 countries where limited data was available. We based our calculations on the World Resources Institute and World Business Council for Sustainable Development (WRI/WBCSD) GHG Protocol, which is the most widely used footprint calculation methodology (WBCSD 2007). We

[8] Zurich Financial Services. FTE-reporting to February 29, 2007. Group Planning & Performance Management.

believe our calculation of the carbon footprint of this subset of countries provides a reasonable approximation of Zurich's global emissions baseline.

We chose to normalize net output by number of employees, rather than gross written premium. This decision was made because human capital is one of the most important input factors in financial institutions. For service-oriented companies, the number of employees is also a primary determinant of the size of the carbon footprint (Ortner and Geiger 2006).

As this is Zurich's first attempt to estimate its footprint, our biggest challenge was to acquire the necessary data for the footprint calculations. Data collection procedures are not yet established or integrated within Zurich's operations. This, combined with Zurich's global extent, create challenges in acquiring detailed facility-level data. A critical objective for our project was to develop effective data collection and reporting procedures for Zurich's future use.

To ensure a credible and representative analysis of Zurich's carbon footprint, we considered relevant operational (i.e., owned and controlled) and organizational (i.e., financial, legal, and operational) boundaries per specifications of the WRI/WBCSD GHG Protocol. Service providers contribute to GHG emissions through energy use, heating, cooling, travel/transportation, land use/land cover change, manufacturing, and construction through the supply chain (WBCSD 2007). Identified boundaries affect the degree to which each source of emissions is included in our estimation of Zurich's carbon footprint.

After quantifying Zurich's global emissions, we formulated possible carbon management plans. Examination of Zurich's corporate culture and organizational structure was necessary to evaluate the likelihood of its implementation of our recommended mitigation strategies. For example, because financial services providers must travel to perform risk assessments, it would be unreasonable to suggest that Zurich eliminate business travel altogether. Furthermore, identifying barriers (e.g., employee acceptance) to organizational change allowed us to make recommendations specific to Zurich and its corporate culture. Finally, to increase the likelihood of immediate environmental action, we proposed mitigation options varying in both cost-effectiveness and the degree to which organizational or behavioral changes would be required.

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Chapter 2: Calculation & Analysis of Zurich's Carbon Footprint

2.1 PROTOCOL CHOICE

No global or sector-specific methodology exists that companies must follow when reporting GHG emissions. As a result, companies can choose from a variety of protocols. In a June 2008 report on corporate GHG emissions reporting, the Ethical Corporation Institute found 34 protocols were used by the global Fortune 500 companies reporting emissions. The report also found that the protocol used most often was the WRI/WBCSD GHG Protocol (Protocol) (Ethical Corporation Institute report 2008). Ultimately, we chose to apply the WRI/WBCSD GHG Protocol and the supplement specific to the service sector. This protocol, "Hot Climate, Cool Commerce: A Service Sector Guide to Greenhouse Gas Management," was published in 2006.

We applied this protocol due to several factors. First, the Carbon Disclosure Project (CDP), the largest corporate GHG emissions database in the world, encourages companies to report annual emissions data using the Protocol. The CDP recommends the Protocol, because it is the most widely used international accounting tool and the one with which global governments and industries are most familiar. Additionally, in the United States, the Environmental Protection Agency (EPA) Climate Leaders' GHG Inventory Protocol is based on the Protocol.

Thirdly, a number of European financial services companies use VfU indicators to measure emissions.[9] In 2003, VfU partnered with five financial institutions (Allianz Group, Credit Suisse Group, Swiss Re, UBS, and Westpac Banking Corporation) to revise the indicators and create a more comprehensive list of seven measures to assess the internal environmental performance of financial institutions (VfU 2003). One measure recommends that companies measure direct and indirect emissions, as described in the Protocol (VfU 2003). In addition, the Global Reporting Initiative (GRI)—also based on the WRI/WBCSD's methodology—is used by insurance companies such as Allianz, Munich Re, and Swiss Re.

Furthermore, our project evaluated Zurich's carbon footprint and related environmental actions within the larger context of the financial services industry. Our client focused our analysis on 18 of Zurich's key competitors.[10] Of these 18 companies, 13 measure their emissions, and, of these 13, half used the WRI/WBCSD Protocol. Four of the remaining five companies used protocols based on that of the WRI/WBCSD. In our research, we found that financial services companies consistently applied the Protocol, or emissions-intensity indicators based on the Protocol.

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[9] Verein fur Umweltmanagement (VfU) in Banken. VfU is translated as the Association for Environmental Management in Banks, Savings Banks, and Insurance Companies. VfU indicators include: 1) business travel generated, 2) paper consumed, 3) water consumed, and 4) waste produced.

[10] The 18 competitors include: Ace Ltd., Aegon, Aflac Inc., AIG, Allianz Group, Allstate Corp., Chubb Group, Hartford Financial Services, ING Group, Lincoln National, Loews, Manulife, Munich Re, Progressive Corp., Prudential Financial, Travelers Companies Inc., Sun Life Financial, and Swiss Re.

2.1.1 Derivation of Emission Factors

The WRI/WBCSD GHG Protocol is the result of a multinational collaboration led by the WRI, a U.S.-based environmental NGO, and the WBCSD, a Geneva-based group of over 170 companies. The Protocol provides an accounting and reporting framework for governments and businesses worldwide to measure their GHG emissions. The Protocol provides cross-sector and sector-specific calculation tools, as well as electronic worksheets that facilitate calculation of GHG emissions from specific sources or industries. Presently, the overarching protocol most widely used is the Corporate Accounting and Reporting Standard.[11]

The Protocol requires measurement of GHG emissions from several sources (e.g. stationary combustion, mobile combustion, process emissions, and fugitive emissions). However, because emissions are not easily monitored by actual concentrations and/or flow rates, emission factors are used to calculate and estimate the magnitude of emissions. To increase the consistency and transparency of GHG reporting between companies, the Protocol provides sector-specific emission factors.

Emission factors are calculated ratios, which relate GHG emissions to an estimated measure of activity at the emission source. The default emission factors provided in the Protocol spreadsheets are country-specific (or region-specific in the case of the U.S.) averages based on data collected from multiple industries. However, more specific sectors, such as the International Aluminum Institute, International Iron and Steel Institute, American Petroleum Institute, and WBCSD Cement Initiative, have provided industry-specific emission factors.

Emission factors are calculated based on varying degrees of company- and site-specific data. For example, emission factors for fuel consumption can be based on fuel energy content, mass, or volume. Two types of emission factors are associated with electricity consumption: 1) emission factor at generation (EFG) and 2) emission factor at consumption (EFC). EFG is calculated by dividing CO_2 emissions from the generation of electricity by the amount of electricity generated. EFC is calculated by dividing CO_2 emissions from generation by the amount of electricity consumed. We applied EFC for all calculations. Emission factors provide a normalized business metric, allowing for comparison between products/processes over time.

2.2 SCOPE AND EMISSIONS SOURCES

According to the WRI/WBCSD GHG Protocol, the first step in developing a GHG inventory is defining the organizational and operational boundaries (WBCSD 2007). Because this is Zurich's initial attempt at calculating its carbon footprint, data collection systems were not well integrated and information regarding actions outside of Zurich's internal operations was unavailable. Therefore, we did not analyze emissions generated by upstream (e.g., suppliers) and downstream (e.g., brokers and agents) sources.

[11] The WRI/WBCSD has other sector-specific supplements (e.g., Land Use and Land-Use Change and Forestry (LULUCF) and Grid-Connected Electricity Projects). WRI/WBCSD is also developing a protocol for reporting product and supply chain GHG emissions.

Our project aimed to estimate Zurich's group-wide emissions. Although the organizational boundary of our analysis encompassed operations in all 63 countries in which Zurich operates, we collected information from operations in the 34 countries where Zurich currently tracks emissions data. Our emissions inventory and calculations encompassed actual and projected information on seven target countries and projections for the remaining 27 countries.[2,2] We also included emissions generated by the operations of Farmers Insurance Group (FIG), a large, wholly owned subsidiary of Zurich North America (ZNA). Our analysis only accounted for the Farmers Management Group, a division of Farmers Insurance, which employs about 8,000 people and is part of Zurich (i.e., part of Zurich's 58,000 employees).[12] Excluding Farmers' emissions would have underestimated Zurich's footprint.

Operational boundaries include activities represented by Scopes I, II, and III according to the WRI/WBCSD GHG Protocol. We define Scope I emissions as those from company-owned cars and Zurich's corporate jet; Scope II emissions as those from purchased energy (i.e., electricity and heat) in Zurich and FIG's owned facilities; and, Scope III emissions as those from purchased energy (i.e., electricity and heat) in Zurich and FIG's leased facilities, as well as those from Zurich and FIG's business travel (i.e., air travel and rental cars). We did not consider fugitive emissions from heating, ventilation, and air conditioning (HVAC) systems, as these emissions are often considered to be "de minimis" for service-oriented companies (WBCSD 2007).[13] Emissions from company-owned boilers, employee commuting, and contractor-owned vehicles were also outside the scope of this analysis. In setting the operational boundary, we followed the principles outlined by the GHG Protocol (2007)—relevance, completeness, consistency, transparency, and accuracy—but were ultimately influenced by the availability of data of reasonable quality (i.e., what Zurich was already measuring, or what could be estimated from something Zurich was measuring).

We decided to analyze only GHG emissions derived from CO_2 based on three considerations[14]:

1. Quantification of only CO_2 emissions is consistent with reporting standards of companies in the initial development of emissions estimation procedures (CCAR 2008);

2. Unlike product-oriented companies whose manufacturing processes generate substantial emissions of all six GHGs, service-oriented companies generate the majority of emissions in the form of CO_2 (WBCSD 2007); and

3. Data from Zurich was limited to those parameters required to calculate CO_2 emissions.

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[12] In this report, "FIG" refers to the Farmers Management Group of 8,000 employees considered in our analysis.

[13] "De minimis" = Emissions that together account for less than 5% of total emissions.

[14] Other GHGs regulated under Kyoto, but not considered in this analysis, include: methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

2.3 METHODOLOGY & DATA SOURCES

We employed a three-pronged approach to quantify Zurich's Scope I, II, and III emissions. Our primary analysis focused on Zurich's operations in seven countries, which account for 74% of full-time employees (FTEs).[8] We used indices derived from Zurich's operations in these seven countries to estimate/project emissions from Zurich's facilities in an additional 27 countries. Data reflect Zurich's 2007 operations and were aggregated at the country-level.
The following discussion outlines a general methodology applicable to all countries analyzed in our carbon footprint calculation. See Appendix 1 for a description of country-level information and country-specific deviations from the methodology.

Direct Emissions from Company-Owned Cars and Zurich's Corporate Jet (Scope I)

2.3.1 Company-Owned Cars

Data: LeasePlan is a global fleet and vehicle management company contracted by Zurich. LeasePlan provided our group with information on the composition and carbon emissions of Zurich's fleet in the U.S. and six European countries. [15] LeasePlan uses an "EcoCalculator" certified by TUV Rheinald to calculate the carbon footprint of a client's fleet.[16]

Because reporting differences exist between Zurich's U.S. and European operations, the information collected by LeasePlan differs slightly between these two regions.

Information reported for Zurich's U.S. fleet includes:

- Client ID
- LeasePlan Asset #
- Date in service
- Last odometer reading & date of reading
- Make/model year & class description
- Vehicle count
- Fuel type (e.g., gasoline, diesel, and flex fuel)
- Combination highway & city mpg
- Emission factor (kg CO_2/mi)
- CO_2 emissions (metric tons/yr)

Information reported for Zurich's European fleet includes:

- License plate #
- Driver name
- Vehicle make/model
- Vehicle count

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[15] 6 European countries: Austria, Belgium, Ireland, the Netherlands, Switzerland, & the U.K.; information is reported separately for ZNA Executive, ZNA General, FIG Executive, FIG Management, & FIG Exchange.

[16] TUV Rheinald documents the safety and quality of new and existing products, systems, and services. http://www.tuv.com/global/en/index.html

- Budgeted mileage (km/yr/vehicle)
- Total budgeted km/yr
- Fuel type (e.g., hybrid, LPG, petrol, and diesel)
- Manufacturer provided emission factor (g/km)
- CO_2 emissions (metric tons/yr)
- CO_2 emissions per budgeted mile (metric tons/yr/km)

Carbon Footprint Calculations: To test the robustness of LeasePlan's emissions estimates, we applied distance-based emission factors to calculate the footprint of each country's vehicle fleet based on the WRI/WBCSD GHG Protocol.

We applied emission factors based on "vehicle km" (European fleet) or "vehicle mi" (U.S. fleet) for each vehicle type. Diesel vehicles were assumed to approximate "diesel autos," petrol vehicles were assumed to approximate "medium gas autos," and liquefied petroleum gas (LPG) vehicles were assumed to approximate "hybrid autos." These three categories correspond to different fuel efficiency ranges and, hence, emission factors.

Percent differences between carbon emissions based on LeasePlan's "EcoCalculator" and those based on the WRI/WBCSD GHG Protocol were calculated to identify deviations between estimation methodologies. For European countries, differences ranged from -3% to 67%, with the average difference being 40%. Similarly, the percent difference calculated for U.S. business units U.S. ranged from -1% to 65%, with the average difference being 37%. Results are summarized in Tables 2.1 and 2.2.

Table 2.1: European Vehicle Fleet Calculations

Country	Total CO_2 (ton/yr) per fleet based on budgeted mileage (LeasePlan Calculations)	Total CO_2 (ton/yr) per fleet based on budgeted mileage (Group Calculations)	Total CO_2 (ton/yr) per fleet based on budgeted mileage (% Difference)
Austria	299	438	47
Belgium	82	134	64
Ireland	575	791	38
The Netherlands	140	177	26
Switzerland	67	65	-3
U.K.	4,696	7,824	67
Average	977	1,572	40

Table 2.2: U.S. Vehicle Fleet Calculations

US Business Unit	Total CO_2 (ton/yr) per fleet based on budgeted mileage (LeasePlan Calculations)	Total CO_2 (ton/yr) per fleet based on budgeted mileage (Group Calculations)	Total CO_2 (ton/yr) per fleet based on budgeted mileage (% Difference)

2007 ZNA - Executive	2,350	3,886	65
2007 ZNA - General	14,425	20,449	42
2007 FIG - Executive	448	445	-1
2007 FIG - Management	4,659	6,032	29
2007 FIG - Exchange	39,687	58,383	47
Average	12,314	17,839	37

Percent differences between the values calculated by LeasePlan and those calculated by our group are considerable and reflect variation in calculation methodologies. For purposes of the project, we used values calculated by LeasePlan because LeasePlan's emissions estimates were based on emission factors specified by the vehicle manufacturers. Therefore, LeasePlan's emissions values are more exact because they rely on emission factors specific to each vehicle make/model, rather than average factors specified by the WRI/WBCSD GHG Protocol.

In addition to calculating CO_2 emissions from Zurich's vehicle fleet, we developed country-level summary tables. Results for ZNA Executive, ZNA General, FIG Executive, FIG Management, and FIG Exchange were also reported separately. This breakdown allowed us to compare vehicle fleet trends in each country and identify opportunities for mitigation.

2.3.2 Corporate Jet

Data: We sent a data request to the procurement staff within Zurich's Corporate Headquarters in order to query the gallons of jet fuel consumed by Zurich's corporate jet in 2007.

Zurich owns one corporate jet, so data collected corresponds solely to one aircraft. However, Zurich also uses private jet services, called Net Jet. Net Jet information was unavailable and was excluded from our calculations.

Carbon Footprint Calculations: We used a fuel-based calculation approach to determine emissions (metric tons CO_2) from Zurich's corporate jet. This necessitated conversion of fuel consumption into energy (GJ/fuel unit) and selection of an emission factor (kg CO_2/GJ). In this analysis, all conversion and emission factors were based on those specified in the WRI/WBCSD GHG Protocol.[17] We applied factors based on fuel type, as assumptions of fuel efficiency (mpg) are encompassed in the calculation of each factor. The WRI/WBCSD notes that jet kerosene is the most common type of fuel used in corporate jets. Therefore, we chose to use the emissions factor corresponding to jet kerosene.

[17] Emission factors for electricity and heat consumption in Australia, Germany, Italy, Spain, Switzerland, and the U.K. based on 2005 IEA data; emission factors corresponding to gasoline/diesel fuel consumption in these countries are based on WRI/WBCSD 2005 data. Emission factors for the U.S. were derived from the same two sources (i.e., IEA and WRI/WBCSD) but were based on 2004 data.

To calculate CO_2 emissions from Zurich's corporate jet, we:

1. Multiplied fuel consumption of the jet (gal) by the fuel-to-energy conversion factor (GJ/gal) to derive total energy used (GJ) by the corporate jet (Equation 1)

(1) Total energy used = [X gal fuel * conversion factor (GJ/gal)]

2. Multiplied the jet kerosene emission factor (kg CO_2/GJ) by the total energy used (GJ) to derive CO_2 emissions from the corporate jet (metric tons) (Equation 2)

(2) CO_2 emissions from corporate jet (metric tons) = [(Emission factor (kg CO_2/GJ) * total energy used (GJ))/1000]

Indirect Emissions from Purchased Energy in Owned (Scope II) & Leased (Scope III) Buildings

2.3.3 Facilities

Data: Data requests, in the form of Microsoft Excel spreadsheets, were sent to contacts in the seven target countries. Spreadsheets prompted each contact to enter the full inventory of owned and leased buildings in the country for the year 2007. Information on owned and leased buildings was reported separately to facilitate analysis regarding the degree of Zurich's control over each building.

Information reported includes: building name, location, type of lease (all-inclusive or not, *leased facilities only*), year constructed, number of employees, area (m^2), area (m^2) used by Zurich (*leased facilities only*), electricity and heat consumption (kWh), cost of electricity and heat consumption in each country's currency, breakdown of source of electricity and heat (% coal, % oil, % natural gas, % other), building use, source of information, and other energy-saving initiatives in place. Energy use (i.e., electricity and heat) reported represents annual consumption for 2007.

Projections:

Energy Consumption: Raw data in each country included buildings for which no information on energy consumption or source was provided. Because energy consumption information is difficult to obtain from buildings not under Zurich's immediate control, energy data was sparser for leased facilities. Where energy data was unavailable, we estimated CO_2 emissions by projecting from country-specific indices based on facilities for which data was provided. We only used energy projections to estimate energy consumption in buildings without electricity and heat data; we assumed that, if a building reported electricity but not heat data, that heat consumption was either (a) incorporated in electricity consumption estimates or (b) not applicable to that facility.

We calculated the following seven indices for each country:

1. m^2/employee = (area (m^2) in owned buildings w/data + area used by Zurich (m^2) in leased buildings w/data)/(total employees in owned & leased buildings w/data)

2. electricity consumption/employee (kWh/empl) = (kWh electricity used in owned & leased buildings w/data)/(# employees in owned & leased buildings w/data)

3. electricity consumption/area (kWh/m^2) = (kWh electricity used in owned & leased buildings w/data)/(area (m^2) in owned buildings w/data + area *used by Zurich* (m^2) in leased buildings w/data)

4. heat consumption/employee (kWh/empl) = (kWh heat used in owned & leased buildings w/data)/(# employees in owned & leased buildings w/data)

5. heat consumption/area (kWh/m^2) = (kWh heat used in owned & leased buildings w/data) /(area (m^2) in owned buildings w/data + area *used by Zurich* (m^2) in leased buildings w/data)

6. energy consumption/employee (kWh/empl) = (kWh electricity used in owned & leased buildings w/data + kWh heat used in owned & leased buildings w/data)/(# employees in owned & leased buildings w/data)[18]

7. energy consumption/area (kWh/m^2) = (kWh electricity used in owned & leased buildings w/data + kWh heat used in owned & leased buildings w/data)/(area (m^2) in owned buildings w/data + area *used by Zurich* (m^2) in leased buildings w/data)[18]

Indices 1-5 facilitated country comparisons. We applied Indices 6 & 7 to perform two types of projections: (Method 1) based on # employees and (Method 2) based on area (m^2). We applied indices combining electricity *and* heat data to estimate energy consumption, rather than projecting separately for each energy source, because several countries (e.g., Spain) aggregated heat consumption in electricity data or provided minimal information on heat consumption.

To determine the most accurate projection method, we: (1) summed total energy consumption (kWh) for buildings with data, (2) applied projection Methods 1 & 2 to calculate new values for energy consumption for the same buildings, and (3) calculated a percent difference between known and projected values. The most accurate projection method was assumed to be that which yielded the smallest percent difference. We then multiplied the chosen index by either the number of employees or m^2 in each of the buildings lacking data to estimate energy consumption. Note that the most accurate projection method varied by country.

Cost: Facilities lacking energy consumption data also did not report cost information. We estimated annual energy costs in buildings in each country for which data was unavailable by:

[18] Index excludes facilities designated as "data centers," as these buildings are characterized by above average energy consumption. Including energy consumption information from data centers would have overestimated projected consumption by facilities for which data was not provided.

1. Calculating the cost (USD/kWh) for each building for which data was available;[19]
2. Calculating the average cost (USD/kWh) for owned/leased buildings; and[20]
3. Multiplying average cost (USD/kWh) estimates by the best estimate of projected energy consumption (kWh)

Applying a country-specific cost average was thought to yield the most accurate cost estimate.

Carbon Footprint Calculations:

2.3.4 Seven Target Countries

We used energy consumption data, coupled with country-specific (or, for U.S. calculations, region-specific) emission factors from the International Energy Agency (IEA), to calculate CO_2 emissions from facilities in each country.

Similar, but separate, calculations were conducted to determine CO_2 emissions from electricity and heat for owned and leased facilities. This separation allowed us to pinpoint the source of the majority of emissions and to identify differences in electricity and heat consumption among Zurich's national business units. We calculated emissions based on actual data independently from those based on projected energy consumption to facilitate comparison.

To calculate CO_2 emissions, we:

1. Multiplied energy consumption (kWh) in each building by the corresponding percent of energy derived from each source. For example, if a building in Spain derives 20% of its energy from coal, we multiplied energy consumption (kWh) by 20%.
2. Multiplied the product of #1 by the source-specific emission factor to determine its equivalence in grams of CO_2.[17] This calculation is summarized in Equation 3.

(3) [Energy Consumption (kWh) x % energy derived from energy source x emission factor (g CO_2/kWh)] = g CO_2

Because several energy sources (e.g., coal, oil, and natural gas) are often combined to fuel a building, we applied a separate emission factor for each energy source.[21]

[19] We converted to USD using the exchange rate as of September 30, 2008. The exchange rate was based on data from the Financial Management Service – A Bureau of the United States Department of the Treasury. Correction for changes in the value of currency over time was not necessary, as we were only interested in differences in cost relative to other countries.

[20] Separate cost calculations were conducted for electricity and heat data because of the significant difference in price of these two forms of energy. Distinctions were also made between owned and leased facilities in order to determine differences in energy costs between building types.

[21] Note: Because no CO_2 emissions are generated from the use of alternative energy, an emission factor of 0 g CO_2/kWh was applied to all energy derived from alternative sources.

We summed the products of Equation 3 for all energy sources for each building to determine total emissions for each building.
We calculated total emissions (metric tons CO_2) for each building according to Equation 4.

(4) [(Energy consumption (kWh) x emission factor (g CO_2/kWh))/1,000,000] = metric tons CO_2

We summed CO_2 emissions (metric tons) from electricity and heat separately across all facilities in each country.

After calculating CO_2 emissions (metric tons), we constructed summary tables for each country, which included the following parameters:

- Energy consumption per employee (kWh/empl)
- Energy consumption per m^2 (kWh/m^2)
- CO_2 emissions per employee (metric tons/empl)
- CO_2 emissions per m^2 (metric tons/m^2)
- Cost of energy consumed (USD)[19]
- Cost per kWh (USD)
- Cost per metric ton CO_2 (USD)

Calculating these parameters allowed us to compare absolute and relative emissions in each country and between countries.

2.3.5 Additional 27 Countries

To estimate carbon emissions from facilities in the additional 27 countries for which we only received data on the number of FTEs, we:

1. Calculated an average kWh/employee value based on Index 6 values from all countries with energy consumption data;
2. Multiplied this average value by the # of FTEs in each country to estimate energy consumption in each country;
3. Multiplied the product in #2 by the country-specific general emission factor (i.e., represents average fuel mix for each country) to determine its equivalence in grams of CO_2; and
4. Divided the product in #3 by 1,000,000 to convert from grams to metric tons CO_2.

<u>Indirect Emissions from Employee Business Travel: Air Travel & Rental Cars (Scope 3)</u>

2.3.6 Air Travel

<u>Data</u>: We sent a data request to American Express (AmEx) in order to query flights booked through the company by Zurich employees.

Information reported includes: country, cost center, number of flights, number of individuals traveling (based on personal ID), total miles traveled, cost (USD), airlines used for travel, number of flights booked with each airline, and the total number of miles traveled with each airline. Data reflect travel for 20 countries and were expressed by country for the year 2007.[22]

Detailed information on airlines helped identify which companies Zurich books travel with most frequently. This, in turn, provides a foundation for Zurich to investigate airline choice as a potential opportunity for emission reductions.

<u>Carbon Footprint Calculations</u>: We utilized a distance-based calculation approach to determine metric tons CO_2 produced from Zurich's air travel. This approach necessitated selection of an emission factor (kg CO_2/mi) from the WRI/WBCSD GHG Protocol. Emission factors are based on flight category, as certain assumptions of aircraft size and load capacity are encompassed in the calculation of each emission factor. Flight categories include:

- Short-haul (< 310 miles)
- Medium-haul (< 994 miles)
- Long-haul (> 994 miles)

For 2007, the proportions of domestic, short-haul (intra-European), and long-haul flights were 72%, 22%, and 6%, respectively. These figures represent flights for Austria, Denmark, Ireland, Italy, Portugal, Spain, Switzerland, the U.K., and the U.S. Together, these nine countries account for approximately 80% of Zurich's global air volume.[23]

For our purposes, the 72% of "domestic" flights are considered to fall within the Protocol's "short-haul" category, while the 22% of "short-haul" flights are considered to fall within the Protocol's "medium-haul" category. All 6% of "long-haul" flights are considered to fall within WRI/WBCSD's "long-haul" category.

Because the specified percentages reflect a significant portion of Zurich's air travel, we assumed that this breakdown was representative of each country for which we received data.

To calculate CO_2 emissions from air travel by country, we:

1. Multiplied each percent by its corresponding emission factor and summed the three products to derive an overall emission factor (Equation 5)

(5) <u>Emission factor</u> = [72% * short-haul emission factor (kg CO_2/mi) + 22% * medium-haul emission factor (kg CO_2/mi) + 6% * long-haul emission factor (kg CO_2/mi)]

2. Multiplied the overall emission factor by the total number of miles traveled within each country (Equation 6)

[22] 20 countries represented by air travel data: Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, Hong Kong, Finland, Germany, Ireland, Italy, Mexico, the Netherlands, Singapore, Spain/Portugal, Sweden, Switzerland, the U.K. & the U.S.

[23] Breakdown by flight type provided by AmEx and conveyed to Group by Megan Carmody on 10/13/2008.

(6) $\underline{CO_2 \text{ emissions from air travel (metric tons)}}$ = [(Emission factor (kg CO_2/mi) * total # miles)/1000]

In addition to calculating CO_2 emissions from air travel, we computed several parameters to facilitate data analysis. The following parameters allowed us to compare national results, while illuminating opportunities for mitigation:

- # flights per individual traveling
- Cost per individual traveling (USD)
- % employees traveling (i.e., # individuals traveling/total employees in each country)
- # miles per individual traveling
- CO_2 emissions per employee
- CO_2 emissions per individual traveling

2.3.7 Rental Cars

Data: We sent a data request to AmEx in order to query rental car reservations booked through the company by Zurich employees.

Information reported included: country, type of car, number of reservations, number of individuals involved (based on personal ID), total miles driven, total rental cost (USD), and fuel consumption (gal). Data reflect rental car utilization in 21 countries, including the seven countries targeted in our footprint analysis.[24] Data were reported by country and by car type for the year 2007.

With information on rental car agencies and types of car rented (e.g., compact, economy/subcompact, and full size), we identified which companies Zurich makes reservations with most frequently and which types of cars are most often rented. This analysis provided a foundation to investigate rental car agency or car type choice as a carbon management option.

Carbon Footprint Calculations: We utilized a fuel-based calculation approach to determine metric tons CO_2 produced from Zurich's rented fleet. All fuel consumption data from AmEx was reported in gallons of gasoline/petrol. Because employees in Zurich U.S.'s operations made approximately 98% of rental car reservations, it was reasonable to report fuel consumption in U.S. gallons. We, therefore, applied a constant emission factor (8.87 kg CO_2/gal) unique for gasoline from the WRI/WBCSD GHG Protocol.

To calculate CO_2 emissions from rental car use in each country, we:

1. Multiplied total fuel consumption (gal) for each vehicle type by the fuel-based emission factor (Equation 7)

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[24] 21 countries reporting data: Argentina, Australia*, Austria, Belgium, Bermuda, Brazil, Canada, Chile, Finland, Germany*, Hong Kong (China), Ireland, Italy*, Mexico, the Netherlands, Portugal, Spain*, Sweden, Switzerland*, the U.K.*, & the U.S.* (* indicates target country in our analysis)

(7) <u>CO_2 emissions from rental cars (metric tons)</u> = [(Fuel consumption (gal) * 8.87 kg CO_2/gal)/1000]

2. Summed CO_2 emissions across all vehicle types within each country.

We summed country totals to determine:

- Total CO_2 emissions (metric tons) from gasoline for the key seven countries analyzed in our carbon footprint calculation;
- Total CO_2 emissions (metric tons) from gasoline for the remaining 14 countries for which we have rental car data; and
- Total CO_2 emissions (metric tons) from gasoline for all 21 countries.[24]

In addition to calculating CO_2 emissions from rental car use, we computed two rankings of rental car agencies for each country based on:

1. # of reservations
2. total miles driven

These rankings facilitated comparison of national rental car trends and identification of mitigation opportunities.

2.4 SENSITIVITY ANALYSIS

We used sensitivity analysis to test the following two assumptions underlying our carbon footprint calculations to determine how the results would change based on different values:

i. Use of a static exchange rate: All costs were converted to USD using the exchange rate as of September 30, 2008.[19] This date coincided with the start of the project. Correction for changes in the value of currency over time was not necessary, as we were only interested in differences in cost relative to other countries. To ensure that our cost calculations were robust and that there was no considerable impact of exchange rate volatility, we performed a sensitivity analysis by adjusting the exchange rate by +/- 5%. We then modeled changes in the total cost of energy consumption and cost/kWh estimates for each country as a result of variation in the exchange rate. Sensitivity analysis showed that a +/- 5% variation in exchange rate does not significantly affect energy cost estimates. Estimates of cost per kWh only varied in some cases by \$0.01. We are, therefore, confident that projections based on our chosen exchange rate are robust.

ii. Use of aggregated, country-specific indices for facilities projections: Aggregated, country-specific indices (kWh/employee & kWh/m^2) were applied to project energy consumption for facilities that did not provide electricity and/or heat data. This extrapolation method was assumed to be more accurate than applying energy estimates based on building type (e.g., those provided in the Energy Information Administration's Consumer Building Energy Consumption Survey). To validate this assumption, we performed a sensitivity analysis by varying country indices by +/- 5%. We then modeled changes in estimated emissions as a result of variation in these indices. Results demonstrate that a +/- 5% variation in our indices does not significantly change overall emissions estimates. For the seven target countries, percent differences of total CO_2 emissions ranged from 0.1% to 2%. Therefore, we can confidently say that our emissions projections are robust.

2.5 RESULTS[25]

Overall Trends:

As previously noted, we projected energy consumption (kWh) in order to calculate CO_2 emissions for some facilities to fill data gaps. The accuracy of projections depended on the data available in each country from which to develop indices (Figure 2.1). Calculations for the U.S., the U.K., and Spain required the greatest amount of approximation in order to quantify energy consumption from facilities. FIG did not provide any energy consumption information; therefore, we projected emissions based on the area occupied by FIG in each building and the number of employees per building.

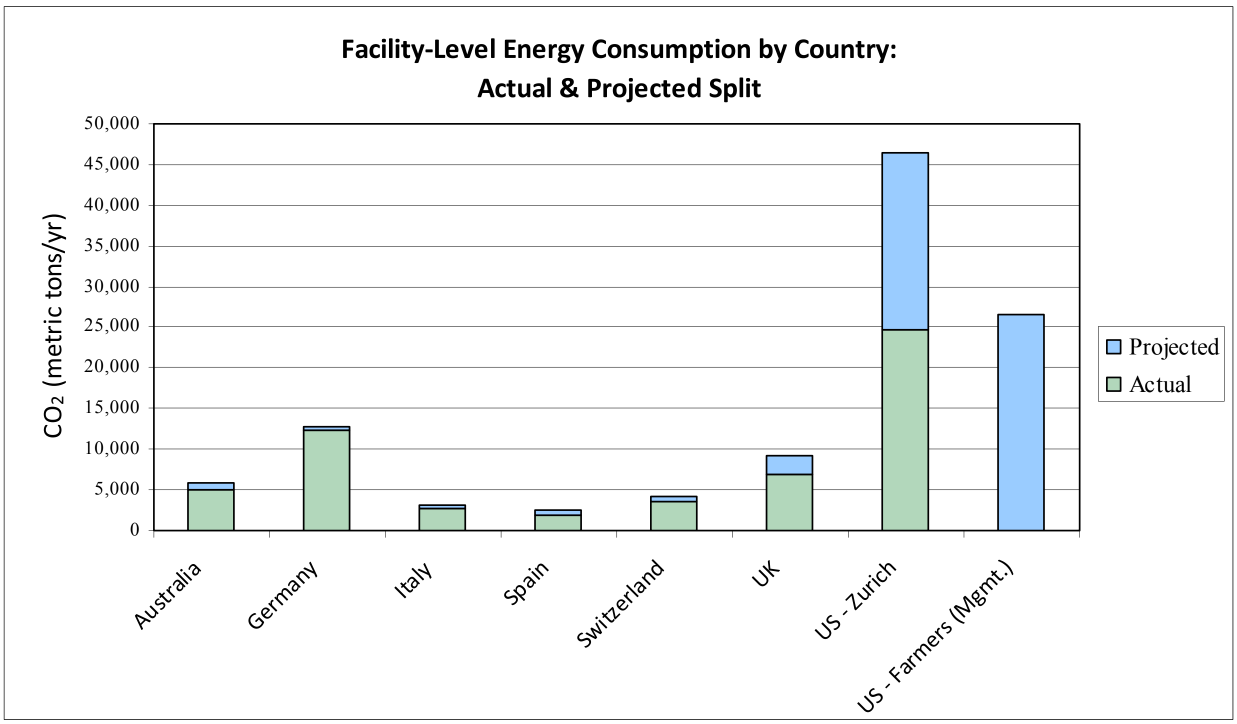

Figure 2.1: Actual vs. Projected Split of Energy Consumption by Country

After determining facility-level energy consumption, we calculated CO_2 emissions from facilities, and added this value to emissions from air travel and leased and rented cars, to calculate total emissions by country. See Appendix 2 for pie charts depicting the emission source breakdown by country. Figure 2.2 illustrates each country's contribution to group-wide emissions. The U.S. (ZNA and Farmers) is the largest emitter, contributing 58% to the group-wide total, while the "Other countries" category ranks second, contributing 16% to group-wide emissions. The smallest contributions to the group-wide total come from Spain and Italy.

[25] Footprint calculations are accurate as of December 2008; Zurich has since revised our numbers to a small extent to reflect new information.

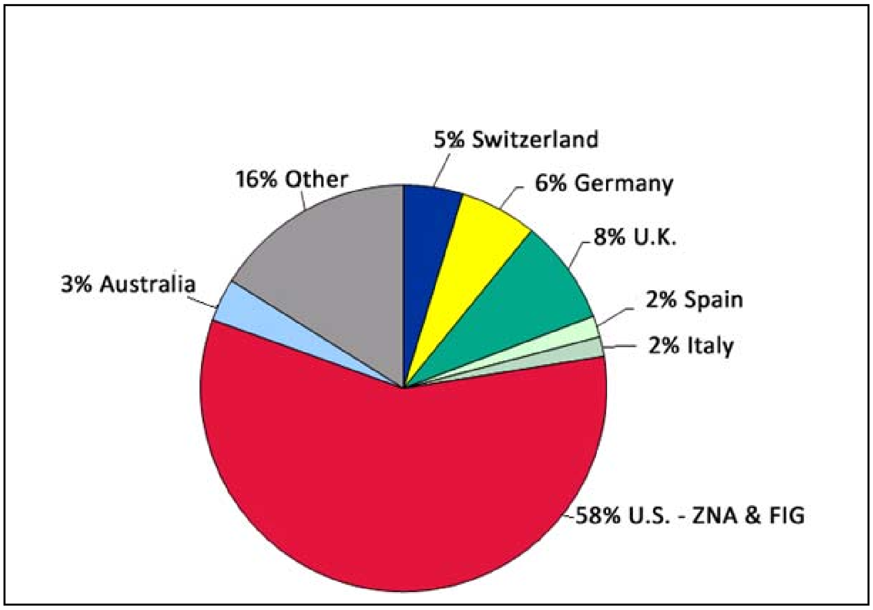

Figure 2.2: Group-wide CO_2 Emissions Breakdown by Country

Examination of group-wide emissions, split by source, reveals that the majority of emissions (63%) are generated by the operation of Zurich's facilities (See Table 2.3). Additionally, 21% of emissions come from air travel, while only 15% come from the cars/other category.

Table 2.3: Group-wide CO_2 Emissions Breakdown by Country

	Total CO_2 emissions (tons/yr)			
Country	**Facilities**	**Air Travel**	**Cars/Other**	**Total**
Australia	5,784	1,791	21	7,596
Germany	12,740	925	1	13,665
Italy	3,095	378	0	3,474
Spain	2,647	1,109	13	3,770
Switzerland	4,239	6,141	119	10,498
U.K.	9,135	4,776	4,710	18,621
U.S. - Zurich & Farmers	73,075	28,918	27,068	129,061
Other countries/not country specific	31,191	3,509	1,147	35,847
Group	**141,906**	**47,546**	**34,558**	**224,011**

In order to compare normalized values, it is helpful to consider emissions per FTE (See Table 2.4). Normalizing results by employee accounts for variation in the size of business operations by country. As with the non-normalized analysis, the majority of total emissions per employee are generated from facilities. The second largest contribution comes from air travel, while the cars/other category contributes the least. This pattern does not hold true for each country. For example, in Switzerland CO_2 emissions per employee from air travel are greater than those from facilities. Additionally, while facilities generate the most emissions per employee in the U.S., emissions per employee from air travel and cars are relatively similar.

When normalized by FTEs, Australia ranks highest with 6.75 tons CO_2 per employee. This is likely because Australia has so few employees and relies heavily on carbon-intensive energy sources, such as coal. Although the U.S. ranks highest with respect to absolute emissions, the U.S. ranks second with 6.38 tons CO_2 per employee when normalized. Our carbon reduction measures consider absolute and normalized rankings and are more stringent for larger emitters.

Table 2.4: Group-wide Emissions per Employee Breakdown by Country

	CO_2 emissions per employee (metric tons/empl/yr)			
Country	**Facilities**	**Air Travel**	**Cars/Other**	**Total**
Australia	5.14	1.59	0.02	6.75
Germany	2.37	0.17	0.00	2.54
Italy	2.91	0.36	0.00	3.27
Spain	1.47	0.62	0.01	2.09
Switzerland	0.68	0.99	0.02	1.68
U.K.	1.27	0.67	0.66	2.60
U.S. - Zurich & Farmers	3.62	1.43	1.34	6.39
Other countries/not country specific	2.03	0.23	0.07	2.34
Group	**2.43**	**0.82**	**0.59**	**3.84**

<u>Owned vs. Leased Facilities</u>

Examination of Zurich's group-wide emissions reveals that 13% of CO_2 emissions come from owned buildings, 37% stem from leased buildings, and 14% are derived from buildings not identified as leased or owned (Figure 2.3). Comparison of facilities data reveals that leased buildings are the largest emissions source. This is because Zurich leases more buildings than it owns, and, therefore, the overall contribution from leased buildings is about three times that of owned buildings. Our carbon management recommendations reflect this distribution and include a discussion of emissions reduction opportunities at leased sites.

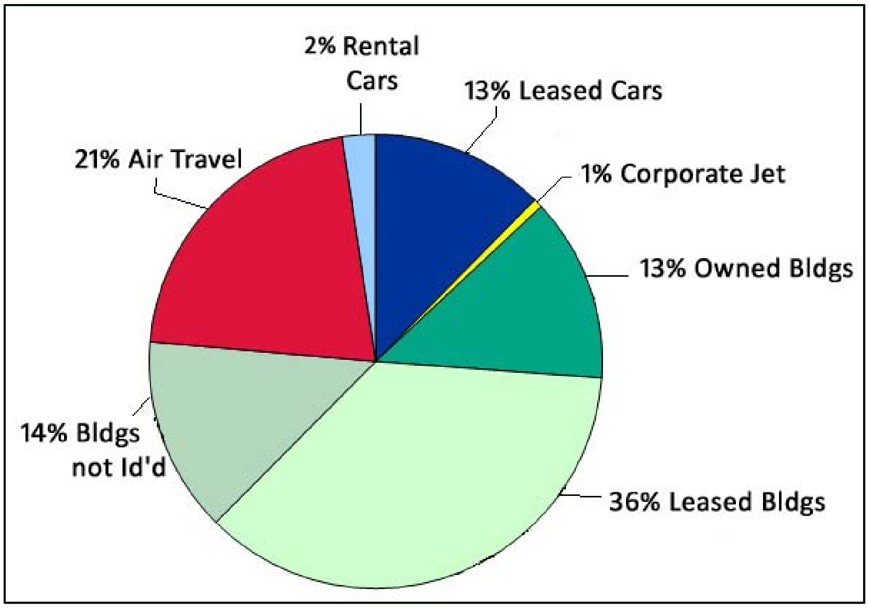

Figure 2.3: Group-wide CO_2 Emissions Breakdown by Source

The predominance of emissions from leased facilities does not hold true for all seven target countries. For example, Australia only has two owned buildings, which contribute 41% of emissions to its country total, and 22 leased buildings, which contribute 35% of emissions to its country total. Although Australia has far more leased than owned buildings, the proportion of emissions derived from its two owned facilities is considerable. Likewise, Italy has five owned buildings that contribute 80% of emissions to its country total. The proportion of emissions from owned facilities in Spain is also greater than that from leased sites (See Table 2.5). While the split between emissions from owned and leased buildings is similar in Germany, the majority of emissions from Zurich's facilities in Switzerland, the U.K., and the U.S. are generated from leased, not owned, buildings. This is logical, as these three countries operate in a significantly higher number of leased, rather than owned, facilities.

Table 2.5: Owned vs. Leased Buildings Split by Number and Contribution to Country Emissions

Country	# Owned Buildings	% Emissions from Owned	# Leased Buildings	% Emissions from Leased
Australia	2	41	22	35
Germany	24	50	71	43
Italy	5	80	28	9
Spain	3	39	61	32
Switzerland	35	16	211	24
U.K.	2	7	42	42
U.S.	1	9	102	48

Sources of energy used to power Zurich's facilities vary by country (Figure 2.4). Australia and the U.S. have the highest percentage of energy from coal and/or oil (the most carbon-intensive fuels). However, both countries also purchase a portion of either nuclear or renewable energy (which is the least carbon-intensive source) to fuel buildings. Zurich Switzerland derives the majority of energy from renewable sources, as hydroelectric power dominates the country's fuel mix. Conversely, Zurich Italy does not purchase any renewable or nuclear energy to power its buildings. Comparing the national fuel mix to the division of energy sources utilized in each country's operations reveals opportunities for Zurich to purchase more renewable energy. If a business unit is operating in an environment with a relatively clean fuel mix, recommendations to increase utilization of energy from renewable sources may be more feasible.

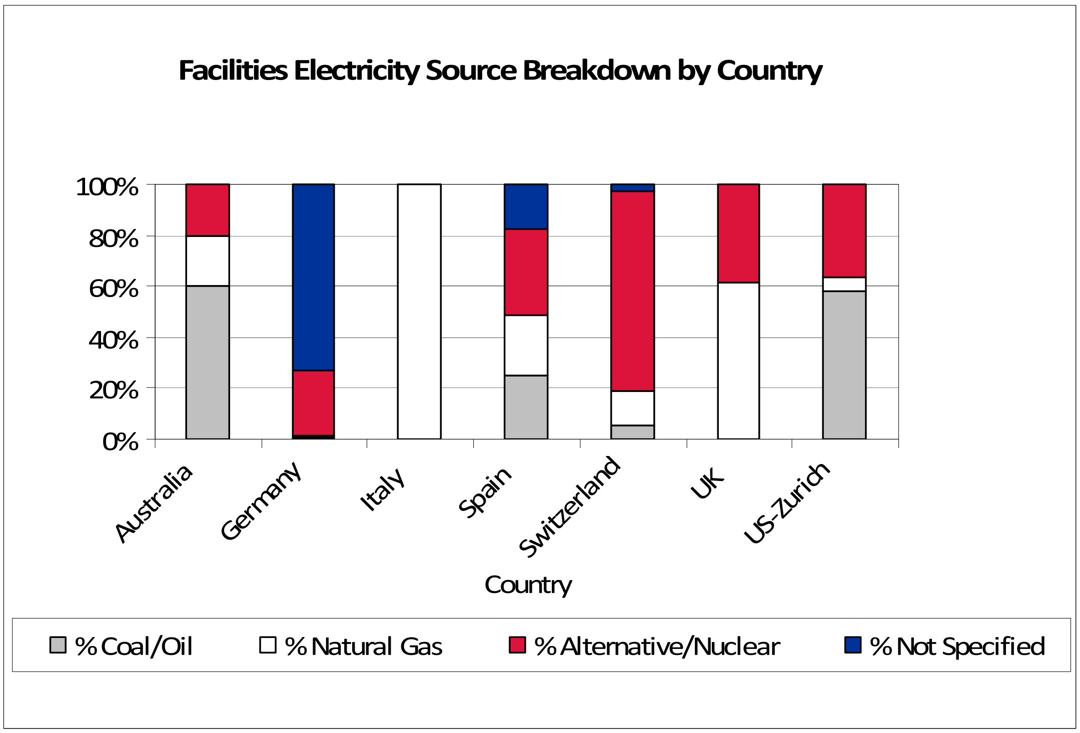

Figure 2.4: Electricity Source Breakdown by Country

Zurich's energy rates (USD/kWh) also vary by country (Figure 2.5). Energy rates are highest in the U.S., Italy, and Spain and lowest in Switzerland and Australia. Understanding variation in energy rates facilitates identification of cost-savings opportunities from energy conservation in each country. Applying data from Figure 2.5 to project cost-savings from energy conservation in facilities highlights the financial benefits of carbon- and energy-savings.

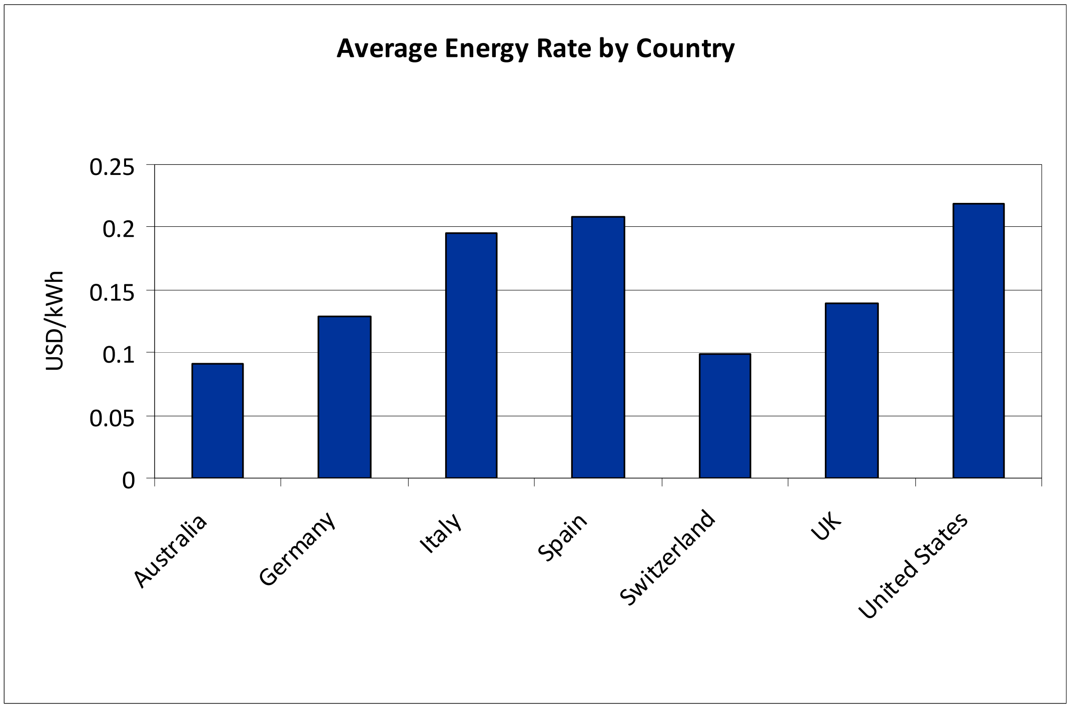

Figure 2.5: Variation in Average Energy Rates in Zurich's Facilities in the Seven Target Countries.
We converted all energy rates to USD for comparison purposes.

<u>Facilities vs. Leased Fleet vs. Rental Cars vs. Air Travel</u>

Zurich's group-wide emissions are split between several sources. Facilities account for 63% of emissions; air travel accounts for 21% of emissions; Zurich's leased fleet accounts for 13% of emissions; and rental cars account for 2% of overall emissions (Figure 2.3). The majority of emissions come from the operation of Zurich's buildings, which is standard for a financial services company.

Air Travel:

Three countries generate the majority of emissions from air travel. Approximately 61% of air travel emissions are generated by U.S. operations, while 13% and 10% are generated from operations in Switzerland and the U.K., respectively. Contributions of emissions from each of the other countries range between 1% and 7%, and therefore do not account for a large portion of air travel emissions.

However, it is also important to consider the relative contribution of emissions from air travel within each country. Although, Australia and Spain contribute less than 7% of total air emissions, the proportion of emissions generated from air travel relative to other sources within each country is significant. 24% and 29% of emissions in Australia and Spain, respectively, are generated from air travel.

Leased Fleet:

Of the seven target countries, only three (Switzerland, the U.K., and the U.S.) have a leased vehicle fleet. Approximately 79% of group-wide fleet emissions are generated by the U.S. (ZNA and Farmers), while 17% and 1% of group-wide fleet emissions are generated by the U.K. and Switzerland, respectively. The relative contribution of leased fleet to total emissions varies among these three countries. The leased fleet accounts for 17% of U.S. emissions, 25% of U.K. emissions, and 1% of emissions from Switzerland.

Rental Cars:

All seven target countries use rental cars for business travel. However, within each country, emissions from rental cars contribute less than 4% of total emissions when compared to other sources. The U.S. is responsible for 98% of group-wide emissions from rental cars.

2.6 DISCUSSION

Calculation of Zurich's baseline emissions elucidated trends on which to base recommendations. Results from the footprint calculation exercise directly support recommended carbon reduction strategies. Preliminary conclusions are discussed below.

Normalized estimates of country-level energy consumption (per employee and per m^2) for owned and leased facilities were relatively similar for most countries. However, normalized values differed greatly between owned and leased sites in Australia and the U.S. In both cases, the observed variation is an artifact of the disproportionately high number of leased facilities. For example, the U.S. has one owned, and 102 leased, buildings. Therefore, normalized estimates for U.S.-owned facilities reflect characteristics of only one building and may be exceptionally high or low.

Because the majority of group-wide emissions are generated by facilities (See Table 2.3), some reduction strategies focus on increasing the energy efficiency of owned and leased buildings. Analysis of Table 2.3 also indicates that the U.S. is the largest contributor to group-wide emissions. This is likely because emissions from FIG are included in U.S. calculations. Nonetheless, we can classify the U.S. as the largest emitter and therefore focus stringent reduction efforts on this region. The next largest emitter is the "Other countries" category, most likely because it encompasses emissions from operations in 27 countries. Subsequently, Germany, Switzerland, and Australia comprise next largest emitters, while the smallest emitters include Spain and Italy. In most cases, emissions are proportional to the size of Zurich's business operations in each country.

It is also important to consider emissions per FTE when comparing the seven target countries to account for national differences in business operations. Foe example, Switzerland is characterized by the lowest emissions per employee, while it emits a moderate amount of absolute emissions (See Table 2.3). This observation is attributable to two factors: 1) energy in Switzerland is clean and primarily derived from hydroelectric power, and 2) Zurich Switzerland employs the third highest number of FTEs (n = 6,232), so its emissions are split among a larger group. Therefore, we will recommend carbon management strategies that reduce emissions from air travel, as well as energy consumption in owned and leased facilities.

Connections between energy- and cost-savings should also be considered. Information depicted in Figure 2.5 has implications for cost-savings in each country. Countries with the highest energy costs, such as the U.S. and Spain, would save the most money from implementation of energy efficiency initiatives. Therefore, recommending strategies that call for stringent reduction in energy consumption in these areas will likely be well-received.

National trends can be further explained by examining national variation in facility-based energy consumption per employee, energy consumption per m^2, and CO_2 emissions per kWh. Figures 2.6, 2.7, and 2.8 depict these relationships.

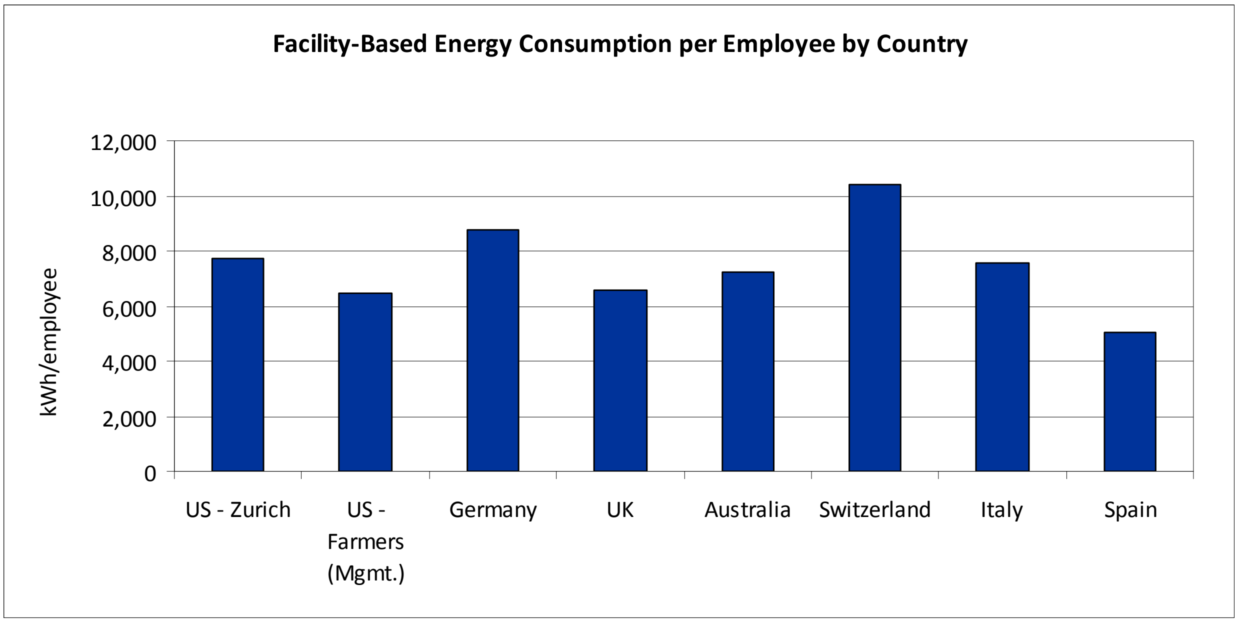

Figure 2.6: Facility-based Energy Consumption per Employee by Country

While it is important to determine the quantity of CO_2 emitted per employee, it is also helpful to understand energy consumption patterns. Figure 2.6 highlights countries in which employees consume the most energy. By understanding this trend, we can focus mitigation measures on reducing energy use within buildings rather than solely making buildings more efficient. For example, carbon reduction strategies in Switzerland may focus on reducing energy consumption rather than purchasing more renewable energy. Switzerland already uses clean energy sources to power its buildings, so promoting energy awareness and conservation may be the most effective mitigation measures.

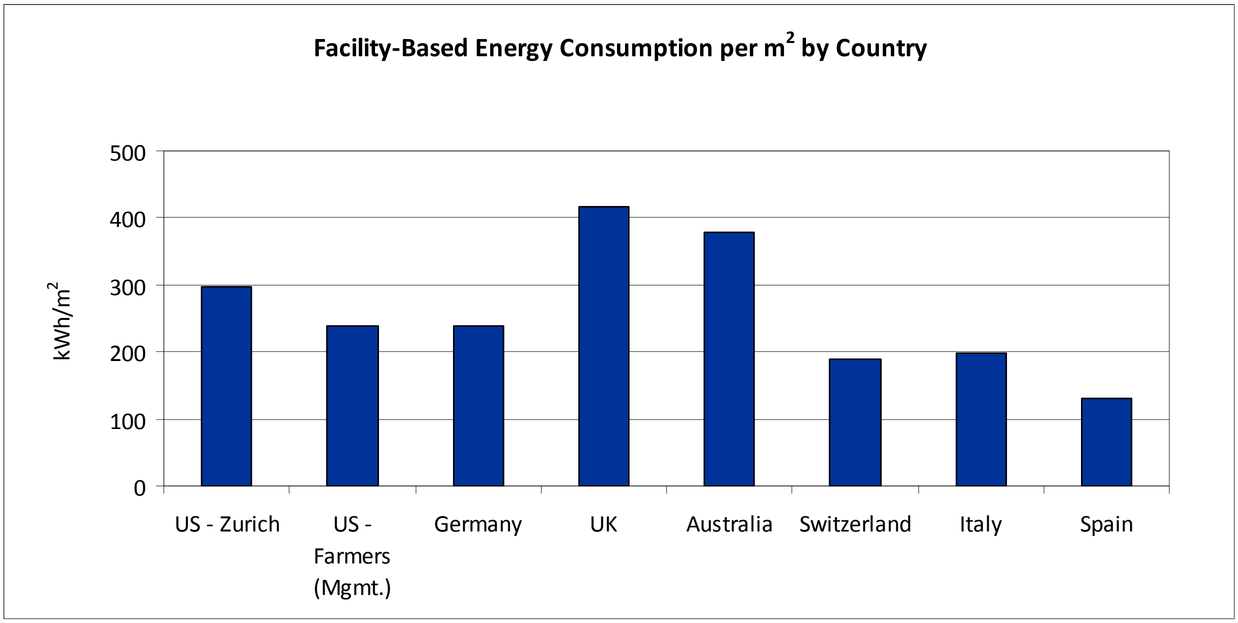

Figure 2.7: Facility-based Energy Consumption per m^2 of Building Area by Country

Figure 2.7 depicts energy efficiency (i.e., energy consumed (kWh) per building area (m^2)) within each country. More energy is required to power buildings in the U.K. and Australia than in Switzerland and Spain. For example, Australia has a smaller number of employees and lower energy consumption than other countries. The fact that Australia is characterized by high energy consumption per m^2 is indicative of inefficient operations. In contrast, Zurich's operations in Spain are relatively efficient. Although energy consumption in Spain in similar to that of Australia, approximately 40,000 more square meters are powered by such energy. Trends highlighted in Figure 2.7 further exemplify that solely analyzing absolute emissions by country may be misleading. For example, Australia accounts for only 3% of absolute group-wide emissions but has very inefficient operations. One must also consider the influence of biophysical factors (e.g., climate) on national energy consumption trends. Therefore, multiple factors must be considered when targeting countries for emissions reductions. Conducting energy audits at facilities may help discern the primary factors influencing observed energy consumption patterns (Refer to Section 5.2.3 for further discussion on energy audits).

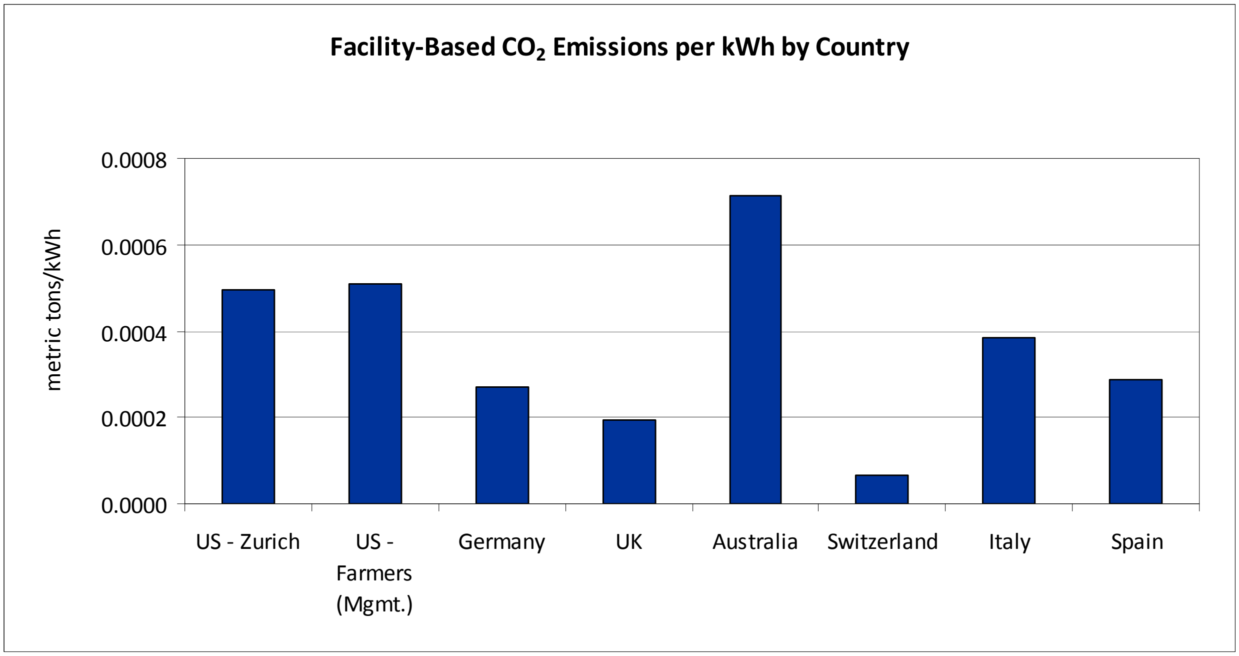

Figure 2.8: Facility-based CO_2 Emissions per kWh of Energy Consumption by Country

In addition to the trends noted above, calculating CO_2 emissions per kWh within each country (Figure 2.8) illuminated national variation in the carbon intensity of Zurich's facilities. This analysis is a direct indication of energy source. As discussed previously, Australia relies on carbon-intensive fuel sources, such as coal. Therefore, more CO_2 will be emitted for every kWh of energy consumed in Australia. Conversely, because Switzerland uses mostly renewable energy sources, very little CO_2 is emitted per kWh of energy consumed. Incorporating more renewable energy to power buildings in the U.S. and Australia will likely reduce the carbon intensity of Zurich's operations in these countries.

Air Travel:

Air travel is necessary due to the nature of the insurance business and the fact that Zurich is a multinational company. While eliminating air travel is not feasible, reducing the number and distance of flights is possible without sacrificing current business practices.

Zurich recently installed tele-presence rooms in Zurich's headquarters; therefore, we did not propose increasing teleconferencing to reduce air travel in Switzerland. Switzerland's emissions from air travel in 2008 are expected to be lower because of this new technology. Likewise, tele-presence rooms were recently installed in the U.S. (Los Angeles, CA, New York City, NY, Schaumburg, IL offices) and in the U.K. (London). We applied the same principle when developing recommendations for these sites. However, Zurich may install more tele-presence rooms throughout the U.S. (the largest contributor to group-wide emissions from air travel) and other countries or increase utilization of these rooms. We recommend that Zurich explore this option further in Australia, Spain, and other U.S. locations.

Leased Fleet:

Zurich's leased fleet contributes considerable emissions. The fleet is primarily used for site visits, and company cars are one component of employee benefits packages. While fleet use may not be reduced, emissions reductions can be realized by changing the fleet composition.

Rental Cars:

Although, rental cars do not contribute greatly to Zurich's group-wide footprint, emissions from this source are not negligible. Few countries use rental cars a great deal, while others do not use them at all. Therefore, our recommendations for emissions reduction from rental cars target the country with highest use, the U.S.

Measuring a company's carbon footprint is the first step in developing an effective GHG management and reduction strategy. As evidenced by the results presented above, each country contributes varying amounts to each emissions source. Therefore, we recommend approaching emissions reduction differently in each country, so as to achieve group-wide targets most efficiently. See Chapter 5 for a more detailed description of recommended mitigation strategies.

2.7 LIMITATIONS

We designed our Phase 1 carbon footprint calculation methodology, including calculation of indices and extrapolation to fill data gaps, with regular consultation with the client and per specifications of the WRI/WBCSD GHG Protocol. However, time and data constraints necessitated making several assumptions, which may limit the applicability of our results. Limitations of our analysis are outlined below.

i. Calculations based solely on 2007 data: It is possible that Zurich's 2007 operations, and associated emissions estimates, are anomalous. However, Zurich did not collect data prior to 2007, so a time series analysis was not feasible.

ii. Use of a static exchange rate: Mitigated through sensitivity analysis.

iii. Aggregated, country-specific indices used for facilities projections: Mitigated through sensitivity analysis.

iv. Application of generic emission factors: In some instances, the fuel mix specific to each building was detailed in data request responses. With this information, we were able to calculate the most accurate emission factor for use in footprint calculations. However, where we did not know the fuel source of the building, we applied a generic emission factor (from the WRI/WBCSD GHG Protocol). Generic emission factors are specific to each country but do not account for regional differences in generation technology and distribution efficiency.

v. Breakdown of electricity consumption not possible: As Zurich's reporting activities become more sophisticated, it may develop a way to separate energy consumption by source. For example, it may be able to track how much energy is consumed by lighting, IT, and HVAC within buildings. Lack of data limited our ability to do this. However, understanding the breakdown of consumption may lead to more specific and targeted reduction strategies.

vi Energy-water nexus not considered: We chose to focus only on the largest energy consuming processes at Zurich's leased and owned facilities. Because water consumption accounts for only a small portion of energy use by service-sector firms, we did not collect water consumption data. As a result, footprint calculations only reflect emissions from heat and electricity consumption in facilities. The scope of subsequent carbon inventories should be expanded to consider the link between water use and energy consumption.

vii Exclusion of employee commute travel: Zurich does not track employee commuting or private car use. Therefore, we did not include employee commute travel in our footprint analysis.

viii Normalizing carbon emissions only by number of full-time employees: Because human capital is one of the most important input factors in financial institutions, the number of employees is a primary determinant of the size of the carbon footprint for service-oriented companies such as Zurich. Hence, we chose to normalize carbon emissions only by number of FTEs and not by gross written premium or any other metric.

Despite these limitations, results from the carbon footprint calculation exercise can be combined with analysis of institutional and organizational frameworks, to assess the feasibility of implementing recommended carbon reduction strategies.

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[WBCSD] The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard-Revised Addition. 2007. Hot Climate, Cool Commerce: A Service Sector Guide to Greenhouse Gas Management. 2006. Both are prepared by the World Business Council on Sustainable Development and the World Resources Institute. Available at: http://www.ghgprotocol.org.

Chapter 3: Institutional & Organizational Frameworks—Theoretical Overview, Barriers, and Statistical Analysis

3.1 ORGANIZATIONAL BEHAVIOR & DECISION-MAKING OVERVIEW

Rationale

Multinational corporations, such as Zurich, do not operate in a vacuum. Both institutional and organizational factors influence organizational behavior (OB) and structure. OB and structure affect internal decision-making, especially decisions regarding implementation of voluntary "green" initiatives. A review of literature on the factors contributing to OB and structure, as well as those that contribute to progressive decision-making, elucidates the complex processes influencing Zurich's internal operations. Information specific to Zurich is detailed below. A more comprehensive description of OB theory applicable to the private sector is provided in Appendix 3.

In addition to examining factors within its corporate boundaries, Zurich must be cognizant of the institutional environment within each country in which it operates. The institutional environment, comprised of regulative, normative, and cognitive components, in large part defines the range of the organizational reality. As Andrew Hoffman, author of *From Heresy to Dogma*, states, "In setting strategy and structure, firms may choose action from a repertoire of possible options. But the range of options is bound by the rules, norms, and beliefs of the organizational field" (148). Consequently, Zurich's organizational field influences the degree of environmentally progressive behavior it displays group-wide and its emission reduction goals.

However, distinction should be made between a surface-level adoption of organizational trends and long-term OB change. As evidenced by our research of Zurich's competitors (See Section 4.1), companies may resemble one another in their visible adherence to evolving organizational norms, but their adoption of underlying values can vary greatly. Hoffman contends that firms may: (1) "adopt to organizational trends as a result of regulatory and normative compliance, thus leading to a symbolic adoption of standard practices and procedures" or (2) "incorporate emerging norms into the cultural foundations of the corporation and the individual roles of each of the firm's members." If Zurich strives to become an environmental leader in the financial services sector, it must adopt the latter approach and begin to "see environmental issues as something internally manageable rather than externally directed."

Schelling, in his book *Micromotives and Macrobehavior*, also discussed potential influences of OB. In contrast to Hoffman, Schelling focuses on drivers at a finer scale. Schelling states, "People's behavior depends on *how many* are behaving a particular way, or how much they are behaving that way." Our research on Zurich's competitors reveals similar statistics; benchmarking against similar service-oriented firms will likely fuel internal changes at Zurich.

Four additional factors that influence decision-making are (Schelling 1978):

- Order and timing of choices and the reversibility of choices
- Information about others' choices

- Signaling, bargaining, and organizing processes
- Custom, precedent, and imitation

These factors are most powerful when taken together, which requires coordination in time and place. Thus, improved coordination and integration within Zurich's operations may foster more progressive and rapid decision-making, especially with respect to environmental initiatives.

3.2 INSTITUTIONAL AND ORGANIZATIONAL BARRIERS

In addition to identifying major contributors to OB, structure, and decision-making, it is also important to ascertain organizational and institutional barriers hindering corporate environmental action. An assessment of barriers unique to the financial services sector and to Zurich follows.

Barriers and Disadvantages to "Greener" Corporate Behavior

EcoTech surveyed 600 financial institutions, including banks and insurance companies, in order to determine what each viewed as barriers or disadvantages to adopting "greener" corporate behavior.[26] The most common response, given by 58% of the companies surveyed, was the belief that "green" technology has a low return on investment. Other common barriers include: budget constraints, difficulty in making a "business case" for environmental initiatives, and a lack of urgency in updating existing IT infrastructure. As evidenced by survey results in Table 3.1, perceived hindrance to profit maximization underlies the most commonly cited reasons for not implementing "green" behavior.

Table 3.1: Barriers to Adopting Green Behavior

Barriers and Disadvantages to Greener Behavior in Financial Service Institutions	% of 600 Institutions Identifying Barrier or Disadvantage
Budgetary Constraints	55
Difficulty Making the Business Case	45
Lack of Urgency in Updating Existing IT Infrastructure	44
Absence of Regulatory Demands	25
Lack of Management Buy-in	21
Lack of Board Buy-In	13
Lack of Employee Buy-In	11
Belief that Green Tech has Low Return on Investment	58

The least-cited barrier noted is a "lack of employee buy-in." It may, therefore, be assumed that employees are not opposed to environmentally-sound corporate changes but rather are not properly positioned to make such decisions. If these companies operate in a top-down manner, behavior changes must be agreed upon by executives and filtered down to employees for

[26] EcoTech is a publication which conducted a research survey of 600 banks and insurance companies to assess environmental awareness and business practices in the financial services sector.

implementation. In order for executives to adopt environmental initiatives, proposed programs must demonstrate ancillary benefits, especially cost-savings and/or reputational enhancement. Information from the EcoTech survey provides insight as to how decisions regarding environmental programs are made within the financial services sector. Zurich, a financial services entity, is likely restricted by issues similar to those identified in Table 3.1. Consequently, when recommending CO_2 emission mitigation strategies for Zurich, we highlighted fiscal benefits the company will accrue if it decides to adopt such strategies.

Zurich-Specific Barriers to Implementation of Carbon Reduction Strategies

In addition to outside research and consultation with the client, responses to our qualitative questionnaire illuminated several barriers limiting Zurich's ability to adopt carbon reduction strategies (See Section 5.2.1 for more detailed analysis). Specifically, we designed the questionnaire (provided in Appendix 4) to gather information on: 1) environmental initiatives currently implemented in offices within each of the seven target countries and 2) obstacles preventing Zurich from taking further action. Some barriers apply to Zurich as a whole, while others are specific to certain countries in which Zurich operates.

Group-wide Barriers

Phase 1 – Carbon Footprint

- Zurich's ability to reduce its footprint is constrained by (CDP 2008):
  - Existing contracts for facilities leasing
  - Local power provider structures and associated regulatory structures
  - Legacy of the information management structure
- Zurich lacks an integrated system to catalogue in-house efficiency measures and, therefore, has a minimal understanding of what is/is not in place at each facility; consequently, it is difficult to assess energy-/cost-savings potential from installation of energy-saving equipment.
- Carbon emissions tracking and management systems and capabilities differ among Zurich's national business units (CDP 2008). This presents a challenge when estimating group-wide emissions and necessitates projections.

Phase 2 – Institutional and Organizational Frameworks

- Zurich is risk averse due to fiduciary obligations to shareholders. Therefore, as described in the beginning of Section 3.2, we must recommend cost-effective mitigation strategies.
- Zurich's large size makes it more difficult to overcome organizational inertia in order to adopt more environmentally friendly behaviors.
- Client stated that Zurich may encounter difficulty convincing executives to conduct energy audits in leased buildings. As a result, thorough analysis may be limited to owned buildings, the majority of which are in Germany and Switzerland.
- Zurich is unable to accurately predict how competitors will change behavior and operations in the future to further reduce emissions; thus, it is difficult to predict how Zurich will rank with respect to its competitors after implementation of CO_2 reduction strategies.

Phase 3 – Emissions Mitigation Strategies

- Because vehicles are part of executives' benefits packages and may act as status symbols, substitution for more compact, fuel-efficient vehicles may not be well-received. This assessment is supported by a client statement that Zurich managers may not be amenable to changes to the leased vehicle fleet.
- In the U.S., 95% of buildings are leased, and opportunities for substantial change at leased sites are limited. Most of Zurich's owned buildings exist in Germany and Switzerland (hence, these two countries have the most control over their buildings). Therefore, recommendations for facility-based changes will be limited to owned buildings in Germany and Switzerland.
- Zurich has full control over the buildings that it owns, and therefore can easily track emissions reductions and implement environmental initiatives in these facilities. The opposite is true for leased buildings, where Zurich has little control. However, due to cost, it is not reasonable to recommend that Zurich purchase more buildings in any country of operation in order to realize the above advantages.
- Most European buildings are old, and by default, less energy efficient than more modern or newly constructed buildings typical in the U.S. Additionally, the high cost of retrofitting old buildings may not be recouped from resulting energy efficiency benefits, at least in the short-term. Therefore, major retrofitting activities are not a feasible recommendation in many facilities. In facilities where structural changes are cost-prohibitive, we recommend targeting smaller scale energy efficiency strategies (e.g., upgrading light bulbs and IT equipment).
- As a primary insurance company, Zurich must make site visits; thus, substantial travel is integral to effective business operations and opportunities to reduce travel are limited.

Country-Specific Barriers

Country-specific barriers detailed below will be built upon in Section 5.2.1.

Switzerland:

- Because Zurich, Switzerland, is the corporate headquarters, reducing air travel to/from this location will be difficult. Therefore, a recommendation to travel less is illogical, because travel is a fundamental component of Zurich's multinational business operations. Focusing on benefits from newly installed tele-presence rooms is more appropriate.

United States:

- Cars are required in most of the U.S. (rental cars for travel and leased cars for site visits). Therefore, reducing driving or the size of the leased fleet may not be possible.
- In the U.S., property leases are all-inclusive; therefore, building occupants do not pay electricity and heating bills separately and cannot assess differences in energy consumption between processes.
- Per conversation with our client, it is not feasible for Zurich to buy or own a larger share of facilities due to tax purposes. Paying a mortgage, a down-payment, and property tax is not

cost-effective compared to paying rent. This is especially true if Zurich has a discounted long-term rent contract with its property management company.

- Determining energy (kWh) savings from leased buildings within the U.S. is not feasible, because Zurich's energy costs are not presented separately in its monthly bill. Aggregation of costs prevents Zurich from realizing monetary savings from reduced energy consumption, which lessens the incentive to adopt energy efficiency programs. Additionally, it may be impossible in some facilities to separate Zurich's energy use from that of other tenants.

Zurich faces several barriers to adopting environmentally friendly initiatives. We considered these group-wide and national barriers when recommending carbon mitigation strategies and tailored recommendations to business units in each country.

<u>Tenant – Landlord Barriers to Implementation of Energy Efficiency Initiatives</u>

Barriers also exist that specifically affect Zurich's leased facilities and its ability to negotiate energy efficiency programs with property managers. In a multi-tenant commercial office building, determining which party pays for energy efficiency retrofits and which party enjoys the resulting energy cost reductions, or carbon savings, is not straightforward (Sinreich 2008).

In a traditional commercial office lease, the method of allocating capital costs and operating expenses between tenants and landlords often provides a disincentive to the landlord to invest in energy-saving initiatives. Typically, the key leasehold provisions that must be evaluated are those which govern whether the cost of the energy efficiency upgrade may be passed through to the tenants and those which govern whether the landlord and/or the tenants receive the reward of lower energy costs. Before leasing a building, Zurich should conduct a detailed survey of all environmental and energy-related issues to select a site that is, or can become, a high-performance/energy efficient building (DOE 2008).

Within the U.S., most commercial office leases do not permit building owners to pass through capital costs to tenants. Thus, in most cases, the costs incurred to implement facility-wide energy retrofits are directed at the landlord. In some leases, however, the landlord is able to pass through capital costs for building improvements that result in lowering the building's operating expenses. It is important that Zurich identifies leases that do not penalize the landlords or create disincentives to undertaking energy efficiency projects. This particularly applies to capital expenditures that lower the building's energy consumption costs. Even if this pass-through of capital costs is permitted, the landlord will not be able to pass through the costs in the year that they were incurred but will amortize them over a number of years, typically the useful life of the improvements (Sinreich 2008). Zurich's facilities may also be managed by a few property management companies, and direct negotiation with these companies may result in a smoother transition to energy efficiency improvements (See Section 8.1.2).

Ultimately, to determine whether the landlord or tenant will enjoy the benefits of lower utility bills, the lease provisions governing how the building's operating expenses are allocated between landlord and tenant must be evaluated. An ideal commercial office lease may include a variation on the following: the landlord is responsible for a base amount of each year's building operating expenses, and the tenant is responsible for its share of increases in the building operating expenses over that base amount.

The method of computing the "increased expenses" to which the tenant must contribute varies from lease to lease. In some cases, the actual increase in building-wide operating expenses is applied. When the tenant's obligation to contribute to yearly building-wide operating expenses is based on actual increases, the tenant, not the landlord, benefits from reduced energy costs. This sometimes results in what is referred to as a "split incentive": the landlord pays for the capital cost of implementing the energy efficiency initiative, but the tenant reaps the financial reward of lower energy consumption. This option should be considered as a top preference by Zurich.

Alternatively, the "increase" may be based on different indicators of inflation, such as fluctuations in the Consumer Price Index (CPI) (Sinreich 2008). Under these conditions, the landlord can pass through the capital costs of the energy-saving initiative (Sinreich 2008). Consequently, the landlord receives the financial rewards of reduced energy costs, while the tenant incurs some of the economic burden of implementing energy-saving initiatives.

Further complicating the analysis is the fact that, in a multi-tenant office building, the allocation of capital costs and building-wide operating expenses between landlord and tenants will vary by tenant. Variation stems from changes in market conditions and tenant characteristics at the time of lease negotiation. In most cases, the energy bill cannot be divided between multiple tenants, and it is currently impossible for Zurich to know its share of total facility energy consumption. Thus, a careful analysis of each lease must be undertaken to project the flow of funds in connection with implementing an energy-saving initiative in a multi-tenant office building. Only then can a building owner perform a cost-benefit and payback analysis to determine if the capital expenditure that is necessary to achieve the desired energy efficiency makes economic sense. Furthermore, it is crucial for Zurich to know how much it reduced energy consumption to report carbon emission reductions accurately.

Finally, commercial office leases may be designed to facilitate energy efficiency improvements. Attention must be paid to allocating the costs and benefits for energy efficiencies between landlord and tenant in a manner that incentivizes the landlord to make the investments necessary to implement those initiatives. This way, both parties can enjoy a more energy efficient building.

Conclusions & Recommendations

Specific conclusions and recommendations from our analysis of institutional and organizational barriers follow:

- As evidenced by the EcoTech survey of 600 financial services institutions (many of which have operations in the seven countries targeted in this analysis), long payback periods, budget constraints, and lack of urgency pose obstacles for rapid innovation, both in terms of technology and core competency/company culture.
- Traditional incentive structures (e.g., provision of luxury cars for executives), lease arrangements (the majority of which are all-inclusive), and corporate structure (which detracts from efficient emissions tracking and reporting and identification of energy efficiency measures currently in place at each site) also present challenges.

- Therefore, we recommend that Zurich first focus its mitigation efforts on initiatives yielding immediate cost-savings or providing obvious reputational benefits.
- After establishing the "business case" for emissions mitigation and gaining acceptance at all management levels, we suggest introducing more aggressive (and costly) mitigation measures in the seven target countries. These countries provide an ideal test bed for innovation given that they are characterized by institutional factors which foster "green" initiatives and that, together, they account for nearly 75% of Zurich's FTEs.

3.3 STATISTICAL ANALYSIS

Rationale & Objectives

Recognizing that corporate culture (including the organizational barriers noted in Section 3.2) and institutional setting impact the degree of adoption of mitigation initiatives, we aimed to identify feasible strategies for reducing Zurich's GHG emissions given these factors. We utilized a two-sample t-test (assuming unequal variances) to address the following question: How do institutional factors explain differences in Zurich's implementation of environmental initiatives?

Results of the statistical analysis allowed our group to tailor recommendations to Zurich by: (1) expanding the 7-country analysis to a 50-country analysis, which is more representative of Zurich's global operations, (2) identifying countries in which Zurich is most likely to introduce mitigation programs, and therefore, (3) helping us differentiate our recommended mitigation strategies based on country category to ensure opportunities are maximized in all business units. Conclusions and recommendations from our statistical analysis are presented below. For a detailed discussion of the data sources, analytical methodology, and results, see Appendix 5.

Conclusions & Recommendations

Results of this analysis will help determine the feasibility of introducing carbon mitigation strategies in Zurich's varied national business units. Specific conclusions and recommendations based on results of our statistical analysis follow:

- Only two institutional factors explain differences in Zurich's implementation of environmental initiatives. These are the degree of development and GDP/capita.
- These factors are moderately correlated ($r = 0.383$), as developed nations with stronger economies tend to be characterized by higher earning citizens.
- Variation in the demonstration of corporate environmentalism is logical, as developing countries are more likely focused on economic growth than on sustainable/ environmentally sound operations.
- Therefore, we recommend that Zurich differentiates its mitigation approach based on country category.
    - In developing countries characterized by lower GDP/capita, Zurich should implement cost-saving mitigation measures. Although Zurich has not traditionally pursued environmental initiatives in developing countries, Zurich should expand its climate strategy to include such nations, thereby expanding employment opportunities in these locations.

- In developed countries characterized by higher GDP/capita (such as the seven countries targeted in our analysis), Zurich should strive to implement more ambitious mitigation measures (with higher upfront costs and longer payback periods).

Chapter 3 References:

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Chapter 4: Institutional & Organizational Frameworks—Competitor Benchmarks, Regulatory Overview, and Emissions Mitigation Targets

4.1 PROFILE OF ZURICH'S COMPETITORS

4.1.1 Rationale

Examining the carbon reduction strategies and environmental performance of other financial service companies provided benchmarks and helped us select group-wide emissions reduction targets. We were also able to identify effective reduction strategies already implemented by competitors. Zurich could potentially implement similar strategies in the future, including changes in procurement options and employee behavior.

4.1.2 Benefits to Zurich from Benchmarking with Competitors

Identifying emissions reduction targets, similar to those achieved by its competitors, will motivate Zurich to manage its carbon footprint. If Zurich improves its environmental performance, it will most likely improve its efficiency and operational effectiveness.

We ranked Zurich by absolute CO_2 emissions, by CO_2 emissions per employee (tons/yr), and by CO_2 emissions per total revenue. By comparing itself to competitor benchmarks, Zurich will be in a position to advance its environmental performance relative to the industry.

4.1.3 Research

Zurich identified the following 18 leading financial services companies as its key competitors:

- ACE Ltd
- Aegon Group
- Aflac Inc.
- AIG
- Allianz Group
- Allstate Corp.
- Chubb Group
- Hartford Financial Services
- ING Group
- Lincoln National
- Loews
- Manulife
- Munich Re
- Progressive Corp.
- Prudential Financial
- Travelers Companies Inc.

- Sun Life Financial
- Swiss Re

For each of these competitors, we collected the following information:

- Measurement of emissions (Y or N)
- Publication of an Annual Report (Y or N)
- Publication of additional disclosures such as Carbon Disclosure Project (CDP) questionnaires, Corporate Social Responsibility (CSR)/Corporate Responsibility (CR)/Sustainability Reports, and/or Environmental Statements (Y or N)
- Establishment of targets (Y or N)
- If so, what type of targets (relative vs. absolute)
- If so, what type of metric is used to measure targets (CO_2 metric tons or CO_2e metric tons)
- Current group-wide emissions (divided by Scopes 1, 2, & 3)
- Number of full-time employees (FTE)
- Emissions per employee (CO_2e metric tons/empl)
- Report of an actual footprint reduction
- Purchase of offsets (Y or N)
- If so, total cost of offsets purchased
- Commitment to carbon neutrality (Y or N)
- Key reduction strategies by company
- Additional environmental initiatives undertaken by each competitor (e.g., partnerships with environmental groups)

We then looked at three of these 18 competitors in detail: Swiss Re, ING Group, and Allianz Group. We targeted these three companies because they are characterized by operations, services, and/or locations similar to those of Zurich; all three companies exhibit leadership in the industry in terms of their environmental initiatives and thus serve as models for Zurich - specifically, Swiss Re and ING Group are carbon neutral and have been so since 2003 and 2007; all have partnered with numerous environmental groups and have been reporting their GHG emissions for over 10 years; and all publish annual reports, CSR/CR/Sustainability reports, and CDP reports. Our research focused primarily on environmental initiatives already undertaken by each company, as well as their established short- and long-term goals. We also summarized relevant content of the main and most current reports published by each company, including CDP responses where applicable. References consulted for this section of the project are listed in Appendix 6.

The last part of our research focused on ranking Zurich (including FIG) and its 18 main competitors with respect to each company's current absolute emissions, emissions per employee and emissions per total revenue (metric tons/yr). The company with the lowest emissions was assigned the number one and the company with the highest emissions was assigned the number 14. Competitors that do not report emissions per employee (i.e., Chubb Group, Lincoln National, Loews, Progressive Corporation, and Sun Life Financial) were excluded from the ranking. It should be noted that certain competitors (i.e., Aflac Inc., Manulife, Prudential Financial, and Travelers Companies, Inc.) do not report emissions from all three scopes, and their reported CO_2 values are expectedly lower than companies who report emissions from all scopes. This may cause a skewing in the ranking. Ranking of Zurich and its main competitors was only performed using baseline emissions. Because it is not possible to predict competitors' future CO_2 emissions, we were limited to a comparison of Zurich's position relative to its competitors currently and after achieving its emissions reductions. We are aware of the likelihood that competitors will continue or begin to implement their own carbon reduction strategies in the future.

4.1.4 Results & Analysis

Mitigation Measures

We then developed possible mitigation strategies for Zurich based on our benchmarking research and the environmental initiatives of its competitors. These measures served as examples of programs and policies Zurich could adopt to reduce emissions. Examples included: company-wide reuse and recycling campaigns, employee awareness workshops for energy efficiency, company-wide environmental policies, and partnerships with environmental and other non-governmental organizations to facilitate development of an internal environmental management system. [27]

We then researched competitors' initiatives to reduce electricity consumption and promote efficiency to create a menu of mitigation recommendations that could be applied to Zurich to reduce facility-level energy use and emissions. Examples include: upgrades to lighting, heating, and cooling systems; installing presence detection devices in offices, as well as room motion light controls; use of mercury-free fluorescent lighting and window tinting; and, workplace design and operations including smart landscaping. We also considered competitors' purchases of renewable energy and carbon offsets to determine the main projects competitors have invested in for both sets of purchases, and the rationale for competitors' choices.

This analysis enabled us to formulate recommendations for Zurich when suggesting they switch to cleaner forms of energy and/or purchase offsets for emissions that cannot be reduced. Other initiatives undertaken by competitors that may contribute to our menu of recommended measures include: energy audits, building according to LEED/Energy Star specifications, and choosing sites to lease based on LEED/Energy Star building certifications. Finally, Zurich could install water recycling programs where possible, construct green roofs, and allocate funds to enable employees to commute to work using public transportation and/or carpooling.

Reporting and Target Setting

We analyzed the reporting and target setting activities of Zurich's identified competitors. Of Zurich's 18 main competitors, 13 measure their emissions. These companies include: ACE Ltd,

[27] Environmental and other non-governmental organizations consulted include: Climate Wise, Climate Trust, Climate Group, Climate Resolve, 3C Combat Climate, Columbia University (Global Roundtable on Climate Change), UNEP, World Resources Institute, WWF and the Energy Resources Group. Examples of partnerships are the United States Climate Action Partnership and EPA's Green Power and Climate Leaders Partnership Programs.

Aegon Group, Aflac Inc., AIG, Allianz Group, Allstate Corporation, Hartford Financial Services, ING Group, Manulife, Munich Re, Prudential Financial, Swiss Re, and Travelers Companies, Inc. Four companies (i.e., Chubb Group, Lincoln National, Loews, and Progressive Corporation) do not measure their emissions, and one (Sun Life Financial) is in the process of doing so. Of the 13 that measure their emissions, only 12 also publish at least one form of report (e.g., Annual, CSR/CR/Sustainability, or Environmental).[28] Lincoln National, Loews, and Sun Life Financial also publish reports unlike the Chubb Group and Progressive Corporation.

While 13 companies measure their emissions, only six (i.e., ACE Ltd, Aegon Group, Allianz Group, Manulife, Munich Re, and Swiss Re) have set emissions reduction targets, and an additional two (i.e., Travelers Companies, Inc. and Sun Life Financial) are developing such targets. Of those companies that have established targets, five (i.e., ACE Ltd, Aegon Group, Allianz Group, Munich Re, and Swiss Re) have set absolute targets, while Progressive Corporation has set a relative target. Group-wide emissions reduction targets from the six companies previously mentioned vary from a 15% reduction by 2009 to a 50% reduction by 2013. Emissions reductions per employee targets range from 8% by 2006-2012 to 10% by 2008.

Three competitors, ING Group, Munich Re, and Swiss Re, are committed to carbon neutrality. Both Swiss Re and ING Group have achieved carbon neutrality since 2003 and 2007, respectively. Munich Re aims to achieve group-wide carbon neutrality by 2012. These three, as well as Aegon Group, AIG, Allianz Group, Allstate Corporation, and Chubb Group, all purchase carbon offsets, but only AIG reports the cost of these purchases. The remaining 10 competitors do not purchase offsets.

As previously mentioned, we conducted three in-depth case studies targeting Allianz Group, ING Group, and Swiss Re. To compare initiatives taken, emissions reductions achieved, and reduction targets set by these companies with those of Zurich, we normalized emissions by the number of FTEs. The number of FTEs by company for 2008 is provided in Table 4.1. Swiss Re has 1/5 the number of employees as Zurich, whereas ING Group and Allianz Group employ approximately two and three times the number of individuals as Zurich, respectively. Of the 18 competitors analyzed, only Aflac Inc. and Munich Re are characterized by a number of FTEs similar to Zurich.

Table 4.1: Number of FTEs (2008)

Company	Number of FTEs
Allianz Group	181,200
ING Group	130,000
Swiss Re	11,702
Aflac Inc.	69,000
Munich Re	43,000
Zurich	58,035

[28] Excluding Aflac, Inc.

We first ranked Zurich and its 18 competitors with respect to company-wide absolute CO_2 emissions. Zurich ranks 10th out of the 14 competitors that report company-wide emissions (See Table 4.2). We ranked the company with the lowest absolute emissions (Aflac Inc.) first and the company with the highest absolute emissions (AIG) 14th. We omitted the five competitors that have not been reporting emissions (Chubb Group, Lincoln Financial, Loews, Progressive Corp. and Sun Life Financial) from the analysis.

Table 4.2: Ranking of Zurich and its 13 Competitors Currently with respect to Company-wide Absolute Emissions (metric tons CO_2/yr)

Competitor	Absolute Emissions (metric tons CO_2/yr)	Ranking
Aflac Inc.	38,348	1* *
ACE Ltd	45,468	2
Travelers Companies Inc.	73,679	3* *
Swiss Re	89,839	4
Aegon Group	98,852	5
Prudential Financial	100,990	6**
Manulife	110,192	7**
Munich Re	186,625	8
ING Group	210,315	9
Zurich	**224,011**	**10**
Hartford Financial Services	232,807	11
Allstate Corp.	310,085	12
Allianz Group	709,005	13
AIG	1,177,538	14

**Emissions from one or more scopes not reported.

We also ranked Zurich with respect to total emissions per employee. Currently, Zurich ranks seventh out of 14 financial services companies, with 3.84 metric tons CO_2 per employee (See Table 4.3). We determined ranking order and omission of companies based on the same criteria used in our analysis of company-wide absolute emissions.

If Zurich reduces its emissions below 2007 (baseline) levels, it may improve its ranking within the industry. Eventually, Zurich could emerge as a leader in carbon measurement and reduction among its competitors, with an ultimate goal of becoming carbon neutral.

Table 4.3: Ranking of Zurich and its 13 Competitors Currently with respect to Company-wide Emissions per Employee (metric tons CO_2/yr)

Competitor	Emissions/Employee (metric tons CO_2/yr)	Ranking
Aflac Inc.	0.56	1* *
ING Group	1.62	2

Travelers Companies Inc.	2.21	3* *
Prudential Financial	2.56	4* *
ACE Ltd.	2.84	5
Aegon Group	3.09	6
Zurich	**3.84**	**7**
Allianz Group	3.91	8
Munich Re	4.34	9
Manulife	5.01	10* *
Hartford Financial Services	7.51	11
Swiss Re	7.68	12
Allstate	8.38	13
AIG	10.15	14

**Emissions from one or more scopes not reported.

Lastly, we ranked Zurich and its competitors with respect to total emissions per total revenue (USD) for 2007. Currently, Zurich ranks 10th out of the 14 competitors considered, with 4.34 metric tons CO_2 emissions per total revenue (See Table 4.4). We ranked the company with the lowest emissions per total revenue (ING Group) first and the company with the highest emissions per total revenue (AIG) 14th. Similar to the previous two ranking schemes, we omitted Chubb Group, Lincoln Financial, Loews, Progressive Corp. and Sun Life Financial from our analysis because these companies do not report emissions.[29]

Table 4.4: Ranking of Zurich and its 13 Competitors Currently with respect to Company-wide Emissions per Total Revenue (metric tons CO_2/yr) for 2007

Competitor	Emissions/Total Revenue* (metric tons CO_2e/yr) 2007	Ranking
ING	0.99	1
Aegon Group	1.52	2
Swiss Re	2.45	3
Aflac	2.49	4**
Travelers	2.83	5**
Prudential Financial	2.94	6**
ACE	3.21	7
Munich Re	3.27	8
Manulife	3.85	9***
Zurich	4.06	10
Allianz	5.41	11

[29] Data for companies' total revenue was extracted from their 2007 financial statements or, if such statements were unavailable, from Reuters.com or values reported by the New York Stock Exchange. Exchange rates used to convert currency to USD came from msn.money (http://www.moneycentral.msn.com.) on February 15, 2009.

Allstate Corp.	8.43	12
Hartford Financial Services	8.98	13
AIG	10.7	14

*Total revenue of all competitors based on 2007 USD.
**Emissions from one or more scopes not reported.

4.1.5 Recommendations

Having identified competitors' emissions reduction targets (ranging from 5% by 2009 to 50% by 2013), we formulated several target ranges for Zurich in line with sector standards. Example target sets include: 15%, 25%, and 40%; 10%, 30%, and 50%; 15%, 30%, and 45%; and 15%, 30%, and 50%. We based our target timelines on those set by competitors; the lowest, middle, and highest targets correspond to 2012, 2016, and 2020, respectively. Allianz Group has 181,200 employees and reports a goal of 20% group-wide emissions reduction by 2012, while Prudential Financial, with 39,422 employees, reports a 30% group-wide emissions reduction by 2012. Zurich, with 58,305 employees, (more than Prudential Financial), may have difficulty reducing group-wide emissions by 30%. However, because Zurich has fewer employees than Allianz Group, it may be easier for Zurich to achieve a target similar to that of Allianz. Therefore, to ensure Zurich achieves substantial reductions and meets/exceeds competitor targets, we recommended that Zurich reduces its CO_2 emissions by 15%, 30%, and 50%, relative to 2007 levels (baseline), by 2012, 2016, and 2020, respectively. The least stringent target set by competitors was 15%, whereas 50% was the most stringent target set by competitors; 30% represents an intermediate target.

Competitors' targets regarding emissions reductions per employee range from 8 to 10% by 2009 to 2012. ACE Ltd, with 16,000 employees, reports reduction targets of 8% per employee, whereas Munich Re and Aegon, with 38,634 and 30,000 employees, respectively, report reduction targets of 10% per employee. Zurich should, therefore, also aim to reduce its emissions per employee by 8% to 10% by 2012. It should be noted that with 58,305 employees, even an 8% emissions reduction target per employee will result in a greater overall reduction for Zurich than for ACE Ltd, assuming current emissions levels for both companies are similar.

Zurich may choose to set absolute emissions targets, (as exhibited by ACE Ltd, Aegon, Allianz Group, Munich Re, and Swiss Re), or a combination of relative and absolute targets (as suggested by our client).

4.1.6 Conclusion

Zurich currently ranks 10th among its competitors with respect to absolute emissions and seventh with respect to emissions per employee, thus placing it slightly below average in its sector. Achievement of recommended reduction targets (15%, 30%, and 50% below 2007 levels by 2012, 2016, and 2020, respectively) will better position Zurich relative to its competitors and, thus, improve its competitiveness and fulfill its public commitment to reduce group-wide emissions.[30] Additionally, assuming a proactive stance towards emissions mitigation will prepare Zurich for future climate change regulation affecting the financial services industry.

4.2 EMISSION REDUCTION TARGETS BY COUNTRY

4.2.1 Rationale & Objective of Analysis

After setting group-wide reduction targets for Zurich, we conducted research to guide our allocation of emissions reductions among the seven target countries. We assessed climate change and energy regulations in the seven target countries to align our mitigation recommendations for Zurich's operations in each of these countries with national policies.[2] Analysis of regulations and short- and long-term targets helped gauge the ease of implementing mitigation strategies given varied national, corporate, and governance frameworks and barriers. Regulations and targets identified also helped us determine how stringent emissions reduction targets and mitigation measures could be in each country.

4.2.2 Research

The following information was collected for all seven target countries:

- Kyoto targets, if applicable
- National emissions reduction strategies (or similar initiatives implemented)
- Additional public commitments

Research was primarily based on each country's most recent climate change strategy, as outlined by their respective Environment Ministry or head environmental agency. References are provided at the end of this chapter. The analysis for each of the seven target countries is presented in Section 4.2.3 in order of highest to lowest emitter (with respect to absolute emissions). For a more detailed discussion of each country's, and each state's (where applicable) climate change targets and initiatives, please refer to Appendix 7.

4.2.3 Results & Analysis

Regulatory Overview

United States

Because the U.S. is responsible for the greatest amount of Zurich's emissions, Zurich must investigate state policies and regulations, as no federal GHG emissions reduction targets currently exist.

In the 1992 Framework Convention in Rio de Janeiro, the U.S., under the presidency of George W. Bush, agreed, in principle, to work with other nations to bring about the "stabilization of GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic human-caused interference with the climate system" (UNFCCC 1992). However, the

[30] It should be noted that Zurich's future ranking, relative to its competitors, will be dependent on emissions reduction measures undertaken by Zurich's competitors.

Framework Convention was completely voluntary and the U.S. was not legally or formally bound to any enforceable reduction standard. At present, the U.S. has still not ratified the Kyoto Protocol and has not demonstrated a definitive federal commitment to reduce GHG emissions.

The newly elected administration, under the leadership of President Barack Obama, is more likely to introduce both federal regulations and incentives for individuals and corporations to become more energy efficient and use alternative/renewable energy.

The Energy Independence and Security Act of 2007 focuses, in large part, on fuel efficiency for automobiles in the form of increased CAFÉ standards to require automakers to boost fleet-wide gas mileage to 35 mpg by 2020 and incentives to develop hybrids. The act also calls for an increase in the production of biofuels. Other moderate measures call for an increase in efficiency of light bulbs and the reduction of fossil fuel use in federal buildings 2007.[31] While a step in the right direction, many would argue that the objectives are not aggressive enough, asking for relatively small changes in a time period that is much too long to address the pressing issues related to climate change.

Despite the lack of federal leadership, individual states and state leaders (governors and mayors) have been taking the lead to set emissions reduction targets. California has set the most aggressive reduction targets and energy policy reforms in the country; however, other states, including Florida, Hawaii, Maryland, Minnesota, New Jersey, Oregon, and Washington have also established reduction targets and are implementing their own regulations for the transport sector (Union of Concerned Scientists (UCS) 2008). A more detailed analysis of state-level targets and regulations can be viewed in Appendix 6.

Application to ZNA & Farmers

With the new administration under President Barack Obama, the possibility that the U.S. will ratify Kyoto and/or establish federal reduction targets for GHGs is higher. However, because there is currently large variation in state policies, Zurich will have to focus on individual state policies and energy options. Therefore, any action taken by Zurich's facilities in the U.S. might pre-empt future national and state legislation.

Zurich will be able to take advantage of fuel efficient vehicle options (including hybrids) for rental cars and vehicles leased to executives. Alternative energy generation is also expanding in the U.S. (UCS 2008). Therefore, Zurich may more easily obtain part or all of its electricity and/or heat from renewable sources (especially in Zurich's offices in environmentally proactive states, such as California). Zurich and Farmers can also use their leverage (depending on how much space they occupy in specific buildings) to promote energy efficiency and purchase of renewable energy in the buildings they occupy.

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[31] Information on the Energy Independence and Security Act is available at the White House website: http://www.whitehouse.gov/news/releases/2007/12/20071219-1.html.

United Kingdom

Regulatory Overview

The U.K. has a Kyoto target of reducing its emissions 12.5% below 1990 levels between 2008 and 2012 (Europa 2006a).[32] Furthermore, in late 2008, the U.K. passed the Climate Change Act (CCA), which set a goal of reducing national net carbon emissions by at least 80% below the 1990 baseline by 2050 (CCA 2008). The world's first long-term, legally binding climate change framework, the CCA, reinforces the U.K.'s existing domestic goal of achieving a net U.K. carbon reduction of 20% below 1990 levels by 2010 (CCA 2008). The U.K. is also an active member of the EU Emissions Trading Scheme (EU ETS), under which it is set to achieve an emissions reduction of 23 to 25% by 2010 (Europa 2008). The U.K. is the only EU member state with a national ETS.

Application to Zurich U.K.

The U.K. is characterized by ambitious domestic emissions reduction goals, which are significantly above its Kyoto target. The U.K.'s CCA indicates the government's willingness and ability to exceed what is legally required to successfully reduce the country's contribution to climate change. Therefore, Zurich U.K. can justifiably be targeted with stringent reduction targets and ambitious mitigation measures. However, because Zurich U.K has been measuring and managing its emissions longer than Zurich's other national business units, opportunities for further reductions must involve large-scale changes.

Furthermore, the U.K. is the only country considered in this analysis with a domestic ETS (U.K. ETS). Its active involvement in carbon trading, and the leadership it has exhibited in the matter, indicate its familiarity with the requirement to pay for the right to emit. In addition, London residents are particularly familiar with being taxed for pollution through the London Congestion Charge, which is now set at £8 per day between the hours of 7am and 6pm (Transport for London 2008). Zurich may, therefore, wish to consider a bubble scheme for reducing emissions throughout U.K. offices or even a bubble scheme for Zurich's EU offices, beginning with the five European countries targeted in this initial footprint analysis (i.e., Germany, Italy, Spain, Switzerland, and the U.K.).

Finally, both the EU and U.K. renewable energy targets aim to substantially increase the amount of renewable energy produced nationally. Wind farms are already common in the U.K. (BWEA 2007). Therefore, where feasible, we recommend that Zurich invests in wind farms in the U.K. and obtains a significant portion of its electricity from such farms to fuel its U.K. offices.

Germany

Regulatory Overview

Of the five European countries highlighted in our footprint analysis, Germany has agreed to the greatest Kyoto reduction target. It aims to reduce emissions by 21% below 1990 levels between

2008 and 2012 (FMENCNS 2008).[32] By 2020, Germany strives to reduce its domestic CO_2 emissions by 40% below 1990 levels, pending an agreement by the other EU member states to reduce 30% of EU emissions over the same period (FMENCNS 2007). These targets are supported by a considerable list of initiatives that may help Germany regain its once leading economic position within the EU.

Application to Zurich Germany

Germany's broad list of domestic initiatives is suggestive of its proactive environmental stance and ability to move beyond status quo regulations. Given that Germany has set the most ambitious renewable energy targets of the five EU member states highlighted in this project, our recommendations for Zurich Germany include increased purchase of renewable energy for facilities. Germany's cold, windy climate makes it particularly suitable for wind farms, and the necessary infrastructure is already in place. Germany also has a strong focus on biofuels. Recommendations could, therefore, include suggestions of consuming heat and electricity generated from biofuels at Zurich Germany's offices.

It is also worth noting that Germany is a large manufacturer of cars including Audi, BMW, Mercedes-Benz, Porsche, and Volkswagen. Sustainability of these automobile companies requires abiding by both domestic and EU regulations, which seek to reduce vehicle emissions per kilometer. As such, we recommend purchase of cleaner, more energy-efficient rented and leased vehicles for Zurich Germany employees and executives as they become available.

Switzerland

Regulatory Overview

Switzerland's Kyoto target is the second lowest of the five European countries considered in our analysis. Switzerland aims to reduce emissions 8% below 1990 levels between 2008 and 2012 (Europa 2006a).[32] Its domestic targets are slightly higher, requiring a 10% reduction below 1990 levels by 2010 (UNFCCC 2005).

Application to Zurich Switzerland

Switzerland already derives a considerable amount of energy from renewable sources, especially hydroelectric and nuclear. Consequently, opportunities for further emissions reductions from clean energy are minimal. Switzerland's progressive environmental record and its leadership regarding the consumption of renewable energy justify our assignment of particularly stringent targets and mitigation strategies for Zurich Switzerland. Switzerland could benefit from increasing the use of facility-level energy efficiency measures, especially since such measures

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[32] Under the Kyoto Protocol's "common but differentiated responsibilities" principle, developed nations including most European Union (EU) member states are faced with a heavier burden than developing nations. According to the June 1998 Burden Sharing Agreement, this burden is divided unequally among nations. For example, most member states share EU's overall reduction target of 8% by being allocated different national reduction targets based on each country's current level of emissions, the opportunities for reducing emissions, and the national level of economic development. This Burden Sharing Agreement also includes Switzerland, which is bound by the Kyoto Protocol but is not an EU member state (UNFCCC 2007).

support Switzerland's Swiss Energy Program and its domestic targets. The nation's historically "green" record and disciplined nature suggest that Zurich Switzerland is well-positioned to lead the company's group-wide emissions reductions.

Australia

Regulatory Overview

Until recently, Australia has been one of the largest developed countries, along with the U.S., to resist ratifying the Kyoto Protocol. For the past 11 years, under former Prime Minister John Howard, Australia has lacked a national policy to address the environment or climate change. In the recent 2008 election, Kevin Rudd was elected the new Prime Minister. Unlike the previous Prime Minister, Prime Minister Rudd immediately ratified Kyoto and committed Australia to a long-term emissions reduction target of 60% below 2000 levels by 2050 (The Prime Minister of Australia 2008).

Application to Zurich Australia

Operating in a country with little or no environmental policy means that Zurich's Australia offices will now have to adopt aggressive measures to tackle climate change, such as powering buildings with alternative energy sources. This may be easier now than in the past, since the country exhibits a goal of transitioning from a coal-dominated fuel mix to use of cleaner alternative and renewable energies (Energy Supply Association of Australia 2008). Furthermore, the new administration has implemented a cap-and-trade system to encourage businesses to reduce carbon emissions; this system may present Zurich with an opportunity for financial gains in the future. By lowering emissions, Zurich Australia's offices could sell remaining pollution permits, thus generating revenue.

Other environmental opportunities for Zurich Australia include water conservation activities. Reducing water use also reduces energy consumption, and hence emissions generation, within buildings. Australia is one of the world's driest continents and may suffer dramatically from a water shortage from the enhanced effects of climate change. Water-saving measures, such as better management of irrigation schedules through sub-metering and landscaping with less water-intensive plants, may simultaneously yield cost-savings (Linstroth 2008).

Italy

Regulatory Overview

According to the Burden Sharing Agreement, Italy must reduce emissions by 6.5% below 1990 levels between 2008 and 2012 (Europa 2006a).[32] Italy has no additional domestic targets for reducing CO_2 emissions.

Application to Zurich Italy

Italy has the lowest Kyoto target of the five European nations considered in our footprint analysis and is the least proactive with respect to its environmental goals. That, in combination with Italy's Mediterranean temperament, heavy bureaucracy, and lack of national discipline and structure, may make it difficult to impose any, let alone stringent, reduction targets on Zurich Italy. It will be especially difficult without monitoring to ensure implementation or compliance (i.e., proactive individuals within Italy's offices willing to take it upon themselves to change the status quo). Zurich Italy's employees may have similar mindsets and consequently, demonstrate lower attendance rates at environmental awareness workshops or less compliance with company-wide environmental policies.

However, Italy is developing programs to increase the use of solar panels and geothermal energy production nationally. Given Italy's warm climate, numerous volcanoes, and considerable infrastructure and resources already allocated to increasing Italy's generation of solar and geothermal energy, we recommend that Zurich Italy increases its consumption of renewable energy within facilities.

Lastly, Italy is characterized by a large automobile industry. Similar to our recommendation for Germany, we suggest that environmentally friendly, domestically manufactured vehicles be utilized by Zurich Italy's employees and executives.

Spain

Regulatory Overview

As specified in the Burden Sharing Agreement, Spain's Kyoto target requires a 15% reduction of emissions below 1990 levels between 2008 and 2012 (Europa 2006a).[32] Its main climate change target is to reduce CO_2 emissions by 20% below 1990 levels by 2020, with a provision to increase reduction to 30% if other industrialized countries commit to reduce emissions according to their capabilities (Spanish Strategy for Clean Energy and Climate Change 2007).

Application to Zurich Spain

Spain's relatively average domestic reduction targets are in line with its Kyoto target of a 15% reduction in emissions below 1990 levels between 2008 and 2012 and its EU targets for improved energy efficiency and increase of renewable energy generation. Therefore, Spain seems to be willing and able to fulfill its obligations as an EU member, but not willing to go beyond obligations and deviate from the status quo. This national stance may impact Zurich Spain's operations. For example, employees may only follow initiatives and targets already adopted by other Zurich offices. As a Mediterranean country, Spain is characterized by heavy bureaucracy and a generally slower pace of life on a micro- (employee) and macro- (national) scale. Our recommended reduction targets and mitigation measures for Zurich Spain reflect the country's (and its residents') identity and are not overly ambitious.

Spain is particularly focused on energy savings and energy efficiency through domestic initiatives. We, therefore, target the development and purchase of renewable energy for Zurich Spain's offices as one means to reduce the country's contribution to Zurich's group-wide emissions. Particular emphasis should be placed on solar panels given the local climate.

4.2.4 Energy Sources & Options for Use of Renewable Energy by Country

Like other service-sector companies, the bulk of Zurich's emissions stem from energy use at its facilities. Any strategy to lower Zurich's emissions must address energy use at both owned and leased facilities by taking advantage of opportunities for using renewable energy. Wherever possible, Zurich should choose "clean" energy sources. However, energy sources vary substantially both within and among countries. In the U.S., energy sources vary within and between states.

We researched primary and potential energy sources in the seven target countries to support our recommendations to Zurich regarding its energy options. We also examined energy sources currently used by other insurance companies within the seven target countries to gauge potential energy sources that Zurich may access. A more detailed discussion of our analysis, as well as a list of energy options by country, and by state (where applicable), can be found in Appendix 8.

Four of the seven target countries considered in our footprint analysis (i.e., Germany, Switzerland, the U.K., and the U.S.) are characterized by a growing renewable energy market (IEA 2008). Germany has the world's largest wind power sector and solar power market (IEA 2008). In the U.K., natural gas-fired power stations are starting to replace coal as the principal power source; renewable energy is also available. Switzerland is making great strides in developing solar energy, energy from wood and biomass, as well as wind and geothermal energy (IEA 2008). Energy options within the U.S. vary substantially by state. ZNA and Farmers have offices spanning multiple states. It would, therefore, be advantageous for all offices, especially offices in the seven states with renewable energy markets, to explore renewable energy options.[33]

It is important to recognize that even those countries traditionally characterized by use of carbon-intensive fuels (e.g., Australia, Italy, and Spain) also have renewable energy options available that should be utilized by Zurich's local offices.

As exemplified by this discussion, and that in Appendix 8, energy sources vary considerably by location. In addition, Zurich may not have immediate control over its energy sources. Therefore, as part of Zurich's mitigation strategy, it must investigate available energy options by country and region in the countries in which it operates.

[33] These seven states are California, Florida, Hawaii, Minnesota, New Jersey, Oregon, and Washington.

4.3 ZURICH GROUP-WIDE REDUCTION TARGETS MODELING

4.3.1 Rationale

To develop a menu of mitigation strategies for Zurich, it was first necessary to determine group-wide emission reduction targets and timetables for such reductions. We subsequently devised scenarios to model how Zurich may achieve recommended targets.

Based on competitors' short-term, group-wide CO_2 reduction targets (See Section 4.1), we developed three group-wide emissions reduction scenarios for Zurich. Targets reflect the range of competitors' emissions reduction targets. The three scenarios are 15%, 30%, and 50% CO_2 emissions reductions below 2007 levels (baseline) to be achieved by 2012, 2016, and 2020, respectively. The lowest emissions reduction target (15%) corresponds to the lowest reduction target set by competitors, while the highest emissions reduction target (50%) corresponds to the highest target set by competitors.

It should be noted that for the following calculations, group-wide emissions (including both Zurich and Farmers) for 2007 equal 222,354 metric tons/yr.[34]

4.3.2 Research

For each scenario (15%, 30%, and 50% reductions), we reported the following information:

1. Country
2. Baseline emissions (metric tons CO_2/year)
3. Group-wide baseline emissions, including Farmers (metric tons CO_2/year)
4. Number of FTEs per country
5. Group-wide FTEs (including Farmers)

Under each scenario, we calculated the following variables for Zurich (including Farmers):

1. Total emissions (metric tons CO_2/year) by which Zurich should reduce for each of the three scenarios. This was calculated by multiplying the percent of emissions reduction targeted in each scenario by Zurich's group-wide CO_2 emissions for the baseline year (2007).

   Example: For the 30% reduction scenario:
   - 30/100 * 222,354 metric tons CO_2/year => 66,706 metric tons CO_2/year

[34] We excluded emissions from the corporate jet from this analysis because its use is engrained in Zurich's executive culture; reduction in use is, therefore, likely infeasible. Moreover, annual emissions from the corporate jet account for a relatively small percentage of overall emissions (0.66%). We also excluded emissions from rental cars because of the small relative magnitude of emissions from rental cars and, hence, the limited contribution of "green" rental car policies to group-wide reductions. Additionally, it was difficult to allocate emissions reductions from "green" rental car policies to individual countries. Baseline group-wide emissions for Zurich were initially 224,011metric tons CO_2/yr. Total emissions from the corporate jet are 1,479 metric tons CO_2/yr, and total emissions from rental cars are 178 metric tons CO_2/yr. Therefore, 224,011 – 1,479 – 178 => 222,354 metric tons CO_2/yr.

2. Group-wide target level of emissions (metric tons CO_2/year) for each scenario under the respective deadlines. This was calculated as the difference between the baseline CO_2 emissions (metric tons/year) and the emissions by which Zurich should reduce.

   Example: For the 30% reduction scenario:
   - 222,354 – 66,706 => 155,648 metric tons CO_2/year.

3. Emissions (metric tons CO_2/year) by which each country should reduce. This was calculated in two steps:
   a. Baseline emissions per country (metric tons CO_2/year) were divided by total group-wide baseline emissions (metric tons CO_2/year).

   Example: For the 30% reduction scenario for the U.K.:
   - 18,621/222,354 => 0.084 metric tons CO_2/year

   b. The quotient was then multiplied by the total emissions (metric tons CO_2/year) by which Zurich must reduce for each of scenario.

   Example: For the 30% reduction scenario for the U.K.:
   - 0.084 * 66,706 => 5,586 metric tons CO_2/year

4. Emissions per employee (metric tons CO_2) by which each country should reduce. This was calculated by dividing the total emissions (metric tons CO_2/year) by which each country must reduce by the total number of full-time employees in each country.

   Example: For the 30% reduction scenario for the U.K.:
   - 5,586/7,168 => 0.779 metric tons CO_2/year/employee

5. Total emissions per employee for Zurich (including Farmers). This was calculated by dividing the target level of total emissions (metric tons CO_2/year) for Zurich under each scenario by the total number of FTEs in Zurich.

   Example: For the 30% reduction scenario:
   - 155,648/58,305 => 2.67 metric tons CO_2/year

4.3.3 Results & Analysis

Modeling these three scenarios (15%, 30%, and 50% reductions) enabled us to identify the total emissions by which each of the seven target countries must reduce to achieve Zurich's group-wide reduction target within the proposed timeframe for each scenario. Total emissions by which each country should reduce are shown in Table 4.5.

Table 4.5: Emissions Reductions by Country

	Required Emissions (metric tons CO_2/yr) Reductions by Country to Achieve Target		
Country	**15% Reduction Target**	**30% Reduction Target**	**50% Reduction Target**
Australia	1,138	2,277	3,795
Germany	2,048	4,096	6,827
Italy	521	1,041	1,735
Spain	565	1,130	1,883
Switzerland	1,573	3,147	5,245
UK	2,791	5,582	9,303
US (ZNA & Farmers)	19,344	38,687	64,479
Other countries/ not country specific	5,373	10,746	17,909
Total	33,353	66,706	111,177

Additionally, analysis of Zurich's emissions by country allowed us to identify its largest emitters. For purposes of this analysis, the biggest emitters are required to reduce emissions by a greater amount than smaller emitters. Under all three scenarios, the top three emitters, and, therefore, the countries that must reduce emissions the most, are the U.S., Other countries (emissions from the additional 27 countries combined), and the U.K. 15%, 30%, and 50% reduction scenarios for all target countries are depicted in Figures 4.1, 4.2, and 4.3, respectively.

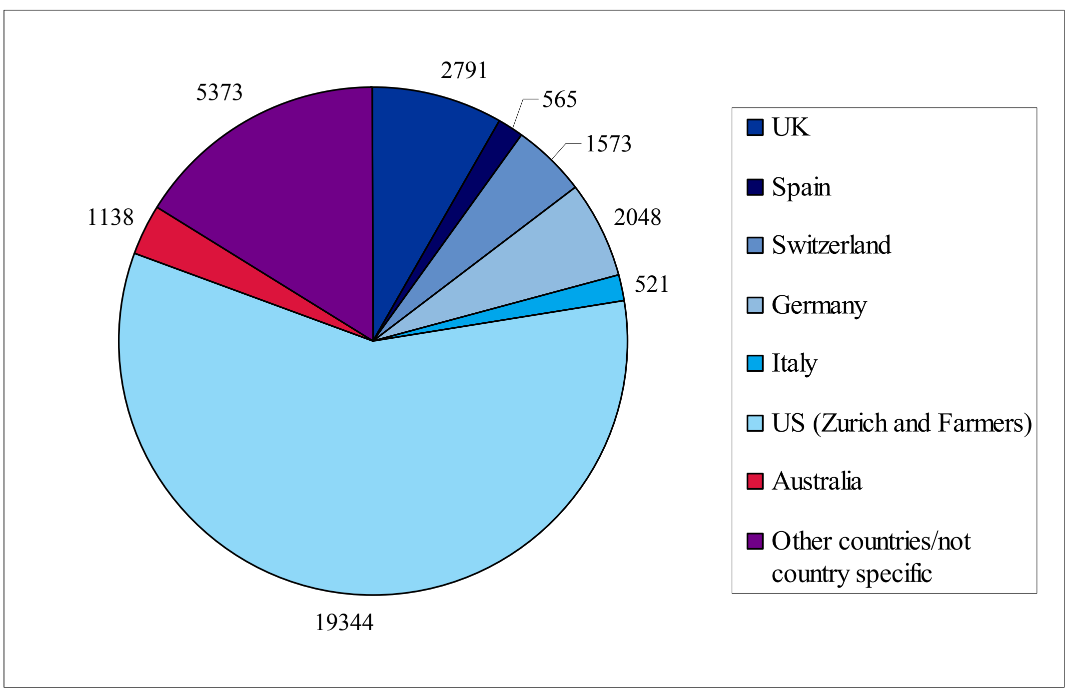

Figure 4.1: Amount of Emissions (metric tons CO_2/yr) by which Each Country is Required to Reduce for the 15% Reduction Scenario

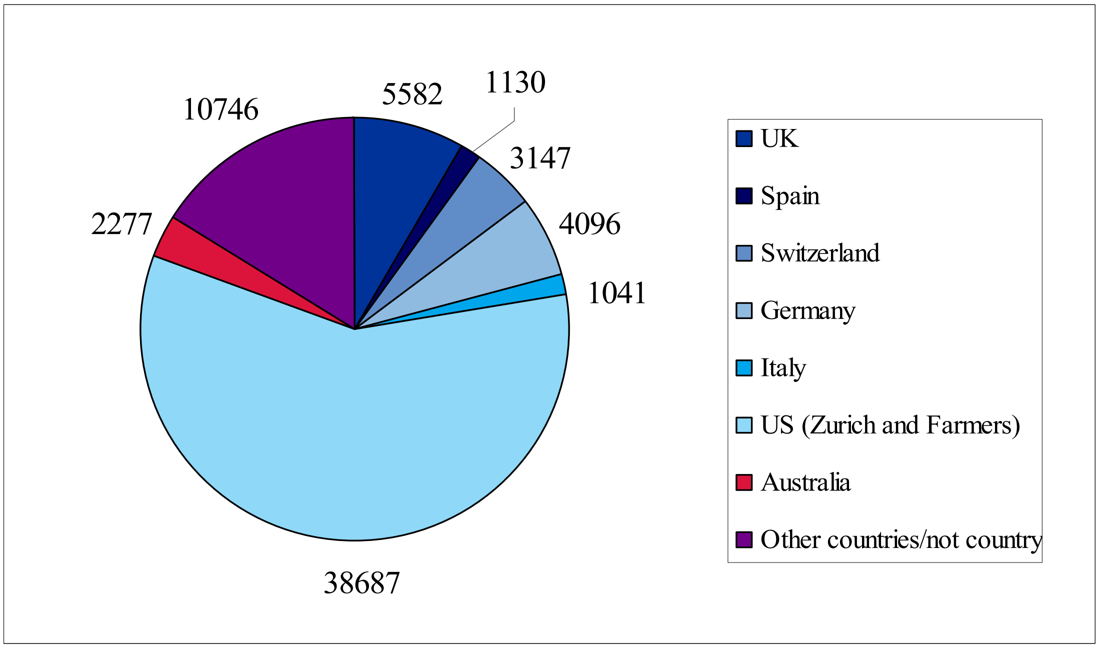

Figure 4.2: Amount of Emissions (metric tons CO_2/yr) by which Each Country is Required to Reduce for the 30% Reduction Scenario

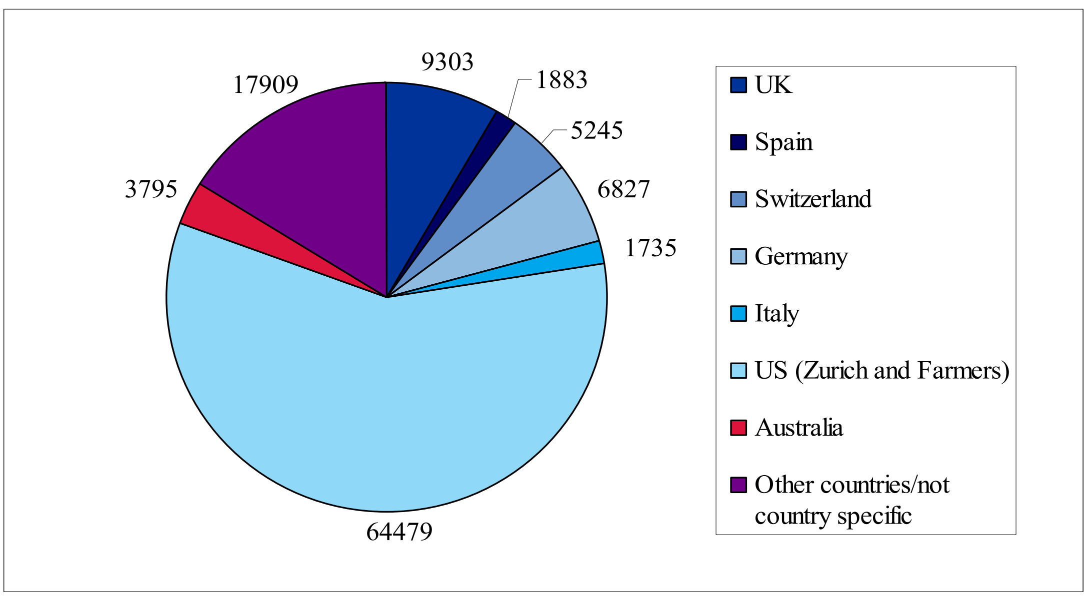

Figure 4.3: Amount of Emissions (metric tons CO_2/yr) by which Each Country is Required to Reduce for the 50% Reduction Scenario

Calculating baseline emissions per employee revealed the countries characterized by the highest emissions per employee. Such countries must reduce emissions by the greatest amount per employee to achieve Zurich's group-wide emissions target under each scenario.

Under all reduction scenarios, the top three emitters per employee, and, therefore, the countries that must reduce emissions the greatest amount per employee, are Australia, the U.S., and Italy. 15%, 30%, and 50% reduction scenarios are depicted in Figures 4.4, 4.5, and 4.6, respectively.

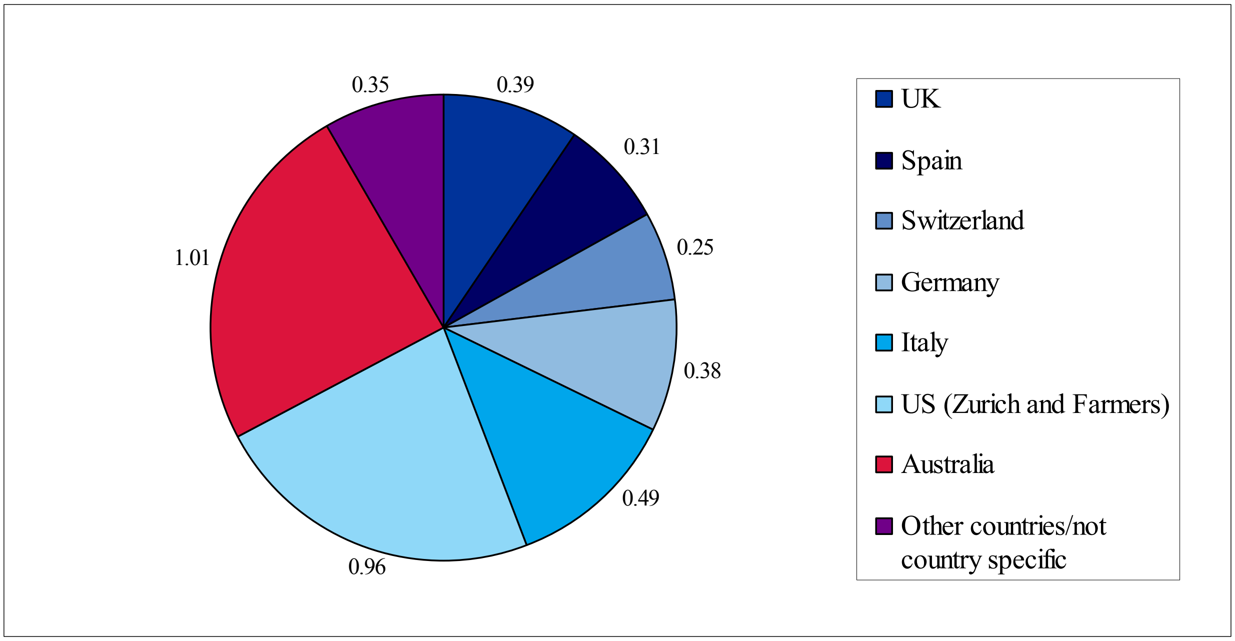

Figure 4.4: Emission Reductions per Employee (metric tons CO_2/yr) by Country Required to Achieve the 15% Reduction Scenario

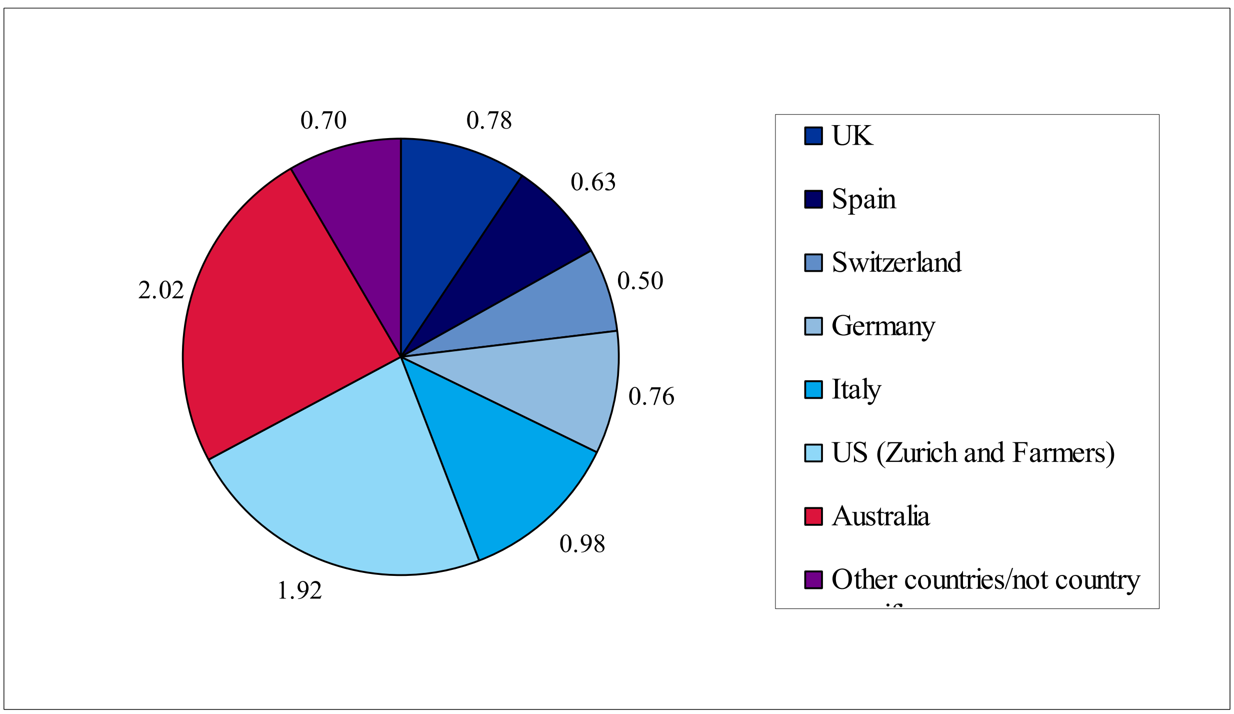

Figure 4.5: Emission Reductions per Employee (metric tons CO_2/yr) by Country Required to Achieve the 30% Reduction Scenario

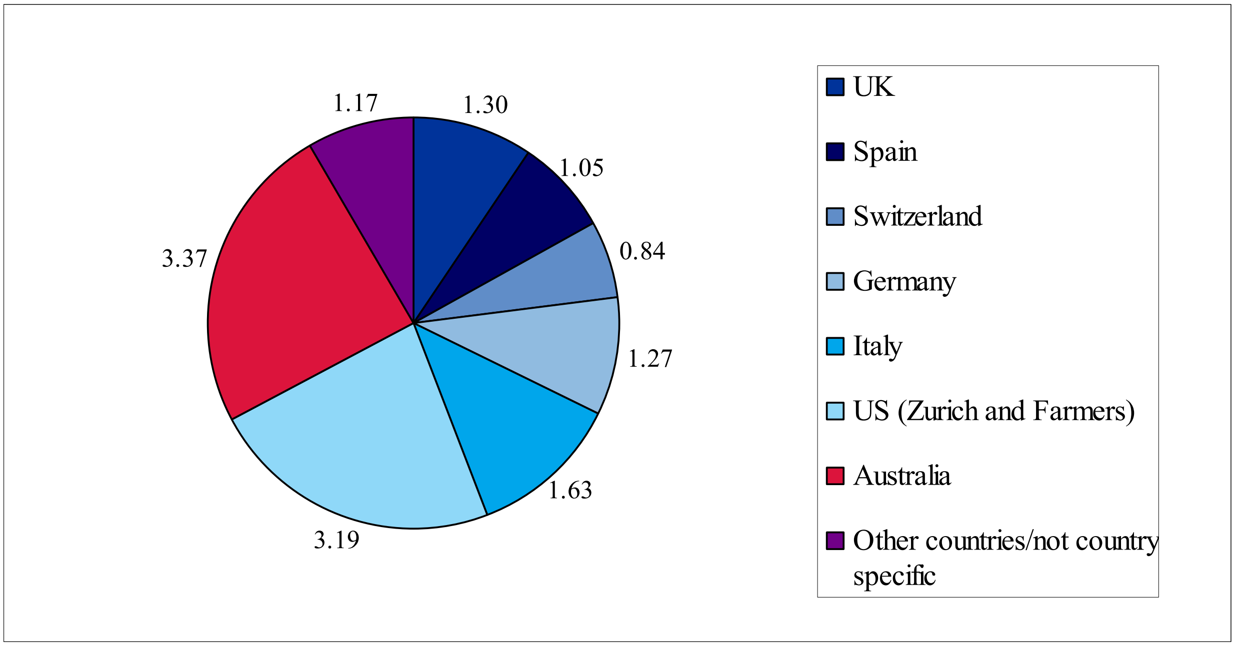

Figure 4.6: Emission Reductions per Employee (metric tons CO_2/yr) by Country Required to Achieve the 50% Reduction Scenario

4.3.4 Conclusion

After modeling all three reduction scenarios, we chose the 15% emissions reduction target as the group-wide target from which to derive country-wide targets. Zurich has recently publicly committed to a 10% reduction of group-wide emissions by 2013. We focus on a 15% reduction of Zurich's group-wide emissions by 2012, because it is slightly more ambitious than its current goal, but still realistic, thereby providing Zurich sufficient time to achieve substantial change. From this point forward, discussion of country-level analysis assumes a group-wide emissions reduction target of 15% by 2012.

4.4. LIMITATIONS

Due to time and data constraints, we based our Phase 2 analysis (outlined in Chapter 3 and 4) on several assumptions, which may limit the applicability of our results; limitations may be categorized as follows:

i Company-wide barriers: Our analysis elucidated company-wide barriers, such as time and money constraints and lack of employee buy-in, that may limit the implementation of our group-wide reduction targets.

ii Country-specific barriers: We identified country-specific barriers that limit the implementation of our mitigation strategies. Barriers may impede reducing the use of air travel to and from Switzerland and eliminating the use of cars in the U.S. The tenant-landlord barrier may also preclude implementation of energy efficiency measures in leased facilities.

iii Statistical analysis: Our statistical analysis was limited by the choice of breakpoint for institutional factors. In addition, "green" actions analyzed may not be all-inclusive and observed trends may only be illustrative of the subset of countries analyzed in each grouping. Consequently, our analysis may be subject to sampling bias, and one must consider that the countries we targeted may not be representative of all countries in each region.

iv Competitors' benchmarking analysis: Only 13 of the 18 competitors analyzed actually report emissions, and thus we only ranked 13 competitors against Zurich in terms of absolute emissions, emissions per employee, and emissions per total revenue. Because not all 13 competitors report emissions from all three scopes specified in the WRI/WBCSD GHG Protocol, reported values may be deceptively low potentially skewing the ranking. Furthermore, given that competitors report different targets to be achieved by different deadlines, it was not possible to rank competitors against Zurich in the future. Therefore, Zurich is ranked against its competitors based solely on emissions reported currently.

v Group-wide emission reduction target modeling: When modeling group-wide emission reduction targets, we did not include emissions from the corporate jet nor from rental cars. Emissions from the corporate jet were not included because reductions in use are likely infeasible. Emissions from rental cars were excluded because of the small relative magnitude of emissions from rental cars, and hence the limited contribution of "green" rental car policies to group-wide reductions. Furthermore, it was difficult to allocate emissions reductions from such policies to individual countries. Therefore, the emissions reduction baseline used in our analysis is slightly lower than Zurich's actual carbon footprint in 2007.

Despite these limitations, we are confident that the results of our analyses are robust and applicable to Zurich and the countries in which it operates. These results can thus be used to guide development of short- and long-term mitigation strategies.

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Chapter 5: SCENARIOS TO ACHIEVE GROUP-WIDE EMISSION REDUCTION TARGETS

After analyzing institutional and organizational frameworks in Phase 2, we developed a set of Zurich-specific mitigation measures based on this information in Phase 3.

Zurich must implement mitigation measures related to its business travel and within its facilities to achieve recommended emissions reductions. The following strategies—based on consultation with experts at Zurich, examination of competitors' case studies, and research on industry standard energy efficient technologies—represent several feasible mitigation options.

5.1 ZURICH'S RENTED AND LEASED FLEET—SCENARIO ANALYSIS

Rationale and Objectives

Our client demonstrated interest in investigating changes to Zurich's rented and leased vehicle fleet to reduce a portion of the company's emissions. Transportation was identified as a relatively easy target for carbon reduction, with the exception of corporate car policies for executives. To calculate carbon savings from changes to the composition of Zurich's vehicle fleet, we modeled two reduction scenarios for rental cars in 21 countries and four reduction scenarios for leased vehicles in the U.S. and U.K.[35] We targeted the U.S. and U.K. because, of the seven target countries considered in our footprint analysis, these countries possess the largest leased vehicle fleets.

Rental Car Companies Utilized by Zurich: Environmental Policies and Fleet Composition

We identified which companies Zurich makes reservations with most often by assessing information on rental car agencies and number of cars rented from these agencies. This provided a foundation to investigate rental car agency and car type as a potential opportunity for emission reductions. We collected, but did not analyze, similar information on Zurich's preferred airlines and hotel chains. Consideration of such information (presented in Appendix 9) could further guide Zurich's environmental initiatives.

The four rental car agencies used most frequently by Zurich (within the 21 countries for which we received rental car data) include: Hertz, Budget, Avis, and Europcar. All four companies offer hybrid vehicles; however, the availability of these vehicles varies between countries and between rental car locations. Although hybrid vehicles may not be available at all rental locations, each company offers additional fuel-efficient vehicles (e.g., Hertz's "Green Collection" and Avis's "Eco Rides" fleet) (Table 5.1). Moreover, Budget, Avis, and Europcar have partnerships with carbon offset providers such as Carbon Fund and Climate Care.

[35] The 21 countries for which we received rental car data include: The seven target countries (Australia, Germany, Italy, Spain, Switzerland, the U.K., & the U.S.), plus Argentina, Austria, Belgium, Bermuda, Brazil, Canada, Chile, Hong Kong (China), Finland, Ireland, Mexico, the Netherlands, Portugal, and Sweden.

Table 5.1: Environmental Fleet Programs Offered by Zurich's Primary Rental Car Providers***

	Hertz	Budget	Avis	Europcar
Hybrid Vehicle Option	Yes - "Green Collection" in select countries. Availability varies.	Yes - Over 2,000 hybrids in the U.S, selection may vary in other countries depending on availability	Yes - "EcoRides" in select countries. Availability varies.	Hybrid Options Limited
Fuel Efficient Vehicle Option	Yes	Yes - EPA SmartWay* Vehicles depending on availability and country	Yes - EPA SmartWay Vehicles depending on availability and country	Yes
Carbon Offset Availability	No - Partnership not declared	Yes - Partnership with CarbonFund.org	Yes - Partnership with CarbonFund.org	Yes - Partnership with ClimateCare

***Note that options may vary depending on availability within each country.

Ranking of rental car reservations by country, based on total miles driven by Zurich employees, revealed that ZNA employees drive more miles in rented cars (139,800 mi/yr) than employees in all other countries combined (combined total = 4,867 mi/yr) (Table 5.2). Furthermore, ranking of agencies by percent of reservations demonstrates that the majority of ZNA's rental car reservations are made through Hertz (34%) and Avis (30%) (Table 5.3). Both Hertz and Avis offer "green" fleet options (Table 5.1). Consequently, Zurich may achieve emissions reductions by renting primarily from Hertz's "Green Collection" and Avis's "Eco Rides" fleet.

Table 5.2: Rankings per Country by Total Miles Driven***

Country	1	Miles Driven	2	Miles Driven	3	Miles Driven
Australia	HERTZ	335	AVIS	257	EUROPCAR	17
Austria	BUDGET	41	HERTZ	19	EUROPCAR	9
Belgium	AVIS	5	n/a		n/a	
Bermuda	HERTZ	657	n/a		n/a	
Brazil	LOCALIZA	34	HERTZ	17	AVIS	4
Canada	AVIS	665	BUDGET	143	THRIFTY	105
Finland	AVIS	5	EUROPCAR	5	n/a	
Germany	SIXT	82	AVIS	5	n/a	
Mexico	HERTZ	15	n/a		n/a	
Netherland	BUDGET	13	EUROPCAR	4	n/a	
Spain	AVIS	501	NATIONAL	9	HERTZ	5
Sweden	AVIS	151	AIRPORT BUS	74	EUROPCAR	11
Switzerland	AVIS	1,051	HERTZ	186	EUROPCAR	85
United Kingdom	HERTZ	200	EUROPCAR	108	BUDGET	49

United States	HERTZ	68,419	AVIS	49,848	YY	21,534

*** See Appendix 10 for discussion of rental car ranking methodology.

Table 5.3: Rankings per Country by % of Reservations***

Country	1	% of Reservations	2	% of Reservations	3	% of Reservations
Australia	HERTZ	53.8%	AVIS	39.4%	EUROPCAR	3.03%
Austria	BUDGET	50.0%	HERTZ	25.0%	EUROPCAR	16.67%
Belgium	AVIS	100.0%	n/a		n/a	
Bermuda	HERTZ	100.0%	n/a		n/a	
Brazil	LOCALIZA	46.2%	HERTZ	38.5%	AVIS	7.69%
Canada	AVIS	61.5%	BUDGET	11.5%	ENTERPRISE	8.46%
Finland	AVIS / EUROPCAR	50.0% / 50.0%	n/a		n/a	
Germany	SIXT	92.3%	AVIS	7.7%	n/a	
Mexico	HERTZ	100.0%	n/a		n/a	
Netherland	BUDGET	75.0%	Europcar	25.0%	n/a	
Spain	AVIS	98.1%	HERTZ / NATIONAL	1.0% / 1.0%	n/a	
Sweden	AVIS	53.7%	AIRPORT BUS	40.2%	EUROPCAR	6.10%
Switzerland	AVIS	72.6%	HERTZ	10.9%	EUROPCAR	5.47%
United Kingdom	HERTZ	34.1%	BUDGET	27.3%	NATIONAL	11.36%
United States	HERTZ	33.8%	AVIS	29.7%	YY	29.15%

*** See Appendix 10 for discussion of rental car ranking methodology.

Hertz has nearly 35,000 cars in its “Green Collection” fleet, which is composed primarily of the Toyota Corolla, Toyota Camry, and Ford Fusion. All vehicles are:

- Reservable by specific make and model
- Characterized by an EPA highway fuel efficiency rating of at least 28 mpg
- Available at 50 major airport locations in the U.S.

Avis Eco-Rides are comprised of hybrid or “SmartWay” certified vehicles, including the:

- Nissan Altima Hybrid (35 mpg city/33 mpg highway)
- Toyota Prius (48 mpg city/45 mpg highway)
- Ford Escape Hybrid (34 mpg city/31 mpg highway)[36]

5.1.1 Reduction scenarios for Zurich’s rented fleet

Given that each of the companies from which Zurich rents offers fuel-efficient fleet packages, it was reasonable to conduct scenario analyses modeling emissions reductions from company policies requiring “green” vehicle purchases. Emission reduction scenarios (and associated CO_2

[36] Fuel efficiency is based on manufacturer standards for 2009 models.

savings) are summarized in Table 5.4. A detailed description of the methodology employed for all scenarios and supporting tables are included in Appendix 11.

Scenario 1: Implementation of a company policy by which employees must rent vehicles with fuel efficiencies similar to those of Hertz's "green" fleet

Requiring rental of "green" vehicles (with a minimum 27.0 combination city/highway mpg) yields minimal emissions reductions. Universal adoption of "green" rental cars in the seven target countries reduces emissions by only 180 metric tons CO_2/yr (3.4% reduction in emissions compared to the current fleet in these countries) (See Table I in Appendix 11). Because cars rented in the additional 14 countries analyzed are slightly more efficient than those in the target countries (average of 26.0 mpg vs. 26.2 mpg for rental cars in target countries), conversion to a "green" fleet would increase emissions in these countries by 2 metric tons CO_2/yr (3.2% increase in emissions compared to the status quo). Because the number of miles driven by employees in Zurich's seven target countries is approximately 95 times the number driven in the remaining 14 countries, emissions reductions achieved in target countries from this rental car policy translate to a group-wide emissions reduction of 178 metric tons CO_2/yr (3.3% reduction in emissions compared to Zurich's current group-wide rental car fleet). It is important to note that the "green" fleet standard may be U.S.-specific. Therefore, applications of this analysis, which assumes that Hertz's "green" fleet is similar in all countries, may be limited.

Scenario 2: Implementation of a company policy by which employees must not rent vehicles larger than midsize/intermediate

Zurich currently rents vehicles in all size classes ranging from compact to premium. A group-wide directive to prohibit rental of vehicles beyond the "midsize/intermediate" class may, therefore, reduce emissions from Zurich's rented fleet. However, results of Scenario 2 parallel those of Scenario 1 in that emissions reductions are minimal (overall reduction is only 1.0% compared to the current fleet in all 21 countries), and reductions are limited to operations in the seven target countries (See Table II in Appendix 11).

Table 5.4: Summary – Zurich's Rented and Leased Fleet Scenario Analysis

Emission Reduction Scenario	CO_2 Savings (metric tons)	% Difference
<u>Rented Fleet</u>		
Scenario 1: Rent only "Green" Cars	178	-3.3%
Scenario 2: No Rentals Beyond Midsize/ Intermediate	52	-1.0%
<u>Leased Fleet</u>		
<u>United Kingdom</u>		
Scenario 1: Convert 20% of fleet to "green"	136	-2.9%
Scenario 2: Convert 50% of fleet to "green"	340	-7.3%
Scenario 3: Convert 80% of fleet to "green"	543	-11.6%
Scenario 4: Convert 20% of fleet to "hybrid"	296	-6.3%

United States		
Scenario 1: Convert 20% of fleet to "green"	194	-1.1%
Scenario 2: Convert 50% of fleet to "green"	484	-2.8%
Scenario 3: Convert 80% of fleet to "green"	774	-4.5%
Scenario 4: Convert 20% of fleet to "hybrid"	1,749	-10.2%

Recommendations for Zurich

Because most vehicles (~ 66.4%) currently rented by Zurich's employees are compact, economy/subcompact, or midsize/intermediate, a company-wide policy encouraging increased rental of smaller, more fuel-efficient cars will yield minimal CO_2 savings. Zurich should instead promote "green"/hybrid rentals.

5.1.2 Reduction Scenarios for Zurich's Leased Fleet

Zurich's leased fleet in the U.S. (i.e., ZNA General) and U.K. accounts for approximately 94% of CO_2 emissions generated from the portion of the fleet managed by LeasePlan, Zurich's fleet manager. Therefore, we hypothesized that emissions reductions from conversion to country-specific "green" fleets or hybrids would yield substantial CO_2 savings. Four leased fleet scenarios (and associated CO_2 savings) are summarized in Table 5.4.

Because vehicle size and fuel efficiency standards differ between the U.S. and U.K., we varied our modeling methodology by country. A detailed description of the methodology for U.S. and U.K. scenarios is provided in Appendices 12 and 13, respectively. Results and recommendations stemming from the analyses also differ between the two countries.

U.S. Scenarios 1 – 3: 20%, 50%, and 80% conversion of leased fleet to "green" vehicles, respectively (as defined by Hertz's "green" standard)

Results demonstrate that ZNA General's leased fleet is already fairly fuel-efficient. Conversion of the leased fleet to "green" vehicles yields minimal reductions ranging from 194 metric tons CO_2/yr (20% conversion) to 774 metric tons CO_2/yr (80% conversion).

U.S. Scenario 4: 20% conversion of leased fleet to hybrid vehicles (as defined by the 2006 EIA distance-based emission factor for hybrids)

Hybrid vehicles are more fuel-efficient than the average "green" vehicle by U.S. standards. Consequently, emissions reductions modeled from a 20% conversion to hybrids were greatest of the four U.S. scenarios. Annual CO_2 savings represent a 10% reduction in emissions from ZNA General's leased fleet.

Recommendations for Zurich

"Green" car standards in the U.S. are less stringent than in Europe. Therefore, although ZNA could achieve emission reductions by increasing utilization of "green" cars, such policies will not yield large CO_2 savings. Consequently, it is recommended that ZNA pursue hybrid car options and employ more ambitious policies than the modeled 20% conversion to hybrids analyzed.

U.K. Scenarios 1 – 3: 20%, 50%, and 80% conversion of leased fleet to "green" vehicles, respectively (as defined by Clean Green Cars, a U.K.-based green motoring guide)

Zurich U.K.'s leased fleet is not as fuel-efficient as that of ZNA General when compared to country standards. Zurich U.K.'s leased fleet generates an average 166 g CO_2/km; this emission factor is comparable to that of the average "green" luxury sports cars in the U.K. (171 g CO_2/km) but exceeds that of the average "green" compact executive car in the U.K. (133 g CO_2/km) (Clean Green Cars 2008). Consequently, conversion of the leased fleet to "green" compact executive vehicles yields substantial emissions reductions ranging from a 2.9% reduction in CO_2/yr (20% conversion) to an 11.6% reduction in CO_2/yr (80% conversion).

U.K. Scenario 4: 20% conversion of leased fleet to hybrid vehicles (as defined by Clean Green Cars, a U.K.-based green motoring guide)

Because "green" vehicles in the U.K. are highly fuel-efficient, conversion of the leased fleet to hybrids does not yield emissions reductions as large as those modeled in U.S. Scenario 4. Annual CO_2 savings from a 20% conversion to hybrids only reduce emissions by 6.3%.

Recommendations for Zurich

The U.K.'s "green" car standard is more stringent than that of the U.S. Therefore, converting the same percentage of Zurich U.K.'s fleet to "green" cars generates larger CO_2 reductions than doing the same for ZNA's fleet. Because "green" cars in the U.K. are already fuel-efficient, a 50% and 80% conversion to "green" cars yields larger reductions than a 20% conversion to hybrids. Additionally, hybrid cars are not as popular in the U.K., so an emission reduction strategy focused on reducing car size and increasing average fuel efficiency, rather than increasing the use of hybrids, is likely more feasible for Zurich U.K. We recommend that Zurich U.K. focus on purchasing smaller, more fuel-efficient cars available in the U.K., such as the BMW 318D, BMW 320D, and Volvo S40 1.6D (all classified as "green" compact executive cars by Clean Green Cars).

Conclusion

Zurich may achieve emissions reductions through changes to its rented and leased vehicle fleet. However, the potential for CO_2 savings via fleet change policies is limited. The largest emissions reduction modeled was 11.6% for an 80% conversion of Zurich U.K.'s leased fleet to "green" cars. This quantity accounts for only 10.6% of required emissions reductions in the U.K. to achieve the targeted 15% emissions reduction from the 2007 level (baseline) by 2012. Consequently, although changes to Zurich's vehicle fleet are a good starting point, and should be incorporated into Zurich's group-wide emissions reduction strategy, larger/more costly initiatives will be required to achieve significant reductions.

Before pursuing a hybrid car policy, however, Zurich must understand the advantages and disadvantages of hybrids from a lifecycle perspective, as well as how these advantages and disadvantages differ by region (e.g., the U.S. vs. Europe).

5.1.3 The Potential for Hybrids to Reduce GHG Emissions from Zurich's Fleet

Zurich's challenge to reduce its GHG emissions stems, in large part, from factors outside its sphere of influence (e.g., the national fuel mix). In contrast, Zurich's vehicle fleet is within its immediate control, and changes to its fleet require minimal behavioral and organizational modifications.

Zurich's fleet is not selected based on environmental criteria, such as lowest GHG emissions per mile or lowest GHG emissions by fuel type. Therefore, increasing use of hybrids at Zurich may yield GHG reductions. Hybrids differ in their fuel efficiency, generation of GHGs, manufacturing processes, battery size and type, and electric engine size and type. Whether a hybrid is "better" for Zurich's fleet than a traditional car, for the purposes of this project, was determined by whether hybrid use reduced fuel consumption and GHG emissions. Additional criteria not considered in this report include whether: a) GHG emissions reductions occur in the use phase of the vehicle or over the entire lifecycle of the vehicle, including the production/manufacturing phase, and b) particulate emissions (e.g., PM-2.5 & PM-10) emitted from the vehicle have been reduced.

Although not straightforward, most research suggests that hybrids reduce fuel consumption and GHGs emitted over the vehicle lifecycle (Wang 1999; Delucchi 2003). [37]

United States

The case for hybrids in the U.S. differs from operations internationally. U.S. cars tend to be significantly larger. Larger cars are less fuel-efficient, thus the benefit (i.e., reduction in GHG emissions) from the use of hybrids in the U.S. may be relatively greater than in other countries. Additionally, hybrids are primarily an American trend; hybrids are less popular in other parts of the world where cars are smaller and more efficient. Therefore, not only is it easier for ZNA to institute the use of hybrid vehicles, but ZNA will also benefit most from increased hybrid use.

<u>ZNA Rental Car Data</u>

In 2007, Zurich rented a total of 33,320 cars in eight size classes. 86% of Zurich's rental cars in the U.S. were categorized as either "midsize/intermediate" (49%) or "large/standard" (37%). Table 5.5 contrasts fuel economy and CO_2 emissions from both vehicle types to those of hybrid vehicles of similar/equivalent size based on industry standards (EPA 2008).[38]

[37] This conclusion is based on reported fuel efficiencies and carbon footprint data from the U.S. EPA.
[38] Fuel efficiency depends on several factors, including the driving style of the individual (i.e., does he/she accelerate/brake quickly or gradually, does he/she drive mostly on highways or on city streets, etc.). However, even after acknowledging these differences, hybrids are characterized by improved fuel efficiency and reduced GHG emissions. It is also important to realize that mpg and GHG values reported for car models are based on average driving cycles and velocity profiles determined by the U.S. EPA; therefore, fuel efficiency and emissions estimates do not necessarily reflect exact car models used by Zurich employees.

Table 5.5: Fuel Economy and CO_2 Emissions from Midsize, Large/Standard, and Hybrid Vehicles

Car Type/Class	Car Model (2007)	MPG City	MPG Highway	CO_2 Emissions (metric tons/year)
Midsize	Chevrolet Malibu	21	31	7.3
Midsize	Toyota Camry	21	31	7.3
Midsize	Honda Accord	23	31	7.1
Midsize	Ford Fusion	20	29	8
Large/Standard	Hyundai Sonata	21	30	7.7
Large/Standard	Toyota Avalon	20	28	8
Large/Standard	Ford Five Hundred	19	26	8.7
Large/Standard	Chevrolet Impala	18	28	8.3
Hybrid	Toyota Prius	48	45	4
Hybrid	Nissan Altima Hybrid	35	33	5.4
Hybrid	Toyota Camry Hybrid	33	34	5.4

Results

A comparative analysis conducted at UCSB's Bren School, entitled "Reducing Greenhouse Gas Emissions with Hybrid-Electric Vehicles: An Environmental and Economic Analysis," examined the difference between traditional and hybrid vehicles made by the same manufacturer. A portion of their analysis compared the Honda Civic Hybrid to the Civic gasoline engine. As shown in Table 5.6, over the vehicle life cycle, it is only in the materials and transport to market phases that hybrids produce greater GHG emissions. Moreover, emissions reductions associated with the upstream fuel and product use phases counter this increase, resulting in significantly lower GHG emissions over the vehicle's lifecycle (Delucchi 2003; Wang 1999; Geyer 2008). The Bren study concluded that GHG emissions for hybrid vehicles are "significantly lower than for comparable internal combustion engines, both during vehicle operation and over the entire vehicle life cycle." The reduction in GHG emissions for the operation phase ranged from 10 - 40%, and life cycle reductions ranged from 8 - 35% (Bren Group Project 2005).[39]

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[39] The same Bren Group Project also compared the 2005 Ford Escape Hybrid to the 2005 Ford Escape gasoline engine, and, as in the case of the Honda Civic, Ford Escape hybrids were characterized by lower GHG emissions over the life cycle of the vehicle.

Table 5.6: Life Cycle GHG Emissions (kg CO_2e)

Lifecycle Stage	2005 Honda Civic Hybrid (manual)	2005 Honda Civic LX (manual)
Materials	7,015	6,349
Product Assembly	376	525
Transport to Market	294	166
Upstream Fuel	9,247	12,917
Product Use	29,882	40,900
Total	46,813	60,858

(Source: *2005 Bren Group Project*)

Hybrids in the United Kingdom and other European countries

Vehicles in the U.K. and throughout Europe tend to be more compact and fuel-efficient and, therefore, less GHG intensive than larger American cars. European cars also tend to use diesel fuel, which has advantages (potentially better gas mileage) and disadvantages (higher particulate emissions). Because Zurich utilizes a large number of cars, switching to low emission vehicles throughout Europe may considerably reduce Zurich's GHG emissions and fuel consumption.

Switching to hybrid fleets in Europe is not as straightforward an alternative as in the U.S. An October 2008 report published by Clean Green Cars of the U.K. indicated that less than 0.01% of all cars on U.K. roads are electric (Clean Green Cars 2008). According to a March 2008 report by Clean Green Cars, hybrid sales in the U.K. have fallen substantially and are down 58% from 2007 (Clean Green Cars 2008). Possible reasons for the decline include the recent reversal of London's decision to exempt electric cars from parking charges along with proposals to exempt standard petrol and diesel cars with less than 120g/km CO_2 emissions from driving fees.

The British government has announced a £100 million package to boost sales of all-electric vehicles over the next five years. However, the solution in Europe may be to focus on utilizing cars with the highest fuel efficiencies and lowest GHG emissions, rather than focusing on engine type. In the U.S., cars with high fuel efficiencies and low emissions are likely hybrids. In Europe, a greater number of options exist. For example, Citroen Car Company offers more than 20 models in the U.K. with emissions of 120g/km or less (Clean Green Cars 2008). Zurich, therefore, has the opportunity to capitalize on the existing fleet options in Europe to reduce group-wide emissions.

Findings

From a life cycle perspective, hybrids yield fewer GHG emissions than traditional vehicles. Switching to hybrids in the U.S. may reduce a significant amount of GHG emissions. In

European countries, where hybrids are less available, Zurich should also consider purchasing smaller, lighter, and more fuel-efficient cars.

5.2 EMISSIONS REDUCTIONS FROM FACILITIES

Owned and leased facilities are responsible for 64% of Zurich's group-wide emissions. Therefore, reduction scenarios must target facility-level changes. The remainder of this chapter details how Zurich may achieve emissions reductions at its facilities.

5.2.1 Questionnaire

Before evaluating mitigation strategies, it was necessary to determine what energy efficiency measures were in place and what opportunities for improvement existed in each country's offices. We sent a questionnaire (See Appendix 4) to contacts in the seven key countries of footprint analysis to gather such information. Questionnaire results elucidated variance across countries and, together with analysis of barriers described in Section 3.2, provided a foundation on which to develop realistic, country-specific mitigation measures for the seven target countries. A country-level discussion of questionnaire responses is provided in Appendix 4.

5.2.2 Emission Reductions from IT – Scenario Analysis

Over the past 15 to 20 years, the use of personal computers (PCs) and other Information Technology (IT) has risen dramatically. This increase of IT products and other plug loads/ electronic equipment in the workplace has added strain to operational budgets through increased energy costs.[40] Energy consumed by PCs and other types of office equipment constitutes a significant component of electricity consumption in commercial buildings. A 1999 Department of Energy (DOE) study showed that office equipment is responsible for 26% of electricity end-use consumption in office buildings (Figure 5.1).

[40] A plug load is any electrical device that receives power from an AC wall outlet; plug load equipment ranges from cell phones to small appliances.

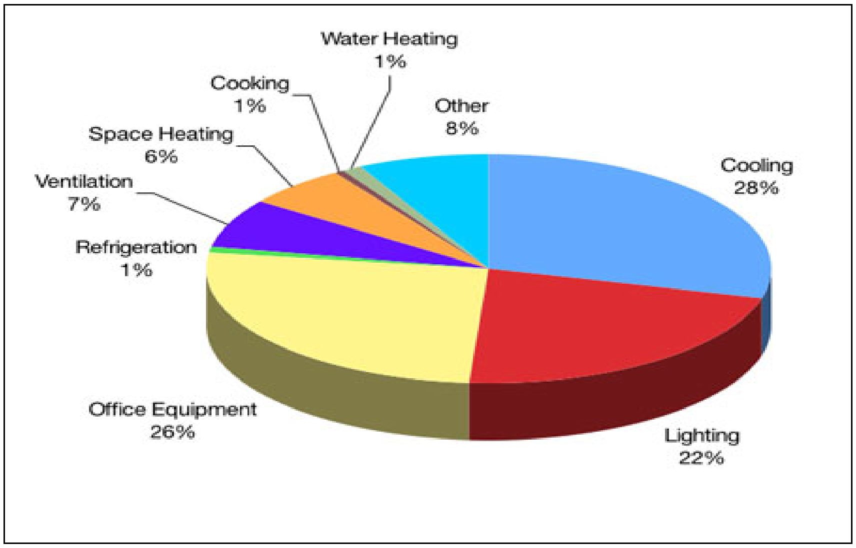

Figure 5.1: Electricity End-Use Consumption in Office Buildings by Activity
Source: *The Department of Energy, Energy Information Administration, Building End-Use Consumption Survey, 1999.*

On-site surveys have revealed that 44% of all computer monitors are left on after-hours. Also, a larger percentage of computers are powered on but are barely used during the day (CSC 2008). Thus, Zurich may realize energy savings merely from powering down equipment not in use.

Zurich may achieve further energy and carbon savings by upgrading existing IT equipment to more Energy Star-qualified products. Our analysis was limited to ZNA and Farmer's IT products because calculators used to model energy-saving are U.S.-centric (i.e., based on assumptions unique to the U.S.); therefore, we did not believe it was justifiable to extrapolate results to other regions (See Appendix 14 for list of DOE calculator assumptions). Products analyzed include multi-functional devices (MFDs), monitors, and printers.

Per-unit net life cycle cost-savings from IT switch outs range from $20 for MFDs and printers to almost $300 for monitors (Table 5.7). Although per-unit savings may seem insubstantial, extrapolation of savings based on 25%, 50%, 75%, and 100% replacement of traditional products with energy-efficient counterparts across ZNA and Farmers yields considerable cost, kWh, and carbon reductions (Tables 5.8, 5.9, & 5.10).

IT Emission Reduction Scenario Tables

Table 5.7: Per-Unit Differences Between Non Energy Efficient and Energy Star-Certified IT

	MFD	Monitor	Printer
Initial cost difference	$20	$51	$0
Life cycle cost-savings	$41	$345	$21
Net life cycle cost-savings (life cycle savings - additional cost)	$21	$294	$21
Simple payback of additional cost (years)	2.6	0.5	0

Life cycle electricity saved (kWh)	209	1,704	104
Life cycle air pollution reduction (lbs CO_2)	321	2,624	160
Life cycle air pollution reduction (metric tons CO_2)	**0.15**	**1.19**	**0.07**

Because Zurich typically uses Dell IT products, we applied Dell Energy Star MFD and monitor costs in our analysis. The majority of assumptions used in our scenario analysis (See Appendix 15 for detailed methodology) were not specific to Zurich, however, so values reported should be viewed only as estimates.

Comparison of cost- and carbon-savings from the three IT categories reveals that replacing ZNA and Farmers' monitors with Energy Star equivalents yields the largest reductions. Monitors are typically used for longer periods than MFDs or printers, both of which are often on standby mode until activated or queued to perform their functions. Additionally, there are less MFDs and printers, than monitors, per office. As such, even if Zurich could only switch out 25% of its monitors, net life cycle cost-savings would be greater than $3 million per year with a payback period of 0.5 years (Table 5.9). More specific IT recommendations are detailed in Section 8.1.2.

Table 5.8: Multi-Functional Device - Dell 1125 Mono MFP Laser (unit cost = $200)

	Zurich				Farmers			
	100%	75%	50%	25%	100%	75%	50%	25%
Total units	1,005	753	502	251	162	121	81	40
Initial cost difference	$20,100	$15,060	$10,040	$5,020	$3,240	$2,420	$1,620	$800
Life cycle cost-savings	$40,866	$30,619	$20,413	$10,206	$6,587	$4,920	$3,294	$1,627
Net life cycle cost-savings (life cycle savings - additional cost)	$20,766	$15,559	$10,373	$5,186	$3,347	$2,500	$1,674	$827
Simple payback of additional cost (years)	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Life cycle electricity saved (kWh)	209,748	157,155	104,770	52,385	33,810	25,253	16,905	8,348
Life cycle air pollution reduction (lbs CO_2)	323,012	242,018	161,345	80,673	52,068	38,890	26,034	12,856
Life cycle air pollution reduction (metric tons CO_2)	**147**	**110**	**73**	**37**	**24**	**18**	**12**	**6**

Table 5.9: Monitor - Dell Latitude TM E4200 (unit cost = $200)

	Zurich				Farmers			
	100%	75%	50%	25%	100%	75%	50%	25%
Total units	50,225	37,669	25,113	12,556	8,080	6,060	4,040	2,020
Initial cost difference	$2,561,475	$1,921,119	$1,280,763	$640,356	$412,080	$309,060	$206,040	$103,020
Life cycle cost-savings	$17,318,342	$12,988,843	$8,659,344	$4,329,499	$2,786,107	$2,089,580	$1,393,053	$696,527
Net life cycle cost-savings (life cycle savings - additional cost)	$14,756,867	$11,067,724	$7,378,581	$3,689,143	$2,374,027	$1,780,520	$1,187,013	$593,507
Simple payback of additional cost (years)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Life cycle electricity saved (kWh)	85,579,029	64,184,698	42,790,367	21,394,331	13,767,617	10,325,713	6,883,808	3,441,904
Life cycle air pollution reduction (lbs CO_2)	131,791,705	98,844,435	65,897,165	32,947,270	21,202,130	15,901,597	10,601,065	5,300,532
Life cycle air pollution reduction (metric tons CO_2)	**59,780**	**44,835**	**29,890**	**14,945**	**9,617**	**7,213**	**4,809**	**2,404**

Table 5.10: Printer – Energy Star Qualified Laser (unit cost = $535)

	Zurich			
	100%	75%	50%	25%
Total units	278	209	139	70
Initial cost difference	$0	$0	$0	$0
Life cycle cost-savings	$5,741	$4,305	$2,870	$1,445
Net life cycle cost-savings (life cycle savings - additional cost)	$5,741	$4,305	$2,870	$1,445
Simple payback of additional cost (years)	0	0	0	0
Life cycle electricity saved (kWh)	28,912	21,684	14,456	7,280
Life cycle air pollution reduction (lbs CO_2)	44,380	33,285	22,190	11,175
Life cycle air pollution reduction (metric tons CO_2)	**20**	**15**	**10**	**5**

5.2.3 Energy Audits

In today's competitive business environment, minimizing operating costs is a top priority. Within the U.S., the building sector is responsible for approximately 66% of electricity consumed (USGBC 2008). Electricity consumption in buildings doubled between 1989 and 2005. If this growth rate is sustained, electricity demand in buildings will increase another 150% by 2030 (FYP 2008). Installation of energy efficient equipment is one way to reduce costs; however, energy audits may be required to reveal immediate opportunities for cost reductions and energy conservation in commercial office buildings.

An energy audit is an inspection to identify the energy portfolio of a facility. Audits reveal opportunities within a facility to conserve energy and reduce energy-related expenses. Energy audit programs are designed to encourage the use of high-efficiency space and water heating equipment, central air conditioning, lighting, and other energy-efficient measures in commercial buildings. Energy audits can also address where energy efficient plug load technologies can be upgraded. Potential for cost-savings exists even in recently constructed buildings through strategic energy management that improves efficiency and reduces costs and unnecessary expenditures (USGBC 2008).

Making specific energy efficiency recommendations for Zurich, as well as calculating kWh- and cost-savings, was challenging due to lack of detailed information regarding Zurich's facilities (e.g., types of lighting, insulation, and HVAC systems). Therefore, to provide Zurich with substantive information, we focused our efforts on the research of energy audit types and associated costs for commercial office buildings.

Zurich may utilize one, or any combination, of the three main energy audit types (discussed below) in its owned and leased facilities. Audit types are differentiated by cost and by the level of detail and analysis. The less detailed the audit, the less accurate the estimates of project cost and energy savings. More sophisticated audits report an energy balance comparing actual energy use from past utility bills with the estimated energy use of the existing equipment based on assumptions of current operating conditions (CEC 2000).

Preliminary/Walk-Through Energy Audits

- Quick evaluations to determine a project's potential for energy retrofits and to decide if a more detailed energy audit is warranted.
- Typically cost about one to three cents per square foot (CEC 2000). Cost includes a report with a preliminary list of feasible projects.
- Do not consider the interaction between projects (e.g., the effect of installing efficient windows that reduce heat transfer on the HVAC system). As a result, projected energy savings are not exact and should not be used as the basis for project financing.
- Least expensive option.

Single Purpose or Targeted Energy Audits

- Detailed analyses on one or more types of projects; typically conducted by vendors who specialize in a particular type of equipment (e.g., lighting).
- For an audit targeting lighting, cost is approximately three to seven cents per square foot (CEC 2000). Cost could be less depending on facility size.
- An energy management project, or an HVAC replacement project, generally requires more analysis than a lighting project and may cost five to nine cents per square foot (CEC 2000).

Comprehensive Audits

- Provide a detailed energy project implementation plan for a facility and evaluate all major energy using systems, including: building envelope, lighting, domestic hot water, and HVAC and controls.
- Consider interactive effects of all energy efficiency projects and include detailed energy cost-saving calculations and project costs.
- Cost varies from 18 to 50 cents per square foot for facilities with less than 50,000 square feet of conditioned area, about 12 cents per square foot for larger facilities (i.e., greater than 250,000 square feet), and 10 cents per square foot for very large facilities (i.e., greater than one million square feet) (CEC 2000).
- Most accurate and expensive option.

<u>Energy Audits in Europe</u>

Energy audit programs have been applied successfully in several European countries. See Appendix 16 for a comprehensive energy audit case study of one of Zurich's European-based competitors, Swiss Re. Although European commercial office buildings differ from those in North America, Asia, and Australia with respect to style and age, the benefits from reducing energy consumption are equally great. According to the AUDIT II study of more than 40 energy audit programs, the best programs cost between 10 and 14€ per ton of CO_2 saved (AEA 2002).

The main aim of the ongoing AUDIT II study is to establish long-term and continuous European level cooperation in the area of energy auditing (Motiva 2003).[41]

Effective use of energy audits to guide facility-based energy-saving programs, plus the installation of more energy-efficient IT equipment, represent short-term steps toward Zurich's group-wide emissions reduction goal. These critical energy-efficient measures, combined with "green" rented and leased fleet policies, have the potential to yield significant reductions without substantially altering Zurich's operations.

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CHAPTER 6: COST OF MITIGATION MEASURES AND ENERGY EFFICIENCY INITIATIVES

6.1 GENERAL COST-SAVINGS TRENDS

As suggested by our IT scenario calculations in Section 5.2, installation of energy efficient equipment may produce considerable cost-savings. An EcoTech Research survey of 600 banks and insurance companies indicated that cost advantages of "greener" corporate behavior motivated implementation of energy efficiency programs at 56% of companies. Mass Mutual, one such company, realized annual cost-savings of $1.45 million (2007) from installation of electronic ballasts, on-demand ventilation, and more efficient data centers (Climate Group 2005). The top 43 energy efficient companies in the survey (including Barclays Bank, HSBC, Mass Mutual, and Swiss Re) saved a combined $11.6 billion from improved energy efficiency at facilities (Climate Group 2005). Given that Zurich operates in 609 (owned and leased) buildings, which together generate 64% of group-wide emissions, Zurich also stands to realize substantial cost-savings from improved energy efficiency, both in terms of energy efficient technologies and infrastructural improvements. However, cost-savings are not limited to facility-level initiatives. The following section includes a discussion of costs/cost-savings related to: 1) "green" rental car purchases, 2) reduced air travel, 3) facility-level energy efficiency programs, and 4) energy audits of facilities.

Note that because Zurich could not provide us with detailed cost data related to transportation- and facility-based mitigation options, our analysis focused on gross, not net, cost-savings and does not account for costs incurred to achieve the stated scenario, unless otherwise stated. For example, in Table 6.1, the $72,225 savings noted for Scenario 1 represent cost-savings from reduced fuel consumption but not the price premium of renting "green" cars.

6.2 COST-SAVINGS FROM "GREENER" RENTAL CAR PURCHASES & REDUCED AIR TRAVEL—SCENARIO ANALYSIS

6.2.1 Rationale and Objectives

As a publicly-owned company with responsibilities to its shareholders, Zurich must consider its "bottom line." Therefore, cost-effective CO_2 emission reduction strategies are most likely to be adopted. Modeling gross cost-savings from conversion to a "greener" rental car fleet (two scenarios) and reduced air travel (four scenarios) reveals potential monetary incentives. Annual cost-savings from each of the six scenarios modeled are summarized in Table 6.1. A detailed description of the methodology for all scenarios and supporting tables are in Appendix 17.

6.2.2 Cost-Saving Scenarios for Zurich's Rented Fleet

Rental Car Scenario 1: Implementation of a company policy by which employees must rent vehicles with fuel efficiencies similar to those of Hertz's "green" fleet

Increasing the average fuel efficiency of Zurich's rented fleet, all else being equal, would reduce fuel consumption and, hence, fuel costs. Requiring rental of "green" vehicles (with a minimum combination city/highway 27.0 mpg) would yield substantial cost-savings, especially in the seven target countries (Table 6.1). Approximately 99% of cost-savings will be realized in the target countries because of the disproportionately high use of rental cars in these locations.

Rental Car Scenario 2: Implementation of a company policy by which employees must not rent vehicles larger than midsize/intermediate

Annual savings modeled in Scenario 2 are less than those in Scenario 1 (Table 6.1). As in Scenario 1, the vast majority of cost-savings will be realized in the seven target countries.

6.2.3 Cost-Saving Scenarios Targeting Zurich's Air Travel

Air Travel Scenario 1: Reduce air travel by 25% in Switzerland, the U.K., and the U.S. and by 15% in all other countries for which we have air travel data

This scenario attempts to target those countries (i.e., Switzerland, the U.K., and the U.S.) where air travel is most prevalent. Air travel is most frequent in the U.S., where employees traveled 128.3 million miles in 2007, followed by Switzerland and the U.K., where annual miles traveled equaled 27.2 and 21.2 million miles, respectively. Emissions normalized by the number of individuals traveling are also highest in these countries (metric tons CO_2/individual traveling = 3.18, 2.42, 1.89 for Switzerland, the U.S., and the U.K., respectively).[42] We applied a smaller reduction target to the remaining 13 countries for which we have air travel data, as we assumed it would be more difficult to reduce flights in countries already characterized by infrequent travel. Cost-savings modeled by this scenario are approximately 204 times greater than those achieved by Rental Car Scenario 1 (Table 6.1).

Air Travel Scenario 2: Reduce air travel by 15% in all 20 countries

Implementation and enforcement of country-specific caps on air travel may be difficult; therefore, this scenario models cost-savings generated from a consistent, 15% reduction in all countries. Of the four air travel scenarios modeled, Scenario 2 yields the lowest potential gross cost-savings (Table 6.1). Because employees in Zurich's seven target countries are responsible for the most air miles (~ 93%), cost-savings are greatest in these countries.

Air Travel Scenario 3: Reduce air travel by 25% in all 20 countries

Currently, Zurich ranks seventh among 13 of its competitors in the financial services sector in terms of CO_2 emissions/employee. Assuming that Zurich strives to be among the top 50% of companies in the financial services sector, it will need to set ambitious, short-term reduction

[42] Note that Australia (with 2.38 metric tons CO_2/individual traveling) actually ranks third in terms of emissions normalized by traveling employees; however, this high value was attributed to the long distance of Zurich Australia's flights (given its geographical location) rather than the frequency of flights. Therefore, we did not consider reducing Zurich Australia's air travel to be a high priority. In fact, Zurich Australia ranks sixth of the seven target countries with respect to number of flights booked.

targets. This scenario models gross cost-savings from a substantial decrease in air travel. Cost-savings from this scenario are approximately $1 million greater than those modeled in Air Travel Scenario 1 (Table 6.1).

Air Travel Scenario 4: Reduce air travel by 50% in all 20 countries

Although currently infeasible, technological innovation and increasing travel prices may encourage even greater reductions in air travel in the long-term. Although idealistic, Scenario 4 yields approximately two times the gross cost-savings of Scenario 1 (Table 6.1)

Table 6.1: Summary of Potential Cost-Savings from 6 Scenarios

Mode of Transportation	Gross Cost-Savings (USD)
Rental Cars	
Scenario 1: Rent only "Green" Cars	$72,225
Scenario 2: No Rentals Beyond Midsize/ Intermediate	$21,684
Air Travel	
Scenario 1: Reduce travel by 25% in Switzerland, the U.K., & the U.S. and by 15% in all other countries	$14,751,288
Scenario 2: Reduce travel by 15% in all countries	$9,464,839
Scenario 3: Reduce travel by 25% in all countries	$15,774,731
Scenario 4: Reduce travel by 50% in all countries	$31,549,462

6.2.4 Conclusions and Recommendations for Zurich

Implementing CO_2 mitigation initiatives aimed at Zurich's rented vehicle fleet and air travel may yield substantial cost-savings. The following conclusions and recommendations stem from this scenario analysis:

- To achieve the largest gross cost-savings from conversion of the rented fleet, Zurich should purchase "greener" rental cars. Cost-savings from a more fuel-efficient rented fleet are approximately three times the cost-savings associated with a company policy capping rental car purchases at the "midsize/intermediate" size class.
- Substantial cost-savings from Zurich's leased fleet may be realized by encouraging "green" fleet policies in ZNA and Zurich U.K. operations (both characterized by large leased fleets). We recommend Zurich acquire fuel consumption data on its leased fleet, as opposed to data on budgeted mileage, to allow cost-savings to be modeled.
- Reductions in air travel generate far greater cost-savings than conversions of Zurich's rented vehicle fleet to "greener" vehicles. Gross cost-savings from reduced air travel range from $9.5 to $31.5 million per annum based on 2007 travel rates.

- Increased use of teleconference equipment may replace air travel. Operational costs (network, service, etc.) for Zurich's five telepresence rooms currently in use equal USD 260,000 per year (or USD 52,000 per room, on average).[43] Therefore, modeled cost-savings from all air travel reduction scenarios far exceed the cost of telepresence room installation and maintenance.
- Moreover, in Zurich's business units in the U.S., U.K., and Switzerland (where air travel is most prevalent), the number of flights in each country that would have to be reduced via use of teleconferencing equipment to re-coup the average cost of installing one telepresence room is 264, 156, and 110 (or 0.18%, 0.53%, and 0.42% of annual flights booked), respectively. Further reductions in flights would yield average per-flight cost-savings for Zurich of USD 197, 333, and 474, respectively. Because only a small number of flights must be reduced to break-even, use of telepresence rooms is a promising mitigation option from a financial perspective. It should be noted, however, that the rate of use may be limited by the media availability of Zurich's clients.
- We recommend a company air travel policy encouraging the largest travel reductions in those countries in which air travel is most prevalent. However, this may appear inequitable and, therefore, may be less feasible.

6.3 FACILITY-BASED ENERGY EFFICIENCY OPTIONS

In contrast to rental car and air travel cost-savings scenarios, we were unable to calculate gross cost-savings from facilities-based energy efficiency initiatives due to lack of data regarding site-specific energy efficiency measures and technologies. However, facility-level cost-savings may be substantial and should be assessed.

The potential for energy conservation and cost-savings at facilities varies greatly depending on each building's lease provisions. Zurich may have leverage to require substantial facility upgrades at wholly owned sites, including modification of large scale HVAC systems, implementation of an energy management system, and installation of improved T-8 fluorescent smaller scale lighting. All three measures may dramatically reduce operational costs; however, upfront costs may be greater, and ROI periods may be longer, for larger scale energy efficiency projects (DOE 2008). Reducing energy consumption may be more difficult in leased buildings.

6.3.1 Energy Efficiency Options – Leased Facilities

Because tenancy arrangements within leased buildings often limit flexibility to initiate energy-saving initiatives, opportunities for energy conservation and cost-savings may be fewer at leased sites. In leased facilities, it is difficult to influence property management to install energy efficiency retrofits. However, tenants, such as Zurich, can usually reduce light and power costs by switching out inefficient IT equipment and lighting, as well as by implementing conservation and energy education programs to influence employee behavior.

[43] Information provided by client in 1/7/09 presentation to Zurich's Climate Change Advisory Council. Telepresence rooms currently located in London, Los Angeles, New York, Schaumburg, and Zurich Headquarters offices.

Another issue specific to Zurich's leased sites is that energy costs can be charged to tenants either as an outgoing expense or incorporated into the total rent bill. In most of Zurich's facilities, energy costs are included in the rent. Consequently, employees and managers are often unaware of energy costs and thus energy use. Installing energy efficient technologies in leased facilities, therefore, may not yield direct energy- and carbon-savings for Zurich.

Conversely, in some privately owned buildings, costs are often treated as an outgoing expense and divided between tenants based on the ratio of leased to total area (SEDO 2008). However, energy use may be outside the direct control of the tenant, as is the case for air conditioning systems. In such situations, property managers must be motivated to implement building-wide changes to benefit all tenants, and Zurich can use its market power to catalyze energy efficiency improvements. Although structural and technological upgrades at facilities will result in cost- and carbon-savings for Zurich, such benefits may be shared by "free-riding" tenants.

Ultimately, responsibility for the efficient operation of buildings lies with the facility owner. Setting a fixed rate for central services, or assuming responsibility for the central services energy costs via inclusion in the rent, may achieve this (SEDO 2008). In this case, the financial benefits accrue to the building owner, providing an incentive to achieve energy- and cost-savings. Thus, the tenant may continue paying the same rent while the owner benefits from reduced operational costs. Tenant rent payments should decrease if the tenant-landlord lease agreement is restructured (See Section 3.2 for further discussion of tenant-landlord barriers).

Because negotiating lease agreements may be a difficult way to achieve energy conservation, Zurich should consider other options for leased facilities. For example, Zurich may wish to concentrate on consolidating its offices in locations that have multiple leased floor locations. This will reduce the number of leased facilities, as well as the operating and transaction costs incurred, when negotiating with facility landlords.

Energy upgrades should be carefully analyzed prior to implementation to assess positive and negative ramifications of system changes in order to maximize potential energy- and cost-savings. For example, extensive lighting retrofits or window glazing replacements may substantially reduce HVAC loads, enabling chillers to be downsized. Even if total energy use is not reduced, changes in electric demand profiles may yield substantial monetary savings, depending on utility pricing (DOE 2008).

Table 6.2 highlights several energy efficient products in which Zurich may wish to invest to achieve energy- and cost-savings. Note that values provided are estimates based on industry standards and are not specific to Zurich's sites. In addition, some products, such as occupancy sensors and window tinting equipment, require measurement and verification (M&V) of kWh-savings via energy audits.

Table 6.2: Energy Efficient Product List with Estimates of Product Cost, Energy Savings, Annual Monetary Savings, and Cost of Implementation[44]

Energy Efficiency Measure	Product	Product Cost (USD)	Energy Savings (kWh)	Annual Savings (Cost/kWh)	Cost of Implementation
CFLs	Philips - Marathon 60 CFL Bulbs	$11.95 / 3 CFLs	--Use 66% less energy than incandescent bulb and last up to 10x longer (Use 14W compared to 60W incandescent) --143.52 kWh/yr, (0.046 kW/yr), 46W/yr (based on 1000bulbs.com's energy calculator)	$31.57	N/A
Occupancy Sensor	Sensor Switch Single Pole LWS Large Area Wall Switch Sensor	$75.00	M&V required	20-80% reduction in lighting energy cost	N/A
T-8 Fluorescent Lay In Electronic Ballast	Howard Industries - F32T8, F25T8, F17T8 or FB32T8/U Electronic Ballast 120-277V (Single Ballast)	$30.00	M&V required	Approximately 30-40% energy savings compared to T12 ballast	N/A
T8 Fluorescent Lights	Phillips - T8 25W ADV850 XEW ALTO	$7	7W (120 kWh)	$6 / 3,750 hrs	N/A
	Philip - 25w T8 Fluorescent F25T8/TL730	$4.70	7W (120 kWh)	$6 / 3,750 hrs	N/A
Window Tinting	ToolBase Services	$3.00 - $12.00 per square foot	M&V required	M&V required	Cost varies depending on service provider's audit quote
Laptop	Dell LatitudeTM E4200	$2,000	M&V required	M&V required	N/A

[44] We estimated energy- and cost-savings based on product research. Research included, but was not limited to, review of product manufacturers' websites, the U.S. EPA's Energy Star website, and other energy efficiency information-based websites. Estimates are subject to change with technology advancements and reductions in material and production costs.

Multi-Functional Device (Printer, Scanner, and All-In-One)	Dell 1125 Mono MFP Laser	$200	See Tables 5.8 – 5.10	See Tables 5.8 – 5.10	N/A
Monitors Only	Dell E228WFPf	$200	See Tables 5.8 – 5.10	See Tables 5.8 – 5.10	N/A
Cavity Wall Insulation	Service provider varies	50 cents per square foot, depending on access	M&V required	£160 per year per household	Installation cost = £250 when subsidized under the Carbon Emissions Reduction Target
Solid Wall Insulation	Service provider varies	Costs vary depending on service provider's audit quote	M&V required	£500 per year per household	Costs vary depending on service provider's installation fees
Tank & Pipe Insulation	Service provider varies	Costs vary depending on service provider's audit quote	Cut heat loss by 75%; save £40 per year per household	M&V required	Installation cost = £5-10 per pipe
Cool Roofs	Service provider varies	Costs vary depending on service provider's audit quote	20-70% savings in annual cooling energy use; 122-327 kWh savings per 1000 ft^2 of roof area	$4-$34 savings/1000 ft^2 of roof area	Costs vary depending on service provider's installation fees
Solar Panels	Variety of solar panels are available that provide different energy outputs (MW)	Prices vary depending on MW output desired	N/A	N/A	Costs vary depending on service provider's installation fees

6.3.2 Cost of Energy Audits

As mentioned in Section 5.3, energy audits reveal opportunities for immediate cost-savings in commercial office buildings via energy conservation. Before proceeding with energy audits, however, Zurich must consider variation in energy audit cost within and among countries, as well as among energy audit companies.

Table 6.3: Cost Ranges for 3 Types of Energy Audits in California

Type of Energy Audit	Cost (USD) per square foot
Preliminary	1 – 3 cents†
Single Purpose/Targeted	3 – 7 cents for lighting; 5 – 9 cents for HVAC
Comprehensive	18 – 50 cents

† Cost estimates representative of industry standards in California. Note that energy audits are now performed for free, or at low cost, by major electric utilities in California (e.g., SDG&E, SCE, and PG&E) (CEC 2000).

Energy Audit Costs for Zurich's Facilities by Country

Total country-specific costs for Preliminary, Single Purpose/Targeted, and Comprehensive energy audits for Zurich's facilities were calculated using the CEC's cost ranges for energy audits (See Appendix 18 for methodology). The CEC reports cost ranges for three types of audits (Table 6.3).

A summary of energy audit cost by country is provided for Preliminary, Single Purpose/Targeted, and Comprehensive audits in Tables 6.4, 6.5, and 6.6, respectively. As expected, costs in countries with greater facility area were highest for all audit types. Costs are highest for Switzerland, US-ZNA, and US-FIG, respectively.

Table 6.4: Estimated Preliminary Energy Audit Costs at Zurich's Facilities by Country

	Actual Data		Projected Data		Actual & Projected Data		Preliminary Audit Costs (per ft^2)	
Country	**No. of Buildings**	**m^2**	**No. of Buildings**	**m^2**	**Total m^2**	**Total ft^2**	**(1 cent)**	**(3 cents)**
Australia	22	18,660	2	2,848	21,508	231,512	$232	$695
Germany	55	193,118	40	4,913	198,031	2,131,604	$2,132	$6,395
Italy	3	31,665	30	9,081	40,746	438,590	$439	$1,316
Spain	7	44,172	57	25,297	69,469	747,767	$748	$2,243
Switzerland	16	194,584	230	148,853	343,437	3,696,760	$3,697	$11,090
UK	26	88,167	18	24,820	112,987	1,216,192	$1,216	$3,649
US - Zurich	7	155,646	96	158,369	314,016	3,380,063	$3,380	$10,140
US - Farmers (Management Group)	0	0	21	218,412	218,412	2,350,990	$2,351	$7,053
Total Key 7 Countries (w/ Farmers)	**136**	**726,013**	**494**	**592,593**	**1,318,606**	**14,193,478**	**$14,193**	**$42,580**

Note: Yellow shading designates countries with highest estimated energy audit costs.

Table 6.5: Estimated Single Purpose/Targeted Energy Audit Costs at Zurich's Facilities by Country

	Actual Data		Projected Data		Actual & Projected Data		Single Purpose / Targeted Audit Costs (per ft^2)			
Country	**No. of Buildings**	**m^2**	**No. of Buildings**	**m^2**	**Total m^2**	**Total ft^2**	**(Lighting, 3 cents)**	**(Lighting, 7 cents)**	**(HVAC, 5 cents)**	**(HVAC, 9 cents)**
Australia	22	18,660	2	2,848	21,508	231,512	$695	$1,621	$1,158	$2,084
Germany	55	193,118	40	4,913	198,031	2,131,604	$6,395	$14,921	$10,658	$19,184
Italy	3	31,665	30	9,081	40,746	438,590	$1,316	$3,070	$2,193	$3,947
Spain	7	44,172	57	25,297	69,469	747,767	$2,243	$5,234	$3,739	$6,730
Switzerland	16	194,584	230	148,853	343,437	3,696,760	$11,090	$25,877	$18,484	$33,271
UK	26	88,167	18	24,820	112,987	1,216,192	$3,649	$8,513	$6,081	$10,946
US - Zurich	7	155,646	96	158,369	314,016	3,380,063	$10,140	$23,660	$16,900	$30,421

US - Farmers (Management Group)	0	0	21	218,412	218,412	2,350,990	$7,053	$16,457	$11,755	$21,159
Total Key 7 Countries (w/ Farmers)	**136**	**726,012**	**494**	**592,593**	**1,318,606**	**14,193,478**	**$42,580**	**$99,354**	**$70,967**	**$127,741**

Note: Yellow shading designates countries with highest estimated energy audit costs.

Table 6.6: Estimated Comprehensive Energy Audit Costs at Zurich's Facilities by Country

	Actual Data		Projected Data		Actual & Projected Data		Comprehensive Audit Cost (per ft^2)	
Country	**No. of Buildings**	**m^2**	**No. of Buildings**	**m^2**	**Total m^2**	**Total ft^2**	**(8 cents)**	**(50 cents)**
Australia	22	18,660	2	2,848	21,508	231,512	$1,852	$115,756
Germany	55	193,118	40	4,913	198,031	2,131,604	$17,053	$1,065,802
Italy	3	31,665	30	9,081	40,746	438,590	$3,509	$219,295
Spain	7	44,172	57	25,297	69,469	747,767	$5,982	$373,884
Switzerland	16	194,584	230	148,853	343,437	3,696,760	$29,574	$1,848,380
UK	26	88,167	18	24,820	112,987	1,216,192	$9,730	$608,096
US - Zurich	7	155,646	96	158,369	314,016	3,380,063	$27,041	$1,690,032
US - Farmers (Management Group)	0	0	21	218,412	218,412	2,350,990	$18,808	$1,175,495
Total Key 7 Countries (w/ Farmers)	**136**	**726,013**	**494**	**592,593**	**1,318,606**	**14,193,478**	**$113,548**	**$7,096,739**

Note: Yellow shading designates countries with highest estimated energy audit costs.

Chapter 6 References:

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CHAPTER 7: RECOMMENDATIONS

7.1 EMISSIONS MITIGATION OPTIONS BY COUNTRY

After inventorying carbon emissions and sources, identifying organizational and institutional barriers, researching country-level emissions targets, and assessing potential mitigation measures for application in the seven target countries, we developed a set of country-specific mitigation options. Employing this multi-phase approach elucidated the most feasible and organizationally expedient mitigation strategies for each country.

The following discussion details: 1) country-level recommendations for mitigation strategies and measures to achieve emissions reductions, 2) justification for such recommendations, and 3) identification of organizational barriers which may impede implementing suggested measures (where identified).[45] We first focused on those countries generating the most absolute emissions rather than on those countries characterized by the lowest cost of abatement. Although it may be easier for Zurich to target low-cost abaters, Zurich will not be able to achieve its reduction goals without targeting high-emitting countries, such as the U.S. We used this logic as a guideline when developing a group-wide carbon mitigation strategy for Zurich; therefore, the following country discussion is organized from largest to smallest emitter in absolute terms.

7.1.1 United States

Emissions from Zurich's buildings in the U.S. are proportionate to facility number. Therefore, the magnitude of ZNA leased (n = 102) to owned (n = 1) buildings (and associated emissions) necessitates targeting leased sites. Zurich U.S. has a unique opportunity to negotiate the terms of its leases with property managers, as about 88% of contracts will expire by 2012. When re-negotiating leases, Zurich can influence property managers to purchase more renewable energy and increase use of energy-efficient technologies. Additionally, smaller scale changes, such as replacing IT equipment with more energy-efficient devices and installing more efficient light bulbs, should also be implemented at leased sites. Energy-/carbon- and cost-savings achievable from installation of more energy-efficient IT equipment are modeled in Section 5.2.2.
A significant portion (22%) of ZNA and Farmers' emissions are also generated by air travel.[46] Reducing air travel by utilizing videoconferencing equipment and promoting telecommuting is, therefore, recommended.

Additionally, ZNA and Farmers' leased vehicle fleet accounts for 17% of countrywide emissions, and ZNA ranks first in terms of emissions from leased vehicles. Therefore, "green" fleet programs increasing use of more fuel-efficient vehicles and hybrids may yield substantial CO_2 savings.

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[45] Note that, when proposing mitigation measures, we assumed that energy-savings and installation costs of energy-efficient equipment were equivalent in all countries analyzed. Benefits and costs likely vary regionally or nationally, but without conducting energy audits at Zurich's facilities, it was not possible to discern such differences.

[46] Note that it was not possible to separate emissions from air travel or rental cars between ZNA and Farmers.

Finally, ZNA and Farmers lead Zurich in emissions from rental cars. Although emissions from rental cars account for less than 4% of country-wide emissions, promoting rental of more fuel-efficient vehicles is recommended given the high rate of use.[46]

7.1.2 United Kingdom

Similar to the U.S., facility-level emissions are also proportionate to facility number in the U.K. Therefore, the magnitude of Zurich U.K. leased (n = 42) to owned (n = 2) buildings (and associated emissions) necessitates targeting leased sites. Zurich may wish to consider a bubble scheme for reducing emissions throughout its U.K. offices. The U.K. is the only country considered in this analysis with a domestic ETS (U.K. ETS) and is also an active member of the EU ETS. Under the bubble scheme, facilities which find it easier to reduce emissions will do so by a greater amount than those which face obstacles (financial or otherwise) to doing so. Implementing a similar bubble scheme will provide Zurich U.K.'s facilities with much needed flexibility to reduce emissions. The U.K.'s active involvement in carbon trading, and the leadership it has exhibited in the matter, indicate its familiarity with being required to pay for the right to emit. Such experience may guide Zurich U.K.'s bubble scheme attempt. Depending on the success of its domestic scheme, Zurich could expand a bubble policy to its EU offices, beginning with the five EU countries targeted in this initial footprint analysis (i.e., Germany, Italy, Spain, Switzerland, and the U.K.). Furthermore, emissions at leased facilities may also be reduced using measures similar to those recommended for the U.S.

A significant portion (26%) of Zurich U.K.'s emissions are also generated by air travel. Reducing air travel by utilizing videoconferencing equipment and promoting telecommuting is, therefore, recommended.

Furthermore, Zurich U.K.'s leased vehicle fleet accounts for 25% of country-wide emissions and ranks second in terms of emissions from all leased vehicles. Therefore, "green" fleet programs targeting more fuel-efficient vehicles may yield substantial CO_2 savings.

7.1.3 Germany

Because the fraction of emissions generated by owned (51%) and leased (42%) facilities and the number of buildings of each type (24 owned, 71 leased) is relatively similar, we recommend targeting mitigation strategies at both owned and leased sites (Figure 7.1).

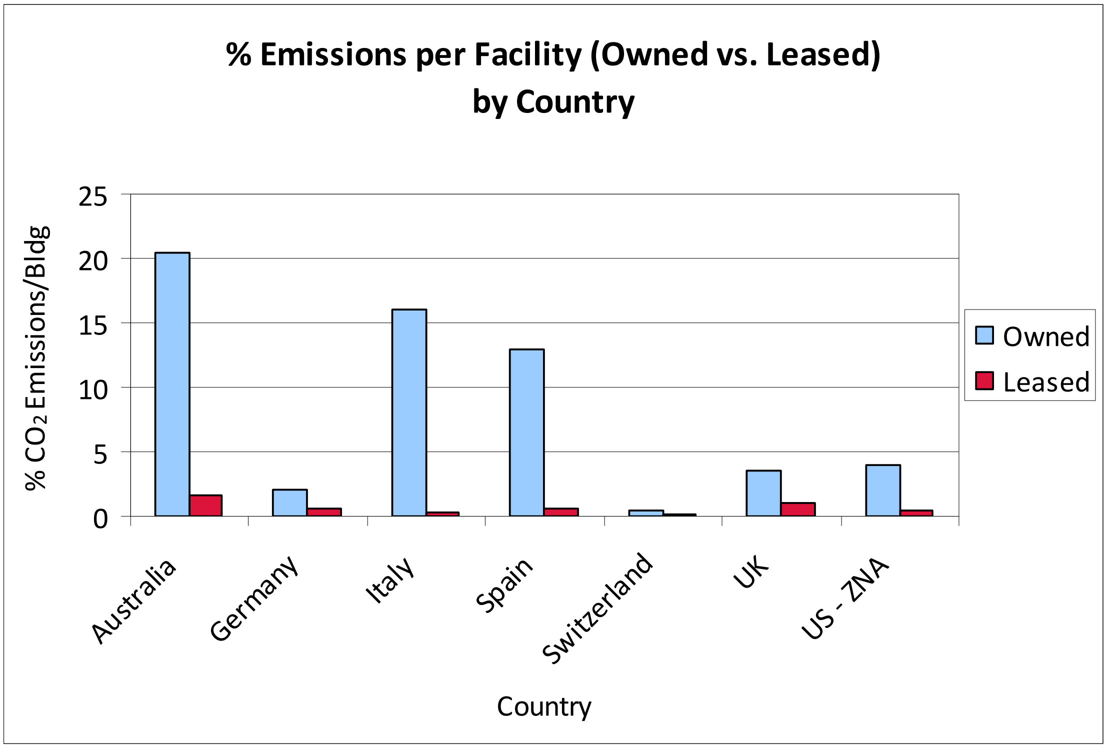

Figure 7.1: Percent Emissions per Facility (owned vs. leased) by Country.
Note that variation in emissions/building between owned and leased sites is greatest in Australia, Italy, and Spain.

Mitigation measures at owned facilities should include larger scale changes, such as increasing renewable energy purchased and improving insulation and HVAC systems due to Germany's cold climate. Emissions at leased facilities may be reduced using measures similar to those recommended for the U.S. and the U.K.

Air travel represents only 7% of country-wide emissions and, therefore, was not highlighted as part of Zurich Germany's mitigation package.

7.1.4 Switzerland

Although the portion of emissions from Zurich Switzerland's leased (24%) and owned (16%) facilities is similar, the magnitude of its leased (n = 211) to owned (n = 35) buildings necessitates targeting leased sites. Emissions at leased facilities may be targeted using measures similar to those recommended for Germany, the U.S. and the U.K.

Moreover, the proportion of emissions from air travel in Zurich Switzerland (59%) exceeds that of all other target countries. This is logical given that Zurich's international headquarters are located in Switzerland, making it a hub for business travel. Reducing air travel by utilizing videoconferencing equipment is, therefore, recommended.

Emissions from Zurich Switzerland's leased vehicle fleet account for only 1% of country-wide emissions and, therefore, we chose not to target this source in our mitigation package for this country.

7.1.5 Australia

Although Zurich Australia operates in more leased (n = 22) than owned (n = 2) buildings, the portion of emissions derived from its two owned facilities (41% vs. 35% for leased) is so great as to justify focusing mitigation efforts on owned structures (Figure 7.1). Therefore, emissions at owned facilities should be targeted through purchase of renewable energy, more energy-efficient HVAC systems, improved building and pipe insulation, and installation of motion-sensor lighting and energy-efficient light bulbs (e.g., CFLs).[47]

A substantial portion (24%) of Zurich Australia's emissions is also generated by air travel. Reducing air travel by utilizing videoconferencing equipment is, therefore, recommended. However, due to the significant time difference between Australia and the countries with which it conducts the majority of its business (i.e., EU and North American countries), in-person meetings may be preferable.

7.1.6 Spain

Major emissions sources and recommended mitigation measures for Zurich Spain parallel those for Zurich Australia. Although Zurich Spain operates in far more leased (n = 61) than owned (n = 3) buildings, the proportion of emissions derived from its three owned facilities (39% vs. 32% for leased) is so great as to justify focusing mitigation efforts on owned structures (Figure 7.1). It should be noted that the majority of buildings used by Zurich Spain are very old and, hence, energy-intensive and inefficient. Ideally, Zurich Spain would relocate to modern, energy-efficient sites to reduce emissions at the facility level, but this change is highly infeasible at a large scale. Therefore, emissions reductions at owned facilities may be achieved using measures similar to those proposed for Australia, with a particular emphasis on increasing the purchase of solar energy (especially in sunny, Mediterranean regions in the south).

A significant portion (29%) of Zurich Spain's emissions are also generated by air travel. Reducing air travel by utilizing videoconferencing equipment is, therefore, recommended.

7.1.7 Italy

Similar to Zurich Australia and Zurich Spain, Zurich Italy also generates a disproportionate amount of CO_2 emissions from owned facilities (Figure 7.1). Although Zurich Italy operates in far more leased (n = 28) than owned (n = 5) buildings, the portion of emissions derived from its five owned facilities (80% vs. 9% for leased) is so great as to justify focusing mitigation efforts on owned structures. Targeting owned facilities also provides Zurich Italy with maximum

[47] It is important not to discount potential mitigation measures applicable to *leased* facilities; if opportunities to introduce changes to leased sites emerge, action should be taken. However, due to the disproportionate generation of emissions by owned facilities in Australia, we decided to focus our analysis on owned sites. The same caveat applies to our recommendations for Spain.

flexibility and leverage to implement mitigation measures. Furthermore, Italy's institutional culture (characterized by relatively low Kyoto targets and a "status quo" mentality) may hinder major changes to increase energy efficiency at leased sites where Zurich already has minimal control over building operations.

Emissions at owned facilities should be targeted through increased purchase of renewable energy, more energy-efficient HVAC systems, improved building and pipe insulation, and installation of window tinting (especially in sunny regions).

Air travel represents only 11% of country-wide emissions and, therefore, was not targeted in Zurich Italy's mitigation package.

7.1.8 Recommendations

As evidenced by the previous discussion, it is impractical to make uniform recommendations across Zurich's operations. One must consider country-level variation in the primary sources of emissions, relative proportion of emissions from each source, and infrastructural, organizational, and institutional obstacles to implementing mitigation measures. Consequently, it is recommended that Zurich consider the interplay among all variables impacting corporate environmental action when developing future GHG reduction strategies.

7.2 COMPREHENSIVE REDUCTION PLANS

7.2.1 Overview

After identifying emissions reduction targets in each country, we assessed how Zurich may achieve such targets by employing strategic mitigation options.
Although Zurich has publicly committed to a 10% reduction goal by 2013, we believe it is capable of achieving a slightly more ambitious target. Therefore, we modeled several ways Zurich may achieve a 15% reduction in emissions below 2007 levels (baseline) by 2012. This target is not much greater than Zurich's publicly communicated goal. Additionally, if Zurich reduces its emissions by 10% or more before its 2013 deadline, it may enjoy reputational benefits.

Zurich may achieve the 15% group-wide reduction target by combining emissions reductions from multiple components of its operations. Emissions reductions may stem from four sources:

1) A company-wide rental car policy requiring rental of more fuel-efficient vehicles

2) Conversion of the existing leased vehicle fleet to a more fuel-efficient fleet (e.g., increasing the proportion of "green" cars or hybrids) in the U.K. and U.S. [48]

3) Country-specific reductions in air travel

4) Implementation of energy efficiency measures at owned and leased facilities.

[48] Hertz's "green" fleet is composed of the Toyota Corolla, Toyota Camry, and Ford Fusion. This fleet achieves an average combination city/highway 27.0 mpg. Fuel efficiency is based on manufacturer standards for 2009 models.

Scenario analysis modeling for rented and leased vehicles (Section 5.1) demonstrated that transportation-based mitigation policies will not account for the majority of Zurich's required reductions. Zurich must target its facilities to achieve the bulk of its emissions reductions. However, energy-/carbon-saving initiatives at facilities may be more costly, and require greater changes in corporate structure and employee behavior to implement, than transportation-based initiatives.

We developed three mitigation options (A, B, & C). Each option emphasized reductions over different time frames and from different emissions sources. Option A represents a short-term strategy, which maximizes emissions reductions from business travel (i.e., increased use of more fuel-efficient vehicles and reduced air travel). Option B is a long-term strategy that places a greater emphasis on facility-based emissions reductions. Option C combines short- and long-term strategies and models moderate emissions reductions from both business travel and facilities.

We calculated country-level and group-wide emissions reductions for each option, as well as energy (kWh)- and cost (USD)-savings associated with such reductions. A detailed description of the methodology used to calculate these values is provided in Appendix 19. Note that cost-savings presented in this analysis represent only gross/fixed, not net, values.

7.2.2 Mitigation Option A: Short-Term

CO_2 emissions reductions and kWh- and cost-savings from Option A are summarized in Table 7.1. CO_2 emissions reductions by country are depicted in Figure 7.2.

Analysis of Table 7.1 and comparison of Option A to Options B & C reveal the following trends, which impact the feasibility of implementation:

- Option A may be the easiest package to implement.
- Because a significant portion of modeled emissions reductions in Option A are generated from easy-to-change sources, it represents an effective *short-term* plan for Zurich and is the optimal choice for achieving immediate emissions reductions.
- However, facility-level energy and gross cost-savings from Option A are less than those corresponding to Options B & C, which provides minimal incentive for building owners and/or property managers to take action.

Table 7.1: Mitigation Option A

Country	Emission Source	CO_2 Reduction (metric tons)	Facility-Based Energy Savings (kWh)	Gross Cost-Savings (USD)
Australia	Air Travel	448	n/a	$604,256
	Facilities--Owned	690	790,097	$72,113
	Total	**1,138**	**790,097**	**$676,369**
Germany	Facilities--Owned	1,126	3,224,218	$414,598
	Facilities -- Leased	922	$2,640,079	$339,484.728
	Total	**2,048**	**3,224,218**	**$754,083**
Italy	Facilities--Owned	521	1,285,173	$251,230
	Total	**521**	**1,285,173**	**$251,230**
Spain	Air Travel	277	n/a	$440,622
	Facilities--Owned	288	824,511	$171,604
	Total	**565**	**824,511**	**$612,226**
Switzerland	Air Travel	1,535	n/a	$3,115,769
	Facilities--Leased	38	1,448,668	$143,722
	Total	**1,573**	**1,448,668**	**$3,259,491**
United Kingdom	Leased Vehicle Fleet	296	n/a	n/a
	Air Travel	1,194	n/a	$2,451,175
	Facilities--Leased	1,301	2,753,358	$382,799
	Total	**2,791**	**2,753,358**	**$2,833,974**
United States	Leased Vehicle Fleet	774	n/a	n/a
	Air Travel	7,230	n/a	$7,321,509
	Facilities--Leased	11,340	19,792,856	$4,339,401
	Total	**19,344**	**19,792,856**	**$11,660,910**
Other	Air Travel	877	n/a	$1,054,923
	Facilities	4,496	9,938,006	$1,534,643
	Total	**5,373**	**9,938,006**	**$2,589,566**
Group-wide Total		**33,353**	**40,056,885**	**$22,637,848**

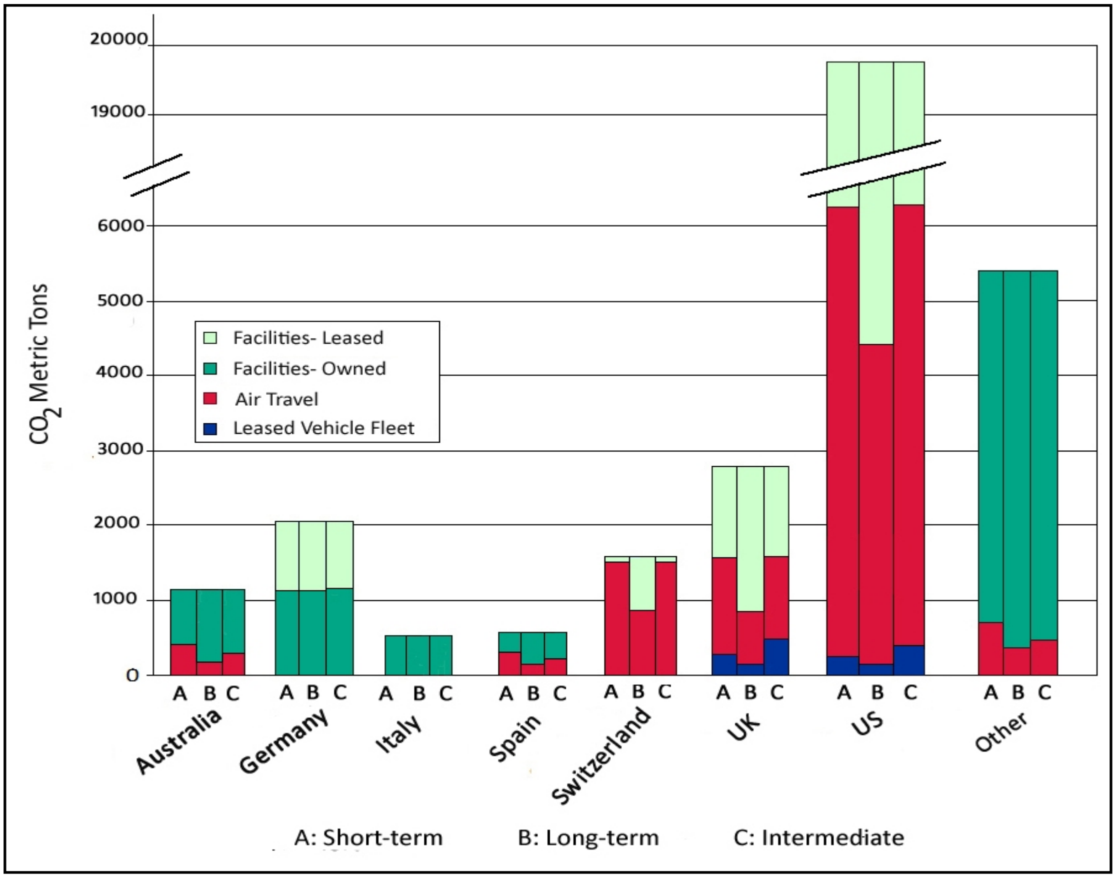

Figure 7.2: **CO_2 Emissions Reductions by Country for Mitigation Options A, B, and C.** Note that modeled reductions are greatest for the U.S., which has the largest carbon footprint of the countries in which Zurich operates.

7.2.3 Mitigation Option B: Long-Term

CO_2 emissions reductions and kWh- and cost-savings from Option B are summarized in Table 7.2. CO_2 emissions reductions by country are depicted in Figure 7.2.

Table 7.2: Mitigation Option B

Country	Emission Source	CO_2 Reduction (metric tons)	Facility-Based Energy Savings (kWh)	Gross Cost-Savings (USD)
Australia	Air Travel	269	n/a	$362,554
	Facilities--Owned	869	995,065	$90,821
	Total	**1,138**	**995,065**	**$453,375**
Germany	Facilities--Owned	1,126	3,224,218	$414,598
	Facilities -- Leased	922	2,640,079	$339,485
	Total	**2,048**	**5,864,297**	**$754,083**
Italy	Facilities--Owned	521	1,285,173	$251,230
	Total	**521**	**1,285,173**	**$251,230**
Spain	Air Travel	166	n/a	$264,373

	Facilities--Owned	399	1,142,291	$237,742
	Total	**565**	**1,142,291**	**$502,116**
Switzerland	Air Travel	921	n/a	$1,869,461
	Facilities--Leased	652	24,856,086	$2,465,962
	Total	**1,573**	**24,856,086**	**$4,335,424**
United Kingdom	Leased Vehicle Fleet	136	n/a	n/a
	Air Travel	716	n/a	$1,470,705
	Facilities--Leased	1,939	4,103,582	$570,520
	Total	**2,791**	**4,103,582**	**$2,041,225**
United States	Leased Vehicle Fleet	194	n/a	n/a
	Air Travel	4,338	n/a	$4,392,905
	Facilities--Leased	14,812	25,852,891	$5,668,007
	Total	**19,344**	**25,852,891**	**$10,060,913**
Other	Air Travel	526	n/a	$632,954
	Facilities	4,847	10,713,860	$1,654,452
	Total	**5,373**	**10,713,860**	**$2,287,405**
Group-wide Total		**33,353**	**74,813,244**	**$20,685,770**

The feasibility of implementing Option B, compared to Options A and C, is as follows:

- Option B may be the most difficult to implement as it maximizes emissions reductions from facilities. Under this scenario, it is expected that emissions from facilities (owned and/or leased) will be reduced by 25% or more in some cases. While this aligns with Option B's emphasis on reductions from buildings, it may not be feasible for Zurich to achieve such large decreases without completely retrofitting facilities or purchasing offsets. Therefore, this scenario may not be the most realistic or cost-effective.
- Option B represents an effective plan for Zurich to increase the efficiency of its buildings but may require more time to implement, as a significant portion of modeled emissions reductions are generated from hard-to-change sources.
- Facility-level energy and gross cost-savings from Option B are greater than those corresponding to Option A, which provides an incentive for building owners/property managers to take action.
- However, overall gross cost-savings from Option A are greater than those of Option B by approximately $2 million, making Option A a slightly more desirable scheme for reducing emissions from a purely financial perspective.

7.2.4 Mitigation Option C: Intermediate-Term

CO_2 emissions reductions and kWh- and cost-savings from Option C are summarized in Table 7.3. CO_2 emissions reductions by country are depicted in Figure 7.2.

Table 7.3: Mitigation Option C

Country	Emission Source	CO_2 Reduction (metric tons)	Facility-Based Energy Savings (kWh)	Gross Cost-Savings (USD)
Australia	Air Travel	269	n/a	$362,554
	Facilities--Owned	869	995,065	$90,821
	Total	**1,138**	**995,065**	**$453,375**
Germany	Facilities--Owned	1,126	3,224,218	$414,598
	Facilities--Leased	922	2,640,079	$339,485
	Total	**2,048**	**5,864,297**	**$754,083**
Italy	Facilities--Owned	521	1,285,173	$251,230
	Total	**521**	**1,285,173**	**$251,230**
Spain	Air Travel	166	n/a	$264,373
	Facilities--Owned	399	1,142,291	$237,742
	Total	**565**	**1,142,291**	**$502,116**
Switzerland	Air Travel	1,535	n/a	$3,115,769
	Facilities--Leased	38	1,448,668	$143,722
	Total	**1,573**	**1,448,668**	**$3,259,491**
United Kingdom	Leased Vehicle Fleet	340	n/a	n/a
	Air Travel	1,194	n/a	$2,451,175
	Facilities--Leased	1,257	2,660,239	$369,852
	Total	**2,791**	**2,660,239**	**$2,821,028**
United States	Leased Vehicle Fleet	774	n/a	n/a
	Air Travel	7,230	n/a	$7,321,509
	Facilities--Leased	11,340	19,792,856	$4,339,401
	Total	**19,344**	**19,792,856**	**$11,660,910**
Other	Air Travel	526	n/a	$632,954
	Facilities	4,847	10,713,860	$1,654,452
	Total	**5,373**	**10,713,860**	**$2,287,405**
Group-wide Total		**33,353**	**43,902,447**	**$21,989,637**

The feasibility of implementing Option C, compared to Options A and B, is as follows:

- Option C combines short- and long-term strategies and models moderate emissions reductions from business travel and facilities. With respect to emissions reductions from facilities, which represent the bulk of emissions produced by Zurich, Option C is easier to implement than Option B but harder to implement than Option A. This is because Option B maximizes, while Option A minimizes, emissions reductions from facilities.
- As for Option B, under this scenario, it is expected that emissions from facilities (owned and/or leased) will be reduced by 25% or more. It may not be feasible for Zurich to achieve this goal without completely retrofitting facilities or purchasing offsets.

- Option C also models a combination of 15% and 25% reductions in air travel. These ambitious targets contribute to greater gross cost-savings than Option B ($21,989,637 compared to $20,685,770) and also present a more realistic alternative to Option A, which requires 25% reduction in air travel in all countries.
- Option C places more emphasis on reducing emissions from facilities compared to Option A, resulting in facility-based energy savings of 43,902,447 kWh (as compared to 40,056,885 kWh savings from Option A). We encourage Zurich to extend its planning horizon and invest in energy efficiency upgrades that will yield considerably more energy savings in the long-run; increased energy savings prompt building owners/property managers to take action.
- Option C may represent a more realistic and cost-effective plan for Zurich than Option B, while also encouraging the company to increase the efficiency of its buildings. Similar to Option B, Option C may require more time to implement compared to Option A, as a significant portion of modeled emissions reductions are generated from hard-to-change sources.

Comparison of Mitigation Strategies

From a purely financial perspective, Option A is most desirable, as it yields the greatest gross cost-savings ($22,637,848). However, as Figure 7.3 depicts, Option B is the most desirable strategy from an environmental perspective, as it yields the greatest energy savings from facilities (74,813,244 kWh).

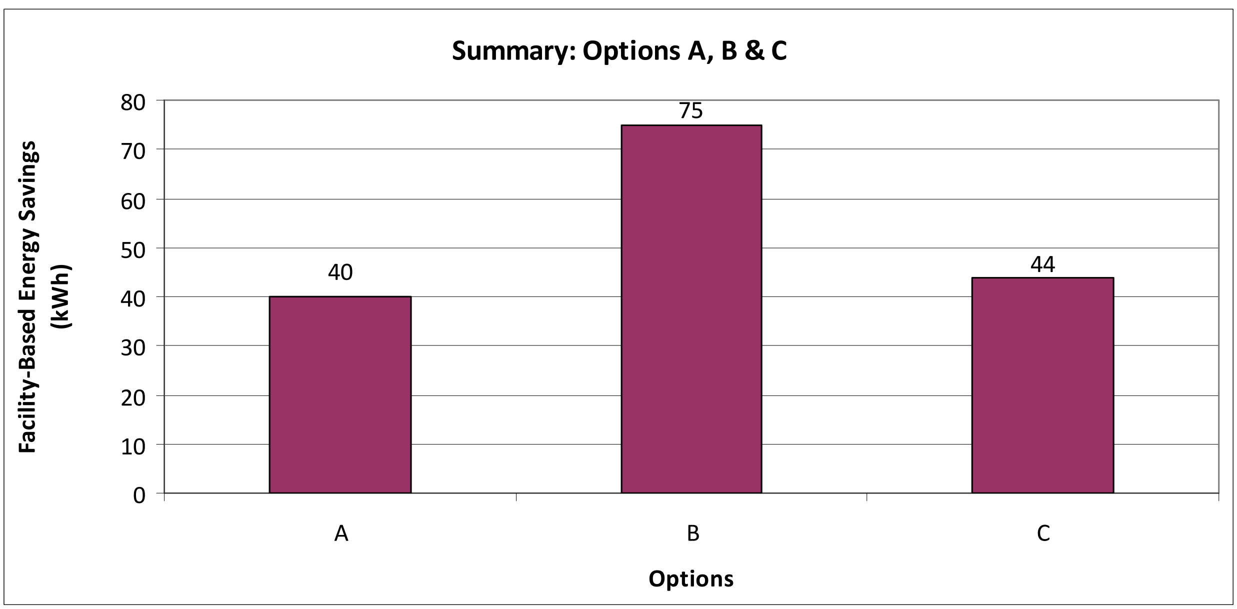

Figure 7.3: Comparison of Mitigation Options in terms of Facility-based Energy Savings (kWh)

Zurich may choose to implement the option which best aligns with its corporate strategy and financial capabilities. If Zurich seeks to pursue a more aggressive carbon management plan in the future, it may consider implementing one of the additional targets we established (Refer to Section 4.3 for a detailed discussion of reduction target choice and modeling):

- 30% below 2007 levels by 2016
- 50% below 2007 levels by 2020

Our preliminary analysis, based on a 15% reduction target, provides a starting point for Zurich to pursue long-term emissions reductions.

7.3 CARBON OFFSETS

If Zurich seeks to become carbon neutral in the future, it may have to partially rely on the purchase of carbon offsets. Offsets require an up-front cost without the potential for cost-savings or return on investment. In contrast, many environmental measures, such as retrofitting buildings with updated HVAC and lighting systems, installing energy-efficient technology, and increasing the efficiency of employee behavior, yield significant cost savings.

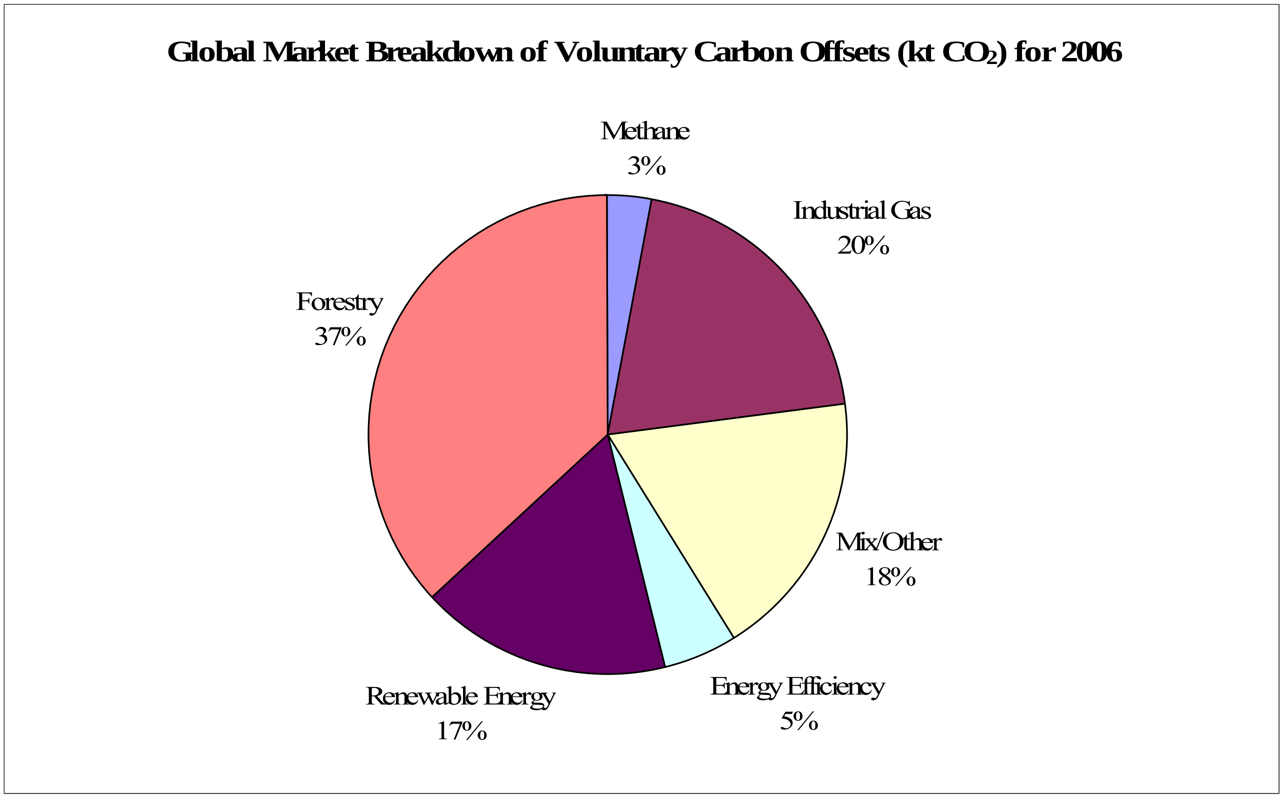

Figure 7.6: Major Classifications of Offset Projects Worldwide

7.3.1 Overview

The global voluntary carbon offset market has grown rapidly within the last decade (Hamilton et al. 2007). From 2002 to 2006, the number of organizations supplying carbon credits grew by 200%, with online retailers being the fastest growing sector. Between 2005 and 2006, the voluntary carbon market also grew 200% to a value of US$54.9 million (Hamilton et al. 2007).[49] Figure 7.6 depicts the global breakdown of offset projects (Hamilton et al. 2007).[50] Most companies who participate in the voluntary market aim to offset their on-site electricity and energy use as shown in Figure 7.7 (Hamilton et al. 2007).[50] Eight of Zurich's 18 main competitors claim to invest in carbon offsets as part of their larger plan to reduce GHG emissions. These eight include some of the most environmentally dedicated and ambitious companies such as AIG, Allianz, Munich Re, and Swiss Re.

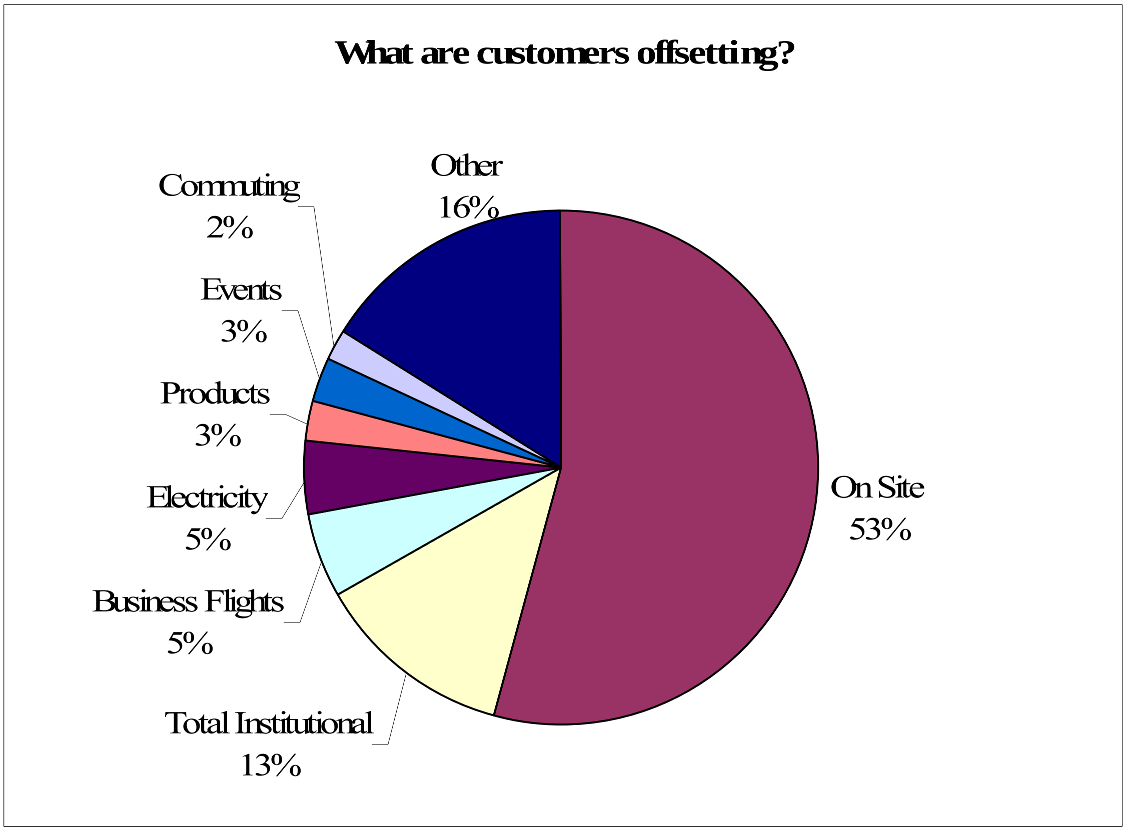

Figure 7.7: Activities Targeted by Customers Purchasing Carbon Offsets

The growth of the offset market does not guarantee it is strong or economically advantageous. The offset market is unregulated and lacks quality and pricing standards and is, to an extent, a risky investment for a company, particularly when the environmental, economic, and social trade-offs of offsets are evaluated.

[49] The carbon offset market value varies substantially by source. Nita Chestney reports in *Reuters*, Oct. 3, 2008, that the value in 2007 was worth $330 million. Melissa Checker reported in *Counterpunch*, Oct. 27, 2008, that the market grew 175% between 2005 and 2007 and reached $110 million. Discrepancies in reported values are indicative of the larger problem in the voluntary offset market: the lack of transparency and lack of global standards/regulations, which not only make it difficult to measure the quality of the transactions but also make it virtually impossible to measure the value of transactions.

[50] Our group created these figures based on data provided in the State of the Voluntary Carbon Market Report by Hamilton et al. (2007).

Several independent studies have analyzed the value of carbon offsets. One study performed by Environmental Data Services (EDS), an environmental research specialist, concluded that of the 170 offset companies reviewed, only 30 were considered "quality" providers (Harvey 2007). A 2007 *Financial Times* investigation found widespread examples of individuals and organizations buying worthless credits, industrial companies gaining carbon credits for actions from which they had already benefited, brokers providing services of questionable or no value, and a shortage of verification procedures and regulations (Harvey 2007). *The Guardian*, a UK-based newspaper, suggested, as a result of its findings, that schemes are well-meaning but thoroughly unreliable (Davies 2007). In 2008, Environmental Defense Fund (EDF) released their Carbon Offset Project List. EDF found only 12 worthwhile global offset projects, and 11 of the 12 projects focused on methane capture (Winston 2008).

7.3.2 Disadvantages of Offsets

Offsets have been heavily criticized, mainly for the uncertainty associated with their use. The main criticisms, accompanied by examples, are outlined in Table 7.4. For further information on these examples, refer to Appendix 20.

Table 7.4: Criticisms of Offsets with Accompanying Examples

Criticism	Specific Details and/or Examples
Consumers are unable to verify whether emissions reductions have actually occurred	• Example: Coldplay in Karnataka, India
Additionality; investments offset projects that would have occurred regardless	• Destroying harmful gases which are already regulated (e.g., HFCs are to be phased out under the Montreal Protocol as ozone-depleting substances anyhow) • Example: Alaska Village Electric Cooperative and Native Energy
Lack of transparency and regulation due to lack of accepted international standards and/or verification procedures	• Uncertified providers can take money premium for private gain • Example: Atmosfair
Lack of permanence	• Forestry schemes cannot guarantee trees will not be cut down or die of diseases, lack of water, etc. • Example: Coldplay
Leakage; unintended but detrimental effects outside project boundary.	• Reforestation schemes utilize excessive quantities of local water supply at the expense of agricultural crops in the area, thus merely transferring deforestation to another part of the forest and/or the world. • Example: Climate Care and light-bulbs in South Africa
Volatility in prices; no standard approach or pricing structure exists for determining	

the value of offsets.	
Double-counting; no formal requirement to register or retire credits when a project is completed.	• For example, when calculating the offsets required for a flight from point A to point B, some retailers consider the ground vehicles servicing the aircraft before take-off while others simply account for the emissions of the flight.
Future value accounting; might purchase offsets today but due to nature of the project in question, it might take several years for emissions savings to be achieved, thus increasing the possibility that offsets might not actually occur.	

7.3.3 Recommendations

While carbon offsets pose problems, the larger concern is that carbon offsets should not replace direct emission reduction schemes. Carbon offsets should be a "last resort" for companies to neutralize the part of their carbon footprint that cannot be addressed through direct emissions reductions, the purchase of alternative or renewable energy, energy efficiency programs, or retrofitting of buildings. Companies who have taken these definitive steps may apply carbon offsets to address the remaining small percentage of emissions that result from certain products, services, or events.

Because the retail market is rapidly changing, it is difficult to recommend individual retailers. This is evidenced by Clean Air, Cool Climate's assessment, which although based on extensive research of retailers at the time of publication, did not stand the test of time. The first place to start, if considering purchasing offsets, is to be well-informed about the retailer and the project by learning the answers to questions, including:

- Is the offset project verified?
- Does the project go beyond common business practice?
- Does the project go beyond legal or regulatory requirements?
- Would the project have happened in the absence of the specific offset project/funding?
- Does the project have a paper trail or any way to determine if the project is actually occurring?
- Is there a way to verify the offsets were sold only once?
- Will the project have sufficient funding and supervision to be maintained?
- What is the time scale (beginning/end date) of the project?
- How is the success of the project measured?

Given the uncertainty and volatility of the voluntary carbon market, carbon offsets are best used to offset small portions of emissions for those individuals or companies who produce significant direct emissions and want to achieve carbon neutrality. Historically, offsets were one of the last mitigation strategies employed and only addressed the remaining emissions that were not reduced by more ambitious strategies. The attitude towards carbon offsets has evolved and some individuals and companies use offsets as their only strategy to lower emissions. This tactic, however, is subject to increasing public criticism; it is the "easy way out" and does not contribute to significant changes in behavior or operations. Consequently, Zurich's first step toward reducing emissions should be an overarching environmental strategy to address energy usage, alternative energy sources, energy efficiency, best practices for individuals, and increased operational efficiency. Only after these major organizational changes have been implemented, and emissions have been reduced, should Zurich consider offsets.

Chapter 7 References:

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CHAPTER 8: NEXT STEPS

Although we outlined several carbon management recommendations for Zurich in Chapter 7, many opportunities for further emissions reductions exist. The following sections outline these opportunities.

SHORT-TERM STRATEGIES

8.1 OPPORTUNITIES TO INCREASE EFFICIENCY AND COST-SAVINGS

Escalating energy prices have recently encouraged corporations to conserve energy, and energy efficiency is becoming a priority item on many corporate agendas. Over the past five years, the average company's energy costs have increased by 10 to 30% (Andrud 2008). Thus, energy conservation/efficiency should be viewed as an opportunity and managed as a company-wide initiative that will provide long-term financial benefits. Zurich should treat energy as an operational challenge that must be managed diligently, deserving the same attention as the purchase and utilization of other assets.

8.1.1 Energy Audit Recommendations: What Type of Audit Does Zurich Need?

The type of audit Zurich selects will depend on the energy project goals. If Zurich specifically seeks to explore options for a specific area, like lighting, a single purpose/targeted audit is the best choice. If Zurich does not know where to focus its efforts, or seeks further information to support its undertaking of energy efficiency initiatives, a comprehensive audit may be preferred. A comprehensive energy audit will help Zurich identify and distinguish energy demand between "plug load" electronic and IT equipment, commercial lighting, and more energy consumptive technologies/systems, such as HVAC. In general, a major renovation involves elements of HVAC retrofits, building envelope modifications, and interior rehabilitation with higher upfront costs. Smaller scale renovations may target lighting or "plug loads" with lower upfront costs and shorter payback periods (LEED 2005). Distinguishing differences in energy demand within facilities would assist Zurich in developing short-term strategies targeting smaller scale retrofits while planning for large-scale renovation and projects in the future.

Table 8.1 lists the CEC's suggested questions that each manager should ask to determine the audit type that best suits his/her facility (CEC 2000):

Table 8.1: Energy Audit Guidance

Questions to help Zurich determine audit needs	If Zurich's answer is "Yes," then we recommend. . .	If Zurich's answer is "No," then we recommend. . .
Do you want a cursory analysis of the potential for energy projects in your facility?	Preliminary energy audit	Single purpose or comprehensive study
Do you already have an energy audit completed?	Existing studies may only need to be updated to get	Preliminary audit or single purpose or comprehensive

	project financing	study
Have some energy efficiency projects been installed?	Single purpose study focusing on specific projects not previously analyzed	Preliminary audit or single purpose or comprehensive study
Do you have limited funds to spend on an audit?	Preliminary or single purpose study	Comprehensive study
Do you know what projects you want to implement?	Single purpose study focusing on specific projects not previously analyzed	Preliminary audit or comprehensive audit
Do you want a document that serves as an energy plan for your facility?	Comprehensive study	Preliminary audit or single purpose study
Are you concerned about accuracy of energy project savings and cost?	Comprehensive study	Single purpose study

Source: *How To Hire An Energy Efficiency Auditor To Identify Energy Efficiency Projects*. Energy Efficiency Division. California Energy Commission (CEC). January 2000.

Because Zurich's managers have the final decision at owned facilities, a comprehensive energy audit to identify all efficiency opportunities should be completed. A comparable strategy was employed by Swiss Re when it launched its Climate Neutral Initiative. By mandating that energy audits be performed at its owned facilities, Swiss Re gained insight as to why some offices produce more emissions than others (See case study in Appendix 16). By emulating Swiss Re, and focusing comprehensive audits on owned facilities, Zurich may better understand the major energy consuming components of its operations, thereby highlighting previously unrecognized opportunities at leased sites.

8.1.2 IT Recommendations

In addition to completing energy audits, Zurich may replace IT equipment and other "plug loads"/electronic equipment within its offices to realize further emissions reductions. These changes can be accomplished more quickly than HVAC upgrades or other large-scale energy efficient technologies. This mitigation option is also advantageous because of short payback periods, 2.6 years (MFDs) and 0.5 years (monitors and printers). Zurich should first focus on upgrading monitors rather than MFDs or printers. Not only does Zurich have very large numbers of monitors in use, but a substantial difference also exists in per-unit electricity consumption (~1,700 kWh) between traditional and energy-efficient products. Cost-savings associated with monitor upgrades are also considerable. For example, a 25% switch out of Zurich's monitors would yield net life cycle cost-savings of ~ $3 million per year (See Table 5.9). One of Zurich's long-term goals should be to replace 100% of its IT equipment with energy-efficient products.

8.1.3 Additional Opportunities for Efficiency

Characteristics of Zurich's lease arrangements may increase Zurich's leverage to implement energy efficiency initiatives in its leased facilities. This could have the most significant impact on reducing Zurich's overall emissions.

Area Occupied by Zurich in Leased Facilities

To take advantage of opportunities for energy efficiency within its leased facilities, Zurich should know the proportion of leased to total floor space it occupies within facilities. If Zurich leases the majority of a building, it will have greater leverage to request that the owner or landlord perform energy retrofits and structural changes to the buildings. In countries (e.g., Switzerland and the U.S.), where Zurich occupies a large percentage of its leased buildings, Zurich can use its position as a prominent tenant to persuade the landlord to incorporate energy efficiency upgrades. This is especially pertinent when renewing leasing agreements and contracts.

Due to the lack of data from leased facilities in some countries (e.g., Australia and Italy), we cannot predict how much leverage Zurich may have in all its leased buildings (Table 8.2). Similarly, data from countries such as Spain and Switzerland make it difficult to accurately assess the degree of Zurich's influence or control in its facilities. A more thorough analysis of leased space in the future requires that Zurich aggregates information on total occupied floor space within leased facilities.

Table 8.2: Proportion of Leased Space within Buildings per Country

Country	Leased Facilities with Data	Average Leased to Total Facility Area (%)
Australia	0 out of 22	n/a
Germany	68 out of 71	3
Italy	0 out of 28	n/a
Spain	5 out of 61	32
Switzerland	6 out of 211	95
United Kingdom	39 out of 42	55
United States	4 out of 4	97

Lease Expiration Dates

In an effort to explore opportunities for efficiency within Zurich, we researched the expiration dates of contracts for leased buildings. By aggregating the expiration dates of leases for Zurich's operations in the U.S. and Canada, we determined that the majority of these dates coincide with our three reduction target timelines (2012, 2016, and 2020). Herein lies a critical opportunity for Zurich: within the next 11 years, Zurich will have the opportunity to re-negotiate the terms of its leases to incorporate more energy efficient elements. For example, Zurich may enter into discussions with property managers when leases expire to increase the amount of renewable energy purchased. Where Zurich has substantial leverage to encourage facility-level changes, it should develop in-house initiatives in line with those of its competitors including recycling campaigns, partnerships with NGOs, and energy efficiency measurs.

Table 8.3 presents a summary of the expiration dates of leases for Zurich's operations in the U.S. and Canada. Approximately 88% and 57% of leases will expire by 2012 in the U.S. and Canada, respectively. This presents an opportunity for Zurich to leverage its large market share in the financial services sector to make substantial changes to its contracts to become more energy efficient. Furthermore, an additional 10% and 43% of leases will expire by 2020 within the U.S. and Canada, respectively. Thus, nearly all contracts for leased facilities will end during the same year that Zurich is forecasted to reach our proposed 50% reduction target.

Table 8.3: Expiration Timelines for Building Leases

Business Unit	% of Leases Expiring by 2012	% of Additional Leases Expiring by 2016	% of Additional Leases Expiring by 2020	# Month-to-Month Leases	% of Month-to-Month Leases
ZNA - US	88%	7%	3%	1	0.8%
ZNA - Canada	57%	29%	14%	0	0.0%

Finally, one U.S. facility operates on a month-to-month lease. Therefore, the opportunity to negotiate terms of the contract to incorporate energy efficient elements can begin immediately. This building is not responsible for a large portion of ZNA's emissions or business operations, as it is a small facility (375 sq. ft.), which currently houses one employee. However, the opportunity to reduce emissions through lease negotiations should not be overlooked.

Although similar information on lease expiration dates was available for FIG, large discrepancies exist between data related to expiring leases and the leased buildings data used to calculate the carbon footprint, which we know to be accurate. Because the number and location of FIG leases within the two files did not match, Farmers was excluded from this analysis.

This breakdown demonstrates that Zurich has more leeway in negotiating terms with current building managers or changing its leases than previously thought. However, this analysis represents only two examples of Zurich's ability to achieve emissions reductions without moving locations or considerably retrofitting its facilities. Hence, Zurich should obtain information regarding lease expiration dates in other countries to take advantage of similar opportunities.

8.2 WORKPLACE BEHAVIOR CHANGE/EMPLOYEE ENGAGEMENT

While Zurich may implement several strategies to increase the efficiency of its operations at facilities, the success of environmental initiatives hinges on employee support.

Our questionnaire, administered to Zurich's facility managers in the seven target countries, revealed that "lack of employee buy-in" is a major obstacle in promoting in-house efficiency measures. Yet, substantial improvements in energy efficiency at Zurich's facilities are required to meet its emission reduction targets. Consequently, we recommend that Zurich use the following methods to promote behavior change in the workplace and increase employee engagement in "green" initiatives.

Behavior is shaped by four main sources: (1) social & cultural factors, (2) financial factors, (3) internal factors, and (4) effort factors (i.e., how much effort is required to accomplish the task and at what gain?) (Armel 2008). These sources combine to influence the degree of environmentally responsible behavior exhibited by a company and its employees.

The Verizon Foundation considered these four sources when developing its employee engagement program. Of Verizon's numerous employee engagement initiatives, three are particularly relevant to Zurich:

1. Verizon's carbon credit card program, which logs carbon savings for each employee. Rewards (e.g., environmentally friendly products) are provided to employees who log substantial carbon savings (Murray 2008). This program motivates employees and provides incentives to enhance employee interest and involvement.
2. Verizon provides mechanisms for employees to interact and get involved in environmental issues through formation of employee councils (e.g., "green teams") (Murray 2008).
3. To communicate information across large teams of employees, Verizon leverages the company's Communications Team and attempts to harness motivation from senior executives who may serve to "champion" particular causes.

Zurich may wish to emulate such initiatives to motivate employees, facilitate engagement, and communicate more effectively about environmental programs.

Energy efficiency decisions are further influenced by the following four factors (Armel 2008):

1. Economic savings from technical evolution
2. Content & scope—functional, replacement, capacity, and diversification
3. Analytical characteristics—stimulus, uncertainty, complexity, and controllability
4. Strategy—strategic vs. non-strategic approach

Therefore, implementation of energy efficiency initiatives in corporate facilities may be most feasible when initiatives yield cost-savings, are associated with limited uncertainty, are within the capacity of the corporation, and are integrated strategically. However, as demonstrated by our cost analysis, mitigation measures may have long payback periods and may require changes in company prioritization to initiate. Harnessing the power of fun and competition is one means to facilitate employee and corporate shifts to accomplish such changes (Ward 2007).

Case Study: Swiss Re's Internal Environmental Management Award Program

Swiss Re, one of Zurich's primary competitors, harnessed the power of competition to reduce the environmental impact of business operations through its annual Internal Environmental Management Award program. This program pits management teams against one another in a challenge to reduce energy consumption and associated carbon emissions. The program has generated substantial reductions in energy use. For example, in 2005, the award went to the

Internal Environmental Management team in Munich, which reduced energy consumption by 15.2% between 2003 and 2004 and switched to buying 100% renewable energy in 2005 (Swiss Re 2008). Swiss RE also reinforces the importance of energy efficiency and corporate environmental responsibility through regular Lunch & Learn sessions (Swiss Re 2008). Both activities introduce elements of fun and competition into Swiss Re's operations.

8.2.1 Gaming Applications in the Workplace

Fun and competition are also integral components of massively multi-player online role-playing games (MMORPGs) such as *World of Warcraft*. Convinced that games can help them thrive, some companies (including six Fortune 500 companies) have turned work groups into "guilds," reward staff with experience points when they complete tasks, and portray objectives as "quests" (Ward 2007). MMORPGs, which require distributed decision-making and collaboration within geographically diverse groups, provide a "window into the future of real-world business leadership" and have numerous applications to the corporate arena (Reeves et al. 2008).

The use of gaming/simulation tools in the workplace is an, admittedly, radical concept; yet, designing game-like interfaces and programs aligned with corporate strategies may yield the following micro- and macro-scale benefits (Reeves et al. 2008):

- First, "research suggests that gaming experience helps decision-makers be comfortable with—and operate in a corporate culture that readily accepts—modifying decisions in response to contingencies and adopting iterative strategies marked by repeated course corrections" (Reeves et al. 2008). Such skills would benefit Zurich employees facing a dynamic setting related to energy policy and climate change.
- Additionally, mimicking the structure of games by breaking down large challenges into small projects helps expose leaders to risk. As Reeves *et al*. (2008) indicate, "Failure is more palatable for the individual, and more affordable for the organization, when it happens at the project level rather than on a larger scale." If Zurich is risk-averse, implementing several, small programs to achieve group-wide emission reduction goals may be preferable to single projects requiring large upfront investments.
- Furthermore, interactive games align the objectives of individual players with those of the organization (Ward 2007) and may enhance a company's ability to innovate rapidly and collaborate effectively, even from distant locations (Fitzgerald 2007).
- Numerous companies (e.g., Cold Stone Creamery) have also used video games to train employees (Fitzgerald 2007). By designing an interactive, game-like tool, Zurich may be able to develop a more thorough, integrated monitoring and tracking system for emissions that is understandable by employees group-wide. The same type of tool could be designed to convey an environmentally responsible corporate culture and inform employees of how their actions can contribute to Zurich's emission reduction goals.
- Finally, game environments promote "hypertransparency of information about, for example, team members' real-time performance, which empowers individuals to manage themselves" (Reeves et al. 2008). At Zurich, real-time energy monitoring between offices—possibly through use of SmartMeter technology—within a country or between countries could foster healthy competition, leading to group-wide emissions reductions.

Converting the “workplace” into a “play place” has the potential to increase employee enthusiasm for environmental efforts, enhance the sense of corporate community, and reduce emissions at a faster rate, while encouraging routine monitoring and tracking of emissions. Moreover, applying gaming technology to promote a corporate behavioral shift would provide a unique opportunity for Zurich to differentiate itself in the financial services sector.

LONG-TERM STRATEGIES

8.3 METHODS TO IMPROVE CARBON MANAGAGEMENT

In addition to opportunities at the facility level, Zurich can adopt group-wide policies to improve the ease and accuracy of carbon footprint reporting through the following methods.

8.3.1 Streamline Data Collection

Because this project represents Zurich’s first attempt at calculating its carbon footprint, we encountered several barriers to collecting complete information in a timely manner. Data was collected manually by sending requests to key contacts in each country. However, not all information requested was available, as the task of recording energy use has not traditionally been a standard procedure of high importance for Zurich. For the purposes of this project, the method of data collection was sufficient. However, a streamlined, company-wide policy outlining the type of information needed, the process by which to enter it, and the timeline in which it is needed will greatly improve the ease and accuracy of inventorying and reporting.

We strongly encourage Zurich to implement a centralized system by which employees may report carbon footprint data and related information. This may parallel the type of system used to report financial earnings or company sales. Adoption of such a system would require an employee in each country to enter such information for the previous year by the end of January, so carbon footprint results can be communicated in Zurich’s annual report, CDP report, and the Dow Jones Sustainability Index.

Additionally, this system can be used to gather qualitative information, similar to that collected in our questionnaire (Appendix 4). Not only is it important to collect raw data for footprint calculations, but it is also imperative that Zurich track environmental initiatives executed within its offices. This will allow Zurich to understand the components that it can either implement or strengthen to realize emissions reductions.

8.3.2 Analyze Trends & Revise Baseline in Response to Industry Leaders and Company Growth

As Zurich’s operations expand, it must revise its baseline footprint per specifications of the WRI/WBCSD GHG Protocol. This will allow Zurich to analyze emissions trends. Zurich should also revise its baseline in response to commitments by competitors/industry leaders and company growth. The latter may be accounted for by normalizing emissions.

Setting relative, as opposed to absolute, targets will allow for continued refinement of emissions goals to account for business growth. Relative targets may be defined as a percent reduction in emissions relative to FTEs, gross written premium, or some other normalizing metric. For example, Zurich may establish a goal of reducing 3% of its emissions per billion dollars of gross written premium over the next three years. Conversely, absolute targets reflect a percent reduction over time irrespective of changes in business operations. Therefore, as noted in the WRI/WBCSD GHG Protocol, a company may be praised for improving its carbon footprint, when really it only reduced its business operations or output. Because of the advantages related to relative targets and their inherent consideration of operational growth, it is recommended that Zurich establish relative targets.

8.3.3 Expand the Scope of Footprint Analysis

Our analysis targets Zurich's core operations, but implementation of a tracking system for life cycle emissions will be important in the future. By considering upstream and downstream sources, Zurich can more accurately understand and reduce its contribution to climate change. For example, we recommend that Zurich expand its transportation analysis to include employee commute travel. Zurich could potentially track private car use within the company, especially for cars that are leased as part of employment benefits packages. Additionally, Zurich should try to better understand how employees in nations, other than the U.K. and the U.S., travel to and from work. This may necessitate tracking and incorporating emissions from public transit, such as city trams and trains. The need to inventory these additional emissions increases the importance of a streamlined, and possibly real-time, tracking system in the future.

It is important that Zurich consider the most appropriate and accurate procedures as it becomes more sophisticated in measuring and managing its carbon footprint.

8.4 LIMITATIONS

Our Phase 3 analysis (Chapters 5 – 8) was limited by several assumptions outlined below.

i. Scenario analyses for rented and leased fleets: Because we were provided with data on budgeted mileage, rather than fuel consumption, for Zurich's leased fleet, we were unable to model cost-savings from the stated scenarios.

ii. Questionnaire: Inherent limitations to the questionnaire include the type of questions asked (open- versus close-ended) and the answer choices provided, which were not all-inclusive.

iii. Lack of detailed facility-based energy & cost data: Due to the lack of data from Zurich's facilities, it was not possible to determine variation in energy use between equipment types and processes. Consequently, we could not model detailed energy and cost-savings for facilities.

iv. Energy-water nexus: Our analysis was also limited by lack of data on water consumption at Zurich's leased and owned facilities. We were, thus, unable to compute energy- and cost-savings from water conservation. However, for service companies like Zurich, water consumption accounts for a smaller portion of the energy bill, and hence, is of secondary importance.

v Lack of Zurich-specific cost analyses for IT and lighting: The lack of Zurich-specific data on IT and lighting equipment in leased and owned facilities restricted our ability to conduct Zurich-specific cost-benefit analyses and/or cost-effectiveness analyses to evaluate potential cost-savings from implementing energy efficiency initiatives.

vi Lack of financial analysis for mitigation strategies: Due to lack of Zurich-specific data on IT and lighting equipment, we were also unable to compute pay-back periods for our recommended facility-based mitigation strategies. We were also limited in our ability to provide information on variable costs and net cost-savings. In the future, Zurich would benefit by inventorying and aggregating more detailed cost information.

Despite these limitations, we are confident that our country-specific mitigation strategies and group-wide targets are both relevant and applicable to Zurich.

8.5 CONCLUSION

Zurich may choose to adopt any combination of our recommended mitigation strategies and next steps to achieve group-wide emissions reduction. By capitalizing on such flexibility, Zurich may achieve the greatest emissions reductions in the most efficient manner. Group-wide carbon neutrality, through the purchase of carbon offsets, may also be a long-term goal for Zurich.

Implementation of the aforementioned carbon management strategies will enable Zurich to honor its public commitment to reducing its contribution to climate change. Other benefits to Zurich of implementing our recommendations include: (1) preparing Zurich for future regulation targeting the services industry and/or energy consumption at facilities, (2) improving Zurich's corporate social responsibility, thereby positioning it as an environmental leader in its industry, (3) assisting Zurich in establishing a competitive advantage in the financial services sector through potential cost-savings, and (4) strengthening Zurich's risk-management strategy, thereby improving its reputation and brand value.

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APPENDICES

APPENDIX 1: COUNTRY-SPECIFIC INFORMATION & DEVIATIONS FROM THE CARBON FOOTPRINT CALCULATION PROTOCOL

The scope of facilities data coverage by country is described below. It was important for us to understand country-differences when calculating Zurich's group-wide carbon footprint. Additionally, country-specific deviations from the general carbon footprint calculation protocol relating to both owned (Scope II) and leased (Scope III) facilities, follows. Such deviations enabled our group to accurately calculate and estimate indirect emissions from purchased electricity for each of the seven target countries.[2]

United States

Data Coverage:

- Owned Facilities: Electricity consumption data and heat consumption data was available for one building; (1 total owned facility listed)
- Leased Facilities: Electricity consumption data was available for 6 buildings (represents ~6% of leased buildings), while heat consumption data was only available for 4 of those 6 buildings (~ 4% of leased buildings); (102 total leased facilities listed)
- Heat consumption information was provided as gallons of gasoline and gallons of diesel/heating oil. These values were converted to kWh in order to apply the appropriate emission factors.
- For one leased building, we were given electricity consumption (kWh) information corresponding to the whole building rather than that used in the area occupied by Zurich. Therefore, the area (m^2) used by Zurich was divided by the total area (m^2) of the building to derive a proportion. This proportion was then multiplied by the total energy consumption (kWh) of the building to estimate kWh used by Zurich.

Projections:

- Projections based on Index 7 (kWh/m^2) most closely approximated energy consumption in facilities.

Cost:

- Cost information for the two facilities without area (m^2) information was estimated based on an average cost per employee value. This value was calculated from buildings for which data was provided.
- Buildings with heat consumption information did not necessarily have heat cost information, and vice versa. Only 1 building (leased) had both heat consumption and heat cost information.
- Heat cost, but not heat consumption, information was provided for one leased building. Therefore, an index of heat cost per kWh was calculated based on the single leased building for which data was available. The heat cost from the building without

consumption information was then divided by the index to estimate heat consumption in kWh.

Carbon Footprint:

- Emission factor (g CO_2/kWh) applied was based on the specific region into which each state is categorized. These emission factors are not separated by energy source in each region; rather, the average regional fuel mix is included in each calculated factor.
- Emission factors for each U.S. region represent the EPA's eGRID Subregion averages and were reported in the WRI/WBCSD GHG Protocol.
- Emissions from Zurich's facilities in the U.S., Farmers Insurance Group's facilities, and Farmer's Exchanges were calculated separately. This allowed us to distinguish between buildings over which ZFS has and does not have control.

Farmers Insurance Group

Data Coverage:

- Owned Facilities: No electricity or heat data provided; (45 total owned facilities listed)
- Leased Facilities: No electricity or heat data provided; (217 total leased facilities listed)

Projections:

- Employee numbers were not provided for any Farmers buildings; therefore, projections were based on Index 7 (kWh/m^2).
- Area (m^2) is not specified for some buildings; energy estimates were assumed to be zero in these cases.

Cost:

- Cost was not provided for any *Farmers* buildings and thus was estimated based on energy projections.
- We calculated $/kWh for each *Zurich* building for which data was available;
- We calculated an average $/kWh index for energy in *Zurich* owned & leased buildings;
- Annual cost of energy in *Farmers* buildings was estimated by multiplying average $/kWh estimates from *Zurich* buildings by projected energy consumption (kWh) from *Farmers* buildings.
  - We assumed that cost could be best estimated by applying average values unique to Zurich's U.S. operations.
- Buildings which have no area (m^2) data, and therefore no energy (kWh) estimates, also have no cost ($) information.

Carbon Footprint:

- Same deviations as specified for Zurich's U.S. facilities

United Kingdom

Data Coverage:

- Owned Facilities: Electricity and heat data was available for two buildings; (2 total owned facilities listed)

- Leased Facilities: Electricity and heat data was available for 33 buildings; (42 total leased facilities listed)

Projections:

- Projections based on Index 6 (kWh/employee) most closely approximated energy consumption in facilities.
- No breakdown by electricity and heat was provided for leased facilities without energy consumption data.

Cost:

- No deviations

Carbon Footprint:

- Percentage breakdown by energy source was not provided for all facilities; where a breakdown was not specified, a generic emission factor from the WRI/WBCSD GHG Protocol corresponding to the average fuel mix in the United Kingdom was applied.

Germany

Data Coverage:

- Owned Facilities: Electricity consumption data was available for 23 buildings; heat consumption data was available for 11 buildings (24 total owned facilities listed)
- Leased Facilities: Electricity consumption data was available for 32 buildings; heat consumption data was available for 13 buildings (71 total leased facilities listed)

Projections:

- Projections based on Index 6 (kWh/employee) most closely approximated energy consumption in leased facilities. However, Index 7 (kWh/m^2) was used to estimate energy consumption for the one owned building for which data was not provided, as it produced the smallest percent difference between actual and projected energy consumption in owned buildings.
- No breakdown by electricity and heat was provided for leased facilities without energy consumption data.

Cost:

- Buildings with heat consumption information did not necessarily have heat cost information and vice versa.
- Heat cost, but not heat consumption, information was provided for several leased and owned buildings. Therefore, an index of heat cost per kWh was calculated based on the leased or owned buildings for which both data parameters were available. The heat cost from the buildings without consumption information was then divided by the index to estimate heat consumption in kWh.

Carbon Footprint:

- Percentage breakdown by energy source was not provided for all facilities; where a breakdown was not specified, a generic emission factor from the WRI/WBCSD GHG Protocol corresponding to the average fuel mix in Germany was applied.

Switzerland

Data Coverage:

- Owned Facilities: Electricity and heat consumption data was available for three buildings (represents ~ 8% of owned buildings); (35 total owned facilities listed)
- Leased Facilities: Electricity and heat consumption data was available for seven buildings (represents ~3% of leased buildings); (211 total leased facilities listed)

Projections:

- Projections based on Index 7 (kWh/m^2) most closely approximated energy consumption in facilities.

Cost:

- No deviations

Carbon Footprint:

- Percentage breakdown by energy source was not provided for all facilities; where a breakdown was not specified, a generic emission factor from the WRI/WBCSD GHG Protocol corresponding to the average fuel mix in Switzerland was applied.

Australia

Data Coverage:

- Owned Facilities: Electricity consumption data was available for two buildings; heat consumption data was available for one building (2 total owned facilities listed)
- Leased Facilities: Electricity consumption data was available for 20 buildings (represents ~91% of leased buildings); no heat data was provided (22 total leased facilities listed)

Projections:

- Indices 4 & 5 were calculated based only on heat consumption, employee count, and area (m^2) at one owned building; no heat consumption data was available for leased buildings.
- Projections based on Index 7 (kWh/m^2) most closely approximated energy consumption in facilities.

Cost:

- No deviations

Carbon Footprint:

- Percentage breakdown by energy source was not provided for all facilities; where a breakdown was not specified, a generic emission factor from the WRI/WBCSD GHG Protocol corresponding to the average fuel mix in Australia was applied.

Italy

Data Coverage:

- Data Provided: Reported # of employees *and consultants* (owned facilities only); reported # of Zurich employees (leased facilities only); maximum working spaces (i.e., maximum # of employees that could be supported in the office) specified
- Owned Facilities: Electricity and heat consumption data was available for three buildings (represents ~ 60% of owned buildings); (5 total owned facilities listed)

- Leased Facilities: No electricity or heat data provided; (28 total leased facilities listed)

Projections:

- No electricity or heat consumption data was available for leased buildings. Additionally, two of three owned buildings contained data centers and were, therefore, excluded from the energy consumption index. All projections are based on data from one owned building.
- Projections based on Index 6 (kWh/empl) most closely approximated energy consumption in facilities.

Cost:

- Because no cost information was available for leased buildings, average $/kWh values based on cost data for owned buildings was applied to estimate cost in all facilities.
- For leased facilities, cost was projected based on the most conservative (lower) energy estimate.

Carbon Footprint:

- Percentage breakdown by energy source was not provided for electricity data for owned facilities and for energy consumption in leased facilities; where a breakdown was not specified, a generic emission factor from the WRI/WBCSD GHG Protocol corresponding to the average fuel mix in Italy was applied.

Spain

Data Coverage:

- Owned Facilities: Electricity consumption data was available for three buildings; heat consumption data was available for one building; (3 total owned facilities listed)
- Leased Facilities: Electricity data was available for four buildings (represents ~7% of owned buildings); no heat data was provided; (61 total leased facilities listed)

Projections:

- Indices 4 & 5 were calculated based only on heat consumption, employee count, and area (m^2) at one owned building; no heat consumption data was available for leased buildings.
- Projections based on Index 7 (kWh/m^2) most closely approximated energy consumption in facilities.

Cost:

- No deviations

Carbon Footprint:

- No deviations

APPENDIX 2: EMISSIONS BREAKDOWN BY TARGET COUNTRY

<u>The U.S.:</u>

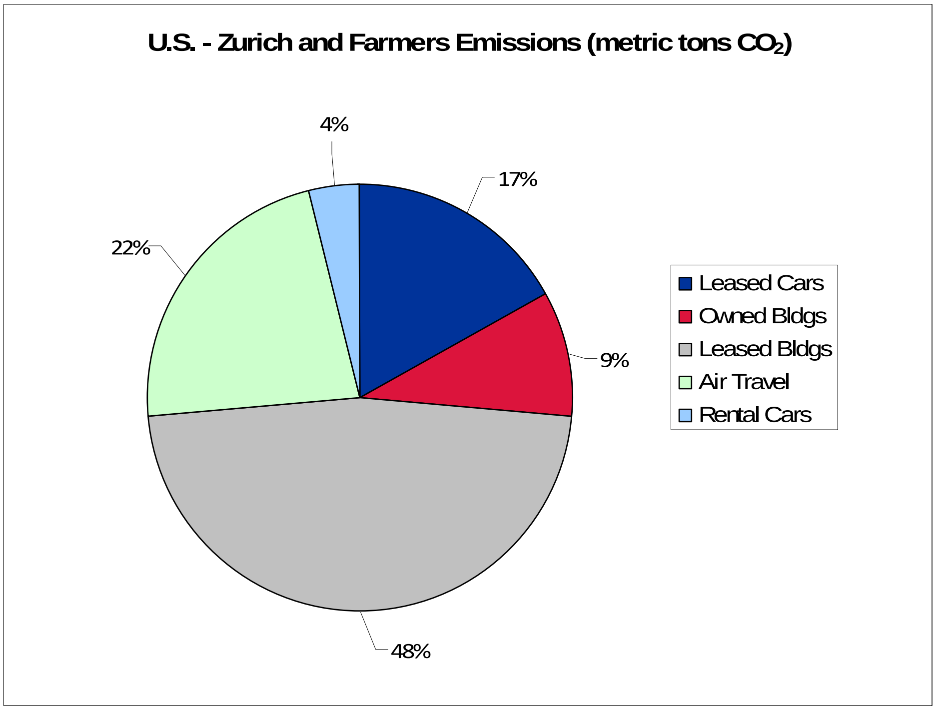

Figure I: U.S. Breakdown of Emissions

Leased buildings contribute the greatest amount to total U.S. emissions, followed by air travel and car leases. The U.S. is the only country in which emissions from rental cars exceed 1% of the total.

Table I: U.S. Emissions

Source	CO_2 (metric tons)	Percentage of Total Emissions (%)
Leased Bldgs	61,074	48
Air Travel	28,918	22
Car Leases	21,889	17
Owned Bldgs	12,001	9
Rental Cars	5,179	4

The U.K.:

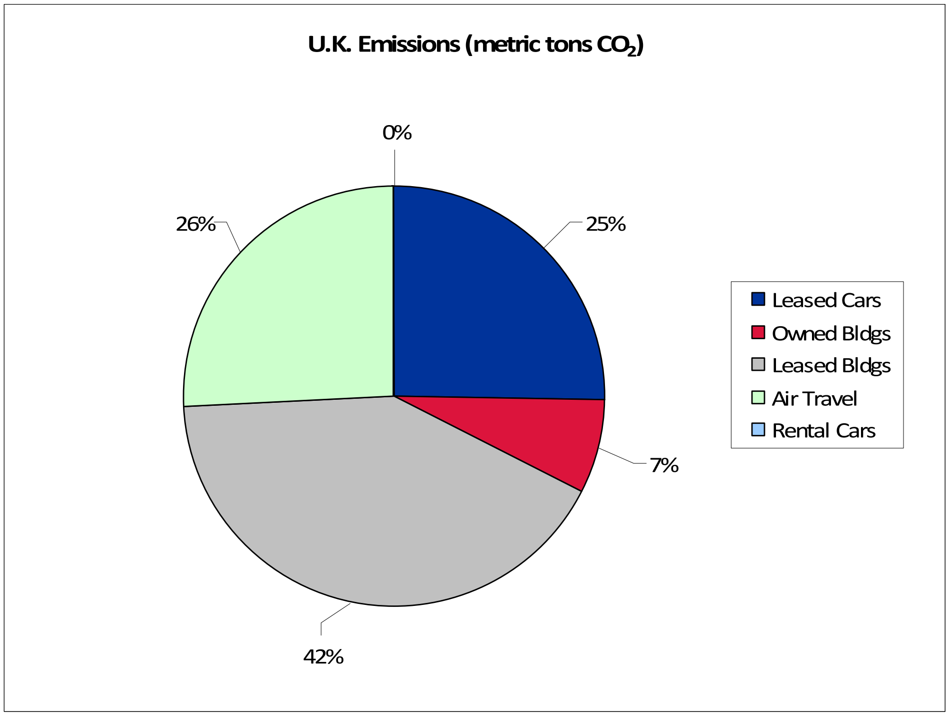

Figure II: U.K. Breakdown of Emissions

While leased buildings account for the largest portion of the U.K.'s emissions, air travel and car leases each contribute to about one quarter of the country's total. These three sources can be targeted for sizeable reductions within the U.K.

Table II: U.K. Emissions

Source	CO_2 (metric tons)	Percentage of Total Emissions (%)
Leased Bldgs	7,773	42
Air Travel	4,776	26
Car Leases	4,696	25
Owned Bldgs	1,362	7
Rental Cars	14	0

Germany:

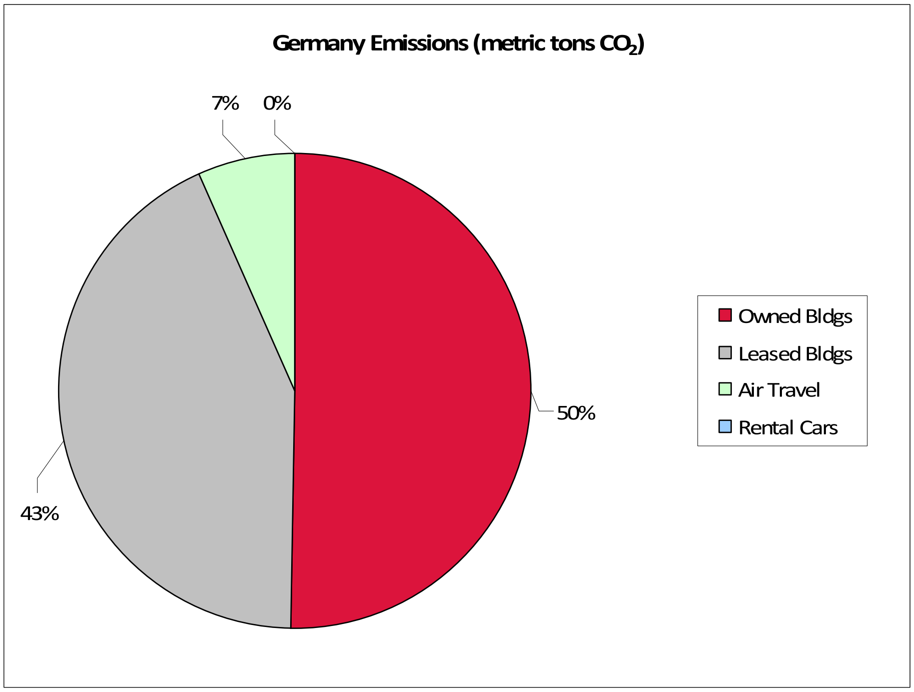

Figure III: Germany Breakdown of Emissions

Owned buildings are the largest contributors to Zurich Germany's footprint, followed by leased buildings.

Table III: Germany Emissions

Source	CO_2 (metric tons)	Percentage of Total Emissions (%)
Owned Bldgs	6,885	50
Leased Bldgs	5,855	43
Air Travel	925	7
Rental Cars	1	0

Switzerland:

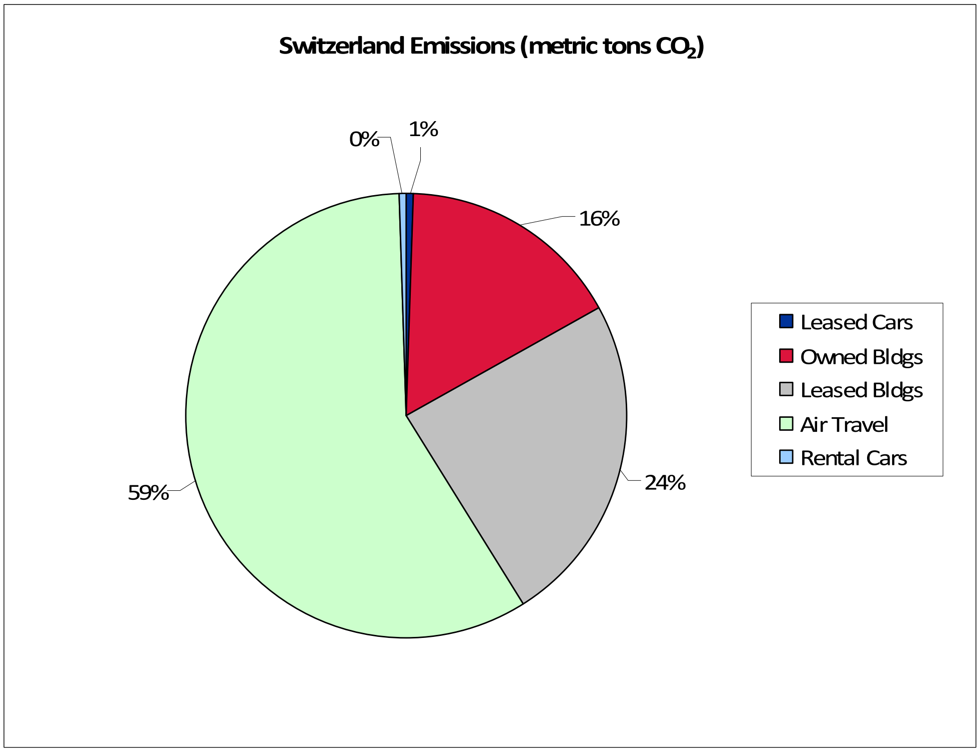

Figure IV: Switzerland Breakdown of Emissions

In Zurich Switzerland, emissions from air travel contribute over half of total emissions. This is a greater contribution than is generated by owned and leased buildings combined.

Table IV: Switzerland Emissions

Source	CO_2 (metric tons)	Percentage of Total Emissions (%)
Air Travel	6,141	59
Leased Bldgs	2,516	24
Owned Bldgs	1,722	16
Car Leases	67	1
Rental Cars	52	0

Australia:

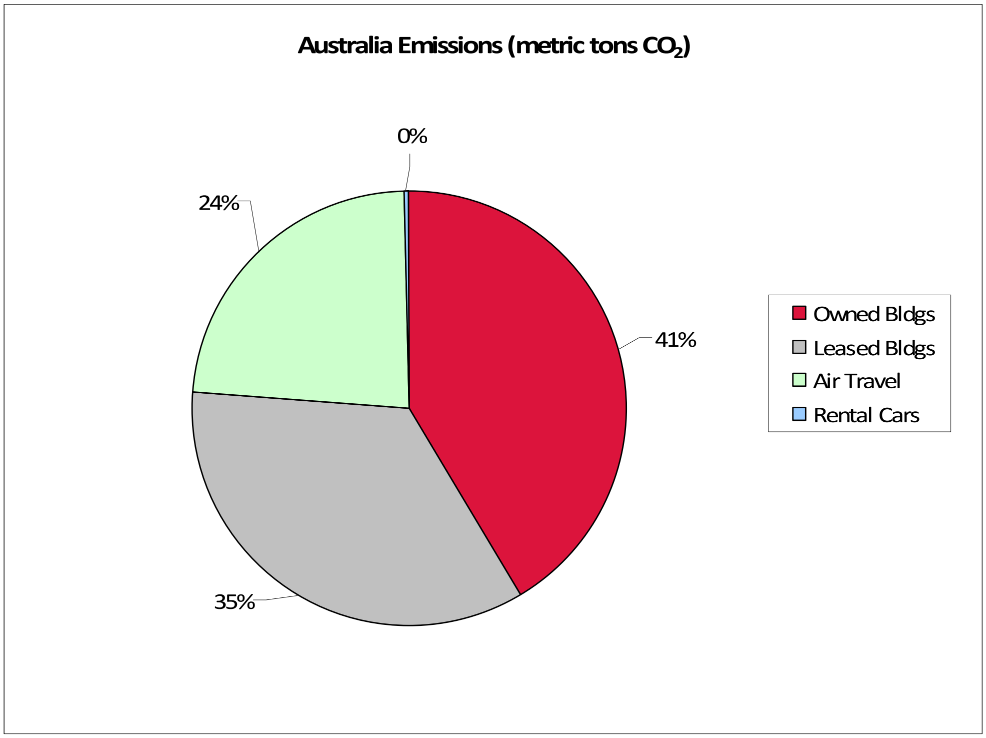

Figure V: Australia Breakdown of Emissions

In Australia, owned and leased buildings are responsible for the greatest portions of CO_2 emissions. Emissions from air travel follow, contributing to about one quarter of the country's emissions. Air travel can be targeted for sizable emissions reductions.

Table V: Australia Emissions

Source	CO_2 (metric tons)	Percentage of Total Emissions (%)
Owned Bldgs	3,143	41
Leased Bldgs	2,641	35
Air Travel	1,791	24
Rental Cars	21	0

Italy:

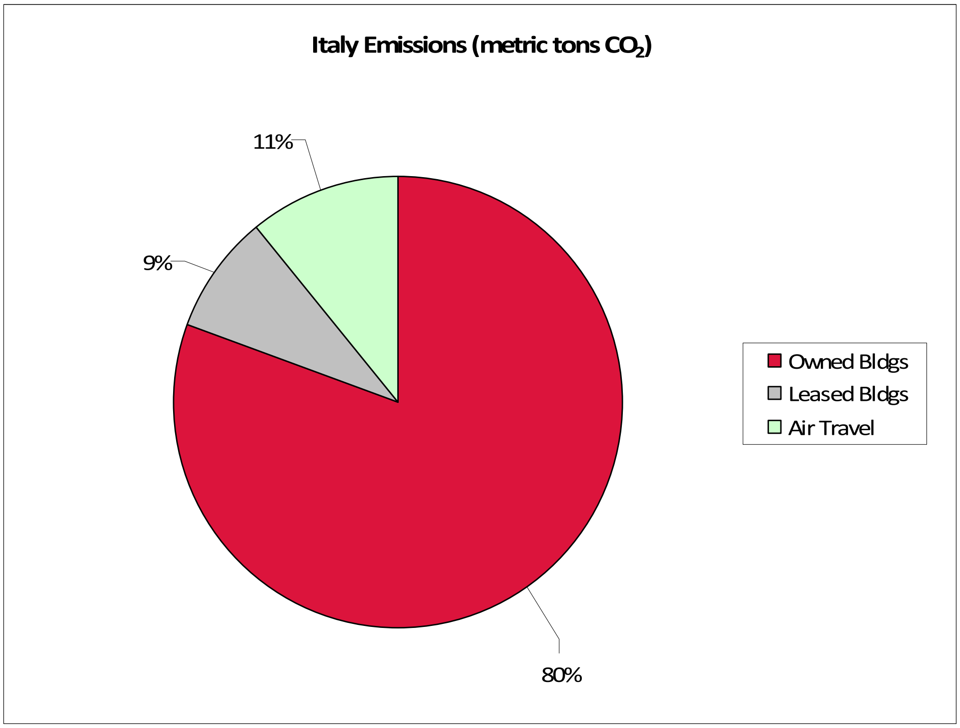

Figure VII: Italy Breakdown of Emissions

A vast majority (80%) of Zurich Italy's emissions are generated from owned buildings. Mitigation strategies for Italy focus on reducing energy consumption within such facilities.

Table VII: Italy Emissions

Source	CO_2 (metric tons)	Percentage of Total Emissions (%)
Owned Bldgs	2,798	80
Air Travel	378	11
Leased Bldgs	297	9

Spain:

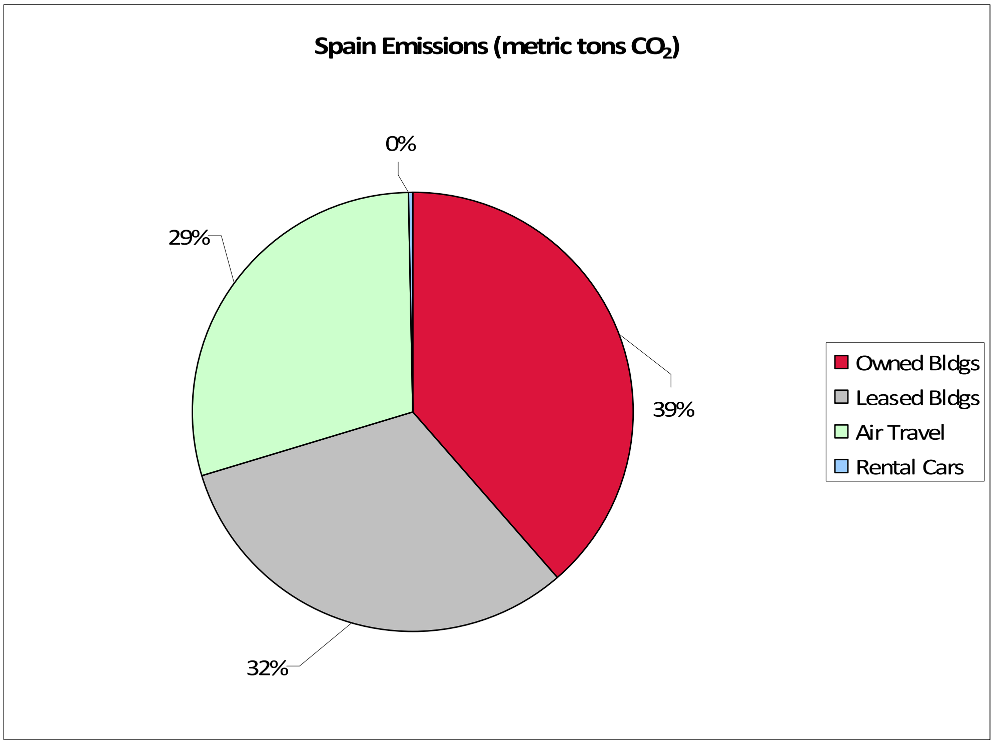

Figure VI: Spain Breakdown of Emissions

Owned and leased facilities account for over half of Zurich Spain's emissions. Air travel also contributes a considerable amount of emissions relative to other countries. High-traffic countries such as Spain should adopt our recommendation for a company policy to decrease air travel.

Table VI: Spain Emissions

Source	CO_2 (metric tons)	Percentage of Total Emissions (%)
Owned Bldgs	1,456	39
Leased Bldgs	1,191	32
Air Travel	1,109	29
Rental Cars	13	0

APPENDIX 3: SUMMARY OF LITERATURE ON ORGANIZATIONAL BEHAVIOR THEORY RELEVANT TO THE PRIVATE SECTOR

In his book, *From Heresy to Dogma*, Hoffman (1997) discusses the three primary drivers of OB behavior and structure. These three fields/levels are:

1. The organizational field: This field is defined as the "actors that make up the firm's social environment." This group of organizations determines the dominant conceptions of environmental management, including the rules, norms, and beliefs. For Zurich, the "organizational field" may be described as Zurich's competitors in the financial services sector.

2. Institutions: This level is defined as the "coercive rules, normative standards, and cognitive values of the organizational field." Oftentimes, an organization's culture reflects the dominant conceptions of environmental management within the organizational field, not just the guidance of corporate executives. For Zurich, the "institutional field" may be described as the political and regulatory structure of the countries in which Zurich operates.

3. Internal structure & culture of the corporate organization: This field "reveals the organizational motivation for addressing environmental affairs; it is a measure of the firm's environmental commitment over the long term." The following five questions help assess a firm's organizational structure:
    a. How have the firm's environmental affairs been structured?
    b. How has the firm rewarded and promoted its employees?
    c. Who has been assigned particular responsibilities?
    d. Has the company established environmental goals?
    e. Were these goals supported by executive management

Zurich would benefit by investigating answers to these questions to best assess its corporate willingness to undertake environmental initiatives and identify potential areas for structural improvement to further environmental action.

APPENDIX 4: FACILITIES QUESTIONNAIRE

Introduction:

Through prior communication and the compilation of the 2007 data for the footprint, we already have some understanding of your local initiatives. However, we would like to refresh and compile this information in a consistent manner. For that reason, we have developed this questionnaire that we would like you to complete. Responding to the questionnaire should only take you about 10-15 minutes. This information will be helpful in allowing us to continue developing our reduction strategies that we will eventually recommend for Zurich.

Questions:

1. What country do you operate in?

   Australia

   Germany

   Italy

   Spain

   Switzerland

   UK

   US

Owned Facilities

1. Are you currently purchasing renewable energy in owned buildings?

   Yes

   No

2. If yes, roughly what percentage of the energy used in owned buildings comes from renewable sources?
3. If yes, please state your renewable energy source(s) (type – e.g., water, wind, etc. – and provider).
4. If no, do you have the option of purchasing renewable energy for your owned buildings?

   Yes

   No

5. If yes, explain why you have not incorporated alternative energy into your fuel mix to date. If cost is an issue, can you provide some information on the relative costs for alternative vs. traditional sources (e.g., $/kWh)?

6. Aside from buying alternative energy, what other types of energy efficient products are used in owned buildings?

   Efficient lighting (e.g., CFL bulbs)

   Programmable thermostats

   Computers

   Printers

   Other equipment (e.g., scanners, fax machine, copiers, etc.)

   Not using any energy efficient products

   Not sure

7. Does the design of your owned buildings incorporate any energy efficient elements?

   LEED Certification

   Cool roofs

   Green roofs

   Window tinting

   Insulation

   Energy efficient HVAC systems

   Other

   Not using any elements of energy efficient building design

   Not sure

8. Please indicate the amount of flexibility you have in implementing environmentally friendly initiatives in owned buildings (e.g., recycling, double-sided printing, low VOC paints, and energy efficiency).

   Maximum flexibility

   Some

   None

9. If you answered some or none, please explain the sources of opposition.

   Lack of resources (e.g., money & time)

   Not in line with company priorities

   Lack of employee buy-in

   Other

Leased Facilities

1. Are you currently purchasing renewable energy for leased buildings?

   Yes

   No

2. If yes, roughly what percentage of the energy used in leased buildings comes from renewable sources?

3. If yes, please state your renewable energy source(s) (type – e.g., water, wind, etc. – and provider).

4. If no, do you have the option of purchasing renewable energy for your leased buildings?

   Yes

   No

5. If yes, explain why you have not incorporated alternative energy into your fuel mix to date. If cost is an issue, can you provide some information on the relative costs for alternative vs. traditional sources (e.g., $/kWh)?

6. Aside from buying alternative energy, what other types of energy efficient products are used in leased buildings?

   Efficient lighting (e.g., CFL bulbs)

   Programmable Thermostats

   Computers

   Printers

   Other equipment (e.g., scanners, fax machine, copiers, etc.)

   Not using any energy efficient products

   Not Sure

7. Does the design of your leased buildings incorporate any energy efficient elements?

   LEED Certification

   Cool roofs

   Green roofs

   Window tinting

   Insulation

   Energy efficient HVAC systems

   Other

Not using any elements of energy efficient building design

Not Sure

8. Please indicate the amount of flexibility you have in implementing environmentally friendly initiatives in leased buildings (e.g., recycling, double-sided printing, low VOC paints, and energy efficiency).

   Maximum

   Some

   None

9. If you answered some or none, which of the following were/are obstacles to implementing environmentally friendly initiatives?

   Lack of resources (e.g., monetary, time)

   Not in line with company priorities

   Lack of employee buy-in

   Other

Questionnaire Results by Country

The United States:

Within its U.S. offices, Zurich purchases about 12% renewable energy from hydroelectric and wind sources, to power its owned building. However, it is not known whether renewable energy is purchased to power leased buildings. Zurich also uses energy efficient products in its owned and leased U.S. offices. These products include efficient lighting, computers, printers, and other office equipment. Leased buildings also use programmable thermostats. Additionally, Zurich incorporates elements of energy efficient design, including window tinting, insulation, and efficient HVAC systems, within owned and leased buildings. Zurich has some flexibility in implementing environmentally friendly initiatives in its U.S. buildings, but a lack of monetary and time resources acts as a barrier to implementation of larger measures.

The United Kingdom:

Zurich is currently purchasing renewable forms of energy for owned and leased buildings. At least 85% of each facility's energy is derived from renewable sources, although the amount varies by office. Sources include wind power, biomass, and methane. Zurich also uses energy efficient products in-house, including energy efficient lighting, programmable thermostats, other office equipment, Dyson hand dryers, daylight sensors for lighting, and passive infra-red sensors (PIRs). Additionally, the design of owned buildings incorporates energy efficient elements, such as window tinting, insulation, and efficient HVAC systems, while leased buildings incorporate window tinting and insulation. Zurich U.K. indicated some amount of flexibility in implementing environmental initiatives (e.g., recycling, double-sided printing, low VOC paints, and energy efficiency), with lack of employee buy-in being the main source of opposition.

Germany:

Zurich purchases renewable energy to power its owned buildings within Germany. Alternative energy is also used to some degree within leased buildings.

Switzerland:

Zurich Switzerland purchases about 50% of energy from renewable sources, namely hydroelectricity, to power its owned and leased buildings. Zurich Switzerland also uses energy efficient products in owned and leased buildings, such as efficient lighting, programmable thermostats, computers and office equipment. Additionally, Zurich Switzerland's buildings have energy efficient design elements, including insulation and energy efficient HVAC systems. The flexibility to implement environmentally friendly initiatives in Swiss offices does exist, but lack of financing and time are sources of opposition.

Australia:

Zurich purchases renewable energy to power owned and leased buildings within Australia. About 25% of its energy is derived from renewable sources, namely biomass. Zurich Australia also purchases and uses energy efficient products in owned and leased buildings, such as efficient lighting and plug load equipment such as computers, printers, copiers, fax machines, and scanners. However, no elements of energy efficient building design are incorporated into owned or leased buildings. Zurich Australia believes that it has some flexibility in implementing environmentally friendly initiatives. Sources of opposition to more efficient operations include lack of employee buy-in and lack of resources (i.e., time and money).

Italy:

Zurich is not purchasing renewable energy to power its owned or leased buildings, nor does it have the option to do so. However, it does use efficient products in owned and leased buildings, including programmable thermostats, efficient lighting, and energy efficient printers. Additionally, Zurich Italy incorporates elements of energy efficient building design into owned and leased buildings. Window tinting, insulation, and energy efficient HVAC systems exist within owned buildings, while LEED certification, green roofs, window tinting, insulation, and energy efficient HVAC systems are incorporated in leased buildings. While the flexibility to implement environmentally friendly initiatives in Italy's owned and leased buildings does exist, lack of employee buy-in presents a barrier to the actual implementation of such programs.

Spain:

Zurich is unsure whether renewable energy is purchased to power owned and leased buildings throughout Spain. In owned buildings, energy efficient products, such as efficient lighting, programmable thermostats, computers, printers, and other office equipment, are used, as are elements of energy-efficient building design. In leased buildings, it is unclear whether any of these products are used. Zurich Spain has some flexibility in implementing environmentally friendly initiatives, but the lack of monetary and time resources inhibit further action.

APPENDIX 5: ADDITIONAL INFORMATION RELATED TO STATISTICAL ANALYSIS

Data Sources & Methodology

Organizational Factors

Lindene Patton (Climate Product Officer, Zurich Financial Services) provided data on Zurich's 2006 "green" initiatives in 50 of the 63 countries in which it operates. Data reflect environmental behaviors related to Zurich's building design, internal facility-based operations, and travel. Sub-categories within each of the three behavior types are listed below.

<u>Environmental Behavior Type Sub-Categories</u>

Sub-categories within "Building Design" included:

- Insulation
- Material manufacturers
- HVAC
- Fixtures

Sub-categories within "Internal Facility-Based Operations" included:

- Paper recycling
- Aluminum/steel/glass/plastic recycling
- Toner/printer cartridge recycling
- Computer recycling
- Employee use of paper
- Employee use of water
- Employee use of electricity
- Office supplies and suppliers

Sub-categories within "Travel" included:

- Air
- Car
- Rail
- Hotels
- Fleet vehicles

Institutional Factors

We collected data on five institutional factors for which information was available for all 50 countries; these factors included:

- Degree of development
- Per capita CO_2 emissions (metric tons CO_2/capita)
- GDP/capita (USD)

- Ratification of the Kyoto Protocol (Yes or No)
- Level of democracy (2006)[51]

Statistical Analysis Set-Up

Qualitative data were provided on the specific environmental behaviors in each category undertaken by Zurich in each country. For the purposes of the statistical analysis, numbers were assigned to each written description as follows: a "0" was assigned to categories where "no action" was indicated; a "1" was assigned to categories in which some action (i.e., one environmental measure) had been implemented; a "2" was assigned to categories in which 2 or more environmental measures had been implemented; a "3" was assigned to categories designated as "under investigation;" and, a "4" was assigned to those categories for which targets had been identified but action had not been taken toward achieving that target.

The total number of "0s," "1s," "2s," "3s," and "4s" from all categories were aggregated by country. Additionally, the number of "1s" and "2s,"—which represent "some" and "substantial" corporate action, respectively—was summed to represent the total count for "action" taken in each country.

T-Tests

- We used the Statistical Analysis ToolPak in Microsoft Excel to perform all t-tests.
- We applied the combined counts resulting from the summation of "1s" and "2s" (as defined above) for all t-tests.
- To analyze Hypotheses 2, 3, and 5, we split countries according to the institutional factor being targeted. Our rationale for selecting the breakpoints we used in our analysis is explained below:

Hypothesis #2

- The 2.0 metric ton CO_2/capita cut-off was chosen because dividing countries at this point places a relatively equal number of countries in both categories (CO_2/capita < 2.0 metric tons = 21 countries; CO_2 capita > 2.0 metric tons = 24 countries).

Hypothesis #3

- The $30,000 GDP/yr cut-off was chosen because dividing countries at this point places a relatively equal number of countries in both categories (GDP/capita < $30,000/yr = 28 countries; GDP/capita > $30,000/yr = 18 countries).

Hypothesis #5

- The 8.0 level of democracy cut-off was chosen, as it represents countries with full democracies. For purposes of this analysis, countries were either full democracies or something less than full democracies.

[51] Level of democracy is based on a 10-point scale: authoritarian regimes = < 4; hybrid regimes = 4 – 5.9; flawed democracies = 6 – 7.9; and full democracies = 8 – 10.

Hypotheses

We developed five hypotheses, each focused on a different institutional factor. Results of the statistical analysis testing each hypothesis are summarized in Table I. The five hypotheses are detailed below, along with interpretation and explanation of observed results as they apply to Zurich.

1. The number of environmental initiatives undertaken in Zurich's operations in developing countries is less than the number undertaken in developed countries.
    a. Interpretation: The number of environmental initiatives undertaken in developing countries is significantly different than the number undertaken in developed countries; the difference is significant at the $\alpha = 0.05$ level.
    b. Explanation: Developing countries may be more focused on economic growth than on sustainable/environmentally responsible operations.

2. The number of environmental initiatives undertaken in Zurich's operations in countries where CO_2/capita < 2.0 metric tons is less than the number in countries where CO_2/capita > 2.0 metric tons.
    a. Interpretation: Low CO_2-emitting countries are slightly more likely to demonstrate environmental behavior than high CO_2-emitting countries, but the difference is not statistically significant. Additionally, a very weak negative correlation exists between CO_2/capita and the number of corporate environmental actions taken, as evidenced by the small negative value of the correlation coefficient (r).
    b. Explanation: Zurich's operations in countries which have implemented strong CO_2 reduction policies at the national level are more likely to have demonstrated environmentally responsible behavior. This example demonstrates how institutional norms may shape corporate culture.

3. The number of environmental initiatives undertaken in Zurich's operations in countries where GDP/capita < $30,000/yr is less than the number in countries where GDP/capita > $30,000/yr.
    a. Interpretation: Results of the t-test suggest that Zurich is less likely to have implemented environmental initiatives in countries characterized by lower GDP/capita; this difference is significant at the $\alpha = 0.05$ level. However, the positive correlation between GDP/capita and the number of environmental actions taken is very weak, as evidenced by the small positive value of the correlation coefficient (r).
    b. Explanation: This result parallels that of Hypothesis #1; countries with weaker economies are less likely to be concerned with environmental protection as with economic growth (which may come at the expense of environmentally responsible behavior).

4. The number of environmental initiatives undertaken in Zurich's operations in countries that have ratified the Kyoto Protocol exceeds the number in countries that have not ratified Kyoto.
    a. Interpretation: No significant difference exists in the number of environmental actions undertaken between Zurich's offices in countries that have/have not ratified Kyoto.

b. Explanation: Ratification of the Kyoto Protocol may not be a good indicator of national commitment to reducing emissions, as goals and targets do not guarantee action. Countries that have ratified Kyoto may not set stringent emission targets. Consequently, Zurich's business units in those countries may face little pressure to change and, therefore, proceed under a business-as-usual scenario.

5. The number of environmental initiatives undertaken in Zurich's operations in countries with "full" democracies (i.e., level of democracy > 8.0) exceeds the number in countries characterized by a lower level of democracy (i.e., level of democracy < 8.0).
   a. Interpretation: Results suggest that Zurich is slightly more likely to exhibit action in countries with a higher level of democracy, but this difference is not statistically significant at the $\alpha = 0.05$ level. A weak, positive correlation exists between a country's level of democracy and the number of environmental actions taken by Zurich's business units in that country.
   b. Explanation: This result agrees with those of Hypotheses #1 and #3 above. Countries with higher levels of democracy are also more likely to be developed and be characterized by higher GDP/capita. Therefore, one would expect that more democratic countries would invest more resources in corporate environmental sustainability, although, in this case, the difference is not substantial.

Calculation of Average Counts by Country Groupings

Comparing average counts based on degree of action between country groupings and global regions further elucidates trends regarding differences in the level of implementation of corporate environmental initiatives in Zurich's business units. The following discussion highlights variation among 25 countries in the Americas, Europe, and International Businesses Division (IBD).[52]

Results

Results of the analysis (See Table II) reveal that average counts corresponding to "no action" are highest in Europe and similar in the Americas and IBD. Average counts corresponding to "some action" are highest in the Americas and IBD countries and lowest in European countries. Average counts corresponding to "substantial action" are highest in IBD countries and lowest in European countries. Average counts corresponding to "under investigation" are highest in Europe and lowest in IBD countries.

Analysis

Trends demonstrated by aggregating counts by region (i.e., Americas, Europe, and IBD) contrast with those illuminated via the statistical analysis discussed in the preceding section. For example, IBD countries are associated with the highest counts of "substantial action," although several of these nations (e.g., India, Indonesia, and South Africa) may not be characterized by high GDP/capita or be classified as "developed."

[52] Americas: Argentina, Bermudas, Bolivia, Brazil, Canada, Chile, Mexico, & Venezuela; Europe: Austria, Belgium, France, Ireland, Isle of Man, Morocco, the Netherlands, Portugal, & Russia (including NASTA); IBD: China, Guam, Hong Kong, India, Indonesia, Japan, South Africa, & Taiwan.

Descriptive Statistics for Seven Target Countries

In addition to conducting t-tests and aggregating average regional counts to discern key differences in Zurich's business operations, we calculated descriptive statistics reflecting institutional and organizational factors in the seven countries targeted in our footprint analysis (See Table III). These metrics provide another lens to assess the degree of corporate environmentalism in the target countries and the institutional setting in these countries.

Results

On average, each country is implementing one environmental measure in 29% (5 of 17) of the sub-categories of behaviors and two or more environmental measures in 29% (5 of 17) of the sub-categories of behaviors. On average, each country is not taking action in 41% (7 of 17) of the sub-categories of environmental behaviors. Mean GDP/capita, level of democracy, and CO_2 emissions/capita are relatively high in all target countries.

Analysis

As Table III highlights, the seven countries targeted in our footprint analysis are among the most environmentally progressive countries in which Zurich operates. Comparison of average levels of action between Tables I and III reveal that means corresponding to "no action" in the seven target countries are less than those of other country groupings; the opposite is true for means corresponding to some degree of action (moderate or substantial). Moreover, the seven target countries have fairly similar profiles regarding institutional factors. All seven are characterized by relatively high incomes, full democracies, and considerable emissions (as is typical in most highly developed nations).

Data Sources

- GDP/capita (USD)
  - Source: CIA World Factbook (2007)
- Level of democracy (2006)
  - Source: Freedom House; Available at: http://www.economist.com/media/pdf/DEMOCRACY_INDEX_2007_v3.pdf
- Developed vs. developing country status
  - Sources: http://en.wikipedia.org/wiki/Developing_country#List_of_Emerging_and_Developing_Economies
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    http://www.un.org/Pubs/CyberSchoolBus/infonation3/menu/advanced.asp
- Ratification of the Kyoto Protocol (Yes or No)
  - Source: http://unfccc.int/parties_and_observers/parties/items/2352.php
- Per capita CO_2 emissions (metric tons/capita)
  - Source: Marland et al. 2004

Tables Summarizing Results

Table I: T-Test Summary

Statistical Results									
		Average Counts							
Hypothesis #	**Country Groupings**	**0**	**1**	**2**	**3**	**4**	**t-Stat**	**p-value**	**correlation coefficient (r)**
1	Developing	16.0	2.0	0.7	0.5	0.0	-2.31	0.026**	n/a
	Developed	13.1	3.7	2.2	0.5	0.1			
2	CO_2/capita < 2.0 metric tons	14.6	3.3	1.3	0.2	0.0	-0.09	0.932	-0.063
	CO_2/capita > 2.0 metric tons	14.0	2.9	1.8	0.7	0.1			
3	GDP/capita < $30,000/yr	15.6	2.3	0.9	0.3	0.0	-2.28	0.030**	0.065
	GDP/capita > $30,000/yr	12.1	4.2	2.6	0.7	0.1			
4	Not Ratified Kyoto	13.5	3.5	1.6	0.7	0.0	0.43	0.678	n/a
	Ratified Kyoto	14.7	2.8	1.4	0.4	0.1			
5	Not Full Democracy (LOD < 8.0)	14.5	3.0	1.4	0.5	0.0	-1.38	0.178	0.128
	Full Democracy (LOD > 8.0)	12.4	4.3	2.5	0.3	0.1			

Key (0 = No Action; 1 = Some Action (1 measure); 2 = (2 or more measures); 3 = Under Investigation, 4 = Targets Identified)

** = significant at the $\alpha = 0.05$ level

LOD = Level of Democracy

Table II: Average Counts by Region

Aggregated Counts by Region					
Region	**Average Counts**				
	0	**1**	**2**	**3**	**4**
Americas	13.0	4.5	1.3	0.5	0.0
Europe	14.7	3.1	1.1	0.8	0.0
IBD	13.1	4.4	1.8	0.0	0.0
Key (0 = No Action; 1 = Some Action (1 measure); 2 = (2 or more measures); 3 = Under Investigation, 4 = Targets Identified)					

Table III: Descriptive Statistics for Seven Target Countries

Statistical Analysis for Seven Target Countries***								
	0	**1**	**2**	**3**	**4**	**GDP/Capita (USD)**	**Level of Democracy**	**Per capita CO_2 (metric tons/capita)**
Mean	7.29	5.29	4.71	0.57	0.14	$32,786	8.47	3.00
Standard Error	1.80	1.13	1.61	0.30	0.14	$1,966	0.19	0.56
Median	7	5	4	0	0	$31,400	8.34	2.67
Standard Deviation	4.75	2.98	4.27	0.79	0.38	$5,201	0.51	1.47
Range	12	8	12	2	1	$16,500	1.36	4.14
Minimum	2	2	0	0	0	$27,000	7.73	1.47
Maximum	14	10	12	2	1	$43,500	9.09	5.61
Sum	51	37	33	4	1	$229,500	59.30	21.03
***Seven Target Countries: Australia, Germany, Italy, Spain, Switzerland, the U.K., and the U.S.								

APPENDIX 6: SOURCES CONSULTED FOR COMPETITORS ANALYSIS

The following sources were utilized during the competitors benchmarking analysis:

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APPENDIX 7: EMISSION REDUCTION TARGETS BY COUNTRY & STATE

United States

Regulatory Overview: Further Information

Federal Targets and Strategies

The Department of Energy (DOE) states it is pursuing two major strategies to reduce carbon emissions: making fossil energy systems more efficient by increasing the "fuel-to-energy efficiencies" of coal and natural gas-fired power plants and capturing and sequestering greenhouse gases (Department of Energy (DOE) 2008). However, it should be noted that for the scientific community, the actions of the DOE look relatively conservative (Jasper 2009).

State Targets and Strategies

Maryland

Zurich's only owned building in the U.S. is located in the state of Maryland. Since this building is owned, Zurich has more flexibility to make environmental updates to its operations. Firstly, Zurich could explore the option to power its facility with some form of alternative energy that is currently available in Maryland. Furthermore, Zurich has the freedom to implement energy efficiency measures to the building. Examples include updating the HVAC and lighting systems through the use of different windows and window shades, implementing a facility-wide recycling program, pursuing a water conservation strategy, installing Energy Star certified IT appliances, and making structural changes to utilize solar energy. Maryland offers programs, such as Solar Grants, that provide funding up to $10,000 to install qualified solar energy panels, which Zurich could take advantage of. Such grants can result in lower monthly gas and electricity bills, as well as protection from rising fossil fuel costs and fuel-price inflation over time, and can provide the potential to earn an annual 6 to 25% tax-free rate-of-return on each investment, depending on how much energy is saved (Maryland Energy Administration 2008). Finally, Zurich could pursue LEED certification for its building. The aforementioned initiatives could result in significant reductions in energy use and, therefore, cost-savings.

California

California's proactive environmental stance and regulations identify the state as a leader in the U.S. The passage of AB32, the Global Warming Solutions Act of 2006, committed California to a 30% reduction of 1990 GHG levels by 2020 and an 80% reduction below 1990 levels by 2050. Other major initiatives for reducing emissions were passed by Governor Schwarzenegger in the 2005 Executive Order and the 2004 California Air Resources Board (CARB) regulation to reduce passenger car GHG emissions (California EPA 2008). California's Renewable Electricity Standard currently requires electric utilities to increase use of renewable electricity by at least 1% per year and at least 20% by 2010. A new bill has been proposed by CARB to increase this further to 33% by 2010. CARB is also considering the development of a cap-and-trade program to create a regional market system and have increased the reduction of GHG emissions from transportation from 2 to 5 million $MMTCO_2e$. When Governor Schwarzenegger signed SB375 to reduce GHG emissions through land-use in September 2008, California showed an even greater commitment to environmental conservation, as the bill provides emissions reduction goals for local governments and developers. Additionally, SB375 provides incentives for creating sustainable communities (Office of the Governor 2008). California has requested federal permission to regulate its own automobile emissions and set its own fuel efficiency standards but was denied a waiver under the Bush administration. Under President Obama, the EPA has been ordered to review California's request and the EPA's decision is currently pending. California also plans to implement clean car standards and Low Carbon Fuel Standards and offer potential rebates on new vehicles that emit low levels of GHGs (Office of the Governor 2008).

Oregon

Oregon has a goal to stabilize emissions by 2010, reduce emissions by 10% below 1990 levels by 2020, and achieve a 75% reduction below 1990 levels by 2050 (Pew Center on Global Climate Change 2008). Oregon's climate policy objectives include investing in energy, and materials efficiency; replacing GHG emitting energy resources with clean technology; increasing biological carbon sequestration (farm and forest carbon capture and storage); and supporting education, research and technological development (Oregon Government 2008).

Florida

Florida's State government has committed to reduce emissions 10% by 2012, 25% by 2017, and 40% by 2025. Part of Florida's climate policy includes a strong plan to increase energy efficiency and pursue more renewable energy sources, such as solar and wind technologies, as well as alternative fuels, such as ethanol and hydrogen. Electric utilities must reduce emissions to 2000 levels by 2017, to 1990 levels by 2025, and 80% below 1990 levels by 2050. The state is currently considering to set a possible 20% renewable energy portfolio standard by 2020 (Florida Department of Environmental Protection 2008).

Other

Washington has a goal to reduce its GHG emissions by 25% below 1990 levels by 2035 and a 50% reduction below 1990 levels by 2050. Minnesota and New Jersey have goals of an 80% reduction below 2005/6 levels by 2050, while several other east coast states are considering a regional cap-and-trade program (Pew Center on Global Climate Change 2008).

United Kingdom

Regulatory Overview: Further Information

The U.K. has produced numerous White Papers outlining ambitious domestic emissions reduction goals. The most prominent is the Energy White Paper of 2003, which highlights goals for a future U.K. energy policy and proposes a series of instruments for achieving them (Institute of Electrical Engineers (IEE) 2005). The most current domestic target for the U.K. seeks to reduce carbon by 20% below 1990 levels by 2010, tripling the amount of electricity currently produced by renewable energy sources nationally by 2012, and increasing the use of alternative transport fuels in its fuel-mix by 2.5% (U.K. Climate Change Programme 2008). Another domestic commitment is the Carbon Emission Reduction Target (CERT), which is expected to deliver net annual savings of 4.2 million tons CO_2 by 2010 (U.K. Climate Change Programme 2008). Lastly, the U.K. has tightened its building energy efficiency standards, aiming to increase energy efficiency in buildings by 25% by 2010 and 44% by 2013. The U.K. will strive to achieve carbon neutrality in its buildings by 2016 (U.K. Climate Change Programme 2008).

Under the EU, the U.K. is further obligated to produce 20% of its electricity from renewable sources by 2012 (Europa 2006a). Among the U.K.'s energy efficiency commitments is a national energy savings target of 9% under the EU Energy End-Use Efficiency and Energy Services Directive. The U.K. is currently projected to deliver an 18% reduction (Europa 2006b).

Germany

Regulatory Overview: Further Information

Given Germany's sizeable economy and its breadth of manufacturing industries and services, it has set ambitious domestic targets and has implemented a considerable list of initiatives that may help it regain its once leading economic position within the EU. Both are outlined below.

According to a 2007 governmental report by the German Cabinet at Meseberg, Germany's domestic initiatives primarily combine the production and purchase of renewable energy with energy efficiency (German Cabinet 2007). The Renewable Energy Sources Act seeks to increase the share of power production from renewable energy sources from 13% to between 25 and 30% by 2020. It also aims to increase the share of energy used for heat generation from renewable sources from 6% in 2006 to 14% by 2020. Combined heat and power generation from renewable sources are also projected to double, reaching 25% by 2020.

Furthermore, the Biofuels Quota Act requires that biofuels supply 6% of the country's current consumption of natural gas by 2020 and 10% by 2030. It also specifies that biofuels are to contribute to national efforts to meet the Kyoto and domestic targets by 5% until 2015, increasing to 10% by 2020. In addition, fuel blends will have to contain approximately 20% biofuels by volume by 2020, which is equivalent to 17% energy content.

Finally, a third set of initiatives focuses on energy efficiency. Examples include highly efficient power stations equipped with technology to capture and store CO_2, 50% primary energy savings from refurbished buildings and a reduction of CO_2 emissions from new cars produced within the EU from 164 to 120 g CO_2/km by 2012.

Switzerland

Regulatory Overview: Further Information

In addition to Switzerland's domestic target of a 10% reduction below 1990 levels by 2010, the country also aims to reduce emissions from heating and process fuels by 15% below 1990 levels by 2010 and to reduce emissions from transport fuels by 8% below 1990 levels by 2010 (UNFCCC 2005). A large percentage of Switzerland's national electricity is already derived from hydroelectric and nuclear power (WRI 2006). Switzerland aims to increase that percentage with the Swiss Energy Program, which requires a 10% reduction in fossil fuel consumption by 2010 (UNFCCC 2005).

It should be noted that Switzerland has exhibited environmentally friendly behavior over the last few years, willingly mirroring EU directives in its domestic legislation and abiding by EU directives even though, as a non-EU member state, it is not bound by them.

Australia

Regulatory Overview: Further Information

In July 2008, the new government published the Carbon Pollution Reduction Scheme Green Paper which includes a cap-and-trade system that limits the amount of carbon emitted by pollution industries (Prime Minister 2008). The cap-and-trade scheme is designed to provide strong incentives for businesses to reduce their emissions by requiring affected businesses and industries to buy pollution permits for each ton of carbon they emit.

With the implementation of the Carbon Pollution Reduction Scheme, the cost of producing emissions-intensive goods and services will increase. The government has committed to provide assistance to the most emission-intensive businesses (e.g., the coal-fired electricity generation sector), which will be most strongly impacted by the increased costs (Prime Minister 2008).

The reduction scheme also plans to cut fuel taxes on a cent-by-cent basis to offset the initial price impact on fuel. Every cent raised from the scheme will be used to help Australian households and businesses adjust and invest in clean energy options. Australia's large-scale plans for a transition to a cleaner economy will also include funding investments in low emissions processes and in industrial energy efficiency projects with long payback periods.

While the new administration has demonstrated a commitment to addressing climate change, there are many who believe Australia's goals still fall significantly short of what is necessary.

Italy

Regulatory Overview: Further Information

Despite the fact that Italy has no domestic targets for reducing CO_2 emissions, by 2004 it had reduced emissions 11.8% below 1990 levels, almost double its Kyoto target (Europa 2006a).

Furthermore, Italy has implemented a number of climate change initiatives domestically (Ministry for Environment and Territory and Sea 2008). For example, a task force has been assigned to increase national renewable energy production. The task force developed the National Plan for Reducing Greenhouse Gases referenced in the White Paper on Renewable Energy Production. Goals outlined in the White Paper are to be achieved through: 1) a National Program for the Exploitation of Agricultural and Forest Biomass, 2) a National Program for Information and Research on Climate Change, and 3) a National Program for Biofuels.

The three plans seek to increase renewable energy production by 150 to 1200 MW, increase energy produced from biogas by 750 to 1300 MW, develop low density carbon fuel for buses and private vehicles, and increase the content of biodiesel in fuel mixes to 5%. Furthermore, Italy's National Energy Plan aims to save 10 to 30% of energy consumed nationally through the optimization of contracts. Optimization of energy distribution through, for example, the use of compact fluorescent light-bulbs and motion light detectors will contribute to the 30% reduction goal. A Renewable Energy Program in protected natural areas also exists, whereby renewable energy sources are disseminated within the protected areas and energy saving programs for sustainable mobility are being implemented. Other initiatives undertaken by the task force include the "Photovoltaic Roof" program, which focuses on solar thermodynamic technology, a policy to increase national geothermal energy generation from 785 MWe to 800 MWe by 2012 (given Italy's large number of volcanoes) as well as some small-scale hydroelectric, wind, and biomass energy generation projects.

It is also worth noting that Italy is a major manufacturer of sports cars (e.g., Alfa Romeo, Fiat, Lancia, Ferrari, Maserati, and Lamborghini). However, it is reluctant to implement EU regulations requiring the manufacture of lower emission vehicles and even more reluctant to issue fines for non-compliance with such regulations (Left Lane 2008). Such opposition may be indicative of potential resistance to mitigation measures we propose for Zurich Italy.

Spain

Regulatory Overview: Further information

Spain's most notable domestic climate change initiatives include the Spanish Strategy for Clean Energy and Climate Change (EECCEL), the Energy Saving and Efficiency Strategy for Spain for 2004 – 2012, the Plan to Promote Renewable Energies (PFER) 2000 – 2010, and the Renewable Energy Plan (PER) 2005 – 2010 (Climate Change in Spain 2007). The PER seeks 12.1% of primary energy consumption by 2010 to come from renewable energy sources, 10% of transportation fuels to be biofuels by 2020, and 32% of gross electricity consumption by 2012 to be from renewable energy sources, with a provision to become 37% by 2020 (Climate Change in Spain 2007). Spain is also in line with its EU targets of a 20% increase in energy efficiency and a 20% increase in renewable energy generation, both by 2020 (Climate Change in Spain 2007).

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APPENDIX 8: ENERGY SOURCES & OPTIONS FOR RENEWABLE ENERGY USE BY COUNTRY

U.S.

Energy options within the U.S. vary substantially by state. Zurich and Farmers, with offices in several states, should focus on state policies and local options for renewable energy. California, Florida, Hawaii, Minnesota, New Jersey, Oregon, and Washington have growing renewable energy markets.

U.K.

In the U.K., natural gas-fired power stations are starting to replace coal as the principal power source. The U.K. is also expanding generation of wind and wave power and of liquefied natural gas (IEA 2008). 52% of Prudential U.K.'s purchased electricity comes from green energy.

Germany

Germany's Renewable Energy Sources Act states that 27% of Germany's energy must come from renewable sources by 2020, with an increase to 45% by 2030. Germany is also characterized by the world's largest wind power sector and solar power market (IEA 2008). Munich Re's offices in Dusseldorf have completely relied on green electricity since January 2008 (Munich Re 2008). Allianz Group in Germany owns the largest hydroelectric plant in the world in addition to wind farms (Allianz Group 2008).

Switzerland

In Switzerland, 58% of electricity is derived from renewable sources. Switzerland is investing in developing solar, wood and biomass, wind and geothermal energy (IEA 2008). Allianz Group is developing hydroelectric power for its Swiss operations (Allianz Group 2008).

Australia

Australia's new administration is committed to reducing the country's emissions and aims to incorporate cleaner energy sources into Australia's fuel mix.

Italy

Allianz Italy has supplied 94% of its electricity from hydroelectric power since 2002. Munich Re's Milan office has completely switched to green power.

Spain

Spain is currently the second largest producer of wind power behind Germany and is also investing in other forms of renewable energy.

Table I: Energy Options by Country

Country	Energy Sources	Renewable Energy Potential	Competitors' Energy Sources
Australia	• Coal is dominant energy source • 75% of purchased electricity derived from coal o 55% of that from black coal • Imports petroleum	• Renewable energy target set: 9.5 Bkwh of total electricity generation from renewable sources • Australia's largest power retailer plans to increase natural gas-fired plants • Significant natural gas reserves (currently exporting a large percentage but policy shift to use it internally)	• Insurance Australia Group (IAG) estimates that 10% of total MWh purchased for energy comes from renewable sources • IAG pays a premium for this energy
Germany	• Relies on coal and brown coal • Majority of electricity from oil, followed by coal and natural gas • 4th largest consumer of coal in the world • Largest coal reserves in the EU • World's 3rd largest consumer of natural gas • World's largest operator of wind generation • World's 4th largest producer of nuclear power, but plans to close all nuclear power plants by 2022	• Strong renewable energy industry • World's largest wind power sector but only accounts for 6.2% of total energy supply • World's largest solar power market • Renewable Energy Sources Act requires that by 2020, 27% of energy must come from renewable sources; by 2030, 45% must come from renewable sources • Government providing incentives to develop biomass power and geothermal energy	• Munich Re office in Dusseldorf powered by green electricity since January 2008 • Allianz Group in Germany owns largest hydroelectric plant, which is expected to supply 600 million kWh of energy per year • Allianz Group also owns Prottlin wind farm, which expects to provide 38 million kWh of energy per year to Germany (and possibly other European countries)
Italy	• Relies on imports for all oil needs • 47% of total electricity from oil • 35% from natural gas, but growing • 8% from coal • 5% from hydroelectricity • 2% from other renewable sources • Shortage of domestic generation capacity	• No significant progress with renewable energy yet • Difficulty meeting country's energy demand	• Allianz's Italian subsidiary, RAS, has sourced 94% of its electricity demand with hydroelectric power since 2002 • Munich Re's Milan office switched to green power on June 1, 2008 • Allianz Group invested in wind energy project in Francofonte in 2005

Spain	• One of EU's largest LNG importers • 52% of total electricity from oil • 17% from natural gas • 14% from coal • 10% from nuclear • 5% from hydro & 3% from other renewable Sources	• Attempting to develop domestic energy sources through hydropower and renewable sources • 2nd largest producer of wind power behind Germany • Utilizes combined cycle gas-fired turbines to reduce need for hydropower	• Allianz Group in Spain seeks to purchase wind energy
Switzerland	• 58% of electricity from renewable sources; 97% of which comes from hydropower • Energy is primarily derived from petroleum and natural gas with a small amount from coal	• Renewable energy sources include: solar, wood, biomass, wind, and geothermal energy	• Allianz Group in Switzerland is developing hydroelectric power along with its German operations
U.K.	• Natural gas-fired power stations starting to replace coal as principle power source • Major European oil and natural gas producer • Nuclear power is used • Private electricity sector • Conventional thermal plants provide significant amount of electricity • Largest oil producer in the EU, but production has been declining	• Regulations require 3% of energy to be derived from renewable sources • Set to increase this to 10% in 2010 • Developing wind and wave power, as well as hydroelectric and LNG	• Prudential U.K., now requires that all buildings (constructed, sold, or rented) meet the EU Energy Performance of Buildings Directive • Energy Performance Certified (EPC) since April 2008 • 52% of Prudential U.K.'s purchased electricity from renewable sources
U.S.	• World's largest consumer and 2nd largest producer of natural gas • Domestic oil production is declining • Possesses world's largest coal reserves • Energy sources vary by state	• Growing availability of alternative energy from sources like wind, solar, hydropower, and wave power	• Hartford Financial Services in the U.S. participates in EPA's Energy Star program and is consolidating its data centers

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APPENDIX 9: INFORMATION ON ZURICH’S PREFERRED SUPPLIERS

Table I: Zurich’s 2008 Travel and Entertainment Contracts

Industry	Vendor	POS Country
Airline	AeroMexico/Skyteam	Mexico
	Air Berlin	Austria, Switzerland
	Air France/KLM	Switzerland
	American Airlines/One World	Mexico, Switzerland
	Austrian Airlines/STAR	Switzerland, United Kingdom
	BMI British Midland/STAR	United States, United Kingdom
	British Airways	Switzerland
	Continental/Delta/Northwest	United States
	Emirates	United Kingdom
	Germanwings	Switzerland
	Iberia	Spain
	Lufthansa/STAR	Germany, Mexico, Switzerland
	Mexicana/Oneworld	Mexico
	Singapore Airlines/STAR	United Kingdom
	Swiss International/STAR	Switzerland, United States, United Kingdom
	TAP Air Portugal/STAR	Switzerland, United Kingdom
	United Airlines/STAR	Austria, Canada, Germany, Switzerland, United States, United Kingdom
	Virgin Atlantic	United States, United Kingdom
	Qantas	Australia
Car Company	Avis	NA Continent, Spain, Switzerland
	Europcar	Austria
	National Car Rentals (Vanguard)	United Kingdom
	Sixt	Germany
	Hertz	Australia
Hotel Chains (<u>Note</u>: Hotel Chain Agreements; not individual hotels)	AC Hoteles	Spain
	Accor	Global
	Berrini/Tryp	Brazil
	Best Western	Global
	Blue Tree Hotels	Brazil*
	Dorint	Global
	Event Hotelgruppe	Global
	Gunnewig	Global
	Hesperia	Spain
	Hyatt	Brazil
	InterContinental Hotel Group	Global
	Maritim	Global
	Movenpick	Global
	NH Hoteles	Global
	Ramada	Global
	Steigenberger	Global
	Tryp	Global
Other	American Express	Global

Table II: Environmental Options for Specific Airlines

Preferred Suppliers	Is there a uniform fuel type used for air travel?	If not, are there different fuel options or eco-friendly options that incorporate cleaner burning fuels?	Do any airlines offer environmentally friendly options, such as the ability to buy carbon offsets for air travel?	Other
Star Alliance	All aircraft engines use JET A1 fuel type world-wide	There are currently no other options available, although fossil fuel alternatives are being researched. In fact, Air New Zealand expects to operate its first biofuel flight before the end of the year. In the interim, airlines continue to focus on increased efficiencies through aircraft modernization, improved flight routes, and slower flying to burn less fuel and produce a smaller carbon footprint.	Star Alliance carriers offering carbon offsets for air travel include: Air Canada, Air New Zealand, Austrian Airlines, Lufthansa, Scandinavian Airlines, Spanair, and Swiss International. More information on the individual carrier's programs can be found on their websites. **Air Canada:** http://www.aircanada.com/en/travelinfo/traveller/zfp.html?src=hp_ql **Air New Zealand** http://www.airnewzealand.com/aboutus/environment/default.htm **Austrian Airlines** http://www.austrianairlines.co.at/eng/Austrian/environment/ **Scandinavian Airlines** http://sasems.port.se/EmissionCalc.cfm?lang=1&utbryt=0&sid=geninfo&left=geninfo?WT.ac=CO2&ID=60091 **SpanAir** http://www.spanair.com/web/en-gb/Services/Offset-your-CO2-Emissions/ **Swiss International Airlines** http://www.swiss.com/web/EN/about_swiss/environmental_affairs/Pages/economic_tools.aspx?WT.ac=Presenter-MyClimate_PR_CH_EN04	Also, Lufthansa provides a sustainability report (which includes Swiss) that can be accessed at: http://konzern.lufthansa.com/en/html/presse/downloads/publikationen/index.html#balance

Table II: Environmental Options for Specific Airlines

Preferred Suppliers	Is there a uniform fuel type used for air travel?	If not, are there different fuel options or eco-friendly options that incorporate cleaner burning fuels?	Do any airlines offer environmentally friendly options, such as the ability to buy carbon offsets for air travel?	Other
Delta	Jet fuel is the uniform fuel type used for travel. Jet fuel is a type of aviation fuel designed for use in aircrafts powered by gas-turbine engines and is produced to an internationally standardized set of specifications.	Delta supports the Commercial Aviation Alternative Fuels Initiative (CAAFI) program. The CAAFI program represents a significant step towards the development of alternative fuels, such as aviation bio-fuels, which are environmentally friendly. The program's progress is highlighted by some of its more prominent achievements, such as the completion of the first transcontinental flight by the U.S. Air Force using synthetic fuel in December 2007.	Delta was the first U.S. airline to help customers offset carbon emissions associated with their air travel. Its environmental goals include improving fuel efficiency, reducing its carbon intensity, promoting conservation, and advancing technologies that encourage energy diversification. As a result of Delta's fuel conservation efforts and other efficiency improvements, it has achieved a significant overall reduction in total aircraft CO_2 emissions since 2000.	Delta's corporate responsibility report can be accessed at: http://images.delta.com.edgesuite.net/delta/pdfs/corporate_responsibility_report.pdf
British Air	Kerosene is the uniform fuel type used for travel.	British Air has recently announced a joint initiative with Rolls-Royce to lead research in this area and share the results with the industry. Additional options are currently being researched.	Yes, British Air offers this on its website through a simple selection as part of the booking process. Money goes to UN certified projects that not only have an environmental carbon reduction emphasis, but also have social and economic benefits.	In September 2005, British Air became the first airline to offer its customers the opportunity to offset the CO_2 emissions generated by flying. Early in 2008, it unveiled an upgraded carbon offset scheme, making the offset more user-friendly. Customers are now able to buy an offset at the same time they book their flights in one transaction. Details can be found on the British Air website: www.ba.com

APPENDIX 10: RENTAL CAR RANKING METHODOLOGY

The top three rental car agencies used by Zurich were identified and ranked by: (i) the percent of reservations with each agency out of group-wide total reservations; (ii) miles driven with each agency out of the group-wide total. This was done for each country using raw data provided by American Express. Note that, within some countries, only one rental car agency is used by Zurich.

After identifying Zurich's four most preferred rental car agencies, we researched each based on three rental fleet options: (1) hybrid availability, (2) fuel-efficient/EPA "SmartWay" vehicle availability, (3) and carbon offset options (See Table 5.1). Each vehicle listed in the EPA "SmartWay" Green Vehicle Guide receives an Air Pollution Score and a Greenhouse Gas Score, on a scale from 1 to 10. A vehicle must receive at least a 6 for both scores, and have a combined score of at least 13, in order to be awarded "SmartWay" designation. Vehicles that receive the designation are considered to be better environmental performers than traditional vehicles.

APPENDIX 11: METHODOLOGY - REDUCTION SCENARIOS FOR ZURICH'S RENTED FLEET

2 Scenarios for Rental Cars:

Scenario 1: Implementation of a company policy by which employees must rent vehicles with fuel-efficiencies similar to those realized by Hertz's "green" fleet

Methodology

- Total miles driven were aggregated at the country level.
- New fuel consumption was calculated by multiplying the total miles driven per country by the average highway and city mpg corresponding to Hertz's "green" fleet; this value was labeled "combo mpg" for purposes of this analysis.
  - Hertz's "green" fleet is composed of the Toyota Corolla, Toyota Camry, and Ford Fusion. Highway and city mpg values are based on manufacturer standards for 2009 models.
- CO_2 emissions from gasoline (metric tons) were subsequently calculated by: (1) multiplying total fuel consumption (gal) in each country by the WRI/WBCSD's fuel-based emission factor for gasoline and (2) dividing by 1000 to convert kg to metric tons.
- Total CO_2 emissions were summed for: (1) the 7 target countries, (2) the additional 14 countries for which we have rental car data, and (3) for all 21 countries.
- A percent difference was calculated between the modeled emissions estimates and the original emissions estimates based on the fuel efficiency of Zurich's current rented fleet (Table I).

Scenario 2: Implementation of a company policy by which employees must not rent vehicles larger than midsize/intermediate

Methodology

- Information on size class of Zurich's rented fleet (e.g., economy, midsize, full size) was provided in records from AmEx.
- Total miles driven were calculated for compact, economy/subcompact, and midsize/intermediate cars in each country; all cars larger than midsize/intermediate were added to the midsize/intermediate classification for purposes of this scenario analysis.
- MPG specified by AmEx for compact and economy/subcompact cars was assumed to be accurate and was applied to all cars already in these size classes.
- An average MPG value for all midsize/intermediate was calculated based on the MPGs of all cars in this size class from all 21 countries; this average value was considered to represent all midsize/intermediate cars in this scenario.
- Fuel consumption (gal) was derived by multiplying total miles driven by cars of each size class in each country by the inverse of the mpg value for that size class.

- CO_2 emissions from gasoline (metric tons) were subsequently calculated by: (1) multiplying total fuel consumption (gal) in each country by the WRI/WBCSD's fuel-based emission factor for gasoline and (2) dividing by 1000 to convert kg to metric tons.
- Total CO_2 emissions were summed for: (1) the 7 target countries, (2) the additional 14 countries for which we have rental car data, and (3) for all 21 countries.
- A percent difference was calculated between the modeled emissions estimates and the original emissions estimates based on the fuel efficiency of Zurich's current rented fleet (Table II).

Table I: Results of Rental Car Scenario 1
(Company Policy = Rent only "Green" Cars)

Country	Total Miles Driven	Fuel Consumption (gal)	NEW CO_2 emissions (metric tons)	ORIGINAL CO_2 emissions (metric tons)	% Difference
Australia	61,923	2,293	20		
Germany	2,284	85	1		
Italy *	0	0	0		
Spain	39,568	1,465	13		
Switzerland	152,743	5,657	50		
U.K.	41,659	1,543	14		
U.S.	15,227,735	563,990	5,003		
Total for 7 key countries:	**15,525,912**	**575,034**	**5,101**	**5,280**	**-3.4%**
Argentina	14,804	548	5		
Austria	7,655	284	3		
Belgium	458	17	1		
Bermuda	657	24	1		
Brazil	5,696	211	2		
Canada	107,370	3,977	35		
Chile*	0	0	0		
Hong Kong*	0	0	0		
Finland	915	34	1		
Ireland*	0	0	0		
Mexico	1,533	57	1		
Netherlands	228	8	0		
Portugal*	0	0	0		
Sweden	23,590	874	8		
Total for Remaining Countries	**162,906**	**6,034**	**54**	**52**	**3.2%**
Total All Countries	**15,688,818**	**581,067**	**5,154**	**5,332**	**-3.3%**
***Data unavailable**					

Table II: Results of Rental Car Scenario 2
(Company Policy = No Rentals Beyond Midsize/Intermediate)

Country	Type of Car	Total Miles Driven	MPG	Fuel Consumption (gal)	NEW CO_2 emissions (metric tons)	ORIGINAL CO_2 emissions (metric tons)	% Difference
Australia	Compact	19,600	25.0	784	7		
Australia	Economy/Subcompact	114	28.5	4	0		
Australia	Midsize/Intermediate	42,209	26.4	1,600	14		
Germany	Compact	2,284	26.3	87	1		
Italy *							
Spain	Compact	39,568	26.2	1,508	13		
Switzerland	Compact	58,992	26.2	2,248	20		
Switzerland	Economy/Subcompact	52,304	26.1	2,001	18		
Switzerland	Midsize/Intermediate	41,447	26.4	1,571	14		
U.K.	Compact	8,222	26.3	313	3		
U.K.	Economy/Subcompact	3,911	26.1	150	1		
U.K.	Midsize/Intermediate	29,526	26.4	1,119	10		
U.S.	Compact	915,431	26.1	35,098	311		
U.S.	Economy/Subcompact	307,308	26.1	11,780	105		
U.S.	Midsize/Intermediate	14,004,996	26.4	530,826	4,708		
Total for 7 key countries:		**15,525,912**		**589,089**	**5,225**	**5,280**	**-1.0%**
Argentina	Economy/Subcompact	14,804	26.0	569	5		
Austria	Compact	1,305	25.1	52	1		
Austria	Economy/Subcompact	1,320	26.4	50	1		
Austria	Midsize/Intermediate	5,030	26.4	191	2		
Belgium	Economy/Subcompact	458	25.4	18	0		
Bermuda	Midsize/Intermediate	657	26.3	25	0		
Brazil	Economy/Subcompact	5,696	26.0	219	2		
Canada	Compact	5,358	26.0	206	2		
Canada	Economy/Subcompact	2,288	26.0	88	1		
Canada	Midsize/Intermediate	99,724	26.4	3,780	34		
Chile*							
Hong Kong*							
Finland	Compact	457	26.9	17	1		
Finland	Economy/Subcompact	458	25.4	18	1		
Ireland*							
Mexico	Midsize/Intermediate	1,533	26.0	59	1		
Netherlands	Compact	228	25.3	9	0		
Portugal*							
Sweden	Compact	1,830	26.1	70	1		
Sweden	Economy/Subcompact	3,660	26.1	140	1		
Sweden	Midsize/Intermediate	18,100	26.4	686	6		
Total for Remaining Countries		**162,906**		**6,196**	**55**	**52**	**5.9%**
Total All Countries		**15,688,818**		**595,285**	**5,280**	**5,332**	**-1.0%**
***Data Unavailable**							

APPENDIX 12: METHODOLOGY – REDUCTION SCENARIOS FOR ZNA GENERAL'S LEASED FLEET

4 Scenarios for Zurich U.S.'s Leased Fleet:

U.S. Scenario 1: 20% conversion of leased fleet to "green" vehicles (as defined by Hertz's "green" fleet standard)

<u>Methodology</u>

- ZNA General's leased fleet was selected for this scenario analysis, as we assumed that changes to the General fleet would be implemented more easily than those to the Executive fleet.
- ZNA's General leased fleet was ranked in ascending order of "combo city and hwy mpg" (mpg data provided by AmEx).
- Car counts and total miles driven were aggregated for each mpg value.
- Emission factors were assigned to cars corresponding to each mpg value; these emission factors are based on distance-based emission factors from the WRI/WBCSD GHG Protocol; emission factors correspond to those values closest to the actual mpg value without going over.
- Total car count and miles driven for each mpg class was multiplied by 0.8 to calculate the number of "original" cars (and miles driven by such cars) and 0.2 to calculate the number of "green" cars (and miles driven by such cars).
- If there was only 1 car in the mpg class, it was assumed to be an "original" car.
- Separate emission factors were applied to original and "green" cars. The EF for original cars corresponds to the distance-based emission factor described above. The EF for "green" cars was based on the distance-based EF provided by the WRI/WBCSD GHG Protocol for cars averaging 27.5 mpg; this value is very close to the 27 mpg average for Hertz's "green" fleet.
  - Hertz's "green" fleet is composed of the Toyota Corolla, Toyota Camry, and Ford Fusion. Highway and city mpg values are based on manufacturer standards for 2009 models.
- CO_2 emissions from original and "green" cars were calculated by adding the product of miles driven by original cars and the original EF and the product of miles driven by "green" cars and the lower EF corresponding to "green" cars.
- Total CO_2 emissions were summed for ZNA General's entire fleet.
- A percent difference was calculated between modeled emissions estimates and the original emissions estimates based on the fuel efficiency of ZNA General's current leased fleet.

U.S. Scenario 2: 50% conversion of leased fleet to "green" vehicles (as defined by Hertz's "green" fleet standard)

Methodology

- The same methodology outlined for Scenario 1 was applied to Scenario 2 except that the number of cars/miles driven in each mpg class was split evenly between "original" and "green" vehicles. Therefore, the original set of EFs was applied to 50% of cars/miles driven, and the EF corresponding to "green" cars was applied to 50% of cars/miles.

U.S. Scenario 3: 80% conversion of leased fleet to "green" vehicles (as defined by Hertz's "green" fleet standard)

Methodology

- The same methodology outlined for Scenario 1 was applied to Scenario 3 except that 80% of cars/miles driven in each mpg class were assigned "green" EFs, while the remaining 20% of ZNA General's leased fleet was assigned "original" EFs.

U.S. Scenario 4: 20% conversion of leased fleet to hybrid vehicles (as defined by the EIA 2006 emission factor)

Methodology

- Total car count and miles driven for each mpg class was multiplied by 0.8 to calculate the number of "original" cars (and miles driven by such cars) and 0.2 to calculate the number of hybrid cars (and miles driven by such cars).
- If there was only 1 car in the mpg class, it was assumed to be an "original" car.
- Separate emission factors were applied to "original" and hybrid cars. The EF for original cars corresponds to the distance-based EF described above. The EF for hybrid cars was based on the "vehicle-mile," distance-based EF for hybrid cars calculated by the EIA and applied in the WRI/WBCSD GHG Protocol.
- CO_2 emissions from "original" and hybrid cars were calculated by adding the product of miles driven by "original" cars and the "original" EF and the product of miles driven by hybrid cars and the lower EF corresponding to hybrid cars.
- Total CO_2 emissions were summed for ZNA General's entire fleet.
- A percent difference was calculated between modeled emissions estimates and the original emissions estimates based on the fuel efficiency of ZNA General's current leased fleet.

APPENDIX 13: METHODOLOGY - REDUCTION SCENARIOS FOR ZURICH U.K.'S LEASED FLEET

4 Scenarios for Zurich U.K.'s Leased Fleet:

U.K. Scenario 1: 20% conversion of leased fleet to "green" vehicles[53]

Methodology

- A complete inventory of Zurich U.K.'s entire leased fleet was provided by AmEx; this inventory included the make, model, total budgeted km/yr, and total CO_2 (metric tons/yr).
- The number of cars of each make/model was subsequently calculated, and the average CO_2/budgeted km was calculated for each type of car.
- Zurich's UK leased fleet was ranked in ascending order of average CO_2/budgeted km.
- Total budgeted km driven for each car type was multiplied by 0.8 to calculate the number of km driven by "original" cars of each type and by 0.2 to calculate the number of km driven by "green" cars under a 20% conversion to "green" fleet scenario
- Total CO_2 emissions generated by the 80% of km driven by the "original" fleet was calculated as the product of budgeted miles driven by each type of "original" car and the average CO_2/budgeted km for each type of car
- Total CO_2 emissions generated by the 20% of km driven by the "green" fleet was calculated as the product of budgeted km driven by each type of "green" car and the distance-based EF (0.1332 kg CO_2/km) corresponding to the average kg CO_2/km for "green" compact executive cars identified by Clean Green Cars, divided by 1000 (to convert from kg to metric tons).[54]
- This EF was chosen (rather than applying an EF related to Hertz's "green" fleet) because it was believed to more accurately reflect the average composition of cars in the U.K.
- An EF corresponding to "compact executive cars" was chosen, as this was thought to represent a reasonable choice for corporate cars. It is unlikely that employees would be amenable to smaller cars (e.g., city cars or superminis), especially if they are traveling long distances in such cars for site visits.
- CO_2 emissions from each make/model of "original" and "green" car were summed to determine total CO_2 emissions generated by each make/model.
- Total CO_2 emissions for each make/model were summed across the entire leased fleet.
- A percent difference was calculated between modeled emissions estimates and the original emissions estimates based on the fuel efficiency of the current leased fleet.

U.K. Scenario 2: 50% conversion of leased fleet to "green" vehicles[53]

Methodology

[53] As defined by Clean Green Cars, a U.K.-based green motoring guide.

[54] Compact executive cars considered in this analysis include the BMW 318D, BMW 320D, Volvo S40 1.6D, BMW 318I, and Audi A4 2.0 TDI. Distance-based EFs reflect manufacturer standards for 2008 models.

Deviations from the methodology for U.K. Scenario 1 are outlined below:

- Total budgeted km driven by each car type was multiplied by 0.5 to calculate the number of km driven by "original" cars of each type and the number of km driven by "green" cars under a 50% conversion to "green" fleet scenario.
- Total CO_2 emissions generated by the 50% of km driven by the "original" fleet was calculated as the product of budgeted km driven by each type of "original" car and the average CO_2/budgeted km for each type of car.
- Total CO_2 emissions generated by the 50% of km driven by the "green" fleet was calculated as the product of budgeted km driven by each type of "green" car and the distance-based EF (0.1332 kg CO_2/km) corresponding to the average kg CO_2/km for "green" compact executive cars identified by Clean Green Cars, divided by 1000 (to convert from kg to metric tons).

U.K. Scenario 3: 80% conversion of leased fleet to "green" vehicles[53]

Methodology

Deviations from the methodology for U.K. Scenario 1 are outlined below:

- Total budgeted km driven for each car type was multiplied by 0.2 to calculate the number of km driven by "original" cars of each type and by 0.8 to calculate the number of km driven by "green" cars under an 80% conversion to "green" fleet scenario.
- Total CO_2 emissions generated by the 20% of km driven by the "original" fleet was calculated as the product of budgeted km driven by each type of "original" car and the average CO_2/budgeted km for each type of car.
- Total CO_2 emissions generated by the 80% of km driven by the "green" fleet was calculated as the product of budgeted km driven by each type of "green" car and the distance-based EF (0.1332 kg CO_2/km) corresponding to the average kg CO_2/km for "green" compact executive cars identified by Clean Green Cars, divided by 1000 (to convert from kg to metric tons).

U.K. Scenario 4: 20% conversion of leased fleet to hybrid vehicles[55]

Methodology

Deviations from the methodology for U.K. Scenario 1 are outlined below:

- Total budgeted km driven for each car type was multiplied by 0.8 to calculate the number of km driven by "original" cars of each type and by 0.2 to calculate the number of km driven by hybrid cars under a 20% conversion to hybrid fleet scenario.
- Total CO_2 emissions generated by the 80% of km driven by the "original" fleet was calculated as the product of budgeted km driven by each type of "original" car and the average CO_2/budgeted km for each type of car.
- Total CO_2 emissions generated by the 20% of km driven by the hybrid fleet was calculated as the product of budgeted km driven by hybrid cars and the distance-based EF

[55] As defined by Clean Green Cars, a U.K.-based green motoring guide.

(0.1065 kg CO_2/mi) corresponding to the average kg CO_2/km for hybrid cars identified by Clean Green Cars, divided by 1000 (to convert from kg to metric tons).[56]

- This EF was chosen for the U.K. analysis (rather than applying an EF for hybrid vehicles based on the WRI/WBCSD GHG Protocol) because it was believed to more accurately reflect the average composition of hybrid cars in the U.K.

[56] Hybrid cars considered in this analysis include the Honda Civic Hybrid and Toyota Prius. Distance-based EFs reflect manufacturer standards for 2008 models.

APPENDIX 14: ASSUMPTIONS OF DEPARTMENT OF ENERGY CALCULATORS

Table I: Assumptions of DOE Calculators

Assumptions for Printers			
Category	**Value**		**Data Source**
Power			
Energy Star-qualified Unit-Ink Jet (Color/Mono)			
Average hourly energy in "off" mode	0.4	watts	EPA 2006
Average hourly energy in "standby" mode	3.0	watts	EPA 2006
Average hourly energy in "ready" mode	3.0	watts	LBNL 2007
Average hourly energy in "active" mode	13.4	watts	LBNL 2007
Initial cost per unit (estimated retail price)	$105		Industry data 2008
Average annual unit energy (enabled, left on)	17.3	kWh	Calculated
Average annual unit energy (not enabled, left on)	17.3	kWh	Calculated
Average annual unit energy (enabled, turned off)	7.9	kWh	Calculated
Average annual unit energy (not enabled, turned off)	7.9	kWh	Calculated
Average annual unit energy consumption	14.5	kWh	Calculated
Energy Star-qualified Unit-Laser			
Color	7.8	kWh/week	EPA 2006
Monochrome	6.0	kWh/week	EPA 2006
Selected Unit Energy Consumption	6.0	kWh/week	Calculated
Initial cost per unit (Color)	$956		Industry data 2008
Initial cost per unit (Monochrome)	$535		Industry data 2008
Selected Unit Initial Cost	$535		Industry data 2008
Lifetime	5	years	LBNL 2007
Conventional Unit-Ink Jet (Color/Mono)			
Average hourly energy in "off" mode	2.3	watts	EPA 2006
Average hourly energy in "standby" mode	5.3	watts	EPA 2006
Average hourly energy in "ready" mode	5.3	watts	LBNL 2007
Average hourly energy in "active" mode	13.4	watts	LBNL 2007
Initial cost per unit (estimated retail price)	$105		Industry data 2008
Average annual unit energy (enabled, left on)	30.5	kWh	Calculated
Average annual unit energy (not enabled, left on)	30.5	kWh	Calculated
Average annual unit energy (enabled, turned off)	19.7	kWh	Calculated
Average annual unit energy (not enabled, turned off)	19.7	kWh	Calculated
Average annual unit energy consumption	27.3	kWh	Calculated
Conventional Unit-Laser			
Color	10.6	kWh/week	EPA 2006
Monochrome	6.4	kWh/week	EPA 2006
Selected Unit Energy Consumption	6.4	kWh/week	Calculated
Initial cost per unit (Color)	$956		Industry data 2008

Initial cost per unit (Monochrome)	$535		Industry data 2008
Initial cost per unit (estimated retail price)	$535		Industry data 2008
Lifetime	5.0	years	Assumes conventional model has the same lifetime as Energy Star-qualified unit.
Maintenance			
Energy Star-qualified Unit			
Lifetime maintenance cost	0		Assumes that unit is traded in or no longer used at the end of expected lifetime.
Conventional Unit			
Lifetime maintenance cost	0		Assumes that unit is traded in or no longer used at the end of expected lifetime.
Usage-Ink Jet			
Number of days in use per year	240.0	days/year	LBNL 2007
Percent of units left on 24 hrs per day	70%		LBNL 2007
Enabling scenario	95%		LBNL 2007
Number of hours in "off" mode per day	15.0	hours/day	LBNL 2007
Number of hours in "standby" mode per day	0.0	hours/day	LBNL 2007
Number of hours in "ready" mode per day	9.0	hours/day	LBNL 2007
Number of hours in "active" mode per day	0.0	hours/day	LBNL 2007
Average number of hours in "off" mode per year	3600.0	hours/year	Calculated.
Average number of hours in "standby" mode per year	0.0	hours/year	Calculated.
Average number of hours in "ready" mode per year	2160.0	hours/year	Calculated.
Average number of hours in "active" mode per year	0.0	hours/year	Calculated.
Discount Rate			
Commercial and Residential Discount Rate (real)	4%		A real discount rate of 4 percent is assumed, which is roughly equivalent to the nominal discount rate of 7 percent (4 percent real discount rate + 3 percent inflation rate).
Energy Prices			
Commercial	$0.2230	$/kWh	Zurich
Residential	$0.0971	$/kWh	EIA 2007
Selected	$0.2230	$/kWh	
CO_2 Emissions Factors			
Electricity Carbon Emission Factors	1.5350	lbs CO2/kWh	EPA 2006
CO_2 Equivalents			

Annual CO_2 sequestration per forested acre	8,066.0	lbs CO2/yr	EPA 2006
Annual CO_2 emissions for "average" passenger car	11,470.0	lbs CO2/yr	EPA 2006
Last updated 06/08			
If you have any questions, please contact ESCalcs@cadmusgroup.com.			
Assumptions for Monitors			
Category	**Value**		**Data Source**
Power			
Monitor			
Energy Star-qualified Unit			
Initial cost per unit (estimated retail price)	$200		Dell LatitudeTM E4200 (Date on the market September 12, 2008)
Average power in "active" mode	28.0	Watts	LBNL 2007
Average power in "sleep" mode	2.0	Watts	ENERGY STAR Specification
Average power in "off" mode	1.0	Watts	ENERGY STAR Specification
Conventional Unit			
LCD			
Initial cost per unit (estimated retail price)	$299		Industry Data 2007
Average power in "active" mode	41.0	Watts	LBNL 2007
Average power in "sleep" mode	3.0	Watts	LBNL 2007
Average power in "off" mode	2.0	Watts	LBNL 2007
CRT			
Initial cost per unit (estimated retail price)	$149		Industry Data 2007
Average power in "active" mode	73.0	Watts	LBNL 2007
Average power in "sleep" mode	3.0	Watts	LBNL 2007
Average power in "off" mode	1.0	Watts	LBNL 2007
Maintenance			
Energy Star-qualified Unit			
Lifetime maintenance cost	$0		Assumes that unit is traded in or no longer used at the end of expected lifetime.
Conventional Unit			
Lifetime maintenance cost	$0		Assumes that unit is traded in or no longer used at the end of expected lifetime.
Usage			

All Monitors			
Lifetime	4	years	LBNL 2007
Night time turn off rate	0%		Based on user input
With Power Management Enabled			
Average number of hours in "active" mode per year	0	hours/year	LBNL 2007
Average number of hours in "sleep" mode per year	0	hours/year	LBNL 2007
Average number of hours in "off" mode per year	0	hours/year	LBNL 2007
Without Power Management Enabled			
Average number of hours in "active" mode per year	0	hours/year	LBNL 2007
Average number of hours in "sleep" mode per year	0	hours/year	LBNL 2007
Average number of hours in "off" mode per year	0	hours/year	LBNL 2007
Discount Rate			
Commercial and Residential Discount Rate (real)	4%		A real discount rate of 4 percent is assumed, which is roughly equivalent to the nominal discount rate of 7 percent (4 percent real discount rate + 3 percent inflation rate).
Energy Prices			
Commercial Electricity Price	$0.2230	$/kWh	Zurich
Residential Electricity Price	$0.1059	$/kWh	EIA 2008
CO_2 Emissions Factors			
Electricity CO_2 Emission Factor	1.54	lbs CO_2/kWh	EIA 2008
CO_2 Equivalents			
Annual CO_2 sequestration per forested acre	9,700	lbs CO_2/year	EPA 2007
Annual CO_2 emissions for "average" passenger car	12,037	lbs CO_2/year	EPA 2007
Calculator last updated: 08/08			
If you have any questions, please contact ESCalcs@cadmusgroup.com.			

Assumptions for MFDs

Category	Value		Data Source
Power			
Energy Star-qualified Unit			
Average hourly energy in "off" mode	0.3	watts	EPA 2006
Average hourly energy in "standby" mode	3.0	watts	EPA 2006
Average hourly energy in "ready" mode	3.0	watts	LBNL 2007
Average hourly energy in "active" mode	15.6	watts	LBNL 2007

Initial cost per unit (estimated retail price)	200.00		Dell 1125 Mono MFP laser
Lifetime	6	years	LBNL 2007
Average annual unit energy (enabled, left on)	0.8	kWh	Calculated
Average annual unit energy (not enabled, left on)	0.0	kWh	Calculated
Average annual unit energy (enabled, turned off)	0.3	kWh	Calculated
Average annual unit energy (not enabled, turned off)	0.0	kWh	Calculated
Average annual unit energy consumption	0.7	kWh	Calculated
Conventional Unit			
Average hourly energy in "off" mode	5.8	watts	EPA 2006
Average hourly energy in "standby" mode	8.6	watts	EPA 2006
Average hourly energy in "ready" mode	9.1	watts	LBNL 2007
Average hourly energy in "active" mode	15.6	watts	LBNL 2007
Initial cost per unit (estimated retail price)	180.00		No price premium found between conventional and ENERGY STAR models
Lifetime	0.0	years	Assumes conventional model has the same lifetime as Energy Star-qualified unit.
Average annual unit energy (enabled, left on)	2.2	kWh	Calculated
Average annual unit energy (not enabled, left on)	0.0	kWh	Calculated
Average annual unit energy (enabled, turned off)	1.7	kWh	Calculated
Average annual unit energy (not enabled, turned off)	0.0	kWh	Calculated
Average annual unit energy consumption	2.1	kWh	Calculated
Maintenance			
Energy Star-qualified Unit			
Lifetime maintenance cost	0		Assumes that unit is traded in or no longer used at the end of expected lifetime.
Conventional Unit			
Lifetime maintenance cost	0		Assumes that unit is traded in or no longer used at the end of expected lifetime.
Usage			
Number of days in use per year	264.0	days/year	LBNL 2007
Percent of units left on 24 hrs per day	81%		LBNL 2007
Enabling scenario	100%		LBNL 2007
Number of hours in "off" mode per day	18.0	hours/day	LBNL 2007
Number of hours in "standby" mode per day	4.5	hours/day	LBNL 2007
Number of hours in "ready" mode per day	1.0	hours/day	LBNL 2007
Number of hours in "active" mode per day	0.5	hours/day	LBNL 2007
Average number of hours in "off" mode per year	190.8	hours/year	Calculated.
Average number of hours in "standby" mode per year	47.7	hours/year	Calculated.
Average number of hours in "ready" mode per year	10.6	hours/year	Calculated.

Average number of hours in "active" mode per year	5.3	hours/year	Calculated.
Discount Rate			
Commercial and Residential Discount Rate (real)	4%		A real discount rate of 4 percent is assumed, which is roughly equivalent to the nominal discount rate of 7 percent (4 percent real discount rate + 3 percent inflation rate).
Energy Prices			
Commercial	$0.2230	$/kWh	EIA 2008
Residential	$0.1059	$/kWh	EIA 2008
Selected	#N/A	$/kWh	
CO_2 Emissions Factors			
Electricity Carbon Emission Factors	1.5400	lbs CO2/kWh	EPA 2008
CO_2 Equivalents			
Annual CO_2 sequestration per forested acre	9,700.0	lbs CO2/yr	EPA 2007
Annual CO_2 emissions for "average" passenger car	12,037.0	lbs CO2/yr	EPA 2007
Last updated 08/08			
If you have any questions, please contact ESCalcs@cadmusgroup.com.			

APPENDIX 15: IT METHODOLOGY

Overview

We identified a menu of energy efficient (Energy Star) IT products that could replace typical, non energy efficient office IT equipment used in ZNA and Farmers' commercial facilities. IT equipment considered included printers, monitors, and multi- functional devices (MFDs). Zurich currently supplies employees with Dell computers; our research identified Energy Star-certified Dell products that form part of our recommendations. Although Zurich typically uses Ricoh MFDs and printers, we have based our calculations for *all* IT products on Dell standards, to simplify the analysis and promote consistency. Given that Ricoh's corporate headquarters are in Japan, while the calculator used to assess IT savings is U.S.-based, we considered that Dell, which is a U.S. based company, and its standards would improve the accuracy of our recommendations.

Through this research, costs for energy efficient Dell MFDs and printers were identified:

- Dell 1125 Mono MFL Laser MFD ($200)
- Dell Latitude TM E4200 Printer ($200)
- Energy Star Average Laser Printer based on Energy Star's website (No exact product)

To calculate kWh- and cost-savings, a product-specific calculator developed by the U.S. EPA and U.S. DOE was used. These government-certified calculators, titled "Life Cycle Cost Estimate for Energy Star-Qualified Products," are publicly available on the U.S. EPA's Energy Star website and provide a credible means to estimate potential unit and group-wide CO_2- and cost-savings. The calculators rely on product-specific energy cost and energy use assumptions, which are based on U.S. averages identified and labeled in an "Assumptions" worksheet within each calculator (See Appendix 14 for complete list of assumptions).

Assumptions

As noted earlier, only IT products from ZNA and Farmers' commercial facilities were analyzed. This is because the calculators are U.S.-centric (based on assumptions unique to the U.S.), and therefore extrapolating to other regions was not justified. Note that we changed two integral assumptions built into the calculator: (1) we replaced the average cost of electricity specified in the calculator with Zurich's average energy rate ($0.223 per kWh), and (2) we changed the unit cost of each type of Energy Star product to reflect information from Dell's sales website. Additionally, due to the lack of raw data, we made assumptions on the number of replacements needed for each of the three products. No information was given regarding the total number of monitors or MFDs that ZNA and Farmers currently use, so we assumed there would be one monitor per employee and one MFD per 50 employees. Furthermore, the 50,225 employees working for Zurich were separated from the 8,080 employees working for Farmers. Thus, we estimated a total of 1,005 and 162 MFDs for use within Zurich and Farmers, respectively.

Estimated savings from installation of energy efficient printers were more accurate, because Zurich provided us with a detailed printer inventory from Ricoh reflecting the number of black & white and color printers used by region (e.g., EMEA, AP, the U.S., and Canada).[57] The inventory was split by traditional and eco-friendly printers; eco-friendly printers were designated as EnergyStar certified. From this file, we determined the number of non-energy efficient printers (n = 278) used in the United States and, hence, the number of units that must be replaced.

Calculations

Using the calculators' pre-programmed assumptions, we assumed different scenarios of product replacement rates (Energy Star replacement of non-energy efficient products). This scenario analysis was conducted to account for the lack of data regarding the number of traditional vs. Energy Star-certified MFDs and monitors. These scenarios were completed for both Zurich and Farmers separately. A 100% replacement rate was used, which assumed all of Farmers and Zurich's products were replaced with Energy Star equipment. This same procedure was replicated using 75%, 50%, and 25% replacement rates for all non energy efficient products.

Metrics calculated included:

- Initial cost difference between the specific Energy Star products versus standard non-energy efficient product in the same category (e.g., Dell Latitude TM E4200 printer vs. non Energy Star printer) as defined in the assumptions of the calculator
- Life cycle cost-savings
- Net life cycle cost-savings (life cycle savings and additional cost of maintenance and repair)
- Simple payback of additional cost (years)
- Life cycle electricity saved (kWh)
- Life cycle air pollution reduction (lbs. CO_2)

Once these values were calculated, lbs. CO_2 was converted into metric tons CO_2 using the conversion factor (1 lb. = .000453592 metric tons). Finally, the same output values were also calculated, based on replacing a single non energy efficient unit with its Energy Star-qualified counterpart.

[57] AP refers to Australia, whereas EMEA includes Austria, Belgium, Finland, Germany, Italy, Portugal, Spain, Switzerland, and the U.K.

APPENDIX 16: SWISS RE CASE STUDY

Swiss Re is one of Zurich's main competitors. It is also one of the most environmentally progressive companies in the financial services sector. Swiss Re has launched several environmental initiatives focused on a variety issues, with energy use and climate change being the major themes. Furthermore, Swiss Re has created a Carbon Neutral Initiative. In order to achieve this goal, Swiss Re has created a portfolio of their energy consumption in order to identify opportunities for energy use reductions (Hoffman 2005).

In 2004, detailed energy audits at the four largest Swiss Re-owned locations (Zurich, Munich, Armonk, and Johannesburg) identified long-term energy savings potentials ranging from 10% to 40%. Additional audits were conducted, which showed that the majority of office emissions came from the nine buildings that the company owned, and from another 61 facilities in which it rented space. While the nine owned buildings are responsible for 87% of the company's total energy consumption, the company also chose to reduce emissions from its rented office.

Swiss Re employed a three-tiered approach to reduce its energy consumption:

1. The first tier includes zero-cost investments, such as turning down heating and cooling, and turning off lighting systems during non-working hours.
2. The second tier focuses on small investments with paybacks of one year or less, such as motion sensors and compact fluorescent light-bulbs.
3. The final tier includes refurbishments of property and buildings owned by Swiss Re, such as replacing cooling towers, generators, insulation, or windows. The payback period for these investments can be as long as 10 years.

Based on the recommendations, local action plans have been drawn up for the next three years to install and assess Swiss Re's energy-saving initiatives. Meanwhile, the company has learned some key insights into why some offices have more emissions than others. Factors influencing emissions intensity include: building age, building location, property manager's knowledge of and/or concern for energy efficiency. Additionally, operations split between two separate buildings with different property managers minimize the company's leverage with respect to lease negotiations. Swiss Re is consolidating office space wherever possible and actively organizing tenant groups to create change within the management company.

Reference:

Hoffman, A. 2005. *Getting Ahead of the Curve: Corporate Strategies That Address Climate Change*. Pew Center on Global Climate Change.

APPENDIX 17: METHODOLOGY - RENTED VEHICLE FLEET AND AIR TRAVEL COST-SAVINGS SCENARIO ANALYSIS

2 Scenarios for Zurich's Rented Vehicle Fleet:

Rental Car Scenario 1: Implementation of a company policy by which employees must rent vehicles with fuel efficiencies similar to those realized by Hertz's "green" fleet

Methodology

- AmEx provided fuel consumption (gal) data for rental cars in 21 countries in which Zurich operates.
- Reduced fuel consumption (gal) resulting from a company-wide "green" car rental policy, calculated at the country-level was assumed to be equivalent to that calculated for rental car Scenario 1 as part of the CO_2 reduction scenario analysis (see Appendix 11 for more details).
- Fuel-savings resulting from implementation of a "green" rental car policy were calculated for each country as the difference between original and reduced fuel consumption.
- Annual cost-savings from reduced fuel consumption were calculated as the product of gallons saved and the price of fuel (USD)/gal.
- Average gasoline prices for Belgium, France, Germany, Italy, the Netherlands, the U.K., and the U.S. were collected from the Energy Information Administration; prices were verified accurate as of March 10, 2008 (Figure I).
- Country-specific USD/gal values were applied (where data was available); in cases where fuel cost data was not provided, an average USD/gal value was applied, which reflected gasoline prices for all countries except the U.S.
    - o U.S. fuel costs were much lower than those of European countries; therefore, it was decided to exclude this value when calculating the average price of fuel, so as not to skew the mean gasoline price.
- Total cost-savings were calculated for: (1) each of the 21 countries, (2) all 7 target countries, (3) the additional 14 countries for which we have rental car data, and (4) all 21 countries combined.

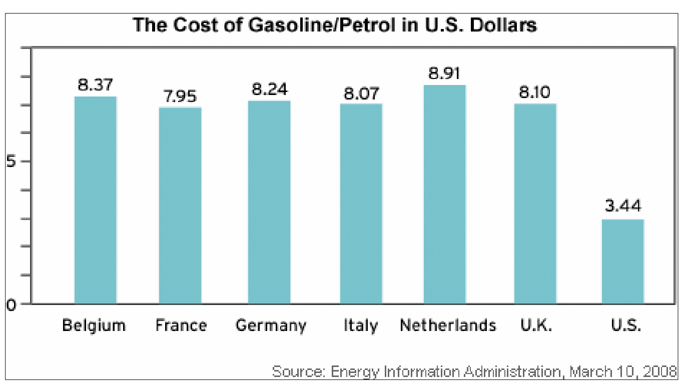

Figure I: Average Gasoline Prices (USD) for Six European Countries and the U.S. as of March 10, 2008.

Rental Car Scenario 2: Implementation of a company policy by which employees must not rent vehicles larger than midsize/intermediate

Methodology

Deviations from the methodology for Rental Car Scenario 1 are outlined below:

- Reduced fuel consumption (gal) resulting from adoption of a company-wide rental car policy to not rent cars beyond the "midsize/intermediate" size class was assumed to be equivalent to that calculated for rental car Scenario 2 as part of the CO_2 reduction scenario analysis (see Appendix 11 for a detailed description of the fuel-savings calculation methodology); reduced fuel consumption was calculated at the country-level.
- Fuel-savings resulting from implementation of a company-wide rental car policy to not rent cars beyond the "midsize/intermediate" size class were calculated for each country as the difference between original and reduced fuel consumption.

4 Scenarios Targeting Zurich's Air Travel:

Air Travel Scenario 1: Reduce air travel by 25% in Switzerland, the U.K., and the U.S. and by 15% in all other countries for which we have air travel data

Methodology

- AmEx provided data on annual air miles traveled and total cost of travel for Zurich's operations in 20 countries.[58]
- From this data, we calculated "cost (USD)/mi" for each country by dividing total cost of travel by total miles traveled.
- The number of air miles traveled under this reduction scenario was calculated by multiplying "original total miles traveled" by 0.75 in Switzerland, the U.K., and the U.S., and by 0.85 in the remaining 17 countries for which we were provided air travel data. This number was labeled as "reduced total miles traveled."
- Travel costs associated with this reduction scenario were calculated by multiplying "cost (USD)/mi" by "reduced total miles traveled" for each country.
- Annual cost-savings were calculated as the difference between the original and reduced cost of air travel (all costs were in 2008 USD).
- Cost-savings were calculated for each country and summed across all 20 countries to determine group-wide cost-savings from reduced air travel.

Air Travel Scenario 2: Reduce air travel by 15% in all 20 countries

Methodology

Deviations from the methodology for Air Travel Scenario 1 are outlined below:

- The number of air miles traveled under this reduction scenario was calculated by multiplying "original total miles traveled" by 0.85 for all 20 countries for which we were provided air travel data.

[58] 20 countries include: the seven target countries (i.e., Australia, Germany, Italy, Spain, Switzerland, the U.K., and the U.S.) and 13 additional countries (i.e., Argentina, Austria, Belgium, Brazil, Canada, Chile, Hong Kong, Finland, Ireland, Mexico, the Netherlands, Singapore, and Sweden).

Air Travel Scenario 3: Reduce air travel by 25% in all 20 countries

Methodology

Deviations from the methodology for Air Travel Scenario 1 are outlined below:

- The number of air miles traveled under this reduction scenario was calculated by multiplying "original total miles traveled" by 0.75 for all 20 countries for which we were provided air travel data.

Air Travel Scenario 4: Reduce air travel by 50% in all 20 countries

Methodology

Deviations from the methodology for Air Travel Scenario 1 are outlined below:

- The number of air miles traveled under this reduction scenario was calculated by multiplying "original total miles traveled" by 0.50 for all 20 countries for which we were provided air travel data.

APPENDIX 18: ENERGY AUDIT METHODOLOGY

Energy audit cost ranges per square foot were provided for the three main energy audit types (i.e., Preliminary, Single Purpose/Targeted, and Comprehensive) in the California Energy Commission's (CEC) January 2000 report "How to Hire an Energy Efficiency Auditor to Identify Energy Efficiency Projects." We converted raw data on the total area (square meters) for all facilities within each country incorporated in the footprint analysis to square feet because the CEC's energy audit costs were based on square feet. We subsequently multiplied cost ranges for the three types of energy audits by the combined area (square feet) of all facilities in each country to derive the total cost per type of energy audit. Finally, we summed the total cost for all seven countries, including FIG, for each type of energy audit.

Reference:

California Energy Commission (CEC). 2000. How To Hire An Energy Efficiency Auditor To Identify Energy Efficiency Projects. Energy Efficiency Division.

APPENDIX 19: MITIGATION OPTIONS METHODOLOGY

Overall Reduction Calculations

- Excluding the corporate jet, Zurich and Farmers' operations currently emit 222,532 metric tons CO_2 per annum.[34] Therefore, a 15% group-wide reduction in emissions requires annual CO_2 savings of 33,380 metric tons.
- It was not possible to allocate emission reductions from "green" rental car policies to individual countries. Furthermore, rental cars/site visits are integral to Zurich's business operations, and we do not want to recommend mitigation strategies requiring substantial changes to Zurich's business structure. Lastly, potential emission reductions from renting "greener" fleets are minimal. Therefore, total potential savings from rental cars (178 metric tons) were also subtracted from annual group-wide emissions (222,532 metric tons) to yield a new starting point estimate for emission reductions (222,354 metric tons). Thus, a 15% group-wide reduction in emissions now requires annual CO_2 savings of 33,353 metric tons.

Mitigation Option A: Short-Term

<u>CO_2 Emissions Reductions</u>

- Emission reduction targets, outlined in Section 4.3, were specified for all seven target countries, as well as the group of 27 countries designated as "Other."
  - Country-specific reduction targets are depicted in Table 4.3.
  - Note that for purposes of mitigation package development, ZNA and Farmers were grouped as "U.S."
- Options for emissions mitigation were assigned to all seven target countries, as well as the group of 27 countries designated as "Other," based on criteria discussed in Section 7.1.
- In countries with a large leased vehicle fleet (the U.K. and the U.S.), potential CO_2 savings based on U.K. Leased Fleet Scenario 3 (i.e., conversion of 80% of the leased fleet to "green" cars by U.K. standards) and U.S. Leased Fleet Scenario 4 (i.e., conversion of 20% of the leased fleet to hybrids) (Table 5.4) were modeled. These scenarios depict the largest CO_2 savings modeled from changes to the composition of the leased fleet.
- In countries with substantial emissions from air travel (Australia, Spain, Switzerland, the U.K., the U.S., and "Other"), potential CO_2 savings based on Air Travel Scenario 3 (i.e., 25% reduction in air travel) (Table 6.1) were modeled. CO_2 savings from reduced air travel were calculated by multiplying total CO_2 (metric tons) generated by air travel in each country by 0.5). This scenario depicts the largest CO_2 savings modeled from changes to Zurich's business operations to reduce air travel.
- The remainder of emissions reductions in each country, after subtracting the sum of emissions reductions from increased fuel-efficiency of the leased fleet and reduced air travel from the country emission target, were achieved by targeting facilities.
- Emission reductions at the facility level were assigned to owned or leased sites in each country based on reasons specified in Section 7.1.
- In countries where it was reasonable to recommend targeting both owned and leased facilities (per reasons specified in Section 7.1) we chose to focus on emissions reductions from owned facilities. This decision assumes that implementing changes at owned facilities is more

feasible than at leased sites where Zurich may not have significant control over building operations.

- For the group of countries specified as “Other,” it was not possible to decipher between owned and leased sites. Therefore, emissions reductions were simply targeted for facilities in general.

Energy Savings (kWh)

Although it is important to quantify potential reductions in CO_2 emissions, building owners and managers may be more familiar with energy (kWh) data. Therefore, it was important to quantify energy savings from facility-based emissions reductions from each package. Note that energy-saving calculations do not apply to air travel, as emissions from air travel stem from fuel burned rather than electricity consumed.

Energy savings were calculated group-wide, by country, and by emission source in each country as follows (Table 7.1):

- The quantity of CO_2 emissions reduced was multiplied by 1,000,000 to convert from metric tons CO_2 to grams CO_2.
- Grams CO_2 was divided by the country-specific “all fuels” emission factor specified in the WRI/WBCSD GHG Protocol. An emission factor representing the average emission factor of all 27 non-target countries was applied to calculate potential energy savings in countries designated as “Other.”

Cost-Savings (USD)

Cost-savings often drive business decisions. Therefore, modeling potential cost-savings from each mitigation package was determined to be critical for this analysis. Note that, due to data limitations, cost-savings modeled represent gross, not net, estimates and do not account for costs incurred to achieve the stated scenario (e.g., the upfront cost of installing more efficienct HVAC systems, lighting ballasts, etc.).
Cost-savings from reduced air travel were calculated as follows:

- Cost-savings for the seven target countries were taken to be the same as those calculated for Air Travel Scenario 3 (Calculation methodology detailed in Appendix 17)
- Cost-savings for countries designated as “Other” reflect the combined cost-savings achieved from a 25% reduction in air travel by the 13 non-target countries considered in the air travel analysis (See Appendix 17 for list of countries)

Facility-level cost-savings were calculated group-wide, by country, and by emission source in each country as follows (Table 7.1):

- Energy-savings were multiplied by country-specific average energy rates ($/kWh) based on actual cost data provided by Zurich and cost projections by the group (See Section 2.3.3 for a detailed description of how costs were projected).
- Because no cost data was provided for “Other” countries, the energy rate applied to the 27 non-target countries analyzed corresponds to the average energy rate from the seven target countries.

- Calculation of cost-savings from increased use of more fuel-efficient leased vehicles was not possible because Lease Plan did not provide cost data on Zurich's leased fleet.

Mitigation Option B: Long-Term

Deviations from the methodology used to derive Option A are detailed below.

<u>CO_2 Emissions Reduction</u>

- In countries with a large leased vehicle fleet (the U.K. and U.S.), potential CO_2 savings based on U.K. Leased Fleet Scenario 1 (i.e., conversion of 20% of the leased fleet to "green" cars by U.K. standards) and U.S. Leased Fleet Scenario 1 (i.e., conversion of 20% of the leased fleet to "green" cars by Hertz standards) were modeled (Table 5.4). These scenarios depict the smallest CO_2 savings modeled from changes to the composition of the leased fleet.
- In countries with substantial emissions from air travel (Australia, Spain, Switzerland, the U.K., the U.S., and "Other"), potential CO_2 savings based on Air Travel Scenario 2 (i.e., 15% reduction in air travel) were modeled (Table 6.1). CO_2 savings from reduced air travel were calculated by multiplying total CO_2 (metric tons) generated by air travel in each country by 0.15. This scenario depicts the smallest CO_2 savings modeled from changes to Zurich's business operations to reduce air travel.
- The remainder of emissions reductions in each country, after subtracting the sum of emissions reductions from increased fuel-efficiency of the leased fleet and reduced air travel from the country emission target, were achieved by targeting facilities.
- In countries where it was reasonable to recommend targeting both owned and leased facilities (per reasons specified in Part A of this section of the report), we determined emissions reductions from each facility type as follows:
    - Divide the % of emissions from owned (or leased) sites by the total % of emissions generated at all sites within the country of interest
    - Multiply the quotient corresponding to owned (or leased) sites by the total facilities-based emissions that must be mitigated in that country
    - Example: If 35% of emissions stem from owned sites, 45% stem from leased sites, and the total emissions that must be mitigated is 5,000 metric tons, one would perform the following calculations:
        - [35%/(35% + 45%)] * 5,000 = 2,188 metric tons CO_2 (emissions reductions from owned facilities)
        - [45%/(35% + 45%)] * 5,000 = 2,813 metric tons CO_2 (emissions reductions from leased facilities)

<u>Energy Savings (kWh)</u>

- No deviations from the energy savings methodology applied to Option A.

<u>Cost-Savings (USD)</u>

Cost-savings from reduced air travel were calculated as follows:

- Cost-savings for the seven target countries were taken to be the same as those calculated for Air Travel Scenario 2 (Calculation methodology detailed in Appendix 17).

- Cost-savings for countries designated as "Other" reflect the combined cost-savings achieved from a 15% reduction in air travel by the 13 non-target countries considered in the air travel analysis (See Appendix 17 for list of countries).

Mitigation Option C: Intermediate-Term

Deviations from the methodologies used to derive Options A and B are explained below.

CO_2 Emissions Reduction

- In countries with a large leased vehicle fleet (the U.K. and U.S.), potential CO_2 savings based on U.K. Leased Fleet Scenario 2 (i.e., conversion of 50% of the leased fleet to "green" cars by U.K. standards) and U.S. Leased Fleet Scenario 3 (i.e., conversion of 80% of the leased fleet to "green" cars by Hertz standards) were modeled (Table 5.4). These scenarios depict intermediate CO_2 savings modeled from changes to the composition of the leased fleet.
- In countries with substantial emissions from air travel (Australia, Spain, Switzerland, the U.K., the U.S., and "Other"), potential CO_2 savings based on Air Travel Scenario 1 (i.e., 25% reduction in air travel for Switzerland, the U.K. and the U.S. and 15% reduction in air travel for Australia, Spain, and "Other") were modeled (Table 6.1). CO_2 savings from reduced air travel were calculated by multiplying total CO_2 (metric tons) generated by air travel in each country by 0.25 or 0.15 accordingly. This scenario depicts moderate CO_2 savings modeled from changes to Zurich's business operations to reduce air travel; modeled CO_2 savings are less than those derived from Option A but greater than those derived from Option B.
- The remainder of emissions reductions in each country, after subtracting the sum of emissions reductions from increased fuel-efficiency of the leased fleet and reduced air travel from the country emission target, was achieved by targeting facilities.
- In countries where it was reasonable to recommend targeting both owned and leased facilities (per reasons specified in Part A of this section of the report), we determined emissions reductions from each facility type as specified in Option B above.

Energy Savings (kWh)

- No deviations from the energy savings methodology applied to Option A.

Cost-Savings (USD)

Cost-savings from reduced air travel were calculated as follows:

- Cost-savings for the seven target countries were taken to be the same as those calculated for Air Travel Scenario 1 (Calculation methodology detailed in Appendix 17).
- Cost-savings for countries designated as "Other" reflect the combined cost-savings achieved from a 15% reduction in air travel by the 13 non-target countries considered in the air travel analysis (See Appendix 17 for list of countries)

APPENDIX 20: CARBON OFFSETS

Types of Offsets

The different offset project types illustrated in Figure 7.6 in Section 7.2 are described below.

Forestry projects aim to offset emissions from land-use practices by avoiding deforestation. Such projects also seek to increase carbon storage by increasing sequestration via reforestation and afforestation and through improving soil management techniques (e.g., no-till agriculture).

Offsets for *renewable energy projects* (e.g., construction of a renewable energy plant to displace a conventional plant of identical capacity) decrease emissions yet maintain energy generation capacity. They may also add a renewable energy plant to a grid. Emission reductions from renewable energy plants are quantified by determining reduction loads from each plant within the grid and comparing this value to overall emissions from the grid.[59]

Methane capture and/or destruction refer to the capture and conversion, or collection and combustion, of methane. Methane may also be used to generate power. Such offset projects can yield substantial reductions in methane emissions globally due to the wide range of methane sources available (e.g., agriculture, industrial productions, landfills, natural gas and petroleum systems, coal mining, and wastewater treatment plans). An example of a methane-based offset project is methane digesters on farms.[60] Processing of methane in anaerobic digesters also generates electricity and/or heat and, thus, may supply power to energy-stressed grids.

Industrial gas destruction refers to the destruction of industrial gases with high global warming potential (GWP).[61] Due to the global abundance of these gases, their destruction generates relatively large volumes of offsets quickly and easily. It should be noted, however, that both in the case of methane capture and/or destruction and industrial gas destruction, countries and/or companies should not be rewarded for substances that should have been eliminated anyhow.

Lastly, *energy efficiency projects* refer to the use of energy-efficient products and/or systems instead of their conventional counterparts.[62]

Description of Offset Project Examples

In 2006, Clean Air, Cool Planet, in partnership with Trexler Climate and Energy Services, Inc., provided one of the most in-depth and thorough evaluations of voluntary retail offset providers to date (Clean Air, Cool Climate 2006). The research group established criteria to assess offset

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[59] For example, if a wind plant will be used to displace the electricity consumption of a coal-fired plant, then the GHG emissions from the quantity of coal that would have burned in the absence of the wind farm are the emissions saved. These types of offsets are referred to as indirect offsets.
[60] Methane digesters convert methane into CO_2 and water upon combustion. Because methane has 23 times the GWP of CO_2, the global warming effect is subsequently reduced by ~ 96%.
[61] Examples of high GWP gases include nitrous oxide (N_2O) and hydroflorocarbons (HFCs).
[62] The overall general description of project types has been synthesized from Clean Air, Cool Climate 2006.

retailers and the final report was peer reviewed by experts in the field.[63] Based on the cumulative scores in these areas, Clean Air, Cool Climate reported top eight retailers; (1) Native Energy (US); (2) Climate Care (UK); (3) AgCert/Driving Green (Ireland); (4) Carbon Neutral Company (UK); (5) Atmosfair (Germany); (6) Climate Trust (US); (7) CO_2Balance (UK); and (8) Sustainable Travel/My Climate (US).

However, at least four of the top eight retailers have experienced tremendous failures. For example, Native Energy paid $36,000 to the Alaska Village Electric Cooperative (a power utility company servicing dozens of remote Eskimo communities in Western Alaska) in exchange for 25 years of CO_2 reductions, when the cooperative had just received $2.8 million in federal funding for a wind turbine project. Since federal funding had already covered the cost of the wind project, Native Energy's offsets were, in fact, additional. Native Energy was profiting from offset fees for a wind project that would have been implemented regardless (Checker 2008).

A second example of the improper use of offsets is highlighted by Climate Care's sale of offsets for compact-fluorescent light bulbs (CFLs) in South Africa. Offset money from Climate Care actually only paid for the purchase of the light bulbs and not for their installation. Additionally, Climate Care's offsets were obsolete because Eskom, a local energy supplier, had already provided CFLs to all Cape-Town residents (The Carbon Neutrality Myth 2007).

Finally, another misuse of offsets resulted from a project by the Carbon Neutral Company in the U.K. A musical band, Coldplay, sought to offset emissions from its concert tours by donating a portion of the profits to planting mango trees in Karnataka, India. After follow-up on the project it was determined that only half of the trees to be planted had actually been planted, and most of those trees were already dead due to lack of sufficient water for irrigation (The Carbon Neutrality Myth 2007).

When considering the validity of carbon offsets, one must question if offsets actually lessen the environmental impact of GHG emissions/climate change. By purchasing offsets, polluters can continue to release high levels of emissions while appearing sensitive to environmental concerns. Most recent research indicates that individuals who doubt, distrust, or disagree with the fundamental concept of carbon offsetting are part of the growing majority.

Additional References:[64]

Clean Air, Cool Planet. December, 2006. *A Consumer's Guide to Retail Carbon Offset Providers.* Available at: http://www.cleanaircoolplanet.org/ConsumersGuidetoCarbonOffsets.pdf.

The Carbon Trade Watch. February, 2007. *The Carbon Neutral Myth: Offset Indulgences for your Climate Sins*. Available at: http://www.carbontradewatch.org/pubs/carbon_neutral_myth.pdf.

[63] The study was peer reviewed by Wiley Barbour, Executive Director, Environmental Resources Trust; Derik Broekhoff, Senior Associate, Climate, Energy and Pollution Program, World Resources Institute; Brian Jones, Senior Consultant, M.J. Bradley & Associates; and Mark Kenber, Policy Director, The Climate Group.

[64] These references are additional to the references at the end of Chapter 7.

GLOSSARY OF TERMS

Additionality
The net, rather than gross, impact after making allowances for what would have happened in the absence of intervention. The idea that a project reduces emissions over and above what would have occurred in the absence of the project.

CDP
The Carbon Disclosure Project (CDP) is an independent not-for-profit organization aiming to create a lasting relationship between shareholders and corporations regarding the implications for shareholder value and commercial operations presented by climate change. Its goal is to facilitate a dialogue, supported by quality information.

Carbon Footprint
The term “carbon footprint” has many definitions. For the purpose of the Bren Master’s Group Project, “carbon footprint” is defined as a measure of the total amount of carbon dioxide and other greenhouse gas emissions that is directly and indirectly caused by an activity or is accumulated over the life stages of a product.

CCAR
The California Climate Action Registry (CCAR) is a private non-profit organization originally formed by the State of California. CCAR serves as a voluntary greenhouse gas (GHG) registry to promote early actions to reduce GHG emissions by organizations. It provides leadership by developing and promoting credible, accurate, and consistent GHG reporting standards and tools for organizations to measure, monitor, third-party verify and reduce their GHG emissions.

CFLs
Compact fluorescent light-bulbs (CFLs) combine the energy efficiency of fluorescent lighting with the convenience of incandescent light-bulbs. CFLs can replace incandescents that are three-to-four times their wattage, saving up to 75 percent of the lighting energy. Although CFLs cost more than their incandescent counterparts, they last 6,000-15,000 hours more.

EcoCalculator
The EcoCalculator referenced in our report is used by LeasePlan, a management company, contracted by Zurich to cover Zurich’s global vehicle fleet.

Efficiency
Under the First Law of Thermodynamics, efficiency is the ratio of energy output to energy input, and cannot exceed 100 percent. Under the Second Law of Thermodynamics efficiency is determined by the ratio of the theoretical minimum energy that is required to accomplish a task relative to the energy actually consumed to accomplish the task. The measured efficiency of a device, as defined by the First Law, will be higher than that defined by the Second Law.

Energy Audit
The process of determining the energy consumption of a building/facility and identifying ways to reduce energy consumption and costs via energy efficient equipment, processes, and suppliers.

Energy Star
Energy Star is a voluntary labeling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions. It is a joint program between the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE) that promotes energy efficient products and practices to individuals and companies.

EU ETS
The European Union Greenhouse Gas Emission Trading Scheme (EU ETS) is "the largest multi-country, multi-sector greenhouse gas emission trading scheme world-wide" (EU 2007).

Financial Services Provider
A financial service provider refers to companies that deal with the management of money. Among these organizations are banks, credit card companies, insurance companies, stock brokerages, and investment funds. Zurich Financial Services is a global financial services provider and is active in more than one sector of the financial services market (e.g., life insurance, general insurance, health insurance, and asset management).

GHG
Greenhouse gas (GHG). GHGs, at their natural levels, make up approximately 1% of the atmosphere and act like a blanket around the earth trapping heat and keeping the planet some 30 degrees ºC warmer than it would be otherwise. The natural levels of these gases are being supplemented by emissions of carbon dioxide from the burning of coal, oil, and natural gas; by additional methane and nitrous oxide produced by farming activities and changes in land use; and by several long-lived industrial gases that do not occur naturally. This is causing an "enhanced greenhouse effect" and is warming the earth's surface and lower atmosphere at unnatural and damaging levels. The Kyoto Protocol currently regulates six GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

GHG Protocol
The GHG Protocol is the most widely used international accounting tool for government and business leaders to understand, quantify, and manage greenhouse gas emissions. The GHG Protocol, a decade-long partnership between the World Resources Institute and the World Business Council for Sustainable Development is working with businesses, governments, and environmental groups around the world to build a new generation of credible and effective programs for tackling climate change. It provides the accounting framework for nearly every GHG standard and program in the world,as well as for hundreds of GHG inventories prepared by individual companies. The GHG Protocol also offers developing countries an internationally accepted management tool to help their businesses compete in the global marketplace and assist their governments in making informed decisions about climate change.

High-Performance Building
A high-performance building achieved through a process called whole-building design, is a building with energy, economic, and environmental performance that is substantially better than standard practice. It is energy efficient, so it saves money and natural resources. It is a healthy place to live and work for its occupants and has relatively low environmental impact.

HVAC
Heating Ventilation and Air Conditioning (HVAC) is a system that provides heating, ventilation, and/or cooling within or associated with a building.

Information Technology (IT)
Information Technology refers to anything related to computing technology, such as networking, hardware, software, the Internet, etc.. For the purpose of this project, IT refers mainly to computing technology such as computers, monitors, printers, and multi-functional devices.

IPCC
The Intergovernmental Panel on Climate Change (IPCC) is a scientific intergovernmental body set up by the World Meteorological Organization (WMO) and by the United Nations Environment Programme (UNEP). The information it provides is based on scientific evidence and reflects existing viewpoints within the scientific community. The comprehensiveness of the scientific content is achieved through contributions from experts in all regions of the world and all relevant disciplines, including industry literature and traditional practices, and has a two stage review process by experts and governments. Because of its intergovernmental nature, the IPCC is able to provide scientific, technical, and socio-economic information in a policy-relevant, but policy neutral, way to decision makers. When governments accept the IPCC reports and approve their Summary for Policymakers, they acknowledge the legitimacy of their scientific content.

Kilowatt-hour
A kilowatt-hour is a unit of electric energy equal to the work done by one kilowatt acting for one hour. The kilowatt-hour is a convenient unit for electrical bills because the energy usage of a typical electrical customer in one month is several hundred kilowatt-hours. Megawatt-hours and terawatt-hours are used for metering larger amounts of electrical energy.

LEED
The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ encourages and accelerates global adoption of sustainable green building and development practices through the creation and implementation of universally understood and accepted tools and performance criteria. LEED is a third-party certification program and the nationally accepted benchmark for the design, construction and operation of high performance green buildings. LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality.

Multi-Functional Device
One piece of equipment which incorporates copying, printing, finishing, and scanning.

Payback Period
The length of time needed for an investment's net cash receipts to cover completely the initial outlay expended in acquiring the investment.

Plug-Load Equipment
Any electrical device that receives power from an AC wall outlet; plug load equipment range from cell phones to small appliances.

Renewable Energy
Renewable energy generally refers to electricity supplied from renewable energy sources, such as wind and solar power, geothermal, hydropower and various forms of biomass. These energy sources are considered renewable sources because their fuel sources are continuously replenished. Renewable energy generally refers to energy derived from sunlight, wind, falling water, sustainable biomass, energy from waste, wave motion, tides, and geothermal power and does not include energy derived from coal, oil, natural gas or nuclear power.

Return on Investment (ROI)
ROI measures how effectively a firm uses its capital to generate profit; the higher the better.

UNFCCC
The United Nations Framework Convention on Climate Change (UNFCCC) sets an overall framework for intergovernmental efforts to tackle the challenges posed by climate change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. Under the Convention: governments gather and share information on GHG emissions, national policies, and best practices; launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries; and cooperate in preparing for adaptation to the impacts of climate change.

USGBC
The U.S. Green Building Council (USGBC) is a non-profit organization committed to expanding sustainable building practices. USGBC is composed of more than 15,000 organizations from across the building industry that are working to advance structures that are environmentally responsible, profitable, and healthy places to live and work. Members include building owners and end-users, real estate developers, facility managers, architects, designers, engineers, general contractors, product and building system manufacturers, government agencies, and non-profits.

Watt
A watt is an International System unit of power equal to one joule per second. It is a measure of power or the rate of energy consumption by an electrical device when it is in operation, calculated by multiplying the voltage at which an appliance operates by the current it draws.

WBCSD
The World Business Council for Sustainable Development (WBCSD) is a CEO-led, global association of some 200 companies dealing exclusively with business and sustainable development. The Council provides a platform for companies to explore sustainable development, share knowledge, experiences and best practices, and advocate business positions on these issues in a variety of forums. Members are drawn from more than 35 countries and 20 major industrial sectors.

WRI
The World Resources Institute (WRI) is an environmental think tank. WRI provides, and helps other institutions provide, objective information and practical proposals for policy and institutional change in four key sectors; People & Ecosystems; Access; Climate Protection; and Markets & Enterprise.