Contents lists available at SciVerse ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Carbon Footprint as a basis for a cleaner research institute in Mexico

Leonor Patricia Güereca*, Nathalia Torres, Adalberto Noyola

Instituto de Ingeniería, Universidad Nacional Autónoma de México, Coyoacán 04510, Mexico City, Mexico

ARTICLE INFO

Article history: Received 25 July 2012 Received in revised form 6 December 2012 Accepted 15 January 2013 Available online 5 February 2013

Keywords: Carbon Footprint Greenhouse gas inventory Scope 3 emissions Research institute Universities

ABSTRACT

Mexico has set a desirable 50% reduction goal of Greenhouse Gas emissions by 2050, compared to the 2000 baseline. In this regard, all the activity sectors, including universities and research institutions, are encouraged to adopt similar targets. As a contribution to the national efforts on the subject, this paper presents the 2010 Greenhouse Gas emission inventory of the Institute of Engineering at Universidad Nacional Autónoma de México based on the academic and research activities developed in 2010. The inventory report, generated according to the Greenhouse Gas Protocol and under a consumption based methodology integrating life-cycle assessment, considers the following activity categories: electric energy generation, vehicle fleet, purchased electricity, commuting, air travels, courier shipments, paper consumption and solid waste. The total Carbon Footprint of the Institute of Engineering in 2010 was calculated in about 1577 tCO₂e, where 42% of the Greenhouse Gas emissions were generated by the use of electricity, 50% by transportation; including its own fleet and commuting vehicles, 5% by air travel, 1% by shipments, 1% by use of paper and 1% associated to the final disposal of solid waste. Four scenarios of potential reduction are proposed based on changes in commuting activity. From the proposed scenarios, the one with a combination of teleworking and carpooling is the most effective.

© 2013 Elsevier Ltd. All rights reserved.

1. Introduction

Climate change is recognized as an international concern since 1992 by the United Nations Framework Convention on Climate Change (UNFCCC). In 1997 the Kyoto protocol strengthened the global commitment for Greenhouse Gas (GHG) emission reductions, oriented by national and regional priorities and reduction targets within an established time-frame. To date, 195 parties belong to the convention and they participate in 2 excluding groups: Annex I and Non-Annex 1 countries. In the first group there are 1) Industrialized countries with an active participation in the Organization for Economic Cooperation and Development (OECD) and, 2) Countries catalogued as economies in transition. Annex I parties were expected to have the highest reductions due to its nature, by the year 2012 achieving similar emission levels as those in 1990. They are requested to submit yearly a greenhouse gas emissions inventory taking into account the base year in order to evidence the reductions. On the other hand, Non-Annex I countries are the second group, which comprises developing countries that also report their actions within climate change, but do it less frequently and are not required to reduce emission levels.

0959-6526/\$ – see front matter @ 2013 Elsevier Ltd. All rights reserved. http://dx.doi.org/10.1016/j.jclepro.2013.01.030 Mexico is a Non-Annex I country; nevertheless, it has a strong commitment with climate change and the UNFCCC. An evidence of this fact is the submission of national communications, 4 in total, from 1997 to 2009. As a consequence of such awareness, from public and private efforts all over the country, a National voluntary carbon accounting and reporting initiative emerged from the industrial sector: *Programa GEI México*. Over the years, other sectors have joined the program such as: commerce, services, municipalities, entertainment, and transport among others (SEMARNAT/CCE/ CESPEDES/WRI/WBCSD, 2012).

In order to limit the increase of future global warming in 2 °C, it is necessary to stabilize the atmospheric concentration of CO_2 equivalent in about 450 ppm. For that purpose, it is required that both Annex I and Non-Annex I countries implement actions to contribute to the reduction of GHG emissions during a time frame of 40 years (from 2010 to 2050). To achieve this objective, Mexico has set by a federal law a desirable 50% reduction goal of GHG emissions by 2050, compared to the 2000 baseline (DOF, 2012), when 643.6 Mt were estimated. In this regard, all the activity sectors are encouraged to adopt similar targets.

In this context, the participation of independent organizations with high public credibility, such as universities, may be regarded as necessary and strategic. Their role should be as observers of the implementation and the results the Mexican public policy on the matter, but also as actors by putting into practice mitigation and adaptation measures in their facilities. Moreover, establishing their





Cleane

^{*} Corresponding author. Tel.: +52 55 56 23 36 01; fax: +52 55 56 23 36 02. *E-mail address*: LGuerecaH@iingen.unam.mx (L.P. Güereca).