CASE STUDY
Category: ICTs and Climate Change Strategy

Climate Change, Innovation & ICTs Project

Centre for Development Informatics (CDI), University of Manchester, UK
With the support of the International Development Research Centre (IDRC)

Building the Evidence Base for Strategic Action on Climate Change: Mexico City's Virtual Climate Change Centre

Author: Olinca Marino

Initiative Overview

Mexico City – also known as the Federal District – is located in the lower part of the Mexico Valley Basin, a naturally enclosed depression in the Mexico City Metropolitan Area (MCMA). The MCMA comprises the 16 boroughs of Mexico City – with a population of nearly 9 million people – and 34 municipalities of the State of Mexico that raise the total population to more than 20 million; roughly one in five of the country's citizens (INEGI 2010).

As the focus for national economic activity, Mexico City is a major contributor to greenhouse gas emissions (NYCG 2010). Around 88% of all such emissions in Mexico City are attributed to energy consumption in the form of fossil fuels and electricity used in transportation, industry, trade, housing and services.

The effects of climate change are already being felt (World Bank 2011). Lankao (2010) explains this has meant an increase in average rainfall as well as an increase in frequency and intensity of extreme events such as floods, droughts and heat waves. Over the centuries, the City has faced a succession of dry and wet periods in a dynamic equilibrium. However, the combination of land use and climate change has disturbed this equilibrium, heightening the risk of – among other things – flooding and landslides. The Federal District is also suffering an increasing "heat island" effect with extreme temperature events (Jáuregui 2009). As shown in Table 1, alongside these intense events will also come future changes in average weather patterns (INE 2010).

	Total annual precipitation change	**Mean annual temperature increase**
2020 scenario	+5 and -5%	Between 0.8 and 1.2°C
2050 scenario	+5 and -15%	Between 1.0 and 2.0°C
2080 scenario	-5 and -20%	Between 2.0 and 4.0°C

Table 1: Projected Changes in Precipitation and Temperature in Mexico City

The Mexico City Government has identified a number of strategic adaptive actions that need to be taken to react to these climatic changes (GDF 2008). Short-term, extreme event-related actions include: implementation of a metropolitan hydro-meteorological monitoring and forecasting system; micro-basin management of urban ravines; assistance to people who are identified as specifically vulnerable to extreme climate events; epidemiological monitoring; protection and recovery of native crops; and remote detection and monitoring of forest fires during the dry season. Actions for a medium-term response – which also encompass actions on mitigation of emissions – include: growth and improvement of public transportation and the transformation of vehicle technology; the efficient use of energy in buildings, industrial facilities, public lighting systems, water pumping systems, and homes; the exploitation of renewable energy sources; the rational use of water, as well as the reduction of waste generation and the promotion of an effective waste management system.

But such strategic actions require a sound evidence base, and also the opportunities for discussion among relevant stakeholders. In order to support this, in 2008, a Virtual Centre on Climate Change

was created (*Centro Virtual de Cambio Climático de la Ciudad de México – CVCCCM*). The rationale for the Centre was that it would provide not just evidence and advice to policy-makers, but also help inform broader society – always enabled by ICT-based networks and other digital tools (Conde et al. n.d.). The working schema for CVCCCM is shown in Figure 1.

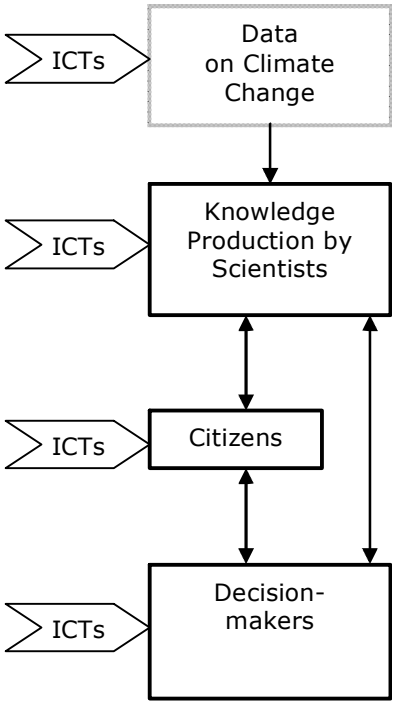

Figure 1: Overall Working Schema for Virtual Centre on Climate Change

The Centre's initial knowledge production tasks included the following:

- Assessment of City air quality, its impact on health and its relation to climate change.
- The effects of temperature, its interaction with ozone and hospital admissions.
- The impact of climate change on water availability in MAMC.
- Assessment of energy consumption scenarios and greenhouse gas emissions produced by the transport sector in MAMC.
- Impacts in MAMC related to solid waste under conditions of climate change.
- Vulnerability of conservation areas to climate change, and possible adaptation measures.
- The economics and politics of climate change.
- Poverty as a risk factor in implementation of public policies on climate change.
- Greenhouse gas emission reductions in MAMC.
- The history of climate and precipitation patterns in the Mexico Valley Basin.
- Popularising climate change science via social networks.

Based on the results of this work, the Centre has been able to make very detailed scientific proposals around climate change and water, air and ground resources; the health sector; public services; and land use planning (Ospina et al. 2011).

Application Description

As would be expected for a virtual organisation, CVCCCM makes extensive use of ICTs; particularly its website but also email for communication between participants, and e-science and GIS applications for modelling and mapping climate change effects and predictions. These are, in the main, the applications that can be seen as mediating the Figure 1 chain from data to knowledge production by scientists. However, in this section, more detail will be provided on the more general use of ICTs –

summarised in Figure 2 – which was trialled as part of the project on popularising climate change science (Meneses 2010).

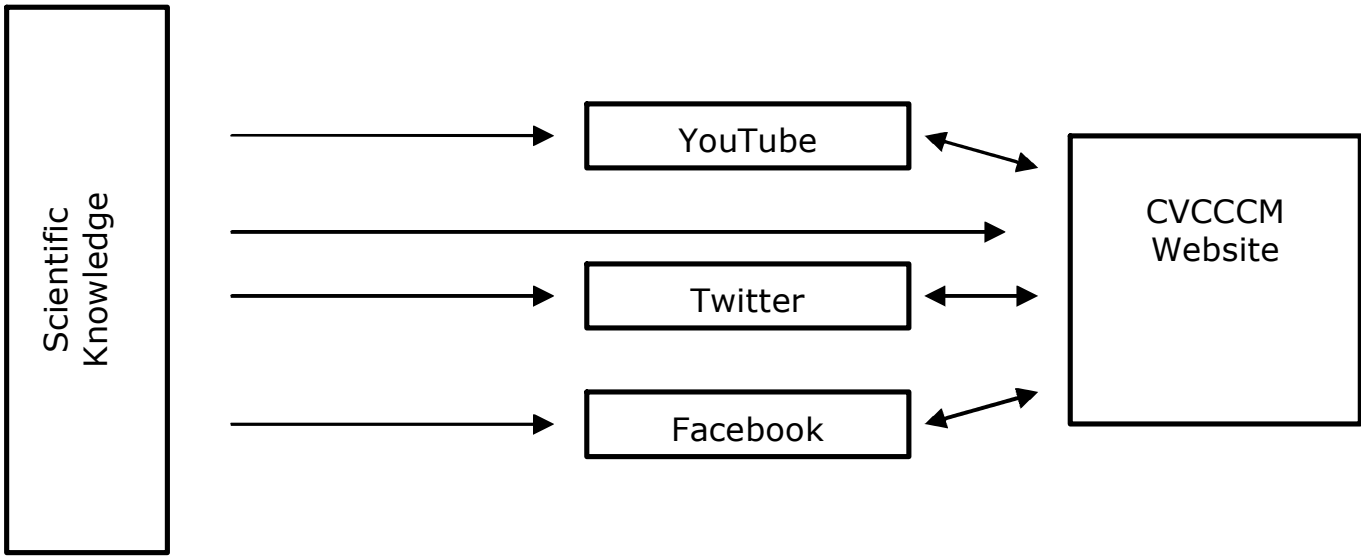

Figure 2: CVCCCM Digital Applications

Looking at each of the components in more detail:

Website: The webpage www.cycccm-atmosfera.unam.mx/cvcccm/ (see Figure 3) went online in August 2008, initially fed with material from the Atmospheric Science Centre of the National Autonomous University of Mexico (UNAM): databases and climate scenarios with their respective mappings. The site has information in Spanish on research studies, activity reports of seminars and workshops, plus news, videos and maps with scientific models of temperature and precipitation. By late 2011, the site had logged just over 43,000 visits since 2008, averaging between 12 and 15 per day. 91% of visits originated from within Mexico, 3% from the United States, and the rest from other Latin American countries (Y. Puente, personal communication 2011).

Figure 3: CVCCCM Website

YouTube: CVCCCM has a YouTube channel (see Figure 4) (www.youtube.com/user/CVCCCMvideo#p/u) with eleven videos. This channel was opened in November 2010 and by late 2011, it had received more than 2,000 viewings in total. Most of the content is CVCCCM researcher interviews on issues related to climate change in Mexico City, for example: future risks, vulnerability of poverty zones, mitigation in industry and trade, impact of climate change on vegetation, the relationship of climate change to air pollution, and climate change and public policies.

Figure 4: CVCCCM YouTube Channel

Twitter: The twitter account (http://twitter.com/#!/CVCC_CM) started operation in October 2010, accumulating 741 tweets by mid-2011 with some 690 followers. Tweet production has been variable on a daily basis, and has been in abeyance since May 2011.

Facebook: CVCCCM joined Facebook in October 2010. A total of 163 persons "like" the Centre's Facebook page. Environmental organisations and governmental officials were tracked and invited to become friends on Facebook and followers on Twitter. Others were accepted who by their own initiative came into this social network (Meneses 2010).

Apart from the above applications, blog and web for mobile were initially considered, but were not taken forward.

Formal Drivers

The main driver for the Centre has been the urgent need to act on the already present environmental impacts provoked by climate change in Mexico City (C. Gay, personal communication 2011). Local authorities have had to deal with extreme events related to the urban heat island such as heat waves, heavy rainfall and resulting floods, and reduced water availability associated with severe droughts in

the catchment basin from which the city supplies part of its water demand (Conde et al. n.d.). No mechanism existed through which decision-makers and academics could meet to resolve city-wide issues linked to climate change (C. Gay, personal communication 2011). No simple communication bridges existed between these two sectors. CVCCCM and ICTs were introduced to help strengthen the task of data monitoring, evidence provision, and to facilitate strategic actions around adaptation and mitigation.

Objectives/Purpose for ICT Usage

The overall purposes of the Virtual Centre were three-fold:

- To build an entity that concentrates and organises the information regarding climate change effects in Mexico City, as well as coordinating research efforts on the subject;
- To support the continuous development of public policies that aim to increase adaptive capacity and reduce vulnerability of different social sectors;
- To create an Adaptation, Vulnerability and Mitigation Policy Framework for Mexico City.

The Centre was created as a virtual entity in order to reduce costs and to enable research scientists to remain embedded within their existing institutions.

Looking specifically as the social networking project outlined above, the intention was to promote active participation of a diverse group – not just CVCCCM researchers but other academics, journalists, students, and citizens – in CVCCCM activities, and more generally to help develop the culture and community around climate change and the environment in order to foment constructive debate, exchange of information, and active reflection (Meneses 2010).

Stakeholders

The CVCCCM is the product of a preliminary collaboration between the Atmospheric Science Centre of UNAM and the Science and Technology Institute of the Mexico City Government (GDF). It also involves additional public, academic, and research institutions, as listed in Table 2.

Name	Public Institution	Academic and Research Institution	Present in CVCCCM website	Involved in research projects
Centro de Investigación y Estudios Avanzados, CINVESTAV, del Instituto Politécnico Nacional		*	*	
Centro de Investigación y Estudios Superiores en Antropología Social		*	*	
El Colegio de México		*	*	
Comisión de Recursos Naturales	*		*	
Bomberos	*		*	
Facultad de Ciencias, UNAM		*	*	
Facultad de Economía, UNAM		*	*	*
Facultad de Química, UNAM		*	*	
Instituto de Ingeniería, UNAM		*		*
Instituto de Geología, UNAM		*		*
Instituto Nacional de Salud Pública	*			*
Instituto Tecnológico de Estudios Superiores de Monterrey		*		*
LOCATEL-GDF	*		*	
Proclimas, Instituto Politécnico Nacional		*		*

Procuraduría Ambiental y del Ordenamiento Territorial	*		*	
Programa Universitario de Estudios sobre la Ciudad, UNAM		*		*
Pronatura México A.C. (NGO)			*	*
Secretaría de Finanzas-GDF	*		*	
Secretaría de Desarrollo y Equidad para las Comunidades-GDF			*	
Secretaría del Medio Ambiente-GDF	*		*	
Secretaría de Obras y Servicios-GDF	*		*	
Secretaría de Seguridad Pública-GDF	*		*	
Secretaría de Salud-GDF	*		*	
Sistema de Aguas de la Ciudad de México	*		*	
Universidad Autónoma de la Ciudad de México		*	*	
University of California, Riverside		*	*	
Universidad Autónoma Metropolitana		*	*	
Universidad Iberoamericana		*		*

Impact: Cost and Benefits

CVCCCM ran in two funded phases, from 2007 to 2009, and from 2009 to the end of 2010. Total costs (the majority of which were provided by the City's Science and Technology Institute) were around US$700,000 of which around half was spent on administration and one-third on the specific research projects (Gay & Martinez 2011).

The Centre's main tangible benefits have been the development of scientific knowledge around the climate change topic areas listed in the Overview, and production of 18 study reports including proposals for government. As noted, ICT – via email, e-science applications, GIS, etc has enabled these reports to be produced. It also enabled virtual attendance at workshops and discussions which were held in-person. And it disseminated all reports and other outputs via its website.

As already noted, its social network project created videos and Facebook/Twitter dissemination, though the associated numbers in terms of home page visitors, video views, etc have been relatively low.

Evaluation: Failure or Success

As a collaborative venture supporting evidence-based strategic actions for climate change, the Centre has had some successes in terms of knowledge and institution building. It has shown that the multiple relevant institutions can work together in a multidisciplinary way; with 50 organisations submitting research proposals during the two phases, 30 being registered with CVCCCM, and with more than 20 participating in both the development and dissemination of climate change research.

Within the research process, ICTs have been invaluable – they have been central to data capture, data processing, data presentation and (to some degree) dissemination. Thus ICTs have helped create a new set of specific information on climate change effects, causes and strategic actions for adaptation and mitigation in Mexico City. Tangibly, this is seen in a set of 18 study reports – five of which have been formally published as books; documentation of meetings and workshops; and two documents of diverse proposals for Mexico City decision-makers. There has also been some use of ICTs to

disseminate climate change evidence to a wider audience via social networks, though – as seen – the extent of this dissemination has been somewhat limited.

Where ICTs have not particularly been used has been to create a broader dialogue that breaks out of the confines of scientific institutions, and a community of strategic practice. There has been no ICT-enabled dialogue between scientists, decision-makers and civil society, and the other stakeholders have not been engaged with – nor have they contributed to – the social media applications. Essentially the scientific community has focused on production and presentation of their results, but has not sought – whether via ICTs or other means – to engage others, or to engage with the formulation and implementation of the strategic actions which their work points to. It is therefore, for example, unclear whether City decision-makers have made any use of the materials produced.

Enablers/Critical Success Factors

The **virtuality** of the Centre is an important part of what it has been able to deliver. In many countries, there are few – if any – dedicated centres dealing specifically with climate change. In addition, climate change has such a wide-ranging effect that it will always require multi-stakeholder, multi-disciplinary approaches to research strategic evidence and actions. Trying to create a new research institution, and draw staff away from existing institutions would create political frictions and resistance. Making the Centre virtual, and allowing staff to remain within their existing institutions avoided this problem.

Drawing on the **best-renowned, most highly-experienced institutions** to form the collaborators of the Virtual Centre was beneficial in two ways. First, by drawing on such a wide range of experience, the quality of the Centre's climate change research was assured. Second, the reputational capital brought by the collaborating institutions, helped lend credibility to the research outputs.

Incentives to collaborate are always vital for a virtual entity, and in this case they were provided via the mechanism of the funded research projects, which motivated the various institutions to engage. Finally, **ICTs** were essential to both the functioning of the Centre overall but most particularly to the scientific research process.

Constraints/Challenges

The **academic mindset and academic priorities** are a difficulty, because what scientific institutions demand of their researchers and what they also value (for example when considering promotion) is the production of research papers (Conde et al. n.d.; Aguayo 2011; Bonfil 2011). Therefore many of the aspects of the Figure 1 model are challenged. Researchers often see their responsibilities coming to an end on production of their research paper. They have little time or motivation for participating in social networks; and when they do it is often in "broadcast" rather than "interaction and engagement" mode. They have little time or motivation for engaging with decision-makers; an activity that would help ensure their research had impact. They have not sought to tailor their materials to particular audiences – for example, to differentiate scientific, policy and general audiences. And some do not even engage with the effort of trying to disseminate their papers. One further result has been the lack of web and other updates since completion of the project's second phase.

Prioritisation of climate change varies over time. After COP16 was held in Cancun, for example, there seemed to be good general awareness within the population, and also a desire for action among policy-makers. However, more recently, the extreme outbreaks of violence and general sense of insecurity have pushed this issue instead to the top of the policy and citizen agendas. More generally, policy-makers are often focused on immediate problems and find it hard to find time for longer-term

issues such as climate change (despite the evidence of present effects).

Finally, the **digital divide** still exists and constrains the ability of the general population and also community-based organisations to participate with online activities, especially those that are bandwidth-heavy like video. Less than 10 percent of the population has access to broadband and more than 70 percent lacks Internet access altogether (Duarte 2011; TyN 2011).

Recommendations/Lessons Learned

Incentivise climate change researchers to engage with policy-makers and others. The production of scientific reports is of some intrinsic value, and it does help to build knowledge. However, much of its potential value is lost if the work does not have some impact on policy and practice. As seen, this is only likely to change if there are incentives for scientific researchers. Such incentives can be project specific – for example, assessment criteria within proposals that require an impact plan including specific details on how the researchers will engage with policy-makers and provide support to policy formulation and implementation. It would require a far greater scope of change, but incentives could also be more systemic – for example, by including assessment of knowledge transfer and research impact in the promotional criteria and institutional evaluation schemes that cover relevant research institutes.

Foster integrated tri-partite climate change research which does not just tack dissemination activities to the end of the project, but which seeks – from the start – to involve not just researchers, but also policy-makers and civil society organisations. These other groups can then have a role in shaping the climate change research agenda, in ensuring the validity and transparency of ongoing project implementation, and in the production of project outputs.

Customise use of ICTs to climate change audience, purposes and context. Climate change research institutions are generally well-provisioned with ICT – at least relative to the general population – and able to use the range of e-science applications for the whole research lifecycle, from data gathering through processing to dissemination. But ICTs must be used appropriately. Where broadband is lacking, then meetings and discussions may need to be held face-to-face, with ICTs as an adjunct. And ICT formats and content must be customised. Academic reports will not suit a general or policy-making audience – short briefings, interactive demonstrations, GIS/map-based graphics, audio and visual presentation may all be more relevant.

When using social media, aim for interaction on climate change not broadcast. The CVCCCM was innovative in including a social media project, but there is a sense in which this was operated with a Web 1.0 not Web 2.0 mentality. In other words, reports were simply placed on the website, videos made by the researchers were placed on YouTube, tweets were broadcast. What was needed instead, was a plan for interactive use of the digital tools; use that would engage with and listen to the wider stakeholders in climate change. Examples might have been a more general climate change space in which others could upload videos, post reports, blog and comment, and so forth.

Data Sources & Further Information

Olinca Marino, Consultant (ICTs, Environmental Sustainability, Gender), omarino@laneta.apc.org

The information presented on the Virtual Centre on Climate Change has been obtained from published materials of the CVCCCM; from data appearing in its digital applications; and from personal interviews with members of the Centre.

References

Aguayo, C.J.E. (2011) Criterios y evaluación sobre la calidad y competitividad en investigación y desarrollo, aplicados por la OCDE y situación actual en México. *Boletín de Investigación e Innovación Tecnológica de la Facultad de Ingeniería*, UNAM http://www.fi-p.unam.mx/paginas/boletin.PDF

Bonfil, M. (2011) La pobre ciencia Mexicana, *La Ciencia por Gusto*, 23 March http://lacienciaporgusto.blogspot.com/2011/03/la-pobre-ciencia-mexicana.html

Conde, C., Martínez, B. & Estrada, F. (n.d) *Mexico City´s Virtual Centre on Climate Change*, CVCCCM, UNAM. http://www.cvcccm-atmosfera.unam.mx/cvcccm//documents/libro_conde

Duarte, E., (2011) México, rezagado en acceso a Internet.*CNNExpansión*,22 February http://www.cnnexpansion.com/economia/2011/02/22/mexico-rezagado-en-acceso-a-internet

Gay, G.C. & Martínez, M.A. (2011) *Libro Blanco del Centro Virtual de Cambio Climático de la Ciudad de México*, CVCCCM, UNAM. http://www.cvcccm-atmosfera.unam.mx/cvcccm/documents/libro_blanco_PROYECTO_CVCCCM.pdf

GDF (2008) *Mexico City Climate Action Program 2008-2012 Summary*, Secretaría del Medio Ambiente. Gobierno del Distrito Federal, Mexico City

INE (2010) *Distrito Federal: Proyecciones del Clima*, Institution Nacional de Ecologia, Mexico City http://www2.ine.gob.mx/cclimatico/edo_sector/estados/futuro_df.html

INEGI (2010) *Censo de Población y Vivienda. Resultados Preliminares*. Instituto Nacional de Estadística Geografía e Informática, Mexico City

NYCG (2010) *Best Practice: Comprehensive Climate Change Plan*, Global Partners Innovation Exchange, City Government, New York http://www.nyc.gov/globalpartners/innovationexchange

Jáuregui, E. (2009) The heat spells of Mexico City. *Investigaciones Geográficas*, Boletín del Instituto de Geografía, 70, 71-76

Lankao, P.R. (2010) Water in Mexico City: what will climate change bring to its history of water-related. *Environment and Urbanization*, 22(1), 157-178

Meneses, M. E. (2010) *Proyecto de Divulgación de la Ciencia en Redes Sociales: Cambio Climático Informe final*, Tecnológico de Monterrey, Campus Ciudad de México.

Ospina, N. J. E., Gay, G.C., Conde, A.C. & Martínez, M.A. (2011) *Sugerencias y Recomendaciones para la Elaboración de Políticas Públicas ante el Cambio Climático en la Ciudad de México, de Acuerdo a los Proyectos Realizados en el CVCCCM*, CVCCCM, UNAM

TyN (2011) Internet en México es de los más lentos y caros del mundo. *TyN Latinoamérica*, June http://www.tynmagazine.com/359992-Internet-en-Mexico-es-de-los-mas-lentos-y-mas-caros-del-mundo.note.aspx

World Bank (2011) *Urban Risk Assessments. An Approach for Understanding Disaster and Climate Risks in Cities,* Urban Development and Local Government Unit, World Bank, Washington, DC

EDITORS:
Richard Heeks
Angelica Valeria Ospina

The **Climate Change, Innovation and ICTs** project is an initiative led by the Centre for Development Informatics (CDI) of the University of Manchester, UK, with funding support from Canada's International Development Research Centre (IDRC).
Further information about the project and related resources can be found at: http://www.niccd.org

2012