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Community Scale Greenhouse Gas Accounting: a trial application in the west of Scotland

Extended abstract

To think coherently about sustainable resource use we need a clear understanding of present resource use. Climate change has focussed attention on greenhouse gas emissions and many national governments now submit annual emissions accounts to UNFCCC based on guidance from IPCC. Action from the business sector has resulted in the development of accounting standards by the World Resources Institute and World Business Council for Sustainable Development (WRI/WBSCD) through the Greenhouse Gas Protocol project. There is also a growing interest in sub-national emissions accounts driven by the growing importance of cities and frustration with the progress of international action to reduce emissions. In order to facilitate community level accounting the International Council for Local Environmental Initiatives (ICLEI), the Covenant of Mayors and C40 Cities have developed guidance issued in draft in 2012 through the Greenhouse Gas Protocol project, the Global Protocol for Community Scale Greenhouse Gas Emissions (GPC) (Arikan, 2012). Local identification of emissions may make the pursuit of targets more meaningful at a scale at which people feel they have the power to act. This has been used to develop an account for an area of the Scottish west Highlands (Brander et al, 2013). Although the GPC was developed with a focus on the role of cities in climate change, the structure is valid for any community.

Data was sourced from national statistics, reports, research papers and local interviews. In some areas data was easily sourced; electricity consumption is available at Middle Layer Super Output Area level, known as Data Zones in Scotland with a minimum population of 500 which mapped precisely to the area under study (DECC, 2012) municipal waste is well documented by the Highland Council (Highland Council, 2012) and large industrial emissions are reported through the Scottish Pollutant Release Inventory (SEPA, 2012). The annual June agricultural census carried out by the Scottish Government enabled livestock numbers to be identified for the relevant agricultural parishes (Scottish Government, 2011) and emission calculations to be made following methodology in the UK national inventory (Brown, 2012). Other areas were more difficult; the lack of a gas grid in the area meant that national statistics did not provide information and neither approaches to local suppliers nor a residential survey were able to fill this gap. Transport emissions were identified from a number of sources. Fuel data was provided for passenger rail and for fishing boats and the Department for Transport count points enabled a clear calculation of emissions from road usage (Department for Transport, 2011). Other emissions were estimated drawing on research on rail freight (Clarke, 2011) and data on aggregate exports (Transport Scotland, 2011). Transport presents particular problems of allocation due to inherent mobility and while an estimate was generated for the basic boundary-limited approach it was not possible to distinguish residential from visiting traffic or to determine origin and destination of journeys. Emissions from wastewater treatment proved complex due to the difficulty of attributing emissions to different stages as material is often subject to a series of treatments.

Results showed total emissions of 362,589t CO₂e with per capita emissions at 18.77t CO₂e much higher than the 9.5t CO₂e reported for Highland by DECC (2013). This is due to a variety of reasons. The account includes areas not normally measured such as agriculture which contributed 1.55t per capita and fishing 1.2t per capita. Emissions from on road transport at 3.7t per capita are much higher than the Scottish average of 1.756t (Transport Scotland, 2014) reflecting the rural geography and possibly the large influx of tourist traffic. Also highlighted was the presence of intensive industrial activity. The two largest operations in the area are aluminium smelting and quarrying which together produce an estimated 5.76t CO₂e per person.

Work is now underway to establish the emissions associated with agriculture and land use.

The GPC does not provide guidance for the inclusion of emissions from a consumption perspective and this is a serious omission given the demonstration of very different results for both emission levels and trends (Barrett et al, 2013, Minx et al, 2009). The issue was recognised as one requiring attention in the pilot version issued in May 2012 and the final version in December 2014 cites a study of King County in the US (SEI-US, 2012) showing that overall consumption based emissions were twice as high as those estimated on a territorial basis. The protocol approves the coverage of Scope 3 emissions other than those specified for transmission losses, transport and waste, and suggests that this might be done by focussing on the key materials of food, water, waste and construction materials, as proposed by Hillman and Ramaswami(2010). However no detailed guidance is provided. The US chapter of ICLEI issued a US Community Protocol in 2012 (ICLEI-US, 2012) which proposes a consumption based account developed alongside the main report. No single methodology is proposed but suggestions include the use of the Cool Climate carbon calculator developed at University of Berkeley or an economic software model such as IMPLAN which is based on input output modelling.

Calculations of sub national consumption emissions have been achieved at local administration level using environmentally extended input output analysis (Dey, 2009, Hermannsson and McIntyre, 2014, Curry, 2011) and for businesses at a local level supplemented with employment data (Bradley et al, 2013). An initial attempt has been made to derive a figure for final demand for the study area but has not yet provided clear results.

The aim of local emissions accounting is to provide a spur to action on reduction. As suggested by Erickson and Lazarus (2012) the focus of accounting needs to be on emissions that the community has some agency over though this agency can vary from direct action to action as citizens to promote policy change. Following the conclusion of the study meetings have been held with local stakeholders and a community based environmental group is developing a project to work with small and medium sized businesses to define their own carbon account. The GPC offers a route to defining a clear account for the territorial emissions from a community but important opportunities for action will be missed unless a clear way can be found to supplement this account with an estimate of emissions associated with consumption.

Arikan, Y, Desai, R, Bhatia, P and Fong, W.K, 2012a, Global Protocol for Community Scale Greenhouse Gas Emissions (GPC) version 0.9, C40 Cities and ICLEI Local Governments for Sustainability retrieved from <http://www.ghgprotocol.org/files/ghgp/GPC%20v9%2020120320.pdf>

- Barrett, J, Peters, G, Wiedmann, T, Scott, K, Lenzen, M, Roelich, K Le Quere, C, 2013, Consumption based GHG emissions: a UK case study, *Climate Policy*, 13 (4) pp451-470
- Bradley P, T Jackson, A Druckman (2012). Commercial local area resource and emissions modelling – navigating towards new perspectives and applications. *Journal of Cleaner Production*, Vol. 42, pp. 241-253.
- Brander, M, Carstairs, S, Topp, CFE, 2013, Global Protocol for Community Scale Greenhouse Gas emissions: a trial application in the West Highlands of Scotland, *Greenhouse Gas Measurement and Management*, 3 (3-4) pp149-165
- Brown, K, Cardenas, L, MacCarthy, J, Murrells, T, Pang, Y, Passant, N, Thistlethwaite, G, Thomson, A and Webb, N, 2012, UK Greenhouse Gas Inventory. AEA report to DECC
- Clarke, G and Van Kalles, M, 2011, Emissions Benchmarking: considering the viability of a rail freight study, AECOM, Dept for Transport
- Curry, R, Maguire, C, 2011, The use of Ecological and Carbon footprint analysis in regional policy making: application and insights using the REAP model, *Local Environment*, 16, 9, 917 – 936
- DECC, 2012, Middle Layer super output area electricity and gas 2010, retrieved from <https://www.gov.uk/government/statistical-data-sets/mlsoa-electricity-and-gas-2010>
- DECC, 2013, Local and Regional CO2 Emissions Estimates for 2005-2011, retrieved from <https://www.gov.uk/government/publications/local-authority-emissions-estimates>.
- Department for Transport (2011) Traffic Counts Highland Council. <http://www.dft.gov.uk/traffic-counts/area.php?region=Scotland&la=Highland>
- ERICKSON, P, LAZARUS, M (2012) Revisiting Community Scale Greenhouse Gas inventories. *Environmental Science and Technology* 46, pp4693-46934
- Hermannsson, K, McIntyre, S, 2014, Local consumption and territorial based accounting for CO2 emissions, *Ecological Economics*, 104, 1-11
- Highland Council (2012) Waste Data Report 2010-2011. <http://www.highland.gov.uk/NR/rdonlyres/4A27474B-CEFB-47C4-AAFE-687E85797DEF/0/201011AnnualWasteDataReport.pdf>
- Hillman, T, Ramaswami, A, 2010, Greenhouse Gas Emission footprints and Energy use Benchmarks for eight US cities, *Environmental Science and Technology*, 44, pp1902-1910
- ICLEI – USA, 2012, *US Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions*, <http://www.icleiusa.org/tools/ghg-protocol/community-protocol>
- Minx, JC, Wiedmann, T, Wood, R, Peters, GP, Lenzen, M, Owen, A, Scott, K, Barrett, J, Hubacek, K, Baiocchi, G, Paul, A, Dawkins, E, Briggs, J, Guan, D, Suh, S, Ackerman, F, 2009, IO analysis and Carbon Footprinting: an overview of applications, *Economic Systems Research*, 21 (3) 187-216

SEPA (2012) Scottish Pollutant Release Inventory.

http://www.sepa.org.uk/air/process_industry_regulation/pollutant_release_inventory.aspx

Scottish Government, 2011, Results from the 2011 June Agricultural Census

<http://www.scotland.gov.uk/Publications/2011/09/27083355/0>

Transport Scotland, 2011, Scottish Transport Statistics 2011 edition, retrieved from

<http://www.transportscotland.gov.uk/strategy-and-research/publications-and-consultations/j205779-138.htm>

Transport Scotland, 2014, Carbon Account for Transport 2013-14, Scottish Government

<http://www.transportscotland.gov.uk/report/j317395-00.htm>