Role of Community-Based Approaches with Administrative Support in an Urban Low-Carbon Society in the UK

Masako Murota*1

1 Professor, Faculty of Environmental Studies, Tokyo City University, Japan

Abstract
This paper deals with community-based approaches to a low-carbon society in the UK and aims to clarify the types of community-based approaches, the factors involved in goal attainment, the roles of actors and the positive and negative points of community-based approaches. We divide community-based approaches supported by government into two types. We focus on a multiple-targeted approach and examine the case of Muswell Hill in London. We observe that the approaches encourage change in people's behaviour and have an effect on promoting low carbon in homes and communities. These approaches use direct and intensive methods, and residents can be involved in several activities. Meanwhile, we point out that these activities are meaningless, if the low-carbon community activities are not continued and extended. In conclusion, we consider that this approach is significant in empowering communities instead of merely promoting low-carbon activities.

Keywords: low carbon; community-based approach; area-based approach; multiple-targeted approach; administrative policy

1. Introduction
After the Kyoto Protocol was adopted, participating countries set the goal of CO₂ reduction. The European Commission made the 'Roadmap for moving to a Competitive Low Carbon Economy in 2050'; it has a target of a 25% reduction in CO₂ emissions by 2020, and an 80% reduction by 2050 compared to the base year, 1990. The UK government innovatively adopted the Climate Change Act 2008, and this sets a duty of greenhouse gas reduction such that the levels for the year 2050 will be 80% lower than the 1990 baseline and for the years 2018–2022 will be 26% lower than 1990. Meanwhile, the Japanese government is changing the goal of a 25% reduction by 2020 because of the nuclear accident in 2011, and many countries have no clear goals for CO₂ reduction.

A low-carbon society requires promotion of low carbon in many fields, including transport, housing, business, industry, agriculture, land use structures and sustainable energy. It requires energy saving and energy efficiency systems, land use planning, forest and agriculture management, lifestyle and behavioural changes, renewable energy generation systems and various other systems. It is important not only to develop the technologies but also to promote changes to social systems and behaviour, and we need to develop various kinds of methods to achieve them.

In order to reduce domestic CO₂ emissions, we need to pay more attention to behavioural aspects and need to develop low-carbon promotion systems of a bottom-up type. Generally speaking, we have taken more notice of technological aspects than people's behavioural aspects and paid more attention to industries than households. Bottom-up systems involving citizens in cutting CO₂ are still in the process of development in Japan and many other countries.

In this paper, we focus on the community-based approach for building a low-carbon society because we regard community-based approaches as bottom-up approaches that promote behavioural changes and reduce CO₂ from households.

Some European and North American countries execute community-based approaches to cutting the CO₂ emissions of houses and local businesses. Some studies have pointed out the effectiveness of a community approach and conclude that this approach is an important solution to support individual behavioural change at home (Heiskanen, Johnson, Robinson, Vadovics and Saastamoinen, 2009). There are many place-based programmes to promote individual behavioural changes by volunteer-driven climate action groups adopting a combination of approaches by addressing both technical and social dimensions of change (Moloney, Horne and Fien, 2009). On the

*Contact Author: Masako Murota, Professor, Faculty of Environmental Studies, Tokyo City University, 3-3-1, Ushikubo-Nishi, Tsuzuki-ku, Yokohama, Kanagawa, 224-5881 Japan
Tel: +81-45-910-0104
E-mail: murota@tcu.ac.jp
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other hand, many types of barriers to low-carbon actions are present, as shown by Canadian low-carbon communities (Burch, 2009).

From the above, many studies have examined programmes using a community-based approach, but the definition of a community-based approach for a low-carbon society is not clear. The size of areas is diverse, and the main promoters are not only community groups but also local governments and partnerships between residents and government. Some articles mentioned that a low-carbon community means a community-based approach for a low-carbon society, and define a low-carbon community as forms of cooperation and collaboration that aim to reduce CO\textsubscript{2} from lifestyles by providing mechanisms that encourage behavioural change (Middlemiss, 2008, Heiskanen, 2009). These papers emphasise organisational forms of cooperation and collaboration, including community groups and local governments.

In general, the term 'low-carbon community' applies to community organisations rather than to global enterprises and to local areas rather than to broad areas. We use this definition and define low-carbon community programmes as a community-based approach and define them as geographical area-based programmes, including housing programmes for a low-carbon society. Also, we define low-carbon communities as local areas where community groups and local organisations conduct many activities involving residents that aim to reduce CO\textsubscript{2} emissions.

This paper deals with low-carbon community programmes supported by governments in the UK. First, we study the contents of low-carbon community programmes and classify these programmes according to the diversity of targets of the programmes. Then we examine a case study of a low-carbon community.

The questions addressed in this paper are as follows:
1. What kinds of community-based approaches to cutting carbon emissions exist in the UK?
2. What factors in a case-study area are relevant to achieving the goal of cutting CO\textsubscript{2} emissions?
3. What types of roles should local government and community groups undertake to reduce CO\textsubscript{2}?
4. What are the pros and cons of a multiple-targeted and geographical area-based approach?

The research of this paper is based on interviews with local governments, information obtained from emails with community groups and local governments, information from the Low Carbon Communities Network, reports and leaflets, and websites from spring 2011 to spring 2013.

2. Community-Based Approaches to Low-Carbon Policies in the UK
2.1 Role of Communities in Low-Carbon Policies

The British government established the Climate Change Act 2008 and set legal targets of a 34% reduction in CO\textsubscript{2} emissions by 2020 and at least an 80% reduction by 2050. A community approach to low-carbon policies in the UK seems to be one of the most important approaches to cutting CO\textsubscript{2}.

The UK Low Carbon Transition Plan 2009 declared a five point plan to tackle climate change, one of the points being 'supporting individuals, communities and businesses to play their part'. In other words, everyone has a role to play in tackling climate change, and the government provides a range of supports to individuals, communities and businesses. We recognise that the Low Carbon Transition Plan enables communities to play an important role in building a low-carbon society.

The Big Energy Shift 2009 mentioned the huge potential for people to change their energy behaviour. It also suggested that the government can help promote individual and community technologies; hence, the government provides individual and community funding options. In addition, the UK Carbon Plan 2011 provided methods of saving energy in houses and communities, and pointed out the role of communities in sustainable low-carbon energy.

Communities in the UK are required to play important roles to achieve the goal of cutting CO\textsubscript{2} emission. Therefore, there are many low-carbon community policies to support communities to encourage behavioural changes and more effective energy use, and to promote the initiative of renewable energy generation and energy conservation in the UK.

Conversely, there are few communities who play roles in building a low-carbon society in Japan, and the government does not attach any importance to the role of communities, despite communities playing important roles in many fields.

2.2 Types of Low-Carbon Community Programmes

Table 1. shows the governments' low-carbon community programmes, which are geographical area-based approaches for community groups and local partnerships that aim to cut CO\textsubscript{2} emission.

The target types of the programmes can be classified into two groups according to whether the targets are multiple or single (see Table 2.).

Type 1 programmes are those with a number of measures for multiple targets, such as houses, local offices, community buildings and transport. This programme type aims to build low-carbon model areas and to test many types of low-carbon measures. The 'Low Carbon Communities Challenge (LCCC)', the 'London Low Carbon Zone (LLCZ)', the 'Local Energy Assessment Fund (LEAF)' and the 'Climate Change Fund (CCF1)' belong to this type.

Type 2 programmes are single target programmes, such as houses and community buildings that encourage energy efficiency in specific geographical areas. The 'Community Saving Energy Programme (CESP)', the 'London Home Energy Efficiency (RE:NEW)' and the 'Community and Renewable Energy Scheme (CARES)2' belong to Type 2.
2.3 Objectives and Target Areas of the Low-Carbon Community Programmes

2.3.1 Type 1

The LCCC programme was conducted by the Department for Energy and Climate Change (DECC) and was locally delivered to communities. It followed the Big Energy Shift, which suggested that households could benefit from joined-up support packages. There is a wide range of variation in community areas, which include urban areas, suburban areas and rural areas. In addition, the area sizes vary from small to large, including neighbourhoods, whole wards, whole cities and combined areas containing several cities.

The LLCZ defines areas as neighbourhood areas including no more than 1000 buildings. The LLCZ sets the target of 20.12% reduction in carbon emissions by 2012 in each area and aims to develop integrated methods and systems for cutting the CO2 emissions of houses, businesses and communities. The programme has a trial aspect, and each local authority calculates the amount of carbon emissions.

The LEAF follows the Energy Hierarchy (reduce energy, use energy efficiently and generate renewable energy), and specifically focuses on energy efficiency.

Table 1. Programmes with Community-Based Approaches

| Names of Programmes | Lead Organisations | Year | Target area and area size, specification of geographical area | Main objectives | Financial supports | Actors |
|---------------------|--------------------|------|----------------------------------------------------------------|-----------------|-------------------|--------|
| Low Carbon Communities Challenge (LCCC) | Department for Energy and Climate Change (DECC) | 2010-12 | 1000-20000 residents area, specification of geographical area basically. | 22. Financial and advisory support to test bed communities in order to test different delivery packages and capture learning to reduce CO2. | Integrated package programme 1. Improved local energy efficiency 2. Renewable energy generation 3. Local employment opportunities 4. Low carbon transport and grow fruit and vegetables | Community group, local government, social enterprise, community centre and school, university |
| London Low Carbon Zone (LLCZ) | Mayor and Greater London Authority | 2009-12 | Neighbourhood areas including no more than 1000 buildings, specification of geographical area | 10. Supporting a community approach to cutting the capital’s carbon footprint | Integrated programme: Free energy efficiency assessments and measures for homes, businesses and schools. Fitting solar photovoltaic panels on local schools. Training local residents to carry out energy efficiency audits. Working within schools to encourage pupil and staff engagement and behaviour change. Establishing community events and centres. Learning from local activities. | Local government, involving local residents, community groups, social enterprise and businesses |
| Local Energy Assessment Fund (LEAF) | Energy Saving Trust and DECC | 2012 | Community groups based on 2009-12 and community benefit structures and they need to specify geographical areas | 20. To help assess the potential for energy efficiency and local renewable energy generation and getting things started in local communities | 1. Energy efficiency/Community energy efficiency survey/ Instalations of energy saving technologies, Running engagement events 2. Renewable Energy: Area-wide renewable energy studies, Outline feasibility studies into specific renewable energy projects, Engagement events, Developing community capacity | Community association, community group, community enterprise, Parish council, local authorities, charities, etc |
| Community Energy Saving Programme (CESP) | Department for Energy and Climate Change (DECC) and large energy companies | 2009-12 | 350 Most areas are located in low income areas selected by dates (1928 areas out of 4508 areas). Some areas can get area bonuses. | 1928. To achieve the legislative obligation of energy efficiency standards and reduce fuel bills in areas of low income via house-by-house, street-by-street approach by delivering through the development of community-based partnerships | Whole house programme 1. Energy efficiency measures and home energy advice: solid wall insulation, loft insulation, window glazing, heating control, heat pumps, boiler replacement 2. Microgeneration measures, | Community-based partnerships between local government, community group and energy company, with social housing providers |
| London Home Energy Efficiency Programme (RENEW) | Mayor and Greater London Authority | 2009-15 | Contractors specify their areas based on 72 | - To help make London’s 1.2 million homes more energy efficient by 2015 via an area-based, whole house approach, | Whole house programme, 1. A free home energy check 2. A range of free energy and water saving devices such as an energy monitor, radiator panels and a low flow showerhead 3. Personalised energy advice | A partnership between the Mayor of London, London Councils and the Energy Saving Trust, and London Boroughs |
| Climate Challenge Fund (CCF) | Scottish Government | 2008-12 | 57 | 30.9 | Two types 1) A geographical area based community 2) Community associations and community | Help community groups who have reduced their carbon footprints and made improvements to their communities | Many kinds of carbon reducing projects which communities plan 1. Energy efficiency: Energy efficiency measures, raising awareness and changing behaviour 2. Transport: Shared car, public transport, cycling and walking promotion 3. Local food promotion | Community group, community council, resident association, local charity, community-led housing association, student union, etc |
| Community and Renewable Energy Scheme (CARES) | 1. Scottish Government 2. Scottish Government | 2011-12 | 5.35 | 2.4 | Two types 1) Not specified 2) Community building in urban areas identified in the top 20% on the Scottish Index of Multiple Deprivation | - To support the development of locally-owned renewable energy projects which provide wider community benefits 1. CARES loan scheme: Trial and development of additional renewable energy generation projects 2. “Sustainable Energy for Urban Communities” Energy audits for community facilities, Installations of renewable technologies, Measures to improve energy efficiency, Awareness raising and educational activities | Community associations, rural local commercial businesses, joint ventures between eligible applicants 2) Community building owners |

Table 2. Programme Types

| Multiple targets | Single target |
|-----------------|--------------|
| Houses, Local offices, Community buildings, Transport etc. | Houses, or Community buildings |
| Type 1 | Type 2 |
| LCCC | CESP |
| LLNZ | RE:NEW |
| LEAF | CARES 2 |
and renewable energy coming from the Green Deal, Renewable Heat Incentive and Feed in Tariffs. Therefore, this programme is positioned between Type 1 and Type 2. It emphasises the community benefit structure in geographical areas and supports more than 230 communities.

The 'Climate Challenge Fund (CCF)' supports various types of low-carbon projects planned by community organisations. The CCF has two types of programmes, and one type has a geographical area-based approach.

2.3.2 Type 2

The CESP is a part of the government's Home Energy Saving Programme as well as a part of the programmes of the Fuel Poverty Strategy. The CESP is intended for deprived areas, and improves old dwellings by replacing energy equipment and installing insulation. We recognise that the CESP has had an effect on the reduction of CO$_2$ emissions, on reducing the fuel bills of low-income people and on improvement in the living environment.

RE:NEW is an area-based and local authority led programme in London to reduce energy bills and stop wasting energy in houses. Local authorities should select target areas based on the maximum potential for carbon savings. Therefore, the most important target is areas of high-density old housing stock. As a result, this programme has a role in reducing fuel bills for low-income people and in improving the living environment in deprived areas.

CARES has two types of programme, one of which aims to reduce CO$_2$ emissions from community facilities in deprived areas. We recognise that cutting the CO$_2$ emissions of community facilities has the effect of informing residents and involving community groups in low-carbon activities.

2.4 The Characteristics of the Programmes

The main aim of low-carbon community programmes is to reduce the carbon emissions of communities. However, there are two additional objectives for these programmes.

First, the programmes of Type 1 are experimental programmes at present. The government tries to understand the effects of a number of measures for cutting CO$_2$ emission in typical communities. These programmes have multiple targets for cutting CO$_2$, and the governments has designated various areas as model areas. Therefore Type 1 aims to build models for cutting CO$_2$ emissions by these experiments.

Secondly, the programmes of Type 2 aim to develop deprived areas where many low-income people live and many old, heat-ineffective buildings remain. The programmes install energy efficiency measures in houses, and decrease the energy cost of fuel poverty and improve the living environment. In the UK, there are many old houses that were built around the beginning of the twentieth century, and energy costs as a proportion of household budgets are higher than in Japan. 'Fuel poverty' means households whose fuel cost proportion is higher than 10%. Therefore, these programmes have a social welfare support aspect in deprived areas.

3. Muswell Hill is Designated as Both a LCCC Area and a Low Carbon Zone Area

3.1 Features of LLCZ Areas

The LLCZ makes it possible to compare the effects on target areas because most local governments estimated reduction of CO$_2$ emissions. Thus, we focus on the LLCZ.

'The Mayor's climate change adaptation strategy' in London committed to the following: 1. Achieving a 60% reduction in London's carbon emissions by 2025; 2. Ensuring 25% of London's energy is delivered through more efficient decentralised energy by 2025; 3. Improving the energy efficiency of London's houses and buildings. The LLCZ was expected to help achieve these aggressive goals.

The features of the LLCZ are as follows: 1. It requires a 20% reduction of CO$_2$ emissions by 2012 in each model area; 2. Ten geographically based areas were selected from ten boroughs; 3. The LLCZ aims to build cooperative partnerships between local boroughs, community groups, residents, local businesses, and electrical power and water suppliers; 4. It requires experimentation with many types of CO$_2$ cutting measures and promotion of new measures.

Table 3. shows features of the zone areas and the results of CO$_2$ reduction. The zones that could achieve the goal of CO$_2$ reduction are Muswell Hill, Queens Park and Lewisham Central. This paper focuses on one area that could achieve the goal of cutting CO$_2$ and clarifies how to accomplish that goal.

3.2 Outline and Goal of the Muswell Hill Area

Muswell Hill is located in a northern suburb of London, and is composed of a commercial zone and a residential zone. The commercial zone includes one of the 156 district centres of London, and the residential zone consists mainly of Victorian and Edwardian architecture.

The Muswell Hill Low Carbon Zone is equal to the area of the Muswell Hill LCCC and includes 860 residential buildings, 30 businesses, three schools, a community centre, two churches, a library and other community buildings.

The community of Muswell Hill is relatively strong, and the living environment is generally healthy and favourable. This area was selected because it is expected to have a large potential for CO$_2$ saving and to form partnerships easily between local government and community groups.

The Muswell Hill Low Carbon Zone set a target of 20% CO$_2$ reduction by 2012, along with other Low Carbon Zone areas. The main projects funds were the LCCC and LLCZ. The DECC contributed 50 million pounds through the LCCC and the Greater London
3. Low-Carbon Projects in Muswell Hill

Low-carbon projects in Muswell Hill are diverse and include the whole Energy Hierarchy, such as energy saving, energy efficiency and renewable energy generation (see Table 4).

The steering partnership comprises officers from a local government named Haringey Borough, the Muswell Hill Sustainability Group (MHS), representatives from London Sustainable Exchange, En10ergy, academics from the University of East Anglia, representatives from local schools and the Muswell Hill Traders’ Association. Many local interest groups were invited and discussed the direction and key aspects of the low-carbon projects.

(1) Energy Efficiency in Houses

The ‘Green Home Make Over’ is the key project to promote energy efficiency in houses. A local volunteer group plays an important role. At first, volunteers visit each home to deliver leaflets and some energy tips, and explain the project and make referrals to the home energy experts of the Creative Environmental Network (CEN). CEN experts visit homes and make home energy assessments, and install some small energy and water saving products. CEN also make energy action plans and give energy-saving advice. The government provides a Low Carbon Loan scheme (A Pay As You Save), so residents can use the loan to install insulation and energy saving measures.

The scheme is a direct method to save energy by visiting homes and providing energy-saving measures for homes. Local government can investigate the energy consumption in houses and amount of carbon emissions reduction by using these measures. The government can collect the data and make future policies to achieve the goal based on these data.

(2) Community Renewable Energy Project

The school solar PV project and the LivingArk project are key projects to promote renewable energy facilities in Muswell Hill. The local government and local schools carried out these projects.

In addition, a community social enterprise was established and involved in the Community Solar PV project. The borough, the social enterprise named En10ergy and Marks & Spencer built a partnership and installed large community-owned solar PV panels on the roof of Marks & Spencer. En10ergy also installed community-owned PV panels on a church.

En10ergy was established by the MHS in October 2009, and the borough awarded a Green Innovation Fund grant to the group to help set up a community energy enterprise. The company solicits community people and members of the public to invest in the company by buying at least 10 shares of £1 each, and it now has over 100 local shareholders. The objectives of En10ergy are to promote and invest in renewable energy installations and reduce CO2 in Muswell Hill.

(3) Sustainable travel, behavior changes and sustainable food projects

To encourage lifestyle changes, several projects were implemented, including delivering newsletters and leaflets to all households, holding community events and making videos.

Delivery of behavioural changes happens not only through the promotional projects but also through other projects, and all projects should be designed to have effects on behaviour.

In this view, the process of the Green Home Make Over is highly esteemed because of the peer-to-peer communication by community volunteers. The Community Solar PV projects are also highly ranked because they are shared by the community and run

Table 3. The London Low Carbon Zone

| Name of zone        | Name of borough | Size and feature of area | Reduction of CO2 |
|---------------------|-----------------|--------------------------|------------------|
|                     |                 |                          | Land use | Tons | % | Year |
| Barking Town Center | Barking and Dagenham | 65 households | 826 shops and restaurants, 25 offices and others | Major centre: commercial and residential area including social housing | 1051.7 | 9.7 | 2012.9 |
| Muswell Hill        | Haringey        | 26 households           | 860 shops and 30 offices | District centre: commercial and residential area including social housing | 1453.0 | 20.0 | 2012.4 |
| Archway             | Islington       | 69 businesses           | 3000 businesses | District centre: commercial and residential area including social housing | - | - | - |
| Brixton             | Lambeth         | 60 businesses           | 3799 businesses and shops | Major centre: commercial and residential area including huge social housing | 28076.0 | 6.7 | 2012.3 |
| Lewisham Central    | Lewisham        | -                       | 1015 businesses | Commercial and residential area, area adjacent to major centre | 651.7 | 19.0 | 2012.9 |
| Wandke Valley       | Merton          | 30 businesses           | 1103 businesses | Residential area and large-open space | 834.0 | 12.1 | 2012.9 |
| Han and Petersham   | Richmond        | 125 businesses          | -              | Residential area and large-open space | - | - | - |
| Pecksham            | Southwark       | 15 businesses           | -              | Residential area including social housing and commercial area adjacent to major centre | 782.5 | 10.8 | 2012.3 |
| Hackbridge          | Sutton          | 19 businesses           | 650 homes      | Residential area | 320.6 | 17.1 | 2012.9 |
| Queens Park         | Westminster     | 45 businesses           | 1336 homes     | Residential area including social housing, 80% of homes are in conservation area | 6726.0 | 25.0 | 2012.9 |
by a community enterprise. Meanwhile, sustainable travel projects such as cycle hoops and new electric car charging points were installed by the borough only, and people do not know about these projects.

Regarding sustainable food projects, many residents are interested in local and organic foods, and so actively participate in community gardens and other food projects. Some residents become hosts of local events or acquire an interest in local energy. So food projects have contributed to an expansion of the range of interest in low-carbon.

4. Role of Local Government and Community Groups in Muswell Hill

4.1 Role and Activities of Haringey Borough

Haringey Borough applied for both the LCCC and LLCZ and won the funds of both programmes.

One officer works full-time for Muswell Hill low-carbon activities and three or four other officers help with the activities. They promote participation in low-carbon activities for residents, community groups, local schools, community centres, churches and businesses. The borough has built collaborative relationships with the MHSG and En10ergy, and successfully involved local schools, community centres, 20 volunteers, a church, a supermarket and several businesses.

Haringey Borough was important in promoting the LCCC and the LLCZ from the beginning.

4.2 Role and Activities of Local Community Organisations

Haringey Borough started Haringey 40:20 and adopted a target 40% reduction in CO₂ emissions by 2020 in all its areas. The Haringey 40:20 project provides information about and reports of low-carbon activities and the experiences of Muswell Hill.

Table 4. Low Carbon Projects in Muswell Hill

| Project                          | Actors                              | Activities                                                                 | Results to 2012          | Fund  |
|----------------------------------|-------------------------------------|----------------------------------------------------------------------------|--------------------------|-------|
| Energy saving and efficiency     | The Green Home Make-over            | A team of 20 volunteers recruited from the local community, CEN, and local government | 450 homes were finished | LCZ   |
| Eco Homes                        | London Sustainability Exchange, Muswell Hill Trades Group, and local government | 1. Free environmental business audit for small businesses  
2. Special networking meetings for green businesses attended by local businesses  
3. Advice on cutting energy cost, saving water and recycling | Several businesses | LCZ   |
| Greening Muswell Hill Businesses | Muswell Hill Centre, Muswell Hill Library, and local government | 1. Energy efficiency measures including gas-fuelled boiler and lighting system were installed | Muswell Hill Centre, a library, the North London Performing Arts centre | LCZ   |
| Renewable energy                 | Three schools and local government  | 1. Solar PV panels at three schools  
2. Digital information boards and educational displays related to energy consumption  
3. Educational programmes on renewable energy and climate change | Three schools | LCZ   |
| The LivingArk project            | Muswell Hill Primary School and local government | Zero carbon cabins for school children and community groups: Living 'green' roof, Solar photovoltaic panel, Sheep’s wool insulation, Low-emissivity glass, Rainwater harvesting, Composting toilet, FSC-certified wood used for construction | One school | LCZ   |
| Community Solar PV project       | En10ergy, local government           | 1. The Muswell Hill Sustainability Group set up community energy enterprise (En10ergy) and the enterprise launched a bulk buying scheme.  
2. En10ergy installed community-owned solar PV arrays on Marks & Spencer and a church  
3. En10ergy set PV arrays on 5 Tottenham schools and 1 Wood Green school | One super market and a church | LCZ   |
| Sustainable Travel               | Local government and Dr. Bike        | 1. Installation of cycle hoops  
2. Cycle promotion | 30 cycle hoops were installed | LCZ   |
| Encouraging behavioural change   | Muswell Hill Sustainability Group, En10ergy, and local government | 1. Delivering newsletters and leaflets to all households  
2. Explanation about the Green Home Makeovers directly by door knocking  
3. Community events and running information stall  
4. Residents voluntary groups are taking part in a carbon trading plot  
5. Making videos of LCZ, energy services, activities and evaluation about low carbon | - | LCZ   |
| Sustainable Food                 | A volunteer group, En10ergy and local government | 1. Residents groups are discussing sustainable food  
2. Fruit tree planting in Springfield Avenue and community garden created in St. John’s Lane  
3. Organic local food box schemes are established | - | LCZ   |

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The MHSG, En10ergy and the Muswell Hill Traders’ Group (MHTG) are the main community organisations playing roles in implementing the LCCC and LLCZ.

The MHSG was set up by members of the Green Association in 2008; its aim is to reduce carbon emissions in the Muswell Hill area. The organisation started to jointly work with Haringey Borough in 2009 and created En10ergy limited to begin a community renewable energy service. From the beginning, the MHSG was expected to have a large role in promoting the programmes. The MHTG supported local businesses by advising on energy efficiency and providing local information for Muswell Hill. However, participation by local businesses in low-carbon activities is rather difficult, so this group now provides local information for Muswell Hill.

En10ergy and the MHSG launched the 100 Homes project in 2010 and supported local residents in identifying how to save energy and how to reduce carbon footprint in many ways. Now most of the residents participating in the 100 Homes project have reduced their carbon footprints, and some of them have cut their footprints by as much as...
as 50%. After the 100 Homes project was completed, En10ergy extended the community areas in Haringey and started 100 energy assessments.

They also started a Low Carbon Buying Group, which is a bulk-purchasing scheme, and introduced lower prices for energy saving measures and renewable energy facilities to local residents in 2010. They now include the new extension areas, so they run the Buying Group in Muswell Hill and surrounding large areas. In parallel with this, they provided DIY draught-busting free workshops with volunteers.

En10ergy is now running carbon reduction projects at six schools in Muswell Hill and surrounding areas separately from the LCCC and LLCZ. The borough has a Schools Sustainable Investment Fund to install energy efficiency measures, and En10ergy advises and helps schools to apply for funding.

We envisage the MHSG and En10ergy trying to continue and extend the low-carbon activities such as home energy assessments, offering energy products at lower prices, DIY workshops and carbon reduction projects of schools separately from the programmes. Thus, they are expected to have a role in sustaining and expanding activities after the programmes are finished.

5. Conclusions
5.1 Factors Involved in Achieving the Goal at Muswell Hill

There are many reasons why Muswell Hill could achieve the goal of cutting 20% of CO₂.

Firstly, they could obtain two subsidies from the LCCC and LLCZ, so this area could use two types of public funds. Secondly, this area had a large potential for cutting CO₂ because there are many old Victorian and Edwardian houses, and the energy use of these houses is inefficient. Thirdly, some community groups already existed in this area, and the government easily asked the community for cooperation. In this manner, this area has suitable conditions to achieve the goal.

Considering the methods of cutting CO₂ emission, first, the steering group people had a means of visiting and providing energy saving measures to 450 out of 860 homes with local volunteers, and this lead to considerable energy-saving in the homes of the Muswell Hill area. Secondly, they could cooperate with large users such as a supermarket, schools and community centres. Although most local businesses have not participated in the programmes, they are not big energy users, so the results can still be successful.

Considering the organisation required to implement the measures, from the beginning, a community group that was interested in building a low-carbon society already existed and aimed to promote both the LCCC and LLCZ with local government. In addition, they established a social enterprise for promotion of energy efficiency and operation of renewable energy supply.

Muswell Hill had unusually favourable conditions and based on such conditions, officers of the borough and community groups cooperated.

5.2 Role of the Local Government and Community Groups in a Community-Based Approach

Regarding the role of governments at LLCZ, the Greater London Authority undertook a role in the provision of programmes which include frameworks, evaluation methods and funds. If people have little interest in low carbon society, a top-down system like this is effective. As for local governments, we consider that the governments undertook a large role in reducing CO₂ emissions. The programmes required supplying information to residents, adjusting power among many organisations, evaluating the ability of each measure and diffusion of knowledge based on the experience and data of the programmes. Therefore, local governments need to lead the way in the development of low carbon activities in communities, especially at the early stage. In addition, governments need to enhance many types of community groups and develop leading community groups to continue work after the completion of the programmes.

Regarding the roles of community groups, we consider that each community group should undertake a specific role. Reduction of CO₂ emissions in communities involves considerable work including promoting energy saving and efficiency tools, building renewable energy generation, sustainable transport, promotion of local food and events to encourage behavioural changes. Basically, community groups need to undertake the work and continue with it for prolonged periods together with other groups. For such occasions, community groups are expected to become social business groups by acquiring special knowledge of low carbon and development of human resources.

5.3 Pros and Cons of a Geographical Area-Based and Multiple-Targeted Approach

A geographical area-based approach can encourage behavioural changes by having neighbours and local volunteers visit each home, directly explain the projects and make it possible to provide home energy assessments and energy advice for each home in the specific area. Neighbours and local volunteers push such promotion by their communications and recommendations at the time of community activities.

Through this approach, neighbours can communicate with new people more easily, and exchange information and opinions concerning not only low carbon activities but any activity.

With respect to the aspect of programmes, energy efficiency programmes in houses are basics and important for building low carbon societies. The energy efficiency project of houses is the most effective measure to cut CO₂ emissions in Muswell Hill and can have an impact on each resident directly by visiting and home assessment.

Meanwhile, we consider that projects are meaningless if low-carbon activities are not continued and extended after the administrative support is finished. One low-carbon community has limited effectiveness regarding
reduction of carbon emissions; hence, it is very important to develop methods for continuity and to expand low-carbon community activities based on the results and experiences of the programmes.

Regarding multiple-targeted programmes, we consider that it can encourage behavioural changes by promoting various kinds of projects. Generally, people are more interested in food, community gardens, and local festivals than energy and global warming issues; hence, a combination of various methods including people's concerns is useful to promote the involvement of a variety of residents. Residents who are interested in only food projects come to have interests in other projects. When community organisations participate in low-carbon energy projects, these programmes can strengthen human resources and allow synergetic effects.

We attach importance to multiple-targeted programmes for a low-carbon society as a method of community empowerment and engagement, and it can play a significant role in empowering a community. Additionally, the programmes can bring stable income to community enterprises if they can build renewable electrical generation facilities and use the Feed-in-Tariff. In this manner, it is useful in promoting social and community businesses.

Therefore, low-carbon community programmes are more useful in problematic areas with poor community relationships, and they should include geographical area-based and multiple-targeted approach, because it can be expected to improve various problems effectively through its synergetic effects.

When thinking of the possible introduction of low-carbon communities in Japan, we should bear in mind that housing conditions, energy cost of homes and the supply system of electric power in Japan is different from that in the UK. However, Japan should introduce low-carbon communities to promote a low-carbon society as well as to activate communities and develop social businesses.

We propose applying low-carbon community programmes to the Tohoku disaster areas, suburban areas where residents have few relationships and old housing estates where residents need mutual cooperation in Japan.

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Notes
1 Interviews with Low Carbon Zone officers of Muswell Hill, Brixton, Archway, and interviews with LCCC, London, Nottingham officers, and emails with MHSG, LCCN, 10 LCZ and officers from 2011.6-2012.9.
2 Most information is based on the period from April, 2011 to May 2013. After 2013 most information did not change.
3 In this paper, we checked with the Department for Energy and Climate Change, the Scottish Government, the Government of Wales, and the Greater London Authority.
4 The proportion of lighting and fuel costs to household budget in Japan is 6.2% on average, and 8% on low-income households (less than 2,480,000 yen) in 2012 (by Family Income and Expenditure Survey).
5 The numbers in Table 3. are based on the answers from officers of each borough.

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