PAPERS

TOWARDS LOW CARBON HOUSING DEVELOPMENT AND ECO-RETROFITTING IN ISTANBUL - ARNAVUTKOY

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THEMATIC HEADING: COMMITMENT TO SUSTAINABILITY IN REHABILITATION

This paper draws on an ongoing international collaborative research project which aims to promote the adoption and implementation of policies for low-carbon housing development and eco-retrofitting in Istanbul. This includes the development of pilot projects in co-operation with the Arnavutkoy District Municipality. The paper first critically reviews the urbanisation processes which have produced the urban sprawl that dominates the Municipality, with particular reference to the adverse environmental impact of largely illegal and/or unplanned development in which rural villages have been engulfed by low-quality housing and associated infrastructure. An assessment of the future impact of a 'business as usual' scenario for the continuing urbanisation of the district demonstrates the need for change.

However, there is now an opportunity for change, as the 1/100.000 Istanbul Master Plan (2009) has established clear guidance for the further development of the Municipality. This guidance designates the now partly urbanized Arnavutkoy as a predominantly green area which will include ecological agriculture zones and ecological tourism, together with strict controls on the location and volume of new housing and action to rehabilitate existing urban areas. But the Master Plan does not address the issue of climate change and the need to reduce carbon emissions generated by buildings. Thus, the housing development and rehabilitation component of this policy guidance does not promote 'green housing'. Therefore the paper draws on evolving UK experience of the move towards zero carbon new housing development and eco-retrofitting of existing neighbourhoods. This analysis is then used to structure an assessment of the prospects for a shift towards low carbon metropolitan development in Turkey/Istanbul, which focuses on the increasingly dynamic national policy environment, in the context of the EU harmonisation process and Turkey's post-Copenhagen carbon reduction targets.

Finally, the paper concludes by providing an initial route map for low carbon housing development and eco-retrofitting in Arnavutkoy.

Recent urbanisation processes in Arnavutkoy

Arnavurkoy is one of Istanbul's outer municipal districts. Since 1950 the city's population has increased from 1.5 million to the 12.5 million revealed by the 2007 Census. This is the result of large-scale immigration from the less prosperous parts of Turkey, particularly eastern Anatolia, as poor people have come to the city in search of jobs and housing. This explosive and continuing urbanization process has placed enormous burdens on the provision of housing, the transport systems and the capacity of public infrastructure. Moreover, much of this population increase has been accommodated on earthquake vulnerable land in apartments with little or no earthquake resistance – the 18,000 deaths in the 1999 earthquake were a tragic reminder of this natural hazard (Kocabas, 2005 and 2006)(1).

The early phase of this urban growth was dominated by self-build gecekondu (literally translated as 'built overnight') development of mainly single storey dwellings, usually with a garden attached. This was illegal development on 'Treasury Land' (i.e. on land owned by the state) and as such had limited (initially illegal) access to basic services of water supply, sewage disposal, electricity etc. In an era dominated by 'clientelist' politics, periodic government amnesties, giving limited flat ownership rights and improved access to services, often rather obviously in exchange for votes. Such amnesties inevitably led to further waves of gecekondu development (Keleş, no date;Tekeli, 1994)(2). The continuing and intensifying pressure for development, combined with the government granting gecekondu occupants vertical development rights, resulted in the redevelopment of many of the original squatter neighbourhoods. Thus in Istanbul groups of the original squatters (typically four or six) co-operated with small-scale constructors to demolish their single storey dwellings and redevelop their combined plots to produce a five storey building containing ten to fifteen flats. Typically each gecekondu 'owner' would receive a flat to live in and one to rent out, with the balance of the flats being sold by the constructor to recoup capital costs and provide a profit. This was known as the 'share of construction method' (yap-sat) which was the mechanism for the redevelopment of many gecekondus – from single storey self build single dwellings to low quality, four- five storey apartment blocks. But as the growth pressures intensified the application of the share of construction system changed emphasis and became the dominant mechanism for the illegal extension of existing settlements, especially in the rural areas on the urban fringes of the expanding metropolis, epitomised by Arnavutkoy.

The legacy of this process is that Istanbul now has a huge number of low standard and deteriorating apartment blocks, many of which are on earthquake vulnerable land. Thus in addition to accommodating further urban growth in better quality and sustainable new neighbourhoods, the city faces the task of rehabilitating hundreds of earthquake threatened neighbourhoods.

The Arnavutkoy Municipality was created in a 2008 local government reorganisation and incorporated villages and market towns which, since the mid-1980s, have been engulfed by the explosive growth of Istanbul (see Figure 1 marked in light green). The urbanisation processes were largely unconstrained by planning and the control of plot development was rudimentary. The result is low quality urban development, which is increasingly interspersed with better quality residential developments sold as second homes to people from Istanbul – including gated communities. Urbanisation has had a negative impact on the natural resources of Arnavutkoy, which is an important catchment area for Istanbul water supplies and includes major forest areas. A major challenge facing the new Municipality is the need to improve the quality of further urban development and rehabilitate the existing neighbourhoods, in ways which protect the natural environment and reduce the carbon impact of the Municipality's housing stock.

In 1985 the population was only 27,000. By 2008 Arnavutkoy's population had reached 163.000. The village population is only 4% of the total - 7.000 people, living in the rural and semi-rural northern parts of the Municipality, which are characterized by agricultural land, forest and scrub areas, interspersed with major dams and disused quarries (see Figure 2). In fact, almost 90% of the local land is designated as water catchment areas and protected and managed by ISKI (Istanbul Water Authority). Thus, in comparison with other municipalities on the edge of the expanding metropolis, the extent of the urbanization of Arnavutkoy has been somewhat restrained because of the importance of its water and forest resources. However, without significant planning intervention this unsustainable 'business as usual scenario' will continue. More good quality agricultural land will be taken out of production and eventually developed, forests will be eroded, and Istanbul's water supplies will be put at ever greater risk. The continued development of new neighbourhoods to predominantly low standards, together with no improvement to existing neighbourhoods will produce increasingly unsustainable urban

Figure 1. Location of Arnavutkoy

Source: Arnavutkoy Municipality (2010).

areas, with a massive and increasing carbon footprint generated by the low insulation standards of buildings, poor public transport, and the continued failure to develop renewable energy sources. This at a time when policy makers in Turkey and across Europe are giving increasing attention to the challenge of moving towards low carbon urban development through the promotion of new eco-settlements and the eco-retrofitting of existing settlements. It is our contention that a completely new vision is needed for the future of the new Arnavutkoy, based on a gradual move, promoted through pilot projects, towards 21st century sustainable urban development processes.

Figure 2. Arnavutkoy landscape

Source: Photos by Arnavutkoy Municipality (2010).

The approval of the 2009 1/100.000 Istanbul Environmental Master Plan provides a platform for the development and delivery of a new vision. It has established a new planning policy framework for moving towards a more sustainable urbanisation process. During Mayor Kadir Topbas's first office term (2004-2009), the 2006 Istanbul Environmental Master Plan was prepared and approved by the Greater Istanbul Metropolitan Municipality (GIMM) within the framework of a protocol signed by the Ministry of Environment and Forestry and the GIMM in January 2004 (Diren, 2010)(3). Moreover, the Mayor decided on a new approach to Master Plan preparation. He established the Istanbul Metropolitan Planning and Urban Design Centre (İMP) as a planning consultancy unit reporting to himself. IMP prepared the 2006 Environmental Master Plan which was approved on July 14th 2006 by the GIMM Council, for the period up to 2023. However, the Plan was challenged in the court with regard to the preparation process

being outside the formal planning bureaucracy, but was legalized by the Higher Court rejecting these challenges in February 2009.

The first objective of the 2009 Plan is to encourage globally competitive economic growth, through a shift from a predominantly industrial economic structure to a service economy based on information and technology. But sustainability principles are to be applied to guide further urban growth, to improve the quality of life, to protect natural assets and improve the standard of living for all groups**.** 12 million population of the city is expected to rise to 16 million in 2017, then to 23 million in 2023. This will further intensify development pressures for commercial, industrial and residential in the northern part of the city, where the forest and water catchment areas are located. Thus the Master Plan provides for alternative development corridors along the Marmara Coast of the European and Asian sides of the city.

The 2009 Master Plan provides the following planning policies for Arnavutkoy:

- designation of large agricultural areas as 'ecological protection zones' with the introduction of new economic activities such as ecological farming, gardening, and ecological tourism;
- designation of area where new construction is prohibited -forests, the river basins and lake basins;
- designation of a large housing rehabilitation zone which includes both new building and the rehabilitation of low standard mainly low income neighbourhoods; and
- the containment of the industrial area and the existing settlement areas to the North East of the Sazlıbosna Lake.

However, the Master Plan has no explicit reference to the contribution that spatial planning can make to climate change mitigation and adaptation policies. This is an important omission because the construction and use of buildings, particularly housing, contribute to more than a quarter of CO2 emissions through the use of fossil fuels for heating, cooling and lighting. It is our contention that the new vision for Arnavutkoy should move the Municipality towards a low carbon built environment by promoting new eco-settlement extensions and by the rehabilitation of existing neighbourhoods through eco-retrofitting.

The need to move towards eco-planning for low carbon urban development and regeneration in Istanbul

The paper now outlines the case for integrating eco-planning for low carbon development in Arnavutkoy within the vision, strategy and action planning for the future of the District. This case is informed by a brief analysis of UK policies, programmes and investment processes for both climate change adaptation and mitigation, which illustrates that a low carbon urban development revolution is underway in Europe. The rapidly changing situation in Turkey is then analysed, in terms of the emergence of a national policy for climate change adaptation and significant changes in energy and building control policies, which are focused on climate change mitigation. This is in the context of the country's commitment to post-Copenhagen carbon reduction targets and the continuing influence of the EU harmonization process. Progress on the ground is illustrated by a brief review of a range of pioneering developments. This analysis leads to the conclusion that the policy environment in Turkey is increasingly conducive to the development of a Turkish version of eco-planning for low carbon urbanization, which could be applied in the new vision for Arnavutkoy.

The UK Low Carbon Transition Plan: zero carbon new development and eco-retrofitting of the existing housing stock

The World Bank emphasizes that an effective response to climate change must combine both mitigation - to avoid the unmanageable - and adaptation, to manage the unavoidable (WB, 2008)(4). Planning for *climate change adaptation* requires action to deal with the climate

changes that are now inevitable, given the impact of global warming that has already occurred and will continue until action is taken to halt the process. In England such measures include much stronger controls on building on coastal and estuarine land liable to flooding, as the typical 'one hundred year flood' will now happen much more frequently, and taking decisions about which vulnerable land cannot be protected from permanent flooding or erosion by the sea at reasonable cost.

Planning for *climate change mitigation* focuses on action to reduce greenhouse gas emissions to slow down and eventually halt global warming, in accordance with international and national carbon emission reduction targets. During the past five years or so, the planning system in England has moved from traditional land-use planning to spatial planning, with an increasing focus on the transition to sustainable development. The planning system will make a major contribution to the delivery of the *UK Low Carbon Transition Plan*, which is now being developed and taken forward by the new centre-right coalition government (DECC, 2009)(5). The Transition Plan includes a strategy for both climate change adaptation and mitigation. The headline target is to reduce the national total of carbon emissions by 18 % on 2008 levels by 2020, as a major step towards achieving the legally binding target of cutting emissions by 30% by 2050. The Plan gives a very high priority for reducing carbon emissions from the built environment, including cuts from emissions from homes by 29% on 2008 levels - energy use in London's existing homes is the largest source of CO2 emissions – nearly 40 % of London's total.

Achieving this target will require the delivery of programmes to increase the use of energy from renewable sources, to eco-retrofit existing housing, move to zero carbon new housing and, eventually, zero carbon new communities.

A major increase in the production of electricity from *renewables* from approximately 4% now to 30% by 2020 will be achieved by:

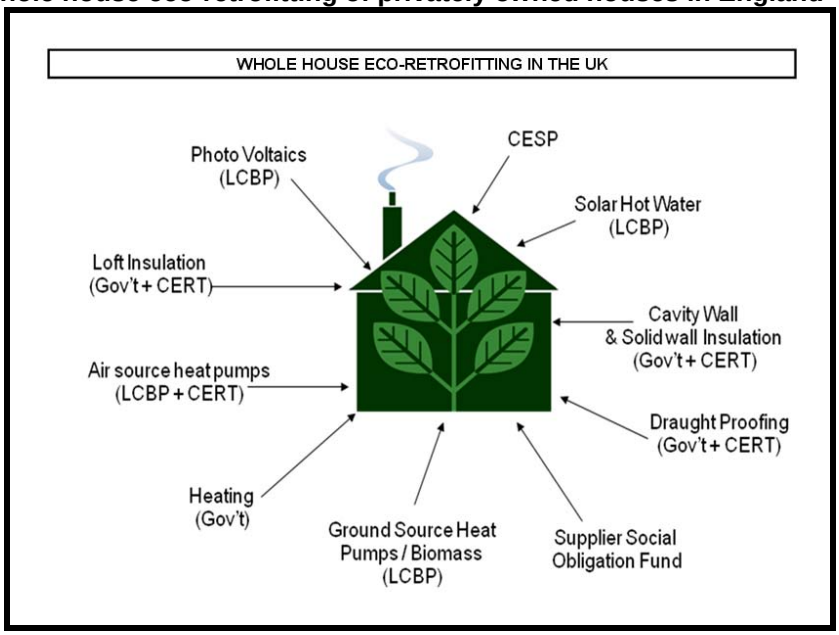
- requiring electricity suppliers to sell electricity generated from renewable sources, including both solar and nuclear power sources; and
- promoting micro-generation of energy from renewable sources (solar and geothermal) by introducing clean energy cash-back schemes - *'the feed in tariffs'*- so that people and businesses will be paid for selling surplus energy, meaning a household with a well-sited solar panels could receive over £800 plus bill savings of around £140 a year.

A major driver of a substantial programme of *eco-retrofitting of existing houses* in mainly older neighbourhoods will be the *insulation* of 6 million existing homes (installing roof and cavity wall insulation in about 1 million properties a year), through a variety of schemes which include the following:

- the *Carbon Emissions Reduction Target (CERT)* scheme requires electricity and gas supply companies to subsidise (up to a 50% discount) the installation of energy efficiency measures by private owners and social housing organisations and pass the £3.2 billion cost on to their customers through what is effectively a climate change levy;
- the *Warm Front Programme* provides government grants to low income private home-owners of up to £2,700 for insulation and heating improvements and is managed by eaga plc. This programme currently delivers much of the eco-retrofitting which aims to alleviate fuel poverty – reducing emssions from 250,000 dwellings per year;
- installing *smart metres* in every home by the end of 2020, which will enable people to monitor their energy use; and
- requiring *Energy Performance Certificate* ratings to be available for all properties when they are sold or let, which provides information about the energy performance of the building and the measures that can be taken to improve that performance – this is rapidly enhancing the carbon consciousness of households in England.

However, to meet the carbon reduction targets it will be necessary to go beyond insulation measures to *whole house retrofitting*, which includes insulation, boiler replacement, solar photo-voltaic panels, solar thermal panels, ground and air source heath pumps (see Figure 3).

Figure 3. Whole house eco-retrofitting of privately owned houses in England



Source: adapted by Kocabas from eaga plc, UK.

Initiatives to promote whole house retrofitting include:

- introducing a community-based approach to deliver a whole house treatments to homes in low income areas, through the *Community Energy Saving Programme (CESP);* and
- piloting a move from upfront payment to *pay as you save* systems for installing energy efficiency measures, which enables people to repay loans for the installations from the reduction in their energy bills. So it will be more affordable to make the whole house low carbon by installing the whole range of measures.

In 2007 the UK government adopted a policy that all new housing will be zero carbon by 2016:

' a zero carbon development is one that achieves zero net carbon emissions from energy use on site, on an annual basis' through energy conservation and use of energy from renewables - wind, solar, wave, bio-mass' (DCLG, 2008)(6).

This zero carbon concept is now being applied at the level of the individual dwelling, the development of new carbon neutral neighbourhoods, the eco-town and is revolutionizing the house-building industry across Europe and further afield (PRP Architects, 2008 and 2009)(7). At the level of the individual dwelling, the UK *Building Regulations* set a wide range of mandatory construction standards, including those for energy conservation**.** The environmental components of these standards are to be ramped up in Autumn 2010, 2013 and in 2016 to zero carbon, using the levels of the Code for Sustainable Homes as the basis for the increase. The Code covers 9 areas: energy, water, materials, surface water run-off and waste, pollution, health and wellbeing, management and ecology. Code Levels are 1-6. The highest standard is 6 which is zero carbon. All new social housing construction has to achieve Code Level 4 from April 2009, as a condition of government funding. Thus housing associations and their contractors are the spearhead of the move towards zero carbon housing.

At the level of the new housing project**,** many LPAs are enforcing policies for sustainable construction that variously require between 10% and 20% of energy use on site to be from on-site or 'near to site' renewable sources – wind turbines, photo voltaic cells, solar panels, ground source heat pumps and the use of bio-fuels. This is a real challenge. All new social housing development schemes now have to include such installations as it is not possible to achieve CSH Level 4 without renewable energy sources. Nor is it possible to achieve CSH Level 4 without e*nergy efficient design.* This involves maximising the use of passive solar gains, natural ventilation, super insulation of walls, roofs and floors, advanced glazing systems, high efficiency condensing boilers, energy efficient lighting and energy labelled white goods. UK planning authorities are now using the energy hierarchy as template for energy efficient design (see Figure 4).

Figure 4. Energy Hierarchy for new Low / Zero Carbon Buildings

Planning authorities in the UK now require all new development to reduce greenhouse gas emissions by applying the energy hierarchy, as a three staged process, right at the start of the design process:

- **good design is used to minimise the development's energy needs:** before any mechanical systems are considered the development should be made as energy efficient as possible by maximising the use of sunlight, thermal mass and the site's micro climate to provide natural lighting, heating and cooling of buildings. Green roofs and walls should also be used where possible.
- **the most use of efficient energy, heating and cooling systems:** if mechanical heating, cooling and ventilation is needed, this needs to be as efficient as possible. The priority is to use local (called 'decentralised') energy sources, in particular combined heat and power (CHP) systems.
- **renewable energy sources are used to meet remaining energy demand:** these zero and low carbon energy sources include solar power, wind power, bio-fuel and geothermal energy.

Source: London Borough of Southwark (2009).

Prospects for low carbon housing development and eco-retrofitting in Turkey / Istanbul

In August 2008 Turkey signed the Kyoto Protocol and following its participation in 2009 Copenhagen Summit committed itself to a 10% carbon emission by 2050. Given this post-Copenhagen commitment, the development of carbon emission reduction policies is a rapidly increasing priority for national energy policy, a trend that is sustained by the continuing EU harmonization process. In broad terms Turkey has benefited from international assistance to make significant progress with the development of a national climate change adaptation policy but progress towards a climate change mitigation policy is proving more difficult although significant innovation is on the horizon.

Since January 2008 the development of *climate change adaptation policies* has been driven by a three year UN Joint Programme, *'Enhancing the Capacity of Turkey to Adapt to Climate Change'* (Dogan, 2008)(8). This action programme was prepared by the UN Turkey Office, in close collaboration with the relevant ministries, academics and UN agencies. The core objective is to develop Turkey's capacity for managing climate change risks to rural and coastal development. This will be achieved by mainstreaming climate change adaptation into the national development framework, building capacity in national and regional institutions, piloting community-based adaptation projects in the Seyhan River Basin, and integrating climate change adaptation into all UN agencies in Turkey.

Climate change mitigation policies focus on reducing the demand for energy through energy efficiency measures and restructuring the supply of energy to move to renewable sources. The *Renewable Energy Law 5436* passed in 2005 established an initial framework for increasing the amount of the country's electricity which is generated from renewable resources. The Law provided for feed-in tariffs for electricity from renewable energy sources. Thus Turkey followed the example of the leading renewable energy countries in Europe like Germany, Spain and

Denmark. Grid operators are obliged in principle to provide access to the grid for renewable energy generators. Thus, independent power producers can potentially benefit from the feed-in tariff which can make it easier for local and rural population and enterprises to benefit from the new legislation and to create a broader basis for an emerging Turkish renewable energy industry. However, the Renewable Energy Law supported mainly wind power by setting up a purchase guarantee of some 5 ct/kWh for a period of 7 years. But this tariff was much below the average remuneration in the leading European wind markets. Thus the Law had only a limited impact on renewable energy generation and attempts to change this situation by increasing the purchase guarantee has got as far as a draft law. However, state owned energy suppliers, such as TEDAS, continue to oppose this move.

The difficulties in increasing the use of renewable energy sources emphasize the need to improve the efficient use of energy. In 2007 the *Energy Efficiency Law* was heralded in the press as 'a new era in energy efficiency in Turkey' (Bora, 2007)(9). This Law was developed as a result of the EU funded *Energy Efficiency in Turkey Project* and an Energy Efficiency Co-ordination Board (EECB) was established by the Ministry of Energy and Natural Resources. The nation-wide role of the EECB is to lead the implementation of a wide range of measures, including all aspects of energy generation and usage, specifically energy used in buildings and transportation, together with action needed to promote public awareness of the need for energy efficiency. By early 2009, the Board produced a *National Energy Efficiency Programme,* which includes energy labelling of white goods and buildings, financial incentives for building owners of up to 20% of the costs of energy efficiency measures, incentives for combined heat and power plants. Thus, a combination of legislation to promote the increased use of renewable energy and energy efficiency in buildings and transport has made some limited, but significant, progress towards establishing the energy policy component of climate change mitigation policy, which will enable Turkey to move towards low-carbon urbanization.

In this context, it can be argued that the 'green shoots' of low carbon urbanization in Turkey are beginning to appear. The government has recently formulated regulations regarding the energy performance of buildings, to ensure increased energy efficiency and to classify buildings according to energy consumption levels. Moreover, a range of other recent initiatives support the view that moving towards higher environmental standards for new buildings and eco-retrofitting existing buildings will become a major item on the urban policy agenda.

- *CEDBİK and the emerging Turkey Green Building Council (WGBC*). The NGO CEDBIK is part of the WorldGBC and is now an emerging Green Building Council. Supported by this global network, CEDBİK has established training programmes for built environment professionals and its developing the Turkish version of the WGBC (see Figure 5).
- *The potential role of TOKI in promoting low carbon urbanization.* In the UK, the state funded organizations providing social housing were given the role of promoting low carbon housing development. In Turkey, there is clearly the potential for TOKI - the government's mass housing organization delivering 400.000 housing units per annum - to assume the same role. If this programme was adjusted to move towards achieving zero carbon housing by 2023, it would make a major contribution to reducing the carbon emissions from Turkey's housing stock. This is particularly important, because an increasing proportion of TOKI's output will be geared to replacing poor quality gecekondu housing, which have huge CO2 emission levels. This is not an entirely incredible scenario because TOKI recently organized a national competition to generate ideas for the regeneration of the Kayabasi gecekondu neighbourhood to obtain an idea project in February 2009. Kayabasi neighbourhood is located on the European side of Istanbul to the north-west city fringe.
- *Pioneering, high prestige, low carbon housing and mixed-use developments*. Several recent high value projects in Istanbul have sought and achieved LEED international accreditation. These include Varyap meridian (see www.varyap.com), Sapphire (Istanbul Sapphire), Tulip Turkuaz (see Emporis.com), etc.

Figure 5. Turkey's position in the World Green Building Council network

WORLD GREEN BUILDING COUNCIL NETWORK	
The World Green Building Council was established in 2002 to foster the development of a union of national councils around the world. Its mission is to accelerate the transformation of the built environment towards sustainability with the following objectives: • to advocate the important role of green buildings in mitigating global climate change; • to facilitate effective communication, share best practices, and promote collaboration between councils, countries and industry leaders; • to create successful GBCs and ensure they have the resources needed to prosper within their respective markets; • to support effective building performance rating tools and promote the development of mandatory minimum standards for energy efficiency in buildings; and • to develop the capacity of the next generation of green building professionals by designing a unique internship programme and innovative university-credited course on green building.	
The Worldgbc Global Network and Green Building Council Representation in the Countries	
• Established (Full) Members:	Australia, Argentina, Brazil, Canada, Emirates, Germany, India, Japan, Mexico, New Zealand, South Africa, Taiwan, United Kingdom, and USA.
• Emerging Members:	Colombia, Israel, Italy, Netherlands, Poland, Romania, Singapore, Spain, Turkey, and Vietnam.
National Green Building Councils And Their Rating Tools For Effective Building Performance	
• GBC of the United States	• Leadership in Energy and Environmental Design (LEED), developed by the United States GBC.
• GBC of the United Kingdom	• Building Research Establishment's Environmental Assessment Method (BREEAM), developed by the UK-based BRE.
• GBC of Turkey is emerging	• Efforts to develop a national certification system is underway, as part of which a local NGO signed a protocol to run joint certificate programmes with BREEAM and LEED in 2009.
Source: Produced as part of an ongoing research by Kocabas (2010).	

Prospects for move to low carbon urbanisation in Arnavutkoy

The challenge facing the Municipality is to apply the overarching planning policies established by the new Istanbul Master Plan through the development and implementation of a new vision for the future of the District, in the context of the continuing growth of the Istanbul metropolis. The ongoing research and development project which MSFAU undertaking with international partners is focused on preparing the route map for future low-carbon urbanisation. Two pilot projects will be initiated; - one for low-carbon new housing development; and one for eco-retrofitting. The project will assess the feasibility of creation of the *Arnavutkoy Green Building Partnership* to be led by the Municipality in partnership with its stakeholders.

There will be a need to relocate owners from the poor quality, originally illegal housing units that were built in the 1980s in the protected zones and now need to be cleared. This project will review accredited low carbon residential development in Istanbul and elsewhere in the country and draw on this experience to design a pilot project that will deliver a new housing neighbourhood which is carbon neutral, i.e. will generate no net carbon emissions through a combination of high insulation standards, passive heating and the use of renewable energy sources. This housing will be used to re-house families displaced from river protection zones.

This project will identify a site for a new housing development that has good links to public transport and access to basic community facilities. It will design a carbon neutral neighbourhood in which all the units will be insulated to high standards and provided with thermally efficient

heating and cooling systems which together will reduce energy demand. The residual energy requirements will be largely met by the installation of micro-generation infrastructure – solar thermal and photo-voltaic panels, and depending on site conditions wind energy could be harnessed to serve the neighbourhood by the installation of wind tribunes.

Building new housing to much higher environmental standards would reduce future carbon emissions. However, the existing stock is the major source of carbon emissions in Arnavutkoy. Thus the greening of Arnavutkoy must include the eco-retrofitting of the existing low standard neighbourhoods, especially those which engulf historic villages. The pilot project will first review the emerging changes in national energy policy which will provide incentives for owners to insulate their properties and install micro-generation technology, such as solar panels. A survey of housing conditions will identify a neighbourhood where there is best prospect for success, most likely where the local community has a strong attachment to the area, such that the relatively high level of social capital offsets low level of physical capital. The proposed Arnavutkoy Green Building Partnership will then lead the design and implementation of neighbourhood eco-retrofitting programme.

The comparison of progress towards zero carbon new housing and eco-retrofitted old neighbourhoods in the UK with progress in Turkey/Istanbul has shown that significant initial steps have been taken towards low carbon urbanization. Moreover, pioneering initiatives demonstrate the emergence of 'green shoots of green housing'. Our work in Arnavutkoy will hopefully see the emergence of such green shoots in this part of the Istanbul metropolitan area in the not too distant future.

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