Addressing Climate Change by Promoting Low Carbon Climate Resilient Development in the UK Overseas Territories

Needs Assessment: Anguilla

Department for International Development

July 2012

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Content List

Background and Purpose

Introduction

This report forms one of a suite of 16 individual needs assessments of the UK Overseas Territories (UKOTs) produced as part of the process of developing a DFID/FCO led cross HMG programme design to address climate change by promoting low carbon climate resilient development in the UKOTs. The purpose of this assignment was to identify the scope and best way to deliver an appropriate climate change programme for all UK OTs and develop a business case for it (contract duration Feb – June 2012).

The purpose of the reports was to provide a rapid synthesis of information contained within available documentation and frame this in a way which: helped to establish a clear rationale for a generic framework forming one business case for the UK OTs but not allowing this to exclude targeted and selective action to meet specific needs. They were also designed to provide an evidence base for the later comparative analysis across OTs and subsequent prioritisation of different approaches for the business case, which was going to be designed later in the consultancy

It was agreed in May 2012 by the client and the consulting team that the contract was not fully deliverable as expressed in the original Terms of Reference. Details of the full programme of work and consultation is available in the project Inception Report (29th March 2012) and End of Contract Report (11th June 2012).

These reports now form a standalone output of the abbreviated consultancy.

The Reports

The original purpose of the reports still holds and the reader should recognise that the design and level of analysis in this report was set to be achievable within the time available (2 days of evidence gathering, research and writing against over 150 specific data points) and for the original purposes specified and no other. This report provides a general overview to facilitate future potential decision making and does not constitute a comprehensive nor in-depth analytical climate change report.

In a process facilitated by the UK Overseas Territories Association, data content in this report has been reviewed by in-country stakeholders via a nominated point of contact, with feedback incorporated if appropriate.

The report is tailored to the data points required to complete a climate change vulnerability matrix (VAM) tool. The VAM is structured around an understanding of four main issues: the exposure of an OT to climate change (threat analysis); adaptation and resilience; low carbon development and UK exposure. Each issue contains a number of subsets and indicators.

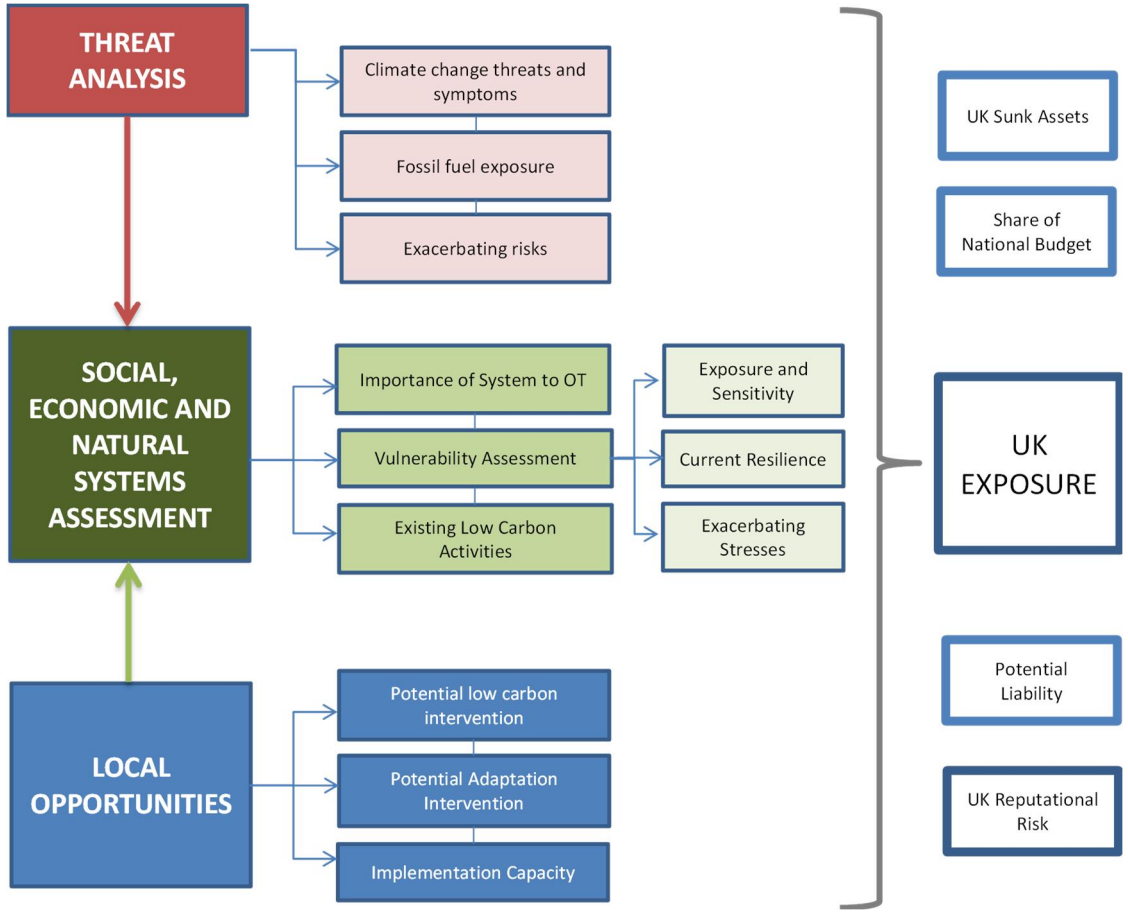
The completed VAM in this report uses a RAG colour coding system to provide a comparative analysis across all of the OTs to feed into the overall programme design. In most cases, data has been included specifically for the later appraisal and business case design process which would have followed.

Attached as annexes to this report are: an associated glossary of terms; a climate change VAM system definitions list; the VAM scoring system (which feeds into the coloured squares in the report text); the scored OT VAM; an initial programme approach table with preliminary sectoral and geographical analysis; and, if relevant, a greenhouse gas emission table.

Figure 1 overleaf illustrates how the data points in the VAM and in this report would have fed into the prioritisation process for a potential UKOT Climate Change Programme and DFID Business Case.

For a full understanding of how the data in this report and the VAM framework has been used, the reader is directed to the programme approaches which are elaborated in the programme Inception Report.

Figure 1: Prioritisation Process for the UKOT Climate Change Programme



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Needs Assessment: Anguilla

KEY INDICATORS	
Population:	16,373 (2010 est)
GDP (US$):	274.8 (2010)
Per Capita GDP:	16,785 (2010)
ODA Entitled:	Yes
UK Annual Budget Support:	N/A
Value of UK Sunk Assets:	N/A
Key Economic Sectors:	Tourism, Financial Services, Fishing and Construction

Threat Exposure Analysis

Climate Change Exposure

Anguilla's climate is characterised by an average monthly temperature of 27°C with seasonal lows of 18 °C (December – February) and highs of over 30 °C (August to September)[1]. Levels of rainfall are highly seasonal, ranging from less than 0.5mm in February to over 25mm in September[2]. The annual range varies significantly depending on the number and intensity of tropical storms that pass through during the June to November hurricane season.

Lying in the "hurricane belt" hurricanes and storms pass through or near to the island every season causing much coastal damage as a result of their wind and wave action, or their torrential rain;[3] between 1995 and 2010 Anguilla was hit by eight such events[4]. Increases in the frequency and intensity of tropical storms are forecast, but there is no universal agreement on the probability of this occurrence.[5]

Evidence suggests that some degree of temperature warming is already taking place in the region. Long term trend data indicates that average annual temperatures increased by more than 0.5 °C over the course of the 20th century[6]. In recent decades the number of "very hot days" (temperatures at or above the 90th percentile) have increased, while the number of "really cool" days and nights (temperatures at or below the 10th percentile) have fallen. A drying trend for the Caribbean summer (June to August) has also been observed[7].

Sea surface temperatures (SST) (for the region) are also rising and generally exceed those being observed over the global tropical oceans over the past 20 years; warming is occurring at 0.2°C to 0.5°C per decade.[8]

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[1] Government of Anguilla and Caribbean Community Climate Change Centre (2010): "Green Paper: A Climate Change Strategy for Anguilla", Caribbean Community Climate Change Centre, Belmopan, Belize, Digital Edition (April 2011)
[2] Average Monthly Rainfall and Temperature for Anguilla (UK) from 1990 to 2009:The World Bank Group Climate Change Knowledge Portal: http://sdwebx.worldbank.org/climateportal/index.cfm?page=country_historical_climate&ThisRegion=North%20America&ThisCCode=AIA
[3] Government of Anguilla and Caribbean Community Climate Change Centre (2010): "Green Paper: A Climate Change Strategy for Anguilla", Caribbean Community Climate Change Centre, Belmopan, Belize, Digital Edition (April 2011)
[4] Ibid and updated in personal communication with Director of the Department of Environment, Karim Hodge, April 2012.
[5] Simpson, M.C et al (2010): op cite p13
[6] Government of Anguilla and Caribbean Community Climate Change Centre (2010): op cite page 20
[7] Neelin, J. D., Munnich, M., Su, H., Meyerson, J. E., and Holloway, C. (2006), "Tropical Drying Trends in Global Warming Models and Observations" PNAS April 18, 2006 vol. 103 no. 16 6110-6115 available at http://www.pnas.org/content/103/16/6110.full.pdf+html
[8] Simpson, M.C., Scott, D., Harrison, M., Silver, N., O'Keeffe, E, Harrison, S., Taylor, M., Sim, R., Lizcano, G., Wilson, M., Rutty, M., Stager, H.,Oldham, J., New, M., Clarke, J., Day, O.J., Fields, N., Georges, J., Waithe, R., McSharry, P.(2010): Quantification and Magnitude of Losses and

Under IPCC A2 (high emissions) and B2 (low emissions) scenarios, projections for mean annual temperature change in the Caribbean Region range from an average of 1.78°C and 1.84 °C by 2050 above the base period average (1961-1990)[9]. Regional Climate Models predict that Anguilla is likely to experience an increase of between 1.61 °C (A2) and 1.72 °C (B2) over this period.[10]

There is an approaching consensus that sea level rise in the Caribbean by the end of the 21st Century will be between 1-2m above 2010 levels.[11]

Predictions for changes in rainfall vary wildly between models and it is not possible to predict long term changes with any degree of confidence.

Resource Exposure

Like many small island states Anguilla is highly vulnerable to any external shocks which affect the supply of important fuel and material. 100 per cent of Anguilla's energy needs are derived from imported fossil fuels.[12] In 2010 approximately 98.5 million kilowatt hours of energy (kwh) were supplied to the grid,[13] (5,326 kwh per capita).[14]

As of March 2012, metered electricity was charged to the consumer on a sliding scale according to utilisation such that: EC$ 22.00 minimum for 0-40 units per kwh; EC$0.63 for 41-25,000 units per kwh and EC$0.62 for 25,001-100,000 units per kwh with a fixed charge of EC$22,000 plus EC$0.43 per unit thereafter.[15]

In March 2012 the average price of a gallon of regular unleaded fuel was EC$17.48 (approximately US$6.45).[16]

Annual water production in 2010 was 297.68 million gallons (approximately 18,181 gallons per capita per annum (daily per capita consumption of 49.81 gallons)).[17]

Greenhouse gas emissions for Anguilla are not included in UK national inventory reporting and there is little data available. Available estimates for 2008 report annual carbon dioxide emissions of approximately 16,000 metric tonnes.[18]

Adaptation and Resilience

Importance to OT

Importance of System to OT

Anguilla is a biodiversity driven economy. Its coastal and marine environments are the key element for its most important sector - low volume, high spend luxury tourism.[19]

Damages Resulting from the Impacts of Climate Change: Modelling the Transformational Impacts and Costs of Sea Level Rise in the Caribbean, United Nations Development Programme (UNDP), Barbados, West Indies.

[9] United Nations Economic Commission for Latin America and the Caribbean (2011):"The Economics of Climate Change in the Caribbean" UNEC, Sub-regional Headquarters for the Caribbean, Port-of-Spain, Trinidad and Tobago

[10] ibid

[11] ibid

[12] Government of Anguilla (2008):"The Anguilla National Energy Policy 2008-2020", GoA, Office of the Chief Minister 2008

[13] GoA (2011): "National Account Statistics" http://www.gov.ai/statistics/NA_Publi_10.htm accessed on 22/03/2012

[14] GoA (2012) – unpublished data tables provided by the GoA via Director of Environment, Mr Kirim Hodge 29/03/2012

[15] Anguilla Electricity Company (2012): http://www.anglec.com/rates.php accessed 22/03/2012

[16] GoA (2012) – unpublished data tables provided by the GoA via Director of Environment, Mr Kirim Hodge 29/03/2012

[17] GoA (2011): "National Account Statistics" http://www.gov.ai/statistics/NA_Publi_10.htm accessed on 22/03/2012 - note this only includes water supplied by the Anguilla Water Authority

[18] http://cdiac.ornl.gov/ftp/trends/emissions/agu.dat accessed 22/03/2012

[19] Government of Anguilla and Caribbean Community Climate Change Centre (2010): "Green Paper: A Climate Change Strategy for Anguilla", Caribbean Community Climate Change Centre, Belmopan, Belize, Digital Edition (April 2011)

Natural

Anguilla and its many outer islands and cays are low-lying and flat. They are mostly rocky, with limestone, corals and sandstone predominating and have generally thin, poor soils. Habitats range from coral reefs to coastal cliffs, degraded evergreen woodland with scattered areas of grassland and scrub, to small areas of mangrove. While its terrestrial vegetation is dominated by scrub forest and shrubs[20] its marine and coastal environment is its most important natural feature, boasting one of the most important, largely unbroken coral reefs in the Eastern Caribbean.[21]

Terrestrial Environment: Among the 520 species of plants, there are a number of native species of particular importance, including the endemics: *Ameiva Corax*, (Little Scrub Ground Lizard), *Ameiva corvina*, (Sombrero Ground Lizard) *Rondeletia anguillensis* (Anguilla Bush) and Thatch Palm *(Thrinax mirrisi)*; these are all at risk from tourism related development. Two native species of orchid are also found on Anguilla.[22]

With no perennial surface water resources, Anguilla's "saltponds" are the only wetland areas on the island. As well as providing important habitat for resident and migratory birds they play a crucial role in flood protection (the value of the flood control services provided by Anguilla's salt ponds is estimated at almost EC$3 million annually[23]) and in coastal protection (salt ponds protect shorelines from tropical storms and hurricanes by acting as buffers to strong surfs, high tides, gale-force winds, and surges of the sea that often come with such severe storms). The roots of the mangroves that line many of Anguilla's ponds also help to bind and stabilise soils along the coast and help limit coastal erosion.[24]

Anguilla has three nationally protected terrestrial area areas (the East End Pond Conservation Area, The Fountain and The Big Spring) set up to protect a landscape disappearing for development.[25]

Seven Important Bird Areas (IBAs) have been identified, covering 8% of Anguilla's land area.[26] The three IBA's on mainland Anguilla are also saltwater ponds. Among the bird species are four range restricted species and globally significant nesting seabird populations.[27]

Marine Environment: The marine environment and resources available to Anguillans cover a much larger area than its terrestrial space and as well as supporting the tourism economy, play an important cultural function.[28] Extensive coral reeds reefs on the north coast and the fringing reefs along the south are included in five nationally protected marine parks.[29] In addition to over 122 species of fish, the parks support migratory populations of migratory turtles (loggerhead, green hawksbill, leatherback and redfooted).[30]

Water Resources: Water scarcity is a serious problem on the island. Anguilla and three of the offshore cays have brackish coastal lagoons and the salt ponds on the mainland are fed by springs from the water table. Porous rocks capture rainfall as groundwater and these have traditionally provided the island's water resources (a brackish water plant at Crocus Hill).[31] Concerns over water quality have led to the development of a new desalination plant (opened in 2011) with daily capacity of 500,000 gallons (one day supply). However, in early 2012 this plant was closed – the exact circumstances are not clear, but press reports signpost unpaid bills.[32]

[20] Government of Anguilla (2009) "The Anguilla Biodiversity Strategy and Action Plan 2009-2014" Prepared by Floyd Homer for the GoA
[21] Government of Anguilla and Caribbean Community Climate Change Centre (2010): "Green Paper: A Climate Change Strategy for Anguilla", Caribbean Community Climate Change Centre, Belmopan, Belize, Digital Edition (April 2011)
[22] Government of Anguilla (2009): "The Anguilla Biodiversity Strategy and Action Plan 2009-2014" Prepared by Floyd Homer for the GoA
[23] The Anguilla National Trust & The Department of Environment (2008):"Saltponds, Ecosystems, and the national Biodiversity Strategy" accessed on 21/3/2012 from
[24] ibid
[25] Government of Anguilla (2009): "The Anguilla Biodiversity Strategy and Action Plan 2009-2014" Prepared by Floyd Homer for the GoA
[26] Birdlife International (2010): http://www.birdlife.org/datazone/userfiles/file/IBAs/CaribCntryPDFs/anguilla_(to_UK).pdf
[27] ibid
[28] Anguilla Climate Change Focal Committee (2011)"Anguilla Vulnerability and Capacity Assessment of the Tourism Sector to Climate Change" Submitted to Caribbean Community Climate Change Centre under the DFID funded ECACC programme, June 2011.
[29] Government of Anguilla (2009): "The Anguilla Biodiversity Strategy and Action Plan 2009-2014" Prepared by Floyd Homer for the GoA
[30] ibid
[31] Anguilla Climate Change Focal Committee (2011): op cite
[32] See for example http://theanguillian.com/2012/05/oh-what-a-beautiful-morning/

Economic

With poor soils, Anguilla is largely unsuitable for agriculture, however, the mainland and a few offshore islands have extensive beaches, clear seas and inshore coral reefs, providing a rich basis for Anguilla's primary tourism industry and supporting fisheries and real estate sectors. Financial services are also important.

Tourism is the driver of the Anguillan economy. Tourism accounted for around 56% of GDP in 2010.[33]The Government target is for this to increase to 64% by 2020.[34] In 2010, 62,000 visitors and 56,400 excursionists to the country spent an estimated US$99.4 million which supported some 3,000 job directly in hotels, restaurants, car rental companies, guesthouses, villas etc. This represented just over two-fifths (41%) of total employment. When the jobs which are indirectly dependent on tourism, such as in shops and construction, are also taken into account, it is estimated that just over 60% of all jobs on Anguilla are dependent on tourism in one way or the other.[35] Anguilla's open economy is extremely vulnerable to changes in the external economic environment and it has suffered since 2008 from the impacts of the global financial crisis (visitor numbers fell from a peak of 77,600 in 2007 to 57,900 in 2009). The GoM is looking to tourism to spearhead the recovery and growth.[36]

Agriculture and Fishing: Fishing is a cultural mainstay of the Anguillan economy, though its contribution to national development is small, accounting for just over 2% of GVA in 2010[37].

Industry and Commerce: Anguilla's financial services industry, real estate and renting and business activities contributed just under 15% each of 2010 GVA, making them the second and third sectors in Anguilla's economy, following tourism (but inextricably linked to that sector).[38]

Energy Supply and Use: High rates of economic growth have led to a year on year increase in annual load growth of 9.7% since 2003 and fuel consumption of 10%. This will require new generating plant of around 5 Megawatts to be installed every two to three years if the present load-growth continues at its present rate.[39]

Social

Population at the last recorded (published census) in 2001 was 11,561. Results from the 2011 census are pending. Most recent estimates suggested that the population is 15,423 in 2012 with a working age population (15-64) of 68%. Life expectancy at birth is 80.98 years.[40] There is little published data on household income and expenditure. That available predates the boom in tourism and construction from 2003. The Department of Social Development currently provides basic needs assistance (and exemption from medical fees) to 150 people.[41]

The relatively small population has been unable to keep pace with the progress of economic development. Up to 2007, approximately, 2000 Chinese and Indian labourers migrated to work in Anguilla on tourism related infrastructure, which are now completed.[42]

[33] Government of Anguilla (2011):"Sustainable Tourism Master Plan 2010-2020" CHL Consulting 2011
[34] ibid
[35] ibid
[36] ibid
[37] GoA (2011): "National Account Statistics" http://www.gov.ai/statistics/NA_Publi_10.htm accessed on 22/03/2012
[38] ibid
[39] GoA (2008):"The Anguilla National Energy Policy 2008-2020", GoA, Office of the Chief Minister 2008
[40] Source to TBC https://www.cia.gov/library/publications/the-world-factbook/geos/av.html accessed 22/03/2012 (note no other source readily available)
[41] GoA (2011): "2012 Budget Address", honourable Minister of Finance, Economic Development, Investment, Commerce and Tourism, Mr Hubert Hughes, Dec 16 2011
[42] Government of Anguilla and Caribbean Community Climate Change Centre (2010): "Green Paper: A Climate Change Strategy for Anguilla", Caribbean Community Climate Change Centre, Belmopan, Belize, Digital Edition (April 2011)

Vulnerability

Sensitivity to Climate Exposure

Increases in surface sea temperature, rising sea levels and a potential change in the intensity of tropical storms could lead to major modifications in the bio-physical environment with an associated impact on tourism. A warming of the ocean could result in massive coral bleaching and coral die-off which would severely impact the fishing industry with the loss of marine habitat, and the tourist industry with the degradation of snorkelling, dive sites and the general beauty of the marine environment. Coral die-off would also eliminate much of the protective and mitigating effects from ground sea erosion along the north coast provided by Prickly Pear, Shoal Bay and other inshore reefs.

The engines of Anguilla's tourism-based economy, led by its luxury hotels (Cap Juluca, Altamer, Cove Castles, etc) are located on relatively low lying sand bars and could face increasing erosion from higher and stronger wave action and even inundation. Erosion of reefs and sand-dunes is already considered one of the major threats facing Anguilla.[43] This is turn would modify the salt pond and mangrove systems which play such a critical role in mitigating flood risk.

Longer term sea level rise is a critical threat to all systems. A suite of hazard risk maps produced as part of a 2011 Vulnerability and Capacity Assessment of the Tourism Sector to Climate Change highlight the vulnerability of major coastal settlements to sea level rise and inland flooding. These include the tourist developments described above at Maunday's Bay and Cove Bay and other settlement areas including the Capital (the Valley), Little Harbour, Blowing Point Village, Rendezvous Bay, Shoal Bay West, Barnes and Meade Bay, Long Bay beach and the settlement of Sandy Ground (the lowest lying village on Anguilla and home to some critical infrastructure (main port for cargo and yachts)). The report concludes *"it is quite evident that Anguilla's coastal and natural resources, as well as its people are likely to be at risks from sea level rise or flooding associated with climate change".* [44]

The relatively flat topography of Anguilla is likely to lead to slow dissipation of flood waters and health risks associated with stagnant water[45].

Saline intrusion of ground water supplies will place greater pressure on expensive desalination technology.[46]

A warming temperature trend is likely to lead to increased demand for expensive imported fossil fuels to support air conditioning and cooling technology, while effects on domestic fisheries and agriculture could increase dependency on imported food supplies[47].

Current Resilience Activities

Although there are few practical measures being undertaken, Anguilla is a very active member of the DFID ECACC programme, under which a draft climate change policy has been developed and there is political will to finalise the policy in 2012.[48.] The Valley Reserve, a 7.35 acres site has been approved by Executive Council for the sole use by the Department of Environment as a demonstration site with regard to environmental management and potentially climate change interventions. It also serves as the headquarters of the Department of Environment.

[43] Wynne S.P. (2010): "Status of Anguilla's Marine Resources 2010"; Report produced for the Government of Anguilla by the Department of Fisheries and Marine Resources
[44] Anguilla Climate Change Focal Committee (2011)"Anguilla Vulnerability and Capacity Assessment of the Tourism Sector to Climate Change" Submitted to Caribbean Community Climate Change Centre under the DFID funded ECACC programme, June 2011.
[45] ibid
[46] ibid
[47] ibid
[48] Reference

Exacerbating Stresses

The local economy is almost wholly dependent on foreign investment in the tourism sector and on external finance, which limits the scope for Government intervention.[49] The small size of Anguilla and its limited natural resource base (including population size) seriously limits the ability of the economy to diversity away from the primacy of tourism within the economy.[50]

The demand for land for housing and tourism related activities and an increase in population growth on the island and from migration has placed severe pressure on an increasingly stressed environment.[51] Anguilla's wetlands and coral reefs are continuously being destroyed for development. The demand for expensive energy and scarce water resources is rising. The mining of sand is undermining protective dune and beach systems. With little domestic agriculture, the majority of food and consumer goods are imported. The value of imported food and animal products increased from US$1m to almost US$3m between 2007 and 2009.[52.]

Anguilla is extremely low lying (the highest point at Crocus Hill is 65 metres (213 feet) above sea level). A number of natural hazards are, therefore, likely to intensify the effects of sea level rise, storm surge and wave action on built infrastructure (major hotels and tourism infrastructure are in very low lying coastal zones) and natural systems (in particular saltponds). These include the degradation of coral systems through acidification, rising sea temperature or an increase in the intensity of tropical storms. The very large coastal to inland land ratio reduces the potential for retreat and relocation policies in times of stress.[53]

Tropical Storms in particular are a major threat. In 1999 Hurricane Lenny brought torrential rains and immense tidal surges. Inland areas (including the Capital, The Valley) were flooded to depths of up to 15 feet. Many hotels were closed for a year with a domino effect on livelihoods[54].

Weak enforcement of legislation has contributed to unplanned and unsustainable development in coastal areas.[55]

Future Opportunities

Potential Adaptation Interventions

The Anguilla Climate Change Strategy 2010[56] and Draft Climate Change Policy[57] identify a range of potential adaptation measures across each sector. Common elements can be summarised as:

- Improvements to the knowledge base – detailed studies are required to confirm: a full inventory of available water resources; a detailed map of geographical vulnerability and disaster prone areas, and an updated and full inventory of baseline biodiversity;
- Finalisation of legislation, policy and plans – there are a range of policies and plans awaiting finalisation and endorsement by the GoA which will help to guide the planning process;

[49] GoA (2010): "Draft Green Paper: A working document to assist with the formulation of A Climate Change Strategy of Anguilla", published by Caribbean Community Climate Change Centre (CCCCC) under the three year regional Enhancing Capacity for Adaptation to Climate Change in the Caribbean UK Overseas Territories (ECACC) Project
[50] ibid
[51] Birdlife International (2010): http://www.birdlife.org/datazone/userfiles/file/IBAs/CaribCntryPDFs/anguilla_(to_UK).pdf
[52] GoA (2011): "National Account Statistics" http://www.gov.ai/statistics/NA_Publi_10.htm accessed on 22/03/2012
[53] GoA (2010): "Draft Green Paper: A working document to assist with the formulation of A Climate Change Strategy of Anguilla", published by Caribbean Community Climate Change Centre (CCCCC) under the three year regional Enhancing Capacity for Adaptation to Climate Change in the Caribbean UK Overseas Territories (ECACC) Project
[54] ibid
[55] ibid
[56] ibid
[57] GoA (2011): "Transforming to a Climate-Resilient, Energy Efficient and Low Carbon Economy-Anguilla's Climate Change Policy (DRAFT)" published by the GoA with the Caribbean Community Climate Change Centre (CCCCC) under the three year regional Enhancing Capacity for Adaptation to Climate Change in the Caribbean UK Overseas Territories (ECACC) Project

- Support to GoA for effective land use planning – this includes the development of land use plans which incorporate vulnerability assessments (through strategic planning and Environmental Impact Assessment processes) and the enforcement of planning decisions;
- Amendments to building codes to formalise requirements for water harvesting and outputs of vulnerability assessments.

Sector specific interventions are described below:

Bio-diversity and eco-systems:

Managing Anguilla's coastal and marine systems is a priority for bio-diversity and the tourist economy that it supports.

- *Effective land use planning* will require a mix of new policy, legislation and strategy and the financial and technical resources to enforce them (including technical assistance and capacity support). This includes enacting and enforcing the draft Environmental Protection Act; approving and enforcing the National Biodiversity Strategy and Action Plan (2008); approving and enforcing the Physical Planning Act and Regulations; approving and implementing the Invasive Species Strategy and Action Plan and approving and implementing a National Wetlands Policy that conserve existing wetland ecosystems and encourages wetland migration strategies.
- An *integrated coastal zone management plan* is required which includes modelling and an understanding of the risk of flooding due to sea level rise and infrastructure improvements. This would be supported by a national coastal monitoring system and system of beach profile collection data in order to assess changes in accretion and erosion.
- Develop a *national biodiversity baseline* against which to monitor and measure change and the effects of change, including adaptive interventions.
- *Practical interventions* include implementing schemes for re-vegetation and re-nourishing beaches and the development of a native nursery for propagation of native plants.

Hydrology and water resources:

Water security is critical for Anguilla. With little natural fresh water a wide package of supporting interventions are proposed:

- *Confirm the resource:* undertake an inventory of underground and surface water resources and an assessment of water use and demand by sector;
- *Public awareness and advocacy:* Establish and promote an educational and awareness programme on water conservation and promote the use of water savings devices (low flush toilets etc) and water harvesting (below);
- *Promote Water harvesting* including revisions to the building code to stipulate a minimum cistern/tank size (10,000 gallons));
- *Technical improvements and more effective maintenance regime* - more effective maintenance of distribution network to reduce leaks;
- *Longer Term Capital Investment* to bring efficiencies to water desalination as technology improves and bring renewable energy sources on stream (wind and solar).

Tourism Sector

Many of the potential interventions for the tourism sector are functions of an effective planning authority that manages and enforces land use and building standards and are also covered elsewhere in this report. Key additional proposals include:

- *Planning and regulation*: Legislate for the requirement that climate change risk assessment and management be a precondition for any tourism type development. Vulnerability assessments should be integrated into planning process for new developments (this could come through the EIA process), and enforce land use planning regulations;

- Establish a *tourism facility licensing system* that includes climate change and environmental risks – this may require tourism facilities to develop, implement and test disaster and climate change risk management and business continuity plans;
- *Practical interventions* - legislate that every tourism type facility has rainwater harvesting and storage capacity and ensure that tourism type facilities be required to separate grey water in watering their grounds and golf courses.

Agriculture and Fisheries:

- *Policy* - develop, adopt and implement an agricultural productivity and food security policy that addresses climate change risks;
- *Planning* - conserve and protect agricultural lands and water sources for agricultural production, balancing the requirements of the agricultural sector with competing land-uses (see points on land use planning and enforcement); develop a fisheries and marine resources management plan which balances the requirements of fisherman with the need for marine conservation and tourism.
- *Technical support to farmers and fisherman* - provide incentives and financial support for farmers to diversify their produce/crops and work their land in different ways – potentially through the more intensive use of agricultural lands, the adoption of pest and draught resistant crop varieties and in the case of fisheries supporting the adoption of new fishery techniques away from reef fishing towards pelagic or aqua-culture

Industry and Commerce:

- *Planning and Development*: Update and enforce building codes to address climate change risks including elevated structures in high risk areas for buildings to cope with periodic flooding;
- *Climate proofing existing infrastructure*: GoA to collaborate with the insurance and financial services sector to establish economic incentives for owners to climate proof existing and new buildings
- Support for improved *waste management and recycling* of material to reduce demand for imports.

Social Systems:

Policy and Legislation updates: Enact and implement the draft Environmental Health and Food Safety Act and regulations and enact and implement the draft Environmental Protection Act and regulations to address sources/points of pollution.

Updated vulnerability mapping: Improve the knowledge base by undertaking a nationwide modelling assessment of key vulnerable zones.

Effective land use planning: Assistance to the GoA to enforce building codes and land-use plans. Consider revising building codes to include elevated structures in high risk areas for buildings to cope with periodic flooding based on vulnerability mapping.

Climate proof critical infrastructure options for locating infrastructure in “safe” zones are very limited and attention will need to focus on climate proofing critical infrastructure including schools, hospitals, all utility plant and infrastructure, the bulk fuel port, fuel storage facilities, port, fuel stations and landfill. It is recommended that a cost benefit analysis and technical evaluation of viable options to bury all utilities is undertaken.

Finally, formally incorporate climate change risks into the national budgeting process and complete a cost benefit analysis of costs of inaction versus costs of action and present this annually in the budget.

Implementation Capacity

"*Above all the issues facing Anguilla's response to the impacts of climate change, the lack of adequate skilled human resources and funding leads the list.*[58]" In 2010 per capita GDP and Government revenue stood at their lowest level since 2004, significantly constraining government spending[59].

A number of government agencies and NGO's play a role in managing the effects of climate change. These include the Department of Environment (DoE), Department of Fisheries and Marine Resources (DFMR), the Physical Planning Department (PPD), the Department of Disaster Management and the Anguilla National Trust. Other departments including Public Works, the water and energy utility companies (GoA Water Authority and Anglec) and the Anguilla Renewable Energy Office (AREO) form part of the institutional framework (and in the latter lead on energy related low carbon development). The lead department on climate change is the DoE.

Among the seven core staff members within the DoE[60] are the following key technical staff: a Director trained with a Certificate of Higher Education in Environmental Science, a Diploma in Endangered Species Management and Masters degree in Conservation Biology; a Co-ordinator for Environment and Sustainable Development trained with a Bachelors in Environmental Management and Masters in Climate Change Impacts and Sustainability; a Coordinator, Scientific Research and Technology Development, with a Bachelors in Civil and Coastal Engineering; a Deputy Director - Strategic Research Programmes trained with a Bachelors in Agriculture and Soil Science and a Masters in Biodiversity and Conservation; a Deputy Director – Policy and Legislative Advancement trained with a Bachelors in Social Sciences and a Masters in Biodiversity and Conservation; a Co-ordinator – Environmental Pollution Prevention and Control trained with a Bachelors in Environmental Engineering and an Education and Awareness Officer with a BSc in Natural Science. Staffing and equipment constraints mean that actual roles are less defined and the team work together as needed.[61]

Draft policies for Climate Change and Biodiversity and legislation (Draft Bill for the Environmental Protection Act) await approval.

Low Carbon Development

Current Emissions

Share of Current Emissions

Emissions data is only available from published sources at the aggregated national level. Anguilla does not report on its GHG emissions.

[58] GoA (2010): "Draft Green Paper: A working document to assist with the formulation of A Climate Change Strategy of Anguilla", published by Caribbean Community Climate Change Centre (CCCCC) under the three year regional Enhancing Capacity for Adaptation to Climate Change in the Caribbean UK Overseas Territories (ECACC) Project

[59] GoA (2011): "Transforming to a Climate-Resilient, Energy Efficient and Low Carbon Economy-Anguilla's Climate Change Policy (DRAFT)" published by the GoA with the Caribbean Community Climate Change Centre (CCCCC) under the three year regional Enhancing Capacity for Adaptation to Climate Change in the Caribbean UK Overseas Territories (ECACC) Project

[60] Provided in written correspondence by Director of the Environment, GoA, Karim Hodge in June 2012

[61] Provided in written correspondence by Director of the Environment, GoA, Karim Hodge in June 2012

GHG Abatement

Abatement Potential

One of the main goals of the draft National Climate Change Policy is to "meet vital energy needs by transitioning towards reliable, affordable, and renewable, energy resources.[62]" The GoA National Energy Policy adopted in 2009[63] and spear headed by the Anguilla Renewable Energy Office (AREO) identifies wind and solar power as the only two sources of renewable energy likely to be viable to reduce the island's dependence on fossil fuels. Preliminary wind data analysis undertaken in 2008 suggested that Anguilla has a very strong wind regime, ideal for wind energy.[64.] Further detailed technical feasibility is planned by the DoE.[65.]

The National Energy Policy actively encourages plans for interconnecting to neighbouring island countries and focuses on regional integration to achieve economies of scale. Anguilla is monitoring progress of a proposed natural gas pipeline from Trinidad and geothermal plant on Nevis. The policy also seeks to examine the feasibility of renewables at macro and micro levels. At micro (household) level it seeks to promote feed-in agreements between the main utility and small independent power providers using renewable energy resources such as solar panels or small wind-generators.

Current Abatement Activities

The GoA have recently engaged consultants[66] to assist efforts to implement key elements of its National Energy Policy and Climate Change Policy by proposing amendments to current electricity legislation. This will provide a clear framework for integrating both utility scale and distributed scale renewable energy into the national electricity grid and the adoption of renewable energy. The initial target is meeting a regional goal of 15% integration into the national grid. The consultancy is also working with DoE to examine updates to the National Energy Policy.[67]

The AREO continues to lead the low carbon agenda in Anguilla, engaging with the public, around the Anguilla Model.[68,]This is a 10 year plan that seeks to make Anguilla energy independent. The AREO are also leading efforts to bring in private sector suppliers to invest in wind and solar activities.

In addition, the Department of Environment has recently written a proposal to obtain funding to carry out a pilot study using solar and wind and another submitted in an attempt to conduct a cost benefit analysis of Anguilla's renewable energy sources in comparison to the non-renewable energy resources. The viability of the wind in particular will also be determined. The DoE continue to engage with the community to keep the islanders abreast of the present situation and how they can be involved.[69]

Future Opportunities

Potential LCD Intervention

The National Energy Policy provides the primary framework for future LCD interventions as follows:

[62] GoA (2011): "Transforming to a Climate-Resilient, Energy Efficient and Low Carbon Economy-Anguilla's Climate Change Policy (DRAFT)" published by the GoA with the Caribbean Community Climate Change Centre (CCCCC) under the three year regional Enhancing Capacity for Adaptation to Climate Change in the Caribbean UK Overseas Territories (ECACC) Project
[63] GoA (2008):"The Anguilla National Energy Policy 2008-2020", GoA, Office of the Chief Minister 2008.
[64] GoA AREO (2010): "Taking Control of Anguilla's Energy Future Today – presentation by Beth Barry at the Anguilla Midterm Economic Review" - http://www.anguillareo.org/resources/AREO%20Presentation,%20MTES%20Feb%202011.pdf
[65] Personal communication, Karim Hodge, Director Department of Environment, June 2012
[66] Climate Development Knowledge Network (CDKN) – details available at http://cdkn.org/project/anguilla-renewable-energy-integration/
[67] Personal communication, Karim Hodge, Director Department of Environment, June 2012
[68] http://www.anguillareo.org/vision.php accessed 12 July 2012
[69] Personal communication, Karim Hodge, Director Department of Environment, June 2012

Energy Supply:

- Renewable Energy: The GoA is actively seeking private sector engagement in the only potential options for Anguilla - wind and solar. Further feasibility work is required to ascertain the true potential for these sources and build upon work of AREO. The DoE is seeking funding for a pilot study. Longer term, there could be potential to link into regional sources of energy arising from potential geothermal networks on Nevis and Montserrat[70].
- There is scope for enhanced efficiency of diesel power generation capabilities.
- Advocacy and communication: customer educational policies to encourage energy efficiency and to promote energy efficient technologies such as energy efficient light fittings and solar hot water heaters. An on-going communications strategy being implemented as part of regulatory reform.

Transport:

The policy has adopted a three pronged approach to Transport: demand side management to encourage smaller and more efficient cars including electric hybrid cars; tax and user pricing to restrict ownership and travel and the development of an efficient public transport system.

Business and residential:

No published source data but potential for future plans to incorporate principles of passive design (for cooling and efficiency).

The Draft Climate Change Policy[71] proposes the establishment of a Climate Change Trust Fund which would raise money from carbon levies, carbon offsets, CDM, and environmental certificates to fund the implementation of the policy.

Implementation Capacity

Key agencies are the AREO and the Department of Environment. Anglec is working closely with both to ensure grid integration of renewables. Man power and capacity constraints in both.

UK Exposure

UK Sunk Assets

Unknown

Absolute Value of UK Transfer

Unknown

Share of National Budget from UK Transfer

Unknown

[70] GoA (2008):"The Anguilla National Energy Policy 2008-2020", GoA, Office of the Chief Minister 2008.
[71] GoA (2011): "Transforming to a Climate-Resilient, Energy Efficient and Low Carbon Economy-Anguilla's Climate Change Policy (DRAFT)" published by the GoA with the Caribbean Community Climate Change Centre (CCCCC) under the three year regional Enhancing Capacity for Adaptation to Climate Change in the Caribbean UK Overseas Territories (ECACC) Project

Potential Liability

Anguilla has a Department of Disaster Management, a Disaster Preparedness Committee, umbrella legislation and has received substantial technical support, including the services of a DFID funded Disaster Management Advisor in 2005.[72] It is likely that any serious natural disaster would affect the whole of Anguilla and HMG would have to respond accordingly. This could include evacuation and repatriation in the UK.

A number of international environmental conventions have been extended to Anguilla, these include: Ramsar Convention on Wetlands of International Importance (no sites have been designated to date), the Vienna Convention for the Protection of the Ozone Layer (no specific action required) and the Montreal Protocol on Substances that Deplete the Ozone Layer (Anguilla is committed to reduce consumption and production of ozone depleting substances). Key international treaties covering migratory species of wild animals do not apply in Anguilla. The appropriate Biodiversity and Heritage Conservation Act 2009 is now enacted but awaits the completion of supporting regulations.

Reputational Risks

Regulation of the financial industry remains the direct responsibility of the Governor under the Constitution, any failure could, therefore, have direct implications as well as reputational impact on the UK[73].

[72] GoA (2011): "Transforming to a Climate-Resilient, Energy Efficient and Low Carbon Economy-Anguilla's Climate Change Policy (DRAFT)" published by the GoA with the Caribbean Community Climate Change Centre (CCCCC) under the three year regional Enhancing Capacity for Adaptation to Climate Change in the Caribbean UK Overseas Territories (ECACC) Project

[73] National Audit Office (2007): "Foreign and Commonwealth Office – Managing Risk in the Overseas Territories" Report by the Controller and Auditor General, HC Session 2007-2008, 16 November 2007

Annex One: UKOT Climate Change Vulnerability Analysis Matrix Glossary of Terms

UKOT Climate Change Vulnerability Analysis Matrix Glossary of Terms

Abatement Potential	(Cost effective) technical potential for reducing emissions within sector.
Absolute GHG Emissions	Annual amount of greenhouse gases (GHG) produced by an Overseas Territory. It is measured as metric tonnes of CO_2 generated per year.
Absolute Value of UK Transfer	Total amount of funding from UK to an Overseas Territory per year.
Adaptation	The extent to which existing initiatives and measures (projects and programmes) are expected to reduce the vulnerability of natural and human systems against actual or expected climate change effects.
Adaptive Capacity	The ability of a social or natural system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt to stress and change.
Carbon sink	A natural or artificial reservoir that accumulates and stores some carbon-containing chemical compound for an indefinite period. Natural: Absorption of carbon dioxide by the oceans via physicochemical and biological processes and photosynthesis by terrestrial plants. Artificial: include landfill and carbon capture and storage.
Climate Change	A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.
Climate Change Impact	Consequences of climate change on social, economic and natural systems without considering adaptation.
Climate Change Exposure	The change in climate with a potential adverse effect on social, economic and natural systems.
Current Abatement Activities	Any action that reduces the emissions or emissions intensity (per unit output) of a given sector on-going or completed in UK Overseas Territories as of March 2012.
Current Resilience Activities	Resilience activities on-going or completed in UK Overseas Territories as of March 2012.
Energy Efficiency	Ratio of energy output of a conversion process or of a system to its energy input: measures taken to reduce demand for energy for the same projected level of development.
Energy Import Dependence	Percentage of energy imported from abroad by the single Overseas Territory.
Exacerbating Stresses	Natural or human factors which in isolation or combination have the potential to lead to a change in the severity or frequency of a climate change threat. This may include inter alia a natural hazard, an extreme weather event, social tension or conflict, demographic trends and population characteristics and institutional and/or societal capacity constraints.
Exposure	The sum of the character, magnitude and rate of climate change variation to which a system is influenced by.
Fossil Fuel Dependence	The percentage of total fuel consumption derived from carbon-based fuels from fossil carbon deposits (including coal, oil, and natural gas) and the percentage of that fuel that is imported.
Frequency and Severity	Occurrence and magnitude of an event in UK Overseas Territories.
Future Opportunities	A territory's ability to reduce greenhouse gas emissions or to enhance carbon sink (Potential LCD Intervention) coupled with its potential to plan adjustment interventions in response to the effects of climate change (Potential Adaptation Intervention).
GHG Abatement (Current)	Potential for reducing emissions within sector coupled with any action already in place that reduces the emissions or emissions intensity of a given sector.

Implementation Capacity	Current (March 2012) capacity to design, implement and monitor all related low carbon / adaptive capacity activities. This includes all current resource constraints (i.e. funding, local personnel capacity, lack of personnel, supportive infrastructure etc.) and opportunities.
Importance of system to OT	The value that society and people in an UK Overseas Territory place on the significance of impacts and vulnerabilities (see Vulnerability) on social, economic and natural systems.
Low Carbon Development (Source)	Actions which include making a contribution towards stabilising levels of CO_2 and other greenhouse gases at a level that will avoid dangerous climate change, through cuts in emissions, demonstrate a high level of energy efficiency, use low-carbon energy sources and/or utilise and enhance carbon sinks.
Magnitude	The area or number of people likely to be affected as a proportion of total population or land area.
Potential Liability	Legal, Financial, Moral and Political exposure arising from the activities of the UK Overseas Territories. This includes UK commitments to legal treaties that extend to the OTs (e.g European Convention on Human Rights) and response to natural and man-made disasters and terrorist events.
Potential LCD Intervention	A territory's ability to reduce anthropogenic CO_2 and other greenhouse gas emissions or to enhance carbon sinks, where ability refers to skills, competencies, fitness and proficiencies that a territory has attained and depends on technology, institutions, wealth, equity, infrastructure and information.
Potential Adaptation Interventions	The potential for a planned intervention which constitutes or contributes to an adjustment in natural, social or economic systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.
Reputational Risk	Reputation is defined as the social evaluation of the public towards HMG. Risk is the probability that a failure to act will produce harm to that reputation. This reputation may be defined in terms of the potential: loss of HMG ethical (moral) reputation for safe guardianship of its citizens) disruption or distortion of HMG relationship with its citizens in the OTs withdrawal of private sector investment in UK Overseas Territories (investor flight).
Resilience	The ability of a social or natural system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt to stress and change.
Resource Exposure	Degree at which a system is influenced by a variation in the availability or the price of resources (specifically water and energy).
Resource Use Efficiency	The effective use of energy and water resources – limiting wastage and maximising usable resources.
Sensitivity to Climate Exposure	Affects the magnitude and/or rate of a climate related perturbation or stress and is the degree to which a system [exposure unit] is affected, either adversely or beneficially, by climate variability or climate change. The effect may be direct (e.g. a change in crop yield in response to a change in the mean, range, or variability of temperature) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to sea level rise).
Share of Current Emissions	Percentage of OT's Absolute GHG Emissions generated by each sector.
Share of National Budget from UK Transfer	Percentage and amount (at 2011 prices) of the total Overseas Territory Budget which comes from HMG budgetary support.
System (Social, Economic and Natural)	A set of functionally inter-related elements subdivided into Natural (ecosystems and bio-diversity) and Social and Economic (Human) elements.
Threat Exposure Analysis	Identification of the threats that may affect a system and evaluation of their frequency and severity.
UK Exposure	Risk to the UK arising from activities in the UK Overseas Territories. It includes UK Sunk Assets, Share of National Budget from UK Transfer, Potential Liability and Reputational Risk.

UK Sunk Assets	UK investments in physical infrastructure in the Overseas Territories which cannot be recovered.
Vulnerability	The degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity.

Key:

Voice reported in VAM

Additional voice

Annex Two: UKOT Climate Change VAM Systems Definition

SOCIAL, ECONOMIC AND NATURAL SYSTEMS DEFINITIONS	
Biodiversity and Ecosystems (Marine and terrestrial)	Ecosystems – A community of living (plants and animals) and non-living things (climate, landscape) which interact together and affect each other. Biodiversity – The variety of plant and animal life found in an ecosystem and the variation in their genetic makeup. It is a measure of the health of an ecosystem, with healthy ecosystems having greater variety and variation in plant and animal life than unhealthy ones. *Source: Brown, 2008*[i]
Hydrology and Water resources	Hydrology - The various systems that are involved in the hydrological cycle (water evaporation, atmospheric circulation of water vapour, cloud formation, precipitation, interception by plant life, land surface runoff, soil infiltrations, groundwater recharge, discharge into streams etc). Water resources – The availability of useful water, often a limiting factor for social and economic development. Sources include groundwater, rainwater and surface reservoirs or rivers. *Source: Gray, 2010*[ii]*; Parry et al., 2007*[iii]
Tourism	Comprises the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purpose *Source: UNWTO, 2011*[iv]
Transportation	A system of conveying people, goods, etc., from one place to another. The definition includes water, air, and land transport.
Agriculture and Fisheries	Agriculture- The science or practise of cultivating the soil and rearing animals Fisheries – The occupation of catching or rearing fish
Forestry	All economic activities that mostly depend on the production of goods and services from forests including commercial activities that are dependent on the production of wood fibre. It also includes activities such as the commercial production and processing of non-wood forest products and the subsistence use of forest products *Source: FAO, 2004*[v]
Energy Supply and Use	Energy supply - Extraction, conversion, and transportation of fuels and electricity to ultimate end use Energy use - The amount of fuels and electricity utilized during a period of time to provide a useful service such as heating, cooling, or transportation *Source: Wilbanks et al., 2008*[vi]
Industry and Commerce	Industry - Industry includes manufacturing, mining, construction and related informal production activities. Other categories, such as transport, energy supply & demand and processing of forest products have been included in other sectors. Commerce – Commerce is the exchange or buying and selling of commodities. In our definition it includes trade, retail and other commercial activities.
Human Health	Human health includes physical, social and psychological well-being. Society – Society includes *infrastructures*, *human settlements* and *social issues*. *Infrastructures* are systems designed to meet relatively general human needs, often through largely or entirely public utility-type institutions. Infrastructures for settlements and society include both 'physical' (sanitation and communication systems) and 'institutional' (shelter, health care, food supply, security and fire services and other forms of emergency protection). *Human settlements* comprise physical capital (buildings) where most of the world's population live. *Social issues* include all the factors relating to human society and its members, concerning the way of life of the local population (livelihoods and welfare). *Source: Parry et al., 2007*

HDI/ Livelihoods/ Poverty	HDI (Human Development Index) - A summary composite index that measures a country's average achievements in three basic aspects of human development: longevity, knowledge, and a decent standard of living. Livelihoods - A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. Poverty – A state or condition in which a person or community lacks the financial resources and essentials to enjoy a minimum standard of life and well-being that is considered acceptable in society. *Source: Chambers and Conway, 1991*[vii]

Note: The sectors considered as potential sources of greenhouse gases in the Low Carbon Development section are the ones reported by Department of Energy and Climate Change, 2009[viii].

[i] Brown, N., 2008. *Climate Change in Overseas Territories: An Overview of the Science, Policy and You,* Peterborough, UK: Joint Nature Conservation Committee

[ii] Gray, G. A. L., 2010. *Montserrat National Climate Change Issue Paper,* Montserrat: Ministry of Agriculture, Land, Housing and the Environment

[iii] Parry, M., Canziani, O. & Palutikof, J. P., 2007. *Climate Change 2007: Impacts, adaptation and Vulnerability, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernment Panel on Climate Change,* Cambridge, UK: Cambridge University Press.

[iv] UNWTO, 2011. *World Tourism Organisation UNWTO.* [Online] Available at: http://statistics.unwto.org/en. [Accessed 12 03 2012].

[v] FAO, 2004: Trends and Current Status of the Contribution of the Forestry Sector to National Economies, Rome: FAO, available on http://www.fao.org/docrep/007/ad493e/ad493e05.htm

[vi] Wilbanks T. J. et al., 2008. *Effects of Climate Change on Energy Production and Use in the United States*, Washington, US: US Climate Change Science Programme

[vii] Chambers, R., & Conway, G. (1991). *Sustainable Rural Livelihoods: Practical Concepts for the 21st Century.* Online] Available at: http://www.smallstock.info/reference/IDS/dp296.pdf [Accessed 28 03 2012].

[viii] Department of Energy and Climate Change, 2009. *5NC - The UK's Fifth National Communication under the United Nations Framework Convention On Climate Change.* London

Annex Three: UKOT Scoring Matrix

ANNEX III: RAG SCORING FOR UKOT VAM

#		Red	Red/Amber	Amber/Green	Green
Threats Exposure Analysis					
	Exposure: Frequency and Severity of climate effects	Current: High Impact 2050: Impact + Confidence	Current: Medium Impact 2050: Impact + Confidence	Current: Low Impact 2050: Impact + Confidence	Current: No impact 2050: No impact
Resource Exposure					
	Exposure: Fossil Fuel and Energy Import Dependence, Resource Use Efficiency and GHG Emission	High Dependency, Emissions and Low Resource Use Efficiency	Medium Dependency, Emissions and low Resource Use Efficiency	Low dependency, emissions and medium resource use efficiency	Low (or No) dependency, emissions, and high resource use efficiency
Importance to Overseas Territory					
1	Importance of System to OT *Natural Systems*	Bio-diversity characterised by high levels of endemic / endangered species and / or territory with internationally recognised environmental designation[1] Critical levels of water stress	Bio-diversity characterised by presence of endemic / endangered species and internationally recognised environmental designation Moderate levels of water stress	Bio-diversity characterised by low levels of endemic / endangered species and no internationally recognised environmental designation Limited levels of water stress	Bio-diversity characterised by very low levels of endemic / endangered species and no internationally recognised environmental designation No water stress
	Economic Systems	Dominant contribution to OT GDP (>20%)	Significant contribution to OT GDP (5%-20%)	Limited contribution (<5%) to OT GDP	No contribution (0%) to OT GDP

[1] As identified by IUCN redbook.

#		Red	Red/Amber	Amber/Green	Green
	Social Systems	Per capita GDP (<$6000) Low life expectancy / High infant mortality rates	Per capita GDP ($6001 - $20000) Medium life expectancy / Medium infant mortality rates	Per capita GDP ($20001 - $50000) Medium life expectancy / Low infant mortality rates	Per capita GDP ($50000 +) High life expectancy / Low infant mortality rates
Vulnerability (Current)					
2.1	Sensitivity to Climate Exposure	High sensitivity to climate change exposure/high potential for irreversible impacts	Medium sensitivity to climate change exposure/medium potential for irreversible impacts	Low sensitivity to climate change exposure/low potential for irreversible impacts	No sensitivity to climate change exposure/no potential for irreversible impacts
2.2	Current Resilience Activities	No resilience planning and/or very limited adaptive capacity	Weak resilience planning and/or adaptive capacity	Moderately effective resilience planning and/or adaptive capacity	Strong resilience planning and/or adaptive capacity
2.3	Exacerbating Stresses	Significant exacerbating stresses	Moderate exacerbating stresses	Limited exacerbating stresses	No exacerbating stresses
Future Opportunities					
3.1	Potential Adaptation Interventions	No technical/programmatic opportunities available.	Limited technical/ programmatic opportunities available, and significant work/investment required to develop bankable projects or programmes	Technical/programmatic opportunities exist, but only as pilot projects/strategies and require further investment to develop bankable projects or programmes	Technical/programmatic opportunities exist and bankable investments/projects are available for immediate funding
3.2	Implementation Capacity	No technical, political and financial capacity to	Limited technical, political and/or financial capacity to	Moderate technical, political and/or financial capacity to implement and	Strong technical, political and financial capacity to implement

#		Red	Red/Amber	Amber/Green	Green
		implement and monitor adaptation activities, with full UK input required.	implement and monitor adaptation activities, with significant UK input required.	monitor adaptation activities, with moderate UK input required.	and monitor adaptation activities, with limited UK input required
Current Emissions					
4.1	Share of Current Emissions	High (>30%)	Medium (15%-30%)	Low (5%-15%)	None/Marginal <5%.
GHG Abatement					
5.1	Abatement Potential	No abatement potential <10%	Limited abatement potential identified 10%-25%	Moderate abatement potential identified 25%-50%	Significant abatement potential identified E.g. >50% of current levels
5.2	Current Abatement Activities	No low carbon development planning or investment	Weak low carbon development planning and investment	Moderately effective low carbon development planning and investment	Strong evidence of effective low carbon development planning and investment
Future Opportunities					
6.1	Potential LCD Intervention	No technical/programmatic opportunities available.	Limited technical/ programmatic opportunities available, and significant work/investment required to develop bankable projects or programmes.	Technical/programmatic opportunities exist, but only as pilot projects/strategies and require further investment to develop bankable projects or programmes.	Technical/programmatic opportunities exist and bankable investments/ projects are available for immediate funding.
6.2	Implementation Capacity	No technical, political and financial capacity to implement and monitor low carbon activities, with full UK input required.	Limited technical, political and/or financial capacity to implement and monitor low carbon activities, with significant UK input required.	Moderate technical, political and/or financial capacity to implement and monitor low carbon activities, with moderate UK input required.	Strong technical, political and financial capacity to implement and monitor low carbon activities, with limited UK input required.

UK Exposure (2012)					
7.1	UK Sunk Assets	>£100m	£20-£100m	£5-£20m	£0-£5m
7.2	Absolute Value of UK Transfer	£500,001 - £1,000,000	£250,001 - £500,000	£100,001 - £250,000	>£100,000
7.3	Share of National Budget from UK Transfer	75%> of national budget for specific system from UK transfer	51% to 75% of national budget for specific system from UK transfer	26% to 50% of national budget for specific system from UK transfer	25%< of national budget for specific system from UK transfer
7.4	Potential Liability	Cost of honouring and implementing legal treaties and other HMG commitments (>£200m)	Cost of honouring and implementing legal treaties and other HMG commitments (>£50m)	Cost of honouring and implementing legal treaties and other HMG commitments (>£10m)	Cost of honouring and implementing legal treaties and other HMG commitments (<£10m)
7.5	Reputational Risks	Irreparable reputational risk in terms of loss of: HMG reputation for safeguarding citizens / climate change and ecosystems; HMG disruption to the relationship with its citizens; and potential to severely disrupt private sector investment in the UKOTs related to specific system.	Serious but not irreparable reputational risk in regards to loss of HMG safeguarding reputation, HMG relationship with citizens or private sector investment related to specific system.	Limited reputational risk in regards to loss of HMG safeguarding reputation, HMG relationship with citizens or private sector investment related to specific system.	No reputational risk in regards to loss of HMG safeguarding reputation, HMG relationship with citizens or private sector investment related to specific system.

Annex Four: Anguilla - Scored VAM

RED
RED/AMBER
GREEN/AMBER
GREEN

Anguilla

Threat Exposure Analysis	Frequency and Severity	
	Current	2050
Climate Change Exposure		
1 Increase in temperature		
2 Increase/decrease/variability in precipitation		
3 Decrease in snow cover and ice		
4 Heat waves		
5 Heavy precipitation events/floods		
6 Extreme storm events		
7 Rising sea levels		
8 Ocean acidification		

Resource Exposure	Current
1 Fossil Fuel Dependence	
2 Energy Import Dependence	
3 Resource use efficiency	
4 Absolute GHG emissions	

Low Carbon Electricity Resource Potential	Share of Current Electricity Production	Potential
1 Wind	X	Medium
2 Hydro	X	X
3 Solar PV	X	Medium
4 Geothermal	X	X
5 Biomass	X	X
6 Waste (solid, liquid)	X	X
Low Carbon Heat Potential	**% of buildings**	**Potential**
1 Solar Thermal	X	Medium
2 Biomass	X	X
Liquid Fuels	**% of consumption**	**Potential**
1 Bioethanol	X	X
2 Bio diesel	X	X

Summary

General Information:
Anguilla, the most northerly of the Leeward Islands, is situated in the northern half of the Caribbean archipelago. Relatively flat and around 35 square miles in area, Population of 15,423 (est 2012).

Threat Exposure Analysis
A low lying small island economy subject to annual tropical storms and hurricanes. Potential exposure to the effects of climate change is very high. The economy is dependent upon a high end tourism product based on beautiful beaches and marine ecology. Sea level rise and inland flooding threaten coastal areas and infrastructure; rising surface water temperatures will affect marine resources impacting on tourism and fisheries. Effects magnified by total dependence on imported fossil fuel and limited potable water resources.

Adaptation and Resilience
Very high sensitivity to the effects of climate change. Exacerbated by multiple stresses, including degradation of terrestrial and marine environment for tourist related development and activities; low lying topography and communities living in flood prone regions and annual hurricane season. Draft adaptation policy in place, but government constrained by lack of capacity and financial resources.

Low Carbon Development
No reporting of GHG emissions. National Carbon Emissions in 2010 estimated at 16,000 metric tonnes of carbon dioxide. GoA pursuing low carbon path, seeking opportunities in wind energy.

UK Exposure
Exposure and liabilities related to effects of extreme weather events on the populace.

Additional Potential Classification

High	High levels of cost effective technical potential identified, with strong evidence of associated planning and investment
Medium	Medium cost effective resource potential identified, with medium evidence of associated planning and investment
Low	Limited cost effective technical potential identified, with limited evidence of associated planning and investment
None	No cost effective technical potential identified.

Adaptation and Resilience	Importance to OT	Vulnerablity (Current)			Future Opportunities	
	Importance of System to OT	Sensitivity to Climate Exposure	Current Resilience Activities	Exacerbating Stresses	Potential Adaptation Interventions	Implementation Capacity
Natural						
Biodiversity and Ecosystems						
Hydrology and Water resources						
Economic						
Tourism						
Transportation						
Agriculture and Fisheries						
Energy Supply and Use						
Industry and Commerce						
Social Systems						
HDI/Livelihoods/Poverty						
Human Health						

UK Exposure (2012)				
UK Sunk Assets	Absolute Value of UK Transfer	Share of National Budget from UK Transfer	Potential Liability	Reputational Risks
x	x	x		
x	x	x		
x	x	x		
x	x	x		
x	x	x		
x	x	x		
x	x	x		
x	x	x		
x	x	x		

Low Carbon Development (Source)	Current Emissions
	Share of Current Emissions
Energy Supply	x
Transport	x
Public	x
Business	x
Residential	x
Industrial Processes	x
Agriculture	x
Waste management	x
Land Use, Land Use Change and Forestry	x

GHG Abatement (Current)	
Abatement Potential	Current Abatement Activities

Future Opportunities	
Potential LCD Intervention	Implementation Capacity

Annex Five: UKOT Potential Programme Approaches – Preliminary Sectoral and Geographical Analysis

	Programme Approach	Sectoral and OT Relevance		Activities	
		Sectors	OTs	Current	Potential
1	Adaptation: Needs Focus	Energy Supply and Use	Gibraltar	Replacement of power plants with a power station powered by diesel engines.	n/a
2	Adaptation: Effectiveness Focus	Biodiversity and Ecosystems	Bermuda	Bermuda Biodiversity Action Plan - Activity report 2010; The Bermuda Plan 2008	Stringent water conservation practices; environmentally-sound desalination operations; better weather forecasting; coastal zone management plan (building on Draft Planning Statement (2008))
			Gibraltar	Management and Action Plan for the conservation of Sites of Community Importance enforced; Marine Special Area of Conservation designated; Catalogue of living resources; Habitat and Species Action Plans.	Dolphin study; climate change studies.
3	Mitigation: Needs Focus	Energy Supply	Bermuda	Electricity for the entire Island is produced at BELCO's Pembroke location.	Public land/seabed allocated for utility-scale renewable electricity generation projects; generation licences for power producers and comprehensive interconnection standards; quality standards specifically for distributed renewable energy systems included in building codes; expedited planning processes for small-scale renewable generation; efficiency standards; energy auditing.
			Gibraltar	Replacement of power plants with a power station powered by diesel engines.	The use of biofuels to be encouraged by selling at lower price in petrol stations; adopt biofuels for Govt fleet.
		Transport	Gibraltar	New bus transport system introduced; free to children.	Reduction in the energy used for road transport (9% target for 2016); Car park and park and ride bus shuttle service construction planned; Increase in public transport times/routes; More free public transport.
4	Mitigation: Emissions Reduction Potential Focus	Energy Supply	Gibraltar	New power station has the capability to run on biofuels.	Adoption of renewable energy resources: wind, energy from waste and tidal current all considered technically viable.
			Montserrat	2008 Montserrat Sustainable Development Plan; shortly be upgrading its diesel based power station to more reliable 1.5 MW source	Exploitation of geothermal energy is a stated aim of the National Energy Policy; test drilling 2012; Geothermal energy is proved to be feasible, there is potential to generate up to 50MW of energy, with export of around 40MW to a neighbouring island; potential wind turbine sites at locations within the Blakes Estate although the new National Physical Development Plan for North Montserrat 2012-2022 zones this land for residential and recreational tourism;
		Transport	Gibraltar	Use of private vehicles discouraged	Car park and park and ride bus shuttle service constructed; increase in public transport times/routes; more free public transport.
		Business	Montserrat	New port development at Carr's Bay	Development of new town at Little Bay creates potential for incorporation of passive design principles; GoM Infrastructure Plan includes suite of potential low cost measures: energy efficient fans, water pumps, cooking appliances and behavioural change.
		Land Use, Land Use Change and Forestry	Montserrat	2008 Montserrat Sustainable Development Plan; New National Physical Development Plan for North Montserrat	National Physical Development Plan for North Montserrat 2012-2022
5	Mitigation: Effectiveness Focus	Business	BVI	National Tourism Policy & Development Master Plan; strengthening Building Regulations; Climate Change risk management protocols, Disaster Relief Fund, micro insurance schemes and mutual/cooperative insurance schemes, financing options for renewable energy installations.	Climate Change Trust Fund - funds would meet costs associated with diversifying tourism product; sub-regional/domestic emissions trading scheme that will ensure benefits are flowing from the UK and European carbon trading scheme; Carbon Levy on guests of hotels and charter yachts; Climate Change Financial Risk Management Levy on foreign registered companies and ships
		Residential	BVI	A National Physical Development Plan, Local Area Plans	Medium/long term implementation A National Physical Development Plan, Local Area Plans
		Waste Management	BVI	Energy & water conservation/efficiency standards;	n/a
		Land Use, Land Use Change and Forestry	BVI	National Tourism Policy & Development Master Plan; expanded protected areas; building & disaster management criteria; National Physical Development Plan; Local Area Plans	Medium/long term implementation A National Physical Development Plan, Local Area Plans

6	Standardised Policy Focus	Relevant to all sectors	Relevant to all OTs	Possibilities are: FCO sponsored pilot on environmental mainstreaming; Scaling up of FCO approach to	Mainstream climate change into existing policies and plans
7	Capacity Building Focus	Relevant to all sectors	Relevant to all OTs	Possibilities are: BAT: provision fo staff education under the Carbon Reduction Strategy. DFID support via	Prioritise interventions in the draft climate change policy and develop programme of capacity support to take forward
8	Next Step Approach	Relevant to all sectors	Relevant to all OTs	Possibilities are: Falklands: scale up wind farm technologies; Gibraltar: renewable energy legislation.DFID support via the ECACC programme and	Prioritise interventions in the draft climate change policy and develop programme of capacity support to take forward
9	UK Exposure Approach	Biodiversity and Ecosystems	Anguilla	Designation of one nationally protected (wetland) area and allocation of 7.5acre demonstration area for Department of Environment; draft climate change policy drafted and to be adopted in 2012;	Conserve existing wetland (saltpond) ecosystems and encourage wetland migration strategies; approve and implement a National Wetlands Policy; continuous monitoring and development of comprehensive bio-diversity baseline; development of an integrated coastal zone management plan which includes understanding the risk of flooding due to sea level rise and improvements to the national coastal monitoring system and system of beach profile data collection ; implement schemes for re-vegetation and re-nourishing beaches
			BAT	26 Specially Protected Areas and Marine Protected Area designated; Penguin distribution study; Wildlife awareness manual; Toolkit for the management of Protected Areas; Identification of important bird areas; Polar Science for Planet Earth project	Proactive management of key Protected Areas; Continuation of the penguin distribution study
			Falklands	Bio-diversity strategy in place. FIG sponsored environmental research, awareness raising, conservetion and management activities. OTEP projects to conserve or collect species or restore plant habitats.	Species monitoring and species action plans in place.
			Montserrat	Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention); Vienna Convention for the Protection of the Ozone Layer;	protected areas/zoning; in situ conservation of endemic species and control of invasive species; revise port legislation re discharge; ensure protection of ghauts and vegetative strips and enforce all aspects of land use planning
			Gibraltar	Management and Action Plan for the conservation of Sites of Community Importance enforced; Marine Special Area of Conservation designated; Catalogue of living resources; Habitat and Species Action Plans.	Dolphin study; climate change studies
			SBAs	Special protection Areas designated; Turtle projects; Acacia Control Project	Designation of Special Areas of Conservation; MoU for Conservation of Migratory Birds of Prey in Africa and Eurasia
		Hydrology and Water Resources	Anguilla	New desalination water plant	Water harvesting, increased water storage and more effective maintenance of distribution network to reduce leaks; promote the use of water savings devices (low flush toilets etc); develop and implement national outreach and educational programmes; bring efficiencies to water desalination as technology improves and bring renewable energy sources on stream (wind and solar).
			BAT	Introduction of more efficient reverse osmosis plants; Introduction of water saving flow reduction valves	Implementation of a programme of water efficiency technology changes
			Falklands	n/a	Climate change modelling based on collected data.
			Gibraltar	Modernisation of fresh water distribution (saving of energy during desalinisation; seawater used for conveyance of sewage and other non-domestic purposes; Replacement of sea defences	Flood defences; Improvement of drainage infrastructure.
			Montserrat	Some adhoc water harvesting, (minidams, roof rainwater harvesting). Many assets not maintained and now in disrepair.	Protect groundwater sources from pollution; develop better water resource management and allocation systems; Opportunity for all new build at Little Bay and Carr's Bay.
			SBAs	n/a	Adoption of Concentrating Solar Power technologies for water desalination

		Tourism	BAT	n/a	Enhancement of UK expertise on tourism management
			Montserrat	Potential investments in the new town at Little Bay and the construction of a new port, if affected, would not reflect well in the international press.	Fiscal incentives to encourage sustainable tourism; integrate mainstream CC issues (impact, responses, opportunities) into tourism development strategy; recommended design speeds increased for new tourism-related structures; enhanced reef monitoring systems to provide early warning alerts of bleaching events, and; artificial reefs or fish-aggregating devices
			Gibraltar	n/a	n/a
		Transportation	SBAs	n/a	n/a
			Montserrat	Potential investments in the new town at Little Bay and the construction of a new port, if affected, would not reflect well in the international press.	Integrate CC issues into current port design and the master plan development at Little Bay and other infrastructural development projects.
			Gibraltar	New bus transport system introduced; free to children.	Car park and park and ride bus shuttle service construction planned; Increase in public transport times/routes; More free public transport.
		Energy Supply and Use	Anguilla	n/a	Enhance efficiency of diesel power generation. Link into regional sources of energy arising from potential geothermal networks on Nevis and Montserrat. Customer educational policies to encourage energy efficiency; promote energy efficient technologies such as energy efficient light fittings and solar hot water heaters.
			BAT	Solar heating systems installed at 2 stations; Introduction of sub-metering more effective monitoing of energy consumption; Introduction of LCD screens	Adoption of renewable enrgy sources: wind turbine and solar photovoltaic systems; Energy efficient rettrofits for research ships; use of unmanned aerial vehicles
			Montserrat	2008 Montserrat Sustainable Development Plan; shortly be upgrading its diesel based power station to more reliable 1.5 MW source.	Exploitation of geothermal energy is a stated aim of the National Energy Policy; test drilling 2012; Geothermal energy is proved to be feasible, there is potential to generate up to 50MW of energy, with export of around 40MW to a neighbouring island; potential wind turbine sites at locations within the Blakes Estate although the new National Physical Development Plan for North Montserrat 2012-2022 zones this land for residential and recreational tourism.
			Gibraltar	Replacement of power plants with a power station powered by diesel engines.	The use of biofuels to be encouraged by selling at lower price in petrol stations; adopt biofuels for Govt fleet; Adoption of renewable energy resources: wind, energy from waste and tidal current all considered technically viable.
		Industry and Commerce	BAT	All infrastructures constructed with best practices in low energy design.	n/a
			Montserrat	Potential investments in the new town at Little Bay and the construction of a new port, if affected, would not reflect well in the international press.	n/a
			Gibraltar	n/a	Incentives for import and use of highly efficient equipment.
		Livelihoods/Poverty	Anguilla	n/a	n/a
			Montserrat	Invested heavily in irrigation infrastructure, training of farmers, livestock production units and a farmer's resource centre.	Government is investing in improved fisheries infrastructure and training to improve the quantity, quality and presentation of produce.
			Falklands	n/a	n/a
			Gibraltar	n/a	n/a
		Human Health	Anguilla	n/a	n/a
			Montserrat	n/a	Public education and outreach; forecasting systems for Dengue Fever and other vector-borne diseases.
			Falklands	n/a	n/a
			Gibraltar	n/a	n/a
10	Do Nothing Approach	n/a	n/a	n/a	n/a