Three Rivers District Council Climate Emergency and Sustainability Strategy Supplementary Document

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Glossary of Key Terms:

Algal Bloom: A large, often considered excessive, growth of algae on or near the surface of water (lakes or sea), occurring naturally or as a result of an oversupply of nutrients from organic pollution.[1]

Biodiversity: the variability among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems. [2]

Biodiversity Net Gain: an approach to development that seeks to make its impact on the environment positive, delivering biodiversity improvements through habitat creation or enhancement, after avoiding or mitigating harm. [3]

Bus Infrastructure: Bus shelters, passenger information and paths to bus stops.

Carbon Emissions: Where carbon emissions are mentioned, this is a generic term which encompasses all greenhouse gas emissions.

Circular Economy: an alternative economic system aimed at eliminating waste and the continual use of resources. Circular systems employ reuse, sharing, repair, refurbishment, remanufacturing and recycling to create a closed-loop system, minimising the use of resource inputs and the creation of waste, pollution and greenhouse-gas emissions. [4]

Climate Change Adaptation: the process of adjustment to actual or expected climate change and its effects. Adaptation seeks to moderate or avoid harm and exploit beneficial opportunities that may arise.[5]

Climate Change Mitigation: human intervention to reduce greenhouse gas emissions or enhance greenhouse gas sinks (e.g. forests, oceans, soil). [6]

Community Energy Schemes: a community-led scheme which acts to reduce, purchase, manage and generate energy in the local community for the collective benefit of the community. [7]

Decentralised Energy: energy that is generated close to where it will be used, rather than at an industrial plant and distributed via the National Grid. Decentralised systems typically use renewable energy sources such as biomass, solar and wind power. [8]

Ecosystem Services: the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural

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[1] https://www.biodiversitya-z.org/content/algal-bloom

[2] https://www.cbd.int/convention/articles/?a=cbd-02

[3] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/819823/net-gain-consult-sum-resp.pdf

[4] https://www.repository.cam.ac.uk/bitstream/handle/1810/261957/The%20Circular%20Economy%20-%20a%20new%20sustainability%20paradigm_accepted%20version.pdf?sequence=1&isAllowed=y

[5] https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-AnnexII_FINAL.pdf

[6] https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-AnnexII_FINAL.pdf

[7] https://www.gov.uk/guidance/community-energy

[8] https://www.edie.net/definition/Decentralised-energy/33

services such as spiritual, recreational, and cultural benefits; and supporting services such as nutrient cycling that maintain the conditions for life on Earth. [9]

Energy Performance Contract (EPC): finances energy upgrades from cost reductions. Under an EPC, an Energy Service Company implements an energy efficiency or renewable energy project, and uses the income from the cost savings or the renewable energy produced, to repay the costs of the project. [10]

Eutrophic*:* (of a lake or other body of water) rich in nutrients and so supporting a dense plant population, the decomposition of which kills animal life by depriving it of oxygen.[11]

Flood Zone 1: land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%) (Low probability).
Flood Zone 2: land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year (Medium probability).
Flood Zone 3a: land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year (High probability).
Flood Zone 3b: land which has a 1 in 20 chance of flooding (5%), classified as functional floodplain. (Very high probability). [12]

Green and Blue Infrastructure Network: a network of multi-functional green and blue spaces and features, urban or rural, which can deliver quality of life and environmental benefits for communities. Green infrastructure includes parks, open spaces, playing fields, woodlands, street trees, allotments, private gardens, green roofs and walls, sustainable drainage systems and soils. Blue infrastructure refers to water elements like rivers, canals, ponds, wetlands, floodplains, water treatment facilities etc.[13]

Lead Local Flood Authority: are county councils and unitary authorities designated under the Flood and Water Management Act 2010 to lead in managing local flood risks (i.e. risks of flooding from surface water, ground water and ordinary watercourses). [14]

Natural Flood Management: utilises natural processes to reduce the risk of flooding and coastal erosion, by, for example: restoring bends in rivers, changing the way land is managed so soil can absorb more water, and creating saltmarshes on the coast to absorb wave energy. [15]

Net Zero Carbon: is achieved when the amount of greenhouse gas emitted is equal to the amount removed from the atmosphere –also known as carbon neutrality. This differs from “zero carbon” which means that no carbon emissions are being produced. 16

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[9] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/819823/net-gain-consult-sum-resp.pdf

[10] http://citynvest.eu/content/what-energy-performance-contracting-epc

[11] https://www.lexico.com/definition/eutrophic

[12] https://www.gov.uk/guidance/flood-risk-and-coastal-change#flood-zone-and-flood-risk-tables

[13] https://www.tcpa.org.uk/green-infrastructure-definition

[14] https://www.local.gov.uk/topics/severe-weather/flooding/local-flood-risk-management/managing-flood-risk-roles-and

[15] https://www.gov.uk/government/news/natural-flood-management-part-of-the-nations-flood-resilience

[16] https://www.edie.net/definition/Net-zero-carbon/232

Permaculture: the conscious design and maintenance of agriculturally productive ecosystems which have the diversity, stability, and resilience of natural ecosystems. Permaculture utilises a range of sustainable, regenerative agricultural practices including (but not limited to): organic farming, rotational grazing, mulching, composting, agroforestry and rainwater harvesting. [17]

Rewilding: conservation efforts aimed at restoring and protecting natural processes and wilderness areas. This may include providing connectivity between habitats, and protecting or reintroducing apex predators and keystone species. [18]

Stakeholders: individuals, groups or other entities that have an interest in any decision, activity or policy of an organization. The Council's stakeholders include (but are not limited to): residents, parish councils, local schools, colleges and universities, local businesses, faith groups, youth groups, emergency services, government departments and agencies, housing associations, care homes, Councillors, charities, transport operators and utility companies. [19]

Sustainable Drainage Systems (SUDS): drainage systems that provide an alternative to the direct channelling of surface water through networks of pipes and sewers to nearby watercourses. SUDS aim to reduce surface water flooding, improve water quality, and enhance biodiversity by lowering flow rates, increasing water storage capacity and reducing transferral of pollution to waterways. [20]

Tipping Point: a tipping point in the climate system is a threshold that, when exceeded, can lead to large changes in the state of the system which are often irreversible.[21]

Urban Heat Island: an urban or metropolitan area that has consistently higher temperatures than surrounding rural areas, due to of lack of vegetation, the low reflectivity of buildings, roads and other infrastructure, and the production of waste heat by vehicles or buildings.[22]

[17] https://www.permaculturenews.org/what-is-permaculture/

[18] https://en.wikipedia.org/wiki/Rewilding_(conservation_biology)

[19] https://asq.org/quality-resources/stakeholders

[20] https://www.bgs.ac.uk/geology-projects/suds/

[21] https://www.ipcc.ch/site/assets/uploads/sites/2/2019/02/SR15_Chapter3_Low_Res.pdf

[22] https://www.thefreedictionary.com/Urban+heat+island

Glossary of Acronyms:

BEIS: Department for Business, Energy & Industrial Strategy

BREEAM: Building Research Establishment Environmental Assessment Method - the world's longest established method of assessing, rating, and certifying the sustainability of buildings. It sets standards for the environmental performance of buildings through the design, specification, construction and operation phases and can be applied to new developments or refurbishment schemes.

CHP: Combined heat and power a highly efficient process that captures and utilises the heat that is a by-product of the electricity generation process. By generating heat and power simultaneously, CHP can reduce carbon emissions by up to 30% compared to the separate means of conventional generation via a boiler and power station.

CO_2e: Carbon dioxide equivalent **-** For any amount of any gas, it is the amount of CO_2 which would warm the earth as much as that amount of that gas. Thus it provides a common scale for measuring the climate effects of different gases.

CV: Calorific Value - The calorific value of LFG can be defined as the amount of heat produced on combusting a unit volume of gas

GHG: Greenhouse Gas – heat-trapping gases that contribute to the greenhouse effect which causes global warming, examples include: carbon dioxide, methane, nitrous oxide, ozone and water vapour.

HCCSP: Hertfordshire Climate Change and Sustainability Partnership; a group comprised of representatives from district councils in Hertfordshire and from the Hertfordshire Local Enterprise Partnership (LEP) which aims to lead and enable the creation of a more sustainable Hertfordshire.

IPCC: Intergovernmental Panel on Climate Change – a United Nations body of scientists and economists which assesses scientific, technical and socio-economic information relevant to the understanding of human induced climate change, potential impacts of climate change and options for mitigation and adaptation.

IPBES: Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.

KWh: Kilo watt hour (1000 watts)
MWh: Megawatt hour (1 million watts)
GWh: Gigawatt hour (1 billion watts, 1000 megawatts)

Kt CO_2: kilo tonnes of carbon dioxide
t CO_2: tonnes of carbon dioxide

MWp: Mega Watt peak, a solar power measure in photo-voltaic (PV) industry to describe a unit's nominal power.

WWF: the World Wide Fund for Nature.

Key Studies and Reports – the scientific basis for action:

- The IPCC 'Special Report: Global Warming of 1.5°C' published in 2018 declared humanity has already exceeded global warming of 1°C above pre-industrial levels and will likely experience 1.5°C of warming between 2030 and 2052. [23]
- The IPBES 'Global Assessment Report on Biodiversity and Ecosystem Services' 2019 revealed 75% of Earth's ice-free land and 66% of the marine environment has been significantly altered by human actions, and 1 million animal and plant species are now threatened with extinction, many within decades.[24]
- The World Economic Forum 'Global Risks Report 2020' recognised biodiversity loss as one of the top five threats facing humanity, which has "critical implications … from the collapse of food and health systems to the disruption of entire supply chains."[25]
- The WWF Living Planet Report 2020 warned the planet's wildlife populations have plummeted by 68% on average since 1970.[26]

Where We Are Now: 4 of 9 Planetary Boundaries Have Been Crossed

The Earth has crossed four of nine 'planetary boundaries' due to human activities, increasing the risk of irreversibly driving the Earth in to a much less hospitable state. These boundaries are: extinction rate (an indicator for biosphere integrity), deforestation, atmospheric CO_2 concentration (an indicator for climate change), and the flow of nitrogen and phosphorus.

Planetary boundaries are scientifically based levels of human pressure on critical global processes that could create irreversible and abrupt change to the 'Earth System' — the complex interaction of atmosphere, ice caps, oceans, land and living organisms.

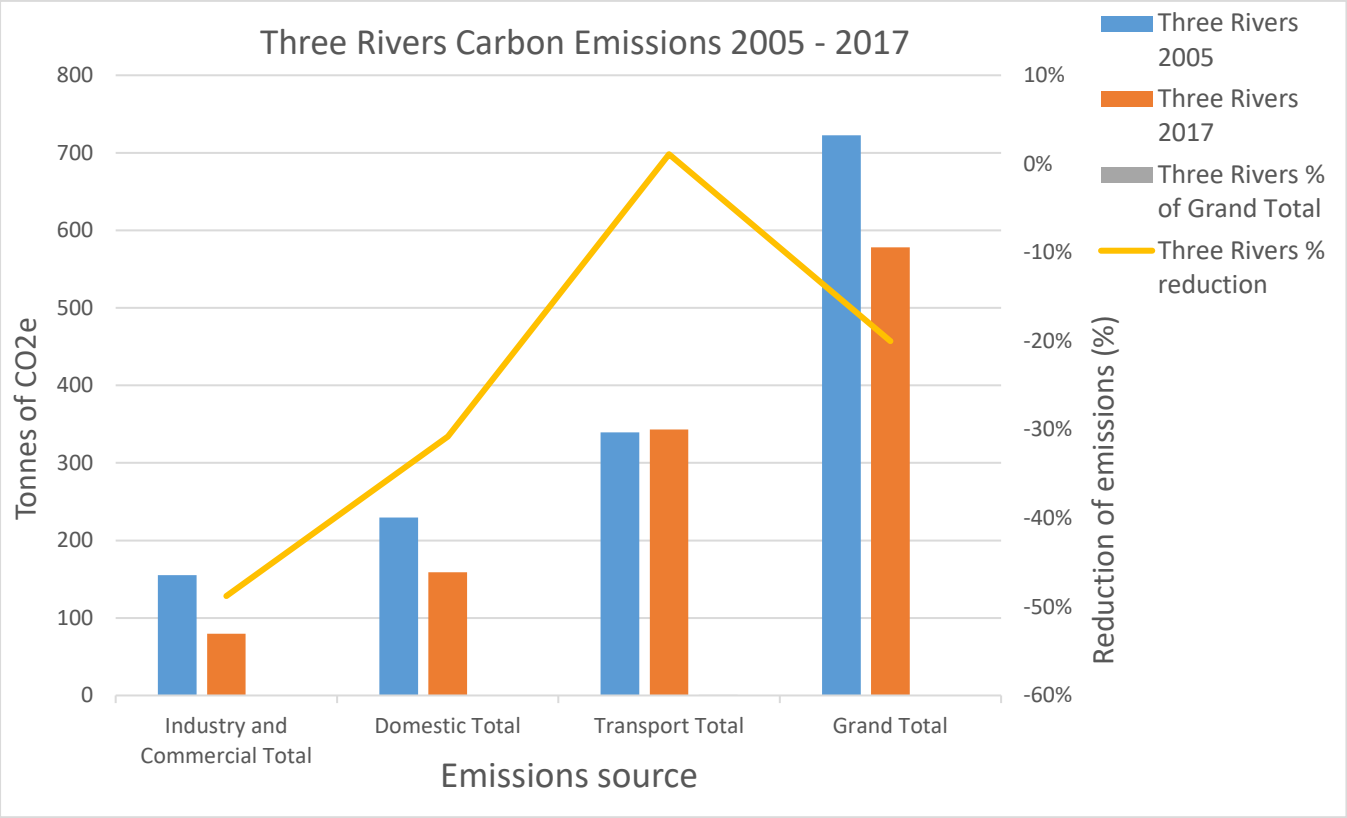
Action therefore needs to be taken to return humanity to a "safe operating space".

(Sources:
https://www.stockholmresilience.org/research/research-news/2015-01-15-planetary-boundaries---an-update.html
https://ec.europa.eu/environment/integration/research/newsalert/pdf/four_out_of_nine_planetary_boundaries_exceeded_410na1_en.pdf)

[23] https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_SPM_version_report_LR.pdf
[24] https://ipbes.net/sites/default/files/2020-02/ipbes_global_assessment_report_summary_for_policymakers_en.pdf
[25] http://www3.weforum.org/docs/WEF_Global_Risk_Report_2020.pdf
[26] https://www.zsl.org/sites/default/files/LPR%202020%20Full%20report.pdf

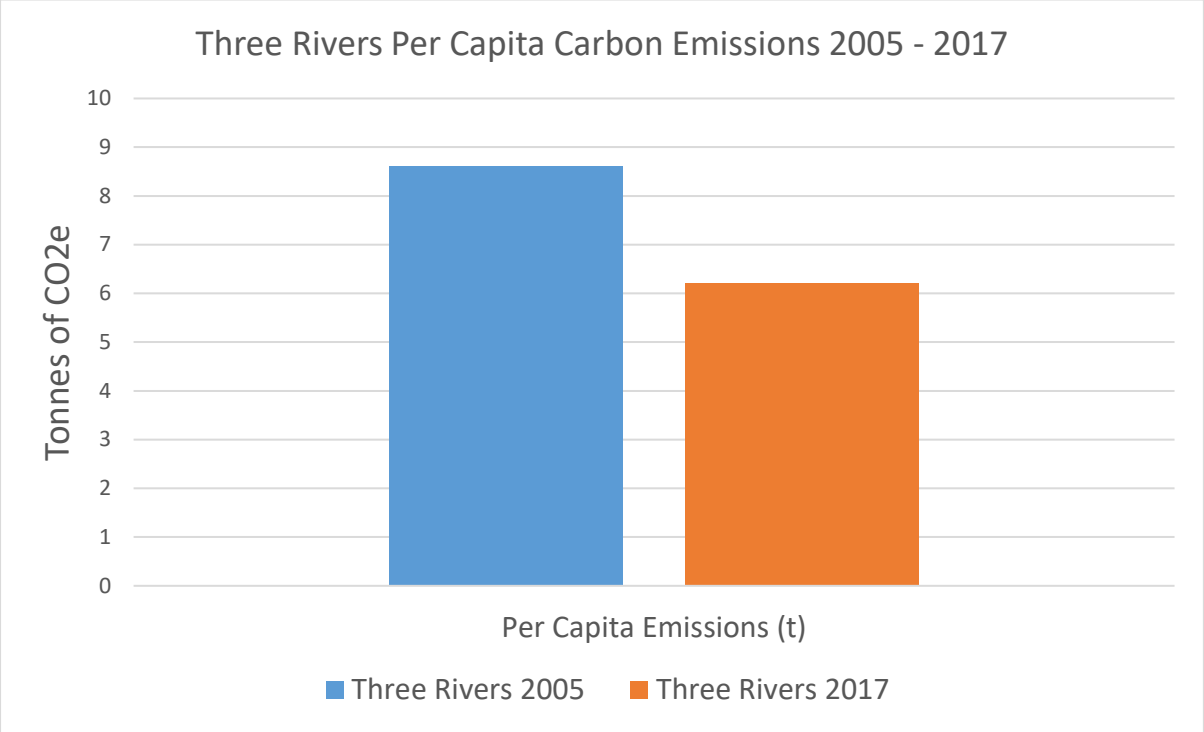
Carbon Emissions in the District:

The 2008 Climate Change Act has committed the UK to drastically curtail its contribution to global heating by 2050. Net-zero means any greenhouse gas emissions produced must be balanced by emissions removed from the atmosphere.



Source: https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2017

	Three Rivers				England	
Year	2005	2017	% of Grand Total	% reduction	2017	% of Grand Total
A. Industry and Commercial Electricity	101.2	42.6	7%	-58%		
B. Industry and Commercial Gas	35.2	25	4%	-29%		
C. Large Industrial Installations						
D. Industrial and Commercial Other Fuels	17.2	10.2	2%	-41%		
E. Agriculture	1.9	1.7	0%	-11%	3,527	1%
Industry and Commercial Total	155.4	79.6	14%	-49%	103,993	36%
F. Domestic Electricity	93.9	42.1	7%	-55%		
G. Domestic Gas	130.4	111.1	19%	-15%		
H. Domestic 'Other Fuels'	5.1	5.6	1%	10%		
Domestic Total	229.4	158.8	27%	-31%	78,090	27%
I. Road Transport (A Roads)	57.5	43.6	8%	-24%		
J. Road Transport (Motorways)	216.3	232.6	40%	8%		
K. Road Transport (Minor Roads)	64	65.4	19%	2%		
L. Diesel railways	0.2	0.2	0%	0%		
M. Transport Other	1.5	1.3	21%	-13%		
Transport Total	339.4	343.1	59%	1%	106,234	37%
Transport Total excluding motorways	123.1	110.5	19%	-10%		
LULUCF Net Emissions	-1.9	-3.6		89%	-5,104	
Grand Total	722.4	577.9		-20%	286,741	
Grand Total excluding motorways	506.1	345.3		-32%		
Population (mid-year estimate)	84,305	92,641		10%	55,620,000	
Per Capita Emissions (t)	8.6	6.2		-28%	4.3	
Per Capita Emissions (t) excluding motorways	6.0	3.7				

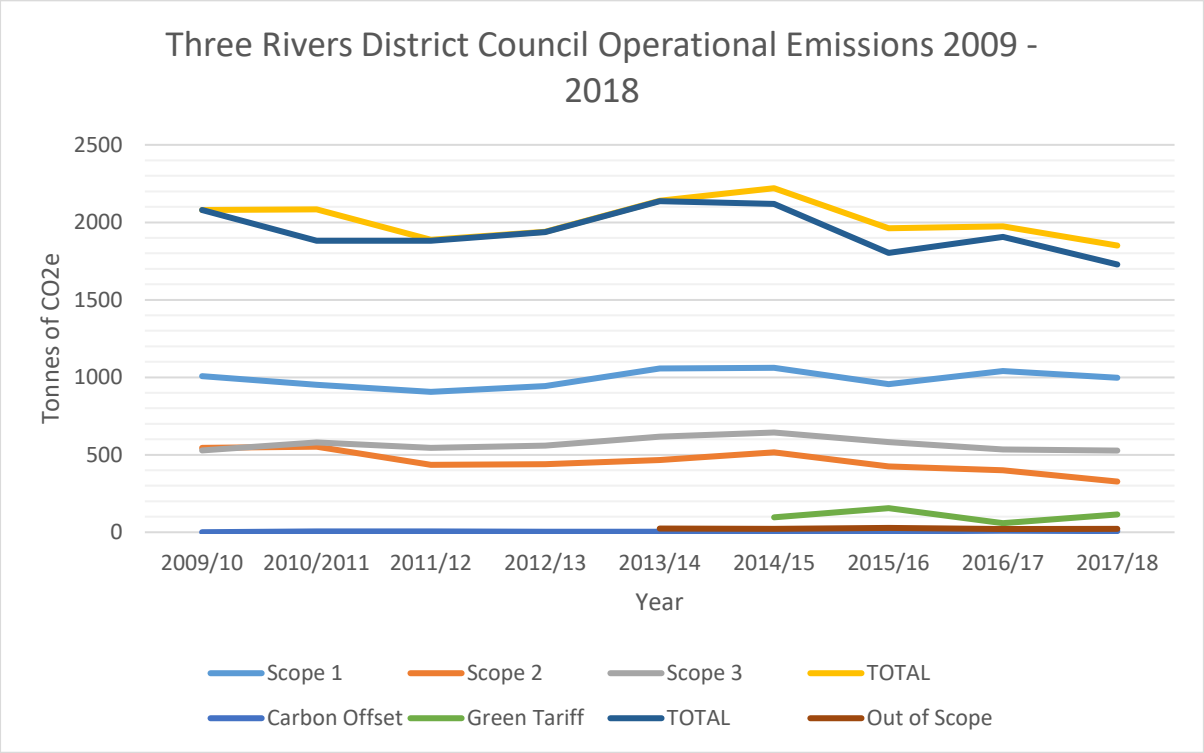


Three Rivers District emissions in 2017 were 577 kt CO_2, which equates to 6.2t CO_2 per capita, a decline of 28% since 2005 which ranks Three Rivers as 40th of 53 authorities in the East of England. This compares to the average per capita in England of 4.3t CO_2.

In 2017 27% of District emissions are from the domestic sector identical to the rest of the England. The industrial and commercial emissions were 14% of all emissions, compared to 36% in England.

Conversely transport emissions were 59% for TRDC compared to 37% for England. This is due to the M25 which represents 40% of all our district emissions.[27]

Council operations 2017/18 emitted 1.729kt CO_2, which is 0.3% of the district emissions. Since measurement started in 2010, emissions have dropped by 11% excluding carbon offset (17% with). This is partly reflective of the solar panel installations in 2010.



The GHG emissions, according to the BEIS reporting system, are categorised between Scopes 1 – 3, where;

Scope 1 (Direct emissions): Emissions from combustion in owned or controlled boilers, furnaces, vehicles. This includes natural gas or other type of liquid fuel to heat buildings for this guidance advises to calculate carbon dioxide emissions based on the gross calorific value (CV). This scope also includes travel undertaken in vehicles owned or controlled by TRDC (fleet).

Scope 2 (Indirect emissions): Emissions resulting from electricity used in for council-owned buildings. Compared with previous years this section has been divided into two different emissions one is reporting emissions from electricity generation which are reported within Scope 2 and a second one is reporting emissions from Transmission & Distribution which are counted within Scope 3.

[27] 2005-17_UK_local_and_regional_CO2_emissions_tables

Scope 3 (Indirect - labelled Well to Tank (WTT)): Emissions that are a consequence of council actions, which occur at sources which Three Rivers doesn't own or control and which are not classed as scope 2 emissions. This is now inclusive of the emissions from the Electricity Transmission and Distribution (T&D) and the WTT of electricity generation and T&D. Emissions from miles travelled for business purposes in staff owned vehicles, contracted services with no control and emissions from extracting, processing and transporting of fuel.

Renewable Energy

In 2018 Three Rivers had 639 sites generating renewable electricity 638 of which are Solar PV and one is gas from sewage at Maple Cross Lodge. Capacity is 5.3 MW which represented a 1.4% growth on the previous year compared to the national average for the UK of 11%.[28]

Three Rivers consumes on average 4300kWh of electricity a total of 334 GWh per household, per annum. This ranks TRDC 31st out of 45 local authorities classified in the region "East" in terms of highest electric consumption. [29]

Coursers Farm Anaerobic Digestion (AD) plant processes the district's food waste, and converts it to electricity.

Renewable energy produced within Three Rivers (0.0053 GWh) meets approximately 0.0016% of the electricity consumed (334 GWh) which is significantly below the national levels of 33% generated from renewable sources of energy including wind, solar, bioenergy, hydro, tidal and others. [4]

28 https://www.gov.uk/government/statistics/regional-renewable-statistics

29 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/853754/Sub-national_electricity_consumption_statistics_2005-2018.xlsx

The table below provides a summary of the risks, impacts and opportunities associated with climate change in Three Rivers[30,31,32].

Event:	Risk:	Impact:	Opportunities:
Hotter, drier summers.	Overheating	Heatwaves and increased summer temperatures may lead to increased risk of mortality and morbidity due to heat-related illness. The elderly, young children and those with existing health conditions are particularly vulnerable to heat-stress. Increased summer temperatures combined with increased periods of time spent outdoors may lead to an increased incidence of skin cancer cases and deaths. Higher temperatures are associated with declines in workplace productivity, which can have significant negative economic impacts. Increased demand for artificial cooling to help reduce excessive indoor heat. If provided by air conditioning, this will increase the demand for electricity, further contributing to emissions of CO2 and adding further heat energy to the external urban environment.	Increased summer temperatures and extended periods of outdoor activity could increase vitamin D levels and help to improve peoples' physical and mental health. More economic opportunities for the leisure and tourism sector, e.g. with the rise of "staycations".

[30] https://www.theccc.org.uk/wp-content/uploads/2016/07/UK-CCRA-2017-Synthesis-Report-Committee-on-Climate-Change.pdf

[31] https://www.hertfordshire.gov.uk/microsites/building-futures/a-sustainable-design-toolkit/technical-modules/climate-change-adaptation/risks-and-impacts-in-hertfordshire.aspx#DynamicJumpMenuManager_2_Anchor_1

[32] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69487/pb13698-climate-risk-assessment.pdf

		As our external environment becomes hotter, there will be an increased demand for green and naturally shaded spaces to provide refuge from the sun and heat. If green spaces are not designed with climate change impacts in mind, then they will require irrigation, putting additional pressure on water resources.	
	Poor Air Quality	Hot, dry summer days degrade local air quality by favouring the production of harmful air pollutants such as ground-level ozone and particulate matter. In the absence of wind or rain, these pollutants become highly concentrated, creating a dense blanket of smog. The resulting low air quality can lead to an increase in acute respiratory illnesses, hospitalisations and premature deaths.	
	Buildings and Infrastructure Exposed To Prolonged Extreme Heat	Buildings and other structures will be damaged from cracking caused by extreme heat. This will lead to a higher number of insurance claims being made, driving up premiums and overall costs to property owners. The risk of damage to road and rail networks from buckling rails and cracking or melting roads could potentially become a significant issue for Hertfordshire. Such disruption to the transport network occurred during the heatwave of 2003 and hot summer of 2006.	
	Local Ecosystems And Species Exposed to Prolonged Extreme Heat	Even a slight increase in average annual temperatures could alter Hertfordshire's ecosystems, resulting in a potential reduction of local biodiversity as native flora and fauna struggle to tolerate climatic changes. Meanwhile, non-native species, pests and pathogens may proliferate. Riverine ecosystems are highly sensitive to climatic changes. Warmer rivers, streams and lakes will impact on biodiversity and the productivity and functioning of aquatic ecosystems.	

		Many aquatic species have limited thermal ranges. Increasing water temperatures will likely cause cool-water species of plants, invertebrates and fish to decline in abundance, while some species may become locally unviable, subsequently impacting the species composition of local ecologies. The lower dissolved oxygen content of warmer waters can kill fish and other organisms by anoxia. Increased water temperatures combined with the accumulation of nutrients causes waterways to become eutrophic, enabling the proliferation of algal blooms, which will subsequently increase the cost of water treatment and further deoxygenate aquatic habitats.	Increased habitat range for some generalist species e.g. warm water fish or southerly insects and plants.
	Drought	As natural environments become increasingly arid and new development encroaches on green space, the likelihood of field fires that endanger nearby communities, businesses and wildlife will increase. Drier summers will put pressure on the availability of water in Hertfordshire for drinking, washing and irrigation as groundwater resources, such as aquifers, decline whilst simultaneously being subjected to increased demand by a growing population. Many areas within Hertfordshire will experience acute water stress where demand for mains water exceeds the available supply, necessitating the enforcement of restrictions on water usage. Low water levels and reduced river flows resulting in increasing concentrations of pollutants (due to reduced dilution) will damage freshwater ecologies and undermine the ecosystem services they provide. Low water flows would limit the level of dissolved oxygen available, threatening the survival of freshwater organisms.	

		In severe cases, low flow conditions can cause water bodies to dry out, leading to a complete loss of freshwater habitat.	
	Flash Flooding	Heavy rainfall following a prolonged period of dry weather may result in increased surface water runoff and overflow from inundated drainage networks (particularly in urban settings with a high prevalence of impermeable surfaces), which could cause contamination of waterways and groundwater sources. These declines in water quality will intensify the need for water treatment.	
Milder, wetter winters.			Increased winter temperatures may lead to a reduction in cold-related deaths and disease. Warmer winters will likely reduce the energy demands for heating, thereby reducing greenhouse gas emissions.
	Flooding	Increased flooding would increase the risk of deaths, injuries and people suffering from mental health effects as a result of the impacts of flooding. When floodwaters recede, bacteria and mould may remain, increasing rates of respiratory illnesses, such as asthma. Flood damage to domestic properties could cause the temporary or permanent displacement of people, negatively affecting the wellbeing of local communities. Where homes are severely damaged and occupants are permanently displaced, this could lead to an increase in the number of vacant, decaying houses and the disintegration of communities. Flood damage to non-domestic properties will cause disruption to the functioning of businesses, resulting in financial losses. Where properties are severely damaged and businesses are permanently displaced, this could lead to an increase in the number of	

		vacant buildings and the loss of employment land. Flood damage to public sector buildings and facilities will cause disruption to the services they provide, such as hospitals, schools, and waste collection and processing. Where flood damage to buildings is repairable, this may incur financial costs for the property owner. As more properties suffer floodwater damage, insurance claims will increase, driving up premiums and overall costs to customers. Some homeowners in flood risk areas may find their properties become uninsurable. Flooding may disrupt the provision of utilities such as water, electricity, internet and mobile communications and public transport services by damaging infrastructure. Repairing and replacing flood-damaged roads, bridges, utilities, and other public infrastructure will come with significant costs.	
Intermittent episodes of prolonged drought and heavy rain.	Changing of ground conditions.	Clay soils, found throughout Three Rivers District, are particularly susceptible to shrinking and swelling that can cause structural damage to buildings and infrastructure. Where the underlying geology is clay-based, extended periods of heavy rain risk compromising building foundations, leading to structural damage of the building from subsidence and heave. Heavy rain could also cause landslip, potentially damaging properties, roads and other infrastructure. Clay soils lose water as they dry making them shrink. In periods of drought, the soil cracks, creating deep underground fissures which can cause subsidence and structural damage to buildings and transport infrastructure.	
Increasingly Unpredictable Weather	Uncertainty regarding the availability and recharge of	This uncertainty can lead to increases in unit costs of water supply.	

	groundwater resources.		