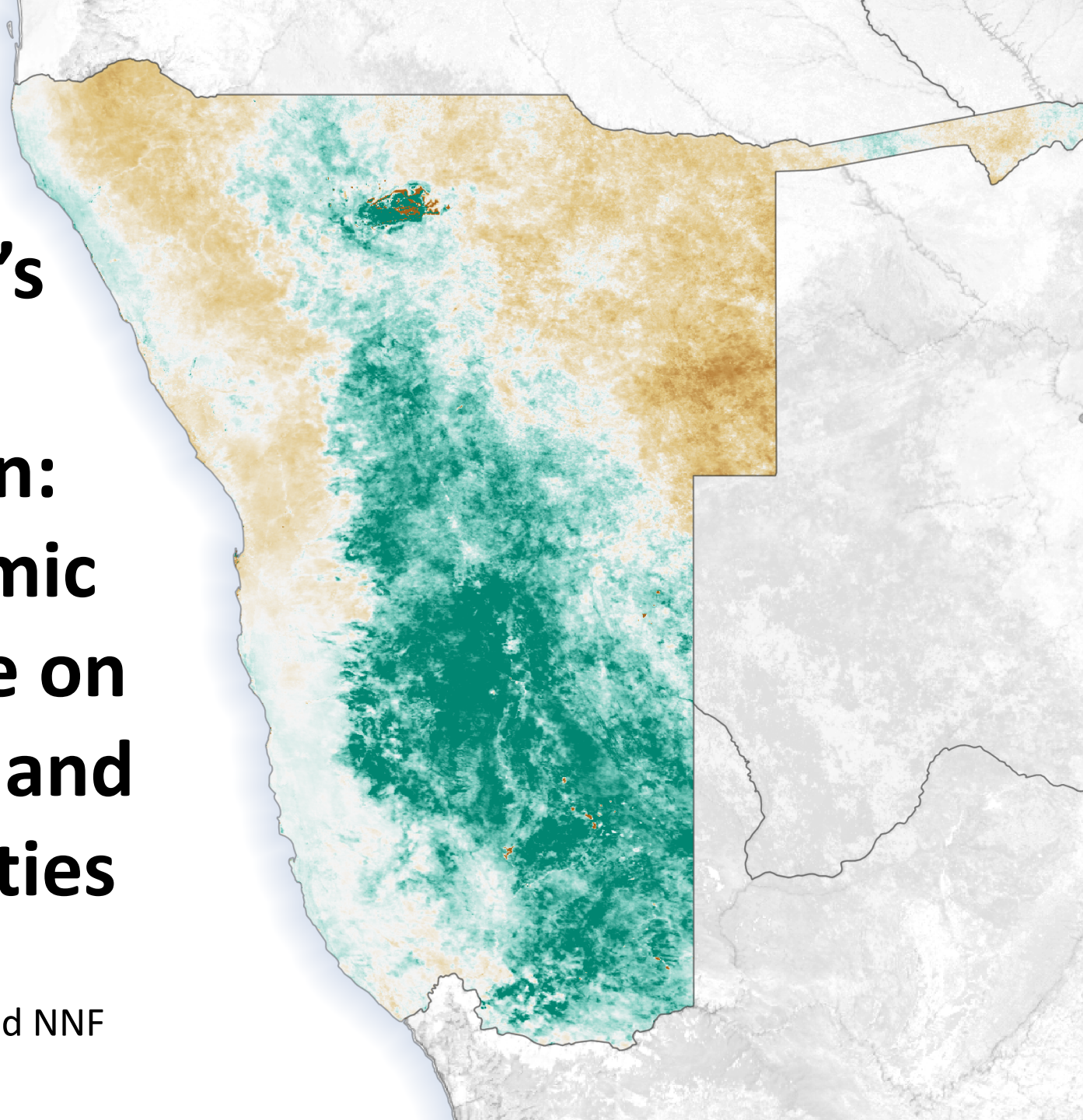
Namibia's Green Transition: An Economic Perspective on Challenges and Opportunities



Robin Sherbourne and NNF

21 April 2022

Disclaimer

The information in this presentation is based on official government statistics (from the Ministry of Finance, the Ministry of Environment and Tourism, and the Namibia Statistics Agency) and recognised international sources (UNFCCC, IPCC, Climate Tracker, the World Bank, Our World in Data), supplemented by a wide range of information and research papers from recognised authorities. This information is provided for the sole purpose of engaging with the Government of the Republic of Namibia on the issue of Namibia's Green Transition.

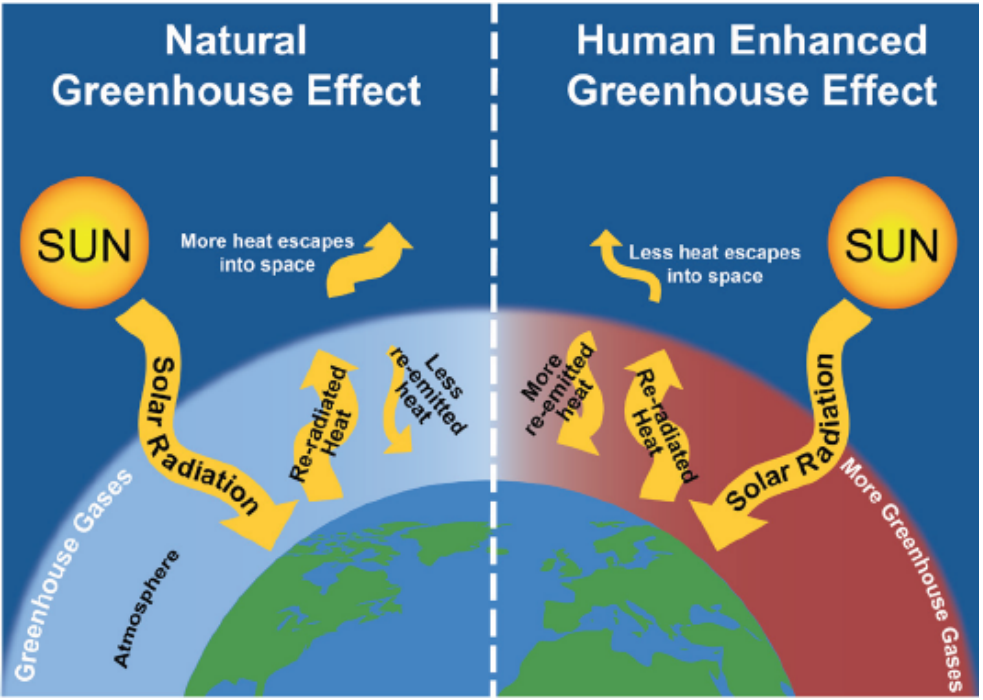
Introduction

- Who am I?
- Why am I giving this presentation? (NNF and FCDO)
- Presentation brings together and summarises the ample work that has been done by a large number of individuals and organisations on climate change globally and in Namibia
- Identify what economic policy in Namibia can do to prepare for the future – address the challenges and take advantage of the opportunities
- Of particular interest to MoF/NPC/OP but important for all stakeholders in the Namibian economy

- **Dr Hage Geingob (President of the Republic of Namibia)** *"Today, 50 years later on #EarthDay2020, a bigger responsibility is placed on us to fight climate change and look after our Earth for future generations. Namibia will continue to play her part in contributing to a greener, healthier and sustainable planet. Happy #EarthDay2020."*
- **António Guterres (Secretary General of the United Nations)** *"Climate change is the defining issue of our time – and we are at a defining time."* 10 September 2018
- **David Attenborough (Renowned environmental broadcaster)** *"Right now we are facing a man-made disaster of global scale. Our greatest threat in thousands of years. Climate Change."* 4 December 2018
- **Greta Thunberg (Swedish climate activist)** *"We need to start listening to the science and that we actually start treating this crisis as the crisis it is."*
- **Vanessa Nakate (Ugandan climate activist)** *"Your actions matter. No action or voice is too small to make a difference."* COP26
- **Simon Kofe (Tovalu Foreign Minister)** *"We cannot wait for speeches, when the sea is rising around us all the time"* COP26

Man-Made (Anthropogenic) Climate Change 101

What is Man-Made Climate Change? The Basics



1. Industrial activity plus land use changes (anthropogenic) have led to rapidly increasing concentrations of Greenhouse Gases (GHGs) in the atmosphere
2. These concentrations act like a greenhouse reflecting more of the sun's energy back towards earth than would otherwise be the case
3. This gives rise to rising average temperatures across the globe - global warming
4. Planet earth is a highly complex system containing complex interactions between its atmosphere, oceans, land mass and living creatures making precise forecasts are hard to make
5. But the existence of climate change is increasingly clear and is the overwhelming scientific consensus (IPCC 2021)

What is Man-Made Climate Change?

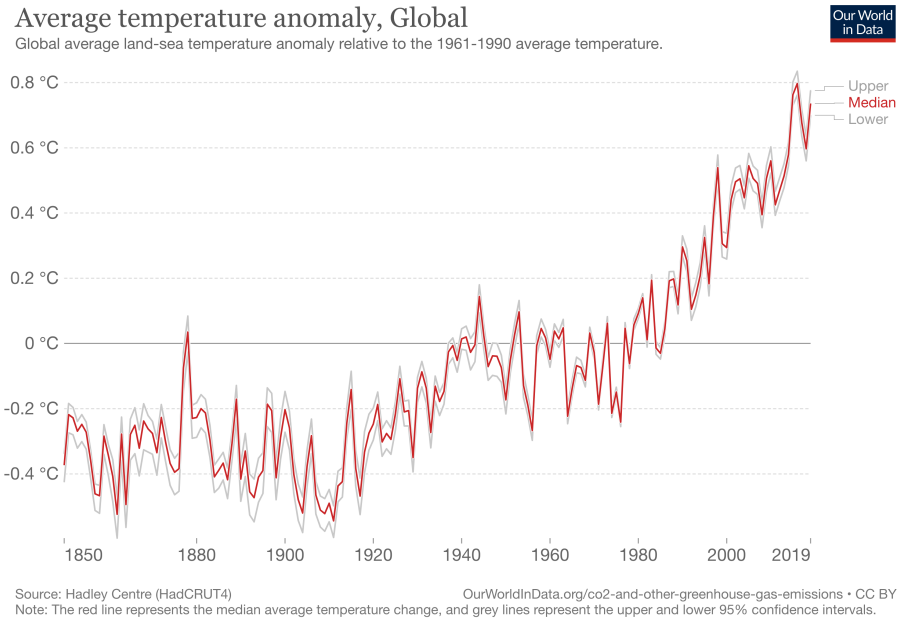
1. Industrial revolution from around 1750 driven by fossil fuels (coal, oil and gas) which give off carbon dioxide when burned
2. Carbon dioxide but other GHGs too with different global warming potential so everything translated into CO_2 (hence million tonnes of carbon dioxide equivalent or $MtCO_2Eq$)

Carbon dioxide	CO2	1
Methane	CH4	21
Nitrous Oxide	N2O	310
HFC-32	CH2F2	650
HFC-125	CH2CF3	2,800
HFC-134a	CF2FCF3	1,300
HFC-143a	CF3CH3	3,800

3. Global, long-term and irreversible trends plus positive feedback loops
4. Possible tipping points so change not necessarily “linear”
5. Emissions and Absorption critical (can work on both sides of the equation to slow climate change)
6. Emphasis on NET emissions (emissions minus absorption)

What are Impacts of Man-Made Climate Change?

1. Higher average global temperatures
2. Melting polar ice caps and glaciers leading to rising sea levels
3. Changing weather patterns
4. Changing evaporation and rainfall patterns
5. More frequent “extreme weather events” (droughts, floods, cyclones, etc)
6. Changes in soil quality
7. Acidification of oceans as (warmer) water absorbs more carbon dioxide
8. Changing patterns of disease
9. But these are general global trends – not country specific ones
10. Huge direct implications for world agriculture and fishing

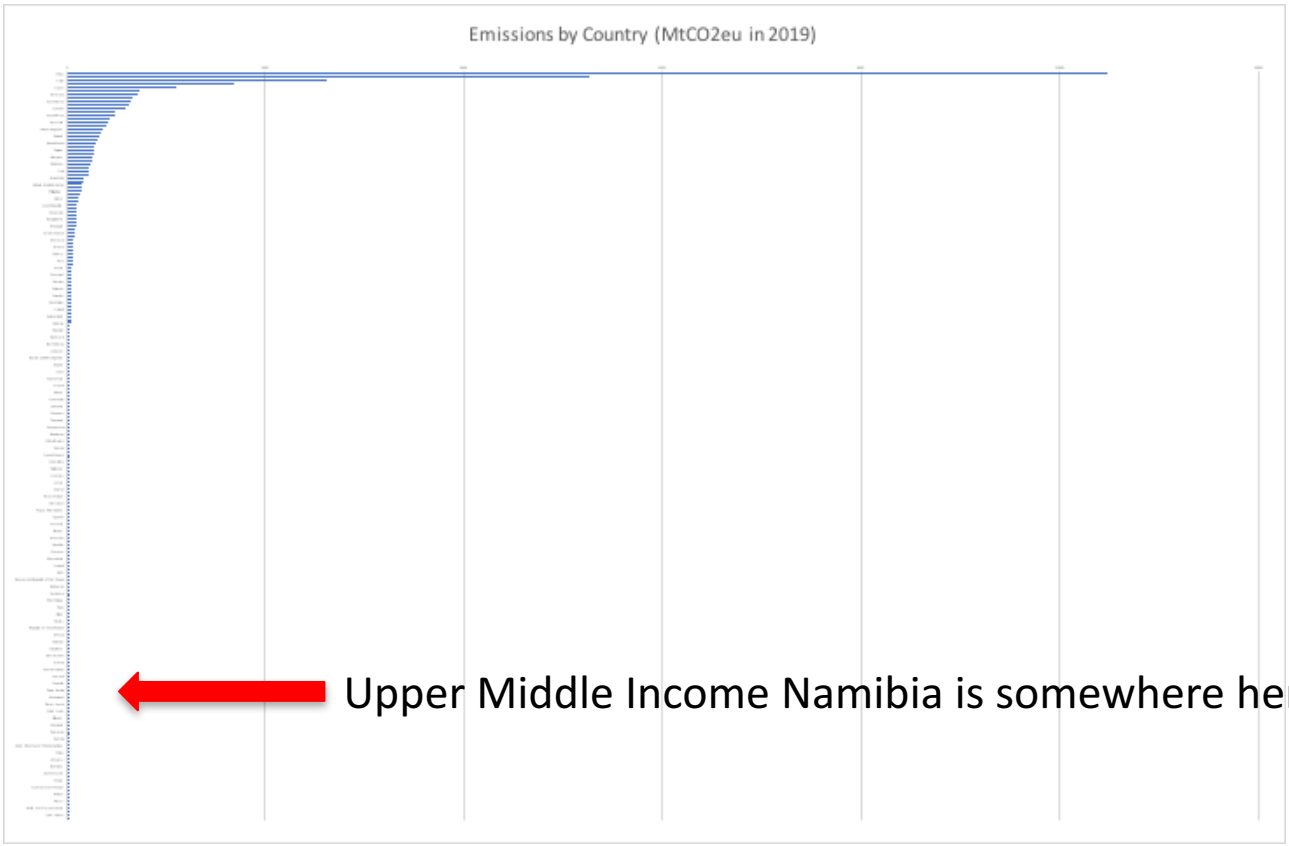


namibian economics

Major GHG Emissions: Countries and Activities

There are different ways of viewing contributors to climate change:

1. Emissions by country ("territorial" and "consumption") including developing countries
2. Per capita emissions by country
3. Historical emissions by country
4. Emissions by activity (eg transport, industry, power generation etc)



GHG emissions by country (total global emissions were 49.36 billion tCO2eq in 2016

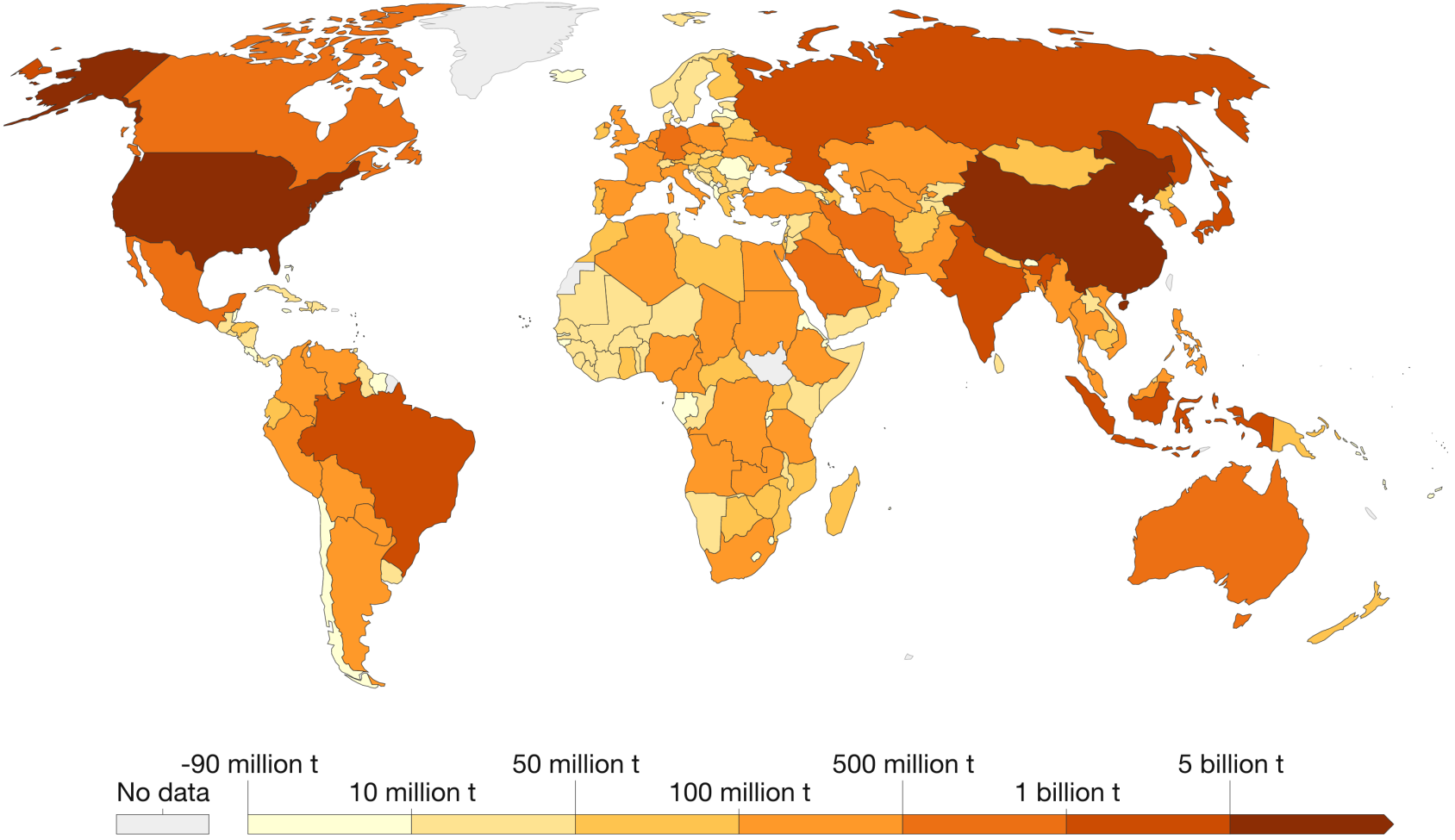
Upper Middle Income Namibia is somewhere here ranking 137 with 0.01%

1. Top 10 countries account for about 70% of emissions
2. Top 20 countries account for about 80% of emissions
3. Top 50 countries account for about 95% of emissions

Total greenhouse gas emissions, 2016

Our World in Data

Greenhouse gas emissions – from carbon dioxide, methane, nitrous oxide, and F-gases – are summed up and measured in tonnes of carbon-dioxide equivalents (CO_2e), where "equivalent" means "having the same warming effect as CO_2 over a period of 100 years". Emissions from land use change – which can be positive or negative – are taken into account.

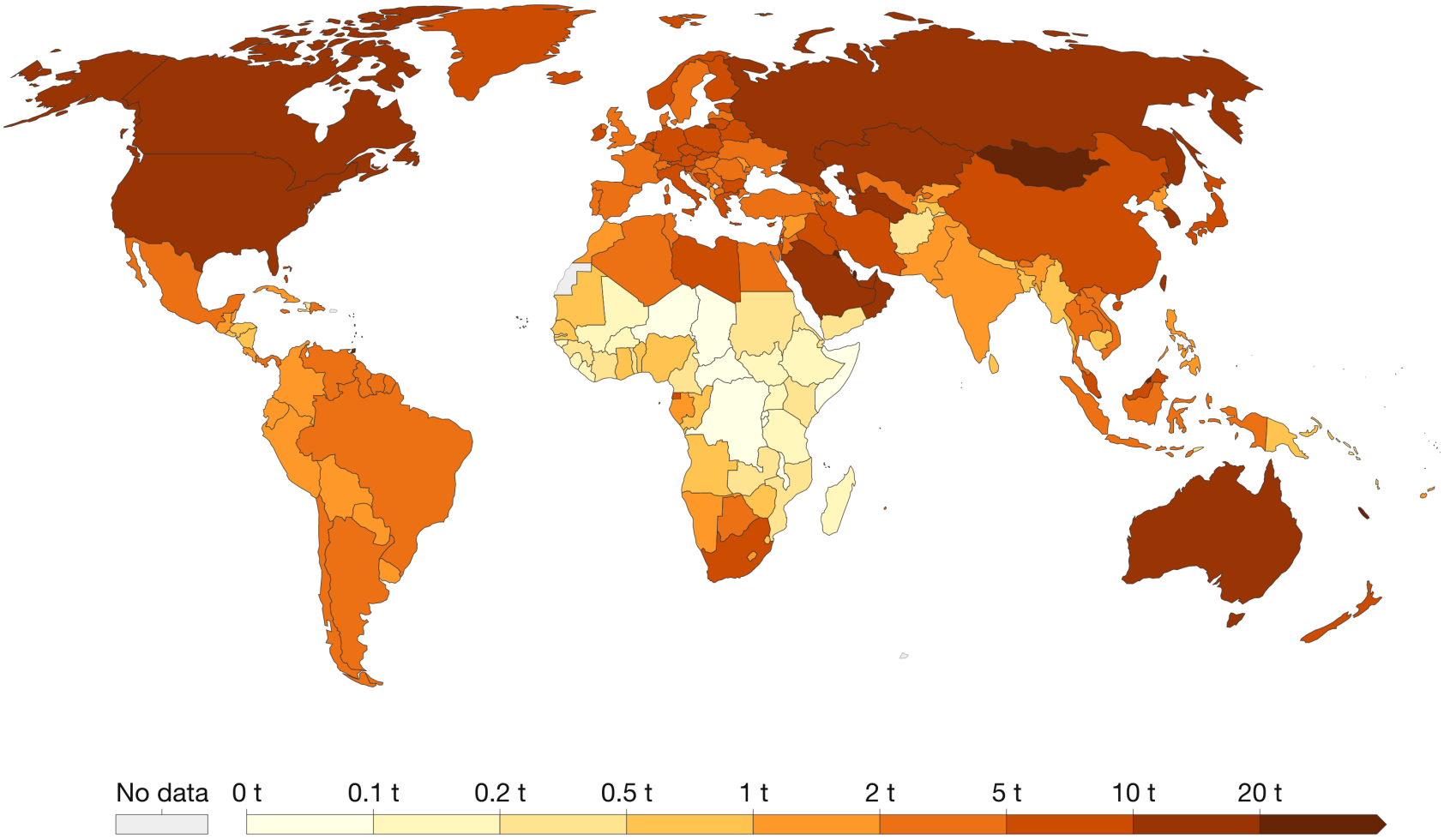


Source: CAIT Climate Data Explorer via. Climate Watch

Per capita CO_2 emissions, 2020

Carbon dioxide (CO_2) emissions from the burning of fossil fuels for energy and cement production. Land use change is not included.

Our World in Data



Source: Our World in Data based on the Global Carbon Project

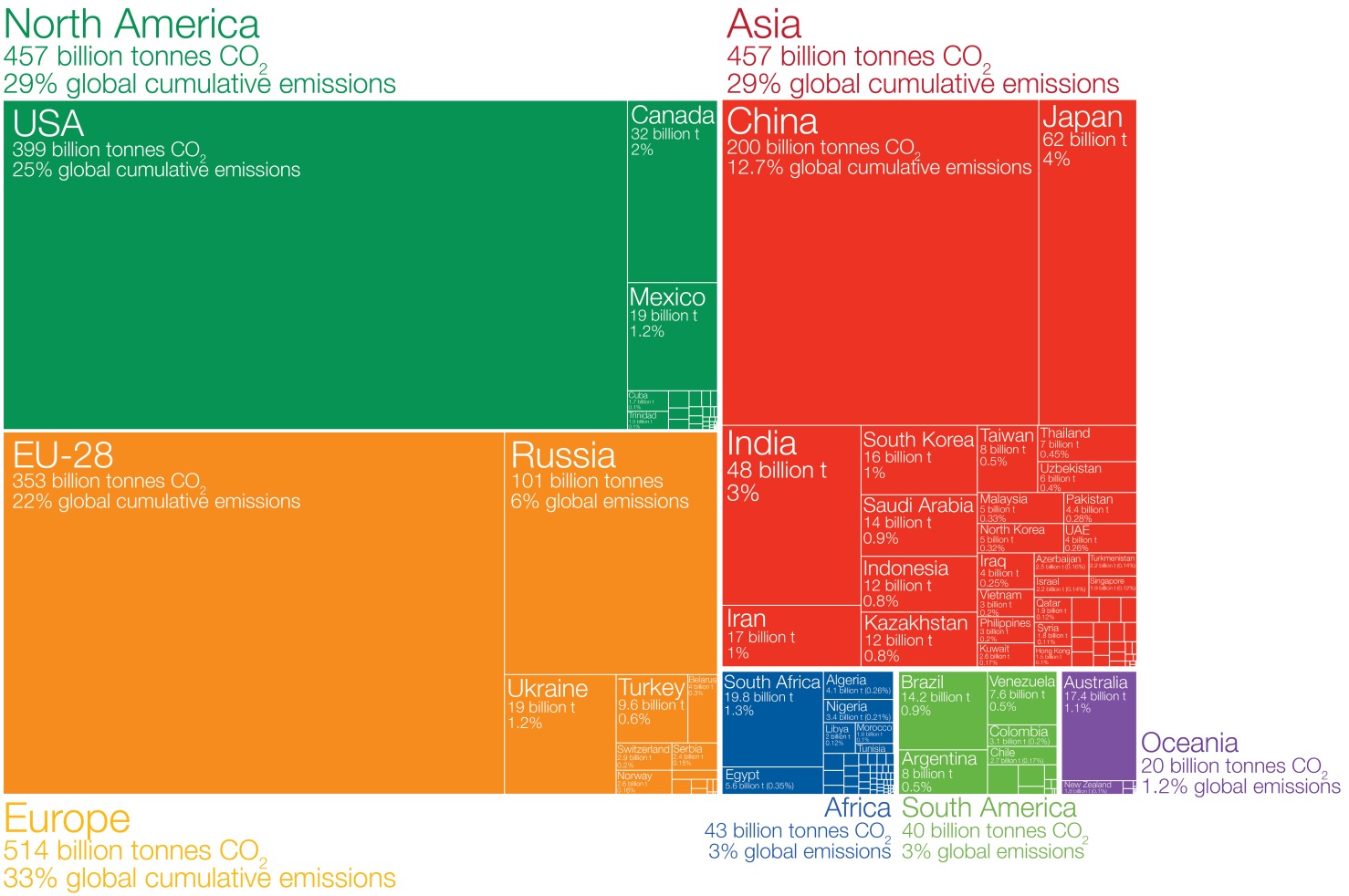
OurWorldInData.org/co2-and-other-greenhouse-gas-emissions/ • CC BY

Note: CO_2 emissions are measured on a production basis, meaning they do not adjust for emissions embedded in traded goods.

Who has contributed most to global CO_2 emissions?

Our World in Data

Cumulative carbon dioxide (CO_2) emissions over the period from 1751 to 2017. Figures are based on production-based emissions which measure CO_2 produced domestically from fossil fuel combustion and cement, and do not correct for emissions embedded in trade (i.e. consumption-based). Emissions from international travel are not included.



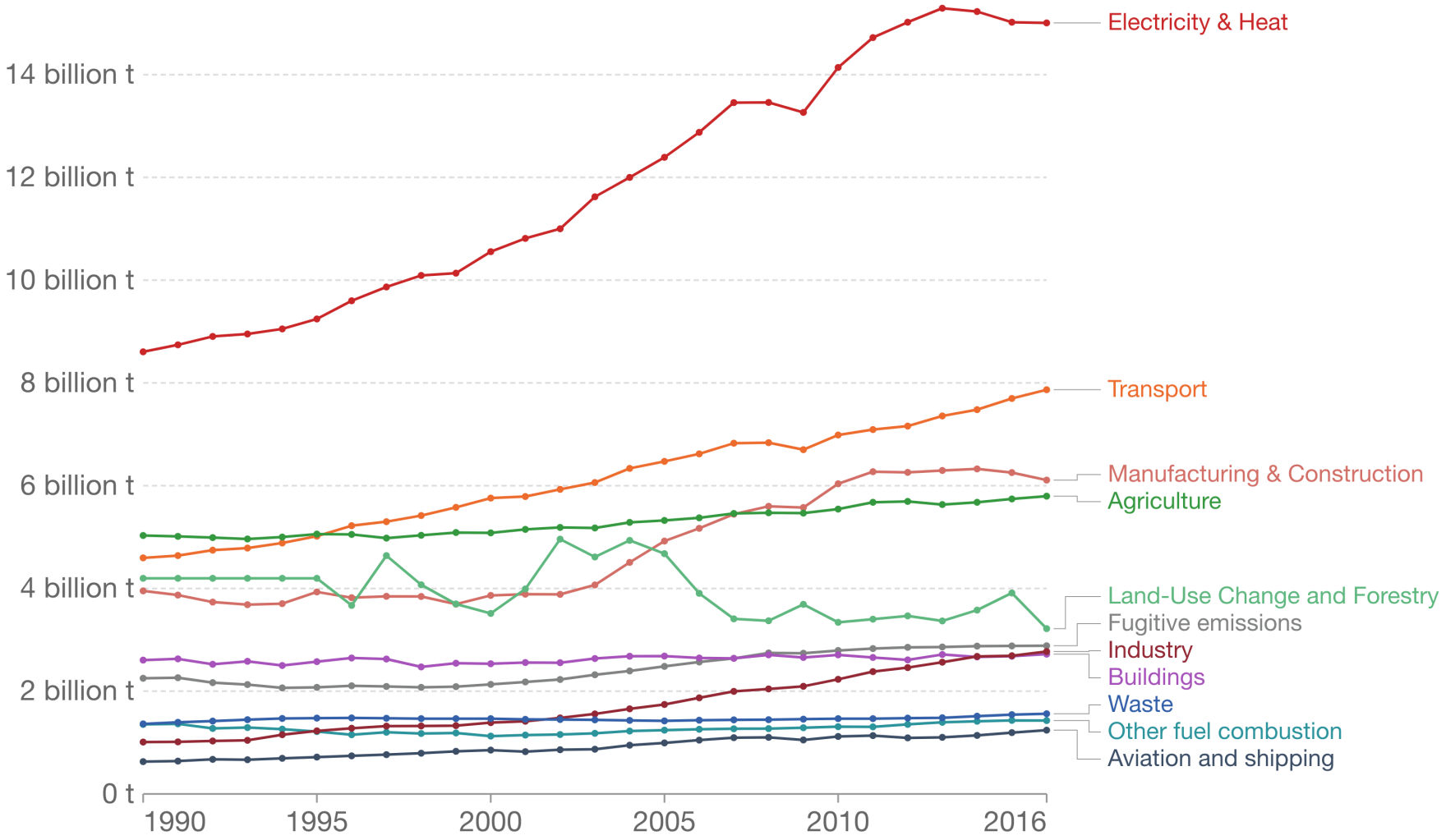
Figures for the 28 countries in the European Union have been grouped as the 'EU-28' since international targets and negotiations are typically set as a collaborative target between EU countries. Values may not sum to 100% due to rounding.

Data source: Calculated by Our World in Data based on data from the Global Carbon Project (GCP) and Carbon Dioxide Analysis Center (CDIAC).
This is a visualization from OurWorldinData.org, where you find data and research on how the world is changing.

namibian economics

Greenhouse gas emissions by sector, World

Greenhouse gas emissions are measured in tonnes of carbon dioxide-equivalents (CO_2e).



Source: CAIT Climate Data Explorer via. Climate Watch

OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY

namibian economics

Dealing with Climate Change

Mitigation (reduce GHGs and enhance carbon sinks)

vs

Adaptation (prepare for coming changes)

Behaviour change (less of damaging industrial activity)

vs

Technical fixes (new technology)

plus

Nature-based solutions focused on land use and forestry

The Economics of Climate Change

Economic Characteristics

1. Economic “externality” due to close relationship between industrialisation and burning of fossil fuels – prices do not reflect cost!
2. Classic market failure where private agents will not act optimally therefore need for intervention (in theory a Pigouvian tax or Coasian change in property rights)
3. Global (not national) externality so international cooperation required (but first mover disadvantage)
4. Costs accrue over very long period of time which traditional economic analysis struggles to deal with (discount rates)
5. Uncertainty and tipping points (non-linearities)
6. Precautionary principle
7. Have to address mitigation and adaptation at the same time

Costs of Mitigation

1. Economically most efficient way of tackling emissions is to look at marginal costs of abatement (if it costs US$1 to abate 1 tonne of carbon in country 1 and US$10 to abate 1 tonne in country 2 it makes sense to focus resources on country 1)
2. “No regrets” (should do anyway) and “conditional” (should do because of climate change) measures
3. Costs of technology and risks of betting on single technologies (how to choose the right technology?)
4. “Carbon tax” versus “cap and trade” and carbon markets (putting a price on emissions)

Where is the World Heading?

1. Global action to address climate change through United Nations Framework Convention on Climate Change (UNFCCC)

2. Need to halve GHG emissions by 2030 and achieve net zero CO_2 by 2050 to limit global temperature rise to 1.5 degrees or “well below 2 degrees”

3. After COP26 136 countries have net zero target covering 88% of emissions, 90% of GDP and 85% of the population.

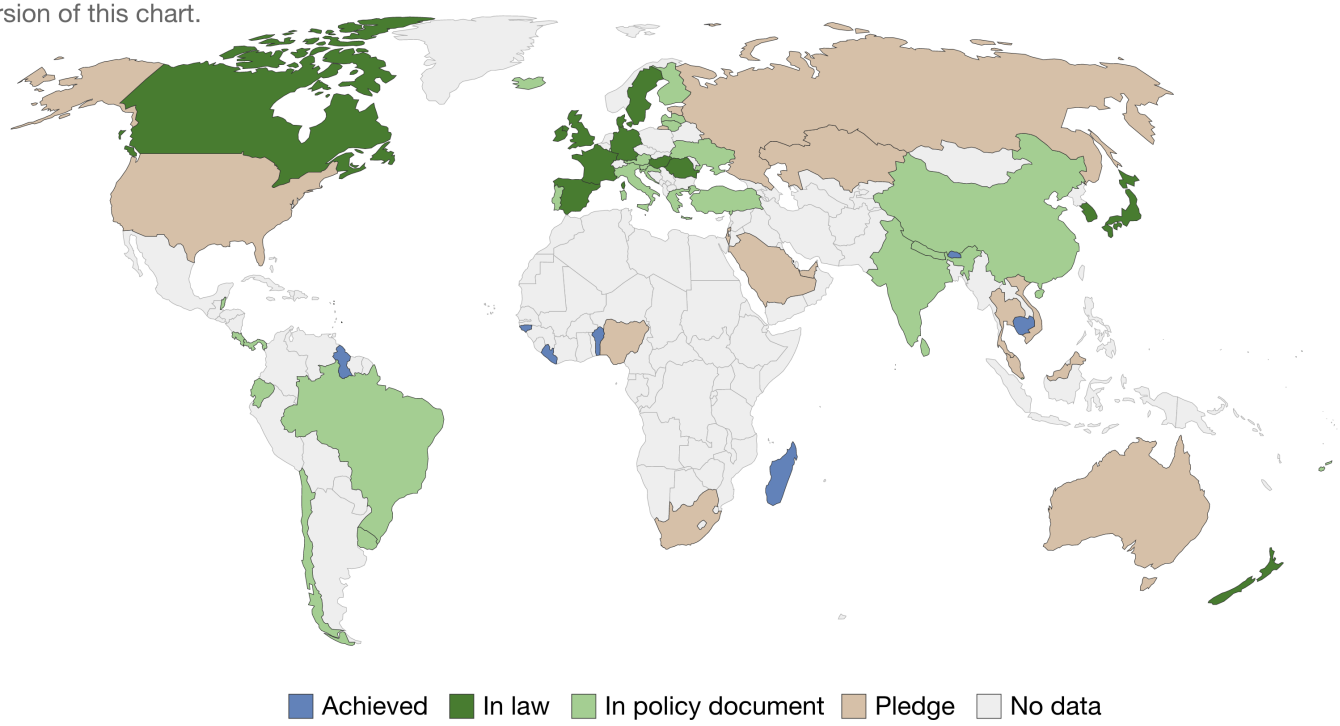
Where is the World Heading?

Status of net-zero carbon emissions targets

Our World in Data

The inclusion criteria for net-zero commitments may vary from country to country. For example, the inclusion of international aviation emissions; or the acceptance of carbon offsets.

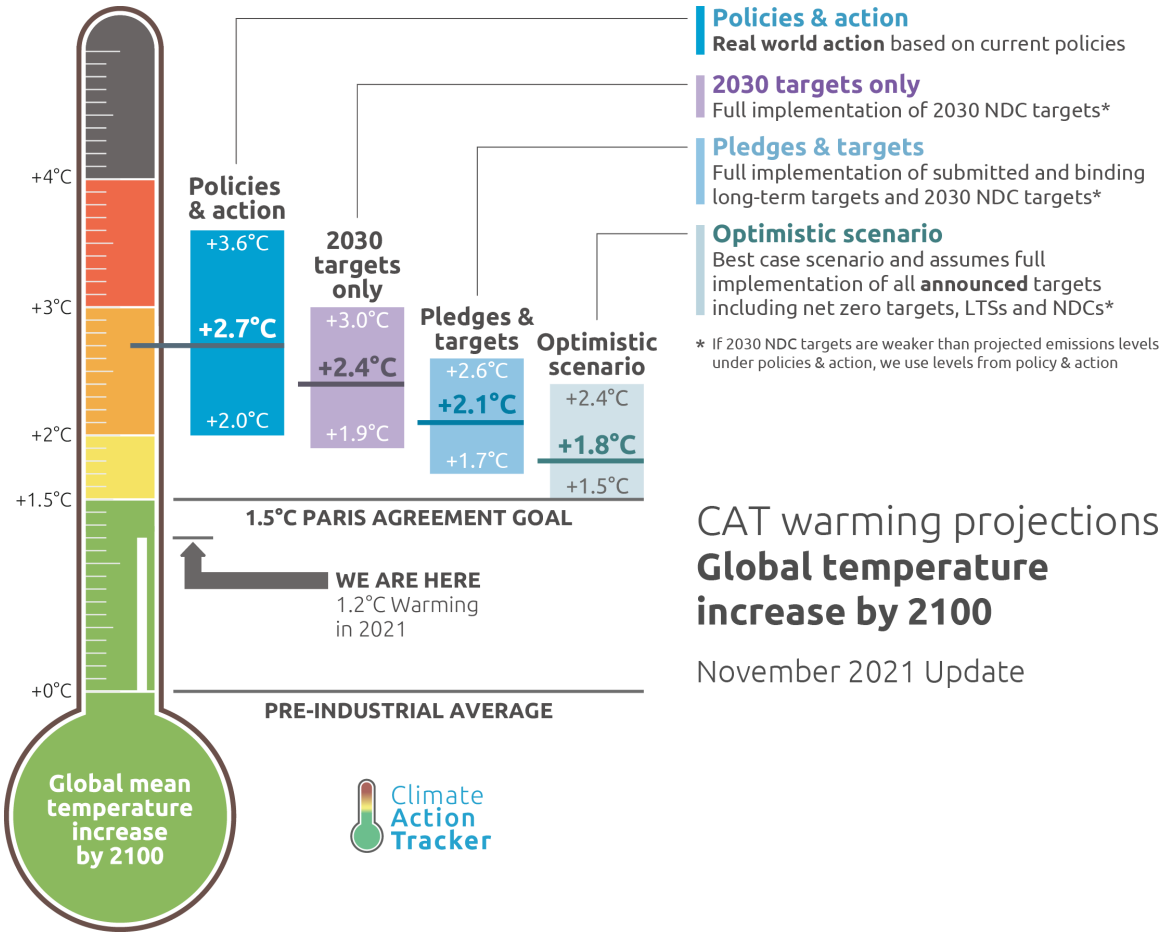
To see the year for which countries have pledged to achieve net-zero, hover over the country in the interactive version of this chart.



Source: Net Zero Tracker. Energy and Climate Intelligence Unit, Data-Driven EnviroLab, NewClimate Institute, Oxford Net Zero. Last updated: 2nd November 2021.
OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY

namibian economics

Where is the World Heading?



CAT warming projections
Global temperature increase by 2100

November 2021 Update

namibian economics

Status of Namibia?

Fully on board with climate change initiatives from early days:

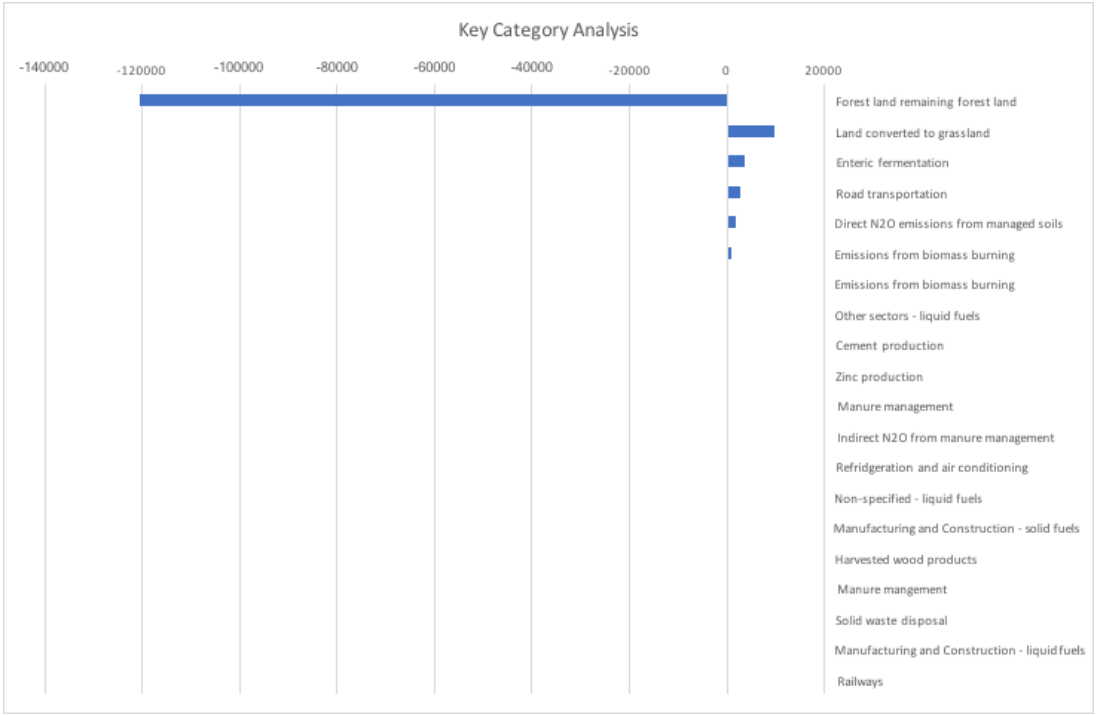
1. 1992 – UNFCCC at Rio Earth Summit
2. 1995 - CoP1 in Berlin (CoPs are annual meetings)
3. 1997 – CoP3 in Kyoto (NAI – Non-Annex I country ratification 4/11/03)
4. NCCC established in 2001 and institutional infrastructure
5. 2015 – CoP21 in Paris (Paris Agreement and NDCs ratification 21/9/16)
6. 2021 – CoP26 in Glasgow
7. National Communications (2002, 2011, 2015, 2020)
8. National (Emissions) Inventory Reports (latest in 2020)
9. Biennial Update Reports (2014, 2016, 2021)
10. (Intended) Nationally Determined Contributions (2015 and 2021)
11. GEF accredited institutions (DRFN, EIF, DBN)

Let’s take a closer look at Namibia

How Namibia's GHG Emissions Compare

1. Chart showing total emissions compared to other countries (see above)
2. Chart showing emissions per capita compared to other countries (see above) (but 1.7t or 10t?)

Breakdown of Namibia's GHG Emissions



1. Which activities do Namibia's GHG emissions come from? (NC4 and NDC)

2. Namibia is a net carbon sink thanks to absorption by landmass

3. But sink characteristic could change with land use change and more carbon intensive industrialisation!

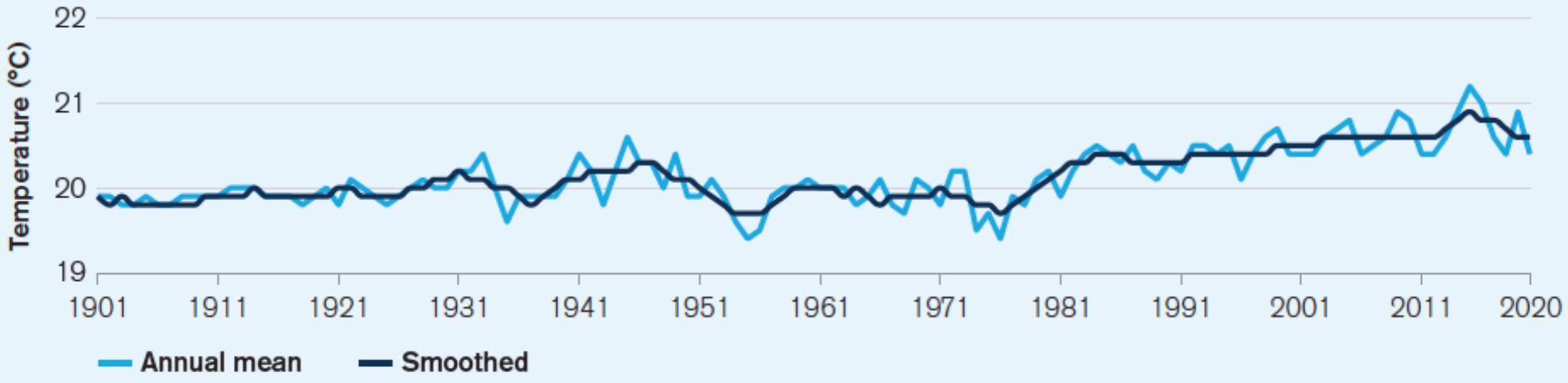
Namibia as a Carbon Sink

1. Map showing Namibian landmass and how different classes of land contribute to sink (not sure we have good information)
2. Six categories of land: forestland, cropland, grassland, wetlands, settlements, other land (NIR5 page 110)

Likely Impact of Climate Change

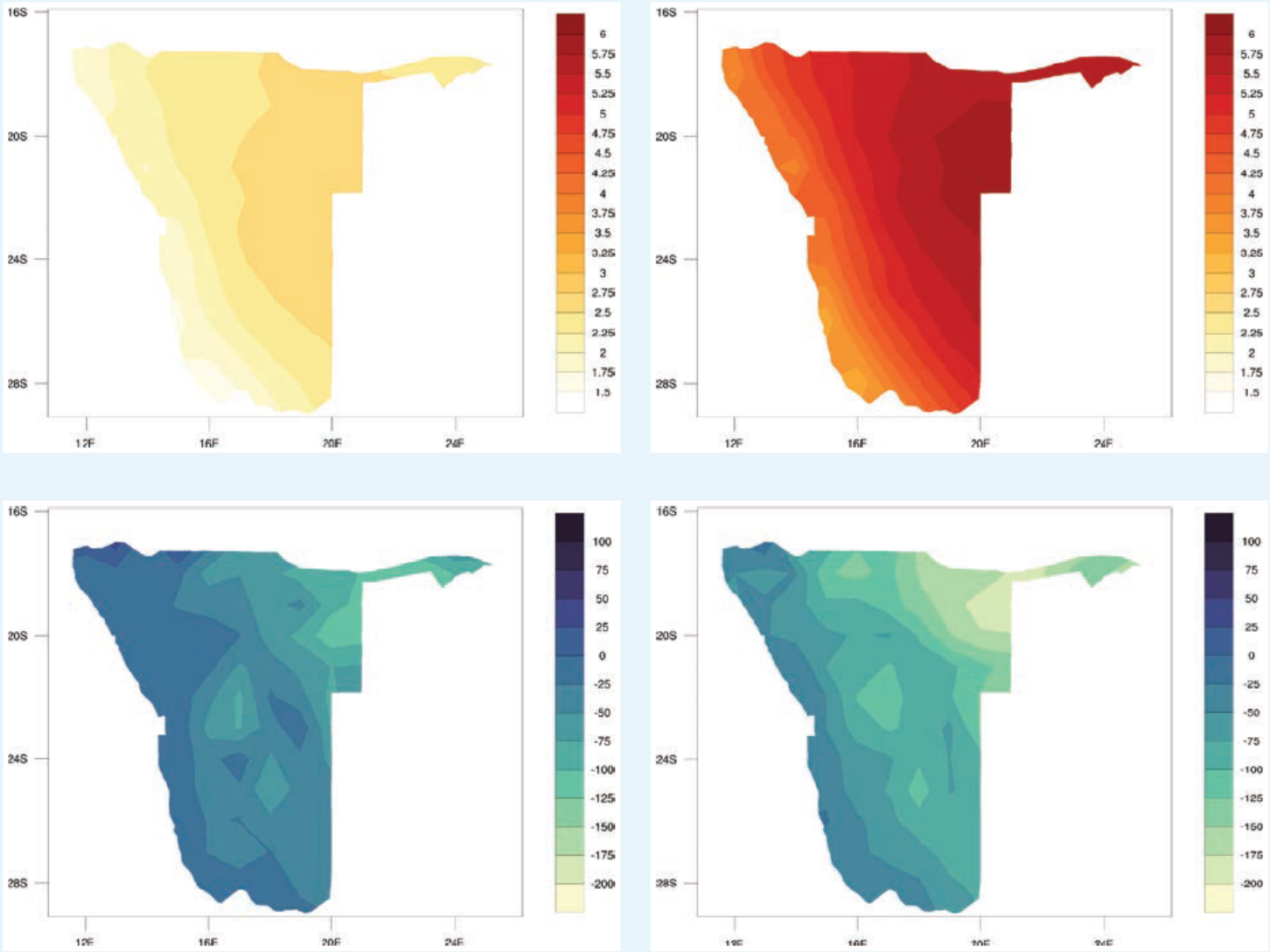
1. Map showing likely temperature rises (actual temperature rises since 1900) and changes in precipitation plus effects on oceans and Benguela Current – temperature clear but precipitation less so

FIGURE 5. Observed Temperature for Namibia, 1901–2020[26]



namibian economics

FIGURE 6. Multi-Model (CMIP5) Ensemble Projected Changes (32 GCMs) in Annual Temperature (top) and Precipitation (bottom) by 2040–2059 (left) and by 2080–2099 (right), Relative to 1986–2005 Baseline under RCP8.5[29]



namibian economics

The Situation Namibia Finds Itself In…

1. Makes negligible contribution to global GHG emissions
2. Is net carbon sink due to large landmass, small population, and limited industrialisation
3. Yet highly vulnerable to climate change
4. Namibia dependent on other countries cooperating to successfully reduce GHGs and tackle climate change – to what extent can the high emission economies be relied upon to achieve net zero?
5. Funds available from high-income countries – what should they be used for?

Key Question:
To what extent can Namibia rely on the world to keep to promises to reduce GHGs?

Key Conclusion:
Surely the balance for Namibia must be on adaptation rather than mitigation?

So how bad will it get and what should Namibia plan for?

How badly will the economy be impacted? What difference can economic policy, finance and tax and spending policies make?

What happens if government does nothing? Many private agents would respond without government support

Surely the balance for Namibia must be on adaptation rather than mitigation?

Let’s take a closer look at what impact climate change is likely to have on the Namibian economy

Economic Vulnerabilities

Impossible to say that increase in global temperature by x% will lead to decrease of Namibian GDP by y%

Agriculture: Livestock

1. Higher temperatures, scarcer water, poorer grazing and more frequent droughts mean lower offtakes
2. Cattle, sheep and goats major source of CH4 in Namibia (enteric fermentation)
3. European breeds and dairy cattle most at risk
4. Harder for communal farmers with fewer alternatives to rearing livestock
5. Harder in north and north-east
6. Changing international tastes towards red meat
7. Mitigation measures?
8. Adaptation measures? Technical fixes: new breeds of cattle, sheep and goats?

Agriculture: Crops and Horticulture

1. Higher temperatures, scarcer water, poorer grazing and more frequent droughts mean lower offtakes
2. Harder for communal farmers
3. Harder in north and north-east
4. Charcoal industry – good for climate change? Creates economic opportunities but at cost to climate of emissions
5. Invader bush and quality of grazing land? Growing and absorbing CO_2 and potential for biomass products
6. Adaptation measures? Technical fixes – new strains of crops, irrigation
7. Food self-sufficiency and food security (chart of domestic production and consumption)
8. Mitigation measures?

Aside: Namibia's Rural Population

Some key numbers:

- 167,242 people "employed" in agriculture, forestry and fishing
- 18,462 and 94,001 subsistence/communal farmers with and without paid employees and 16,539 unpaid family workers
- Subsistence farming is main source of income for 19.8% of Namibian households but 41.6% of rural households (high in Ohangwena, Omusati, West Kavango, Oshikoto) – NLFS 2018
- Subsistence farming is main source of income for 10.6% of Namibian households but 22.4% of rural households – NHIES 2015/16

Forestry

1. Forestry a major carbon sink
2. Deforestation damaging not only for climate change
3. Community forests
4. Some basic stats about deforestation
5. Mitigation measures? Reduce deforestation
6. Adaptation measures?

Fisheries

1. Acidification, oxygenation, sea level rise, stormy waters
2. Hard to predict impact on Namibian fisheries but international evidence?
3. Walvis Bay vulnerable to rising sea levels
4. Realistically little can be done but Namibia less vulnerable than other countries due to industrial fishing industry which can travel further and cope with rougher weather than artisanal fishing
5. Mitigation measures? Vessel technology
6. Adaptation measures?

Mining, oil and gas

1. Uranium important
2. Water consumption an issue
3. Oil and gas will slowly become more difficult to exploit (see below)
4. Mitigation measures? Eg Otjikoto solar PV
5. Adaptation measures?

Manufacturing

1. Meat processing (Meatco already having problems with drought)
2. Other agriprocessing
3. Water intensive industries
4. Mitigation measures?
5. Adaptation measures?

Water and Electricity

1. Higher evaporation rates, droughts and general water scarcity
2. Namibia has long coast line and access to sea water for desalination
3. Water costs likely to rise (emphasise)
4. Vulnerability of existing (Ruacana) and future (Baines) hydroelectric power (emphasise)
5. Mega Solar project Namibia-Botswana-US
6. Renewables policy - 70% renewables by 2030
7. Namwater and NamPower

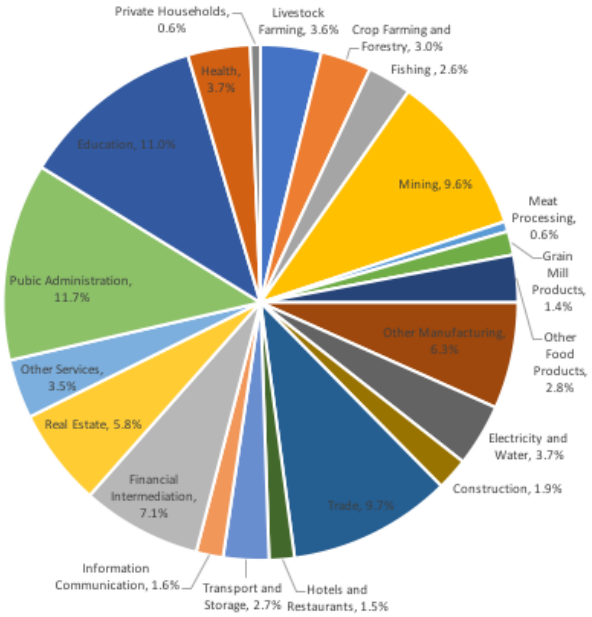
Tourism

1. Changes in biodiversity and wildlife
2. International travel more expensive
3. Future growth in foreign tourism dependent on carbon taxes and changes in aviation technology zero carbon air travel

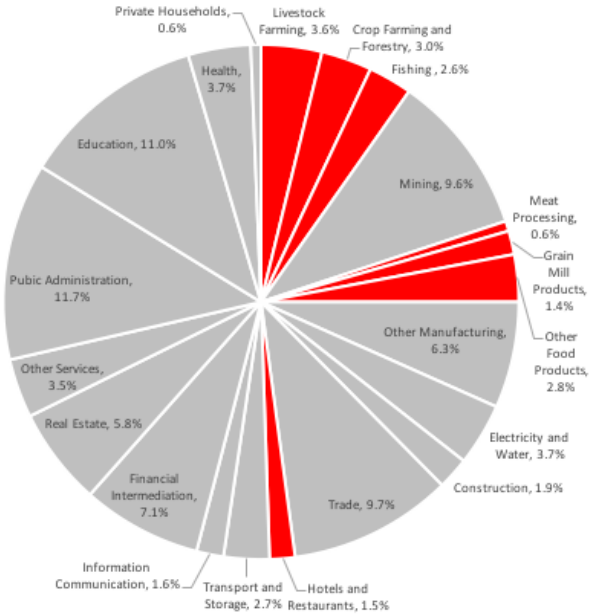
Other Sectors

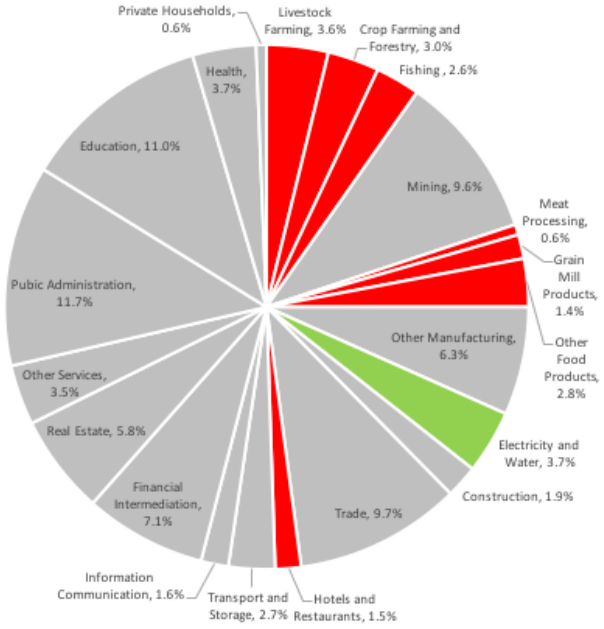
1. Transport and Storage – Little real impact but infrastructure (impact of heat and floods on road maintenance as well as port and airports)
2. Telecommunications and IT – Little real impact but infrastructure (base stations, masts and cables)
3. Financial Services – Little real impact apart from where exposure to agriculture, forestry and fisheries and tourism
4. Government Services – Little real impact but infrastructure and delivery of services (especially rural services)

Agriculture - livestock	Highly vulnerable	
Agriculture - crops	Highly vulnerable	
Forestry	Highly vulnerable	
Fishing	Highly vulnerable	Infrastructure vulnerable
Diamond mining	Not vulnerable	
Uranium mining	Opportunity	
Other mining	Opportunity	
Oil and Gas	Highly vulnerable	
Meat processing	Highly vulnerable	
Grain processing	Highly vulnerable	
Minerals processing	Vulnerable to regulations	
Other manufacturing	Vulnerable to regulations	
Electricity	Opportunity	Infrastructure vulnerable
Water	Vulnerable and Opportunity	Infrastructure vulnerable
Construction	Not vulnerable and Opportunity	
Wholesale and Retail Trade, Repairs	Vulnerable to technology shift	
Hotels and Restaurants	Highly vulnerable	
Transport	Not vulnerable	Infrastructure vulnerable
Storage	Not vulnerable	Infrastructure vulnerable
Information Communication	Opportunity	Infrastructure vulnerable
Financial Services	Vulnerable and Opportunity	
Real Estate	Vulnerable and Opportunity	
Professional Services	Opportunity	
Public Administration and Defence	Not vulnerable	Infrastructure vulnerable
Education	Highly vulnerable	Infrastructure vulnerable
Health	Highly vulnerable	Infrastructure vulnerable



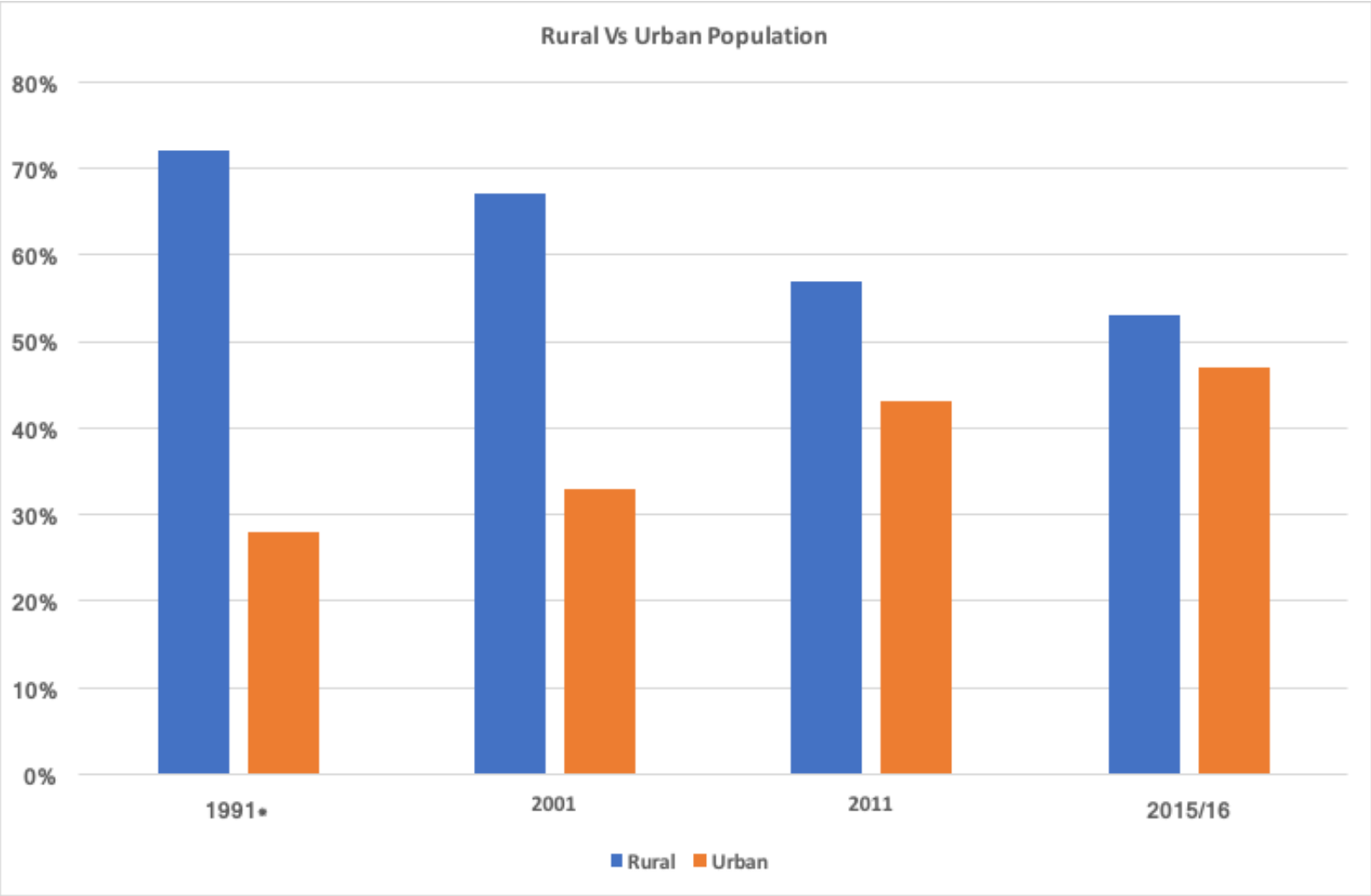
Around 15.5% of the economy is vulnerable to climate change…and it will have significant implications for other sectors too especially electricity and water





namibian economics

What about the Movement of People?



Rural to urban migration already an established trend in Namibia (we're at cross-over point after doubling of population since Independence.

Migration

1. Steady measured flow of people from rural to urban locations (hard to say extent to which due to climate change)
2. Namibia majority urbanised by 2022?
3. In absolute terms rural population has remained almost constant
4. Climate change to have unambiguously negative impact on rural livelihoods and population so can expect this trend to continue and even accelerate
5. Policy question: Should this flow be actively encouraged?
6. The better Namibia manages climate change the more incentive for people to migrate from neighbouring countries
7. Need for urban areas to adapt to climate change (eg Development Workshop Namibia)

Human Health

1. Heat related problems
2. Water related problems
3. Change disease prevalence

4. Best reference for this?

Government Revenue

	FY19/20 (Actual)	
SACU	18,922,264,883	32.4%
Income Tax on Individuals	14,147,288,785	24.2%
VAT	11,515,735,331	19.7%
Non-Mining Companies	5,927,023,972	10.1%
Adminstrative Fees and Charges	2,279,312,904	3.9%
Entrepreneurial and Property Income	1,232,680,124	2.1%
Diamond Mining Companies	1,142,638,946	2.0%
Levy on Fuel	1,106,791,249	1.9%
Witholding Tax	797,078,657	1.4%
NRST	306,573,778	0.5%
Fishing Quota Levies	267,376,219	0.5%
Other Mining Companies	187,357,476	0.3%
Transfer Duties	174,485,914	0.3%
Stamp Duties	108,624,227	0.2%
Tax on Royalty	103,481,894	0.2%
Fines and Forfeitures	99,238,045	0.2%
Environmental Levies	94,428,212	0.2%
Liquor Licences	11,529,776	0.0%
Return of Capital from Lending	11,379,028	0.0%
Prospecting Licences	2,968,384	0.0%
Fishing Licences	141,687	0.0%
Total	58,438,399,491	100.0%

Environmental Taxes

- Announced in 2011/12 Budget and introduced in 2016 then 2019
- More as a revenue measure than to change behaviour
- Plastic bag levy seems to have contributed to behaviour change (any studies?)
- 30% of revenues go to EIF

From 30 May 2016 (GG6019)	
149.00 Electric Filament Lamps	N$3.00 per lamp
149.04 Pneumatic Tyres	N$10 per tyre
151. Motor Vehicles	N$40 per g/km CO2 emissions exceeding 120g/km
From 2 August 2019 (GG6967)	
147.00 Plastic bags	50c per bag
Lubricants and Oils	N$1.80 per litre
85.06 Batteries	5%

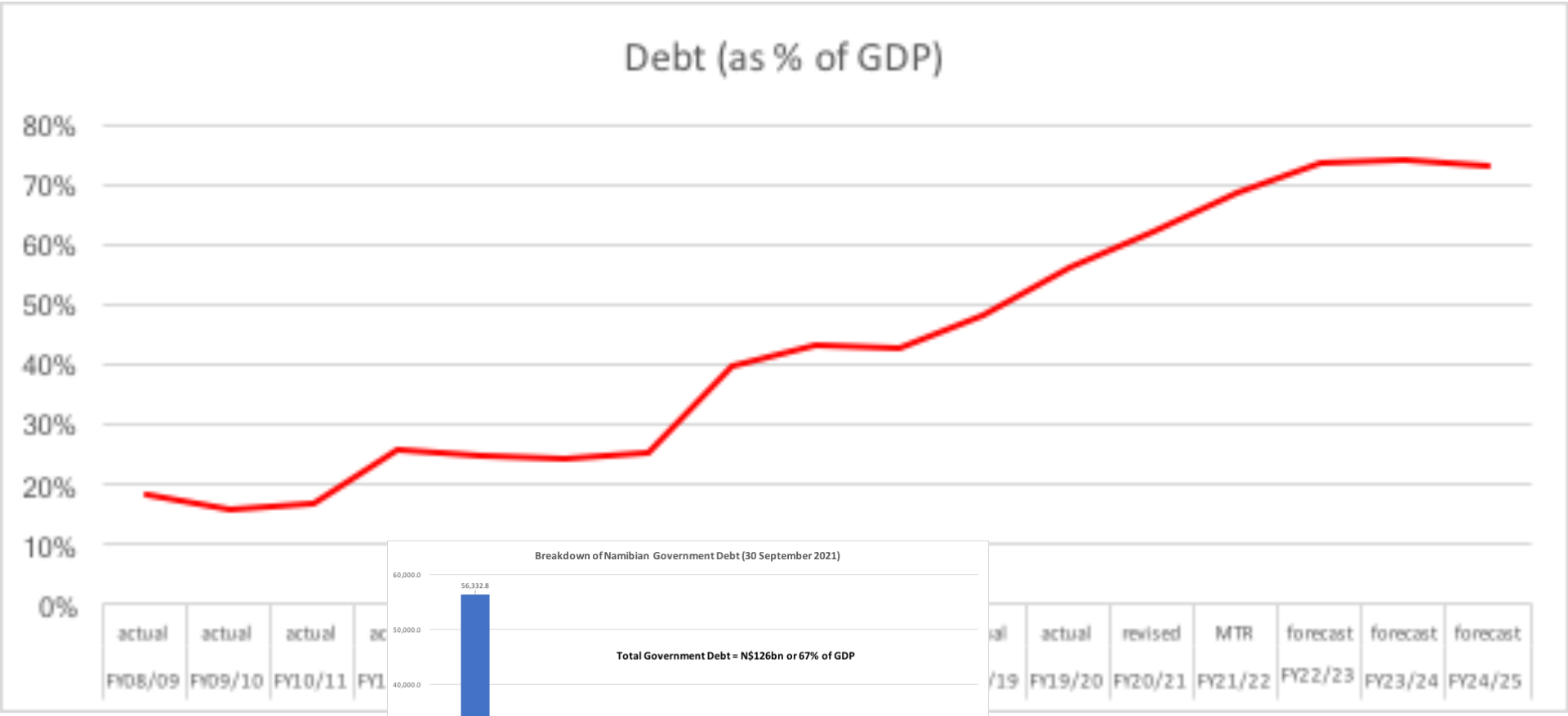
Government Revenue

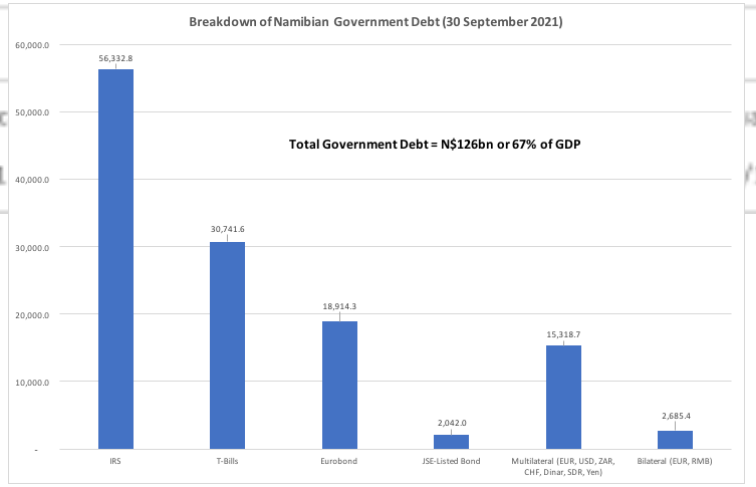
1. Government revenues not especially vulnerable to climate change – how much tax do agriculture, forestry and fishing pay? If tax base was dependent on agriculture and fishing…
2. Government has not used the tax system to change behaviour to any significant extent (environmental levies – plastic bags?)

Government Expenditure

1. Will mitigation and adaptation measures require more government spending? Private sector and PE sector can fund some measures.
2. Most measures so far funded by donors
3. “No regrets” funded by Government or private sector but “conditional” funded by foreign donors

Government Now Highly Indebted





namibian economics

Government Debt

1. Can and should Namibia take on more debt for mitigation and adaptation given it is already highly indebted?
2. Who will buy GRN Green Bonds?
3. Need for more project finance?
4. Debt for nature swaps? (three party or bilaterial/multilateral - US$1bn since Conservation International-Bolivia in 1987 see Botswana example)
5. Debt for climate swaps?

Public Enterprises – Many Vulnerable to Climate Change

Public Enterprise	Impact of Climate Change	Impact
Agribank	Likely to reduce livestock offtakes and crop yields and therefore returns	High
DBN	Likely to increase demand for infrastructure investment	Medium
Epangelo	Minimal	Low
Fishcor	Likely to reduce fish landings and therefore profitability	High
Meatco	Likely to reduce offtakes and inputs and therefore profitability	High
MTC	Need to climate proof infrastructure	Low
Namcor	Decarbonisation will make oil and gas exploration more problematic	High
Namdia	Minimal	Low
Namibia Airports Company	Changes in air transport technology could require new infrastructure	Medium
Namibia Industrial Development Agency	Minimal	Low
Namibia Wildlife Resorts	Changes in wildlife and international air travel could reduce tourist numbers and reduce profitability	High
Namport	Changes in maritime transport technology could require new infrastructure	Medium
Nampost	Minimal	Low
NamPower	Likely to increase demand for infrastructure investment (70% renewables target) plus climate proof infrastructure	High
Namwater	Likely to increase demand for infrastructure investment and water efficiency plus climate proof infrastructure	High
Roads Authority	Need to climate proof infrastructure	Medium
Telecom Namibia	Need to climate proof infrastructure	Low
TransNamib	Need to climate proof infrastructure	Medium

At the same time as climate change is happening the world is changing fast - how might this affect Namibia?

New technologies are developing fast. Rather than backing particular technologies, policymakers are creating the conditions for a variety of technologies to emerge which can then compete

Personal Transport

1. In the quest for zero emissions, BEVs (Battery Electric Vehicles) seem to be winning the battle with fuel cells (using hydrogen) to replace (ICE) Internal Combustion Engine vehicles for passenger cars and light vans.
2. An increasing number of countries (major markets) are planning to eliminate ICEs (eg EVs outsold diesels in EU in 2021)
3. An increasing number of manufacturers are planning to eliminate ICEs (table of manufacturers)
4. BEVs are still expensive and require new charging infrastructure as well as totally different servicing and repair facilities.

Implications for Namibia?

1. How will this transition play out in Namibia?
2. Will manufacturers continue to make ICE vehicles for countries like Namibia?
3. Does Namibia want to use policy to embrace the EV transition (along with SACU and other southern African countries perhaps?). NDC commitments
4. What will this mean for clean energy generation? Namibia has 500,000 vehicles
5. Implications for fuel taxation (minor revenue item – see above)

Vehicle	Date for PHEVs-BEVs Only / Date for BEVs Only	Date for Carbon Neutrality
Bentley	By 2026 By 2030	By 2030
BMW	N/A N/A	100% renewable energy by 2050
Ford	N/A N/A	By 2050
Cadillac	N/A By 2030	N/A
General Motors	N/A By 2035	By 2040
Honda	N/A 2022 (Europe), 2040 (North America)	By 2050
Hyundai-Kia	N/A N/A	Undated pledge
Jaguar Land Rover	100% with some electrification by 2030 By 2030	By 2039
Mazda	N/A N/A	By 2050
Mercedes-Benz	All new platforms EV-only in 2025 2030 with caveats in some markets	By 2039
Mitsubishi	N/A N/A	25% carbon reduction by 2030
Nissan	N/A N/A	By 2050
Rolls-Royce	EVs will be available in 90% of segments N/A	By 2030
Stellantis	70% of European sales, 40% of North American sales electrified in 4 years N/A	N/A
Toyota	8 million electrified vehicles by 2030 N/A	By 2050
Volkswagen Group	50% fully electric sales in U.S. by 2030 Last new combustion platform in 2026	By 2050
Volvo	By 2025, half of global sales fully electric By 2030	By 2040

Heavy Transport

1. Batteries less suitable for HGVs and other heavy equipment
2. Hydrogen may be more suitable (eg JCB hydrogen)
3. Mining companies looking closely at low carbon operations (eg AA in SA)

Implications for Namibia?

1. Is this something Namibia wants to use policy to encourage?
2. Will require new infrastructure at Namibian filling stations and mines

JCB unveils hydrogen-fuelled combustion engine technology

The world's first hydrogen powered double decker bus

namibian economics

Air and Maritime Transport

1. Planes harder to decarbonise than passenger vehicles
2. Developments in low-carbon fuels (what are these?) and ever more efficient engines, hydrogen and electric for commercial aviation but all some years down the road
3. Developments in hydrogen (and sails) for commercial shipping (eg Maersk hydrogen- and carbon neutral methanol powered ships)

Implications for Namibia?

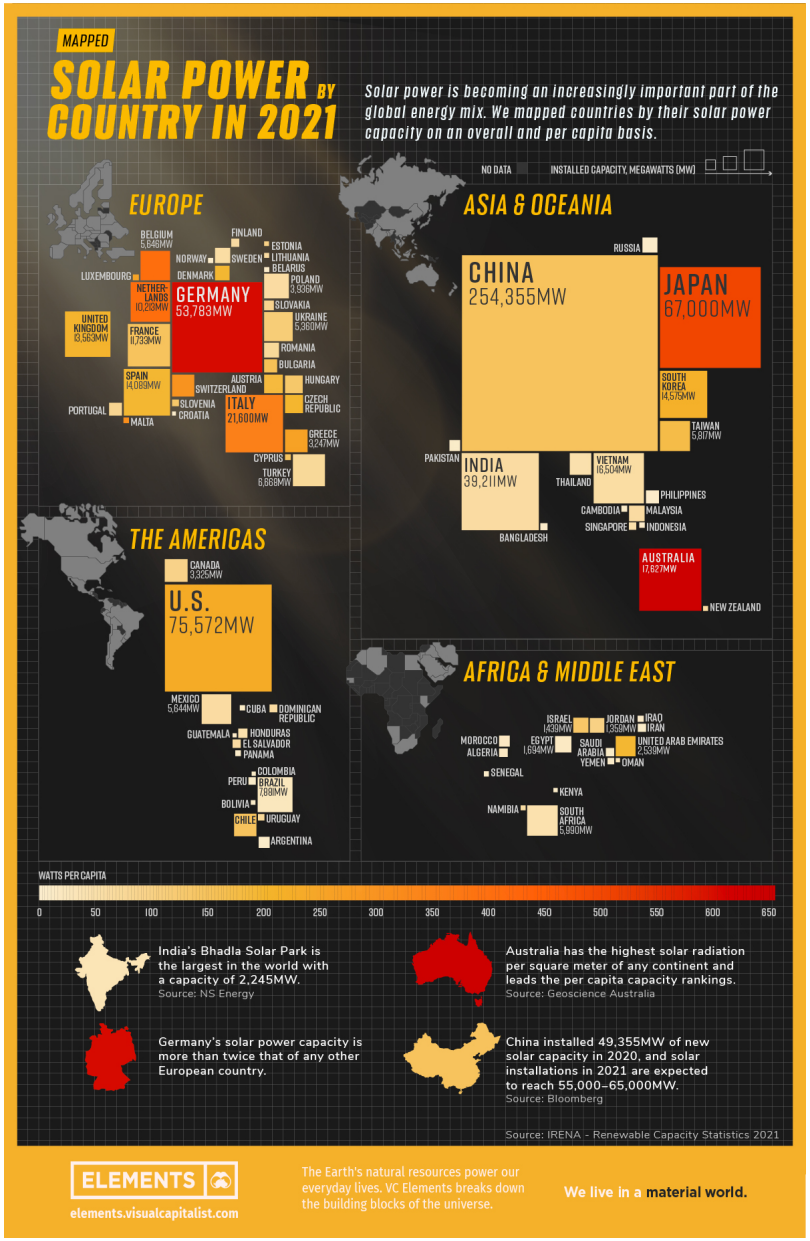
1. Will require new fuel infrastructure at Namibian ports and airports

Power Generation

1. Renewables (solar PV and wind) already cheaper than fossil fuels in many cases but storage still an issue
2. Coal due to be "phased down" (after CoP26) and phased out at some stage (coal-dependent SA is due to transition away from coal – need more on this)
3. Lots of new technology being developed – concentrated solar power, tidal, geothermal, modular nuclear reactors and nuclear fission (nuclear categorised as green by EU), floating offshore wind (energy islands) Namibia is already transitioning towards renewables (mainly solar PV) on the basis of cost – does this need to be speeded up and expanded?
4. Namibia part of SAPP
5. Need to diversify renewables to reduce risk
6. Storage a problem (BESS, batteries and green hydrogen)
7. Use of solar water heaters still limited in Namibia

Implications for Namibia?

1. Already seeing switch to renewables with more to come
2. Namibia could become a net electricity exporter


MAPPED
SOLAR POWER BY COUNTRY IN 2021
Solar power is becoming an increasingly important part of the global energy mix. We mapped countries by their solar power capacity on an overall and per capita basis.
NO DATA
INSTALLED CAPACITY, MEGAWATTS (MW)
EUROPE
BELGIUM 5,648MW
FINLAND
ESTONIA
NORWAY
SWEDEN
LITHUANIA
BELARUS
LUXEMBOURG
DENMARK
POLAND 3,938MW
NETHERLANDS 10,218MW
GERMANY 53,783MW
SLOVAKIA
UNITED KINGDOM 13,563MW
FRANCE 11,233MW
UKRAINE 5,380MW
ROMANIA
BULGARIA
SPAIN 14,089MW
AUSTRIA
HUNGARY
SWITZERLAND
CZECH REPUBLIC
PORTUGAL
SLOVENIA
ITALY 21,600MW
CROATIA
MALTA
GREECE 3,247MW
CYPRUS
TURKEY 8,989MW
ASIA & OCEANIA
RUSSIA
CHINA 254,355MW
JAPAN 67,000MW
SOUTH KOREA 14,575MW
TAIWAN 5,817MW
PAKISTAN
INDIA 39,211MW
THAILAND
VIETNAM 16,504MW
PHILIPPINES
CAMBODIA
MALAYSIA
SINGAPORE
INDONESIA
BANGLADESH
AUSTRALIA 17,627MW
NEW ZEALAND
THE AMERICAS
CANADA 9,325MW
U.S. 75,572MW
MEXICO 5,644MW
CUBA
DOMINICAN REPUBLIC
GUATEMALA
HONDURAS
EL SALVADOR
PANAMA
COLOMBIA
PERU
BRAZIL 7,881MW
BOLIVIA
CHILE
URUGUAY
ARGENTINA
AFRICA & MIDDLE EAST
ISRAEL 1,439MW
JORDAN 1,356MW
IRAQ
IRAN
MOROCCO
ALGERIA
EGYPT 1,694MW
SAUDI ARABIA
UNITED ARAB EMIRATES 2,339MW
YEMEN
OMAN
SENEGAL
KENYA
NAMIBIA
SOUTH AFRICA 5,990MW
WATTS PER CAPITA
0 50 100 150 200 250 300 350 400 450 500 550 600 650
India's Bhadla Solar Park is the largest in the world with a capacity of 2,245MW.
Source: NS Energy
Australia has the highest solar radiation per square meter of any continent and leads the per capita capacity rankings.
Source: Geoscience Australia
Germany's solar power capacity is more than twice that of any other European country.
China installed 49,355MW of new solar capacity in 2020, and solar installations in 2021 are expected to reach 55,000–65,000MW.
Source: Bloomberg
Source: IRENA - Renewable Capacity Statistics 2021
ELEMENTS
elements.visualcapitalist.com
The Earth's natural resources power our everyday lives. VC Elements breaks down the building blocks of the universe.
We live in a material world.

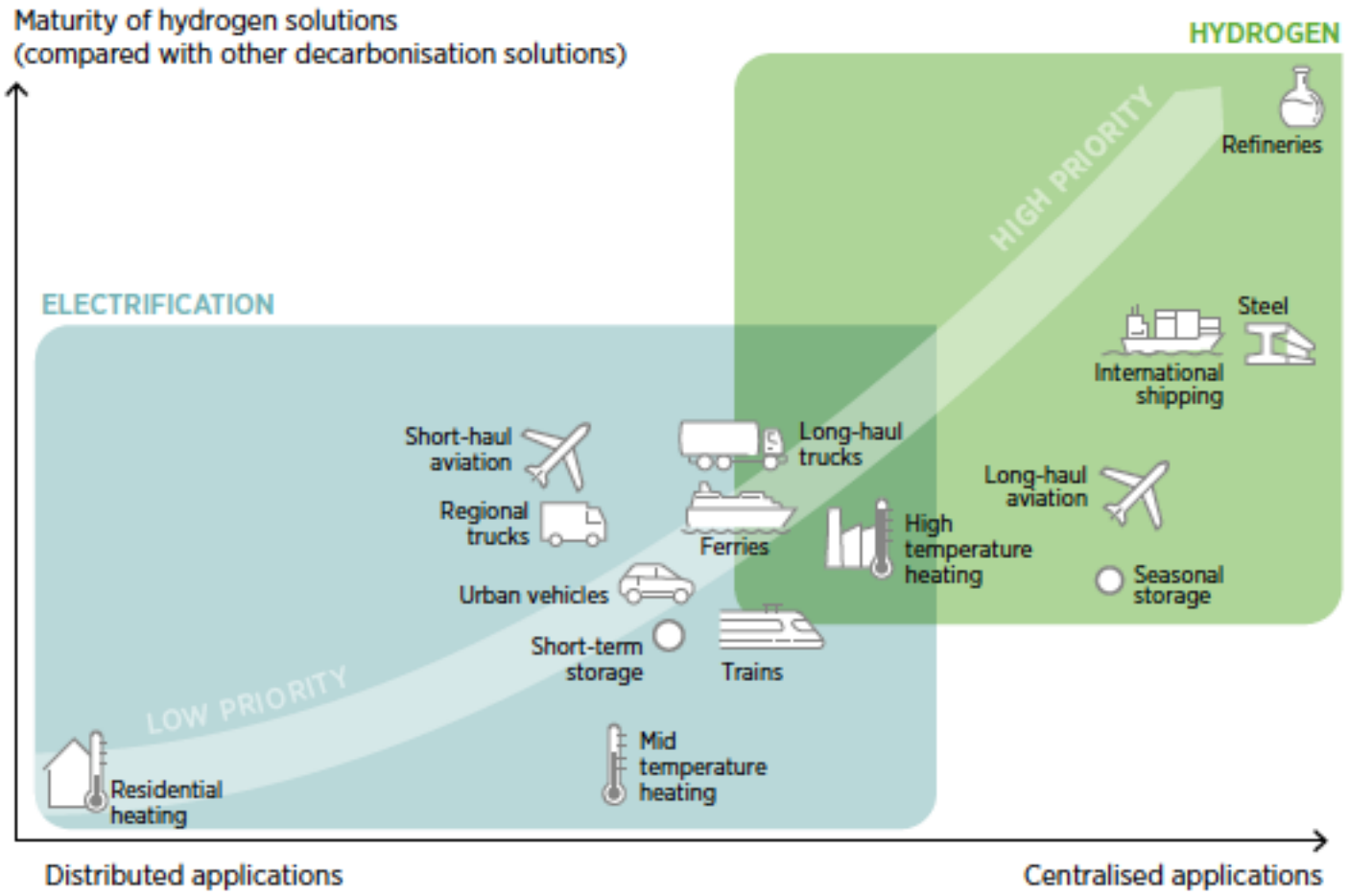
Green Hydrogen and Green Ammonia

1. Different coloured hydrogens (H_2) already exist but huge potential market for hydrogen fuel produced using renewables but huge technical uncertainties and risks
2. Good for decarbonising some activities that are otherwise hard to decarbonise (see hydrogen ladder in slide)
3. Cost of green hydrogen still high (but US Green Hydrogen Shot to achieve 1kg at US$1 in 1 decade “111”)
4. Storage and transport a significant challenge given need to reduce to -253 degree Celsius
5. May be better to minimise storage and transport by focusing on products which embody green hydrogen near where green hydrogen is produced

Implications for Namibia?

1. Potential to develop green hydrogen and ammonia industries but risks

Figure S.3 Clean hydrogen policy priorities



Sources: IRENA (forthcoming-b).

Coal, Oil, and Gas

1. Fossil fuels major cause of climate change but there will be a transition and therefore continued demand for fossil fuels
2. But it's becoming increasingly hard to finance FF projects
3. Oil and gas majors switching to renewables and decarbonisation – considering spinning off these parts of the business but argue that cash generated from oil and gas can be used to promote new business lines
4. Gas is being considered as transition fuel (from coal and oil)
5. SA remains heavily coal dependent

Implications for Namibia?

1. Will become harder to finance and exploit fossil fuel resources and abatement may be required raising costs

Coal, Oil, and Gas

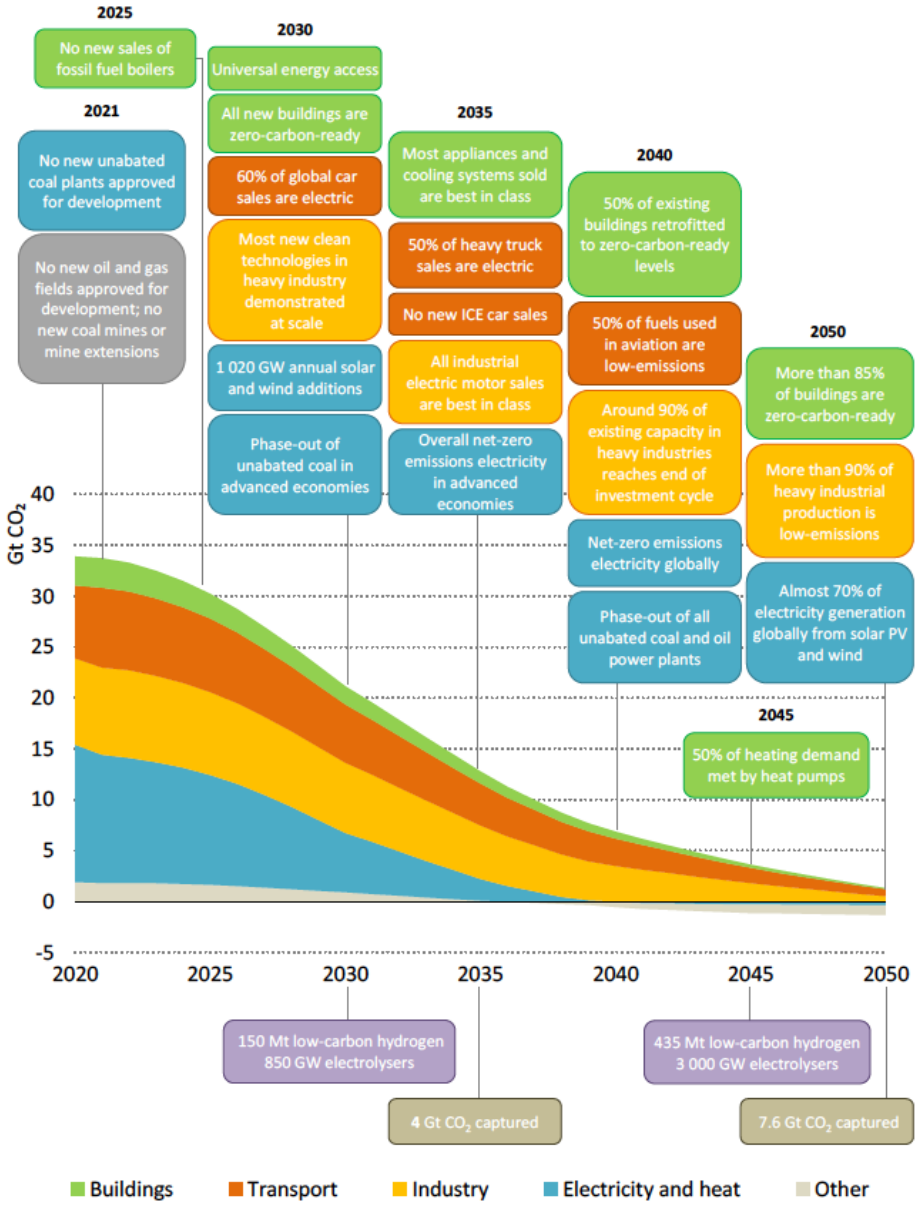
Tom Alweendo, Minister of Mines and Energy:

Namibia will not “suffocate itself by cutting off potential oil and gas resources that will assist in solving our problems”.

Contrast this with the IEA’s (May 2021) Roadmap of 400 milestones to reach Net Zero by 2050:

“…from today, no investment in new fossil fuel supply projects, and no further final investment decisions for new unabated coal plants. By 2035, there are no sales of new internal combustion engine passenger cars, and by 2040, the global electricity sector has already reached net-zero emissions.”

Key milestones in the pathway to net zero



namibian economics

Carbon Capture…Utilisation and Storage (CCUS)

1. Will be hard for world to completely decarbonise
2. Development of CCS will allow continued use of fossil fuels and low carbon processes
3. Examples of technical prototypes eg Sleipner CO2 storage facility in offshore Norway, Orka Carbon Capture by Climeworks AG in Iceland

Implications for Namibia?

1. May become important if Namibia exploits fossil fuel resources

Green Steel and Green Cement

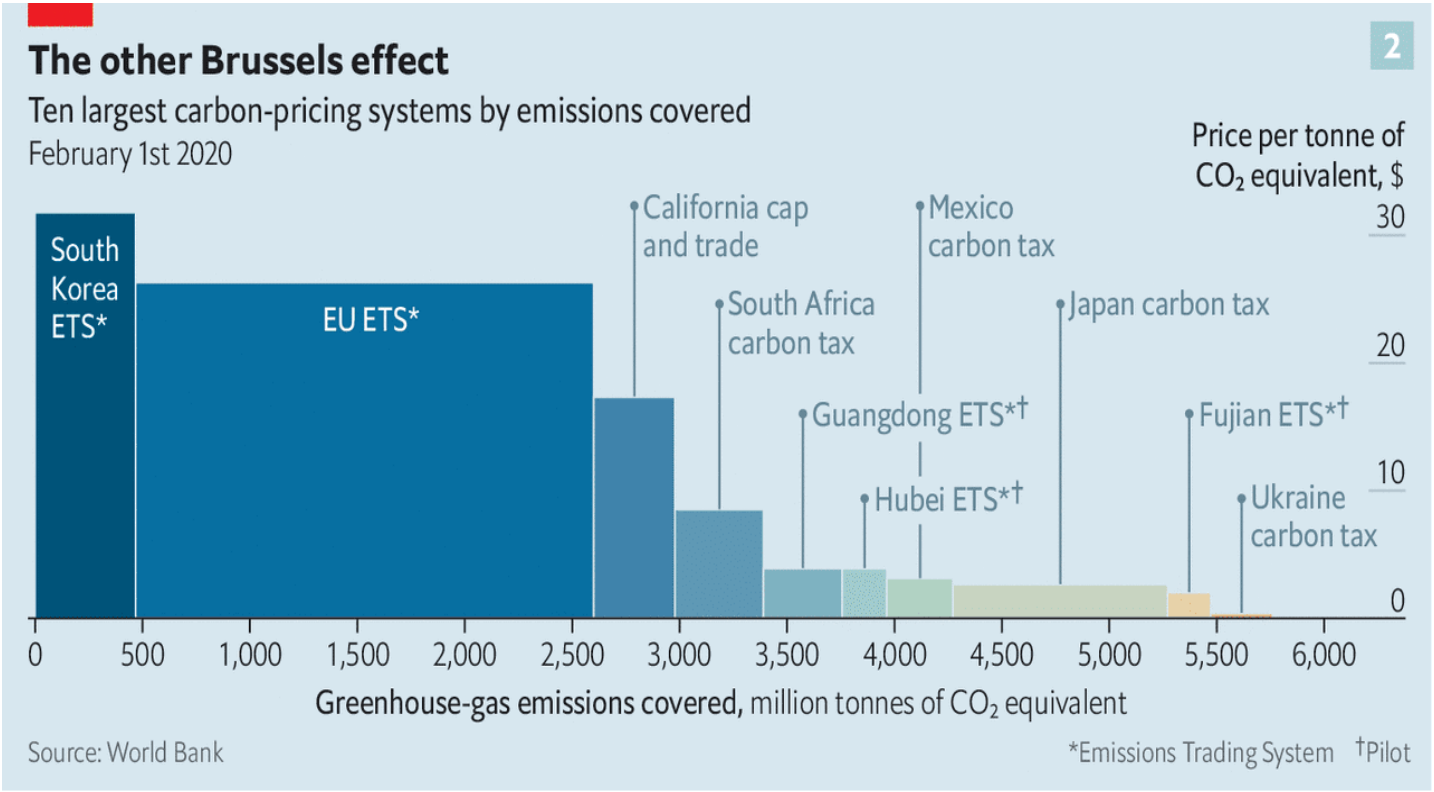
1. Steel about 8% of GHG emissions
2. Steel manufacturing is energy intensive (fossil fuels) and (BF-BOF) usually requires heating iron ore (which contains oxygen) with reducing agent (generally coking coal) to drive off oxygen (which generates CO_2) then blowing more oxygen over resultant pig iron (4% carbon) to reduce carbon content (to <1% carbon) to produce steel (which also generates CO_2) (alternative to BF-BOF is Electric Arc Furnace which produces steel mostly from scrap)
3. Green steel using hydrogen and renewables rather than coking coal (eg Hybrit and H2 Green Steel in Sweden and ThyssenKrupp in Germany)
4. Cement about 8% of GHG CO2? emissions (GCCA CoP26 Net zero pledge)
5. Cement manufacturing is energy intensive (generating CO2) and the process of producing the basic ingredient clinker involves heating limestone in a kiln to drive off carbon dioxide. 10 tonnes of cement produces 6 tonnes of CO_2.
6. Green cement can inject recycled CO_2 back into the cement to produce concrete or curing cement in CO2 as well as low-carbon cement and carbon capture (eg Solidia, CarbonCure, Ecocem)

Implications for Namibia?

1. Relevant to Ohorongo Cement (carbon capture)
2. Green cement and steel industries could be source of demand for green hydrogen
3. Change of materials over time

Border Taxes

1. EU set to introduce border tax adjustments which will make it harder to export “dirty” products into EU single market



The Economist

ESG: Environment, Social and Governance

1. ESG increasingly and voluntarily becoming more important to businesses and investors in certain markets
2. Covers all businesses (not sector specific) but will affect Namibia in mining and finance

3. Lacks common standards and enforcement

International Finance

1. Glasgow Financial Alliance for Net Zero (GFANZ)
2. 450 financial companies across 45 countries responsible for assets of over US$130tr
3. A forum to encourage the transition to net zero via the financial sector

Implications for Namibia? Will make it harder for Namibia to borrow to finance “dirty” projects

Legal Compensation

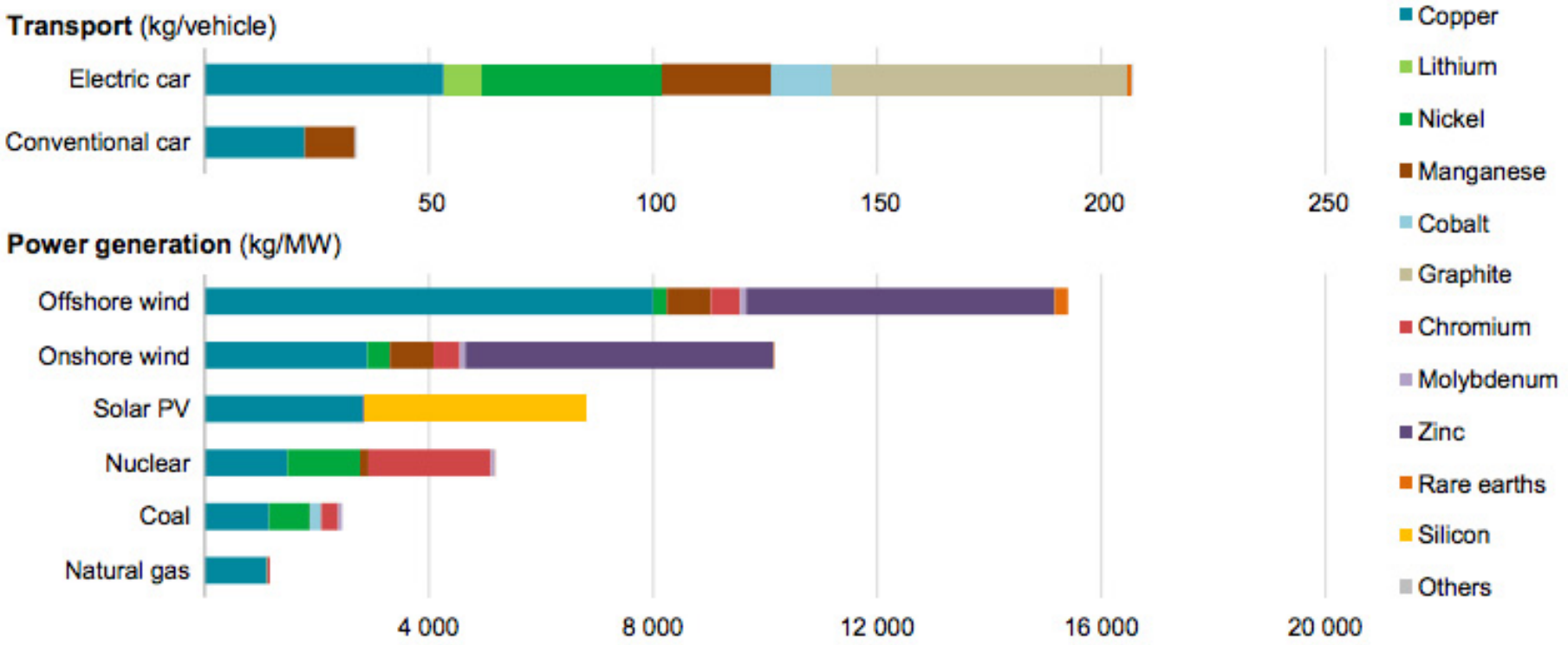
1. Growing interest in legal claims against large emitting countries and oil and gas companies (eg Pacific Islands, Netherlands Shell case)

namibian economics

Minerals

1. The growth in BEVs and renewables means increased demand for key minerals (lithium, nickel, cobalt)
2. Relationship between carmakers and miners (eg Tesla)
3. A potential boom in nuclear energy means renewed interest in uranium
4. Implications for Namibia? Encourage exploration for key minerals

Minerals



namibian economics

Buildings and Heating

1. Building construction (use of wood and other materials)
2. Cement highly carbon-intensive – knocking down old buildings
3. Heating using hydrogen or heat pumps
4. Implications for Namibia?
5. Air conditioning a bigger issue for Namibia

International resources are available which countries like Namibia can take advantage of

International Resources

1. Global Environment Facility
2. Green Climate Fund (US$437.3m – really?)
3. Adaptation Fund
4. Clean Development Mechanism
5. Bilateral country donors (eg GIZ)
6. International finance (ESG)
7. Namibia has made use of these resources (three institutions accredited: EIF, DRFN and DBN) summary of funding so far

LANDSCAPE OF CLIMATE FINANCE IN 2019/2020

Global climate finance flows along their life cycle in 2019 and 2020. Values are average of two years' data, in USD billions.

632 BN USD ANNUAL AVERAGE

CLIMATE POLICY INITIATIVE

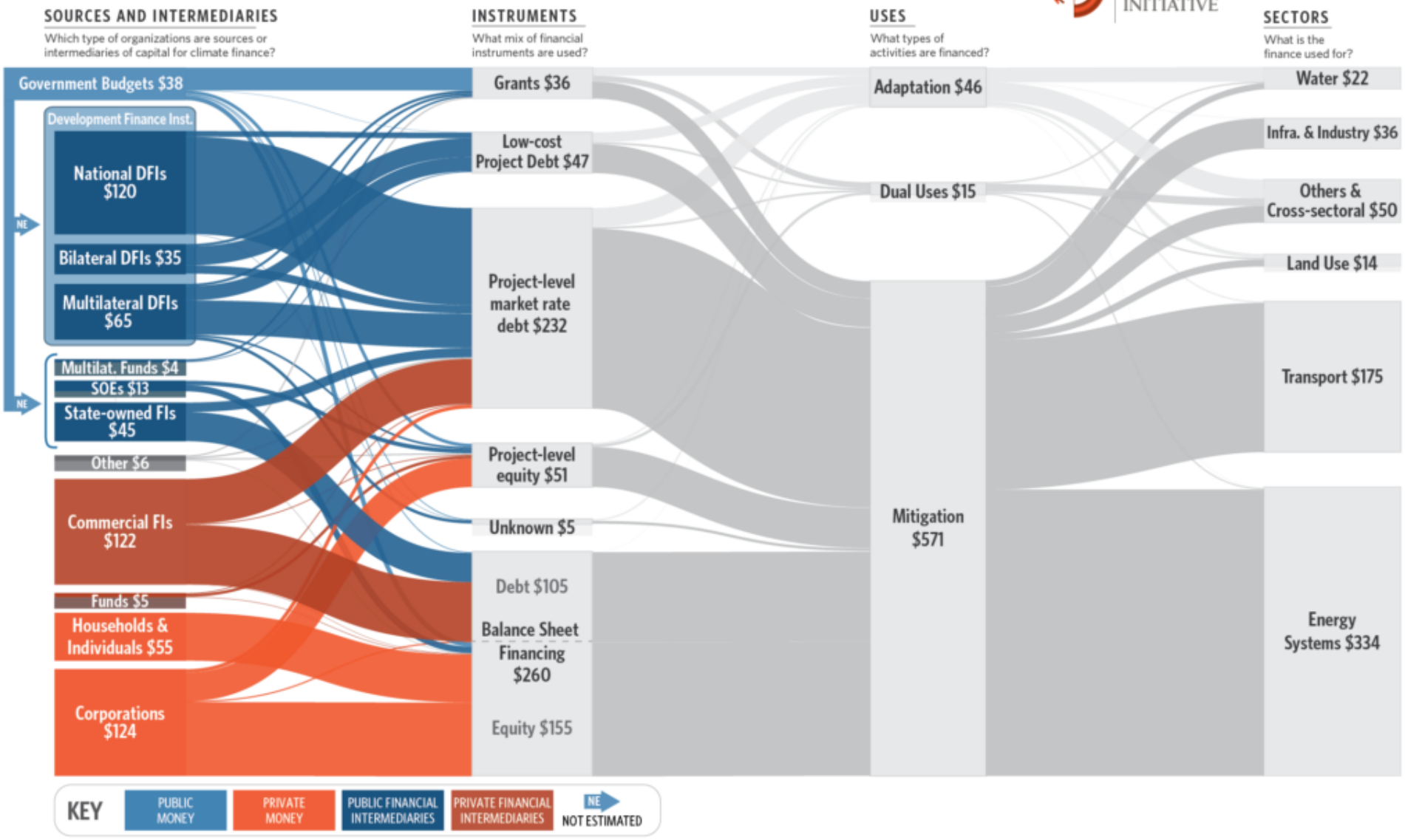
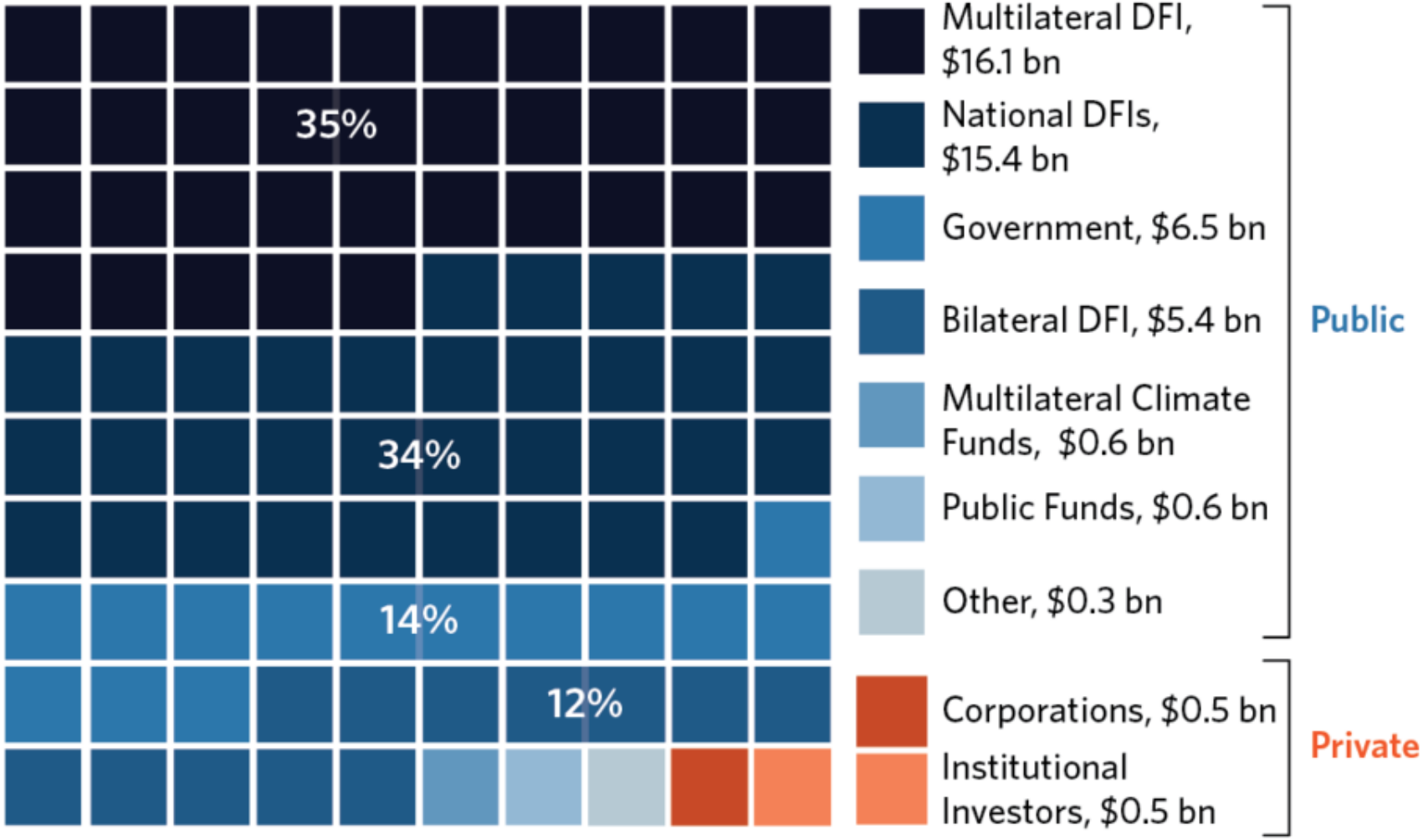
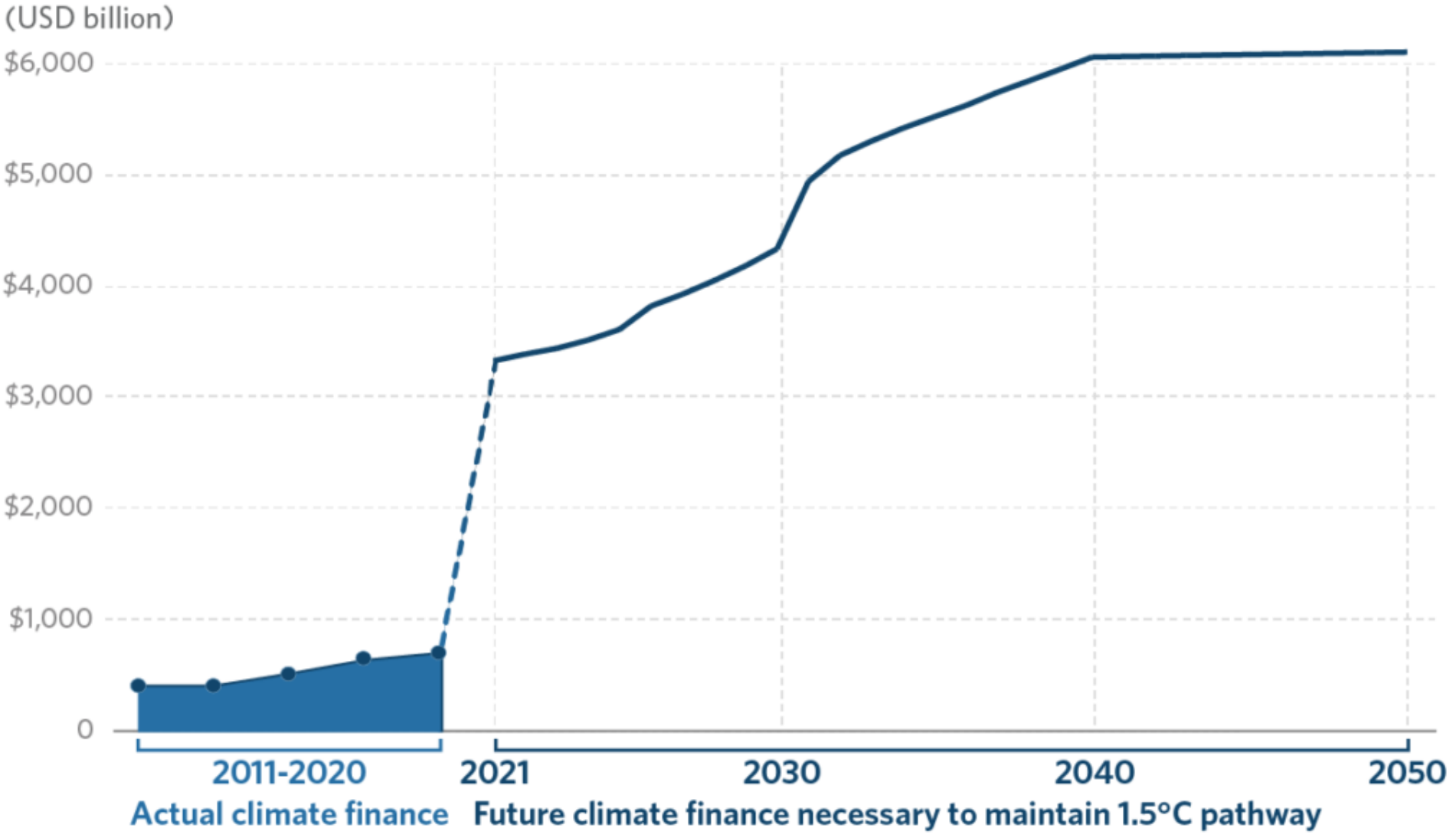


Figure 18: Sources of adaptation finance



Source: Climate Policy Initiative

Figure 3: Global tracked climate finance flows and the average estimated annual climate investment need through 2050



Namibia's Nationally Determined Contribution

1. Namibia is a NAI country
2. Namibia submitted INDC in 2015
3. Namibia submitted NDC in 2021

Namibia's Nationally Determined Contribution

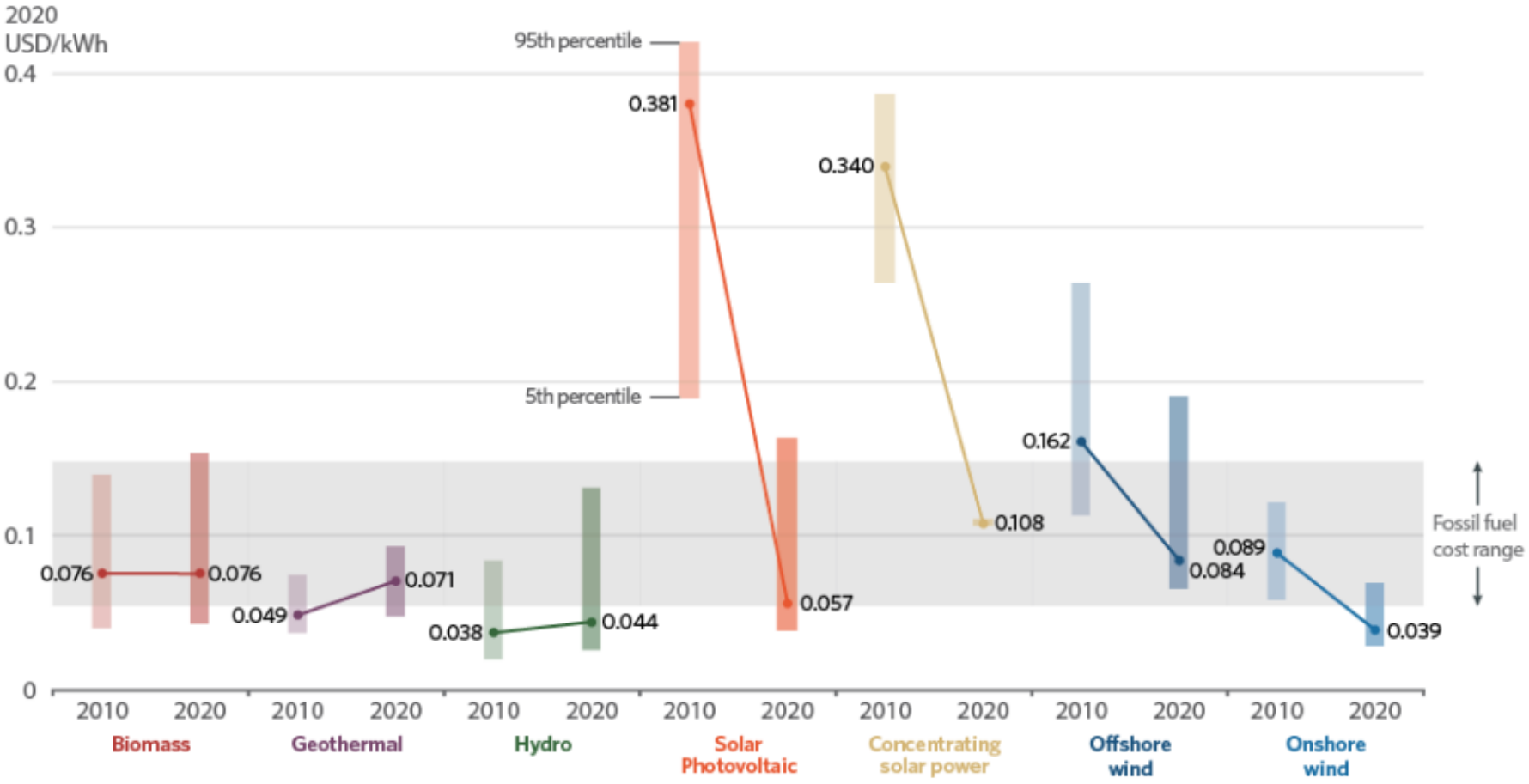
1. Summary of NDC (with gentle critique?)
2. Emphasis on Mitigation rather than Adaptation in NDC
3. INDC US$22.6 billion!

Mitigation (USDm)		
Unconditional	$	2,072
Conditional	$	1,538
Adaptation (USDm)		
Unconditional	$	254
Conditional	$	1,468
Total (USDm)		
	$	5,332

What has Namibia actually done so far?

1. Institutional infrastructure (National Climate Change Committee) and UNFCCC compliance
2. Wide range of donor-funded projects and EIF projects
3. 13 new IPPs in electricity sector and NamPower 70MW REFIT renewables programme
4. Environmental levies but otherwise not really involved MoF

Figure 13: Global LCOEs from newly commissioned, utility-scale renewable power generation technologies (2010-2020)



Source: Climate Policy Initiative

What are other African countries doing?

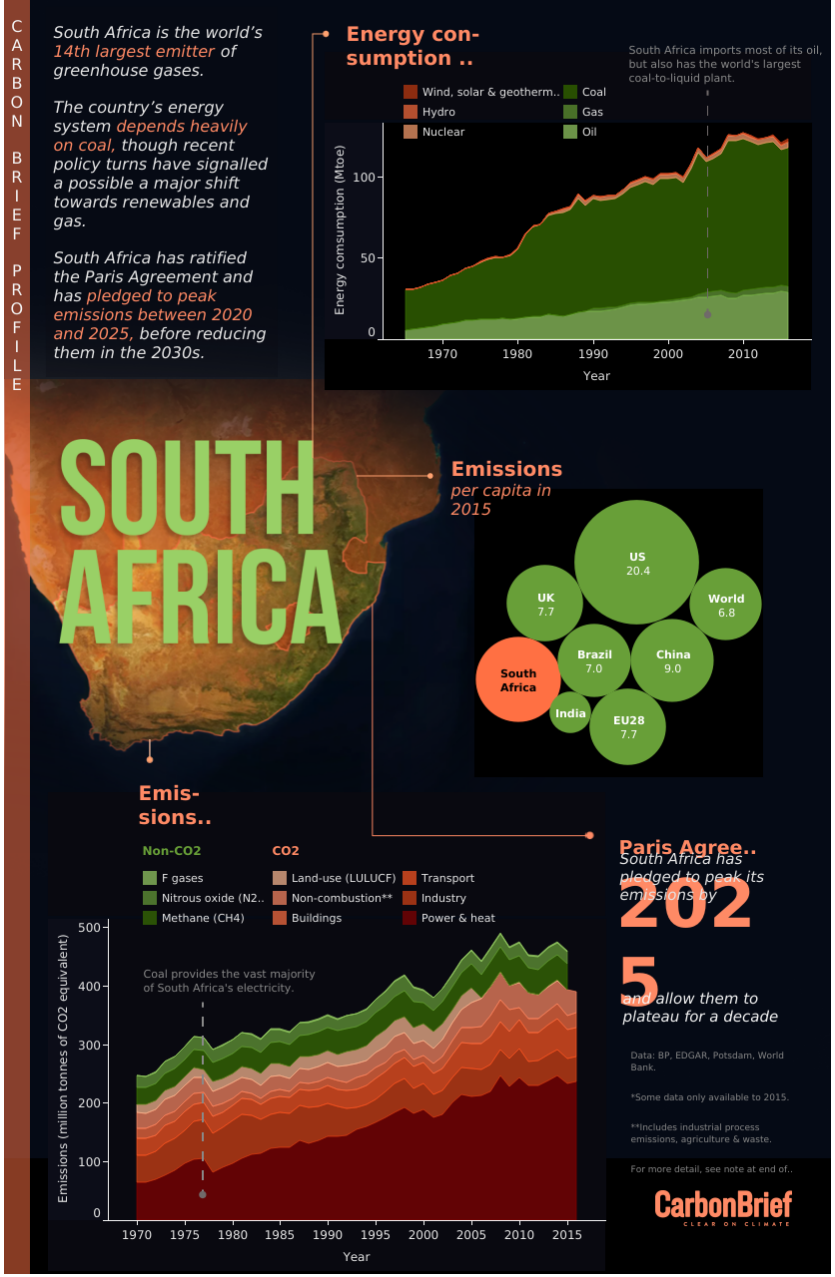
1. The case study of South Africa
2. The case study of Rwanda

What are other African countries doing? South Africa

1. Carbon tax (June 2019)
2. Just Energy Transition (CoP 26 US$8.5bn)
3. Developing a US$500 million green investment plan
4. Green hydrogen initiative (Sasol in Port Nolloth)
5. Net Zero by 2050 ambition
6. Low Emissions Development Strategy submitted to UNFCCC in September 2020
7. Climate Tracker Rating: Insufficient

SA Coal and the Just Energy Transition

1. CoP26 announcement of US$8.5 billion (US, UK France, Germany and EU) Just Energy Transition to end reliance on coal
2. South African electricity is 80% dependent on coal
3. South Africa is 14th largest GHG emitter and largest emitter of sulphur dioxide
4. Before CoP26 move from 80% to 60% by 2030 (wind and solar 25%)
5. Carbon tax introduced on 1 June 2019
6. After CoP26…


CARBON BRIEF PROFILE
South Africa is the world's 14th largest emitter of greenhouse gases.
The country's energy system depends heavily on coal, though recent policy turns have signalled a possible a major shift towards renewables and gas.
South Africa has ratified the Paris Agreement and has pledged to peak emissions between 2020 and 2025, before reducing them in the 2030s.
Energy consumption ..
South Africa imports most of its oil, but also has the world's largest coal-to-liquid plant.
Wind, solar & geotherm..
Hydro
Nuclear
Coal
Gas
Oil
Energy consumption (Mtoe)
100
50
0
1970
1980
1990
2000
2010
Year
SOUTH AFRICA
Emissions
per capita in 2015
US 20.4
UK 7.7
World 6.8
Brazil 7.0
China 9.0
South Africa
India
EU28 7.7
Emis-sions..
Non-CO2
F gases
Nitrous oxide (N2..
Methane (CH4)
CO2
Land-use (LULUCF)
Non-combustion**
Buildings
Transport
Industry
Power & heat
Coal provides the vast majority of South Africa's electricity.
Emissions (million tonnes of CO2 equivalent)
500
400
300
200
100
0
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
Paris Agree..
South Africa has pledged to peak its emissions by
2025
and allow them to plateau for a decade
Data: BP, EDGAR, Potsdam, World Bank.
*Some data only available to 2015.
**Includes industrial process emissions, agriculture & waste.
For more detail, see note at end of..
CarbonBrief
CLEAR ON CLIMATE

What should Namibia do (and how can policy encourage goods and discourage bads)? Need for policy action?

Key questions for economic policy (and MoF):

Q1: Are there currently any harmful tax policies?

No. Revenue side of budget is relatively robust as far as climate change is concerned. (no carbon taxes but environmental levies – no specific fossil fuel tax expenditures)

Q2: Are there currently any harmful expenditure policies?

No. Government does not subsidise fossil fuel usage and other damaging activities to an undue extent.

But current levels of public debt mean it is harder to raise the resources necessary to address challenges of climate change (especially adaptation measures but lots of grant funding available)

	Capacity
1	Enhance capacity of MoF and key ministries to engage on all climate issues (cadre of climate economics across government)
2	Develop programme of strategic climate research for Namibia
3	Develop capacity in range of climate technical skills at Namibia's educational institutions (UNAM,NUST)
4	Maintain watch on key technologies and assess whether and how they can be employed in Namibia
5	Maintain watch on international climate compensation cases and law
6	Maintain watch on international environmental regulations
	Public Revenue, Expenditure and Debt
7	Ensure public financial resources to maintain and enhance the ability of Namibian land to act as carbon sink especially in forestry
8	Introduce forestry tax for commercial loggers
9	Ensure rural communities receive the financial support they need for adaptation (subsidies through agriculture?) via National Adaptation Plan
10	Prepare for increased rural-to-urban migration by providing urban housing (Development Workshop Namibia)
11	Use international grants wherever possible to support mitigation and adaptation efforts taking local co-financing into account
12	Reduce levels of public debt to sustainable levels so that Namibia is in a position to borrow to address coming challenges (better than SWF)
13	Consider selling Green Bonds for indentifiable climate and environmental projects and programmes with clear returns
14	Consider selling project finance bonds for projects with clear identifiable revenue stream
15	Subject public sector projects to full economic cost-benefit analysis including climate costs and benefits
16	Climate-proof and improve energy and water efficiency of public buildings and facilities including government offices, schools, hospital and clinics
	Public Enterprises
17	Climate-proof critical infrastructure including roads, rail, ports, airports, IT, electricity and water infrastructure (public enterprises)
18	Review operations of vulnerable public enterprises, the port and town of Walvis Bay and Ruacana hydropower station
19	Place special emphasis on improving water use and efficiency and ensure maintenance of water infrastructure
	Business and Investment Environment
20	Ensure Namibia improves as an attactive investment destination for FDI to boost growth and jobs (NIPA and NEEEB)
21	Prepare for increased rural-to-urban migration by creating enabling environment for urban investment and jobs
22	Promote private investment in new high-risk ventures and ensure private investors bear risk in developing risky new industries like green hydrogen and ammonia
23	Ensuring Namibia remains attractive to foreign mining investors
24	Decide whether and how to support tourism sector to promote climate friendly tourism
25	Subject large fossil fuel energy projects to full cost-benefit analysis
26	If oil and gas resources are exploited ensure abatement or CCS is incorporated into costs
27	Accelerate move into renewables - solar PV and wind
28	Prepare SAPP for push into renewables including large projects such as Mega Solar
29	Consider whether subsidies or taxes are necessary to transition into new technologies eg BEVs
	Regulation
30	Change building regulations to take account of climate change, energy and water efficiency
31	Examine whether EIA certification process needs to take climate impact into account
32	Examine whether industry-specific regulations need to be changed (for example in mining or manufacturing)
33	Improve regulation of air-conditioners and disposal of refridgerators
34	Decide whether improved mining practices should be encouraged through licencing system and EIA
35	Develop joint plans with neighbouring countries to deal with climate migration

Robin Sherbourne

Namibian Economics
r.c.d.sherbourne@gmail.com

PO Box 86058
Windhoek
Namibia