Dr Andy Scollick
[redacted]
W: andyscollick.com

Professor Dame Louise Richardson DBE
C/o International Security Policy Section
Department of Foreign Affairs
80 St Stephen's Green
Dublin 2, D02 VY53

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Public Consultation on International Security Policy

Submission by Andy Scollick, PhD

Dear Professor Richardson,

I would like to focus on Ireland's foreign, security and defence policies in the context of climate change. The first part looks at some background from the latest scientific assessments regarding climate change, focusing on the human dimension, which sets the evidence-based scene for my assumptions, arguments and opinions that follow. The second part looks at the implications for future policies.

Before beginning, as a write this, the five top headlines on the *Guardian* climate crisis section on 5 July 2023 are indicative of the dire state of affairs regarding climate change:

- *China floods: Xi Jinping urges action as rains destroy buildings and displace thousands*
- *Revealed: UK plans to drop flagship £11.6bn climate pledge*
- *Extreme weather: Monday was hottest day for global average temperature on record, as climate crisis bites*
- *El Niño: Climate-heating El Niño has arrived and threatens lives, declares UN*
- *Climate crisis: Will El Niño on top of global heating create the perfect climate storm?*

1. Climate Change

1.1 Latest IPCC assessment of climate change

Despite the 2015 Paris Agreement, various national climate action plans and significant progress in the transition away from fossil to renewable energy sources, global warming will continue to by driven by future emissions. According to the **Intergovernmental Panel on Climate Change** (IPCC) *Synthesis Report of the IPCC Sixth Assessment Report (AR6)* (Lee *et al*. 2023: pp. 33–43), this will affect all major components of the climate system, that is, the atmosphere, hydrosphere, cryosphere, land, biosphere, anthroposphere and the interactions between them. Every region will experience multiple and concurrent changes, many of which will be irreversible on centennial to millennial time scales.

In nearly all scenarios and modelled pathways considered by the IPCC, global warming will continue to increase in the near term (i.e. before 2040). The Earth will reach a global average temperature of 1.5°C above the 1850–1900 baseline level in the first half of the 2030s. Under the very lowest, most optimistic greenhouse gas (GHG) emissions scenario, the 1.5°C global warming level is likely to be exceeded, with an overshoot of no more than 0.1°C before declining back to 1.4°C by the end of the 21st century. Under higher emissions scenarios, global warming is likely or very likely to exceed the 1.5°C level in the near term. 'Global warming of 2°C will be exceeded during the 21st century unless deep reductions in [carbon dioxide (CO_2)] and other GHG emissions occur in the coming decades' (p. 33).

Future warming depends on future GHG emissions, with cumulative net CO_2 being dominant. The IPCC gives best estimates (and corresponding ranges in brackets) of global warming above the 1850–1900 baseline for the period 2081–2100 that spread from 1.4°C (1.0–1.8°C) for a very low GHG emissions scenario to 2.7°C (2.1°C–3.5°C) for an intermediate scenario and 4.4°C (3.3°C–5.7°C) for a very high GHG emissions scenario. Furthermore, modelled emissions pathways that are consistent with a continuation of current climate policies (as of the end of 2020) lead to global warming of 3.2°C (2.2–3.5°C) by 2100.

Many climate-related risks (i.e. the potential for adverse consequences) are higher than previously assessed. Projected long-term impacts 'will be up to multiple times higher than currently observed' (p. 36), for example, in terms of the number of affected people and species. 'Many changes in the climate system become larger in direct relation to increasing global warming. With every additional increment of global warming, changes in extremes continue to become larger' (p. 34).

Continued global warming will: further amplify permafrost thawing and loss of seasonal snow cover, glaciers, land ice and Arctic sea ice; further intensify the global water cycle, including its variability, global monsoon precipitation, and very wet and very dry weather events and seasons; lead to more frequent and intense marine heatwaves; increase ocean acidification and deoxygenation; and increase global mean sea level. Sea level rise is unavoidable and will continue for thousands of years, 'with higher emissions leading to greater and faster rates of sea level rise' (p. 42).

With every increment of global warming, climate change influences and risks will become increasingly complex and more difficult to manage as regions experience multiple and concurrent changes and events. Compound heatwaves and droughts will become more frequent. At 1.5°C global warming, heavy precipitation and flooding events are projected to intensify and become more frequent in most regions in Africa, Asia, North America and Europe. At 2°C or above, these changes expand to more regions and/or become more significant and more frequent. Severe agricultural and ecological droughts are projected in Europe, Africa, Australasia and North, Central and South America. Other projected regional changes include intensification of tropical cyclones and/or extratropical storms, and increases in aridity and fire weather (pp. 34–35). Risks will potentially cascade across sectors and regions due to the interactions between multiple climatic and non-climatic risk drivers such as biodiversity loss or violent conflict (p. 37).

At 1.5°C global warming, climate-related risks to ecosystems and human health, livelihoods, food security, water supply, human security and economic growth are projected to increase. At 2°C global warming, overall risk levels will transition to *high* and *very high*. Climate-related changes in food availability and diet quality will increase nutrition-related diseases and the number of undernourished people, affecting tens to hundreds of millions of people, particularly among the more vulnerable in sub-Saharan Africa, South Asia and Central America. 'Climate change risks to cities, settlements and key infrastructure will rise sharply in the mid- and long-term with further global warming, especially in places already exposed to high temperatures, along coastlines, or with high vulnerabilities' (p. 36).

At 3°C global warming, 'additional risks in many sectors and regions reach high or very high levels, implying widespread systemic impacts, irreversible change and many additional adaptation limits' (p. 37). At 4°C and above, global warming will lead to far-reaching impacts on natural and human systems. It is projected that about 4 billion people will experience water scarcity and the global burned area will increase by 50–70% and the fire frequency by about 30% compared to today.

As global warming increases so does the likelihood of abrupt and irreversible changes and their impacts. Between 1.5–2.5°C, risks associated with large-scale singular events or tipping points, such as ice sheet instability or ecosystem loss from tropical forests, transition to high risk and then to very high risk between 2.5–4°C. 'The probability of crossing uncertain regional thresholds increases with further warming' (p. 42).

The IPCC synthesis report also addresses high-impact, low-probability risks:

> '**The probability of low-likelihood outcomes associated with potentially very large impacts increases with higher global warming levels** [...]. Warming substantially above the assessed *very likely* range for a given scenario cannot be ruled out, and there is *high confidence* this would lead to regional changes greater than assessed in many aspects of the climate system. Low-likelihood, high-impact outcomes could occur at regional scales even for global warming within the *very likely* assessed range for a given GHG emissions scenario' (p. 43, emphases in original).

For example, a low-probability event such as a sequence of large explosive volcanic eruptions within decades, which would lead to substantial cooling globally and regional climate perturbations over several decades. Or an abrupt collapse of the Atlantic Meridional Overturning Circulation — the 'conveyor belt' that carries warm water northward and cold, dense deeper water southward — which, if it occurs, would '*very likely* cause abrupt shifts in regional weather patterns and water cycle, such as a southward shift in the tropical rain belt, and large impacts on ecosystems and human activities' (p. 43, emphasis in original).

1.2 Climate change updates

Global

The **World Meteorological Organization** (WMO) *State of the Global Climate 2022* report (WMO 2023a) complements the IPCC AR6, which only includes literature submissions up to and including 2021. Key climate indicators show that planetary scale changes caused by record levels of GHGs continued in 2022:

Greenhouse gases — Concentrations of the three main GHGs (CO_2, methane and nitrous oxide) reached record highs in 2021, the latest year for which consolidated global values are available. The annual increase in methane concentration from 2020 to 2021 was the highest on record. Real-time data from specific locations show that levels of the three GHGs continued to increase in 2022.

Temperature — The updated global average temperature over the period 2013–2022 was 1.15°C (1.00–1.25°C) above the 1850–1900 average. The years 2015 to 2022 were the eight warmest in the 173-year instrumental record despite the cooling impact of a La Niña event for the past three years.

Oceans — Global mean sea level continued to rise in 2022. Around 90% of the energy trapped in the climate system by GHGs goes into the ocean. Ocean heat content, which measures this gain in energy, reached a new record high in 2022.

Cryosphere — Sea ice in Antarctica dropped to the lowest level on record. The Greenland Ice Sheet experienced a reduction in mass for the 26th year in a row. The European Alps smashed records for glacier melt in 2022. Measurements on glaciers in High Mountain Asia, western North America, South America and parts of the Arctic also reveal substantial glacier mass losses.

Extreme meteorological and climatological events such as heavy rain and snow, droughts, heatwaves, cold spells and storms, including tropical storms and cyclones, individually, in combination and in conjunction with other factors, can lead to other events such as flooding, landslides, wildfires and compound extremes. 'Together, these have a wide range of impacts on human and natural systems' (WMO 2003a: p. 24). Populations worldwide continue to be gravely impacted by extreme weather and climate events. "For example, in 2022, continuous drought in East Africa, record breaking rainfall in Pakistan and record-breaking heatwaves in China and Europe affected tens of millions, drove food insecurity, boosted mass migration, and cost billions of dollars in loss and damage," said WMO Secretary-General Professor Petteri Taalas (WMO 2023b).

Excess deaths associated with record-breaking heatwaves in Europe in 2022 exceeded 15,000 in total across Spain, Germany, the United Kingdom, France and Portugal. China had its most extensive and long-lasting heatwave since national records began, resulting in the hottest summer on record by a margin of more than 0.5°C. 'As of January 2023, it was estimated that over 20 million people faced acute food insecurity across the region, under the effects of the drought and other shocks' (WMO 2023b). In Pakistan in July and August 2022, record-breaking rainfall led to extensive flooding. Some 33 million people were affected, while almost 8 million people were displaced, with at least 1,700 deaths.

In terms of socio-economic impacts: as of 2021, '2.3 billion people faced food insecurity, of which 924 million people faced severe food insecurity' (WMO 2023a: p. 32). An estimated 767.9 million people — 9.8% of the global population — faced undernourishment in 2021. 'Rising undernourishment has been exacerbated by the compounded effects of hydrometeorological hazards and COVID-19 on health, food security, incomes and equality, as well as the effects of protracted conflicts and violence' (WMO 2023a: p. 33). As of October 2022, people in several countries in Africa and Asia, plus Haiti in the Caribbean, experienced starvation or death and required urgent humanitarian action. 'In these countries, the key drivers and aggravating factors for acute food insecurity were conflict/insecurity, economic shocks, political instability, displacement, dry conditions and cyclones' (p. 33).

Furthermore, heatwaves in the 2022 pre-monsoon season in India and Pakistan caused a decline in crop yields. This, combined with the banning of wheat exports and restrictions on rice exports in India after Russia's attempted full-scale invasion of Ukraine in February 2022, 'threatened the availability, access, and stability of staple foods within international food markets and posed high risks to countries already affected by shortages of staple foods' (WMO 2023a: p. 33).

Throughout 2022, hazardous climate- and weather-related events and conditions drove new population displacement and worsened the situation for many of the 95 million people already living in displacement at the beginning of the year. Though most people displaced by such events remained within the territories where they resided, in some situations people were forced to flee across international borders in search of safety and assistance.

The Horn of Africa (Ethiopia, Kenya and Somalia) was particularly badly affected due to the catastrophic impacts of drought, hunger and conflict. In Syria, severe winter storms, heavy snowfall and flooding damaged displacement sites, leading to secondary displacements. In Pakistan, by October 2022, some 8 million people had been internally displaced by the floods. In Bangladesh, the monsoon season brought the worst floods in 20 years, affecting nearly 7.2 million people, resulting in over 1 million displacements. In Brazil, floods and storms triggered a record 656,000 internal displacements. 'Some high-impact weather events in 2022 happened consecutively, leaving little time for recovery between shocks and compounding repeated and protracted displacement' (WMO 2023a: p. 36).

Europe

The *State of the Climate in Europe Report 2022* by the **WMO and the European Union's (EU) Copernicus Climate Change Service** (WMO 2023c) confirms that Europe is the fastest warming of all the WMO regions. Since the 1980s, Europe has warmed at a rate of +0.5°C per decade, more than twice the global average. The 2022 annual average temperature for Europe was between the second and fourth highest on record: approximately 2.3°C above the pre-industrial (1850-1900) average used as a baseline for the Paris Agreement. Much of south-western Europe was more than 1°C above the 1991–2020 average in 2022, with some areas more than 2°C above. 'The Arctic has been warming at a rate well above the global average since the 1990s, and over north-western Siberia in 2022 annual average temperatures were more than 3°C above the 1991–2020 average' (WMO 2023c: p. 8).

In 2022 Europe had its hottest summer since records began, while many countries in western and south-western Europe had their warmest year on record. Precipitation was below average across much of the region. The high temperatures "exacerbated the severe and widespread drought conditions, fuelled violent wildfires that resulted in the second largest burnt area on record, and led to thousands of heat-associated excess deaths," said Professor Taalas (WMO 2023c: p. 4). The severe heatwaves Europe experienced during the summer contributed to 16,305 reported excess deaths. "Our current understanding of the climate system and its evolution informs us that these kinds of events are part of a pattern that will make heat stress extremes more frequent and more intense across the region," said Dr Carlo Buontempo, Director of the Copernicus Climate Change Service (WMO 2023d). Storms and floods led to dozens of fatalities.

The lack of precipitation, in particular winter snow, combined with high summer temperatures, contributed to the largest loss of glacial ice recorded in the European Alps. The Greenland Ice Sheet continued to lose mass during 2022, and in September periods of exceptional warmth led to widespread surface melt. Meanwhile, North Atlantic sea surface temperatures in the WMO Europe region were the warmest on record and large portions of the region's seas were affected by strong or even severe and extreme marine heatwaves.

1.3 Global warming: where are we now and where are we heading?

The IPCC (Lee *et al*. 2023: p. 6) states that the updated global average surface temperature over the period 2013–2022 was 1.15°C (1.00–1.25°C) warmer than the 1850–1900 pre-industrial average. (The United Kingdom's Met Office puts the 2022 global average temperature at 1.16°C above the same baseline (Madge 2023), while Berkeley Earth (2023a) places it at 1.24°C above the baseline.) This observed net warming is the result of human activities and the emission of GHGs, dominated by CO_2 and methane, partly masked by aerosol cooling, primarily from the combustion of fossil fuels and changes in land use. The land temperatures were 1.65°C (1.36°C–1.90°C) and the ocean temperatures were 0.93°C (0.73°C–1.04°C) above 1850–1900 for the period 2013–2022.

A significant proportion of CO_2 emissions remain in the atmosphere for a very long time. According to the **IPCC** (Masson-Delmotte *et al*. 2021: p. 777), of the about 2,560 billion tonnes of CO_2 that were released into the atmosphere by human activities between 1750 and 2019, about a quarter was absorbed by the ocean (causing ocean acidification) and about a third by land vegetation. About 45% of these emissions remain in the atmosphere. Approximately 15–40% of an emitted CO_2 pulse will remain in the atmosphere longer than 1,000 years, 10–25% will remain for about ten thousand years, and the rest will be removed over several hundred thousand years (Masson-Delmotte *et al*. 2021: p. 2237).

(An earlier IPCC rule-of-thumb was that 'About 50% of a CO_2 increase will be removed from the atmosphere within 30 years, and a further 30% will be removed within a few centuries. The remaining 20% may stay in the atmosphere for many thousands of years' (Deman et al. 2007: p. 501).)

According to the **International Energy Agency** (IEA), global energy-related[1] CO_2 emissions grew by 0.9% or 321 million tonnes to a new all-time high of 36.8 billion tonnes in 2022 (IEA 2023: p. 5). These CO_2 emissions accounted for 89% of energy-related GHG emissions. Energy-related methane emissions rose to nearly 135 million tonnes CH4 or around 4 billion tonnes of CO_2 equivalent in 2022. Total energy-related GHG emissions increased by 1.0% to an all-time high of 41.3 billion tonnes of CO_2 equivalent (p. 14).

An analysis of data from the **Carbon Monitor** project[2] by Liu *et al*. (2023) finds that global CO_2 emissions from fossil fuel combustion and cement production reached 36.1 billion tonnes in 2022: an increase of 1.5% relative to 2021 and de facto rebound to near pre-COVID-19 pandemic levels.[3] 'These 2022 emissions consumed 13%–36% of the remaining

[1] That is, emissions from all uses of fossil fuels for energy purposes, including the combustion of non-renewable waste, as well as emissions from industrial processes such as cement, iron and steel, and chemicals production (IEA 2023: p. 16).
[2] https://carbonmonitor.org
[3] NB. Land-use changes accounted for an additional 4 billion tonnes of CO_2 emissions in 2022.

carbon budget to limit warming to 1.5°C, suggesting permissible emissions could be depleted within 2–7 years (67% likelihood)' (p. 205). The authors speculate that 'global CO_2 emissions might have returned to a pre-pandemic trend of continuous growth, suggesting that the peak of emissions has not yet been reached' (p. 205).

The atmospheric concentration of CO_2 continues to increase. It has risen from a relatively stable 280 parts per million (ppm) for millennia prior to the Industrial Revolution to 370 ppm by 2000 and 400 ppm by 2015. According to the **National Oceanic and Atmospheric Administration** (NOAA) and the '**Keeling Curve**', the monthly average CO_2 concentration currently stands at around 420 ppm (415–425 ppm) and continues its upward trend (NOAA 2023a; Scripps Institution of Oceanography, UC San Diego). As does the atmospheric concentration of other significant greenhouse gases, including fossil methane, which is 82.5 times more potent than CO_2 over 20 years, and nitrous oxide, which is 273 times more potent than CO_2 over 100 years (Masson-Delmotte *et al*. 2021: p. 1017).

According to NOAA, the atmospheric concentration of methane has reached a global monthly average of 1,920 parts per billion (ppb). To put this in perspective, the level was about 1,775 ppb in 2005 (NOAA 2023b). Likewise, atmospheric levels of nitrous oxide continue to reach new highs: a global monthly average of 336.6 ppb in 2023, compared to 319.7 ppb in 2005 (NOAA 2023c).

In other words, the atmospheric levels of CO_2, methane and nitrous oxide are continuing to increase at an alarming rate. The annual increase in methane in 2021 was about 18 ppb: the largest annual increase on record (WMO 2023a: p. 2).

1.4 Internal displacement and migration

In its *2023 Global Report on Internal Displacement*, the **Internal Displacement Monitoring Centre** (IDMC) recorded 60.9 million internal displacements (the number of forced movements of people within a country's borders) worldwide in 2022, a 60% increase on 2021 and the highest number ever. This comprised 28.3 million people displaced as a result of conflict and violence, and 32.6 million people displaced as a result of disasters. Of those displaced by disasters, 31.8 million (98%) were displaced by weather-related hazards, including 19.2 million by floods, 10 million by storms, 2.2 million by droughts and 366,000 by wildfires. The number of people living in internal displacement (IDPs) reached a record high of 71.1 million people at the end of 2022 and continues to rise. In many cases, disasters and conflict overlapped, prolonging IDPs' situations and displacing some for a second or third time. Conflict, disasters and displacement have aggravated global food insecurity. Climate variability, slow-onset hazards linked to climate change and weather-related shocks are likely to continue to drive internal displacements and increase pressure on already stretched systems. IDPs are more vulnerable to climate change impacts (IDMC 2023).

Forcibly displaced populations also include externally displaced people, such as refugees and asylum-seekers. According to the **United Nations Refugee Agency** (UNHCR), at the end of 2022 there were 35.3 million refugees and 5.4 million asylum-seekers worldwide (UNHCR 2023).

The *World Migration Report 2022* by the United Nations **International Organization for Migration** (IOM) states that there were almost 281 million international migrants in the world in 2020, which equates to 3.6% of the global population. This was up from 272 million (or 3.5%) in 2019 and 128 million more than in 1990. Nearly two thirds of these being labour migrants (migrant workers). Europe and Asia each hosted around 87 and 86 million international migrants respectively – comprising 61% of global international migrants. These regions were followed by North America, with almost 59 million international migrants in 2020 or 21% of global migrants, Africa at 9%, Latin America and the Caribbean at 5%, and Oceania at 3% (IOM 2021).

International migration is a complex issue that is subject to misinformation and politicisation. The vast majority of people do not migrate across borders; much larger numbers migrate within countries. Migration is not uniform across the world: it is shaped by economic, geographic, demographic and other factors, including the impacts of climate change, resulting in distinct migration patterns, such as migration 'corridors' being developed over many years. Migration corridors represent an accumulation of migratory movements over time. The largest corridors tend to be from developing countries to larger economies, such as those of the United States, the United Arab Emirates, Saudi Arabia and Germany. Large corridors can also reflect protracted conflict and related displacement, such as from Syria to Turkey (IOM 2021).

The relationship between the impacts of climate change and migration issues, including migration policy and practice, remains subject to significant knowledge gaps. However, it is recognised that migration[4] is generally multicausal, with decisions or the necessity to migrate being shaped by a combination of different factors, including a wide range of environmental and climate factors, from sudden-onset disasters such as typhoons and floods, to slow-onset processes like sea-level rise and land degradation (IOM 2021: p. 233).

In the context of environmental and climate change, migration can take many forms, 'with people moving near or far, internally or across borders, for a limited period of time or permanently' (p. 233). Climate change-induced displacement, migration and planned relocation constitute a continuum from forced (involuntary) to voluntary forms of migration. The corollary, of course, are the immobile and 'trapped' populations left behind who do not have the means to migrate out of areas degraded by the impacts of climate change.

A meta-analysis of literature by **Šedová *et al*.** (2021: p. 37) concludes that slow-onset impacts of climate change, in particular extremely high temperatures and drying conditions (i.e. extreme precipitation decrease or droughts), are generally more likely to increase migration than sudden-onset events (i.e. floods and hurricanes).

Projections of the number of climate migrants

The **World Bank**'s updated *Groundswell* report forecasts that without early and concerted climate and development action, as many as 216 million people could move within their own countries due to slow-onset climate change impacts by 2050. This comprises 85.7 million in Sub-Saharan Africa, 48.4 million in East Asia and the Pacific, 40.5 million in South Asia, 19.3 million in North Africa, 17.1 million in Latin America and 5.1 million in Eastern Europe and Central Asia. They will migrate from areas with water scarcity and lower crop productivity and from areas affected by sea-level rise and storm surges. 'Hotspots of internal climate migration could emerge as early as 2030 and continue to spread and intensify by 2050'

[4] Chapter 9 uses 'migration' as an umbrella term to refer to forced and voluntary forms of movement that can occur in the context of climate and environmental change (IOM 2021: p. 236).

(Clement *et al*. 2021). Some places may become less liveable by 2050 due to heat stress, extreme weather events and land degradation.

The **United Nations** *World Population Prospects 2022* projects global population to grow to around 8.5 billion people in 2030, 9.7 billion people in 2050 and reach a peak of 10.4 billion people in the 2080s and to remain at that level until 2100 (United Nations 2022: p. i).

The **Institute for Economics & Peace**'s (IEP) *Ecological Threat Report 2022* assesses ecological threats relating to food risk, water risk, rapid population growth and natural disasters. Though such threats may exist independently of climate change, climate change will have an amplifying effect, causing further ecological degradation. There were some 768 million people already facing extreme food insecurity (undernourishment) in 2021, 92% of them living in the least peaceful countries. 'Food insecurity and water stress are interlinked, as without adequate water capture it is impossible to provide sufficient food' (IEP 2022: p. 3). More than 1.4 billion people live in regions already experiencing severe levels of water stress. Although sub-Saharan Africa is the most exposed, several European countries are projected to have serious water stress by 2040, including Albania, Estonia, Greece, Italy, Kosovo, Macedonia, Netherlands, Portugal, Romania and Turkey. 'Conflict over water has been increasing, with the number of incidents where water was a trigger of fatal conflict increased by 300 per cent since 2000' (p. 4).

By 2050, 70% of the world's population will live in cities, up from the 54% in 2020. Many megacities (cities with more than 10 million people) have high projected population growth rates, high levels of air pollution, poor sanitation, lack of infrastructure, high crime rates, low levels of societal resilience, low levels of peace and substantial ecological threats (IEP 2022: p. 5).

The *Ecological Threat Report 2022* identifies 27 hotspot countries that face catastrophic ecological threats while also having the lowest levels of societal resilience. These countries are home to 768 million people. Seven of the eight most at risk hotspot countries are in sub-Saharan Africa. These are Burundi, Central African Republic, Chad, Republic of the Congo, Somalia, South Sudan and Uganda. The eighth country is Yemen (IEP 2022: p. 2).

The IEP estimates that in 2050, some 3.4 billion people (34.7% of the world's total population) will reside in countries facing catastrophic ecological threats, compared to 2 billion in 2022. Most of the increase will be in sub-Saharan Africa.

The shrinking human climate niche

A recent paper by **Lenton *et al***. (2023) calculates the numbers of people likely to be left outside of the 'human climate niche' as a consequence of global warming. Humans have adapted physiologically and culturally to a wide range of local climates. However, human population density has historically peaked in places with an average annual temperature of approximately 13°C, with a secondary peak at about 27°C (associated with monsoon climates principally in South Asia). Therefore, our primary niche in which we thrive as a species is around 13°C. The density of domesticated crops and livestock follow similar patterns, while wealth (measured by gross domestic product or GDP) also peaks at about

13°C. Mortality increases at both higher and lower temperatures, consistent with the existence of a niche.[5]

The study shows that global warming has already put approximately 9% of the global population (more than 600 million people) outside the cooler primary (13°C) human climate niche. They are now living in the 'middle ground' between the 13°C and 27°C peaks. "While not dangerously hot, these conditions tend to be much drier and have not historically supported dense human populations," said Professor Chi Xu of Nanjing University (Morrison 2023). "Meanwhile, the vast majority of people set to be left outside the niche due to future warming will be exposed to dangerous heat."

Above the present level of approximately 1.2°C global warming, exposure to dangerous heat extremes (average annual temperatures of 29°C or higher) is predicted to increase markedly (Lenton *et al*. 2023: p. 6). Current climate policies are projected to result in 2.7°C global warming toward the end of the century (2080–2100). This could leave 22–39% of the global population outside the climate niche. **That's between 2.1 billion and 3.7 billion people.**

Population growth is projected to be highest in places at risk of dangerous heat. Assuming a future world of 9.5 billion people and 2.7°C global warming, India would have the greatest population exposed outside the niche at about 600 million people, followed by Nigeria with 300 million exposed. Exposure outside the niche could result in increased morbidity (illness or disease), mortality, adaptation in place, displacement or migration to lower temperature locations. High temperatures have been linked to increased mortality, decreased labour productivity, decreased cognitive performance, impaired learning, adverse pregnancy outcomes, decreased crop yield potential, increased conflict, hate speech, migration and infectious disease spread (Lenton *et al*. 2023: p. 2).

The 2.7°C level of global warming would expose large land areas of some countries to unprecedented heat. The worst-case scenarios of 3.6°C or even 4.4 °C global warming could put half of the world population outside the historical human climate niche, posing an existential risk (Lenton *et al*. 2023: p. 7). On the other hand, "Limiting global warming to 1.5°C rather than 2.7°C would mean five times fewer people in 2100 being exposed to dangerous heat," said Professor Tim Lenton, Director of the Global Systems Institute at the University of Exeter (Morrison 2023).

1.5 Overview and assumptions

Earth's climate shows a global warming of some 1.2°C since pre-industrial times. Concentrations of GHGs continue to increase in the atmosphere as a result of continuing emissions and probably also amplifying feedbacks (see below). Thus, heat continues to build up in the environment.

The impacts of climate change are already affecting many millions of people and this will worsen. In 2022 there were over 30 million people displaced by weather and climate related hazards (IDMC 2023). Some 768 million people faced extreme food insecurity in 2021 and 1.4 billion people live in regions already experiencing severe levels of water stress (IEP 2022). Lenton *et al*. (2023) forecast that under the 2.7°C middle scenario (see below) between 2.1

[5] Exposure to temperatures greater than 40°C can be lethal and lethal temperature decreases as humidity increases.

billion and 3.7 billion people will live outside the human climate niche that has underpinned the emergence, development and continuation of human civilisation for millennia. **In effect, some 2.1–3.7 billion people living across the broad equatorial belt and parts of the adjacent mid-latitude belts will likely be under increased threat of internal displacement and forced migration in 60 to 80 years' time.**

Europe is already an average 2.3°C warmer than during pre-industrial times (WMO 2023c). Long-term (slow-onset) climate change will affect every aspect of Europe's social, economic and ecological fabric. Southern Europe will likely experience some of the largest percentage increases globally in extreme temperatures above 40°C, plus increases in the number of consecutive dry days. Drought, crop failures, wildfires and heat stress as well as extreme wet weather events will increase in frequency and severity, wreaking havoc on livelihoods and infrastructure, potentially including the growing renewable energy sector.

Continuing emissions of GHGs are super-charging weather extremes in Europe and every other region of the world. The UK Met Office (2023) has warned that European governments and citizens need to prepare for new extremes, with temperatures possibly exceeding 50.0°C in Europe in the future. (Temperatures reached 48.8°C in Sicily in 2021.) The French government is already preparing for a 'realistic' 4°C annual average warming in France (AFP 2023; Stam 2023).

Our neighbours in the Mediterranean, North Africa (plus sub-Saharan Africa) and the Middle East regions are all forecast to experience rising temperatures. Using the defence planning horizons of 2030, 2050 and 2070, the **table below** gives the average annual temperature increases for a middle scenario: an intermediate emissions trajectory that assumes that levels of GHG emissions stay approximately consistent through 2050, before gradually declining. Under this scenario, global average warming is expected to have reached approximately 2.7°C by 2100 and still be rising. 'Among the scenarios, this is the closest to the world's current behaviour and emissions' (Berkeley Earth 2023b).

	Average Annual Temperature Increase (°C)			
	2030	2050	2070	2100
Morocco	2.6	3.4	4.1	4.7
Algeria	2.5	3.3	3.8	4.4
Tunisia	2.6	3.3	3.9	4.6
Libya	2.2	2.8	3.3	3.7
Egypt	2.2	2.8	3.3	3.8
Mauritania	2.3	3.0	3.6	4.2
Mali	2.1	2.8	3.4	3.9
Niger	2.2	2.8	3.4	3.9
Chad	2.0	2.7	3.2	3.7
Sudan	2.0	2.7	3.2	3.8
Lebanon	2.4	3.2	3.8	4.3
Syria	2.5	3.3	3.9	4.4
Turkey	2.4	3.1	3.7	4.2
Greece	2.3	3.0	3.5	4.0
Italy	2.6	3.4	3.9	4.6
France	2.5	3.2	3.7	4.4
Spain	2.5	3.3	3.9	4.5

Saudi Arabia	2.3	3.1	3.7	4.2
Iraq	2.7	3.6	4.3	4.8
Iran	2.5	3.4	4.0	4.5

The most optimistic and probably least realistic IPCC scenario for later this century (2081–2100) is 1.4°C (1.0–1.8°C) of global warming above the 1850–1900 baseline. The realistic intermediate or middle scenario is 2.7°C (2.1–3.5°C), while the most pessimistic scenario is 4.4°C (3.3–5.7°C).

The IPPC tends to be conservative in its assessments. The recent AR6 continues to reflect uncertainties regarding the overall understanding of how climate change impacts will affect biodiversity and the anthroposphere. Significant feedbacks that could amplify and accelerate global warming, such as methane degassing from permafrost melting and reduced albedo affect from loss of snow and ice cover, are probably underestimated. So too is the reduced regional cooling effects of sulphate aerosols emitted from shipping, due to the International Maritime Organization's 2020 regulation limiting sulphur in ships' fuel oil.

There are critical thresholds or tipping points (points of no return) in the climate system, in ice sheets, ocean thermohaline circulation and major currents, ocean oxygenation, permafrost regions, tropical rainforests and boreal forests, warm-water coral reefs and monsoon patterns. The focus of climate science tends to be on these global and macro-regional tipping elements rather than on multiple interacting constituent thresholds in the myriad and complex processes and structures at sub-regional and local levels.

Social, cultural, political, military, economic, infrastructural and other anthroposphere system thresholds may occur at lower average global and regional temperatures than do critical thresholds in the other components of the climate system (i.e. atmosphere, hydrosphere, cryosphere, land and biosphere). **In other words, we may encounter a critical nexus of civilisational thresholds before we arrive at and breach the 1.5°C or 2°C temperature 'limits' of the Paris Agreement.** At this time, we simply don't know. It is an 'experiment' on a planetary scale involving the whole of humanity, with the long-term survival of our species at stake. We will likely only know that we have crossed civilisational level thresholds if or when we observe it.

The evidence is clear that our societies, economies, infrastructures, political systems and, consequently, institutions of governance and security will be affected by climate change-related disruption as the impacts grow with every increment of warming. Everything we currently 'take for granted' — a tolerable heat, water availability, crop production, a secure place to live — is in jeopardy. We are undermining nature's resilience and increasing the risk to human life and well-being.

Policy makers and decision takers rely on the IPCC, WMO and other institutions for information to help them understand the scale of the problem, the mitigation measures needed to reduce and eliminate GHG emissions and the need for adaptation. But that information is generally lagging behind the accelerating pace of the 'Climate Emergency', rendering today's decisions out of phase with the required urgent pace of climate actions. For example, the IPCC's Seventh Assessment Report (AR7) cycle is due to commence in July 2023 and will likely conclude around 2030 (Kashdan and Ostanek 2023). By its conclusion, the world is likely to be at 1.4°C average global warming and on the way to passing 1.5°C.

Therefore, we have to build more ambitious, credible and realistic '2.7°C scenario' climate actions into all policies and plans, including Ireland's foreign, security and defence policies, now, not in five or 10 years' time.

Assumptions

- Subject to future international agreement(s) and changing market forces, fossil fuels will be incrementally phased-out over many decades, possibly from the 2030s onwards, as renewables and other alternatives, including energy saving and efficiency measures, are phased-in as part of the global Energy Transition.

- However, the delay (due to lack of leadership and implementation failure) in phasing-out fossil fuels globally will continue to drive up atmospheric concentrations of CO_2 and other GHGs for many decades to come.

- However parsed, technologies and techniques for removing carbon from the atmosphere will not be scaled-up sufficiently this century in order to make a significant difference to atmospheric concentrations of GHGs.

- Geoengineering technologies and techniques, such as solar radiation management, will remain theoretical or experimental due to uncertainties, lack of international agreement and governance, and the potential for sparking off interstate conflicts.

- Therefore, the world is 'realistically' on a trajectory that will see global average temperatures of about 2.7°C toward the end of the century (2080–2100).

- Several critical thresholds ('tipping points') in and among the climate system's various subsystems ('tipping elements') will be crossed as global average temperatures rise between the 1.5°C (reached during 2030–2035) and 2°C Paris Agreement 'guardrail' limits as well as beyond.

- Some feedback processes in the climate system will amplify and accelerate the rate of global and regional warming.

- Flood- and drought-related acute food insecurity and malnutrition will continue to increase in Africa, the Indian subcontinent, East Asia, and Central and South America.

- Climate change impacts (heat, drought, intensification of heavy precipitation and associated flooding, tropical storms and hurricanes, and, increasingly, sea level rise) will worsen and continue to drive both internal displacement and transboundary migration upward, resulting in both attempted movement and net movement poleward from the equatorial belt and adjacent mid-latitude belts, involving hundreds of millions of people by 2050 and at least 1 billion by the end of the century (possibly a lot more).

- Geopolitical rivalries, tensions and conflicts will be exacerbated from the early 2030s onward due to the combination of: declining powers of petrostates, particularly Russia, and rising powers of renewables-dependent states and the shift from 'Big Oil' to 'Big Renewables' companies; increasing competition for control over and access to critical raw materials vital to the global Energy Transition; and internal pressures on states arising from populations increasingly impacted by multiple interacting climate, ecological, food, energy, socio-economic, political, institutional, health and related crises.

- There is a vicious cycle between the degradation of ecological systems and environmental resources, which leads to the reduction of societal resilience, increased factionalism and higher levels of violence, which promotes vulnerability and the conditions for new violent conflicts as well as magnifying existing violent conflicts, which in turn further degrade social–ecological systems and resources. Together with socio-economic conditions and governance failures, climate change impacts help drive this vicious circle. Increases in population sizes, especially in cities, and climate mobility (i.e. the involuntary or voluntary movement of people as a result of climate and environmental impacts) further compound the situation.

- Therefore, ever more pronounced climate change impacts and weather extremes will continue throughout this century and beyond to both contribute to and create humanitarian crises and increase violent conflict, resulting in escalating climate mobility that will affect more people, creating more pressures on states, populations, societies and communities.

2. Implications for Future Foreign, Security and Defence Policies

The conjoint climate and ecological crisis has significant implications for the development of Ireland's foreign, security and defence policies. This is not some far in the future issue: climate change is here and now, and getting worse at an alarming rate. **Put simply, climate change is *the* greatest threat to Ireland's security on multiple levels, and across multiple spaces and timescales.** Why? Because climate change affects the current and future global and regional security environments at every level on every scale. Thus, it affects Ireland both internally and in its external relations, now and throughout the future.

2.1 Governance architecture

Climate change affects everything, including our systems of governance and their design. Governance provides the framework for capabilities, that is, the abilities or powers of a polity to make use of available resources to achieve an objective or desired outcome in specific situations and environments. **Ireland does not currently have the necessary governance-related capabilities to deal with climate change in the security-related policy sense.** No country does. Not yet. The nexus of climate change and foreign, security and defence policy is complex, dynamic and evolving. It is constantly shifting, which by necessity requires a fundamentally adaptive policy approach in order to align with it.

If we are to successfully future-proof governance architecture at international, supranational (i.e. EU), national and sub-national levels of polity, including processes for governing, institutional frameworks for decision making, methods and tools for policy formulation and implementation as well as planning, we must ensure that such architecture not only addresses, but also copes with the consequences and implications of climate change. How do we do that? First, by understanding the key design elements of a multilevel adaptive architecture (Scollick 2020: pp. 32–33).

Borrowing from the field of defence strategy and planning, there are various nested levels at which a broadly security-oriented governance architecture must deal effectively with climate change: the grand strategic (political) level of national policy; strategic level of national or collective multinational security strategy objectives; theatre strategic level of peacetime (or wartime) cooperation plus contingency, crisis action or adaptive planning and execution aimed at achieving strategy objectives; operational level of major operations and missions; tactical level of planning, execution, management and support of tasks to meet objectives; technical level of personnel and equipment; and cross-cutting institutional level of developing material and non-material capabilities (Scollick 2020: p. 31).

For further details regarding designing an adaptive architecture based on an understanding of complex adaptive systems, see:

> Scollick, A. (2020) A Strategic Adaptive Defence Planning Framework for State Polities in the 21st Century. *Defences Forces Review 2020*, pp. 28–37. Available at: https://www.military.ie/en/public-information/publications/defence-forces-review/review-2020.pdf (Accessed on 4 July 2023).

2.2 Building resilience

Next, **how do we build Ireland's resilience** (i.e. the interrelated abilities to adapt and where necessary transform and, therefore, persist) to climate change in the policy environment of foreign affairs, security and defence? First of all, by significantly **raising the priority of climate change** and related issues in all policy making, planning and actions at and across every level in the multilevel governance architecture outlined above. Second, by further **investing in and improving both the soft and hard capabilities** (strategies, plans, procedures, logistics, equipment and personnel) of the Defence Forces AND the Civil Defence. In other words, our national civil and military security and defence assets need future-proofing: they need to become fit for purpose for the climate changing world in which they are required to operate. Third, by focusing on the following:

Greater interoperability between the two branches. Joint training and better coordination regarding preparedness for response operations, whether to extreme weather-related events at home or disaster response missions overseas. This is something which the militaries and civil authorities in the United States, Canada, Australia, New Zealand, Germany, the United Kingdom and elsewhere have come to realise through recent experiences of increasingly large-scale, frequent and persistent extreme weather events. Furthermore, the Defence Forces should explore opportunities for interoperability with other European (EU and UK) militaries regarding climate change and security (Wauters *et al.* 2021: pp. 10–14), including through the European Defence Agency[6] and Finabel European Army Interoperability Centre[7].

Preparedness, that is, being better prepared for multiple crises. The exercise of foresight is key. Preparedness begins with being informed about the evidence and projections regarding climate change. Future climate change-impacted operational environments require foresight

[6] The EDA promotes and facilitates integration between member states within the EU's Common Security and Defence Policy. https://eda.europa.eu

[7] Finabel promotes and facilitates the interoperability of land forces through the harmonisation of military concepts, doctrines and procedures. https://finabel.org/

analysis, especially concerning Defence Forces' overseas deployments. More can be done to assess future operational environments, for example, regarding potential climate-related crises. The Defence Forces must be prepared to operate effectively whenever and wherever needed in response to climate change impacts; and to sustain multiple, concurrent and complex (MCC) response operations. Preparedness requires adaptive planning for enhanced defence capabilities to deliver an increasing number and range of MCC response operations. Preparedness also requires coordination with Civil Defence, Irish Coast Guard and An Garda Síochána to plan for joint MCC response operations at home.

Building adaptive capacity. The Defence Forces and Department of Defence must develop climate change adaptation policies and plans based on assessments of the projected negative impacts of climate change on Defence Forces' capabilities and operations as well as built and natural estate. Climate change and security should require an adaptive defence policy and planning approach (Scollick 2020).

Information is key to preparedness and adaptation. Evidence-based analysis is needed by policy makers as well as decision takers. Defence planners need data and military intelligence; crisis managers need timely information in order to build a picture and respond effectively to climate change-related disasters or changes in the operational environment.

For further details regarding climate change-impacted operational environment and the implications for the Defence Forces, see:

> Scollick, A. (2022) The Irish Defence Forces in a Changing Climate: Implications and Suggestions for Preparedness, Adaptation and Mitigation Measures. Defence Forces Review 2021, pp. 32–43. Available at: https://www.military.ie/en/public-information/publications/defence-forces-review/df-review-2021-digital-versions-single.pdf (Accessed on 4 July 2023).

2.3 A multilateral approach

The **Public Consultation online questionnaire** asks if we should take or are we even capable of taking such steps, as outlined above, aimed at building resilience, in this case in relation to the threats posed by climate change, on our own? Should Ireland continue to work with other countries and/or international organisations, such as the EU and the North Atlantic Treaty Organization (NATO), in the area of security and defence?

Logic train
In short, yes we should take such steps, but our ability to take them on our own is limited. Ireland has a small military. That is unlikely to change in the near term (before 2040). Both costs and practicalities dictate that we have to not only continue to work with external actors, but also continue to deepen our cooperation and extend our coordination with them. Let's look at this further.

In terms of rationale, climate change will displace tens then hundreds of millions of people in Africa, the Middle East and beyond, and force many of them to migrate toward Europe (see Assumptions above). Even within Europe, millions of southern Europeans are likely to be displaced and many forced to migrate ('relocate') northward. In the coming decades, this net poleward movement of large numbers of vulnerable people will affect Ireland, both directly and indirectly. Directly in the sense that each EU Member State will (eventually) be required to receive, accommodate and assimilate a proportion ('fair share') of the net migration. It is a question of basic humanity and morality. Indirectly in the sense that Ireland is — and ought to remain — a participant in one form or another in multinational frameworks (the United Nations, NATO and EU) that already address the climate–security nexus and/or internal displacement and/or migration.

People or even entire populations displaced and undertaking either involuntary or voluntary migration as a consequence of climate change, extreme weather events, conflict and related issues (hereafter 'climate refugees') will, because of the numbers involved, be extremely vulnerable to violence. This may originate from tensions within climate refugee groups or between groups and inhabitants of locations and areas that the climate refugees enter; or it may result from predatory and exploitative behaviours of brigands, extremists and people traffickers; or arise from a conflict environment, such as when warlords or commanders seek to conscript ('press-gang') refugees into warbands, mercenary groups or even state militaries. (This is a far more complex picture, for example, involving sexual slavery, than I can do justice to here.)

Therefore, ethically, the coming mass migration of climate refugees will require the militaries and civilian agencies of responsible state and intergovernmental actors to secure and protect migration corridors, transit camps, transports, reception camps, humanitarian aid and welfare distribution and, finally, resettlement locations in reception or destination countries — not 'host' countries, as this is a one-way migration. Climate refugees will not be returning. Their originating countries will likely remain inhospitable as the human climate niche continues to contract, rendering further areas of the world uninhabitable (Xu *et al*. 2020; Lenton *et al*. 2023).

It will likely take the combined capacities and capabilities of the world's responsible militaries (i.e. excluding Russia and other bad actors) as they are constituted today in order to cope with mass climate-related displacement and migration at its peak. This peak could come as soon as the 2060s, but is more likely during the 2070s to 2080s. However, the lead-up period during the 2030s to 2050s will require increasing focus and effort by our militaries. Such efforts require a framework or frameworks for cooperation and coordination to be effective in meeting the challenges and delivering favourable outcomes. In other words, it requires a massive coordinated global effort involving the United Nations, NATO, EU, African Union[8] and other regional organisations (including those yet to emerge).

Regardless of ongoing (no one expects Russia to cease its war against Ukraine and the West in general in the foreseeable future) and future interstate wars, it is necessary to further integrate and more deeply coordinate the functions of state militaries, including Ireland's Defence Forces, in order to address climate change impacts and the consequences, particularly regarding climate refugees and their security.

Put simply, we need to be humane and humanitarian in dealing with climate refugees. High levels of displacement and migration will occur. We must be prepared to provide security. This must be reflected fully in Ireland's foreign, security and defence policies. Providing security for climate refugees can only be achieved effectively through

[8] Ireland continues to increase its diplomatic presence on the continent of Africa and, as part of *Global Ireland: Ireland's Strategy for Africa to 2025*, seeks to deepen engagement with African partners through multilateral institutions such as the African Union. See https://www.dfa.ie/our-role-policies/international-priorities/africa/

multilateralism, especially deeper cooperation through existing multilateral frameworks, including the United Nations, NATO, EU and African Union.

Recommendation 1
Incorporate the **defence planning horizons** of 2030, 2050 and 2070 into foreign, security and defence policies in relation to climate change. This is necessary in order to adequately address the 'slow-onset' aspects of climate change; the large scale of preparations required to deal with the projected consequences of climate change, particularly regarding climate refugees; and procurement issues regarding personnel and materiel of both the Defence Forces and Civil Defence. Procurement must factor in the lead-in time before acquisition of equipment (or recruitment of personnel), the expected lifespan (ca. 40 years) of equipment and replacement horizon. In other words, the Defence Forces require new and replacement equipment to continue to function effectively and securely in climate-changed operational environments in the 2030s to 2070s. In addition to procurement, Defence Forces planning, training, operations, logistics and infrastructure require future-proofing regarding climate change.

We will expect the Defence Forces to fully participate in multilateral missions between 2030 and 2070 aimed at securing and protecting (i.e. peacekeeping and kinetic peace enforcement) migration corridors and camps. Can we expect our Defence Forces personnel to do this inadequately equipped? No, of course not. The local, regional and global operational environments in which the Defence Forces will be expected to function are continually changing: it will be significantly different in 2030, more so in 2050 and radically different in 2070. Preparedness for this begins today in 2023.

Recommendation 2
Defence Forces personnel require and deserve whatever resources they need to do their jobs on behalf of our society and its civilised values. Can we afford to acquire those hard and soft capabilities on our own? Yes, Ireland is a wealthy OECD country. However, that is not necessarily a cost-effective or rational option. The logical option is to **spread the cost burden between partners** through greater integration, division of labour and materiel, pooling and other methods. This is not 'militarisation' or developing an 'EU army'. It is simple commonsense and thrift: value for the taxpayer. (Discussion of the EU's Permanent Structured Cooperation (PESCO) and other frameworks regarding structural integration is beyond my remit here.)

Recommendation 3
It is unrealistic to expect the Defence Forces to be able to single-handedly mount an overseas mission, in an inhospitable operational environment, to protect hundreds of thousands of vulnerable climate refugees when required to. It can only be achieved effectively through multilateral cooperation and joint effort.

Work in partnership. The Defence Forces should leverage existing partnerships and seek to form new partnerships in order to share expertise and assist the development of joint capabilities and preparedness for MCC response operations. Staff exchanges and joint learning and training activities pave the way for multilateral responses to climate change-related events. The aim should be to improve operational effectiveness and efficiency.

Ireland can build resilience into foreign, security and defence policies as regards the climate change threat by proactively **working within existing and emerging frameworks** aimed at guiding actions to address interactions between climate change and security and defence.

One particular framework is the EU *Climate Change and Defence Roadmap* produced by the European External Action Service (EEAS 2020a). This includes a focus on:

1. The impact of climate change on the operational environment in which Common Security and Defence Policy (CSDP) missions and operations are deployed;
2. Capability development to ensure that military equipment remains effective under extreme weather conditions, and that energy efficiency and new technologies and practices will reduce the carbon and environmental footprint of missions, operations and the defence sector in general; and
3. Strengthening diplomatic outreach in multilateral fora and partnership frameworks dealing with climate change, defence and security, including synergies with the United Nations and NATO (EEAS 2020b).

This EU framework provides a mechanism to transfer climate and security related knowledge and best practices among EU Member States. The *Roadmap* intends to draw on examples of innovation and implementation emerging in and around militaries from around the world (Scollick 2022: pp. 38–39).

For further details regarding progress made in implementing the *Roadmap*, see the *Joint Progress Report on Climate Change, Defence and Security (2020-2022)* (EEAS 2022). For additional reading, see European Defence Agency (20230.

Another notable framework within which Ireland could work, as part of the NATO Partnership for Peace programme, is the new NATO Climate Change and Security Centre of Excellence (CCASCOE) currently being established in Montreal, Canada (NATO 2022a).

The CASSCOE is intended to be a platform through which both military actors and civilians will develop, enhance and share knowledge on the security impacts of climate change. It will allow participants to work together to acquire and build the capabilities that will be required in the future security environment, and establish best practices and contribute to NATO's goal of reducing the climate impact of its military activities (Government of Canada 2023).

According to the *NATO 2022 Strategic Concept*:

> 'Climate change is a defining challenge of our time, with a profound impact on Allied security. It is a crisis and threat multiplier. It can exacerbate conflict, fragility and geopolitical competition. Increasing temperatures cause rising sea levels, wildfires and more frequent and extreme weather events, disrupting our societies, undermining our security and threatening the lives and livelihoods of our citizens. Climate change also affects the way our armed forces operate. Our infrastructure, assets and bases are vulnerable to its effects. Our forces need to operate in more extreme climate conditions and our militaries are more frequently called upon to assist in disaster relief' (NATO 2022b: p. 6).

The *Strategic Concept* emphasises the cross-cutting importance of integrating *inter alia* climate change and human security across all of NATO's core tasks. Regarding the strategic environment, NATO recognises that the impacts of climate change, fragile institutions, health emergencies and food insecurity aggravate interconnected security, demographic, economic and political challenges as well as conflict, fragility and instability in Africa and the Middle East.

Regarding crisis prevention and management, NATO intends to further develop the Alliance's ability to support civilian crisis management and relief operations and to prepare for the effects of climate change, food insecurity and health emergencies on Allied security, thus allowing NATO to respond to any contingency at short notice.

Regarding cooperative security, NATO will enhance the NATO–EU strategic partnership, strengthen political consultations and increase cooperation on issues of common interest, including the impact of climate change on security.

> 'NATO should become the leading international organisation when it comes to understanding and adapting to the impact of climate change on security. The Alliance will lead efforts to assess the impact of climate change on defence and security and address those challenges. We will contribute to combating climate change by reducing greenhouse gas emissions, improving energy efficiency, investing in the transition to clean energy sources and leveraging green technologies, while ensuring military effectiveness and a credible deterrence and defence posture' (NATO 2022b: p. 11).

Recommendation 4
As stated in the background information to the Public Consultation,[9] Ireland is currently in the process of renewing its partnership with NATO through a transition to the new Individually Tailored Partnership Programme (ITPP) mechanism. This framework provides potential new opportunities for strengthening cooperation between Ireland and NATO in areas such as maritime security, cyber and hybrid, wider cooperation on civil preparedness, climate and security, and enhancing resilience, including of undersea infrastructure. Climate change is an area of common interest. Therefore, **Ireland should maximise its partnership with NATO through the new ITPP approach, particularly in relation to climate change**. Other countries currently negotiating or which have recently adopted an ITPP with NATO include Australia, Azerbaijan, Bahrain, Colombia, Japan, Kazakhstan, New Zealand and South Korea. As the Tánaiste and Minister for Defence, Micheál Martin TD, recently stated:

> "Cooperating with NATO on areas of mutual interest does not indicate a move closer to NATO, it is about practical cooperation, which is of benefit to Ireland. Considerable progress has been made on developing Ireland's ITPP and it is anticipated that it will be finalised by the end of 2023" (Houses of the Oireachtas 2023).

3. Conclusion

[9] https://www.gov.ie/en/publication/9aa15-international-security-policy-background-information/

Given the continuing combustion of fossil fuels and land-use change, the most realistic projection for global average temperature in 60 to 80 years' time is about 2.7°C, with higher average temperatures over land, for example, 4.0–4.5°C in Europe's southern neighbourhood. Extreme heat, droughts, wildfires, storms, flooding, sea-level rise and other climate change impacts, combined with increases in violent conflict, will displace many millions of people and drive them to move from increasingly uninhabitable zones to seek refuge in more hospitable zones, including in Europe's northern regions. **There will be no remedy for this situation for centuries to come.**

Therefore, it is imperative that the Department of Foreign Affairs, Department of Defence and other Government departments, the Defence Forces and, on the domestic front, Civil Defence prepare now for an operational environment that is shaped by climate change.

The impacts of climate change will fundamentally affect the ways in which the Defence Forces plan, organise, train, deploy and sustain the military means to advance state policy and achieve strategic, operational and tactical objectives.

Ireland should shoulder its responsibilities toward our fellow human beings, particularly the most vulnerable, in the climate-changing world. We need to dig deeper into our collective resourcefulness and national spirit to help humanity by doing all we can to improve its security in the most difficult of circumstances.

Thank you for your consideration of this submission, a copy of which will be available for download from my website https://andyscollick.com, should you require it.

Yours sincerely,

Andy Scollick

Biographical Note

Dr. Andy Scollick is an independent consultant in the field of European and transatlantic security and defence. He specialises in systems thinking and the interactions between climate change, the energy transition, security and defence. Since 2014, he has been a policy advisor to government, military and civil society actors in Ukraine regarding the development and implementation of security and defence policy. For 22 years before that, he was an advocate, policy wonk and consultant in the field of European marine sustainability and maritime policy, working for national, EU and international level NGOs. Andy holds a PhD in Sustainability Science (complex adaptive systems and resilience theory, and maritime governance) from University College Cork where he also worked as an EU project researcher and lecturer.

Declaration

I have no vested interests, financial or otherwise, in any of the companies or organisations or their products mentioned or implied in this submission.

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