

Decarbonising and Diversifying Defence in the United Kingdom and United States

A workers' enquiry for a just transition

July 2022

Karen Bell
Vivian Price
Keith McLoughlin
Mijin Cha
Lara Skinner

Karen Simpson
Rosie Jones
Anita Raman
Zach Cunningham

About the authors

Dr Karen Bell is Senior Lecturer in Sustainable Development at the University of Glasgow. Professor Vivian Price is Professor of Interdisciplinary Studies at California State University, Dominguez Hills. Dr Keith McLoughlin is Lecturer in History at the University of Bristol. Dr Mijin Cha is Research Fellow at Cornell University. Dr Lara Skinner is Director of the Labor Leading on Climate Initiative at Cornell University. Karen Simpson is Research Associate at the University of the West of England. Rosie Jones is Research Associate at the University of the West of England. Dr Anita Raman is Research Associate at Cornell University. Zach Cunningham is Research Associate at Cornell University.

Acknowledgements

This research was conducted by researchers at the University of Glasgow, California State University - Dominguez Hills, University of Bristol and Cornell University and financially supported by the British Academy. The authors would like to thank their advisory board members from the UK Department of Business and Industrial Strategy; UK Public and Commercial Services Union; UK Trade Union Congress (TUC); International Association of Machinists and Aerospace Workers (IAM); US Institute for Policy Studies; Campaign Against the Arms Trade; Texas Christian University; two international defence companies who wished to remain anonymous; and one UK Government department who wished to remain anonymous. The authors also thank the anonymous reviewers at the British Academy for their comments on the manuscript. In addition, it is important to thank the University of the West of England, Bristol for initially hosting the project until it moved to the University of Glasgow. Finally, the authors are immensely grateful to the defence sector workers for their participation in the project and those that facilitated their interviews.

Please note that, while the authors have been as inclusive and participatory as possible, the advisory board, financial supporters, academic institutions and interview participants do not necessarily agree with the interpretations, conclusions or recommendations of this report. In addition, any errors or omissions are the responsibility of the research team only.

About Just Transitions within Sectors and Industries Globally

The programme examines how just transitions whilst tackling climate change and biodiversity is key to supporting inclusive economies and societies in the future. Through the programme, the Academy awarded funding to nine research projects exploring the actions required in sectors and industries globally across supply and value chains, with a focus on key economic emitters or areas of society that will help reduce and/or eliminate greenhouse gas emissions. The programme was funded by the UK's Department for Business, Energy and Industrial Strategy.

Contents

Introduction	4
Context	5
Method	9
Worker views	11
Decarbonisation	11
Diversification	12
Just transition	13
Scope of change	15
Drivers and challenges	16
Solutions	20
Dialogue	21
International expert and trade union views	22
Conclusion	26
Key recommendations	27
References	29
About the Academy	31

Introduction

This study highlights the views of a cross-section of current and former defence workers on transitioning the defence sector to environmental sustainability in the United States (US) and the United Kingdom (UK). It is framed by the ethos of 'Just Transition', a call for entering into social dialogue with workers around what the transition to environmental sustainability means for their lives, identities, jobs and communities. Within this, the project focuses on 'decarbonisation' and 'diversification' as two key processes that are particularly relevant to the defence sector. The project used the following working definitions of these terms, based on previous reports and literature (see long report for further information on these were decided):

- Defence sector: 'Those currently or formerly involved in the design, manufacture, and use of defence equipment and the research and development associated with this'
- Decarbonisation: 'The process of reducing the carbon emissions which contribute to climate change'
- Diversification: 'The broadening of defence sector business to non-military business fields'
- Just Transition: 'A framework developed by trade unions and communities to secure workers' rights and livelihoods and community well-being when shifting to sustainable production'

It is important to note that decarbonisation, alone, while of critical importance, does not equate to the diverse environmental aspects of Just Transition, which can relate to a wide range of environmental issues where humanity is currently, or in danger of, overstepping planetary boundaries.¹ It may even include ending types of production that are low on social value and high on environmental harm. Hence, this project also touches on the question of the social value of defence and whether production should be reduced.

This document is the summary report. The full report and other related publications and data can be found at <https://decarbonising-defence.co.uk/>.

¹ Steffen et al. (2015) 'Planetary boundaries: Guiding human development on a changing planet', *Science*, 347, 6223.

Context

In the context of new and necessary net zero, biodiversity and sustainable development targets, dialogue with workers can improve policies and plans; reduce resistance to change; and support a more rapid, effective and equitable transition. Yet consultation with defence sector workers on transitioning to sustainability has rarely been evident to date. This project aimed to address this gap and uncover what a transition to net zero and wider environmental sustainability in the defence sector might mean for the people that work in the industry and their communities. The study focuses on the US and the UK, as they are the two largest global defence exporters on a rolling 10-year basis.²

Political context

Throughout the 20th century, defence was closely tied to foreign policy ambitions, such as deterring the Soviet Union and fortifying NATO.³ As such, the defence sector had a close relationship with the government in the UK and the US. A 'Cold War coalition'⁴ consisting of business, politicians and trade unionists ensured that a consistent supply of military orders kept their employees and constituents in employment. Consequently, the defence coalition was bipartisan with, for example, some previously anti-war Democrats fighting to retain defence work in their local districts.⁵ In the UK, as in the US, the Cold War defence economy was recognised for its role in sustaining employment, particularly in areas such as shipbuilding that were in decline.⁶ Defence was a feature of wider economic and industrial strategy, both for 'New Deal' liberals in the US and social democrats in the UK.⁷ According to Brenes, defence workers do not all cohere to a conservative political ideology. He gives examples of defence workers opposing the Vietnam war, and lobbying for defence contracts for nuclear warheads, while arguing that they should not be used to resolve international crises.

Environmental context

Although there is limited data on the environmental impacts of defence as it tends to be exempted from CO2 targets and associated monitoring, a number of reports suggest exceptionally high rates of greenhouse gas (GHG) emissions, pollution and

2 DFIT (2020) *UK defence and security export statistics for 2019* - GovUK, UK Dept for International Trade <https://www.gov.uk/government/statistics/uk-defence-and-security-export-statistics-for-2019/uk-defence-and-security-export-statistics-for-2019>. The US is currently 1st in terms of national military spending and the UK 5th in a global league table, with US and UK defence expenditures rising in 2020 to \$778 billion and \$59.2 billion, respectively - SIPRI (2021) *Trends in world military expenditure, 2020* https://sipri.org/sites/default/files/2021-04/fs_2104_milex_0.pdf

3 McLoughlin, K. (2022) *The British Left and the Defence Economy: Rockets, Guns and Kidney Machines, 1970-83*, Manchester: Manchester University Press.

4 Brenes, M. (2020) *For might and right: Cold War defense spending and the remaking of American democracy*, Amherst: University of Massachusetts Press.

5 Brenes, M. (2020) *For might and right*.

6 Hartley, K. (1996) 'The Defence Economy', in *Britain in the 1970s: The Troubled Decade*, ed. Richard Coopey and N.W.C. Woodward, London: University College London Press, pp. 212-235.

7 McLoughlin, K. (2022) *The British Left and the Defence Economy*.

use of non-renewable resources from this sector.⁸ With the requirement to prioritise safety, reliability, and performance, and in a context where it has not been expected to be as transparent as other sectors, the defence sector may have been less ready to address its environmental issues. In addition, some of its infrastructure and operations may be more difficult to decarbonise than in many other sectors and, since deployment cycles can span decades, it may be a long time before changes are seen.

However, since defence accounts for 50% of UK, and 80% of US, Government emissions, there is increasing recognition that decarbonisation of the defence sector is vital to achieve the US and UK governments' net-zero ambitions.⁹ It has also been noted that 'You cannot ask citizens to reduce emissions but not have militaries do it. It is important for public acceptance'.¹⁰ In addition, the defence sector is now recognizing that climate change, particularly in the form of the increasing number of extreme weather events, rising sea levels and desertification can potentially accelerate insecurity and armed conflict. The UK Ministry of Defence (MoD) has stated that this will not only increase demands for international and domestic humanitarian assistance but will also have negative effects on UK bases and deployed forces, both at home and abroad.¹¹ In the US, President Biden spoke of climate change as the 'greatest threat' to US national security during his electoral campaign.¹²

Defence context

The defence sector in the US, UK, and beyond has, therefore, been working quite intensively in recent years to reduce its environmental impact. Many defence organisations are now addressing the environmental aspects of their work, particularly GHGs, in recent reports, statements, innovations, and strategies.¹³ Suggestions and initiatives for effective decarbonisation of the defence sector proposed and/or implemented by military leaders, defence companies, and defence analysts have included: Setting supply-chain decarbonisation requirements aligned

- 8 For example, Bigger, P. and Neimark, B.D. (2017) 'Weaponizing nature: The geopolitical ecology of the US Navy's biofuel program', *Political Geography*, 60, pp. 13-22; Crawford, N.C. (2019) *Pentagon fuel use, climate change, and the costs of war*, Watson Institute; Belcher, O. et al. (2020) 'Hidden carbon costs of the "everywhere war": Logistics, geopolitical ecology, and the carbon boot-print of the US military', *Transactions of the Institute of British Geographers*, 45 (1), pp. 65-80; Parkinson, S. (2021) 'More fight, less fuel: the military approach to climate change', *Responsible Science blog*, 15 June; Parkinson, S. (2020a) *The environmental impacts of the UK military sector*, *Scientists for Global Responsibility*, Lancaster https://www.sgr.org.uk/sites/default/files/2020-05/SGR-DUK_UK_Military_Env_Impacts.pdf; Parkinson, S. (2020b) Will the UK Reduce its Military Carbon Emissions? <https://rethinkingsecurity.org.uk/2020/07/02/uk-military-carbon-emissions/>
- 9 Barry, B. (2021) 'UK to adapt military to changing climate, but does it have the funds and backing of troops?' *DefenseNews*, August 9; Frazer-Nash (2020) 'Where next for UK Defence in an era of climate crisis?' <https://www.fnc.co.uk/resources/where-next-for-uk-defence-in-an-era-of-climate-crisis/>
- 10 Duvic-Paoli, L-A, Interview in Frazer-Nash Consultancy (2020) *Where next for UK Defence in an era of climate crisis?* <https://www.fnc.co.uk/resources/where-next-for-uk-defence-in-an-era-of-climate-crisis/> (no page)
- 11 MoD (2021) Ministry of Defence climate change and sustainability strategic approach, March 30 <https://www.gov.uk/government/publications/ministry-of-defence-climate-change-and-sustainability-strategic-approach>
- 12 ABC News (2021) Biden says climate change is biggest threat to national security at campaign rally, <https://abcnews.go.com/Politics/video/biden-climate-change-biggest-threat-national-security-campaign-58698610>
- 13 see, for example, US Army (2022) *United States Army climate strategy*, Department of the Army, Office of the Assistant Secretary of the Army for Installations, Energy and Environment, Washington, DC. https://www.army.mil/e2/downloads/rv7/about/2022_army_climate_strategy.pdf; StartUs (2022) *Top 10 military technology trends & innovations for 2022* <https://www.startus-insights.com/innovators-guide/top-10-military-technology-trends-2022/>; Dimitrova, D., Lyons, M. Losada, P. et al. (2021) *The growing climate stakes for the defense industry*, Boston Consulting Group, Sept 10 <https://www.bcg.com/publications/2021/growing-climate-stakes-for-the-defense-industry>; Honeywell (2021) *How we'll reach carbon neutral by 2035* <https://www.honeywell.com/us/en/news/2021/04/how-we-will-reach-carbon-neutral-by-2035>; MoD (2021) *Ministry of Defence climate change and sustainability strategic approach*, March 30 <https://www.gov.uk/government/publications/ministry-of-defence-climate-change-and-sustainability-strategic-approach>; Owen-Burge, C. (2021) *MOD climate chief: Inaction will lead to a "more expensive, weaker military"*, *Race to Zero*, May 25 <https://racetozero.unfccc.int/mod-climate-chief-inaction-will-lead-to-a-more-expensive-weaker-military/>; Raytheon Technologies (2021) *Sustainable aviation: How Raytheon Technologies is working to cut carbon emissions* <https://www.rtx.com/news/2021/04/20/sustainable-aviation>; Rolls Royce (2021a) *Our decarbonisation strategy* <https://www.rolls-royce.com/innovation/net-zero/our-decarbonisation-strategy.aspx>; Rolls Royce (2021b) *Leading the Transition to Net Zero Carbon* <https://www.rolls-royce.com/-/media/Files/R/Rolls-Royce/documents/others/rr-net-zero-exec-summary.pdf>; Rolls Royce (2021c) *Our pathway to Net Zero* <https://www.rolls-royce.com/innovation/net-zero.aspx#/>; Sutcliffe, J. (2021) *Our commitment to Net Zero* <https://www.baesystems.com/en-uk/blog/our-commitment-to-net-zero>; Judson, J. (2017) *US Army gives green light to shape vehicle electrification requirements*, *DefenceNews*, Sep 21 <https://www.defensenews.com/land/2020/09/21/army-gives-green-light-to-shape-vehicle-electrification-requirements/>

to national targets for all suppliers; leveraging assets, such as land, to generate renewable energy or capture carbon; using biofuels for powering ships and aircraft; introducing electric unmanned aerial vehicles (UAVs);¹⁴ increasing the energy efficiency of platforms and installations; using clean distributed-energy generation and storage; electrifying vehicle fleets;¹⁵ and using more efficient engines, lightweight materials and aero- or hydro- dynamic designs.¹⁶ Some of these technologies have had spin-off civil environmental benefits. For example, GE was recently selected by the Defense Advanced Research Projects Agency (DARPA) to lead a four-year project that could simplify the transport of potable water to troops in the field and address water scarcity around the world.¹⁷ In another example, BAE Systems is reportedly developing flap-free technologies that make aircraft lighter and more fuel efficient.¹⁸

Human security

However, there has been some criticism that these defence sector documents, discourses and activities focus disproportionately on technical change, with inadequate attention to arms control, diplomacy and human security as more transformative alternatives to reducing the carbon emissions and other environmental harms associated with defence.¹⁹ Critics ask for more consideration of ‘diversification’, arguing that the defence sector is extremely expensive for the state and its citizens since, in the main defence hardware producing countries, defence industries are heavily subsidised by the state via citizen taxation.²⁰ Advocates of diversification, therefore, point to a potential ‘peace dividend’ which can be gained from the transfer of resources from military to civilian use. It is considered that this transfer will lead to improved economies by avoiding the harm to people, property, markets and the environment that conflict causes. It is also considered less environmentally wasteful to create products and services that can be of immediate benefit to the public (e.g., sanitation systems in the Global South) rather than products where the best-case scenario is that the weapons will never be used.

Inclusion

A particular omission from the strategies of the governments and companies, is discussion of how to include workers in the process of transitioning to sustainability. The idea of ‘social dialogue’ across governments, businesses, trade unions and civil society is fundamental to Just Transition, according to many trade unions.²¹ Hence, the UK Trade Union Congress (TUC) has called for a UK-wide Just Transition Commission to ensure that workers’ voice is central to guiding net zero policies.²²

14 see Bowcott, H., Gatto, G., Hamilton, A. and Sullivan, E. (2021) Decarbonizing defense: Imperative and opportunity, McKinsey <https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/decarbonizing-defense-imperative-and-opportunity>

15 e.g. US Defense Secretary, Lloyd Austin, in Vergun, D. Defense secretary calls climate change an existential threat, US Department of Defense, April 22, 2021, [defense.gov](https://www.defense.gov).

16 IATA (2019) Aircraft technology roadmap to 2050, International Aircraft Transport Association, December 2019, [iata.org](https://www.iata.org)

17 GE (2020) Sustainability report: Building a world that works for tomorrow, <https://www.ge.com/sustainability>

18 Dimitrova, D., Lyons, M., Losada, P. et al. (2021) The growing climate stakes for the defense industry, Boston Consulting Group, Sept 10 <https://www.bcg.com/publications/2021/growing-climate-stakes-for-the-defense-industry>

19 e.g. Bigger, P. and Neimark, B.D. (2017) ‘Weaponizing nature: The geopolitical ecology of the US Navy’s biofuel program’, *Political Geography*, 60, pp. 13-22; Gardner, T. (2017) U.S. military marches forward on green energy, despite Trump, Reuters, March 1, <https://www.reuters.com/article/us-usa-military-green-energy-insight/u-s-military-marches-forward-on-green-energy-despite-trump-idUSKBN1683BL>; Parkinson, S. (2021) More fight, less fuel: the military approach to climate change, *Responsible Science* blog, 15 June <https://www.sgr.org.uk/resources/more-fight-less-fuel-military-approach-climate-change>

20 e.g. CAAT (2014) Arms to renewables: work for the future. <https://www.caat.org.uk/campaigns/arms-to-renewables/armsto-renewables-backgroundbriefing.pdf>

21 ETUC (2019) *What is Social Dialogue*, The European Trade Union Confederation website <https://www.etuc.org/en/what-social-dialogue>; Smith, S. (2017) *Just Transition: A report for the OECD*. Organisation for Economic Co-operation and Development. May 2017. <https://www.oecd.org/environment/cc/g20-climate/collapsecontents/Just-Transition-Centre-reportjust-transition.pdf>

22 TUC (2020) Voice and place: how to plan fair and successful paths to net zero emissions <https://www.tuc.org.uk/research-analysis/reports/voice-and-place-how-plan-fair-and-successful-paths-net-zero-emissions>

Social dialogue means discussing what transition means to those affected and to their communities. How to frame this dialogue is important for engaging workers and developing effective policy and programmes.

The main UK unions have stated that ‘The test for any just transition is whether those most affected are allowed to lead the debate and have ownership of the priorities. If not, it cannot be a just transition’.²³ Yet, a survey run by the UK Prospect union found that 65% of those responding answered with a ‘no’ when asked ‘Does the government do enough to engage defence workers when shaping defence industrial policy?, compared to less than 5% replying ‘yes’.²⁴

Defence policy and operational standards drive much of the decision-making around production in the defence sector. Defence workers are, therefore, subject not only to companies’ business decisions but also to political and governmental considerations. As such, their views may not be sought and there can be an assumption that they are uninterested in wider environmental and social issues. These workers also face the challenge that jobs are declining in both the US and UK defence sector due to automation and job relocation in the search for more flexible labour and environmental standards. In the context of these social and environmental challenges and the lack of dialogue with defence workers to date, it is timely to consider the Just Transition of the defence sector and the views of the workers in relation to that. Therefore, this workers’ enquiry intended to amplify the voices of defence sector workers building on effective models of participation,²⁵ respecting and valuing diverse perspectives and knowledge bases.

23 Prospect/GMB/Unite/Unison (2018) Demanding a Just Transition for Energy Workers <https://www.unison.org.uk/content/uploads/2019/01/just-transition-to-low-carbon-leaflet.pdf> (np)

24 Prospect (2021) Integrated defence review – member feedback 2021-00568-Circular_Standard-Integrated-Defence-Review---member-feedback-Version-14-06-2021 (1).pdf

25 Bell, K. and Reed, M.S. (2021) ‘The tree of participation: A new model for inclusive decision-making’. *Community Development bsab018*, <https://doi.org/10.1093/cdj/bsab018>

Method

This study took place between October 2021 and March 2022. The main strand of the project was a ‘workers’ enquiry’ - a method that encourages workers to think about and articulate their situation in the productive process. To recruit our sample, more than 200 large and small organisations were approached including the large defence sector companies, for example, Rolls Royce, Honeywell, BAE systems; smaller defence supply companies; the main trade unions that cover the defence sector in each country; defence interest groups, such as US Military, US Airforce, Defence Forum, and Defence and Security Portal Facebook groups; veteran organisations, including Veterans for Peace in the US and UK and AMVETS (American Veterans); and community-based environmental groups, such as WE ACT for Environmental Justice New York. Fifty-eight interviews were carried out with self-selected (i.e. they responded to announcements or other communications about the research) current and former defence sector workers in the US (n 28) and the UK (n30). Forty-seven of these identified as male and eleven as female. We also held ‘international trade union dialogue’ and ‘international expert dialogue’ focus groups, with representatives including the International Trade Union Confederation, and key unions with defence sector members in the US and the UK. The methods and outputs were developed in consultation with an advisory committee which included representatives from defence companies, government departments, academia and trade unions who gave their time voluntarily to the project. This included the following people (three asked for anonymity):

- Brendan Donegan, Programme Lead for 2050 Calculator and Team Lead for Just Transition. Dept. Business, Enterprise and Industrial Strategy, UK Government
- Mika Minio-Paluello and Anna Markova, Policy Leads on Industry and Climate, UK Trade Union Council
- Sam Perlo Freeman, Research Coordinator, Campaign Against the Arms Trade
- Sam Mason, Policy Officer, Public and Commercial Services Union
- [ANONYMISED], Chief Technologist, [ANONYMISED international defence company]
- Erik Kojola, Assistant Professor, Sociology, Texas Christian University
- [ANONYMISED], Manager, Energy Transition, [ANONYMISED international defence company]
- John Harrity, Board Member, Labor for Sustainability
- [ANONYMISED], Director of Climate Change and Sustainability, [ANONYMISED UK Gov. Dept].
- Miriam Pemberton, Associate Fellow, US Institute for Policy Studies

The interview data has been anonymised, including individual, company, and third person names and identifiers. Fully informed consent was obtained, and workers were told that they can withdraw from the study at any time, without explanation. However, we did not offer confidentiality to the focus group participants as these were 'experts' and high-level representatives. Two subsequently asked for anonymity so they are not named, and identifiers have been removed. Hence, our methods emphasised confidentiality, respect for diverse views and the right to withdraw from the research up to the publication of the report.

Worker views

Decarbonisation

Most of the workers interviewed understood the term 'decarbonisation' and they generally supported the idea of decarbonising the defence sector. All said they were concerned about climate change and other environmental issues and were trying to make corresponding changes in their personal and work lives, as illustrated by the following comment:

I suppose it developed over the years as the awareness has been raised within the press and the media and, you can quote all the standard phrases, if you like, 'there is no planet B' and stuff like that. So, I do what I can to try and mitigate that in my home life and if I can do that while I'm here at work then I will be trying that as well ...in the office, we just generally try to be as frugal as we can be with resources, like paper where you're printing stuff off, you're using paper, you're using ink, electricity and all the rest of it. So, unless we absolutely, necessarily have to, and sometimes it is a necessity to print off large documents, we don't (UK016).

The workers interviewed described numerous decarbonisation and other environmentally progressive activities that were already underway in their company, department and sector. This included phasing out of old equipment (e.g. UK010); moving their office building locations to public transport hubs (e.g. UK009); increasing mentions of sustainability terms, such as 'net zero', 'carbon neutral' etc. on meeting minutes and intranet sites (e.g. UK008); recycling water (e.g. US023); recycling other waste (e.g. US021); biodiversity initiatives (e.g. UK018); complying with environmental legislation (e.g. UK017); using simulators instead of live training (e.g. UK013); new solar panels on roofs (e.g. US015); switching to electric or hybrid cars (e.g. US021); monitoring hazardous substances around the factory (e.g. US023); and staff voluntary activities, such as beach cleaning (e.g. UK003). Even so, many thought that more could be done and that it should be a greater priority in their workplace.

However, in the United States, where there tends to be greater controversy about climate science than in the UK, a few interviewees spoke about how their colleagues were not on board with the current scientific consensus that climate change is caused by human behaviour. Several of the interviewees were also concerned that outsourcing and offshoring had been used, and could be further used, in the drive towards decarbonisation. It was reported that these processes were being used as a way of reducing domestic emissions and workers were, therefore, worried that this this would reduce the defence work available in their own countries.

Diversification

Few of those interviewed had heard of the term 'diversification' before the study. When given the project working definition, the interview participants were divided in terms of their support for, and resistance to, the idea. Of those who agreed, some would only support a version of diversification that would broaden defence company business to encompass civil, while others wanted to see a more general scaling back of defence operations and production. The former group argued that the defence

sector is essential and needs to be adequately equipped to be able to respond to threats as argued, for example, by the following research participants:

... countries need the defence industry and you don't want to whittle down the skill base too much that you might lose it. You're always gonna need some kind of capability to ...design and build weapons (UK022).

We do need a defence force in this country – there's no two ways around it. Every country does, but there's plenty of other areas, I think, where skills could be reused to support those green jobs – I don't think we need to be taking them from defence (UK030).

...a strong defence is what you have to have in order to show the world that you can take them on, and the United States ... some people would like to call it 'the protectors of the world' ... (US007).

The point was also made that diversification was not a government priority whereas decarbonisation currently is. Therefore, there is government funding and impetus for decarbonisation, whereas there is not for diversification (e.g. UK029).

However, some of the workers interviewed were interested in a more focused defence sector with some limits on arms production and sales as elucidated in the following comments:

Moving the defence into a format that is more focused towards home rather than abroad - I would be interested in that... I do think that the military and the defence sector do get involved in some things that either they shouldn't, or that they should not prioritise as much as they are (UK002).

Do we really need any more weapons? I don't think I can answer that...I think we do need, given the current state of play with the world, I think we do need some kind of defence but, in the same token, are we producing too much? (UK005).

Just putting solar panels up isn't going to do it. So, we're trying to stress that the only way to really lower emissions of the military is - you've got to make the military smaller. ...Don't we have enough to blow up the world three times over, or five times over? (US008).

Most of these more negative views of the defence sector came from ex- workers, particularly ex-military. However, some current workers also expressed these opinions. A few of the current defence sector workers spoke about their discomfort in working in the sector and, for that reason, would be happy for their jobs to transform into civil roles, particularly working towards a sustainable transition:

I'm in a weird place because my politics don't really line up with the work that I do and so, on the one hand, I am really grateful that I have such a secure job in a secure industry but, on the other hand, it would be wonderful if my job didn't necessarily have to exist (US015).

I would be happy to lose this job and find another. And, if it was in a renewable resource, research or job, that would be fantastic. ...I would feel better about my life if I did that. ... I feel that it's important that I do my job properly in order to keep people safe... Would I prefer to do something that was more relevant for the world? Absolutely! (US013).

Just Transition

Most of the workers interviewed were unaware of the term 'Just Transition' before they had the information about the study. The majority were positive about the concept, once explained, and endorsed its importance. Various interpretations and prioritisations of different aspects of Just Transition from a 'jobs focus' to an 'environmental focus' to a 'society focus' are apparent, as in the statements below:

... if we don't support our workers and we don't provide for them, we're not going to have a good morale. We're not going to have workers that are dedicated towards defence and they're certainly not going to commit or provide as much loyalty as we would like if they don't feel that we're going to support them. Definitely, defence has to consider that workers do have to be valued (UK002).

The positives [of Just Transition], clearly, are not increasing the division within society – that's one of the key things we see at the moment. I certainly don't remember it in my lifetime as being as divided a country as we are and, if we start leaving people behind on this transition, then it's gonna get worse, and that's not good for anyone... (UK030).

Labour will either support decarbonisation, or they will oppose decarbonisation. That will be based on whether we do have that Just Transition, or not (US017). I think it [Just Transition] would be beneficial because it would start to make companies morally and ethically responsible for the decisions that they make regarding their workforce. There is almost a bit of, you've become a commodity. The individual isn't an individual anymore for an awful lot of these large companies. You are a commodity that can be used and, once you are exhausted, you can be cast aside and another can be brought online (UK010).

Some of those interviewed, however, expressed hesitation or scepticism about the concept of Just Transition because of a history of unjust workplace changes. Even so, they were not opposed to the values embodied in the concept i.e. greening the sector; consultation with workers; and support for workers and communities in the transition. In general, the interviewees tended not to anticipate that their jobs would change significantly or be lost as a result of decarbonisation. This was mainly based on the notions that that governments are, ultimately, always committed to defence; that sustainability initiatives were more likely to transform areas of their work, rather than completely change or eliminate their jobs; and that the workers had transferrable skills that would always be in demand. For example, US015 said:

So, as long as we continue predominantly servicing defence, I think that the plant is not going anywhere, I don't think my job is going anywhere. We've survived cuts - the cuts are never really that large but we've survived changes in defence funding. We've made it through Covid primarily because we were mostly servicing defence programmes (US015).

Particularly in the US, workers stated that their politicians saw support for defence spending as necessary for electoral victories. However, some of those interviewed felt that there was a general job insecurity in the sector due to automation and outsourcing and, therefore, it could be hard for workers to focus on decarbonisation and lowering the emissions of the defence sector when these other issues are pressing. A few spoke of some fears among other colleagues and union members about potential job losses when transitioning to sustainability as US022 discussed here:

... our existence is based off of building these polluting aircraft and cars. ... I think the unions look at it as, "We'll lose all these members – we'll lose all these jobs". I think, there is a way to get around that, and that's just by simple, honest communication and showing 'em jobs are still there. They'll be there because, if you're building something that's green-friendly, somebody's gotta do that work – somebody's gotta build this infrastructure, somebody's gotta build it and I think part of the problem is people are afraid to talk about that (US022).

A few of the interviewees also highlighted how outsourcing and offshoring could be used in the drive towards decarbonisation and sustainability as a way of reducing domestic emissions and complying with environmental regulation in the core countries (US and UK). Workers spoke of their frustration with environmental groups pushing for the closure of a polluting facility in the home country and then the facility being relocated to somewhere in the Global South as US020 explains,

Well, it's actually scary, the more years I've worked in this industry. In the beginning, we did everything, we made everything, everything was done in the United States. We had so much work, we just didn't know what to do with it. Thousands and thousands of employees. Since then, we're offshoring and ...instead of dealing with the environmental issue, they'll just send the work to another country that doesn't have the same restrictions that we do, and now... Our work goes everywhere; it feels like it's going everywhere but here (US020).

Workers made the point that, if jobs need to change, they need to be equivalent in terms of pay and status. There needs to be suitable replacement employment and upskilling of workers through training programmes. Several workers noted that because defence workers are often highly skilled and well-paid, it may be challenging to create equivalent low-carbon jobs. The point was also made that efforts need to be made to include particular disadvantaged and marginalised social groups in these debates to achieve a Just Transition. In general, Just Transition was considered to require adequate advance planning, with input from all key stakeholders, particularly workers; sufficient resources; and local and national government leadership and support.

Scope of change

There were very different views about what the scope of change should be with regard to the transition to sustainability of the defence sector. This reflected the range of interpretations of Just Transition that were evident, from 'jobs focused', to 'environment focused', to 'society focused'. Some of those interviewed were keen to extend the debate beyond decarbonisation to wider environmental harms, as these interviewees discussed:

I think, when we're talking about our sustainability strategy, it's not just about net zero. It's also about the broader definition of sustainability, which is also about supporting communities, ensuring that you're not having a negative impact upon society and people as you are going about your business (UK007).

...the amount of waste is unimaginable. I've seen literally millions of dollars of snap on tools just thrown in the recycling bin out back. ... I've never seen nothing like it in my life. ...It's the same way with bolts, for example, bolts in a bin that

somebody uses on this part of the rocket. They actually have an expiration date, a bolt, and if it's not used within a year then you throw them away and order some new ones (US002).

Many emphasised that it would be important to constrain the change towards what could be done without impacting negatively on the current defence capacity. Others, mostly but not entirely, former (rather than current) soldiers and defence workers, felt that it is critical to scale back production and operations to adequately reduce the negative environmental impacts of the defence sector. A number of the interviewees spoke about how the money spent on defence could be better used for other purposes, in line with the ideas of 'peace dividend' proponents. Some of the interviewees proposed that other means of dealing with conflict would be preferable and less environmentally harmful than responses that rely on defence sector products and operations. These points are illustrated in the following statements:

So, if we weren't spending as much [on defence] or if we were taking that money and putting it towards social needs, those could have a great impact on the quality of life for most Americans in terms of stuff like national healthcare and a lot of the safety net things that, say, most countries in Europe take for granted because they don't spend as much money on weaponry as we do ... (US011).

... people just grow up with respecting the people in the military, not understanding that they are the – they're just the face, the attractive face, for a vast network of military industrial production which poisons ground water and makes workers sick and eats up our tax dollars and has many, many other effects that are harmful. Not only does the US military not protect us, you know, in any meaningful way, it is actively harmful (US004).

Several interviewees spoke about the rather superficial and low-key changes their companies were making compared to the scale of what was necessary, as US015 discusses here:

... Also, the resources that go into manufacturing - the raw materials that we use are very carbon intensive. It's all forged metals ... It doesn't feel great, there's a lot of irony in the fact that I ride an electric bike to work to go and make jet engines ... The company, they put solar panels and stuff in the parking lot but none of that is going to offset what we're dumping (US015).

These perceptions of the scope and scale of the transition required, in turn, linked to the workers' understandings of what would achieve a Just Transition. Some workers were more focused on technical change, others on behavioural change, and others on systemic and political change, as discussed in their consideration of the drivers, challenges and solutions for transitioning outlined in the next sections.

Drivers and challenges

A point that was frequently made by the workers interviewed was that a key driver for transitioning to sustainability in the defence sector is the security aspect, including the likelihood that climate change would undermine military assets, destabilize societies and trigger civil conflict. The interviewees also identified a great deal of interest in transitioning to sustainability within the defence sector for improving its operational capacity, public image, independence and resilience, as the following comment highlights:

I think there's a lot more to it than just environmental benefits with decarbonisation. There is an increase in resilience of our supply chain if we can... wean ourselves off reliance on fossil fuels because we don't have a natural supply of fossil fuels... If we can operate on green hydrogen, on wind energy related stuff, we've got plenty of those, and we're not importing them and we're not subject to fluctuations and not subject to not being able to get hold of those materials and relying on other people... If you're not reliant on shipping things in, just basic things like water, like energy, fuel supplies, all those kind of things that you need to get into your frontline or into your operating bases, if you can actually be more independent of those ... that for me is one of the key things about sustainability (UK006).

Other perceived drivers included the threats to human and ecological health and wellbeing arising from the climate crisis; and public pressure to reduce the defence sector ecological impacts.

The main barriers to transitioning were considered to be technological factors, in terms of reducing emissions while maintaining the operational standards required for defence; human factors, including attitudes, habits, identities and culture; cost, to the government, companies and customers; and the political economy, including the drives for profit and power. With regard to technological factors, the interviewees pinpointed numerous technical difficulties that would need to be overcome in order to decarbonise defence, including the following:

Yes, moving to simulation is great for the air training part of it but, for the live part of it, where you have to fly, then you know, jet engines are really, really carbon inefficient. The amount of fuel that you burn per hour is astronomical in a large aircraft. ... With a battery, battery technology itself, the amount of energy you can get into a battery is finite. ... I think if we could forward alternative fuels, then that's probably gonna be more efficient... so if you can produce engines that are able to be powered and get their energy from hydrogen rather than a battery, then yeah it would be more advantageous.... The negative effect is that you don't get the same level of training from simulation and you don't get what's generally termed as the 'random effect' (UK013).

Some of the workers interviewed also discussed long equipment life cycles, whereby fossil-fuel-powered equipment that is being used now or coming into service will still need to be in use in 2050. In addition, points were made regarding a lack of appropriate infrastructure for decarbonisation, as in the following comment:

... it's not just a matter of getting electric vehicles, for example. The whole of the electric vehicle infrastructure to charge these vehicles has not yet been created really in the United States. I mean it exists in a kind of skeletal patchwork fashion and it certainly does not exist in other countries, as yet, where all these [United States Military bases] are. So, I think that there's just a lot of really [sigh] - there are really practical barriers (US004).

The interviewees frequently mentioned the need to prioritise operational capacity in the endeavour to decarbonise, as these excerpts highlight:

... If the option is to deliver a full capability that has an environmental impact or a degraded capability with zero environmental impact, the end user is always going

to select full capability. That's what they want. The ideal state would be delivering full capability with zero environmental impact but often that becomes prohibitively expensive (UK010).

I think, whilst we're not at war, we can make some clever decisions and transitions to decarbonise. I think, when we do go to war, there's a bit of a compromise between capability and environmental impact. Mission criticality comes into its own and that may take precedent over any environmental decisions.... If you're in a mission critical scenario then you probably don't have the luxury of choosing and spending and using the more, sort of, sustainable fuels, you kind of have to put up with whatever is available at the time depending on where you are in the world (UK018).

Related to this, a few of those interviewed were concerned that diversification of the sector, in terms of using civil components or companies, would not be workable because defence has its own standards and these cannot be compromised as US014 discusses here:

... we are inclined in our industry to understand that we're not making cars, we're not making toaster ovens, we're not making washing machines. The products we make, people's lives depend on. They have to work every time they're used, every time they're used, no exceptions, no excuses, no "it was left in a warehouse for five years, it was in the Antarctic, it was in the Sahara Desert"; it has to work no matter what. So the quality of what we produce is very, very good, but it comes at a very high cost ... So, at least my experience of [ANONYMISED defence company], it's hard to make that transition to, "well it's a toaster oven, so if it doesn't work they can bring it back and get another one". Well, you can't bring it back and get another patriot missile. If it doesn't fire when it's supposed to fire, people are going to die. So, it's a different mentality in the industry (US014).

Lastly, in terms of technical barriers, the interviewees also mentioned new problems that could be created through changing technologies, particularly regarding creating other environmental issues elsewhere from using alternative fuels and technologies, and new global conflicts that might ensue as a result.

Some of those we interviewed located the barriers to transitioning to sustainability in human feelings, thinking and behaviour, either as the key limiting factors or as associated factors. Some of the interviewees touched on the identities of defence workers as perhaps standing in the way of transitioning the sector, as in the following comment:

It becomes more complicated when you go to defence workers and you say, "well, we're going to cut out these weapons because we need more nurses and teachers and we need more highways" or something, because we're not nurses and teachers or construction workers, so people need to keep the thing that's relevant to what we do (US011).

The workers that we interviewed generally expressed a great deal of job satisfaction, primarily as a result of enjoying working with their colleagues (e.g. US012); feeling that they are making a difference (e.g. UK007); having a degree of autonomy (e.g. UK009); variety in the job (e.g. UK010); interacting with a range of people (e.g. UK010); opportunities for learning (UK008); enjoying meeting people (e.g. UK014); using their skills (e.g. US025); making a worthwhile contribution in terms of supporting the defence of the country (e.g. UK008); and pay, conditions and job security (e.g. US015). Some said this high level of job satisfaction would be a barrier to transition as civil jobs, including 'green jobs', tend not to be as good in these respects.

A barrier to change that was very commonly mentioned by interviewees was the cost of decarbonising and bringing about a Just Transition. Interviewees regularly mentioned the cost implications in implementing both, as these interviewees described:

... it's all very well setting out these aspirations, it's practically what are you going to do about it and have you put the funds aside to do so because it's costly? So, for example, on the defence estate we've got 50,000 homes. Well, you need to be putting heat exchanges in those, etc. Well, that's a lot of money (UK007).

I think that, whatever the Pentagon is saying about electric vehicles and solar power for certain military bases or installations, the obvious physical fact remains that the vast array of jets, helicopters, warships, tanks, you know, huge fleets of just regular cars and trucks, all of that runs on petroleum, and will for the foreseeable future. It's going to be an extremely expensive endeavour to convert even a fraction of that to electric vehicles (US004).

There was some uncertainty regarding whether adequate funds would be made available for greening the defence sector as, for example, expressed here:

We have to demand a better solution and, unfortunately, people aren't prepared to pay for it. We absolutely have to be prepared to pay for the more sustainable option. That might be the downside that it's more expensive but we have to be prepared to do that. We cannot sacrifice environment for cost (UK006).

... In order to go greener, they would have to invest a whole lot of their money into that whole transition. Companies don't really have an interest in moving in that direction just because that's gonna be money taken away from stockholders – away from CEOs – people that are running those businesses (US022).

In terms of the political-economic barriers to change, some of those interviewed felt that defence industry options were constrained by economic imperatives, including vested interests and perverse incentives within the system:

... defence is easy money for companies and doing anything else is risk ... it comes down to the money thing and the incentives. So if the country and the government wants the defence industry to diversify, there needs to be incentives that minimise the risk for them to do that so, whether that's funding support, whatever, that needs to be there and I guess then on the other side we need to make defence funding less attractive or more strict because the defence industry, from my point of view, is essentially a magic money tree. There is always money available no matter what you do and so...they almost need to be made less dependent on that to make them do other things (UK022).

... defence work is essentially state run. It's a state run industry and the majority of the funding is through the taxpayer. So, for the defence industry to branch out, you'd probably have to have an equal amount of investment from state governments to justify it. ...the private sector is so focused on short term reward that they're not really going to be interested in putting in the type of investment it would take to transition entire sectors into something out of the defence industry. ...they don't care where their money comes from as long as they make their money. So, if they can see the same type of profit margin through renewable energy then maybe they will invest as much in that as they have in aviation in the past, but the problem is with defence work it's kind of like a blank cheque (US015).

Some of those interviewed discussed the profit motive as a barrier for change, as in the following excerpts:

I think it's short-term thinking by business, that they're not planning strategically like that. They're spending more time worried about stock buy backs and compensation levels for their executives and return on investment to stockholders than they are about the long-term vision of what are we going to be doing in the 2080s? ... Yes. I think that's the main problem (US017).

I think that there's just so much money, and I think it all just boils right down to that. There's just so much money in the defence side – My sense is that people who do a lot of defence work really don't wanna get into the greening of the economy – the profit margins aren't as good as defence manufacturing (US024).

Some of the interviewees connected these vested interests to power, associated lobbying, and consequent inadequate legal and regulatory back up, as illustrated by the following comments:

Well, the major barrier is this, for Trident, the only reason they have got it - they can't use it because if they used it, you would be talking the annihilation of civilisation - the only reason they have got it is to keep a seat at the top table of the Security Council at the UN and it's a political thing. It's no' really a defence weapon, it's a macho thing. Britain is still the imperial power or it thinks it is ... That's part of the problem (UK020).

The military is one of the, sort of, exempt, keep your hands off, as far as giving any rules to the military goes and that should not be ... [ANONYMISED names of defence companies], they contribute heavily to political campaigns, putting in politicians that favour their views (US003).

The barriers for change, then, were mainly seen in terms of technological issues, human attitudes, cost and the political economy. These considerations were then addressed in the workers' proposed solutions, as discussed in the next section.

Solutions

The interviewees saw change regarding diversification, decarbonisation, and Just Transition as being the responsibility of, and being initiated and driven by, a variety of agents including the national government, the public, defence companies, unions and defence sector workers. The solutions that they proposed to help to overcome the perceived barriers included government and company incentives, regulations and policies; contractual requirements; becoming more cost-efficient (wasting less); and trade union organising around these topics, including engaging workers in social dialogue. For example, interviewees said:

... There is an awful lot we can do with minimal investment and, actually, it would incur long-term savings for the defence sector. For example, solar panels - the facilities that I work in don't have a single solar panel on them whatsoever (UK002).

We just need to reallocate our budget. Instead of investing in the same technology from [ANONYMISED] – or whoever you want to name in terms of the equipment we're using – we need to allocate it towards renewable resources, possibly even turning down our engagements in conflicts around the world (US019).

I just really want to stress that organised labour, I think, is the most powerful tool

when it comes to shifting economies and industries and even politics. ...that's what's going to decarbonise and transition the defence sector, is the people that are doing the work (USO15).

... I think, if you keep at a positive message - when I talk to people about climate change, I always emphasise our kids and their kids and future generations because I think it's the only way to make sure that you feel fully the imperative ... What I've found, when I go and talk to groups of workers, there is some scepticism sometimes but, really, they're just wondering what can be done about it [climate change]. People are actually really worried, and they know their kids are really worried, so they really just want somebody to say we can deal with this (USO11).

Reallocating budgets, organising in trade unions, and positive discourses that address worker concerns were, therefore, seen as some of the key solutions needed to achieve a Just Transition.

Dialogue

Almost all the workers interviewed expressed an interest in being consulted on plans for decarbonisation, diversification, and/or Just Transition to a greater or lesser extent. Yet, the majority of workers interviewed had not been consulted on any of these by their company, union or government. Several of the workers interviewed had tried to make proposals to their company, or seen others do so, that were not taken up. They were given the impression that such ideas were a distraction from their main job. Workers said that inclusion was important in order for the workforce to feel part of the process and, therefore, less resistant to the accompanying change. They also felt that they had a strong contribution to make in terms of knowing the reality of implementing policies on the ground. The point was also made that efforts need to be made to include disadvantaged and marginalised social groups in these debates to achieve a Just Transition. A number of interviewees that were involved in the union felt that they needed to increase the power of the unions and use collective action in order to have influence on their companies and workplace. Related to that, several of the interviewees highlighted the importance of workplace democracy for achieving a Just Transition, and how the discourses and values embedded in this concept could, in turn, push forward such democratic workplaces. UKO17, for example, argued,

If we built the ... infrastructure that would be required to move this [Just Transition] policy forward, it will at the same time create the political infrastructure that will promote workers' democracy on the job. So, I think they go together (UKO17).

Overall, then, the workers expressed a desire to be involved in conversations about decarbonisation, diversification and Just Transition, but were mostly excluded or felt their influence was minimal unless supported by organisational or company leaders.

International expert and trade union views

Within the international expert dialogues, some questioned the assumption that defence is more carbon intensive than other sectors on the grounds of inadequate emissions monitoring across sectors. It was generally agreed, however, that this debate might be a distraction as all sectors would need to reduce their emissions to meet net zero targets.

Those who were opposed to diversification argued that changing to civil production would not reduce GHG emissions, particularly, since civil was no less harmful. They also argued that defence is fundamentally necessary for national defence and, thereby, the wellbeing of humanity. Those who supported diversification raised the concern that there would not be enough funds to deal with climate change if society continues to invest so heavily in military products. Some expressed that a large part of military activity is not actually contributing to our real security needs. The point was also made that defence is linked to colonialism, for example, in terms of the extraction of resources, testing of weapons and the US bases around the world. It was argued that, since oil has been a major source of military conflict, reducing its use would automatically drive diversification as there would be less need for defence operations.

Most of the group agreed that decarbonisation and the wider Just Transition would require government incentivisation and regulation. A few considered it important to ensure there was good accounting and monitoring of the defence sector as the basis for this, so that there could be checks against standards.

With regard to Just Transition, the expert group were asked why they thought many of the workers we had interviewed had not been consulted on JT. Several in the group said that some companies and organisations might avoid using the specific term, although would address the issues that it embodies (for example, Brendan Donegan, International Climate Finance Just Transition Lead, UK Government Dept Business, Enterprise and Industrial Strategy). It was also proposed that this was not a conversation that is currently taking place because job losses are not foreseen as a result of decarbonisation, as an anonymised defence sector representative comments here:

... certainly, the part of the defence sector that I work in, I don't think we'd have those sorts of discussions because I don't think that we would see that decarbonisation would lead to job loss. It would just be that we would be working on different projects. ...I think we would just expect the sorts of project, the sorts of equipment and technologies that we're working on, to change over time and to some extent, our skill sets would evolve but it would be an evolution rather than a mass job loss.

However, another anonymised defence company senior manager explained that their company did have a process for engaging workers around decarbonisation:

... we have an engagement process with the workforce around ideas for net zero and decarbonisation from small scale things, recycling, right the way up to large scale electric products ...through to new ways of doing things in the defence environment, that would be low carbon footprint. We're certainly actively engaging

the workforces ... everybody's on this agenda and everyone's embracing it. It's a real attractor for the next generation coming through in terms of jobs and skills and it's certainly galvanised the workforce because it's the right thing to do.

Even so, setting this in the broader context of workers in the UK, Anna Markova, Policy Lead on Industry and Climate Change at the Trade Union Congress, described the results of polling carried out by the TUC last year on UK workers in general²⁶. Two in three of the workers polled (65%) said it is important that their employer is actively helping to tackle climate change, but only one in three (33%) said that their employer had put measures in place in the workplace to help tackle climate change. Only one in eight of those surveyed had been consulted by their employer or had a chance to voice their ideas about decarbonisation. Anna remarked that, despite this, workers have come up with their own plans when the employer was reluctant to engage with the topic. She gave an example of recent action at Rolls Royce where union representatives across three UK sites, together with local environmental and community activists, developed their own transition plans for sustainable and green manufacturing, and lifted threats of closure²⁷.

The TUC representative also made the point that workers can have an expanded view of JT, beyond a 'jobs focus'. The workers did not only focus on their own jobs, but sometimes took into consideration the wider issues pertaining to their work. The case of the AUKUS deal was discussed, a trilateral security pact between Australia, the United Kingdom and the United States, announced in 2021. According to this agreement, the US and the UK will help Australia to acquire nuclear-powered submarines and cooperate on cyber capabilities and artificial intelligence, among other programmes. The Maritime Union of Australia was totally opposed to the deal even though they could gain out of it in terms of jobs. They were opposed because they did not agree that is where public investment should be going. Finally, the point was made by the union members of the expert group that a great challenge for Just Transition is the drive to reduce the costs of manufacturing, even for renewables, so that companies need to compete to become the cheapest supplier and, therefore, move jobs internationally to reduce the costs of labour, minimising the chances of a Just Transition.

In the second focus group, the international trade union dialogue, representatives said that, in relation to Just Transition, particularly where diversification was considered as an element of this, there were worker concerns regarding (1) pay, which is usually better in the defence sector than in the 'green' sector or other manufacturing work; (2) attachment to defence jobs, with workers being very proud of helping with the defence of their country; (3) maintaining the quality requirements for the military, which tends to be higher than that of civil (4) trust - how to demonstrate to workers that good jobs will be part of this transition. Some of the main drivers for decarbonisation and a Just Transition identified by this group were the international agreements, particularly the Paris Agreement and the infrastructure that followed it, including the nationally determined contributions.

26 TUC (2022) Most workers back the move to a greener economy, but just one in four believe current plans will create many new jobs in their local area, 11 Feb 2022 <https://www.tuc.org.uk/news/most-workers-back-move-greener-economy-just-one-four-believe-current-plans-will-create-many>

27 Minio-Paluello, M. (2021) Pushing for a Green New Deal at Rolls Royce <https://www.tuc.org.uk/blogs/pushing-green-new-deal-rolls-royce>

The Paris Agreement included Just Transition and made a direct link with decent work and quality jobs. The most recent COP in Glasgow also highlighted Just Transition. Bert De Wel, Climate Policy Officer for the International Trade Union Confederation, stated that the key issues that needed to change were:

... in terms of the private [defence] sector and decarbonisation, the first requirement is much more transparency. Till this moment, the climate impact of this sector is pretty much unknown. They continue to be under the radar. How are you going to regulate, stimulate, deal with this sector if they avoid being transparent? ... That would be the first thing. The second thing ... climate policy is, in a sense, industrial policy and we need everybody on the table to discuss this. Then it's a question of budgets and fiscal policies and tax policies to pay for the investments that are needed, that are linked to your industrial policies and this [defence] sector has to pay up for this too because there are huge profits there. The fourth factor is a level playing field because there is always this race to the bottom, delocalisation, this threat, and you have to close the back doors in order to make industrial policy effective and not just shift the impact to other regions

Bert De Wel, Climate Policy Officer for the International Trade Union Confederation

Other members of the group also reiterated the key message that investment is needed. In addition, they emphasised that social dialogue is important. Unions need to make sure that their members are involved in Just Transition plans, including proposing and initiating those plans. Training and upskilling is also crucial for workers so that they can continue to have quality jobs (e.g. Rick Graham, Researcher, Aerospace, Engineering and Manufacturing, Unite the Union).

The importance of union organisation was highlighted, as in the following excerpt:

So I think these are some things we have to do as trade unions, but we have to do a lot of work within our own memberships as well. PCS has a very long track record on this agenda but, as I like to say to colleagues, we have to be careful we don't live in our own bubbles with this. If we went out to our whole membership tomorrow, I wonder how many would know what our policies are and the various campaigns we're supporting. ... it's about getting our reps and the rank and file having these discussions

Sam Mason, Policy Officer, PCS Union

Referring to the Lucas Plan for diversification in the 1970s, Owen Tudor, Deputy General Secretary, International Trade Union Confederation, went on to discuss the importance of workplace democracy, in general, stating,

...from a union perspective, one of the other lessons of Lucas, obviously, is that it was actually somewhat about workers' control as well. I mean, the movement that it came out of, the movement that it generated, is about giving workers generally more of a say over what goes on with the work that they deliver.we're [trade unions are] often characterised as an organisation which simply monitors the price, or negotiates over, the price of handing over our labour, whereas all of the traditions of working class apprenticeships and things like that in skilled jobs was that you were actually not just giving over some labour and skill ...for which you wanted to be decently rewarded, you actually wanted to have a role in determining what was done with that labour and those skills.

The importance of the global supply chain, offshoring and lack of protective government policies were important issues for this group. Just Transition was not chiming well with some workers, as they could see that jobs are being lost, as Adam Kaszynski, Local 201 leader of the Industrial Division of the Communications

Workers of America (IUE-CWA) discussed, stating:

[defence products] ...this is, basically, the last stuff that we're making around here. Because of NAFTA, because of free trade and because of the lack of US industrial policy, we're lucky to have anything left. So the idea that we can go ahead and transition and be making something else when everything is going out the door for the past 30 years does not sit well with manufacturing workers. I mean, we know it's a lie. So, I think that trade agreements have to be addressed.

The importance of the global supply chain, offshoring and lack of protective government policies were important issues for this group. The International Trade Union Confederation representatives discussed how they have been working to ensure that global supply chains do not undermine workers' basic rights. They are working to connect employees internationally to ensure that workers across the supply chain have a voice.

Conclusion

The study indicates the range of opinion and attention to nuance and complexity among an occupationally and geographically diverse group of defence sector workers in the US and UK. Although it is a small study and generalisations cannot be made from the self-selecting sample, their statements provide helpful insights and highlight numerous issues that could be investigated further by researchers, companies, governments, and unions. We strongly urge readers to also look at the testimonies of the workers presented in the full report to better understand the depth of thought, consideration, knowledge and caring that is evident. This is available on the project website, to be found at <https://decarbonising-defence.co.uk/>

The project is currently missing the voices of workers in Eastern Europe and the Global South who are now increasingly working on US and UK defence contracts. To achieve a Just Transition along the supply chain, the structural interdependencies and inequities that have resulted from outsourcing and offshoring means that enabling Just Transition in Eastern Europe and the Global South is going to require changes in policy and practices in the United Kingdom and the United States.

It is evident that Just Transition is not solely about jobs for these workers but also environmental and social justice. The study suggests the support of most defence workers for the defence industry but confirms Brenes (2020) more complex argument that, even though defence workers fight for their jobs, they have diverse perspectives about what the future of the industry should be. However, a common theme is that, as long as their immediate interests are not threatened, the workers seemed to enthusiastically embrace the transition to sustainability. It is important to note that diversification will be unhelpful in reducing environmental impact if the alternative jobs created are just as environmentally harmful. If jobs are transitioned, they need to be towards 'green' jobs or aspects of production and service that are less environmentally harmful. The defence sector is unique in that the use of its products often leads to considerable further environmental harm through destruction of property and nature and through post-conflict reconstruction. These emissions, and other downstream environmental impacts, are critical to an assessment of the relative merits of converting defence, yet there is very minimal data on this. The need for transparency in environmental monitoring is, therefore, vital across the defence sector and the wider economy.

The requirement for funding and regulation are also key themes emerging from the workers' perspectives in this research. However, worker inclusion in the planning and decision-making is undoubtedly the strongest message. Defence sector workers are an important source of expertise and can be a moral compass in the necessary Just Transition of the defence sector. There needs to be more formal engagement with them to make the most of what they bring to the endeavour to create a sustainable future.

Key recommendations

Recommendations based on the worker interviews can only be tentative, given the small sample size of the participant cohort. However, putting this data in the context of the other aspects of the study, including the advisory committee inputs, literature review, document analysis, and focus group dialogues with relevant international experts and worker leaders, we can more confidently offer the following recommendations for consideration:

For companies:

- Set up structures and programmes so as to include workers at all levels in decarbonisation and diversification planning and implementation
- Create contractual clauses for companies along your global supply chain to comply with, or improve upon, US and UK environmental and employment standards
- Make your GHG emissions and other environmental impact data publicly available
- Work with suppliers to estimate upstream emissions and environmental impacts for each product and identify opportunities for switching to more environmentally benign inputs
- Understand the downstream emissions of customers for each of your products and solutions

For unions:

- Create more opportunities for education and dialogue around decarbonization, diversification and Just Transition with rank-and-file defence workers
- Increase work on building solidarity with, and including the perspectives of, workers in Eastern Europe and the Global South who are supplying the defence sector
- Prioritise unionising the 'green' sector and improving job security and pay in this sector so that these jobs begin to become more attractive to workers
- Press for company forward planning, with consultation from rank-and-file workers, to ensure a Just Transition for their workforce

For governments:

- Enact legislation to include defence sector greenhouse gas emissions in national carbon accounting
- Supply significant ring-fenced funding to enable the defence sector to decarbonise and address its other environmental issues, including adequate financing for the retraining of workers
- Create contractual obligations for private companies that supply the MoD/DoD to work to high environmental standards and reduced greenhouse gases
- Consider transitioning security policies and budget priorities to support a 'human security' approach, addressing the global and national poverty, inequality, health and environmental crises and investing in the jobs that would accompany this
- Set up a UK-wide Just Transition Commission, and US-wide equivalent, to ensure that workers' voice is central to guiding net zero and other environmental policies

For NGOs:

- Link up with trade unions on relevant shared interests around achieving a Just Transition
- Consider focussing on the defence sector as a possible contributor to the problems and solutions you are working on

For workers:

- Propose decarbonisation, diversification and Just Transition education and dialogue in your company and union
- Demand greater consultation and inclusion in company decision-making on these topics

References

-
- ABC News (2021) Biden says climate change is biggest threat to national security at campaign rally, <https://abcnews.go.com/Politics/video/biden-climate-change-biggest-threat-national-security-campaign-58698610>
-
- Barry, B. (2021) UK to adapt military to changing climate, but does it have the funds and backing of troops? *DefenseNews*, August 9
-
- Belcher, O. et al. (2020) 'Hidden carbon costs of the "everywhere war": Logistics, geopolitical ecology, and the carbon boot-print of the US military', *Transactions of the Institute of British Geographers*, 45 (1), pp. 65-80.
-
- Bell, K. and Reed, M.S. (2021) 'The tree of participation: A new model for inclusive decision-making'. *Community Development* bsab018, <https://doi.org/10.1093/cdj/bsab018>
-
- Bigger, P. and Neimark, B.D. (2017) 'Weaponizing nature: The geopolitical ecology of the US Navy's biofuel program', *Political Geography*, 60, pp. 13-22.
-
- Brenes, M. (2020) *For might and right: Cold War defense spending and the remaking of American democracy*, Amherst: University of Massachusetts Press.
-
- Bowcott, H., Gatto, G., Hamilton, A. and Sullivan, E. (2021) Decarbonizing defense: Imperative and opportunity, McKinsey <https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/decarbonizing-defense-imperative-and-opportunity>
-
- CAAT (2014) Arms to renewables: work for the future. <https://www.caat.org.uk/campaigns/arms-to-renewables/armsto-renewables-backgroundbriefing.pdf>.
-
- Crawford, N.C. (2019) Pentagon fuel use, climate change, and the costs of war, Watson Institute
-
- Dimitrova, D., Lyons, M. Losada, P. et al. (2021) The growing climate stakes for the defense industry, Boston Consulting Group, Sept 10 <https://www.bcg.com/publications/2021/growing-climate-stakes-for-the-defense-industry>
-
- DFIT (2020) UK defence and security export statistics for 2019 - Gov.UK, UK Dept for International Trade <https://www.gov.uk/government/statistics/uk-defence-and-security-export-statistics-for-2019/uk-defence-and-securityexport-statistics-for-2019>
-
- Duvic-Paoli, L-A, Interview in Frazer-Nash Consultancy (2020) Where next for UK Defence in an era of climate crisis? <https://www.fnc.co.uk/resources/where-next-for-uk-defence-in-an-era-of-climate-crisis/>
-
- ETUC (2019) What is Social Dialogue, The European Trade Union Confederation website <https://www.etuc.org/en/what-social-dialogue>.
-
- Frazer-Nash (2020) Where next for UK Defence in an era of climate crisis? <https://www.fnc.co.uk/resources/where-next-foruk-defence-in-an-era-of-climate-crisis/>
-
- Gardner, T. (2017) U.S. military marches forward on green energy, despite Trump, *Reuters*, March 1, <https://www.reuters.com/article/us-usa-military-green-energy-insight/u-s-military-marches-forward-on-green-energydespite-trump-idUSKBN1683BL>
-
- GE (2020) Sustainability report: Building a world that works for tomorrow, <https://www.ge.com/sustainability>
-
- Hartley, K. (1996) The Defence Economy', in Britain in the 1970s: The Troubled Decade, ed. Richard Coopey and N.W.C. Woodward, London: University College London Press, pp. 212-235.
-
- Honeywell (2021) How we'll reach carbon neutral by 2035 <https://www.honeywell.com/us/en/news/2021/04/how-we-will-reach-carbon-neutral-by-2035>
-
- IATA (2019) Aircraft technology roadmap to 2050, International Aircraft Transport Association, December 2019, iata.org

Judson, J. (2017) US Army gives green light to shape vehicle electrification requirements, DefenceNews, Sep 21 <https://www.defensenews.com/land/2020/09/21/army-gives-green-light-to-shape-vehicle-electrification-requirements/>

McLoughlin, K. (2022) *The British Left and the Defence Economy: Rockets, Guns and Kidney Machines, 1970-83*, Manchester: Manchester University Press.

Minio-Paluello, M. (2021) Pushing for a Green New Deal at Rolls Royce <https://www.tuc.org.uk/blogs/pushing-green-new-deal-rolls-royce>

MoD (2021) Ministry of Defence climate change and sustainability strategic approach, March 30 <https://www.gov.uk/government/publications/ministry-of-defence-climate-change-and-sustainability-strategic-approach>

NET (2018a) Defence diversification: international learning for Trident jobs, Nuclear Education Trust, <http://www.nucleareducationtrust.org/sites/default/files/NET%20Defence%20Diversification%20%20%20%20Report.pdf>

NET (2018b) The Trident Alternatives Review and the Future of Barrow <http://www.nucleareducationtrust.org/trident-alternatives-review-and-future-barrow>

Owen-Burge, C. (2021) MOD climate chief: Inaction will lead to a “more expensive, weaker military”, *Race to Zero*, May 25 <https://racetozero.unfccc.int/mod-climate-chief-inaction-will-lead-to-a-more-expensive-weaker-military/>

Parkinson, S. (2021) More fight, less fuel: the military approach to climate change, *Responsible Science blog*, 15 June <https://www.sgr.org.uk/resources/more-fight-less-fuel-military-approach-climate-change>

Parkinson, S. (2020a) The environmental impacts of the UK military sector, Scientists for Global Responsibility, Lancaster https://www.sgr.org.uk/sites/default/files/2020-05/SGR-DUK_UK_Military_Env_Impacts.pdf

Parkinson, S. (2020b) Will the UK Reduce its Military Carbon Emissions? <https://rethinkingsecurity.org.uk/2020/07/02/uk-military-carbon-emissions/>

Prospect (2021) Integrated defence review – member feedback 2021-00568-Circular_Standard-Integrated-Defence-Review--member-feedback-Version-14-06-2021 (1).pdf

Prospect/GMB/Unite/Unison (2018) Demanding a Just Transition for Energy Workers <https://www.unison.org.uk/content/uploads/2019/01/just-transition-to-low-carbon-leaflet.pdf>

Raytheon Technologies (2021) Sustainable aviation: How Raytheon Technologies is working to cut carbon emissions <https://www.rtx.com/news/2021/04/20/sustainable-aviation>

Rolls Royce (2021a) Our decarbonisation strategy <https://www.rolls-royce.com/innovation/net-zero/our-decarbonisation-strategy.aspx>

Rolls Royce (2021b) Leading the Transition to Net Zero Carbon <https://www.rolls-royce.com/-/media/Files/R/Rolls-Royce/documents/others/rr-net-zero-exec-summary.pdf>

Rolls Royce (2021c) Our pathway to Net Zero <https://www.rolls-royce.com/innovation/net-zero.aspx#/>

Sutcliffe, J. (2021) Our commitment to Net Zero <https://www.baesystems.com/en-uk/blog/our-commitment-to-net-zero>

SIPRI (2021) Trends in world military expenditure, 2020 https://sipri.org/sites/default/files/2021-04/fs_2104_milex_0.pdf

Smith, S. (2017) Just Transition: A report for the OECD. Organisation for Economic Co-operation and Development. May 2017. <https://www.oecd.org/environment/cc/g20-climate/collapsecontents/Just-Transition-Centre-reportjust-transition.pdf>

StartUs (2022) Top 10 military technology trends & innovations for 2022 <https://www.startus-insights.com/innovators-guide/top-10-military-technology-trends-2022/>

Steffen et al. (2015) ‘Planetary boundaries: Guiding human development on a changing planet’, *Science*, 347 ,

6223.

TUC (2022) Most workers back the move to a greener economy, but just one in four believe current plans will create many new jobs in their local area, 11 Feb 2022 <https://www.tuc.org.uk/news/most-workers-back-move-greener-economy-just-one-four-believe-current-plans-will-create-many>

TUC (2020) Voice and place: how to plan fair and successful paths to net zero emissions <https://www.tuc.org.uk/research-analysis/reports/voice-and-place-how-plan-fair-and-successful-paths-net-zero-emissions>

US Army (2022) United States Army climate strategy, Department of the Army, Office of the Assistant Secretary of the Army for Installations, Energy and Environment. Washington, DC. https://www.army.mil/e2/downloads/rv7/about/2022_army_climate_strategy.pdf

Vergun, D. Defense secretary calls climate change an existential threat, US Department of Defense, April 22, 2021, [defense.gov](https://www.defense.gov).

About the Academy

The British Academy is an independent, self-governing corporation, composed of almost 1,000 UK Fellows and 300 overseas Fellows elected in recognition of their distinction as scholars and researchers. Its objectives, powers and framework of governance are set out in the Charter and its supporting Bye-Laws, as approved by the Privy Council. The Academy receives public funding from the Science and Research budget allocated by a grant from the Department for Business, Energy and Industrial Strategy (BEIS). It also receives support from private sources and draws on its own funds. The views and conclusions expressed here are not necessarily endorsed by individual Fellows but are commended as contributing to public debate.

The British Academy is the UK's national academy for the humanities and social sciences. We mobilise these disciplines to understand the world and shape a brighter future.

From artificial intelligence to climate change, from building prosperity to improving well-being – today's complex challenges can only be resolved by deepening our insight into people, cultures and societies.

We invest in researchers and projects across the UK and overseas, engage the public with fresh thinking and debates, and bring together scholars, government, business and civil society to influence policy for the benefit of everyone.

The British Academy
10–11 Carlton House Terrace
London SW1Y 5AH

Registered charity no. 233176

thebritishacademy.ac.uk
Twitter: @BritishAcademy_
Facebook: TheBritishAcademy

Published July 2022

© The authors. This is an open access publication licensed under a Creative Commons Attribution-NonCommercial-NoDerivs 4.0 Unported License

To cite this report: British Academy (2022), *Decarbonising and Diversifying Defence in the United Kingdom and United States: A workers' enquiry for a just transition*, The British Academy, London

doi.org/10.5871/just-transitions-s-i/K-B

Design by Only