Open Access

Advances in Environmental and Engineering Research

LIDSEN Publishing Inc.

Original Research

From Managing People to Managing Emissions: How Leading Human Resources Firms are Minimising Their Carbon Footprint

Hayden Cartmill, Paul Dargusch, Genia Hill *

School of Earth and Environmental Sciences, University of Queensland, Australia; E-Mails: h.cartmill@uq.net.au; p.dargusch@uq.edu.au; genia.hill@uq.edu.au

* **Correspondence:** Genia Hill; E-Mail: genia.hill@uq.edu.au

Academic Editor: Zed Rengel

Special Issue: Case Studies of Carbon Management in Practice

Adv Environ Eng Res
2022, volume 3, issue 2
doi:10.21926/aeer.2202019

Received: January 10, 2022
Accepted: April 26, 2022
Published: May 06, 2022

Abstract

One of the biggest challenges currently presented to organisations worldwide is their ability to identify and sustainably manage greenhouse gas emissions. 'Carbon management', as it is referred to, is the process of understanding how and where an organisation's activities generate emissions, and extends beyond meeting regulation requirements to being strategically utilised within businesses for social licensing, financial planning and corporate decision-making. The aim of this research is to analyse, discuss and critically assess the fundamental carbon management efforts of the Adecco Group, one of the world's leading human resource (HR) service providers and temporary staffing firms. The significance of this study provides an interesting case of corporate climate policy, as while the direct environmental impact of HR firm's activities may be much less than businesses within other sectors (such as industrial/mining/minerals), their indirect exposure to climate-related risks through their clients is still notable. Being a desktop study, information and emissions statistics were obtained through the collection and comparison of publicly-available sustainability reports from other global leading HR service providers, including Randstad, Manpower Group and Recruit. Interpretation of results found that for FY2019, the Adecco Group's global activities accounted for 153,228 tonnes of CO_2 emissions (or equivalent); 37%

Scope 1, 21% Scope 2, and 45% Scope 3. The three main emission-generating activities included fuel combustion from vehicles (Scope 1), purchasing electricity for heating and cooling (Scope 2), and business travel (such as aviation) (Scope 3). Motivated by the goal of being an "environmental steward" and "safeguarding the planet for future generations", as of 2019 the firm has begun integrating emissions-reduction incentives to target these activities, such as down-sizing and decarbonising their vehicle fleet, purchasing low-carbon alternatives for electricity, promoting video conferencing to minimise business travel and purchasing offsets. A critical evaluation of the Adecco Group's environmental performance with its peers however find's its actions fall short of this claim – with larger groups such as Recruit taking initiative and already achieving carbon neutrality, and the Adecco Group ranking second worst in terms of emissions intensity. In conclusion, in order to be considered an environmental leader within its sector, the Adecco Group must not only modify its own practices, but also be vigilant in promoting environmental stewardship to its clients. To maximise their impact in a sustainable manner, it is recommended that a portion of the Adecco Group's future profits be delegated to accelerate their environmental initiatives on a global scale, as well as transitioning to 100% renewable electricity for heating and cooling their facilities as soon as possible.

Keywords
Carbon management; climate change; human resources; sustainable development; carbon dioxide; greenhouse gases; green human resource management

1. Introduction

Global climate change is one of the greatest and most complex challenges humanity has ever faced. The critical need to attenuate the output of greenhouse gas (GHG) emissions is recognised as the key response required to prevent irreversible harm to not only the environment, but also to human health and global economies [1, 2]. Despite atmospheric warming being first demonstrated in the mid-19th century, and climate change recognised as a threat since the mid-20th century, momentum from within the public and private sectors to tackle the climate crisis only recently increased following the release of the 2015 Paris Agreement [3, 4]. To ensure governments fulfil their pledge of 'pursuing efforts to limit global warming to 1.5℃', the Intergovernmental Panel on Climate Change (IPCC) has outlined the minimum actions required for a 50% chance of achieving this outcome by 2050 [5]:

- Cut global CO_2 emissions by 45% by 2030 [5];
- Bring global CO_2 emissions to net zero by 2050 [5];
- Significantly reduce emissions of other GHGs (such as methane, nitrous oxide, water vapour and chlorofluorocarbons) [5].

Outlined in the IPCC's Sixth Assessment Report, these outcomes can only be achieved if policymakers actively coordinate the environmental performance of the organisations within their countries, necessitating the practice of global 'corporate carbon management' [6].

From a business perspective, carbon management is concerned with identifying how and where internal activities generate GHGs' so that appropriate actions can be taken to minimise these emissions in an ongoing and financially sustainable way [7]. Alongside combatting climate change, there are several business drivers that make carbon management an important practice for companies to conduct; including mitigating future business risks, saving costs and meeting stakeholder demand (see Table 1) [7]. A recent study from Zakari et al. [8] found that there is a positive relationship between sustainable financial development and energy efficiency; indicating carbon management can be utilised as a strategic financial driver for business improvement [8].

Table 1 Business Drivers of Carbon Management.

Business Driver	Description	Ref.
Cost Saving	Carbon emissions are inherently related to a business's electricity consumption, raw materials usage and waste disposal; all of which have an operational cost. By minimising their carbon footprint, an organisation is likely to find opportunities to reduce their operational costs.	[7]
Reduce Risks	By managing their carbon footprint, an organisation could identify and mitigate enterprise risks before they affect the business; including compliance, regulatory, financial, operational or reputational risk.	[7]
Reputation	A company's corporate environmental reputation (CER) affects both the interest it obtains from investors, as well as the social license to operate (SLO) from the general public. A strong CER and public perception are strategically beneficial to a business's performance and engagement with its stakeholders.	[7, 9]
Competitive Advantage	In completing carbon management procedures, a company is investing money to understand all current or future risks it may face; including environmental accidents, fines/non-compliance penalties, regulatory requirements, incentives, future sectoral standards and/or legislation. Enhanced competitive advantage is seen through reputational benefits, public image, segmentation and long-term cost savings.	[7, 10]
Stakeholder Value	Governments, NGOs, investors, clients and employees all have certain environmental management expectations for companies they have an interest or stake in. A study conducted by Unilever found that more than 50% of consumers would prefer to buy from companies demonstrating environmental stewardship. Furthermore, investor initiatives such as Climate Action 100+ have been developed to encourage companies to improve their carbon management to maintain or attract investor support.	[7]

Innovation	Environmental challenges present immense untapped market opportunities, and disruptive intra-company innovation focussed on carbon management could optimise business operations, improve process efficiency and contribute to revenue.	[7, 11]
Employee Morale	Staff engagement is an important metric all business's wish to maximise, as it improves efficiency and employee retention. Studies have found that working for an environmentally-friendly company is more rewarding and important to employees than working for a financially successful one.	[7, 12]

Recognising the plethora of benefits for managing their environmental impact, pledges to reach 'net-zero' emissions have been appearing more frequently since the inception of the Paris Agreement in 2015, ranging from private investors' portfolio targets to government's economic development plans [5]. As of 2021, it is estimated that at least two-thirds of the global economy (including one fifth of the world's 2000 largest public companies) have committed to net-zero emissions; the majority also with interim targets, published carbon management plans and specific reporting mechanisms [5]. According to Zahoor et al. [13], this mass adoption of pledges has observed a strategic shift diverging away from carbon-intensive assets, and into mobilising capital for low carbon energy transitions chattel [13].

1.1 Motivation

Coupled with the challenge of physically abating carbon emissions at a global scale, is also the task of assigning responsibility and taking accountability for environmental harm. Nowadays, one of the major points of debate is not just the identification of major sources of emissions, but also where they originate from, which economic sectors are involved, and who to lay blame [14]. Unfortunately, while this method may be effective at motivating some larger corporate bodies to change, if this arduous task is followed too closely, it can potentially undermine the fact that environmental responsibility is a universal obligation that requires action from corporations of all sizes [14, 15]. No single country or corporation can confront the global challenge of growing CO_2 emissions, therefore a cumulative effort at a global level is obligatory in addressing environmental problems [16].

The purpose and core focus of this research paper is to perform a rigorous critique of the practical carbon management strategies currently deployed by leading human resource companies, and the methods being used to decarbonise their activities. Human resource firms provide an interesting case of carbon management, as while their operations typically only govern human sustainability, social and financial value for stakeholders at all levels can be generated by managing environmental opportunities and risks. Furthermore, as worldwide environmental policies begin to undergo significant paradigm shifts, HR companies must now demonstrate environmental stewardship and also reflect it within the companies they service; acting as a lynchpin of sustainability in an organisation [17, 18]. Whether the role reflects communicating employee concerns, reviewing working policies or adapting to environmental change, HR firms must now not only manage their own footprint, but also their client's.

The case study presented in this report focuses on how the Adecco Group, a leading multi-national HR services provider, is estimating its greenhouse gas emissions and taking the necessary steps to reduce its environmental impact. Additionally, the implications of how HR firms can decarbonise their operations extends beyond the scope of their specific industry, and can be applied to the whole of the white-collar sector.

1.2 Overview of the Firm

The Adecco Group, founded 1996 and based in Zürich, Switzerland, is a leading talent advisory conglomerate, workforce solutions company, and the second largest human resources provider in the world [19, 20]. A Fortune Global 500 company[1], The Adecco Group employ over 30,000 permanent staff in 60 different countries; servicing more than 100,000 clients across a broad range of sectors[2] through their 9 subsidiary brands[3] [21, 22]. The direct service lines that the Adecco Group provides include temporary staffing of associates, permanent placement, career transition assistance, outsourcing and consulting, and talent development (i.e., training, upskilling and reskilling) [22]. Despite having offices across the globe, 59% of the Adecco Group's business is conducted within Europe, with the remainder predominantly in Northern America (17%), Japan (8%) and Asia (2%) [22].

Financially, the Adecco Group generated €19.6 bn of revenue and turned over €3.8 bn in profit for FY2020; slightly down from €4.5 bn and €4.4 bn profits in FY2019 and FY2018 respectively [22, 23]. The majority (~84%) of the company's revenue is generated from placing associates with organisations on a temporary basis, currently estimating that 600,000 of its associates are on temporary assignment on any given day [22].

While The Adecco Group's day-to-day operations do not directly rely on or exploit the environment (such as a mining/minerals company or industrial processing organisation), the risks associated with climate change may have a significant effect on Adecco's clients, thus potentially affect Adecco's business model [24, 25]. To mitigate the future impacts of climate change, HR companies must be vigilant in promoting and maintaining environmental stewardship for their clients, as well as meeting the complex and evolving needs of stakeholders in a dynamic ecological environment [24, 26].

1.3 Pledges

The Adecco Group consider "environmental stewardship an integral part of their purpose as an organisation", and believe they can play a key role in facilitating the transition to a low-carbon, more circular economy through their core business [22, 27]. Conscious of the impact their operations can have on the environment and their exposure climate-related risks and opportunities, the Adecco Group have pledged to becoming a completely carbon-neutral organisation by 2030 [22]. To substantiate this, in 2020 the Adecco Group announced a carbon emissions reduction target of 50% by 2030, both in terms of absolute emissions as well as intensity [22]. The reduction target focusses on minimising Scope 1 and 2 emissions while offsetting the remainder, taking their 2018 year as the base-line emissions [22]. While ambitious, the reduction target was set in-line with the methodology

[1] Ranked #445 of 500 as of 2019.
[2] Including office, finance, legal, industrial and technical.
[3] Adecco, Adia, Badenoch and Clark, General Assembly, Hired, LLH, Modis, Pontoon and Spring Professional.

of the Science-Based Targets initiative (SBTi), a framework which outlines the decarbonisation required to limit global warming increase to 1.5℃ above pre-industrial levels [27]. The Adecco Group is one of 1753 companies worldwide currently committed to reducing emissions utilising the SBTi framework [28].

Alongside fighting climate change, the key motivation behind the Adecco Group's pledge for carbon neutrality is to mitigate corporate climate-related risks, and on a lesser extent, take advantage of future transitional opportunities. With legislation and environmental policies undergoing continual review, the Adecco Group predict the increased possibility of carbon pricing schemes being introduced; resulting in increased operational costs for their businesses [27]. By attenuating their carbon emissions, the Adecco Group recognise that now is the perfect time to mitigate climate-driven economic risk at an incremental pace [27]. Furthermore, adherence to stakeholder's demands mitigates the risks of investors withdrawing funds, employee dissatisfaction, losing clients or obtaining a poor reputation [27].

Acknowledging the significant transformation that many of their clients will need to undergo as the ecological environment changes, the Adecco Group have begun to deliver a wide variety of services intending to educate and upskill the labour market [22, 27]. The increased desire for companies to operate sustainably serves as a contemporary, untapped opportunity for the Adecco Group to support their clients while also expanding their products and services [27].

1.4 State of the Art

Due to the inherent nature of their work, human-resource and staffing firms can be broadly categorised as 'white-collar jobs' – grouped with other service industry professions such as law, accounting, consulting or finance firms. By default, these corporations do not directly rely-on or exploit the environment to generate revenue or growth, and as such possess a carbon footprint that dwarves in size in comparison to other industries. Due to this, many employees in this sector expect their employer to reduce emissions to net zero, and according to a 2021 study from Deloitte, just over a third of employers are perceived as already operating on a low emissions basis, if not already expected [29]. However, implementing efficient and targeted environmental regulations without imposing excessive constraints in a liberal economy is a huge challenge – and innovative solutions must be promoted at all levels of the corporate hierarchy [29].

At present, some of the most effective decarbonisation methods being implemented by service employers include:

- Subsidising the cost of public transport for employees to promote lower-emissions commute/business travel [29, 30],
- Sourcing electricity from lower-carbon alternatives to increase office energy efficiency (such as renewables) [29],
- Upgrading office infrastructure to more environmentally-friendly lighting, refrigeration and air-conditioning [29],
- Substituting canteen or vending-machine food with lower-emissions dishes (e.g., less meat, avoiding waste) [29, 30],
- Supporting greater use of videoconferencing technology to eliminate business travel and providing flexible working arrangements [29],

The Adecco Group, being a highly successful company within the service industry, would possess very little difficulty in achieving net-zero emissions should it be observed to implement these state-of-the-art decarbonisation methods. The research conducted following this introduction seeks to critically analyse and quantify the efforts made by this company, and assess whether it is doing enough to meet (or accelerate) net-zero goals considering its impact and standing.

2. Methodology

In order to critically evaluate the emissions reduction efforts from the Adecco Group and other leading human resource firms[4], a quantitative desktop study was performed which collated and analysed publicly available data from company reports. Firstly, emissions estimates were obtained by sourcing numerical values for Scope 1, 2 and 3 emissions from past annual, sustainability and CDP reports – documents which were accessed through the internet or through company archives. Additionally, information pertaining decarbonisation roadmaps, savings estimates and other actions was also sourced in these documents and used to qualitatively appraise the performance of the company, and how close it is to meeting its environmental pledges/targets.

The appraisal of the emissions reductions of the Adecco Group was assessed in two ways; through a historical analysis (to observe if the company has improved its sustainability over time), and also through a comparison of emissions intensity data with other leading HR firms. To ensure a comprehensive assessment of the Adecco Group's historical efforts was made, all publicly available data relevant to absolute emissions, emissions savings and revenue was sourced and analysed over time. Additionally, to accurately compare the environmental performance of the Adecco Group against other firms', the universal metric 'emissions intensity' was utilised, which is calculated from the following equation:

$$Intensity = \frac{\sum_i^n (tCO_2e)'_{i,t,y}}{\sum_i^n (\$Rev)'_{i,t,y}} \quad (1)$$

Emissions intensity, as it appears in equation 1, is a YoY measure of the absolute emissions of a company in tonnes CO_2 equivalent (generally the total of Scope 1 + Scope 2) divided by the revenue.

Once data had been collected, analysed and plotted, the results were discussed and conclusions and recommendations made. Being a case study based on publicly available information, no ethical considerations were applied.

3. Results

3.1 Emissions Estimates

Due to the nature of the Adecco Group's core business as a HR solutions provider, emissions produced from day-to-day operations are a result from consumption of services as opposed to the production of goods and/or raw materials [27]. Compared to other industry sectors such as manufacturing, construction or minerals processing, the emissions that the Adecco Group generate pale in comparison, even at a much smaller scale relative to the size of the organisation [32].

[4] Where the term 'leading HR firms' is based on 2019 revenue rankings by SIA [31].

In order to estimate their emissions data for a comparative analysis, the Adecco Group reports their sustainability in line with the Greenhouse Gas Protocol[5], and has followed this framework since 2012 [23]. Where data is unavailable, the Adecco Group utilises emissions models to extrapolate missing points; ensuring 100% of operations are accounted for [23]. In their most recent Annual Report [22], the Adecco Group disclosed that their absolute global emissions for 2019 was 153,228 tonnes; down 5.5% from 2017 (161,990 t) and 10% from 2018 (169,847 t). Yearly emissions data split by scope[6] is detailed in Table 2, and trends can be observed in Figure 1 below.

Table 2 The Adecco Group Yearly Emissions Data (2012 - Current) [22, 23].

Emissions (tCO_2e)	**2012**	**2016**	**2017**	**2018**	**2019**
Scope 1	51,562	51,647	59,815	64,614	55,716
Scope 2	52,372	29,680	33,045	31,663	30,944
Scope 3	45,194	64,704	69,130	74,020	66,568
Total Emissions	**149,128**	**146,031**	**161,990**	**169,847**	**153,228**

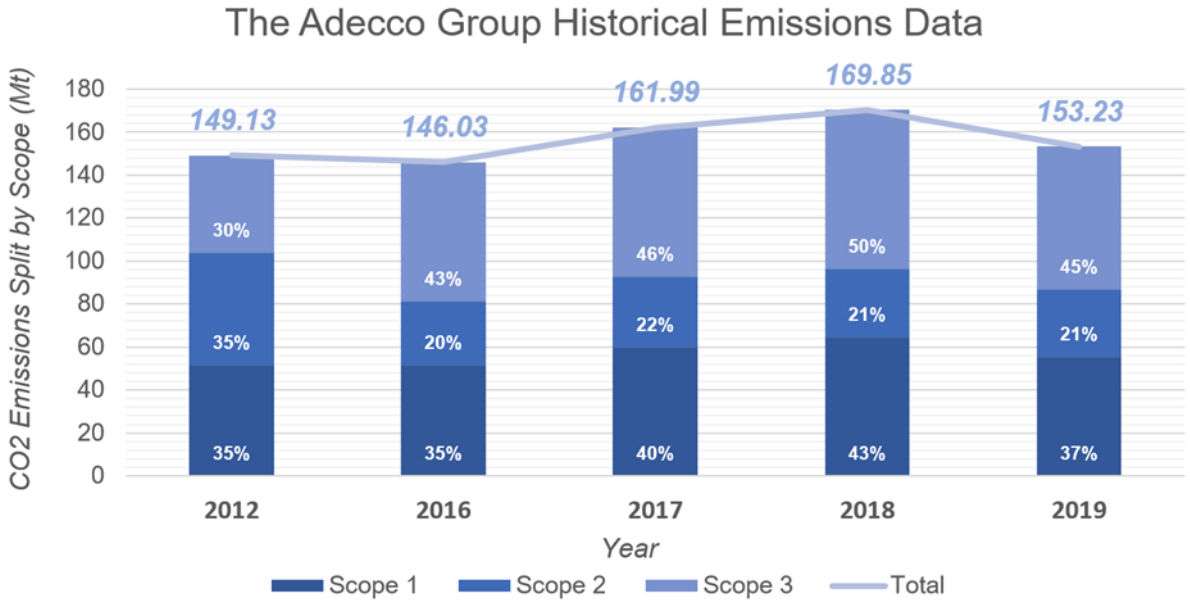

Figure 1 The Adecco Group Yearly Emissions by Scope (2012 – Current) [22, 23].

Subsequent to analysis, it can be observed that the majority of the Adecco Group's emissions tend to source from Scope 3 emissions; which include indirect emissions in the value chain from air travel, employee/associate vehicles, or from use of sold products and services [22]. A break-down of Adecco's emissions by source confirms this, where 48.62% of reportable emissions were a result of employee/associate personal transport, 30.96% from purchased electricity (conventional or renewable), 17.58% from business-related travel, and the remainder from in-office emissions (see Figure 2) [22]. From years 2016 – 2019, Scope 2 emissions have consistently accounted for a fifth of all absolute emissions ($\pm 2\%$), despite fluctuations in Scope 1 and 3 emissions or reductions overall.

[5] A comprehensive global standardised framework to measure and manage greenhouse gas emissions [23].
[6] Scope 1: direct emissions from owned or controlled sources (e.g. business cars, heating via combustion) [22].
Scope 2: indirect emissions from the generation of purchased energy (e.g. electricity, energy for cooling) [22].
Scope 3: other indirect emissions occurring in the value chain (e.g. air travel) [22].

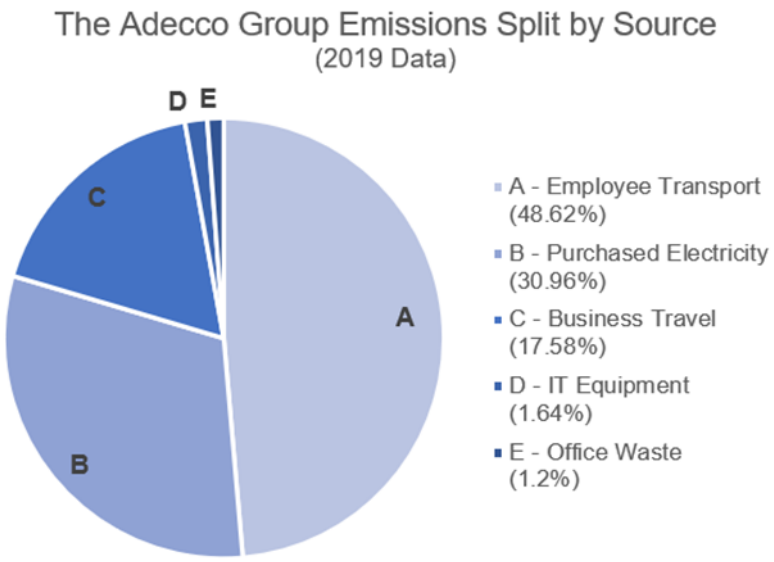

Figure 2 Adecco Group Emissions Split by Source [22].

In comparison to other global leading HR firms such as Randstad (Netherlands), ManpowerGroup (U.S.) and Recruit (Japan), the Adecco Group's environmental performance is significantly worse on an 'intensity' basis – i.e. higher tonnes CO_2 emissions per $mil revenue (see Table 3 and Figure 3 below) [22, 33-35]. While demonstrating a desire to improve its environmental footprint for business advantage and to meet stakeholder demands, at 2019 emission intensity estimates, the Adecco Group ranks second last amongst its biggest competitors (not including Scope 3 emissions).

Table 3 Emissions Data for Leading Global HR Providers [22, 33-35].

2019 Performance Indicator	Adecco Group (Switzerland)	Randstad (Netherlands)	ManpowerGroup (U.S.)	Recruit (Japan)
Revenue ($USbn)	27.57	27.93	20.86	21.82
Scope 1 Emissions (tCO_2)	55,716	68,947	21,499	12,607
Scope 2 Emissions (tCO_2)	30,944	24,141	23,955	29,546
Scope 3 Emissions (tCO_2)	66,568	13,196	41,853	892,104
Absolute CO2 Emissions (tCO_2)	153,228	106,284	87,307	934,257
Scope 1 and 2 Emissions Intensity (tCO_2/$mil)	**3.14**	**3.33**	**2.18**	**1.93**

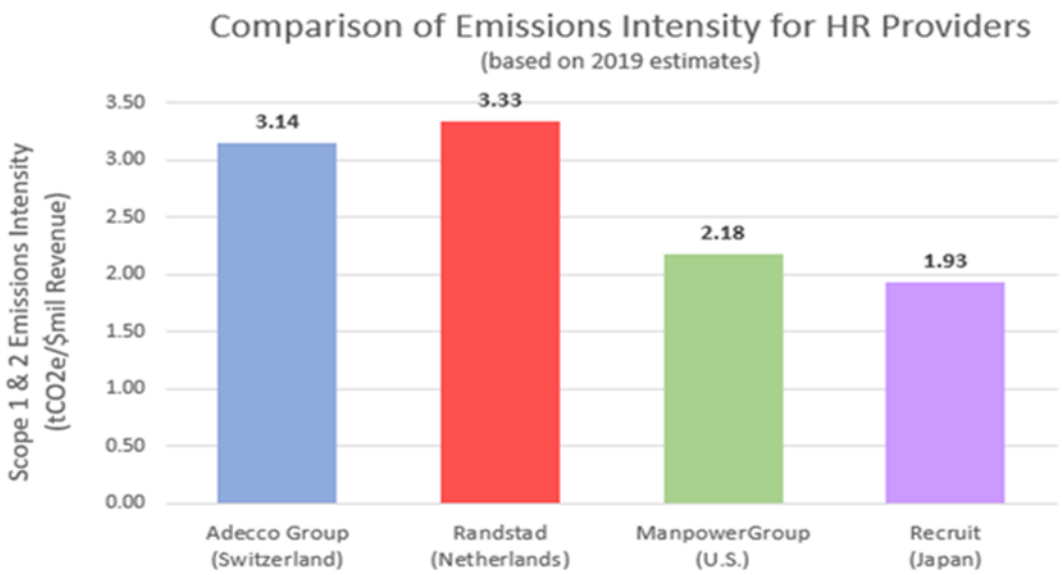

Figure 3 Comparison of Emissions Intensity for Top 4 Global HR Service Providers [22, 33-35].

3.2 Emissions Reductions

Upon a review of the Adecco Group's reported historical emissions estimates, it was observed that the organisation was able to lower their total absolute emissions by 16.62 $MtCO_2$ between 2018 and 2019; a reduction of approximately 10% in just one year [22]. With respect to their company-wide emissions target of achieving carbon-neutrality by 2030 (see Section 1.3 Pledges), this significantly exceeded their year-on-year commitment of 4% within the first year of implementation.

As shown in Table 2, while the Adecco Group's Scope 2 emissions remained relatively constant between 2018 and 2019 ($\pm$2.2%), the largest change was observed within Scope 1 and 3 emissions, decreasing by 13% (8,898 Mt) and 10% (7,452 Mt) respectively. According to the Adecco Group's 2020 Annual and CDP Reports, this was principally achieved by the organisation identifying and targeting three main areas which they believed would have the greatest emissions reduction potential; reducing business travel and using lower carbon alternatives for transport, decarbonizing their private car fleet and improving energy efficiency in their facilities [22, 27].

3.2.1 Reduced Business Travel and Decarbonized Car Fleet (Scope 1)

With the COVID-19 pandemic completely transforming how businesses once interacted and operated with their employees and clients, the Adecco Group have taken the opportunity to shift away from the conventional model of densely populated office-spaces, and begun to adopt a new *hybrid virtual model* [36]. By increasing the deployment of home-offices and encouraging online video conferences instead of meeting clients face-to-face, greenhouse gas emissions generated by work-related travel can be minimised with little effect on business outcomes [37]. Furthermore, unlike other initiatives, this transformation requires minimal expenditure to execute and can actually save money in the long term, with all short-term costs mostly related to employee training and setting up new software.

Since the inception of this initiative in 2018, the Adecco Group have reduced the company's private car fleet by 13%, and decreased business-related travel by 11% across all their global operations; attributed to an overall annual saving of 2136 tonnes of CO_2 emissions [22, 27]. Table 4 details specific travel-related emissions programs introduced across a range of their worldwide offices and estimated annual savings [27]. A comprehensive list of Scope 1 emissions by country can be seen in Table S1, Additional Material 1.

Table 4 The Adecco Group Scope 1 Emission-Savings Initiatives [27].

Country	Description	Estimated Annual CO_2 Savings (tCO_2e/yr)
France	New internal mobility procedures limit the amount of business travel (replaced with video conferencing and utilising trains instead of planes). Pilot-testing of new carpooling platform reduced car fleet by 15%.	50
United Kingdom	Significantly reduced car fleet by 70% and encouraged the use of conference calls to avoid travelling.	2000
India	Carpooling in taxi aggregators like "OLA" and "Uber" for business travel, leading to emissions savings of 25%.	50
Spain	Replacement of 79 gasoline cars to hybrid-electric vehicles. **Annual monetary savings of $18,295 USD.**	36
Total Estimated Scope 1 CO_2 Emissions Savings per Year (tCO_2e/yr)		**2136**

While specific costs associated with reducing/replacing the Adecco Group's car fleet were not disclosed (i.e., expenses, investments or loans), payback periods of approximately 1-3 years were estimated for each initiative [27].

3.2.2 Sustainable Office Spaces (Scope 2)

Another method employed by the Adecco Group to assist with mitigating their carbon emissions was through purchasing lower-carbon alternatives for electricity generation. Renewable and alternative electricity produced from wind, solar, biofuel and hydro sources is all sustainable energy which assists in reducing ecological footprint with minimal economic impact in the long-run [38]. Of the cumulative 72,833.11 MWh of energy consumed by the company's global offices in 2019, ~23% (16,493.42 MWh) was sourced from green electricity[7] in their European offices (see Table S2, Additional Material 2). The Adecco Group attributes 14% of their total emissions reductions between 2018 and 2019 to using lower-carbon alternatives for the heating and cooling their facilities, and based on pricing estimates by IRENA (2020) entails savings of up to $2,144,140 USD per annum when compared to fossil fuels[8] [39].

In unison with purchasing green energy, the Adecco Group also recognised opportunities to reduce operating costs by upgrading some of their current infrastructure to be more energy efficient.

[7] 'Zero-emission electricity' was purchased from a mix of low-carbon technology types, such as solar PV, concentrated solar power (CSP), wind, hydro, nuclear and biomass [27].

[8] Based on 2020 estimates by IRENA: $0.05/kWh for renewables and $0.18/kWh for fossil fuels [39].

Actions taken by various global branches, as well as the estimated annual Scope 2 emissions savings, are summarised in Table 5 below [27].

Table 5 The Adecco Group Scope 2 Emission-Savings Initiatives [27].

Country	Description	Estimated Annual CO_2 Savings (tCO_2e/yr)
India	The national call centre associated with the Indian branch moved from an old building to a newer, more energy efficient, climate neutral building. Offices are equipped with more natural lighting, requiring less energy delegated to powering artificial lights.	40
France	French branches launched a 'zero waste' guide through its digital workplaces.	0.5
Argentina and Poland	Introduction of technology that automatically shuts down power for certain utilities at night, as well as office equipment that is more energy-efficient (i.e. PCs, printers, lighting fixtures, tea room appliances).	10
Total Estimated Scope 2 CO_2 Emissions Savings per Year (tCO_2e/yr)		**50.5**

Similar to their Scope 1 emissions initiatives, payback periods between 1 and 3 years are estimated for each of the Scope 2 emissions-saving initiatives listed above [27].

3.2.3 Emissions Offset Certificates and Internal Carbon Fee

As a part of their 2018 emissions reduction plan to be a carbon-neutral organisation by 2030, the Adecco Group disclosed that when 4% year-on-year emissions reductions are not met, remaining emissions will be offset through the purchase of Renewable Energy Certificates (RECs), Energy Attribute Certificates (EACs) and/or investments into external emissions reductions projects [22, 27]. Due to their better-than-anticipated environmental performance since the inception of their emissions reduction plan, the Adecco Group has not yet been required to purchase any offsets to balance remaining emissions [22]. Should their performance drop in the future, estimated costs for European 'green certificates' vary between 0.3 – 1.0 €/MWh depending on the country of origin [40].

Another method discussed to incentivise the continuous improvement of the Adecco Group's carbon management is the introduction of an internal carbon fee across their branches [27]. Based on the amount of emissions an individual branch emits in the previous calendar year, costs for offsetting will be included into that branch's following yearly budget; prompting a 'feed-forward' change in behaviour to drive accountability at the source [27]. Similar strategies from companies such as Microsoft, Mitsubishi and Ørsted have been observed in the past, all demonstrating successful ways of reducing the company's Scope 2 and 3 emissions [41]. While not formally implemented yet, the Adecco Group estimate that this would likely become effective as of 2021/2022 [27].

4. Discussion

For their improved sustainability performance in 2019 and ability to demonstrate emissions reductions in several areas of their businesses while still facilitating company growth, the Adecco Group have been recognised and applauded by several organisations as an environmental leader (see Table 6) [22]. Upon further analysis of the historical emissions data and intra-sector performance in the results of this study however, it can be established that while the Adecco Group has begun to make critical decisions and changes geared towards reshaping their approach to carbon management, the organisation is not prioritising an accelerated transition towards net-zero operations despite being capable.

Table 6 The Adecco group 2020 environmental performance ratings [22].

The Adecco Group 2020 Ratings and Indices
CDP Climate Change: *B-*
EcoVadis: *Gold Rating (98th Percentile)*
FTSE4Good Index Series *(85th Percentile)*
MSCI ESG Rating: *AA*
Sustainalytics: *'Outperformer' (95th Percentile)*

4.1 Greenwashing

Subsequent to the independent research conducted within this case study, several indicators revealed that the Adecco Group is not prioritising environmental management as much as it may report. Formally known as 'greenwashing', this involves conveying a false impression or providing misleading information to deceive stakeholders into believing the company's products or services are (more) environmentally friendly than what they actually are [42]. This was particularly evident in the Adecco Group's 2020 Annual Report, as while claiming that "*environmental stewardship is an integral part of [their] purpose as an organisation*", and *"being committed to playing [their] part for the planet we live on"*, their CDP Climate Ranking only rose from C to B- after implementing their 'revised plan', and emissions mainly fell due to decreases in company operations [27, 43]. A review of historical emissions intensities supports this trend, where years of lower revenues also resulted in lower emissions (such as 2016) (see Figure 4) [22, 23, 44, 45].

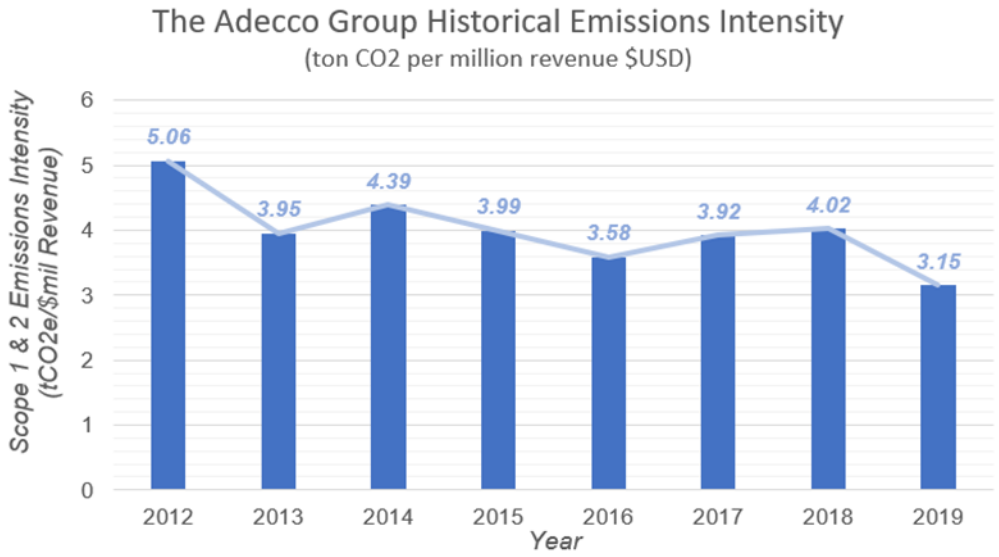

Figure 4 The Adecco Group Historical Emissions Intensities [22, 23, 44, 45].

Furthermore, while announcing that company-wide Scope 2 emissions are being decreased through the purchase of low-carbon electricity (see Section 3.2.2), only 6 of the 19 major countries/regions where the Adecco Group's offices are based are actually participating in sourcing greener alternatives [27]. Of the total 72,800 MWh of electricity purchased in 2019, these 6 countries[9] only account for ~23% (see Table S2, Additional Material 2). A clear discrepancy or lack of prioritisation to reduce Scope 2 emissions is evident, as the Adecco Group's largest electricity consumer, being their U.S. branches, account for 19% on their own (22,557 MWh), and are 100% powered through the combustion of fossil fuels [27]. Interestingly, the only countries replacing their energy source with renewables at this stage are European, which could indicate higher prices or difficulty of acquiring reliable lower-carbon alternatives in countries still powered by fossil fuels [46].

Claiming to report in-line with the Greenhouse Gas Protocol, when the Adecco Group finds missing data, it uses simple yet reliable models to extrapolate for 100% of its operations [22]. According to their 2020 CDP Report, for missing scope 1 emissions data, heating consumption is modelled via calculating heating degree days[10] (HDD) per country and extrapolated to full-time equivalent [27]. Similarly, missing car-fuel consumption is modelled with the average from previous years, and scaled for the size of the fleet in each country [27]. As various greenhouse emissions fall under the umbrella of 'Scope 1 emissions' (e.g. motor fuel, natural gas, oil, diesel), in order to obtain a comparable value for reporting (such as tCO_2e), 'emissions factors' from the *ecoinvent Database* are applied; the world's most consistent and transparent life-cycle inventory database [47]. To estimate the emissions of non-reporting countries within the Adecco Group, the total of all reporting countries is extrapolated and scaled-down [27].

[9] Norway, Sweden Switzerland, Netherlands, Belgium and France.

[10] A measurement designed to quantify the demand for energy needed to heat a building [48].

4.2 Strategic Planning

By definition, good carbon management practice entails prioritising greenhouse gas mitigation methods in an ongoing and financially sustainable way [7]. Despite some years of decreased revenue, the Adecco Group has consistently returned an annual gross profit of > €4 billion since 2015 (see Table 7) [22].

Table 7 The Adecco Group Gross Profits by Year [22].

Year	2012	2013	2014	2015	2016	2017	2018	2019
Gross Profit (€ million)	3,674	3,560	3,703	4,179	4,276	4,346	4,433	4,504

While not directly disclosing how profits are distributed or used in their reports, a lack of information pertaining the costing of current environmental activities indicates that minimal funds are being allocated towards promoting the carbon management initiatives. Literature acknowledges that positive financial development (as observed above) generally encourages the adoption of technological innovations and the promotion of energy efficiency to reduce emissions; however, it is unclear how the Adecco Group is re-allocating profits to improve the sustainability of the company [49, 50]. As a world-leading company that already emits minimal emissions due to the nature of their work, the Adecco Group possess the ability to be carbon-neutral in a very short time-frame at minimal expense. Despite meeting their emissions reduction targets (so far), a fraction of their annual profits could be delegated to transform their carbon management procedures to achieve carbon neutrality in just 3-5 years, instead of incremental 4% reductions over the course of a decade.

4.3 Comparison of Performance with Competitors

In comparison to their main competitors Randstad, ManpowerGroup and Recruit, the Adecco Group performs below average in terms of scope 1, 2 and 3 emissions (on an intensity-scale to account for differing sizes) (see Table 8) [22, 33-35].

Table 8 Comparison of Emissions Intensity for HR Service Providers [22, 33-35].

Intensity (tCO_2e/$US million)	Adecco Group	Randstad	ManpowerGroup	Recruit
Scope 1	2.02	2.47	1.03	0.58
Scope 2	1.12	0.86	1.15	1.35
Scope 3	2.41	0.47	2.01	40.88

Where: Green = **Best**, Yellow = **Good**, Orange = **Poor**, Red = **Worst.**

Recruit Holdings (Japan), while having the highest scope 2 and 3 emission intensities, have already achieved carbon neutrality in their scope 1 emissions as of FY2021, with as little as 0.58tCO_2e/$US mil revenue [35]. On a similar time-frame to the Adecco Group, their target is to achieve complete carbon neutrality in their business activities and entire value chain by 2030 (scope 2 and 3), with current initiatives including 100% renewable buildings, offsets through Renewable

Energy Attribute Certificates and Green Energy Certificates, advocating for remote work and reducing emissions from their magazine business [35].

Conversely, Randstad, while emitting the most direct emissions per unit revenue (scope 1), have the lowest scope 2 and 3 emissions footprints of the four companies compared, largely attributed to their strong engagement of integrating renewable energy and minimising their travel by air [33]. In their most recent annual report, 27% of Randstad's electrical usage is quoted to be sourced from low-carbon resources, and their CO_2 emissions from airplane travel have decreased from 15,383 to 3,277 tCO_2e between 2018 and 2020.

5. Conclusions and Limitations

As Governments and policymakers begin to expand climate-related legislature within the private sector, the practice of good carbon management in business is becoming increasingly important in order to minimise operating costs, reduce risks and maintain competitive advantage. In light of this, the Adecco Group, one of the world's largest HR service providers, has pledged to reach carbon-neutrality by the year 2030, substantiated with a further emissions reduction target of 50% by same year, both in terms of absolute emissions as well as intensity. While environmental governance may not be the key focus of the Adecco Group's corporate model, the analysis presented within this case study determined that the organisation has introduced several effective methods of carbon management which will help assist it with achieving its emissions reduction pledges. Between 2018 and 2019, the organisation was able to reduce their emissions by 16,619 tCO_2e, attributed to reductions in their car fleet (Scope 1), improving the energy efficiency of their buildings (Scope 2), reducing business travel (Scope 3) and purchasing low-carbon alternatives for heating/cooling (Scope 2). While a step in the right direction, an appraisal of the Adecco Group's carbon management found that the organisation is falling short to maximise their environmental governance in comparison to their peers. Global HR firms of similar, if not greater size, have already integrated rigorous approaches to carbon management, with some already achieving carbon-neutrality in some of their activities. With acknowledgement of the average profits generated YoY by the Adecco Group, it is recommended that instead of achieving carbon neutrality by 2030, the organisation delegate funds to fast-track this within the next 3-5 years. Through an investment of switching to 100% renewable electricity, installing energy efficient infrastructure in all their offices, promoting the digitisation of their activities (to reduce the need for business travel) and properly managing their office waste, the Adecco Group would reach their environmental goal of net zero emissions much sooner than 2030.

The greatest limitations hindering the depth of this case study was the availability of information presented within the Adecco Group's annual and sustainability reports. In comparison to competitors such as Recruit and Randstad, the level of detail was inadequate at times could be difficult to interpret due to lack of context. Furthermore, at the time of writing, the most current sustainability information released was for FY2019, despite 2020 data supposedly being available in Q2 2021. This made it impossible to gauge the true effect of the emissions initiatives over their 2-year lifetime.

Author Contributions

Hayden Cartmill – draft writing, editing, analysis. Genia Hill and Paul Dargusch editing, analysis, project management.

Competing Interests

The authors have declared that no competing interests exist.

Additional Materials

The following additional materials are uploaded at the page of this paper.

1. Table S1: Adecco Group Breakdown of Scope 1 Emissions by Country/Region [27].
2. Table S2: Adecco Group Breakdown of Scope 2 Emissions by Country/Region [27].

References

1. Second Nature. Carbon management & greenhouse gas mitigation, n.d. [Internet]. [cited date 2021 August 19]. Available from: https://secondnature.org/signatory-handbook/carbon-management-greenhouse-gas-mitigation/.
2. Haines A, Patz JA. Health effects of climate change. JAMA. 2004: 291: 99-103.
3. NASA. Climate Change: How Do We Know [Internet]? NASA; 2021 [cited date 2021 August 23]. Available from: https://climate.nasa.gov/evidence/.
4. Bergen M, Mountford H. 6 signs of progress since the adoption of the paris agreement [Internet]. World Resources Institute; 2020 [cited date 2021 August 23]. Available from: https://www.wri.org/insights/6-signs-progress-adoption-paris-agreement.
5. Black R, Cullen K, Fay B, Hale T, Lang J, Mahmood S, et al. Taking stock: A global assessment of net zero targets. The Energy & Climate Intelligence Unit and Oxford Net Zero; 2021.
6. IPCC. Climate change 2021: The physical science basis. Contribution of working group I to the Sixth assessment report of the intergovernmental panel on climate change. Cambridge University Press; 2021.
7. Zhou S. Carbon management concepts. Carbon Manag Sust Environ. 2020: 91-121.
8. Zakari A, Khan I, Tan D, Alvarado R, Dagar V. Energy efficiency and sustainable development goals (SDGs). Energy. 2022; 239: 122365.
9. Hussainey K, Salama A. The importance of corporate environmental reputation to investors. J Appl Account Res. 2010: 11: 229-241.
10. Miles MP, Covin JG. Environmental marketing: A source of reputational, competitive, and financial advantage. J Bus Ethics. 2000: 23: 299-311.
11. Wang WZ, Chen J. Achieving low-carbon economy by disruptive innovation in China. 4th ed. Bangkok: IEEE International Conference on Management of Innovation and Technology; 2008.
12. Walsh C, Sulkowski JA. A greener company makes for happier employees more so than does a more valuable one: A regression analysis of employee satisfaction, perceived environmental performance and firm financial value. Interdiscip Environ Rev. 2011: 11: 274-282.
13. Zahoor Z, Khan I, Hou F. Clean energy investment and financial development as determinants of environment and sustainable economic growth: Evidence from China. Environ Sci Pollut Res.

2022; 9: 16006-16016.
14. Bastianoni S, Pulselli FM, Tiezzi E. The problem of assigning responsibility for greenhouse gas emissions. Ecol Econ. 2004: 49: 253-257.
15. Hardin G. Extensions of "the tragedy of the commons". Science. 1998: 280: 682-683.
16. Khan and Hou F. The impact of socio-economic and environmental sustainability on CO_2 emissions: A novel framework for thirty IEA countries. Soc Indic Res. 2021: 155: 1045-1076.
17. Lucidchart. What does HR actually do? 11 key responsibilities [Internet]. Lucidchart, n.d. [cited date 2021 September 5]. Available from: https://www.lucidchart.com/blog/what-does-hr-do.
18. Jamieson H. HR in a heatwave: What role do we play in climate change [Internet]? HRZone, 2019 [cited date 2021 September 5]. Available from: https://www.hrzone.com/lead/change/hr-in-a-heatwave-what-role-do-we-play-in-climate-change.
19. The Adecco Group. About Us [Internet]. 2021. [cited date 2021 August 19]. Available from: https://www.adeccogroup.com/our-group/about-us/at-a-glance/.
20. Staffing Industry Analysists. Largest global staffing firms post $224 billion in revenue; market estimated at $498 billion [Internet]. 2020 [cited date 2021 August 19]. Available from: https://www2.staffingindustry.com/Editorial/Daily-News/Largest-global-staffing-firms-post-224-billion-in-revenue-market-estimated-at-498-billion-56020.
21. Fortune. Global 500 [Internet]. 2019 [cited date 2021 August 19]. Available from: https://fortune.com/global500/2019/adecco-group/.
22. The Adecco Group. Annual Report 2020. Zürich: The Adecco Group; 2020.
23. The Adecco Group. 2019 annual report. Zürich: The Adecco Group; 2019.
24. Wright C, Nyberg D. Why should HR care about climate change [Internet]? Changeboard; 2015 [cited date 2021 August 22]. Available from: https://www.changeboard.com/article-details/14327/why-should-hr-care-about-climate-change-/.
25. Uddin M. How green the human resource managers are?: Perspectives of HR managers from a climate change victim region. J Res Manage. 2019: 2: 31-40.
26. Hopkins C. Addressing climate change in the workplace [Internet]. HRM; 2020. [cited date 2021 August 22]. Available from: https://www.hrmonline.com.au/covid-19/climate-change-workplace/.
27. The Adecco Group. Adecco group AG - climate change 2020. Zürich: CDP; 2020.
28. Science Based Targets. Ambitious corporate climate action [Internet]. Science Based Targets; 2021 [cited date 2021 September 5]. Available from: https://sciencebasedtargets.org/.
29. Grampp M, Mandelz P, Kohler A. Decarbonising the workplace: Sustainable measures and incentives of employers. Zürich: Deloitte; 2021.
30. Opus Energy. Four ways to decarbonise your workplace [Internet]. Opus Energy; 2017 [cited date 2022 March 28]. Available from: https://www.opusenergy.com/brighter-business/decarbonising-your-workplace/.
31. Staffing Industry Analysts. World – Randstad and the Adecco group rank first and second on SIA's 2019 largest global staffing firms list [Internet]. SIA; 2019 [cited date 2022 March 27]. Available from: https://www2.staffingindustry.com/row/Editorial/Daily-News/World-Randstad-and-The-Adecco-Group-rank-first-and-second-on-SIA-s-2019-Largest-Global-Staffing-Firms-list-52039.
32. Ritchie H, Roser M. CO_2 and greenhouse gas emissions: Emissions by sector [Internet]. Our

World in Data; 2020 [cited date 2021 September 14]. Available from: https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions.
33. Randstad. Randstad annual report 2020. Atlanta: Randstad; 2020.
34. ManpowerGroup. ManpowerGroup ESG report 2020. Milwaukee: ManpowerGroup; 2020.
35. Recruit Holdings. Action against climate change [Internet]. Recruit Holdings; 2020. [cited date 2021 September 18]. Available from: https://recruit-holdings.com/sustainability/environment/climate-change/.
36. De Smet A, Alexander A, Mysore M. Reimagining the postpandemic workforce [Internet]. McKinsey Quarterly; 2020 [cited date 2021 September 19]. Available from: https://www.mckinsey.com/business-functions/organization/our-insights/reimagining-the-postpandemic-workforce.
37. Reynolds. The environmental impacts of remote work: Stats and benefits [Internet]. FlexJobs; 2021 [cited date 2021 September 19]. Available from: https://www.flexjobs.com/blog/post/telecommuting-sustainability-how-telecommuting-is-a-green-job/.
38. Bilal, Khan I, Tan D, Azam W, Hassan S. Alternate energy sources and environmental quality: The impact of inflation dynamics. Gondwana Res. 2022: 106: 51-63.
39. Broom. 5 charts show the rapid fall in costs of renewable energy [Internet]. Energy Post; 2020 [cited date 2021 September 21]. Available from: https://energypost.eu/5-charts-show-the-rapid-fall-in-costs-of-renewable-energy/.
40. De Jong C. Renewable energy certificates. Haarlem: KYOS Energy Consulting; 2020.
41. CDP Worldwide. Nearly half of world's biggest companies factoring cost of carbon into business plans [Internet]. Worldwide: CDP; 2021 [cited date 2021 September 21]. Available from: https://www.cdp.net/en/articles/media/nearly-half-of-worlds-biggest-companies-factoring-cost-of-carbon-into-business-plans.
42. Kenton W. Greenwashing [Internet]. Investopedia; 2021 [cited date 2021 September 22]. Available from: https://www.investopedia.com/terms/g/greenwashing.asp.
43. The Adecco Group. Our sustainability framework [Internet]. The Adecco Group; 2021 [cited date 2021 September 22]. Available from: https://www.adeccogroup.com/our-group/sustainability/framework/.
44. The Adecco Group. 2016 Annual Report. Zürich: The Adecco Group; 2016.
45. The Adecco Group. 2017 Annual Report. Zürich: The Adecco Group; 2017.
46. Inspire. Why don't we use more renewable energy [Internet]. Inspire; 2020 [cited date 2021 September 22]. Available from: https://www.inspirecleanenergy.com/blog/clean-energy-101/why-dont-we-use-more-renewable-energy.
47. ecoinvent. ecoinvent Database [Internet]. Ecoinvent; 2021. [cited date 2021 September 22]. Available from: https://ecoinvent.org/the-ecoinvent-database/.
48. Greenhouse Gas Protocol. About us [Internet]. Greenhouse Gas Protocol; 2021 [cited date 2021 September 14]. Available from: https://ghgprotocol.org/about-us.
49. Tamazian A, Chousa JP, Vadlamannati KC. Does higher economic and financial development lead to environmental degradation: Evidence from BRIC countries. Energy Policy. 2009: 37: 246-253.
50. Khan I, Hou F, Zakari A, Ifran M, Ahmad M. Links among energy intensity, non-linear financial development, and environmental sustainability: New evidence from Asia Pacific Economic

Cooperation countries. J Clean Prod. 2022; 330: 129747.