Original Research

The Tension Between Growth and Innovation Led Greenhouse Gas Reductions in the Information and Communication Technology and Media and Entertainment Sector: A Case Study of AT&T Inc.

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Abstract

With scientific consensus on climate change and growing public concern, firms are recognising the multiple risks associated with inaction on their Greenhouse Gas (GHG) emissions. The Information and Communications Technology (ICT) and Entertainment & Media (E&M) sectors provide essential communications services, that are foundational for much of the modern world's social and economic systems. The ICT sector has already demonstrated success in innovations that enable emissions reductions. At the same time, the ICT industry is demanding an increasing share of global energy resources. AT&T Inc. is a significant actor in the ICT and E&M sectors providing a valuable case study for carbon management approaches and outcomes. They have demonstrated a year-on-year reduction in their emissions largely driven through abatement strategies in their fleet, electricity generation, and consumer electricity use. While technological innovations have historically neutralised the increasing demand for energy, this trend is predicted to shift in the coming decade. Achieving AT&T's 2035 target of being carbon neutral will require significant efforts in transitioning to renewable energy sources, at the same time as developing technological solutions for the wider community.

1. Introduction

The UNFCCC COP26 in Glasgow had ambitions to secure a target for global Net Zero emissions by 2050 and firmer commitments on emission reductions by 2030. While the Parties fell short on this goal, it did secure commitments from 153 countries, representing 90% of global emissions and keeping a 1.5°C warming 'within reach' [1]. Countries among the world's largest emitters, such as the US, China, India, and the EU improved their reduction pledges including setting or reaffirming target years for Net Zero, intermediate targets and China's Peak Carbon target [1]. In addition COP26 saw a strong representation from the private sector, recognising the role the private sector plays in meeting global targets [2]. To meet global net-zero commitments, most companies will need to decarbonize their value chains by at least 90–95% by 2050 [3]. Currently around 30% of the world's largest publicly traded companies have made net zero pledges [4]. Globally both national and private sector targets need improvement to limit global warming to 1.5°C or less.

Given the variability in government responses across the globe and under growing pressure from stakeholders and consumers, corporations are adopting Carbon Management Strategies (CMS) to address and report on their Greenhouse Gas (GHG) emissions [5]. Carbon management is defined as a firm's corporate effort in addressing the impact the firm contributes to climate change, in its direct and indirect business activities [6]. A firm's approach to CMS is generally Market or Non-Market based [7]. Market-based CMS can be broadly classified as either CO_2 compensation, CO_2 reduction or CO_2 independence [8]. CO_2 compensation strategies focus on short-term carbon offsets, where firms rely on carbon permits or carbon offset units to counteract their emissions. CO_2 reduction strategies are when firms reduce their carbon emissions through improvements in product, production, or end user efficiency. CO_2 independence are long term strategies that transform operations towards independence from fossil resources [8]. Non-Market based strategies are actions taken that improve the value or overall performance in the nonmarket environment [7]. Motives for nonmarket carbon management include mitigating risk due to physical climate damage, regulatory costs, litigation, reputation, and capitalising on innovative technology or product opportunities [9-11]. Successfully navigating the climate change risks and opportunities through the CMS, will impact a firm's ability to be competitive in a carbon-constrained market.

Increasingly the global community expects firms to provide transparency and disclose their CMS and emission contributions. Studies on the relationship between corporate environmental disclosure and environmental performance have generated mixed results [12]. In general there is believed to be a positive relationship between firms that voluntarily disclose their carbon management performance and the impact that management strategy has on the emissions reductions [13]. Qian [13] reported empirical results that indicate a 1% improvement in carbon disclosure led to a reduction of 1.82 kg of total and 1.48 kg of Scope 1 carbon emissions per thousand dollars of sales revenue earned. Debate remains on whether the progress prompts the disclosure, or the disclosure provides an incentive to improve the progress, but this research indicates that voluntary disclosure will translate into actual emissions reductions.

The Information Communication and Technology (ICT) industry has a total life cycle footprint that is in a state of flux. A recent case study into how the ICT sector drives emissions in China found that electricity and basic material industries contributed 80% of the country's ICT carbon flow [14]. This is consistent with the findings from previous works that electricity consumption for running networks, data centres, electronic equipment (phones and computers), and product manufacturing is a significant component of ICT carbon footprint [15, 16]. And is further highlighted by a carbon footprint assessment of smartphones, finding communication network usage and raw materials combined accounted for around 90% of the GHG emissions [17]. ICT sector electricity consumption varies depending on the year being measured [16, 18], and is estimated to have stabilised below 10% of global energy consumption between 2014 and 2020 [19]. This stabilisation in energy use has been attributed to the increased processing power of equipment that followed Moore's law of doubling chip density every two years [20].

Tension has developed between the growing demand for data and the ability to offset emissions through innovations in technology. The improvements in processing power and the transition from traditional data centres to cloud or hyperscale data centres, have neutralised the impact of growth in end user consumption [21]. Despite recent signs of a slowing in Moore's law, energy efficiencies are expected through software, circuit design, and power management schemes [16]. Lang et al. investigated the potential for ICT growth to decouple from energy usage. They found two effects that would increase the energy demands and two that decrease the energy demands of the ICT. However, all effects are mutually interdependent, and as such, with improved efficiency comes increased growth [22]. Predictions that energy consumption will again rise with the introduction of 5G technology [21], the expansion of block chains like Bitcoin [19] and rising energy requirements in data centres [19, 23], suggest focused efforts to decarbonise the sector are needed.

This case study will look at the complexity of carbon management in the ICT and E&M sectors through an assessment of AT&T's (a telecommunication, technology, and media firm) CMS and emissions performance. It has been suggested that 70% of the world's population use ICT services [24] and it is considered essential for economic growth [25]. In 2015, Malmodin & Lunen [18] estimated that the global contribution of GHG emissions from the ICT sector at 1.4% and the E&M sector at 1.2% (approximately 730 mil and 640 mil $MTCO_2e$ respectively). Due to the global demand and necessity of the ICT sector and with current understanding of the GHG emissions from ICT and E&M this case study provides insight into how a significant corporation in both sectors addresses the corporate risks and opportunities of climate change.

This paper investigates how AT&T actively works towards declaring and reducing their GHG emissions while pivoting their organisation to capitalise on innovative technological products within the emerging carbon management market. They have set science-based targets for their own emissions and exert influence on their supply chain to set emissions reduction targets. In addition, AT&T engages in voluntary programs such as the Climate Disclosure Project (CDP) and participates in the sustainability partnerships, Climate Leadership Council (CLC) and Corporate Electric Vehicles Alliance (CEVA) among others. The ICT industry and the innovative products they offer provide an opportunity to enhance energy efficiency internally and in broader social and economic terms.

2. AT&T Inc.

2.1 Overview

AT&T is a multinational conglomerate holding company that provides telecommunication, media and technology services. The company is registered in Delaware USA, with its headquarters in Whitacre Tower in Dallas Texas, and has over 230,000 employees globally. AT&T is the world's largest telecommunications company [26] and in 2021 was ranked 11 in the Fortune 500 with revenues of US$171.760 billion [27].

The current structure of AT&T Inc. consists of three operating companies, called Communications, WarnerMedia, and Latin America. The Communications segment provides services such as mobile, broadband, and video to U.S. based consumers. This segment also provides services to over 3 million companies worldwide [28]. In 2016, AT&T acquired Time Warner which was rebranded as the WarnerMedia operating company of AT&T Inc. This merger resulted in the vast library of content from Time Warner along with existing content such as Home Box Office (HBO) becoming accessible to AT&T subscribers [26]. As of May 2021, an agreement was entered to combine WarnerMedia with a subsidiary of Discovery Inc. The final segment is AT&T Latin America, which provides mobile services and pay-TV to countries across South and Central America. The combined market value of AT&T operating companies is almost US$200 billion with assets valued at US$525 billion [27].

2.2 Pledges

AT&T's annual Environment and Social Governance (ESG) update, summarises the goals and progress of their CMS [29]. They have a multipronged approach to minimise the risk of climate change impacts on the business and find opportunities for new markets. Risks identified by AT&T include current and emerging regulations, reputation, market demands, acute and chronic infrastructure damage. The targets on addressing climate change (Table 1) and their associated actions are designed to manage the climate related risk and opportunities to the business. Actions that address both direct and indirect GHG emissions are identified across AT&T's network and operations, products and value chains and supply chains.

Table 1 AT&T Carbon Emissions Targets post 2020.

Scope	Business Process	Target year	Target
Scope 1 and Scope 2	Network and Operations	2030	Reduce our absolute Scope 1 and 2 GHG emissions14 63% (against 2015 baseline) – aligning with a 1.5°C pathway.
Scope 1 and Scope 2	Network and Operations	2035	Achieve carbon neutrality (net zero Scope 1 and 2 GHG emissions14) by 2035.

Scope 3	Products and Value Chain	2025*	By 2025, AT&T will enable carbon savings 10 times the footprint of our operations by enhancing the efficiency of our network and delivering sustainable customer solutions.
Scope 3	Products and Value Chain	2035	Deliver connectivity solutions that enable business customers to reduce a gigaton (1 billion metric tons) of GHG emissions by 2035.
Scope 3	Supply Chain	2024	Work to ensure 50% of our suppliers (covering purchased goods and services, capital goods and downstream leased assets as a portion of spend) set their own science-based Scope 1 and Scope 2 GHG targets.
N/A	Supply Chain	2025	Help establish clear, agreed-upon industry sustainability metrics to measure the environmental and social impact of technology supply chains. Promote the use of sustainability metrics in industry sourcing. Develop and follow an industry roadmap toward truly sustainable performance among our suppliers.
Scope 3	Products and Value Chain	2030	Reduce the amount of U.S. waste we send to landfill 30% (2019 base year) by 2030.

*In 2021 this was retired for the more ambitious Gigaton Goal.

Following the Paris Agreement efforts to design a roadmap for rapid decarbonisation [30] resulted in the development of science based targets. The Science Based Targets initiative (SBTi) is a partnership between CDP, the United Nations Global Compact, the World Resources Institute (WRI) and the World Wide Fund for Nature (WWF) [31]. The SBTi provides a standardised approach to the design of a firm's climate change targets, which ensure firms are meeting their obligations towards the Paris agreement of keeping global warming well below 2°C. Fundamentally science based targets need to be 1) possible within the specified time 2) able to demonstrate and test achievement on the target and 3) have clear rationale for the targeted level [32].

AT&T uses SBTi to establish emissions reduction targets in the short and long term. Targets set for 2020 (Table 2) were achieved (except for the waste target), suggesting that they met the first criteria of being possible within the allotted time frame. The targets have a clear method for measuring and demonstrating progress. And finally, the current targets set and approved by SBTi are in line with the 1.5^{o}C pathway. Under this criteria, AT&T set science-based targets and has demonstrated success in achieving their targets.

Table 2 AT&T Carbon Emissions Targets 2020 [29].

Scope	Business Process	Target year	Target
Scope 1	Network and Operations	2020	Reduce Scope 1 GHG emissions 20% using a 2008 baseline of 1,354,054 metric tons of CO_2e.
Scope 1	Network and Operations	2020	Reduce the GHG emissions of the U.S. fleet 30% using a 2008 baseline of 865,777 metric tons of CO_2e.
Scope 1 and Scope 2	Network and Operations	2020	Expand alternative energy use through onsite capacity and pursuit of off-site renewables.
N/A	Products and Value Chain	2020	Develop and deploy a robust methodology to understand the impact of the AT&T network's GHG emissions on society.

N/A	Products and Value Chain	2020	Demonstrate positive social and environmental impacts of AT&T-connected devices and solutions through internal and external collaboration.
Scope 3	Supply Chain	2020	Lead the supply chain to improve its social and environmental impacts by integrating sustainability performance metrics into sourcing decisions for 80% of our spend.
Scope 3	Products and Value Chain	2020	Achieve "zero waste" by 2020 at 100 AT&T facilities, including our Dallas headquarters. **

**Target was not achieved in the timeframe. Adjustments reflected in 2030 target.

The key mechanisms for addressing the 2035 target of Carbon Neutrality (or "net zero Scope 1 and Scope 2 emissions") are: 1) switching to renewable energy, 2) transitioning to sustainable fleet, 3) improving energy efficiency and 4) addressing sustainable production. These mechanisms fall within the CO_2 reduction and CO_2 independence of carbon management. AT&T has not adopted Carbon credits or offsets (CO_2 compensation), suggesting they are focused on long term solutions to reduce their absolute emissions [33]. While this target exceeds the IPCC's recommendation of reaching net zero by 2050 [34], the EU proposed that the ICT sector needs to become carbon neutral by 2030 [35], raising questions about whether the 2035 target is sufficient.

2.3 Emissions Estimates

AT&T voluntarily reports its organisation footprint through the CDP and uses Trucost for the assurance in accordance with AA1000AS v3 [36]. Using this publicly available information, Table 3 below details the GHG emissions for AT&T over the years 2016 to 2020 across Scope 1, 2 and 3 including business activity contributions. In 2020, the global carbon footprint for AT&T was 8,614,713 MT CO_2e. The reported Scope 1 and 2 emissions totalled 5,788,258 MT CO_2e, with 1,044,751 MT CO_2e being from Scope 1 alone. It is clear to see that electrical power is the major contributor to emissions, which is in line with recent case studies [14, 15]. While the Scope 3 emissions for 2020 dropped by more than 1 million MT CO_2e, this is mostly attributed to changes in business travel and end user electricity usage because of COVID. Reporting AT&T's emissions in this fashion provides transparency and accountability.

Table 3 GHG emission reported by AT&T and assured by Trucost for 2016-2020.

SCOPE	SOURCE	UNIT	QUANTITY 2020[1]	QUANTITY 2019[2]	QUANTITY 2018[3]	QUANTITY 2017[4]	QUANTITY 2016[5]
GHG Scope 1	Natural gas	Metric tons CO2e	77,328	83,671	82,568	65,000	145,504
	Propane/LPG		5,470	5,553	6,193	6,052	5,734
	#1 Fuel oil		1,310				
	#2 Fuel oil		2,543	1,562	2,324	2,420	2,361
	Diesel		5,731	7,911	6,076	4,705	3,348
	Gasoline		322	245	4		39
	Stationary generator		114,533	103,544	95,199	103,844	89,506
	Portable generator		7,039	6,038	5,714	5,974	
	Flight operations		5,613	9,042	12,155	12,028	13,506
	Ground fleet		546,294	613,146	654,438	709,902	736,669
	Refrigerants		278,567	160,244	155,024	138,767	138,739
GHG Scope 2	Electrical Power-Location based	Metric tons CO2e	5,624,042	5,998,535	6,507,744	6,810,460	7,725,696
	Electrical Power-Market based		4,732,286	5,517,501	6,575,257	6,612,247	7,527,591
	Steam		8,946	14,076	18,359	14,724	11,569
	Chilled Water		2,275	2,511			
GHG Scope 3	Waste Generated in Operations	Metric tons CO2e	65,646	34,267	25,920		
	Business Travel-Air Travel		27,679	132,962	75,667	79,766	87,423

Business Travel-Car Travel	9,331	21,580	16,876	13,801	14,102
Business Travel-Rail Travel	33	128			
Customer Product Electricity Use	2,723,766	3,705,329	4,216,923	3,525,402	3,296,540

Trucost Assurance statement: AA1000 FY2020; Trucost Assurance statement: AA1000 FY2019; Trucost Assurance statement: AA1000 FY2018; Trucost Assurance statement: AA1000 FY2017; Trucost Assurance statement: AA1000 FY2016.

2.4 Emissions Reductions

In 2020, AT&T's Scope 1 emissions represented 12% of their total reported emissions, with 1,044,751 MT CO_2e. While this is an increase of 5% (118,323 MT CO_2e) from 2019, the increase has been attributed to an accounting decision to report all refrigeration as in-scope from 2020. Despite this accounting increase, AT&T exceeded their 2020 targets reducing the Scope 1 emissions by 22.8% and U.S. based fleet emissions by 38.4% compared to 2008 baseline. The Scope 1 reduction totalled 309,303 MT CO_2e with the reductions in U.S. Fleet contributing 332,658 MT CO_2e GHG emissions savings [37].

Emissions reductions in the US fleet were achieved through two mechanisms. The first is by reducing the size of their domestic fleet in excess of 8,000 vehicles. The second was by increasing the quantity of new hybrid vehicles to 81% of new purchases. Similar results were reported when Walmart improved their fleet efficiency by 25% within one year, saving $75mil and 400,000 T CO_2e [38]. Moving forward, AT&T are exploring electrification of their fleet and is a flagship member of CEVA [39].

Scope 2 emissions are the greatest GHG generators for AT&T, accounting for 81.95% of total operational emissions [37]. ICT organisations require electricity to maintain functionality in their servers, storage, infrastructure and networking equipment [23]. AT&T reports both location based and market based Scope 2 emissions, the latter accounts for renewable energy contributions. Under the 2020 target to expand alternative energy use AT&T committed to purchase 1.5GW of renewable energy capacity in the U.S. domestic market, which they do primarily through Power Purchase Agreements. Their total estimated domestic renewable energy production for 2020 exceeded 2.3GWh. This was achieved through a combination of off-site and on-site (4.7mil kWh) electricity generation, across solar, wind and hydropower [40].

Within the reported Scope 3 emissions, the greatest contribution comes from customer product electricity use, which accounts for a quarter of AT&T's total GHG emissions. The 10x target was designed to enable CO_2e abatement in their customer base equalling 10x AT&T's operational footprint. The emissions savings are measured through AT&T's 10x Methodology with the simplified equation detailed in Figure 1 below. In 2020, savings estimates of 31.3 mil MT CO_2e were reported from this initiative. This achieved 55% of the 2025 target within the first year. A more ambitious

target has now been set, whereby AT&T will deliver connectivity solutions that enable one GT CO_2e abatement in their customer base by 2035. On this target, they reached 72.4mil MT CO_2e in 2020 equating to 7% of the 2035 target.
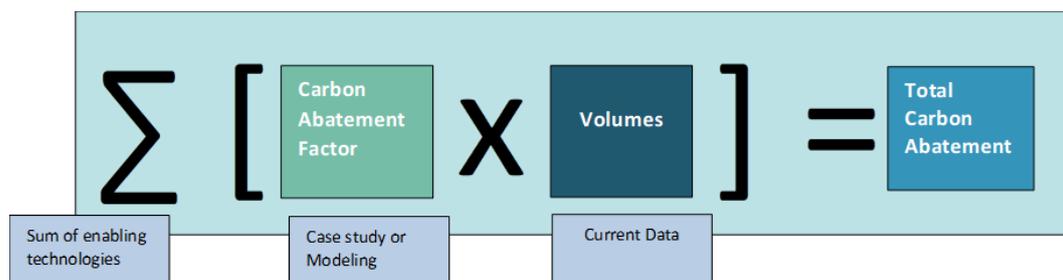

Figure 1 AT&T 10x Methodology [41].

AT&T's primary approach to emissions reductions is through abatement strategies, which fall within the CO_2 reduction category of CMS. The actions with the greatest impact on Scope 1 and Scope 2 emissions are transitioning the U.S. fleet and expanding the clean energy portfolio. Both employ the strategy of investing in low carbon portfolios [10]. Other methods employed include investing in basic technological changes (from low to high impact), such as energy efficient modifications in buildings and actively developing new (and low-carbon) products to satisfy emerging markets [10].

Targets on Scope 3 emissions address waste, up and down stream supply chains, as well as end user emissions. Targets that address upstream and downstream emissions tend to combine emissions reduction strategies with new and emerging market opportunities. One clear example of this is the Connected Climate Initiative (CCI). The goal of the CCI is to enable companies to reduce GHG emissions by 1 GT tons by 2035, through technology and networks developed by AT&T.

The mechanism of technological solutions that enable end user emissions reductions is strongly emphasised in AT&T's strategy. In part, this is driven by a sector wide movement to develop more efficient (low carbon) products, which has reportedly decoupled the energy demands for the ICT sector from the expansion in the user base [23]. AT&T has strategically invested in innovations such as the Climate Change Analysis Tool (CCAT) and 10X Methodology and has a growing portfolio of Internet of Things (IoT) products, that provide a technological solution for the general market [42]. Despite the variety of approaches, AT&T fundamentally uses abatement strategies internally, through supply chains and in the broader market to impact on GHG emissions.

3. Results

US GHG regulations and reporting are managed through the Environmental Protection Agency (EPA). Legislation exists for the emissions standards for road vehicles and permits for large stationary sources of GHG. Reporting in the US is mandated through the EPA's 40 CFR Part 98, also known as the Greenhouse Gas Reporting Program (GHGRP). The intention of this program is to provide an understanding of the sources of GHG and guide the development of policies or programs to reduce GHG. The program mandates reporting for facilities that emit greater than 25,000 $MTCO_2e$ per year. Since 2015, AT&T has not reported GHG emissions for any of their facilities through this government program. All targets set and emissions reported by AT&T are currently voluntary.

Since reporting their efforts through the CDP, AT&T's climate change score has improved from a C in 2011 to an A- for the years 2016-2020. This transition shifts AT&T from a company with awareness (C) to one of leadership (A-) on carbon management [43]. According to AT&T's ESG report and verified through CDP, 2020 targets were met or exceeded and as seen in Figure 2 there is a downward trend in the absolute amount of CO_2e reported each year.
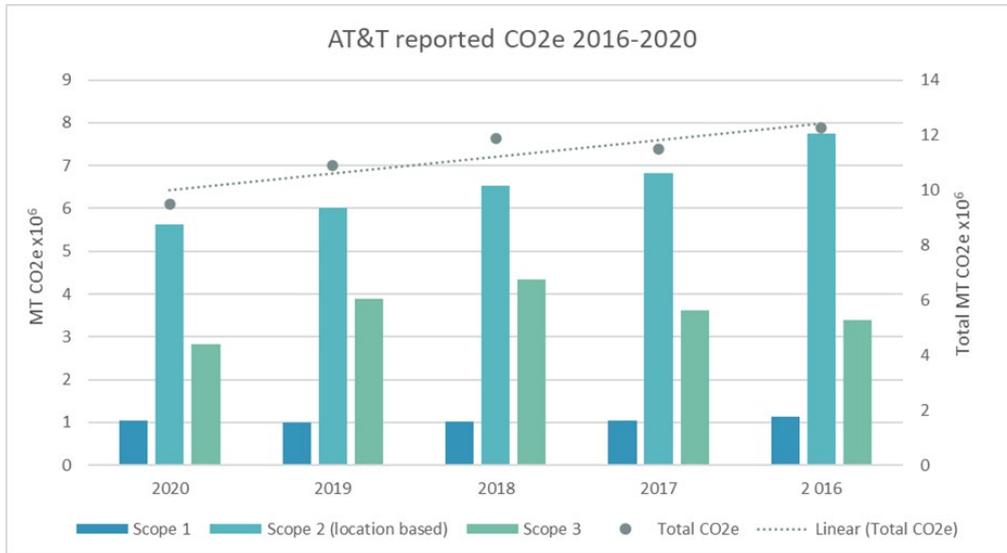

Figure 2 Breakdown of AT&T's CDP reported Scope 1-3 emissions for 2016-2020.

To contextualise the footprint of AT&T, a sector comparison of the 2019 revenue and reported GHG emissions is presented in Figure 3. Telstra was included for an Australian comparison and Walt Disney Company for context on the WarnerMedia contributions to AT&T Inc. All six organisations report their GHG emissions through the CDP, with financials sourced from publicly available annual reports [44-49].
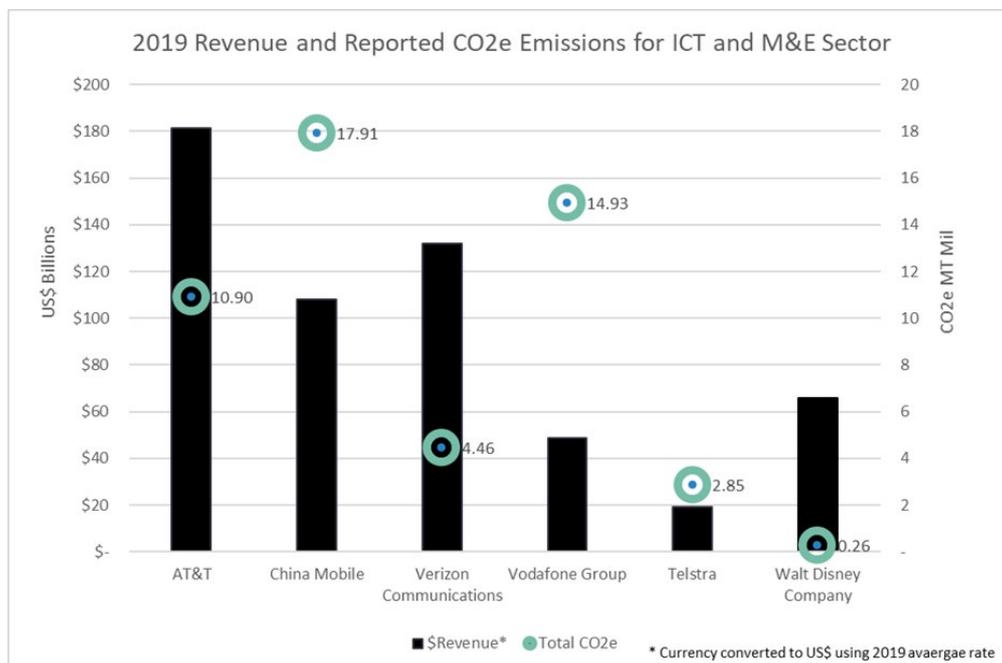

Figure 3 Comparison of emissions and revenue for ICT and M&E firms in 2019.

Similarities and differences are noted in the carbon management strategies of the comparison firms. IoT and products that enable end user efficiencies feature in the carbon management strategy of each organisation. While Telstra purchases carbon offsets to achieve neutrality in 2020 and Verizon Communications reports on tree planting in their ESG, the bulk of reductions across all companies occurs through green energy transition, energy efficiencies in infrastructure, and end-user abatement through innovations. AT&T's target of carbon neutrality by 2035 is one of the more ambitious targets amongst the comparison group.

A detailed analysis of each organisation's footprint is outside the scope of this case study, but some obvious discrepancies have been noted. Figure 4 presents the emissions from each firm in Scope 1, Scope 2 and Scope 3 for comparison across the group. China Mobile Scope 3 emissions include commuter and business travel only, with no estimates for end user electricity use, which may account for the discrepancy when compared to the other examples. A recent case study of the carbon impacts of the ICT sector in China found that digital device exports and digital service imports contribute significantly to the growth of digital related emissions [50]. Suggesting that a full account of China Mobile's Scope 3 emissions would be considerable. Verizon Communications Scope 3 is exclusively corporate business travel. Walt Disney Company did not report any Scope 3 emission estimates. Vodafone includes purchased goods and services in their Scope 3 emissions, which accounts for half of their Scope 3 emissions and is not itemised in the CDP reports of the other firms. Using this brief comparison, AT&T reporting is one of the more comprehensive in the sector. Their GHG emissions are average for the sector, and when comparing the size of the organisation, they could be considered well performing.
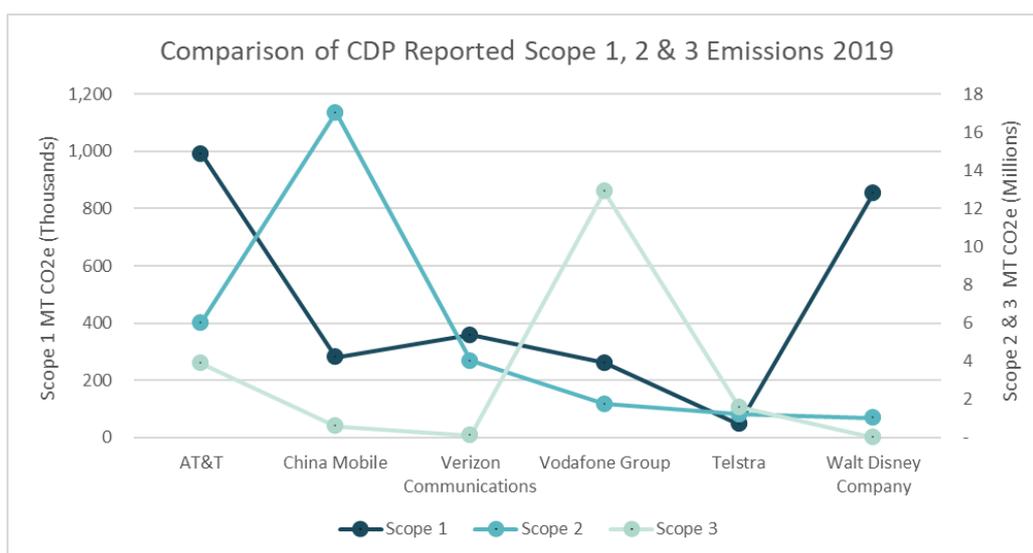

Figure 4 Comparison of Scope 1, Scope 2 and Scope 3 emissions for ICT and M&E firms in 2019.

4. Discussion

Electricity consumption is the largest contributor to GHG emission for organisations in the ICT and E&M sectors. With the exception of Vodafone, the data from the comparison companies aligns with previous findings on this matter [15]. The combined Scope 2 emissions for the comparison group is ~31mil MT CO_2e, representing an average 59% of the emission in 2019. And the estimated

electricity from end users accounted for a quarter of AT&T's emissions. Making energy efficiencies and decarbonising electricity, two mechanisms to significantly reduce the ICT carbon footprint. It is thought that four factors are at play between growth in ICT and energy usage. These factors are that the ICT sector has become more efficient; ICT delivers economy wide efficiencies; and the ICT footprint accounts for a significant proportion of global emissions and is increasing with growth in the economy [51]. Considering projections for sectoral and end user energy demands for data management (data centres and transmission), there continues to be debate on whether innovations will decouple growth from electricity usage [16, 19, 21-23, 52, 53]. There is growing concern that the rate of energy efficiencies will not keep pace with the rate of growth [53].

AT&T's total CO_2e emissions in 2020 are 2,764,268 MT less when compared to 2016. This represents a gradual decrease in emissions. Maintaining this rate suggests the 2035 target of carbon neutrality is achievable. However the reductions observed were achieved through programs that could be considered 'low hanging fruit' [38] and by capitalising on energy efficiencies from sector wide innovations [16, 19, 23]. Further reductions in Scope 2 emissions may be stunted due to limitations in energy storage capacity and existing power stations end of life timeframes. AT&T does not currently participate in offsetting programs in their carbon management strategy, but they may need to adopt this method to reach their 2035 target. Significant opportunity exists for further reductions in Scope 3 emissions through innovations that enable consumer behavioural change [54]. AT&T has successfully achieved their 2020 targets, but challenges exist in meeting their future targets.

There are various motivations for setting targets, but firms will implement environmental policies when there is an economic or regulatory incentive to do so [55, 56]. Leading sceptics to suggest that some carbon management policies are a form of greenwashing [55]. There are currently no regulatory incentives for AT&T to address its carbon footprint. Recognising the global transition to a net zero economy, building resilience into the business and addressing stakeholder concerns are three motivators for AT&T's carbon management. These motivators (among others) contribute a combination of internal and external pressures [57], that suggests AT&T will have a more transparent and active engagement with regards to carbon related activities.

At the UNFCCC COP26 Glasgow meeting, countries were asked to revise their Nationally Determined Contributions (NDCs) to align with the Paris Agreement of limiting global average temperature increase to 1.5°C [58]. The United States of America submitted their new NDCs on re-joining the Paris Agreement in April 2021. In these NDCs, the US committed "to setting an economy-wide target of reducing its net greenhouse gas emissions by 50-52 percent below 2005 levels in 2030" [59], along with their reaffirmed commitment to meet net zero emissions by 2050 [60, 61]. Of particular interest is the electricity sector goal to "reach 100% carbon pollution free electricity by 2035" [59]. With the majority of AT&T's GHG emissions generated through electricity usage, and the uncertainty of future electricity demands to maintain services, this NDC sector goal may influence AT&T's energy strategy. However, overall AT&T's current ESG (climate and energy strategy) aligns with or exceeds the current US NDC pledges.

5. Conclusions

This case study explored the complexity of addressing climate change contributions in the ICT and M&E sector through an investigation of AT&T CMS. An examination of the literature established

that while the consumer base for ICT products and services has expanded over the past decade, technological innovations have stabilised the energy demand. Current predictions suggest that the period of decoupling may be coming to an end. This presents a tension between managing GHG emissions while enabling access to these essential communication services for a growing consumer base. Recognising uncertainty in the impact innovation will continue to have on stabilising GHG emissions over the coming decade. This tension presents a challenge on the need for direct action to address GHG emissions in the sector.

While AT&T has a strong emphasis on leveraging technological solutions to address both internal and general consumer emissions, they also take actions to address GHG emissions directly in their business. A comparison of AT&T with firms in the ICT and M&E sectors indicates that AT&T is making a genuine effort to both report and reduce its GHG emissions. The CDP report does not break the emissions down into the ICT and E&M divisions of AT&T limiting the analysis on each sector's contribution to AT&T emissions. The ICT and E&M sector will need to take advantage of continued innovations in technology to avoid emissions growth, while also addressing emissions generation through their supply chain, production, network, and end users. A strategy that AT&T has commenced, but that may become increasingly difficult to achieve.

Author Contributions

Keleher conducted the research and wrote the manuscript. Dargusch and Hill edited and improved the manuscript.

Competing Interests

The authors have declared that no competing interests exist.

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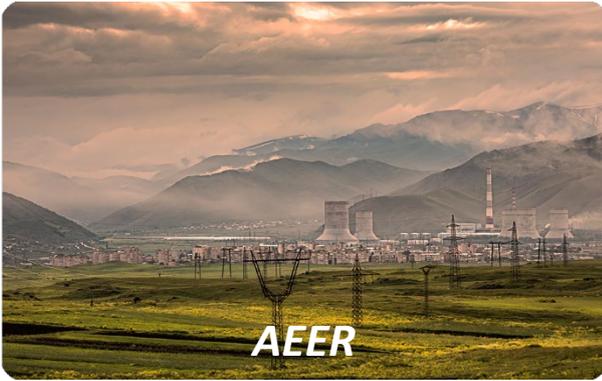
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