



UvA-DARE (Digital Academic Repository)

Conflicting commitments? Examining pension funds, fossil fuel assets and climate policy in the organisation for economic co-operation and development (OECD)

Rempel, A.; Gupta, J.

DOI

[10.1016/j.erss.2020.101736](https://doi.org/10.1016/j.erss.2020.101736)

Publication date

2020

Document Version

Final published version

Published in

Energy Research & Social Science

License

CC BY

[Link to publication](#)

Citation for published version (APA):

Rempel, A., & Gupta, J. (2020). Conflicting commitments? Examining pension funds, fossil fuel assets and climate policy in the organisation for economic co-operation and development (OECD). *Energy Research & Social Science*, 69, Article 101736. <https://doi.org/10.1016/j.erss.2020.101736>

General rights

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: <https://uba.uva.nl/en/contact>, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.



Original research article

Conflicting commitments? Examining pension funds, fossil fuel assets and climate policy in the organisation for economic co-operation and development (OECD)

Arthur Rempel^{a,*}, Joyeeta Gupta^b^a Department of Governance and International Development at the University of Amsterdam, The Netherlands^b Environment and Development in the Global South at the Amsterdam Institute of Social Science Research at the University of Amsterdam and at IHE Institute for Water Education in Delft. She is co-chair of UN Environment's Global Environmental Outlook and co-chair of the Earth Commission, The Netherlands

ARTICLE INFO

Keywords:

Fossil fuels
Divestment
Pension funds
Climate change
Climate policy
Stranded assets

ABSTRACT

The 2015 Paris Agreement on Climate Change implicitly calls for leaving 80% of coal, 50% of gas and 33% of oil reserves underground. This paper studies the scarcely addressed relationship between investors like pension funds and climate policy implementation by addressing the question: what is the extent of pension fund investments in the fossil fuel sector, what is the range of actions that pension funds take to address environmental issues, and what does this suggest about pension fund commitments to ambitious climate targets through leaving fossil fuels underground? A small sample of pension funds alone manages at least €79 billion in liquid fossil fuel assets, suggesting that OECD pension funds may jointly manage between €238–828 billion. Sustainability reports reveal that pension funds engage in five actions to implement climate policies: 1) divestment; 2) direct engagement; 3) carbon footprint calculations; 4) investing in 'green' alternatives; and 5) engaging in climate-oriented coalitions. However, their use of these actions is so far ineffective and counterproductive to taming the fossil fuel sector. Pension funds are not fully committed to leaving fossil fuels underground, which de facto renders them not yet committed to meeting ambitious climate targets. Forthcoming policies must target investors like pension funds to improve the prospects of meeting such targets and protect vulnerable countries from inheriting the risks of stranded assets.

1. Introduction

1.1. Climate targets & fossil fuels

Since 1990, climate negotiations have led to global engagement and awareness of the climate change problem. However, measures being taken within the climate change regime are largely symptomatic, sectoral, and do not address its underlying drivers [1]. In 2015, the Paris Agreement on Climate Change (PA 2015) [2] adopted three objectives, two of which are focal points of this research¹ – the first to ensure that average global temperatures don't exceed 1.5–2 °C above pre-industrial levels, and the third to make “finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development” [2: Art. 2.1c]. This third objective is a nod to the larger structural problems in the global arena.

The PA 2015 does not explicitly target fossil fuels (various

permutations of the terms 'fossil fuel', 'coal', 'oil', and 'natural gas' are not referenced in the PA 2015 document [2]), perhaps because fossil fuels are a politically sensitive 'hot potato' that even investors, stock brokers and academics hesitate to publicly discuss [3]. However, there is a growing realisation that fossil fuels and accompanying infrastructure are becoming obsolete [4,5] and that the vast majority of fossil fuels (80% coal, 50% gas, 33% oil) must be left underground to improve prospects of limiting average global warming to at least 2 °C above pre-industrial levels [6]. Progress on this front has been questionable given that as of 2019, we are globally set to “produce about 50% more fossil fuels by 2030 than would be consistent with a 2 °C pathway and 120% more than would be consistent with a 1.5 °C pathway” [7: p.4]. Some have speculated over the possibility of reducing emissions through Carbon Capture & Storage (CCS) – which would negate the extent to which fossil fuel production ought to be reduced [8] – but ample research shows that CCS technologies are

* Corresponding author at: Burgemeester Hoggguerstraat 957, 1064EE Amsterdam, The Netherlands.

E-mail address: a.m.rempel@uva.nl (A. Rempel).

¹ The PA 2015 second objective (Article 2.1b) is to increase “the ability to adapt to the adverse impacts of climate change and foster climate resilience”, but is not central to this study.

underdeveloped, uneconomical and socially and environmentally problematic [9,10]. As such, more aggressive and immediate action is needed by public and private actors alike to fetter fossil fuel markets and address the climate emergency by Leaving Fossil Fuels Underground (LFFU).

LFFU implies a gargantuan loss of revenue, potentially ranging from €10.7 (\$12) trillion [11] to €165 (\$185) trillion [12] depending on the computational technique. Stranding these fossil resources leaves their accompanying assets stranded by e.g. prematurely decommissioning pipelines and refineries before the end of their life expectancy [13]. This may tremendously devalue the global fossil fuel enterprise and subsequently burst the 'carbon bubble' [14]. The European Investment Bank has warned of the calamitous risks borne by financial actors if they are left with stranded assets on their balance sheets when this devaluation occurs [15].

A larger underlying question is who will bear the risks of the carbon bubble [16–19], particularly from the perspective of major financial actors [20]. While scholarly literature focuses extensively on energy producers, consumers, and infrastructures, comparatively little literature explores the role of influential investors of the fossil fuel sector, like pension funds. The world's top 20 pension funds alone are worth roughly €6.2 (\$7) trillion [21], equivalent to roughly 9% of global GDP in 2018 [22]. Pension fund ties to the fossil sector have begun to come under scrutiny from both academic [23,24] and non-state actors [25], but this research is still in its nascent stages.

1.2. Divestment vs. Engagement

As shareholders of publicly traded fossil fuel firms, pension funds face the predicament of how to uphold their fiduciary duty (see Section 3.1) while addressing environmental concerns. Within this dilemma lies the debate on divestment – the act of selling (liquid) assets (i.e. shares). Discussions on fossil fuel divestment are not new; the 'Fossil Free Divestment Movement' was inaugurated in 2010 and since has accrued over €12.5 (\$14) trillion in pledged divestments by around 1200 institutions, including pension funds [26]. Proponents of divestment argue that, inter alia, pension funds can only abide by their fiduciary duty by ridding themselves of fossil assets due to their negative environmental externalities [27,28]. Furthermore, public divestments may have spill-over effects that stigmatise the fossil fuel industry, potentially prompting firms to redesign their businesses [16,29,30].

Even on a large and coordinated scale, divestment is unlikely to directly influence fossil fuel production and mitigate GHG emissions [16,30], and may inadvertently transfer assets to 'neutral investors' who may be disinterested in climate issues and develop new vested interests in the growth of the fossil fuel sector [31]. Furthermore, divestment may lead to a de facto reallocation of the social and economic risks of stranded assets from the global North to South, rendering it both environmentally problematic and developmentally exclusive [20].

Direct engagement is often proposed as an alternative to divestment; as major shareholders, pension funds can leverage firms to change their behaviour and ultimately influence them to LFFU [16]. Under this logic, the greater the magnitude of assets managed in a particular fossil fuel firm, the greater the potential influence. Such engagement may result in more direct environmental progress [20], though some scholarship argues that engagement and divestment are most effective when strategically employed in unison [24].

1.3. Knowledge gaps and structure

Some studies have explored the carbon intensity of pension fund portfolios and the extent to which they have been decarbonising [23], but virtually no scholarship has attempted to estimate the magnitude of fossil fuel assets that a broader range of pension funds manage. Without this, it is difficult to validate either end of the divestment vs. engagement spectrum – are there even fossil fuel assets for pension funds to

either divest from or to use as leverage?

Furthermore, pension funds possibly employ a broader range of actions to address environmental concerns. Six research papers have been published on pension funds and fossil fuels since 2016, of which only two have scrutinised (albeit limitedly) their environmental and social governance policies [32,33]. Therefore, a second gap in scholarly knowledge pertains to the range of actions that pension funds take beyond divestment and engagement to address environmental issues, and the implications that these actions may bear on both LFFU and the climate emergency.

This paper thus addresses the three-pronged question: What is the extent of pension fund investments in the fossil fuel sector, what is the range of actions that pension funds take to address environmental issues, and what do they suggest about pension fund commitments to ambitious climate targets through LFFU?

Section 2 of this paper first elaborates on methodology and sample selection. Section 3 then explores the fossil fuel assets managed by pension funds, Section 4 scrutinises sustainability reports to gain insight on pension fund commitments to climate policy, and Section 5 draws overarching conclusions and proposes avenues for future research.

2. Methods and materials

Following a literature review, our research entailed two empirical phases. We first computed pension fund assets in the fossil fuel sector (Section 3), and then assessed the actions that they are taking in relation to these assets (Section 4). To do so, we sampled pension funds on the basis that they:

1. disclosed an investment portfolio and/or asset list in 2018 or later;
2. manage liquid portfolio assets that jointly sum to around €2 trillion (10% of global liquid assets under management – see Section 3.1);
3. published a sustainability report in 2018 or later, entailing an explicit focus on environmental sustainability²; and
4. were from an Organisation for Economic Co-operation and Development (OECD) member state³.

We sequentially went through the list of top 300 pension funds [21] and added to our sample until condition (2) was met; Table 1 presents the complete sample list. Most of the investment portfolios were publicly disclosed on pension fund websites, though there were four exceptions: Dutch fund ABP [34] – whose portfolio was acquired through an email request to their public affairs manager; and the portfolios of the three Swedish funds AP1 [35], AP2 [36] and AP4 [37], which were sent to us through a contact at WWF Sweden. All sustainability reports were retrieved from organisation websites.

To estimate the fossil fuel assets managed by the sample, we first analysed coal and oil & gas assets separately. We used a 2019 ranking of the 100 largest coal firms and the 100 largest oil & gas firms (ranked by size of their reserves) [69] and searched the investment portfolios for evidence (and the value) of common shares and convertible bonds (i.e. liquid assets) pertaining to these firms. If an investment portfolio did not indicate assets of a firm from the list, then '€0' was recorded. This eventually generated two separate datasets (one for coal and the other for oil & gas), each of which had 15 columns (corresponding to each sampled pension fund from Table 1) and 100 rows (corresponding to each of the coal and oil & gas firms included in the analysis from [69]) – and each cell reflected the value (in '€')⁴ of the liquid assets that a

² One pension fund (CalPERS) was included in the sample despite not meeting this criterion due to their transparent disclosure of their full asset list and significant presence in the top 20 global funds

³ This condition was set to narrow the scope of the research.

⁴ Closing exchange rates from August 15, 2019 were used to convert to euros if necessary

Table 1

Complete Sample List. Unless otherwise specified, documents were retrieved from official pension fund websites.

Pension Fund	Abbrev.	Country	Investment Portfolio	Sustainability Report
Stichting Pensioenfonds ABP	ABP	NLD	email request [34]	[38]
Stichting Pensioenfonds Zorg en Welzijn	PFZW	NLD	[39,40]	[41]
California Public Employees' Retirement System	CalPERS	USA	[42]	–
California State Teachers' Retirement System	CalSTRS	USA	[43,44]	[45]
Teachers' Retirement System of New York City	TRSNYC	USA	[46]	[47]
AustralianSuper	–	AUS	[48–50]	[51]
Government Pension Fund	GPF	NOR	[52]	[53]
Fonds de réserve pour les retraites	FRR	FRA	[54]	[55]
Canada Pension Plan	CPP	CAN	[56,57]	[58]
Caisse de dépôt et placement du Québec	CDPQ	CAN	[59]	[60]
Arbejdsmarkedets Tillægspension	ATP	DNK	[61,62]	[63]
New York City Common Retirement Fund	NYCCRF	USA	[64]	[65]
Första AP-fonden	AP1	SWE	NGO contact [35]	[66]
Andra AP-fonden	AP2	SWE	NGO contact [36]	[67]
Fjärde AP-fonden	AP4	SWE	NGO contact [37]	[68]

pension fund managed for any given firm. Finally, we summed the assets across all coal and oil & gas companies for each pension fund, and a descriptive statistical analysis was executed to study the sampled data. We note that this analysis omitted illiquid assets (e.g. fossil fuel real estate & infrastructure) due to feasibility constraints.

We subsequently sought to understand how pension funds are taking action as shareholders of fossil fuel firms to address environmental issues. To do so, we first scanned the sampled sustainability reports for evidence of 'divestment' and 'engagement' (see Section 1.2). We then expanded our search to identify other actions by exploring the sections in these reports dedicated to environmental sustainability. Newly identified actions (e.g. 'Portfolio Emissions', see Section 4.2.3) were subsequently searched for in all other reports in tandem with 'divestment' and 'engagement', and this inductive approach was repeated until saturation was reached and no new popular actions were identified.

Our research was designed with 'empirical novelty' in mind [70: p.20]. A cross-sectional analysis of pension fund sustainability reporting has been neglected from scholarship thus far, which is limiting as this can provide an overall and up-to-date overview of their sustainability policies. Our methods hence aspire to contribute 'new data' and 'new types of evidence' to pension fund literature [70]. However, our reliance on cross-sectional data is itself a limitation. Not only are fossil fuel projects executed under long-term planning [71], but the processes of divestment and engagement both embody a temporal element. This study is thus incapable of asserting trends in divestment or link past instances of direct engagement with successful LFFU outcomes. Rather, we aim to evaluate pension fund financial and climate policy documents to assess whether their actions are aligned with the PA 2015 in their most recent state.

3. Fossil fuel assets

3.1. Introduction

Pension funds are savings accounts that pay monthly retirement installations to pensioners [27,72]. Due to their often gargantuan bases, they accrue compounding interest and grow exponentially [72]; as of 2019, pension funds globally manage an estimated €41 trillion in assets (98% of which belong to pension funds from the OECD area) [73], equivalent to 51% of 2018 global GDP [22]. Roughly half of these (~€20 trillion) are 'liquid' assets, which are most relevant to this analysis (see Section 2). Pension funds are particularly interesting financial actors because they are obliged to invest in the best interest of all the beneficiaries for whom they provide a service to – they have fiduciary responsibilities [74]. Unlike other major investors (e.g. hedge funds), pension funds must prioritise earning a return greater than inflation

while not incurring too high a risk [72,74].

This chapter sheds light on pension fund assets in the fossil fuel sector. Section 3.2 first presents our descriptive results, Section 3.3 speculates beyond the sample, and Section 3.4 discusses the implications of our findings.

3.2. Results

Table 2 summarises our results. Of the €2 trillion in total liquid portfolio assets, €79.6 billion belongs to fossil fuel firms, (€60.2 billion in oil & gas and €19.4 billion in coal). Norwegian fund GPF accounts for 45% of this (almost €36 billion in fossil fuel assets); Dutch fund ABP and American funds CalPERS and CalSTRS jointly account for 32% – together managing roughly €25 billion in fossil assets. Other funds manage significantly fewer liquid fossil fuel assets, like Swedish fund AP1 (€270 million).

The sampled pension funds manage a mean of €5.3 billion in overall fossil fuel assets, with means of €4.0 billion in oil & gas and €1.3 billion in coal – see Table 2. Median values are lower (€3.4 billion overall, €2.1 billion oil & gas, €300 million coal), likely because of the impressive size of GPF's assets. Given this skewness, the median values offer a

Table 2
Descriptive Statistical Results.

Pension Fund	Assets Under Management (Billions)				Cum. % Total Fossil	% Portfolio Fossil
	Overall Portfolio	Coal	Oil & Gas	Total Fossil		
GPF	€827.10	€8.95	€27.00	€35.95	45.2	4.35
ABP	€180.38	€2.84	€6.55	€9.39	57.0	5.21
CalPERS	€231.69	€2.02	€6.83	€8.84	68.1	3.82
CalSTRS	€131.04	€1.48	€5.19	€6.67	76.5	5.09
NYCCR	€142.96	€0.27	€4.16	€4.43	82.0	3.10
CDPQ	€166.94	€0.54	€3.70	€4.25	87.4	2.54
CPP	€106.79	€1.36	€2.36	€3.72	92.0	3.49
PFZW	€61.86	€1.36	€2.07	€3.43	96.3	5.55
AP4	€29.30	€0.08	€0.49	€0.57	97.1	1.95
FRR	€21.95	€0.08	€0.46	€0.55	97.7	2.49
ATP	€9.58	€0.03	€0.39	€0.42	98.3	4.43
TRSNYC	€31.96	€0.03	€0.35	€0.38	98.8	1.19
AP2	€22.33	€0.11	€0.26	€0.37	99.2	1.64
Australian Super	€3.34	€0.18	€0.17	€0.35	99.7	10.58
AP1	€22.57	€0.07	€0.20	€0.27	100.0	1.20
Total	€1,989.79	€19.43	€60.18	€79.61	–	–
Mean	€132.65	€1.30	€4.01	€5.31		3.77%
Median	€61.86	€0.27	€2.07	€3.43		3.49%
Min	€3.34	€0.03	€0.17	€0.27		1.19%
Max	€827.10	€8.95	€27.00	€35.95		10.58%
St. Dev.	205.38	2.29	6.79	9.05		0.02

better representation for the average fossil fuel assets managed.

Some pension funds are much larger than others - e.g. GPF's liquid portfolio is €827 billion compared to ATP's €9.6 billion. The mean overall portfolio size is €133 billion, but this is also skewed by GPF; the median of €62 billion again offers a better representation of the average portfolio size. To account for varying portfolio sizes, we also computed the fraction of portfolios that are allocated to fossil fuel firms, shown in the right-most column of Table 2. To a large extent, these fractional allocations are similar across the sample; GPF devotes 4.35% of its liquid portfolio to fossil firm assets and ATP devotes 4.43%, despite GPF's 82x larger portfolio. On average, pension funds devote 3.77% of their portfolios to liquid fossil fuel assets, with a median fraction of 3.49% (and standard deviation of 0.02). In layman's terms, we can estimate that the sample allocates an average of approximately 3.8% of portfolio assets to fossil fuel firms.

There is a notable gap of an order of magnitude between the seventh and eighth pension funds ranked by fossil fuel assets (PFZW, €3.4 billion vs. AP4, €570 million). To discern whether any differences exist between these top and bottom subsets, we repeated the descriptive analysis; Table 3 juxtaposes the descriptive results of the two subsets - namely 'Top 8' and 'Bottom 7'. We note a number of differences; the top 8 subset manages a grand total of €1.85 trillion in overall assets - of which almost €77 billion are fossil fuel assets (over 96% of the total sample) - whereas the bottom 7 subset manages only €141 billion in total assets, of which slightly less than €3 billion are fossil fuel assets. Using the median as guidance, the average portfolio size and fossil fuel assets in the top 8 subset is approximately €155 billion and €5.6 billion, respectively, whereas for the bottom 7 subset these values sit at €22 billion and €380 million. Clearly the top 8 subset heavily overshadows the smaller subset on the basis of magnitude.

Regarding fractions of overall portfolios allocated to fossil assets, we see a closely overlapping mean and median pair of 4.14% and 4.08% for the top 8 subset, indicating that the average pension fund in the larger subset allocates roughly 4.1% of its liquid portfolio to fossil fuel. In the bottom 7 case, we use the median as guidance to estimate that an average of 2% of liquid portfolios belong to fossil fuel assets. The range varies more widely for the bottom 7 group (1.2–10.6%) compared to the top 8 subgroup (2.5–5.6%). This suggests that larger pension funds may on average allocate a larger fraction of their liquid portfolio to fossil fuel assets than smaller funds, but smaller funds may allocate a broader range.

3.3. Beyond the sample

We now briefly speculate over the extent of fossil fuel assets managed by OECD pension funds beyond this sample. Note that the purpose of this exercise is to gauge a range and order of magnitude of such assets rather than computing one value with high certainty.

Our sample size ($n = 15$) is too small to run a regression analysis⁵, so we use our descriptive findings from Section 3.2 as a basis. It follows that a fraction of the some €20 trillion of liquid assets managed by OECD pension funds [68] are fossil fuel assets. To estimate this fraction, we call on the mean, median, minimum and maximum fractions from Tables 2 and 3. Table 4 summarises these speculative results.

Using the overall sample minimum yields an extrapolated value of €238 billion (1.19% of €20 trillion) of fossil fuel assets managed by OECD pension funds. This is likely an underestimate but offers insight into the potential lower limit of the range. Other fractions yield greater estimates, like the overall sample mean (€754 billion) and median (€698 billion), bottom 7 mean (€670 billion) and median (€390 billion), and top 8 mean (€828 billion) and median (€816 billion). Using the sample maximum (10.58%) yields an estimate of €2.2 trillion; since

⁵ Future research should see to expand our sample size in order to do so - see Section 5

Table 3

Descriptive results of the Top 8 & Bottom 7 pension funds, ranked by fossil fuel assets.

	Top 8	Bottom 7
Overall Portfolio (billions)	€1,848.75	€141.04
Mean	€231.09	€20.15
Median	€154.95	€22.33
Min	€61.86	€3.34
Max	€827.10	€31.96
St. Dev.	246.05	10.26
Fossil Fuel Assets (billions)	€76.69	€2.91
Mean	€9.59	€0.42
Median	€5.55	€0.38
Min	€3.43	€0.27
Max	€35.95	€0.57
St. Dev.	10.90	0.11
% Portfolio Fossil	-	-
Mean	4.14%	3.35%
Median	4.08%	1.95%
Min	2.54%	1.19%
Max	5.55%	10.58%
St. Dev.	0.01	0.03

this is an order of magnitude greater than the others and is very likely an overestimate, we consider it an outlier and exclude it from Table 4.

Each method of extrapolation brings with it its own limitations. For example, using the bottom 7 subset mean and median is not representative of the top 8 subset and vice-versa. As a result, we feel that two generalised conclusions are in order:

1. OECD pension funds very likely manage hundreds of billions of euros of liquid fossil fuel assets; and
2. The value of these assets potentially falls within the range of €238–828 billion.

Sections 3.4 and 4.3 discuss the potential implications of these findings.

3.4. Discussion

Section 3.2 reveals that this sample alone managed at least €79 billion in fossil fuel assets, and Section 3.3 suggests that OECD pension funds may manage fossil assets in €238–828 billion range. First, this verifies the relevance of the divestment vs. engagement debate (see Section 1.2). Assets of this magnitude suggest that either divestment or engagement are relevant courses of action for pension funds to consider - discussed further in Section 4.3.

Furthermore, these assets make pension funds at times major shareholders of prominent fossil fuel firms. For instance, the sample jointly manage €7.7 billion in Royal Dutch Shell shares, which translates to 3.74% of Shell's market capitalisation as of August 2019 [75]. Sampled pension funds can jointly leverage firms like Shell to better align with global climate policies by LFFU, though again, direct engagement of this nature is rejected by divestment advocates [76]. It is promising that pension funds may manage hundreds of billions of euros in fossil fuel assets, but the question remains: as major shareholders of fossil fuel firms, are they taking effective action to LFFU and committing to climate policy? We explore this in Section 4.

4. Commitments to LFFU

4.1. Introduction

Given the €79 billion of fossil fuel assets that the sampled pension funds manage (see Section 3.2) and potentially €238–828 billion managed by funds within the OECD (see Section 3.3), we now consider the range of actions that are taken in relation to this equity to align with

Table 4
Estimating fossil fuel assets beyond the sample.

Estimation Method	Fraction Fossil Fuel (%)	Extrapolated Estimate (billions)	Limitations
Sample Minimum	1.19	€238.00	Likely an underestimate
Sample Mean	3.77	€754.00	Inconsiderate of varying portfolio sizes
Sample Median	3.49	€698.00	“
Top 8 Mean	4.14	€828.00	Not representative of smaller funds
Top 8 Median	4.08	€816.00	“
Bottom 7 Mean	3.35	€670.00	Not representative of larger funds
Bottom 7 Median	1.95	€390.00	“

climate policy. Many pension funds publish sustainability reports to discuss environmental concerns and disclose such actions [77], through which they often explicitly pledge their commitments to the PA 2015:

- “The most important thing is that ABP brings its targets in line with the Paris Agreement” [38: p.53]
- “[G]oing forward, energy production must be based on sustainable energy sources if we are to reach the targets set out in the Paris Agreement” [63: p.19]
- “[U]sing carbon and oil sands for energy...makes it difficult to achieve the climate goals set out in the Paris Agreement” [66: p.4]

Most pension funds strive to align with climate policies through their investment practices, but how are they doing so? Section 4.2 presents our empirical findings, which revealed that five popular actions are undertaken: divestment (Section 4.2.1), direct engagement (Section 4.2.2), portfolio emissions (Section 4.2.3), ‘green’ investments (Section 4.2.4), and coalitions & partnerships (Section 4.2.5). Section 4.3 subsequently theorises over how these actions relate to LFFU and climate policy more broadly.

4.2. Divestment, engagement and beyond

4.2.1. Divestment

All sample reports discuss divestment from at least one of two angles: 1) conditional divestment; and 2) industry-wide divestment. Most pension funds practice conditional divestment, in which they only divest from a firm as a last resort if a series of criteria are not met. For instance, ABP evaluates its ability to alter the business practices of and reduce the risks posed by “laggards” and subsequently divests if the risks outweigh their potential influence [38: p.16]; ATP states that if it “finds a company to be in breach of [its] Policy of Responsibility in Investments, the company may be excluded from ATP’s investment portfolio” [63: p.60]. Many pension funds have used these conditional policies to divest from fossil fuel firms; AP2 have divested from 23 unnamed coal firms and 20 unnamed oil & gas firms using a similar framework [67].

Many pension funds also practice industry-wide divestment of e.g. tobacco and (nuclear) weapons, though they seldom target the fossil fuel sector. For instance, GPF no longer invests “in companies that produce certain types of weapons, base its operations on coal, or produce tobacco” [53: p.114], but given the €7.7 billion of coal assets it manages (see Table 2 in Section 3.2), GPF clearly does not divest entirely from the coal sector but rather coal-dependents. No pension funds in the sample expressed industry-wide divestment of the fossil fuel sector, which is coherent with our findings from Section 3.2.

4.2.2. Direct engagement

All pension funds in the sample agree that they “prefer[s] to influence [their] portfolio companies through critical dialogue” [63: p.60] and prioritize engagement over divestment [e.g. 66]. Direct engagement with target firms aspires to “persuade the company to change its conduct ... if there is deemed to be a reasonable expectation” that they can do so [63: p.60]. This shows that sampled pension funds believe

that direct engagement is a more impactful tactic to implement sustainability policies than divestment.

However, only one instance was noted in which engagement was used to promote LFFU. ABP urged an unnamed firm “not to expand their coal-fired power plants any further and to develop a strategy for the transition to sustainable energy” [38: p.18]. Apart from this instance, other engagements with fossil fuel firms were both scarce and reactive rather than proactive. For example, GPF opened dialogue with Royal Dutch Shell and Eni SPA to discuss oil spills, and also engaged with coal firms BHP Billiton and AngloAmerican to discuss corruption allegations [53]. Neither of these engagements sought to influence LFFU. Although there seems to be a consensus across the sample that divestment is a last resort and direct engagement is preferred, there is little evidence to suggest that LFFU is on pension fund agendas when engaging and leveraging fossil firms.

4.2.3. Portfolio emissions & carbon footprint

A third climate action is computing portfolio emissions and carbon footprint as a step towards decarbonising investment portfolios. All sampled pension funds to some degree monitor portfolio carbon emissions using in-house techniques, usually measuring “total carbon emissions, carbon footprint, and carbon intensity” [58: p.61] and often use these metrics to set goals for themselves. For example, PFZW hopes to have the “CO₂ footprint of the investment portfolio halved by 2020” [41: p.5]. Pension funds also use these metrics as a comparison tool; FRR claims that it “ranked second among the 100 pension funds most heavily invested in combating climate change” [55: p.4] based on its carbon footprint. In this narrative, committing to climate policies entails reducing overall portfolio emissions, which can include both actively divesting from carbon-intensive stocks and passively in the event that portfolio companies reduce their own emissions [23].

Two issues arise. First, pension funds themselves admit that “carbon footprints are not fully comparable” [68: p.12] due to “differing GHG calculation methodologies by companies, incomplete reporting by some companies and the resulting use of partial company data to extrapolate or estimate historic emissions based on sector emissions performance” [58: p.62]. Scope 2 emissions are often omitted and scope 3 emissions are almost always omitted from these calculations, apart from ATP [63] and CalSTRS [45: p.17] who “[d]isclose scope 1, scope 2, and if appropriate, scope 3”. Scope 1 refers to all direct emissions of an organisation (e.g. fleet vehicles); scope 2 refers to indirect emissions (e.g. electricity); scope 3 refers to all other indirect emissions. Scope 3 emissions are generally the most substantial of any given organisation’s carbon profile [78]. As a result, pension fund emissions calculations are both incomparable to one another and alarmingly incomplete.

A second notable issue is that emissions calculations ignore the potential emissions from the fossil fuel reserves that they own as partial shareholders. Not one pension fund from the sample either attempted to compute these potential emissions nor acknowledged them. This implies that the portfolio emissions metrics are demand-oriented and do not account for potential upstream emissions from fossil fuel reserves.

4.2.4. Green investments

Another frequent action is investing in ‘green’ fossil fuel-

alternatives, discussed by all but one pension fund [51]. Such investments include: ABP aiming to allocate €5 billion by 2020 in renewable energy to “fund the Dutch energy transition” [55: p.4] and PFZW investing €13.7 billion in “climate, healthcare, food security and water scarcity solutions” [41: p.4]. By allocating financial resources to e.g. renewable energy sources, sampled pension funds argue that they are both reducing net GHG emissions (PA 2015 Article 2.1a) and making financial flows consistent with lower emissions pathways (Article 2.1c).

Here there are also two issues. First, the magnitude of these investments may be negligible; reports show that these ‘green’ investments often pale in comparison to the fossil fuel assets managed by pension funds (see Section 3.2). For instance, CalSTRS discusses a €325 (\$364) million investment in renewable assets in 2018 [45], which is miniscule compared to its fossil assets worth some €6.6 (\$7.4) billion. Similarly, CPP discusses its investments in renewable energy firms Votorantim Energia (€243 (\$272) million) and ReNew Power (€349 (\$391) million) [59], which is overshadowed by its €3.7 (\$4.1) billion of fossil fuel assets.

The second issue with these ‘green investments’ is that “[t]here are no fixed definitions of many of the terms used in sustainable finance” [63: p.20], which allows pension funds to loosely classify what they consider ‘green’. For instance, CalSTRS was issued a ‘green bond’ by the Mexico City Airport, which has been used for airport construction [45], and GPF categorizes its investment in the oil & gas conglomerate Engie SA as “low-emission energy and alternative fuel” [53: p.111]. This is particularly interesting given that Engie SA was the 79th largest oil & gas firm in 2019 [69] and was therefore included in our analysis of fossil fuel assets managed by pension funds (see Section 2).

4.2.5. Coalitions & partnerships

All but one sample pension fund [65] report partaking in a series of climate-oriented coalitions and partnerships, notably including the Task Force for Climate-Related Disclosure (TFCD) and Climate Action 100+, among many others. Pension funds seem eager to collaborate with one another, as voiced by ABP [38: p.15]:

ABP is actively seeking cooperation with other pension funds and financial institutions. By exchanging knowledge and experience and joining forces, we contribute to sustainable financial markets and we have more influence on the companies in which we invest.

Various collaborative platforms provide a forum for pension funds. GPF, for instance, is self-reportedly an active member of 15 organisations [53], CPP in 17 organisations [58], and AP1 is involved with 27 initiatives and groups [66], all of which in some way pledge to combat the climate emergency. On its face, these collaborative platforms are promising in that they may increase the leverage that financial institutions have on fossil fuel firms (see Section 4.2.2). However, the sustainability reports do not delve into much additional detail neither on how these collaborative platforms operate nor disclose instances of collaborate engagements with fossil fuel firms.

4.3. Discussion

We now discuss the five climate-oriented actions frequently employed by pension funds (see Table 5), first focusing on the divestment vs. engagement debate. Most pension funds prefer direct engagement over divestment in a bid to sway business practices, and no sampled pension funds have unconditionally divested from the fossil fuel sector – coherent with the €79 billion in fossil assets that the sample jointly manages (see Section 3.2). On the one hand, this could suggest that pension funds may be absorbing the risks and responsibilities of addressing the climate emergency themselves by refraining from divesting and actively leveraging firms.

However, pension funds show no sign of actively engaging with fossil fuel firms to promote LFFU. They seldom engage with fossil firms in general, and when they do it often concerns reactive issues like minimising oil spills. The absence of proactive efforts to promote LFFU

suggest that pension funds are not seriously committed to lowering fossil fuel production to the extent that is necessary to reach ambitious climate targets (see Section 1.1). Furthermore, pension funds declare that they will conditionally divest from companies if the costs of engagement outweigh their potential influence. This demonstrates that pension funds have no problem with absolving themselves of their leverage over fossil firms and reallocating the responsibilities and risks of addressing the stranded asset problem elsewhere, potentially to neutral investors or poorer and more vulnerable actors from the global South [20].

Beyond divestment and engagement, ‘decarbonisation’ efforts are so far not fully aligned with ambitious climate targets for three reasons. First, scope 3 emissions are almost always omitted from carbon footprints. Second, potential future emissions through ownership of fossil fuel assets are always neglected, implying that the potential upstream GHG emissions from fossil fuels are not on pension fund climate agendas. Finally, incomplete data and varying methodological approaches render decarbonisation metrics like portfolio footprints incomparable across investors. This puts into question the validity and reliability of any decarbonisation efforts altogether. Until improvements are made to standardise computational techniques and enrich emissions data, portfolio emissions are at best a distraction from meaningfully curtailing GHG emissions and LFFU, and at worst are a façade used to distract from vested interests in the growth of the fossil sector.

Finally, loose and ambiguous definitions of what falls within the bounds of ‘green’ investments raises questions over pension fund commitments to making their financial flows consistent with climate policy. Funds allocated to developing Mexico City’s Airport and assets pertaining to oil & gas multinationals have fallen under this umbrella term (see Section 4.2.4). Like with decarbonisation, until there is a consensus on a classification of ‘green investments’ that prioritises LFFU and promotes fossil-substitutes, this approach to materialising climate policies is also at best a distraction from the systemic drivers of climate change and at worst a greenwashing ploy.

It is promising that sample funds expressed an eagerness to collaborate with one another to maximise leverage over firms (see Section 4.2.5) – this could significantly enhance prospects of LFFU outcomes from direct engagement, as joint engagements would bolster prospects of effectively leveraging firms to LFFU. However, thus far pension funds show no evidence of such collaborative efforts of engagement, but the very existence of these coalition platforms leaves us somewhat optimistic. The full potential of these coalitions has not been explored in this review and merits further study (see Section 5).

5. Conclusion & policy implications

This paper has updated estimates of the extent of pension fund assets in the fossil fuel sector, contributed to the divestment vs. engagement debate by identifying a broader range of environmental actions undertaken by pension funds, and determined whether these assets and actions jointly align with ambitious climate targets through LFFU. We statistically find that: (a) sampled pension funds hold almost €79 billion in liquid fossil fuel assets; and (b) speculating beyond the sample suggests that OECD pension funds likely manage several hundreds of billions of euros in liquid fossil fuel assets, possibly within the range of €238–828 billion.

In addition to practicing divestment and engagement, pension funds compute their carbon footprints and seek to decarbonise their portfolios, allocate funds to ‘green’ investment alternatives, and engage in climate-oriented coalitions and partnerships with other investors. However, evidence suggests that pension funds are minimally and ineffectively employing these actions to promote LFFU. Given that substantially LFFU must be the predominant approach to tackling the climate emergency and meeting climate targets like those set forth in the PA 2015 (see Section 1.1), we conclude that pension funds are falling

Table 5

Summary of investor actions, alignment with climate policy through LFFU, and whether pension funds are making effective use of these actions to commit to LFFU.

Action	Theoretically aligned with climate policy?	Effectively used by pension funds?
Divestment	No – divestment is unlikely to have any meaningful environmental impacts and risks transferring assets to climate-indifferent investors or investors from poorer and more vulnerable countries	No – they have divested from various fossil fuel firms and openly consider future divestments under various circumstances
Direct Engagement	Yes – major shareholders can leverage firms to alter their business practices and support LFFU	No – they show no sign of proactive engagement with fossil fuel firms to promote LFFU
Carbon Footprint Reduction	Yes – accurately computing portfolio emissions and financed emissions fossil fuel reserves can elucidate the extent to which investors are progressing towards PA 2015 Article 2.1c	No – carbon footprint calculations are incomplete as they omit scopes 2 and 3 emissions and neglect potentially financed emissions, and are incomparable with one another due to unstandardised methodologies
Investments in Green Alternatives	Yes – investing in fossil-substitutes may make them more affordable and accessible, offsetting demand for fossil fuels and thereby reduce quantity supplied	No – ‘green investments’ are loosely defined, and prima facie evidence suggests that these investments could be contributing to rather than mitigating GHG emissions
Climate -Oriented Investor Coalitions	Yes – coalitions of investors can both maximise leverage over fossil firms and improve efficiency by generating a common agenda across various parties	Semi – they partake in a multitude of coalitions like Climate Action 100 + and TPCD, but are yet to capitalise on the potential of these coalitions

short of meeting ambitious climate targets as they are not yet fully committed to LFFU. This not only hampers the chances of limiting average warming to well below 2 °C, but also threatens the prospects of socially, ecologically and relationally inclusive development [79]. We should note that even if all pension funds were to commit to LFFU, we would globally still have a long way to go in terms of meeting ambitious climate goals given that pension funds represent a subset of global investors. Coordinated global efforts are needed to tackle the climate emergency, which could be catalysed if pension funds revamp their climate practices to promote LFFU.

This brings us to three dilemmas that pension funds face. First, their liquid fossil fuel assets are gargantuan – likely several hundreds of billions of euros. We have not yet computed illiquid assets managed in related real estate and infrastructure – though this is also likely to be substantial. Assuming that fossil fuel resources and infrastructure are globally phased out by 2050, these assets could abruptly devalue – perhaps by as much as €165 (\$185) trillion on a global scale [12] – as the carbon bubble bursts [14]. It would be in the best interest of a pension fund to divest before this devaluation to ensure that their own pensioners are not directly impacted. However, the carbon bubble ‘pop’ is expected to rattle multiple economic sectors and catalyse a global recession [80]. The stranded asset problem thus extends far beyond the fossil fuel sector, and perhaps this offers one reason why pension funds have not yet fully divested from fossil fuels; washing the ‘dirt’ off of their hands may not cut it.

Second, if pension funds were to divest from fossil fuels, where do they reinvest the freed capital? Renewables sound like a solid alternative, but reallocating this immense financial capital to other sectors could also bear significant adverse ecological (and social) consequences [81]. In an analogous case in the Global Environment Outlook in 2019, scholars stressed that ecological damage is quickly approaching its tipping point even with ‘sustainable’ agricultural practices. Devising a sustainable investment schematic detached from the fossil sector will itself be very challenging; perhaps the only ecologically and socially inclusive solution is a market-wide departure from the paradigm of perpetual growth and a restructured economy that focuses on redistribution, balance, equity, and diversity [82]. This is of course more than unlikely given the capitalist ideals that govern global markets, further complicating the stranded asset problem and climate emergency.

Third, if pension funds engage with the fossil fuel sector and ask them to change their practices, this ultimately means that these companies will have to sell or write-off their own investments in fossil reserves and related infrastructures. Many will experience significant financial losses if fossil fuels are left underground as the global fossil fuel enterprise devalues. In this dilemma, pension funds are taking impactful action to address the climate emergency at the expense of their own pensioners, because they are inevitably left with financial losses in

the form of stranded assets on their own balance sheets. However, failing to combat climate change risks leaving their pensioners in a world ripe with famine, conflict and unsustainable migration – a concern that was voiced in a 2019 keynote address by the Climate Envoy of the Dutch Ministry of Economic Affairs [83].

Two questions persist: why are pension funds not committed to LFFU, and what can (or should) be done differently? A tentative answer to the former may lie in the third dilemma. By leveraging firms in which they hold assets to phase out fossil fuels, the assets themselves will eventually devalue – clashing with their fiduciary obligation to pensioners as they incur losses through writing-off these stranded assets. A traditional view of fiduciary duty neglects to account for the future, long-term risks that pensioners are exposed to through both the climate emergency and a recession likely prompted by the bursting of the carbon bubble. To truly uphold their fiduciary duty – particularly for pensioners who will seek pension in the next 30–50 years – pension funds should take stringent climate action to LFFU while simultaneously limiting portfolio risk exposure.

Which brings us to our final point. Moving forward, it is critical that pension funds and other investors actively utilise existing coalition platforms to a) maximise their leverage over fossil firms to phase out fossil fuels, and b) catalyse a process to write-off stranded fossil fuel assets on their own balance sheets so as to maintain global economic stability and protect more vulnerable actors from the South [20]. Furthermore, stringent policies must be implemented to standardise the realm of green finance (like methods to compute portfolio emissions, classifications of ‘green investments’, and scopes 2&3 emissions data availability), and the legality of fiduciary obligations must be modernised to mandate active and effective commitments to LFFU. Only under these conditions can financial actors begin to make progress towards aligning with the PA 2015.

Four pressing opportunities for future research persist. First, although this study takes a stab at estimating pension fund financial ties to the fossil sector, there are limitations. Further research is necessary to both a) expand our small sample of pension funds to extrapolate with greater statistical certainty, and b) to expand the scope to account for illiquid assets (e.g. real estate and infrastructure). Second, scholarship would benefit from an analysis on how reliant pension funds are on their fossil assets; that is, how costly would it be for them if they were to write them off? Third, research should explore the intricacies of and arguments for and against portfolio decarbonisation, green investments and climate-oriented coalitions so as to expand the debate on divestment vs. engagement; our exploratory study began to do so, but the social, economic and environmental costs and benefits of each are still unknown. Finally, a legally-oriented study must explore fiduciary responsibility in a world threatened by the climate emergency and stranded assets: to what degree does engagement with fossil fuel firms to promote LFFU abide by fiduciary obligations? Uncovering this

relationship may hold a key component to making financial flows truly consistent with low-emissions pathways and inclusively addressing the climate emergency.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

We are grateful for the support by the Netherlands Organisation for Scientific Research (NWO) [project number W07.303.104] and the Governance and Inclusive Development Group of the University of Amsterdam in conducting this research. We would also like to thank all of those involved in the review process for thorough revisions that has significantly improved our research.

References

- [1] J. Gupta, *The History of Global Climate Governance*, Cambridge University Press, 2014.
- [2] United Nations Framework Convention on Climate Change (2015). Adoption of the Paris Agreement. Conference of the Parties 21st session, Paris, 30 November–11 December 2015. FCCC/CP/2015/L.9/Rev.1. Retrieved on June 15 2020 from: <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>.
- [3] J. Bebbington, T. Schneider, L. Stevenson, A. Fox, Fossil fuel reserves and resources reporting and unburnable carbon: Investigating conflicting accounts, *Crit. Perspect. Account.* 66 (2020), <https://doi.org/10.1016/j.cpa.2019.04.004>.
- [4] M. Linnenluecke, A. Griffiths, Mumby, Executives' engagement with climate science and perceived need for business adaptation to climate change, *Clim. Change* 131 (2) (2015) 321–333, <https://doi.org/10.1007/s10584-015-1387-1>.
- [5] J. Rozenberg, A. Vogt-Schilb, S. Hallegatte, Transition to clean capital irreversible investment and stranded assets, World Bank Group (2014) Retrieved on April 15 2020 from: <http://documents.worldbank.org/curated/en/768841468171252748/Transition-to-clean-capital-irreversible-investment-and-stranded-assets>.
- [6] C. McGlade, Ekins, p., The geographical distribution of fossil fuels unused when limiting global warming to 2 °C, *Nature* 517 (7533) (2015) 187–190, <https://doi.org/10.1038/nature14016>.
- [7] SEI, IISD, ODI, Climate Analytics, CICERO, & UNEP. (2019). The Production Gap: The discrepancy between countries' planned fossil fuel production and global production levels consistent with limiting warming to 1.5°C or 2°C. Retrieved on June 19 2020 from: <http://productiongap.org/>.
- [8] F. Johnsson, J. Kjærstad, J. Rootzén, The threat to climate change mitigation posed by the abundance of fossil fuels, *Climate Policy* 19 (2) (2019) 258–274, <https://doi.org/10.1080/14693062.2018.1483885>.
- [9] F. van der Ploeg, Rezaei., The simple arithmetic of carbon pricing and stranded assets, *Energ. Effi.* 11 (3) (2018) 627–639, <https://doi.org/10.1007/s12053-017-9592-6>.
- [10] B. Kefford, B. Ballinger, D. Schmeda-Lopez, C. Greig, S. Smart, The early retirement challenge for fossil fuel power plants in deep decarbonisation scenarios, *Energy Policy* 119 (2018) 294–306, <https://doi.org/10.1016/j.enpol.2018.04.018>.
- [11] N. Bauer, I. Mouratiadou, G. Luderer, L. Baumstark, R. Brecha, O. Edenhofer, E. Kriegler, Global fossil energy markets and climate change mitigation – An analysis with REMIND, *Clim. Change* 136 (2013) 69–82, <https://doi.org/10.1007/s10584-013-0901-6>.
- [12] P. Linquiti, N. Cogswell, The Carbon Ask: Effects of climate policy on the value of fossil fuel resources and the implications for technological innovation, *J. Environ. Stud. Sci.* 6 (4) (2016) 662–676, <https://doi.org/10.1007/s13412-016-0397-2>.
- [13] B. Caldecott, E. Harnett, T. Cjoianu, I. Kok, A. Pfeiffer, Stranded assets: A climate risk challenge, *Inter-Am. Develop. Bank* (2016) Retrieved May 10 2020 from: <https://publications.iadb.org/en/publication/12597/stranded-assets-climate-risk-challenge>.
- [14] Carbon Tracker Unburnable Carbon—Are the World's Financial Markets Carrying a Carbon Bubble? Carbon Tracker <https://www.carbontracker.org/reports/carbon-bubble/> 2011 Retrieved on June 15 2020 from:
- [15] European Investment Bank, EU Bank launches ambitious new climate strategy and Energy Lending Policy, European Investment Bank (2019) Retrieved on June 19 2020 from: <https://www.eib.org/en/press/all/2019-313-eu-bank-launches-ambitious-new-climate-strategy-and-energy-lending-policy>.
- [16] A. Ansar, B. Caldecott, J. Tilbury, Stranded assets and the fossil fuel divestment campaign: what does divestment mean for the valuation of fossil fuel assets? University of Oxford, 2013 Retrieved on January 20 2020 from.
- [17] K. Bos, J. Gupta, Stranded assets and stranded resources: Implications for climate change mitigation and global sustainable development, *Energy Res. Social Sci.* 55 (2019) 26–34, <https://doi.org/10.1016/j.erss.2019.05.025>.
- [18] K. Bos, J. Gupta, Climate change: The risks of stranded fossil fuel assets and resources to the developing world, *Third World Quarterly* 39 (3) (2018) 436–453, <https://doi.org/10.1080/01436597.2017.1387477>.
- [19] K. Bos, J. Gupta, Inclusive development, oil extraction and climate change: A multilevel analysis of Kenya, *Int. J. Sustain. Develop. World Ecol.* 23 (6) (2016) 482–492, <https://doi.org/10.1080/13504509.2016.1162217>.
- [20] J. Gupta, A. Rempel, H. Verrest, Access and allocation implications by investors and financiers, *Polit. Law Econ. Int. Environ. Agreements* 20 (2) (2020) 303–322, <https://doi.org/10.1007/s10784-020-09478-4>.
- [21] Willis Tower Watson Top 20 pension funds' AUM declines for first time in seven years. Willis Tower Watson Retrieved on April 23 2019 2020 from:
- [22] World Bank. (2019). GDP (Current US\$). World Bank Group. Retrieved on May 1 2020 from: <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD>.
- [23] M.A. Boermans, R. Galema, Are pension funds actively decarbonizing their portfolios? *Ecol. Econ.* 161 (2019) 50–60, <https://doi.org/10.1016/j.ecolecon.2019.03.008>.
- [24] C. Dawkins, Elevating the role of divestment in socially responsible investing, *J. Bus. Ethics* 153 (2) (2018) 465–478, <https://doi.org/10.1007/s10551-016-3356-7>.
- [25] Both ENDS. (2019). ABP and fossil fuels: how our pensions are fuelling the climate crisis. Both ENDS. Retrieved on May 1 2020 from: <https://www.bothends.org/en/Whats-new/Publicaties/ABP-and-fossil-fuels—How-our-pensions-are-fuelling-the-climate-crisis/>.
- [26] Fossil Free 1000 + Divestment Commitments Fossil Free. 2018 Retrieved on April 1 2020 from:
- [27] S. Sarang, Combating climate change through a duty to divest Columbia, *J. Law Soc. Problems* (2015) 295–341 Retrieved on February 20 2020 from.
- [28] S. Gharamani, Divestment laws, fiduciary duty, and pension fund management: An empirical examination, *Int. J. Law Manage.* 56 (1) (2014) 29–37, <https://doi.org/10.1108/IJLMA-09-2011-0007>.
- [29] M. Goranova, L. Versteegen Ryan, Shareholder activism: A multidisciplinary review, *J. Manage.* 40 (5) (2014) 1230–1268, <https://doi.org/10.1177/0149206313515519>.
- [30] N. Bergman, Impacts of the fossil fuel divestment movement: Effects on finance Policy and Public Discourse, *Sustainability* 10 (7) (2018) 1–18, <https://doi.org/10.3390/su10072529>.
- [31] J. Ritchie, H. Dowlatbadi, Understanding the shadow impacts of investment and divestment decisions: Adapting economic input-output models to calculate biophysical factors of financial returns, *Ecol. Econ.* 106 (2014) 132–140, <https://doi.org/10.1016/j.ecolecon.2014.07.005>.
- [32] J. Ramirez-Cendrero, E. Wirth, Is the Norwegian model exportable to combat Dutch disease? *Resour. Policy* 48 (2016) 85–96, <https://doi.org/10.1016/j.resourpol.2016.02.010>.
- [33] D. Lehmkuhl, Climate change and its significance in the healthcare community: History, landmarks, and major players, *Bundesgesundheitsblatt – Gesundheitsforschung – Gesundheitsschutz* 62 (5) (2019) 546–555, <https://doi.org/10.1007/s00103-019-02935-9>.
- [34] ABP. (2018). Beursgenoteerde beleggingen ABP Q4 2018 NL. Unpublished document.
- [35] AP1, Noterade värdepapper AP1 2019 Retrieved on March 21 2020 from: <https://www.ap1.se/vara-investeringar/aktuell-innehavslista/>.
- [36] AP2, Aktie- och ränteportfölj AP2 2019 Retrieved on March 21 2020 from: <https://www.ap2.se/sv/verksamheten/innehav/aktie-och-ranteporfolj/>.
- [37] AP4, Halvårsrapport 2019 AP4 2019 Retrieved on March 21 2020 from: <http://www.ap4.se/rapporter/>.
- [38] ABP Sustainable and responsible investment 2018 <https://www.abp.nl/images/responsible-investment-report-2018.pdf> 2018 Retrieved on March 21 2020 from:
- [39] PFZW (Pensioenfondszorg & Welzijn), Transparantielijst Aandelen PFZW 2019 Retrieved on March 21 2020 from: <https://www.pfzw.nl/over-ons/zo-beleggen-we/waarin-we-beleggen/transparantielijst-aandelen.html>.
- [40] PFZW Transparantielijst Obligaties PFZW 2019 Retrieved on March 21 2020 from: <https://www.pfzw.nl/over-ons/zo-beleggen-we/waarin-we-beleggen/transparantielijst-obligaties.html>.
- [41] PGGM Annual Responsible Investment Report PGGM 2017 Retrieved on March 21 2020 from: <https://www.pfzw.nl/en/about-us.html>.
- [42] CalPERS. Comprehensive Annual Financial Report 2017–2018. California Public Employees Retirement System 2018 Retrieved on March 21 2020 from:
- [43] CalSTRS. Domestic Equities as of 6/30/2018. California State Teachers Retirement System 2018 Retrieved on March 21 2020 from:
- [44] CalSTRS. International Equities as of 6/30/2018. California State Teachers Retirement System 2018 Retrieved on March 21 2020 from:
- [45] CalSTRS. (2019). 2018-2019 Sustainability Report. California State Teachers Retirement System. Retrieved on March 21 2020 from: <https://www.calstrs.com/sustainability-reports>.
- [46] TRSNYC. (2018). Investment Portfolios. Teachers Retirement System of New York City. Retrieved on March 21 2020 from: <https://www.trsnyc.org/memberportal/Publications/finance>.
- [47] TRSNYC. (2019). Corporate Governance Principles and Proxy Voting Guidelines. Teachers Retirement System of New York City. Retrieved on March 21 2020 from: <https://trsnyc.org/memberportal/WebContent/publications/CorporateGovernanceandProxyVotingGuidelines>, 2019.
- [48] AustralianSuper. (2018). Australian Shares. Australian Super. Retrieved on March 21 2020 from: <https://portal.austriansuper.com/investments-and-performance/what-we-invest-in/superannuation-diy-investment-options/australian-shares.aspx>.
- [49] AustralianSuper. (2018). International Shares. Australian Super. Retrieved on March 21 2020 from: <https://portal.austriansuper.com/investments-and-performance/what-we-invest-in/superannuation-diy-investment-options/international-shares.aspx>.
- [50] AustralianSuper. (2018). Australian Super. Diversified Fixed Interest. Retrieved on

- March 21 2020 from: <https://portal.australiansuper.com/investments-and-performance/what-we-invest-in/superannuation-diy-investment-options/diversified-fixed-interest.aspx>.
- [51] AustralianSuper. (2018). Annual report. Australian Super. Retrieved on March 21 2020 from: <https://www.australiansuper.com/about-us>.
- [52] GPF Holdings as at 31.12.1018. Norway Government Pension Fund 2018 Retrieved on March 21 2020 from: .
- [53] GPF Responsible Investment Government Pension Fund Global. Norway Government Pension Fund 2018 Retrieved on March 21 2020 from: .
- [54] FRR (Fonds de Réserve pour les Retraites), Portfolio Composition FRR 2018 Retrieved on March 21 2020 from: <http://www.fondsdereserve.fr/en/portfolio-composition>.
- [55] FRR Sustainable Investment: A Matter of Public Interest FRR 2018 Retrieved on March 21 2020 from: <http://www.fondsdereserve.fr/en/portfolio-composition>.
- [56] CPPIB. (2019). Canadian public equity holdings as of March 31, 2019. Canada Public Pension Investment Board. Retrieved on March 21 2020 from: <http://www.cppib.com/documents/2033/Canadian-Public-Equity-Holdings-Mar2019-EN.htm>.
- [57] CPPIB. (2019). Foreign public equity holdings as of March 31, 2019. Canada Public Pension Investment Board. Retrieved on March 21 2020 from: <http://www.cppib.com/documents/2034/Foreign-Public-Equity-Holdings-Mar2019-EN.htm>.
- [58] CPPIB. (2018). Investing Responsibly for CPP Contributors and Beneficiaries. Canada Public Pension Investment Board. Retrieved on March 21 2020 from: https://www.cppib.com/documents/1922/CPPIB_SI_2018_ENG.pdf.
- [59] CDPQ Additional Information 2018 CDPQ 2018 Retrieved on March 21 2020 from: <https://www.cdpq.com/en/performance/annual-reports>.
- [60] CDPQ Annual Report 2018 CDPQ 2018 Retrieved on March 21 2020 from: <https://www.cdpq.com/en/performance/annual-reports/2018>.
- [61] ATP (The ATP Group). (2019). Breakdown of the ATP Group's listed Danish equities at the end of H1 2019. The ATP Group. Retrieved on March 21 2020 from: <https://www.atp.dk/en/results-and-reports/annual-and-interim-reports/the-atp-group-further-information>.
- [62] ATP. (2019). Breakdown of the ATP Group's listed International equities at the end of H1 2019. The ATP Group. Retrieved on March 21 2020 from: <https://www.atp.dk/en/results-and-reports/annual-and-interim-reports/the-atp-group-further-information>.
- [63] ATP (2019). Responsibility report. The ATP Group. Retrieved on March 21 2020 from: <https://www.atp.dk/en/responsibility/responsibility-reports>.
- [64] NYCCRF Comprehensive Annual Financial Report 2018. New York City Comptroller Retirement Fund 2018 Retrieved on March 21 2020 from: .
- [65] NYCCRF. (2018). Sustainability. New York City Comptroller Retirement Fund. Retrieved on March 21 2020 from: <https://www.osc.state.ny.us/pension/sustainability.htm>.
- [66] AP1 (Första AP Fonden), Ownership Report 2018 AP1 2018 Retrieved on March 21 2020 from: <https://www.ap1.se/en/news/forsta-ap-fonden-ownership-report-2018/>.
- [67] AP2 (Andra AP Fonden), Annual Report and Sustainability Report AP2 2018 Retrieved on March 21 2020 from: <https://www.ap2.se/globalassets/nyheter-och-rapporter/arsredovisningar/annual-report-and-sustainability-report-2018.pdf>.
- [68] AP4 (Fjärde AP Fonden), Annual report AP4 2018 Retrieved on March 21 2020 from: <https://www.ap4.se/en/reports/annual-reports/>.
- [69] Fossil Free Funds, The Carbon Underground 200™, Unpublished document, Fossil Free, 2019.
- [70] B. Sovacool, J. Axsen, S. Sorrell, Promoting novelty, rigor, and style in energy social science: Towards codes of practice for appropriate methods and research design, *Energy Res. Social Sci.* 45 (2018) 12–42, <https://doi.org/10.1016/j.erss.2018.07.007>.
- [71] S. Davis, R. Socolow, Commitment accounting of CO₂ emissions, *Environ. Res. Lett.* 9 (8) (2014), <https://doi.org/10.1088/1748-9326/9/8/084018>.
- [72] Amadeo, K. (2018). Pension Funds, Types, Top 10. The Balance. Retrieved on March 21 2020 from: <https://www.thebalance.com/pension-funds-definition-list-and-issues-3305875>.
- [73] OECD Pension Markets in Focus 2019 OECD 2019 Retrieved on June 12 2020 from: <http://www.oecd.org/daf/fin/private-pensions/Pension-Markets-in-Focus-2019.pdf>.
- [74] S. Feit Trillion Dollar Transformation: Fiduciary Duty, Divestment, and fossil fuels in an Era of Climate Risk Centre for International Environmental Law. 2016 Retrieved from: <https://www.ciel.org/reports/trillion-dollar-transformation-fiduciary-duty-divestment-fossil-fuels-era-climate-risk/>.
- [75] YCharts, Royal Dutch Shell Market Cap https://ycharts.com/companies/RDSB/market_cap 2019 Retrieved on May 15 2020 from: .
- [76] B. Caldecott N. Robins Greening China's Financial Markets: The Risks and Opportunities of Stranded Assets 2014 University of Oxford Retrieved on March 21 2020 from: .
- [77] A. Kourula, Corporate sustainability and inclusive development: Highlights from international business and management research, *Curr. Opin. Environ. Sustainability* 24 (1) (2017) 14–18, <https://doi.org/10.1016/j.cosust.2017.01.003>.
- [78] GHG (Greenhouse Gas Protocol). (2013). Technical Guidance for Calculating Scope 3 Emissions: Supplement to the Corporate Value Chain (Scope 3) Accounting & Reporting Standard. World Resource Institute. Retrieved May 15 2020 from: http://www.ghgprotocol.org/sites/default/files/ghgp/standards/Scope3_Calculation_Guidance_0.pdf.
- [79] J. Gupta, E. Chu, Inclusive development and climate change: The geopolitics of fossil fuel risks in developing countries, *Afr. Asian Stud.* 17 (1-2) (2018) 90–114, <https://doi.org/10.1163/15692108-12341402>.
- [80] J. Mercure, H. Pollitt, J.E. Viñuales, N.R. Edwards, B. Holden, U. Chewprecha, F. Knobloch, Macroeconomic impact of stranded fossil fuel assets, *Nat. Clim. Change* 8 (2018) 588–593, <https://doi.org/10.1038/s41558-018-0182-1>.
- [81] D. Scholten, M. Bazilian, I. Overland, K. Westphal, The geopolitics of renewables: New board, new game, *Energy Policy* 138 (2020), <https://doi.org/10.1016/j.enpol.2019.111059>.
- [82] M.S. Cato, Green economics: Putting the planet and politics back into economics, *Camb. J. Econ.* 36 (5) (2012) 1033–1049, <https://doi.org/10.1093/cje/bes022>.
- [83] Kesteren, Frank van. (2019). Highlights from the Broker Day. The Broker. Retrieved on June 19 2020 from: <https://www.thebrokeronline.eu/highlights-of-broker-day-2019/>.