

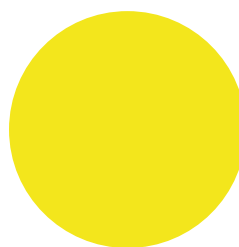
Environmental Financial Accounting in the Public Sector

A Stocktaking of Current Initiatives

Center for Public Financial Management
Antonia Ida Grafl

Working Paper No.1





ZHAW School of Management and Law

Institute of Public Management
Bahnhofplatz 12
P.O. Box
8401 Winterthur
Switzerland

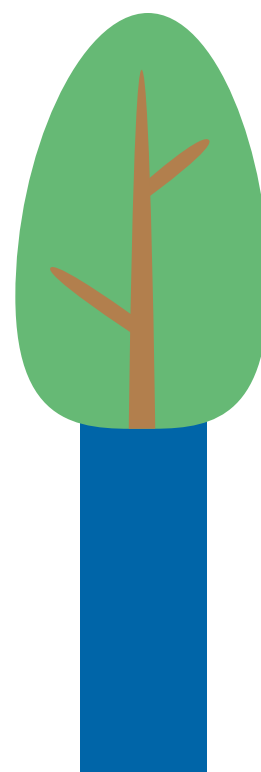
Center for Public Financial Management
<https://www.zhaw.ch/en/sml/institutes-centres/ivm/research-and-consulting/public-sector-financial-management/>

Antonia Ida Graf
antonia.graf@zhaw.ch

April 2021

Copyright © 2021,
ZHAW School of Management and Law

All rights reserved. Nothing from this publication may be reproduced, stored in computerized systems, or published in any form or in any manner, including electronic, mechanical, reprographic, or photographic, without prior written permission from the publisher.



Acknowledgements

This working paper is a knowledge product of the ZHAW School of Management and Law, Institute of Public Management (IPM). It was authored by Antonia Ida Grafl – Lecturer and Senior PFM Expert at the ZHAW Center for Public Financial Management. Valuable comments were provided by Prof. Andreas Bergmann, Director of the Public Sector Department, Dr. Sandro Fuchs, Head of the ZHAW Center for Public Financial Management, and Christoph Schuler, Research Associate and Project Manager at the ZHAW Center for Public Financial Management. Hycent Ajah, Junior PFM Consultant, assisted in the research. This study was reviewed by Bernhard Schatz, Senior Manager at PwC Austria and IPSASB member.

Abbreviations

AASB	Australia Accounting Standards Board
CDSB	Climate Disclosure Standards Board
CIMA	Chartered Institute of Management Accountants
CPA	Chartered Professional Accountants Canada
CP	Consultation Paper
CSO	Civil Society Organization
EFA	Environmental Financial Accounting
ESG	Environmental, social and governance risks
GFSM	Government Finance Statistics Manual
GFS	Government Finance Statistics
GHG	Greenhouse Gas Emissions
GPFR	General Purpose Financial Reports
GRAP	Generally Recognized Accounting Practice
IASB	International Accounting Standards Board
IFRS	International Financial Reporting Standards
IMF	International Monetary Fund
IPSASB	International Public Sector Accounting Board
IPSAS	International Public Sector Accounting
NCA	Natural Capital Accounting
OECD	Organization for Economic Co-operation and Development
PSAB	Canada Public Sector Accounting Board
RPG	Recommended Practice Guidelines
SDG	Sustainable Development Goals
SNA	System of National Accounts
SSB	Sustainability Standards Board
TFCO	Task Force on Climate-related Disclosures
UNEP	United Nations Environment Programme
WEF	World Economic Forum
ZHAW	Zurich University of Applied Sciences

Executive Summary

Failure to act in response to climate change is the most critical worldwide risk according to the global risk map presented at the World Economic Forum (WEF) in 2020. Not only are public sector entities and governments increasingly aware of the gravity of this risk but are also required to take action to combat climate change, as stipulated by UN Sustainable Development Goals (SDGs) and the Paris Climate Agreement. In their report, the Task Force on Climate-Related Disclosures (2020) states that climate-related risks (acute or chronic) and opportunities could impact an entity's financial position, financial performance, and cash flow. Linking environmental data with the accounting information system is one way to make transparent the consequences of global warming for our society and enable governments to make climate-informed decisions.

The concept of Environmental Financial Accounting (EFA) is an approach to financial reporting whereby entities report on their exposure to, and management of, the financial and non-financial impacts resulting from climate change (Borges & Bergamini, 2001)¹. While EFA is gaining ground in the private sector, its conceptualization and use in the public sector is still in the early stages.

This working paper takes stock of current public sector EFA initiatives by identifying relevant stakeholders, focusing on available guidance, and presenting examples of EFA application in the public sector. It finishes with the following main conclusions:

1. The multitude of initiatives and proactive stakeholders in this area underscores the need to systematize Environmental Financial Accounting by connecting and integrating current workstreams. Although much has been done in this regard, a comprehensive, synthesized, public sector-specific approach is needed. The pivotal questions in this respect are, how to develop public-sector EFA further, and who will lead the way in taking this to the next level.
2. Building on existing accounting standards is a pragmatic way forward since many generally accepted recognition and measurement principles could be applied in the context of environmental accounting. IPSAS is the primary reference framework in public sector accounting and provides a suitable starting point. The IPSASB Natural Resource Project will complete the repertoire of accounting standards relevant

for EFA since it addresses accounting for ecosystem services, currently not covered by IPSAS literature. A separate EFA framework is likely to be counterproductive, as it could be associated with an overburdened reporting process and inflated compliance costs. However, efforts should be made to harmonize the IPSAS framework with well-established EFA relevant guidance, such as the recommendations of the Task Force on Climate-Related Disclosures (TCFD).

3. Disclosing high-level information on how entities are affected by climate change is increasingly accepted, while the measurement and recognition of climate-related financial impact is still rare. This could be explained by difficulties in obtaining reliable data and the challenges of measurement. Consequently, additional practice-oriented guidance is needed. When applying standards specifically, the preparers and auditors of financial statements may face highly technical decisions requiring specific skills when evaluating how to account for climate-change-related events, their underlying scenarios, and the ultimate consequences.
4. Efforts should not stop at disclosing climate-related risks along the lines of the TCFD recommendations. Climate change issues should be included in public-sector entities' General Purpose Financial Reports (GPFR), comprising material non-financial and financial information. Governments worldwide need to take immediate action, and comprehensively "greened" financial statements will serve as a robust management tool for ecologically informed decision making.

¹ This approach is sometimes referred to as sustainability reporting.

Table of contents

1. INTRODUCTION	7	6. DEVELOPMENT OF NEW STANDARDS TO ACCOUNT FOR ECOSYSTEM SERVICES	22
2. CONSIDERING CLIMATE CHANGE IMPACTS IN FINANCIAL STATEMENTS	8	6.1. The IPSASB Natural Resource Project	22
3. THE CONCEPT OF ENVIRONMENTAL FINANCIAL ACCOUNTING	10	6.2. Examples of Country Initiatives to Account for Natural Resources	23
4. AVAILABLE GUIDANCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES	12	6.2.1. Colombia	23
4.1. Task Force on Climate-related financial disclosures (TCFD)	12	6.2.2. South Africa	23
4.1.1. Governance Recommendation	13	7. OTHER CURRENT INITIATIVES	24
4.1.2. Strategy Recommendation	13	7.1. United Nations Climate Change Conference (COP26)	24
4.1.3. Risk Management Recommendation	14	7.2. IFRS Foundation to establish Sustainability Standards Board (SSB)	24
4.1.4. Metrics & Targets Recommendation	14	8. CONCLUSIONS	25
4.2. The International Public Sector Accounting Board	16	9. REFERENCES	26
5. AVAILABLE GUIDANCE ON USING EXISTING ACCOUNTING STANDARDS	17		
5.1. Application of IPSAS in the Context of Climate Change Related Events	17		
5.2. The Climate Disclosure Standards Board (CDSB) and Using International Financial Reporting Standards (IFRS) to Report on Climate Change	20		
5.3. Examples of Country Initiatives on Environmental Financial Accounting Standards	21		
5.3.1. Australian Accounting Standards Board (AASB)	21		
5.3.2. Canadian Public Sector Accounting Board (PSAB)	21		

1. Introduction

The WEF Global Risk Report 2020 reveals that climate-related events are the top five most likely global risks – extreme weather, climate action failure, natural disasters, biodiversity loss, and human-made environmental disasters. Climate action failure is the most critical global risk, according to the WEF (2020).

The United Nations Environmental Programme (UNEP, 2019) Global Environment Outlook Report highlights the impacts of climate change, such as global resource depletion, loss of biodiversity, water scarcity, changes in the hydrological cycle, health impacts, ecosystem degradation, and pollution. The report emphasizes the need for an adequate and urgent policy response based on the principles of sustainable development to protect the earth's

environment and ensure a healthy planet for people's well-being and resilience. A growing awareness of the dangers of global warming and the fact that climate change will have a financial impact on public and private entities means all organizations need to link environmental data with their accounting information systems.

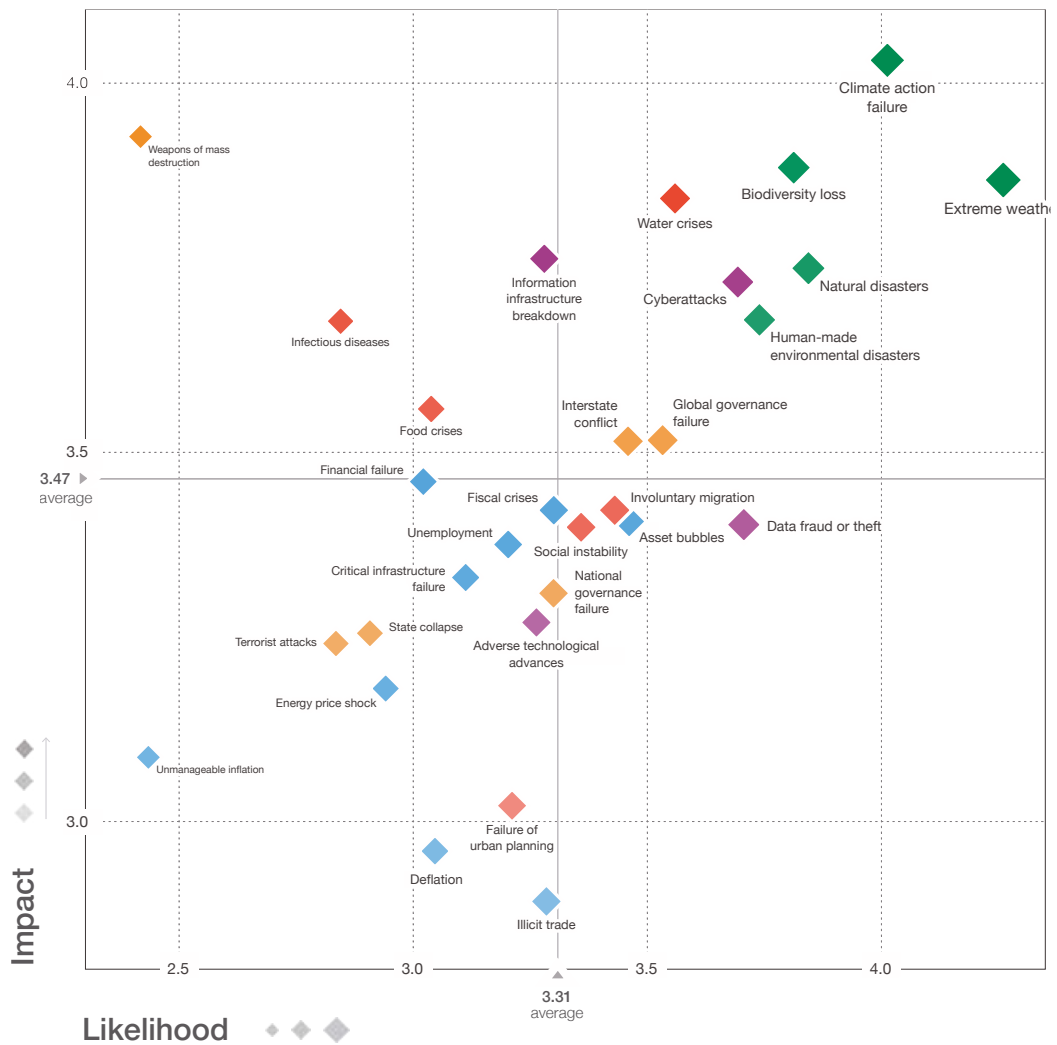


Figure 1: The wicked problems of our time

Source: The Global Risks Report 2020; World Economic Forum, Waves Partnership

2. Considering Climate Change Impacts in Financial Statements

Several climate-related risks and opportunities that impact the financial statements of an entity can be identified and are outlined in Figure 2.

The Australian Accounting Standards Board (AASB) & International Accounting Standards Board (IASB) practice statement (2019, p. 6) indicates that “[...] while there are also other emerging risks such as data breach and cybersecurity risks and broader technological and regulatory risks that could be significant for entities, investors have specifically identified climate-related risks as being used in their decision making.” Including environmental concerns (and rewards) within the accounting information system is increasingly considered best practice (at least in the private sector). The practice statement above also offers several examples of recent statements by investors – such as Blackrock, HSBC, Vanguard, Superfund, and others – pointing out that climate-related impacts are “not adequately addressed in annual reports” (2019, p. 6) and demanding that climate reporting to give a true and fair view of the financial position and performance of business entities.

Accounting data serve as key performance indicators informing the decisions of existing and potential investors, creditors, insurers, and customers. Hence, climate change is relevant to financial reporting, and “preparers of financial statements need to pay attention to this” (CDSB, 2020, p. 8).

In this regard, the IASB published a paper in 2019 clarifying that “material climate-related matters may need to be reflected in the amounts recognised in a company's financial statements and/or require disclosure in the relevant notes to the financial statements” (CDSB, 2020, p. 8).

Growing concerns by public sector stakeholders, such as multilateral organizations, international development agencies, civil society organizations (CSOs), and the wider public increasingly necessitate an approach to financial accounting whereby public sector entities also report on their exposure to – and management of – financial and non-financial impacts resulting from global warming.

Moreover, public sector entities and governments may even be required to report on and take action to combat climate change, as stipulated by UN SDGs and the Paris Climate Agreement, the first legally binding and sanctionable covenant to limit CO₂ emissions and global warming. Currently, 125 countries, including the G25 countries, are committed to net-zero emissions by 2050 (Mark, 2020). In addition, the International Monetary Fund (IMF), a regular informant of financial market participants alongside rating agencies, has decided to integrate climate considerations in their annual economic country assessments – the so-called Article IV consultations (IMF, 2021). These initiatives provide a strong momentum to incorporate climate change considerations into public sector financial reporting.








Risks		Opportunities	
 Transition	Policy and Legal <ul style="list-style-type: none"> ▶ Carbon pricing and reporting obligations ▶ Mandates on and regulation of existing products and services ▶ Exposure to litigation 	 Resource Efficiency	<ul style="list-style-type: none"> ▶ Use of more efficient modes of transport and production and distribution processes ▶ Use of recycling ▶ Move to more efficient buildings ▶ Reduced water usage and consumption
	Technology <ul style="list-style-type: none"> ▶ Substitution of existing products and services with lower emissions options ▶ Unsuccessful investment in new technologies 		 Energy Source
 Physical	Market <ul style="list-style-type: none"> ▶ Changing customer behavior ▶ Uncertainty in market signals ▶ Increase cost of raw materials 	 Products & Services	<ul style="list-style-type: none"> ▶ Development and/or expansion of low emission goods and services ▶ Development of climate adaptation and insurance risk solutions ▶ Development of new products or services through R&D and innovation
	Reputation <ul style="list-style-type: none"> ▶ Shift in consumer preferences ▶ Increased stakeholder concern/negative feedback ▶ Stigmatization of sector 	 Markets	<ul style="list-style-type: none"> ▶ Access to new markets ▶ Use of public-sector incentives ▶ Access to new assets and locations needing insurance coverage
	<ul style="list-style-type: none"> ▶ Acute: Extreme weather events ▶ Chronic: Changing weather patterns and rising mean temperature and sea levels 	 Resilience	<ul style="list-style-type: none"> ▶ Participation in renewable energy programs and adoption of energy-efficiency measures ▶ Resource substitutes/diversification

Figure 2: Climate-related risk and opportunities from the perspective of a private sector entity

Source: Recommendations of the Task Force on Climate-related Financial Disclosures (2017), p. 14

3. The Concept of Environmental Financial Accounting

The concept of Environmental Financial Accounting was first theorized as a new field in 1998, following the Financial and Accounting Report on Environmental Liabilities and Costs by the UN Intergovernmental Working Group of Experts on International Standards of Accounting and Reporting (Borges & Bergamini, 2001). While EFA is gaining acceptance in the private sector, its conceptualization and use in the public sector is still in the early stages.

EFA refers to a broad concept that encompasses all activities associated with presenting financial and non-financial environmental information in financial statements. Moisescu and Anghel (2006) define EFA as the “external reporting of environmental and financial benefits in (sometimes verified) corporate environmental reports or published annual reports.” They also note that EFA is based on an entity’s activity, and as there are no specific accounting standards, it is reported in line with the required accounting standard issued by the various professional accounting bodies.

EFA differs from two related concepts, namely, Environmental Accounting and Environmental Management Accounting. The former relates to a statistical framework focused on the collection, analysis, disclosure, and publication of information about the environment, such as environmental risks, environmental impacts, the value of ecosystem services, cost, liabilities, and environmental performance (see UNCTAD, 2002). The latter can be defined as “an accounting approach that considers the financial impacts of environmentally related activity such as the implementation of environmental protection expenditure, costs of legislative compliance and investment. The costs are allocated and tracked to meet the organization’s own business needs, mirroring the traditional management accounting techniques” (Moisescu & Anghel, 2006).

In its report, the Task Force on Climate-Related Disclosures (TFCD, 2020) states that climate change is a non-diversifiable financial risk with a financial impact on many private and public sector entities regarding their revenues, expenditure, assets, liabilities, capital, and financing. Climate-related risks (acute or chronic) and opportunities can hence impact an entity’s financial position, financial performance, and cash flow.

rowing concerns by public sector stakeholders, such as multilateral organizations, international development agencies, civil society organizations (CSOs), and the wider

public increasingly necessitate an approach to financial accounting whereby public sector entities also report on their exposure to – and management of – financial and non-financial impacts resulting from global warming.

Moreover, public sector entities and governments may even be required to report on and take action to combat climate change, as stipulated by UN SDGs and the Paris Climate Agreement, the first legally binding and sanctionable covenant to limit CO₂ emissions and global warming. Currently, 125 countries, including the G25 countries, are committed to net-zero emissions by 2050 (Mark, 2020). In addition, the International Monetary Fund (IMF), a regular informant of financial market participants alongside rating agencies, has decided to integrate climate considerations in their annual economic country assessments – the so-called Article IV consultations (IMF, 2021). These initiatives provide a strong momentum to incorporate climate change considerations into public sector financial reporting.

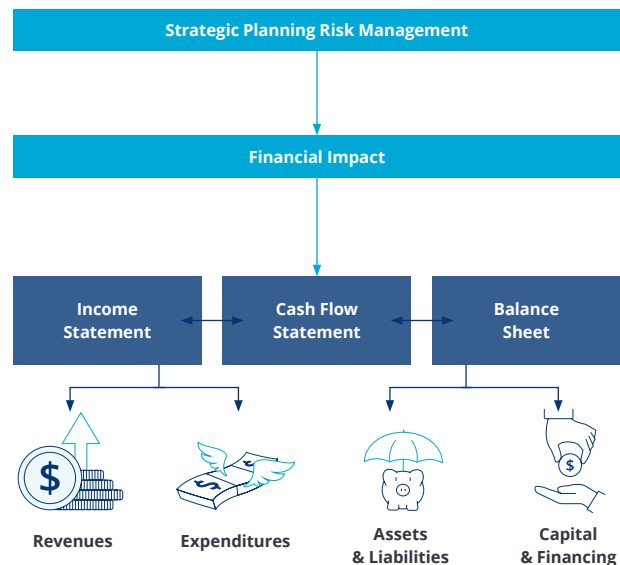


Figure 3: Climate-related risks & opportunities impacts financial statements

Source: Recommendations from the Task Force on Climate-related Financial Disclosures (2017), p. 14

Chartered Professional Accountants Canada (CPA) (2019) highlights several examples of how climate change potentially affects financial statements:

- Impairment or damage caused by climate-related events (e.g., increasing frequency and severity of extreme weather) may affect the useful life of certain assets.
- The upgrade of critical infrastructure might become necessary (e.g., roads, bridges, dams, levees, sewers, and drainage systems).
- Increases in the significance and number of asset retirement obligations if publicly owned sites are contaminated or do not meet environmental standards resulting from climate-related events (such as flooding).
- Changes in insurance liabilities and premiums owing to climate-related damages, such as crop insurance.
- The increased cost of capital if credit rating agencies project climate risk into public entity, long-term planning, and operations.
- Increased provisions associated with service disruptions caused by climate-related events.
- Other potential going-concern implications of climate-related risks.

These impacts are particularly critical in countries and jurisdictions heavily dependent on natural resources and/or tourism as primary sources of revenue (CPA, 2019).

In the following section, this report attempts to systematize public sector Environmental Financial Accounting by considering current initiatives, identifying relevant stakeholders, focusing on available guidance, and presenting examples of EFA applications in the public sector.

4. Available Guidance on Climate-Related Financial Disclosures

4.1. TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES (TCFD)

The TCFD was established in 2015 following a request by the G20 finance ministers and central bank governors and has 32 members comprising banks, insurance companies, pension funds, and credit rating agencies. Its mission is to develop voluntary and consistent recommendations for disclosing climate-related financial risk by private sector entities. This would provide relevant information to financial market participants on how companies are affected by climate change and how they can manage the transition to a low-carbon economy.

As clarified by the International Public Sector Accounting Board (IPSASB) (IPSASB, 2020a), the TCFD recommendations are based on the principles of the SDG requirement to report these. Although the recommendations were initially designed for the private sector, they can also be applied to the public sector. The TCFD is a central and well-established player in terms of climate-related disclosures and enjoys a high level of international attention: As of 2020, more than 1,500 organizations support its recommendations, and “nearly 60% of the world’s 100 largest public companies support the TCFD, report in line with the TCFD recommendations, or both” (FSB, 2020, p.1).

The TCFD is not the only organization to have issued recommendations for the disclosure of climate-related issues. The International Federation of Accountants (IFAC), alongside other accounting bodies and international organizations, published a guide in 2020 on disclosure – specifically to report on SDGs – which also draws on TCFD recommendations (Adams, Druckman, & Picot, 2020). However, the IFAC guide is not specific to climate change-related events and is, therefore, less relevant to our report.

In 2017, the TCFD (2017) published its first comprehensive report, including four thematic recommendations (see Figure 4) on climate-related financial disclosure that applies to the annual financial reports of public and private entities across jurisdictions, countries, and sectors.

The TCFD believes its recommendations will enable various entities to understand and manage climate-related issues better since these directly affect their day-to-day businesses. Furthermore, publicizing the recommended

disclosures in the annual financial statement will foster stakeholder engagement and understanding of climate-related risk and opportunities and ensure appropriate governance and control by Chief Financial Officers and audit committees to produce and disclose the required information (TCFD, 2017).

Finally, the TCFD requires organizations to make financial disclosures in tandem with their national disclosure requirements. If the recommendations conflict with national disclosure requirements, the TCFD encourages organizations to disclose these elements in other official company reports.



Governance

The organization's governance around climate-related risks and opportunities

Strategy

The actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning

Risk Management

The processes used by the organization to identify, assess, and manage climate-related risks

Metrics and Targets

The metrics and targets used to assess and manage relevant climate-related risks and opportunities

Figure 4: Core elements of recommended climate-related financial disclosures

Source: TCFD Report (2017), p. 6

The four thematic TCFD recommendations are outlined in the following subsections.

4.1.1. Governance Recommendation

This relates to the disclosure of the organization's governance concerning climate-related events. The recommended disclosures include (TCFD, 2017):

- a. A description of the board's supervisory role on climate-related risks and opportunities, such as:
 - the process and regularity by which the board and/or board committees (e.g., audit or risk committees) are informed about climate-related risk and opportunities,
 - the extent to which the board and/or board committees consider climate-related events when formulating strategy, operations planning, risk management policies, annual budgets, and business plans. In addition, this includes outlining the organization's performance objectives, the monitoring and supervision of major capital expenditures, acquisitions, and divestitures, and
 - strategies adopted by the board to monitor and evaluate progress based on targets for addressing climate-related risk and opportunities.
- b. A description of the role of management in the assessment and handling of climate-related events, such as:
 - whether the entity has designated climate-related responsibilities for management positions or committees, including reporting requirements to the board or a board-appointed committee,
 - a description of the associated organizational structure(s) for assessing and managing climate-related risk,
 - procedures by which management is informed about climate-related issues, and
 - the strategies adopted by management to monitor climate-related issues.

4.1.2. Strategy Recommendation

This relates to disclosing the actual and the potential effects of climate-related financial risk and opportunities on the entity's operations, strategy, and financial planning. The recommended disclosures include (TCFD, 2017):

- a. A description of the entity's short, medium, and long-term climate-related risks and opportunities, including:

- an explanation of what the organization considers to be the relevant short-, medium-, and long-term time frames, taking into account the useful life of the organization's assets or infrastructure, especially since climate-related issues tend to be evident in the medium- and longer-term,
 - an explanation of the specific climate-related issues for each time frame (short, medium, and long term) that could have a material financial impact on the organization, and
 - an explanation of the procedure(s) used by the entity to determine what risks and opportunities could have a material financial impact.
- b. A description of the impact of climate-related risk and opportunities on the entity's business, operation, and financial planning, such as products and services, supply chain, and/or value chain, adaptation and mitigation activities, investment in research and development, operations, operating costs and revenues, capital expenditures and capital allocation, acquisitions or divestments, and access to capital.
- c. A description of the feasibility of the entity's strategy taking into account different climate-related scenarios, such as:
- how the organization's strategies could be affected by climate-related risks and opportunities,
 - the possibility that an organization's strategies might change in order to address such potential risks and opportunities, and
 - a description of possible climate-related scenarios (such as a rise in temperature) and the associated time horizon(s) for each scenario.

4.1.3. Risk Management Recommendation

This recommendation relates to the disclosure disclosing how the entity identifies, assesses, and manages climate-related risk. The recommended disclosures include (TCFD, 2017):

- a. A description of the entity's procedures for identifying and assessing climate-related risks, such as
- procedures for assessing the possible size and scope of identified climate-related risks and
 - definitions of risk terms and references to be adopted in the risk classification frameworks used.

- b. A description of the entity's processes for managing climate-related risks.
- c. A description of how the processes for identifying, assessing, and managing climate-related risks are integrated into an entity's overall risk management.

4.1.4. Metrics & Targets Recommendation

This relates to disclosing the metrics and targets used to assess and manage climate-related risks and opportunities where such information is material. The recommended disclosures include (TCFD, 2017):

- a. The disclosure of the key metrics used by the business entity to assess climate-related risks and opportunities in line with its strategy and risk management processes, including metrics on climate-related risks associated with water, energy, land use, and waste management, where appropriate and relevant.
- b. The disclosure of greenhouse gas emissions (GHG) of Scopes 1 and 2 – and where appropriate Scope 3 – including the related risks. This requires GHG emissions to be calculated based on the GHG protocol methodology to allow for aggregation and comparability across entities, sectors, and jurisdictions.
- c. A description of the key climate-related targets used by the organization to manage climate-related risks and opportunities, including GHG emissions, water usage, energy usage, etc.

4.2. THE INTERNATIONAL PUBLIC SECTOR ACCOUNTING BOARD

The IPSASB published a Q&A in 2020 (IPSASB, 2020a), outlining how International Public Sector Accounting Standards (IPSAS) accounting requirements and Recommended Practice Guidelines (RPGs) are relevant to climate change reporting. Governments that have adopted the UN SDGs can use existing IPSAS guidance (ibid.) to report on climate-related impacts on service performance objectives of public sector entities and the progress made in terms of implementing SDGs. When preparing general-purpose financial reports (which typically include financial statements and other relevant financial and non-financial information), the IPSASB encourages public sector entities to follow the respective RPGs.

As noted in the Q&A document, RPGs 1-3 are relevant to climate change reporting (IPSASB, 2020a):

- a. RPG 1 - Reporting on the long-term sustainability of an entity's finances:
 - When developing their projections on inflows and outflows, public sector entities should consider relevant climate-related financial impacts.
 - For jurisdictions that have adopted SDGs, the long-term financial impact of these goals should also be disclosed.
- b. RPG 2 - Financial statement discussion and analysis:
 - Climate-related trends, risks, and uncertainties that impact a public sector entity's financial position, financial performance, and cash flows should be disclosed.

- c. RPG 3 - Reporting service performance information:
 - If climate change impacts the services that a public entity provides, it is recommended that the respective entity reports this fact.
 - Reporting on targets to achieve climate change-related SDGs – and the extent to which they have been achieved – is encouraged.

In addition to the above-mentioned RPGs, IPSAS 1 on the presentation of financial statements requires a public sector entity to disclose information on “key sources of estimation uncertainty, which could include climate change-related risks if these risks are expected to have a material impact on the carrying amounts of assets and liabilities in the future or on an entity's ability to continue as a going concern” (IPSASB, 2020a, p. 4)

Example of climate-related financial disclosure - The City of Auckland

Since the publication of the TCFD recommendations in 2017, examples of applying these recommendations in the public sector can be found in several local administrations and cities across Canada, New Zealand, Australia, and the United Kingdom. Below is a brief example of climate-related financial disclosure following the four recommendations of the TCFD, taken from the City of Auckland Annual Report 2019/2020. Other examples exist for Vancouver, Toronto, and the Bank of England.

Governance: The Auckland City Council delegated the responsibility for climate-related disclosure to two committees – the Environment & Climate Change Committee and the Audit & Risk Committee. The Environment & Climate Change Committee is responsible for the broad strategy and policy formulation regarding environment and climate change activities. At the same time, the Audit & Risk Committee plays an advisory role to Auckland City Council on governance, risk management, and internal control matters relating to climate change. Furthermore, various local boards provide strategic direction to their respective local areas and support local authorities in addressing climate change issues.

Strategy: The Auckland City Council has outlined several documents highlighting the strategy for addressing climate change, such as the 10-year budget for climate

change, which focuses on reducing Auckland's GHG emissions and preparing for climate change impacts by

- incorporating climate considerations into planning and decision making,
- increasing public awareness and fostering behavioral change,
- adopting a climate-resilient infrastructure,
- adopting low carbon transportation, and
- reducing corporate emissions.

Risk Management: The Enterprise Lead Team set up by the Auckland City Council is responsible for climate change risk management. This involves identifying new risks, risk rating, classifying existing risks, and risk mitigation. The Enterprise Lead Team's report is validated by the Audit & Risk Committee.

Metrics: The Auckland City Council has published its CO2 emissions, including those of its subsidiaries, and set a short-term target of a 50 percent reduction in greenhouse gas emissions by 2030 as well as a long-term target of zero net emissions by 2050.

The City of Auckland publishes its annual reports online, including a volume on climate disclosure based on TCFD recommendations alongside their financial statements. The municipality also makes a great effort to communicate how residents will be affected by climate change and the relate

Source: ACC, 2020

5. Available Guidance on Using Existing Accounting Standards

5.1. APPLICATION OF IPSAS IN THE CONTEXT OF CLIMATE CHANGE RELATED EVENTS

The IPSASB acknowledges that global warming may impact a public sector entity's financial position, financial performance, and cash flow. As noted in the respective guidance, several IPSASs may be applied in accounting for the effect of climate change in public sector entities financial statement:

a. IPSAS 17: Property, Plant and Equipment

- Public entities must periodically review the estimated residual value and useful life of their assets based on the anticipated impact of climate changes, such as changes in weather patterns.
- For example, extreme weather events could negatively impact the useful life of certain assets such as buildings, plants, and equipment. (IPSASB, 2020a)

b. IPSAS 19: Provision, Contingent Liabilities and Contingent Assets

- The IPSASB notes that provisions arising from the legal obligation to comply with climate and environmental laws and regulations and communicating details of plans to mitigate or adapt to the impact of climate change may be regarded as constructive obligations and should, therefore, be recognized in the financial statement.
- Furthermore, changes in climate and environmental

laws and regulations, or changes in the estimated costs of compliance with climate and environmental laws and regulations could also lead to the recognition of provisions for onerous contracts. (IPSASB, 2020a)

c. IPSAS 21: Impairment of Non-Cash-Generating Assets & IPSAS 26: Impairment of Cash Generating-Assets

- IPSASB notes that climate-related laws and regulations may adversely affect not only an entity's expected cash flow but also the service delivery that an asset can generate.
- This could further impact the recoverable service or recoverable amount of an asset and should, therefore, be recognized in the financial statement. (IPSASB, 2020a)

d. IPSAS 29: Financial Instruments: Recognition and Measurement Financial Instruments, & IPSAS 41: Financial Instruments

- Changes in climate-related laws and regulations may adversely affect the valuation of financial instruments, especially if these instruments comprise real estate and agricultural investments owned by the entity.
- Furthermore, the climate-related risk may affect the public entity's cost of capital when refinancing its debt or bond and should, therefore, be recognized in the financial statement. (IPSASB, 2020a)

Example of the impact of climate change on buildings

A Canadian study shows that severe and frequent temperature fluctuations can have a permanent effect on building constructions and substantially reduces the durability and resilience of construction materials, such as concrete, wood, steel, and plastic. Depending on the timeframe and underlying scenario, this impairment ranges from 10-45% (National Research Council Canada, 2020).

Consequently, the useful life of these assets is reduced accordingly, and the annual depreciation rate and the investment budget necessary for maintaining buildings increases accordingly.

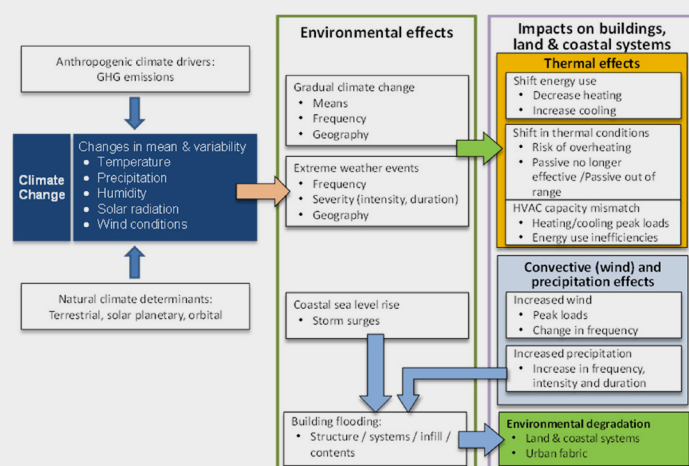


Figure 5: Climate change and impacts on buildings
Source: National Research Council Canada (2020), p.5

Source: PwC, 2020

Example of forming a provision as the result of climate change

The Government Accountability Office in the United States illustrates in a report (GAO, 2020) that an additional budget of USD 48.3 million was needed to relocate

municipalities owing to rising sea levels and unsustainable oil and gas production. This would require recognizing a corresponding provision.

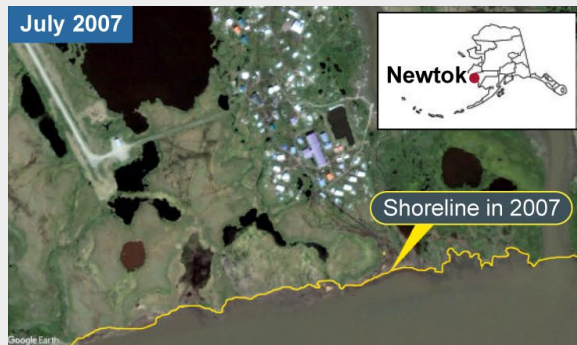


Figure 6: Shoreline erosion at Newtok, Alaska

Source: PwC, 2020

Example of climate-related risk in the calculation and analysis of asset impairment

“The recoverable value estimates used in the impairment of assets analysis considers climate change risk through the adjustment of cash inflows associated with the planned closure of AGL's Liddell Power Station. This recoverable value estimate demonstrates that the carrying value of AGL's Group Operations CGU is not impaired. Management recognizes that there is an increased pace of change in the energy industry and associated political landscape and will continue to work towards incorporating quantification of the financial impact of climate change and related policies within our annual financial filings in accordance with Australian Securities and Investments Commission (ASIC), Australian Prudential Regulation Authority (APRA), and Australian Accounting Standards Board (AASB) recommendations. Notwithstanding the above, any change to the planned closure dates of AGL's coal-fired generation plants because of climate change may have a material impact on the National Electricity Market and may result in a material change to AGL's estimated cash inflows. No impairment loss has been recognized for the Customer Markets, Wholesale Markets or the Group Operations CGUs for the year ended 30 June 2019 (2018: \$nil).”

Source: AGL Annual Report 2019, p. 111

An example from the Commonwealth Bank Annual Report (2019)

“Climate risk is a risk for the Group. The impacts of climate change have the potential to affect our customers' ability to service and repay their loans, and the value of collateral the Group holds to secure loans. These impacts include long-term changes in climatic conditions, extreme weather events, and the action taken by governments, regulators, or society more generally to transition to a low carbon economy. The Group is a major provider of non-retail loans. A key step in credit risk due diligence for non-retail lending is the assessment of potential transactions for environmental, social and governance (ESG) risks, including climate risk, through our ESG Risk Assessment Tool. All Institutional Banking and Markets loans, as well as large loans in other business units, are evaluated through the Group's compulsory ESG risk assessment process. The risk of climate change is assessed at origination and during the annual review process. Exposures with medium or high-risk profile are subject to additional due diligence and heightened consideration and assessment in the credit process. As of 30 June 2019, there is no material risk of loss due to climate-related risk in our client exposures.”

Source: Commonwealth Bank Annual Report 2019, p. 206

5.2. THE CLIMATE DISCLOSURE STANDARDS BOARD (CDSB) AND USING INTERNATIONAL FINANCIAL REPORTING STANDARDS (IFRS) TO REPORT ON CLIMATE CHANGE

The CDSB is an international consortium of business and non-profit organizations working on disclosing climate-related financial implications in a company's financial statement. In December 2020, the CDSB issued guidance on accounting for climate-related risk and events, seeking to bridge financial accounting standards with TCFD recommendations. CDSB guidance (2020) focused on four main IFRSs, similar to those IPSASs discussed above – the Presentation of Financial Statements (IAS 1); Provisions, Contingent Liabilities, and Contingent Assets (IAS 37); the Impairment of Assets (IAS 36); and Property, Plants, and Equipment (IAS 16).

In addition, the IFRS Foundation also released a statement (IFRS, 2020b) in support of the consistent application of requirements in IFRS since these relate to climate change reporting. Although each publication is based on IFRS and addressed mainly to the private sector, it is also relevant to public sector entities in countries that apply IFRS for financial accounting in the public sector, such as the United Kingdom.

The scope of CDSB IFRS guidance, however, is broader as additional standards are listed as relevant in the context of reporting on global warming, such as the following non-exhaustive entries (IFRS, 2020b)²:

- a. IAS 2: Inventories
 - Climate-related risks may cause an organization's inventories to become obsolete, decrease their selling price, or increase their completion cost.
 - Applying IAS 2 to climate-related risks requires the company to record these inventories at their net realizable value.
- b. IFRS 17: Insurance Contracts
 - Climate-related risk could lead to increases in the occurrence or magnitude of insured events or accelerate their occurrence frequency.

² It should be noted, however, that the list of standards mentioned – IFRSs as well as IPSASs – cannot be seen as exhaustive since any standard might be relevant in the context of environmental accounting under certain conditions.

- Examples include the disruption of businesses, property damage, loss of life, and illness. Consequently, climate-related risks need to be factored into insurance contract liabilities.

c. IFRS 13: Fair Value Measurement

- Climate-related risks may affect the fair-value accounting of assets and liabilities in an organization's financial statements.
- For example, the perception by economic agents about climate and environmental law and regulations could affect the fair value of an asset or liability. IFRS 13, therefore, requires assumptions to be made about climate-related risks, when taken by participants in the market.

ON ENVIRONMENTAL FINANCIAL ACCOUNTING STANDARDS

5.3.1. Australian Accounting Standards Board (AASB)

The AASB also outlined a set of accounting standards that can be used to determine the financial implications arising from climate-related risks and opportunities. The guidance issued by the AASB focuses on the following criteria already been covered in earlier discussions, such as the presentation of financial statement, impairment of assets, property, plant and equipment, fair value measurement, provision, contingent liabilities and contingent assets, financial instruments, and financial instrument disclosure (see AASB, 2019).

5.3.2. Canadian Public Sector Accounting Board (PSAB)

The Canadian PSAB published a tool to help cities and public entities assess the financial reporting implications of climate-related impacts. In contrast to other guidance mentioned previously, the tool touches on the central question of materiality, which triggers a requirement by entities to recognize or disclose climate concerns in their financial statements. Consequently, it is more comprehensive and specific than the recently developed materiality practice statement by the IASB (paragraphs 40-55), or the respective IPSASB Q&A dated 2017, as it specifically targets tangible climate-related events. The tool highlights several questions designed to help identify the impact of climate change on the financial position of a city administration or public entity.

6. Development of New Standards to Account for Ecosystem Services

The ecosystem is the foundation of every economic activity as it provides (natural) capital, which underpins all its forms, including financial capital because “[...] ultimately, we rely on it for everything” (CIMA, 2014, p.3). Natural Capital Accounting (NCA) is a concept aimed at integrating the value of ecosystem services and goods, such as fertile soil, multi-functional forests, productive land and seas, fresh water, and clean air into accounting and reporting systems (EC, n.d.). NCA becomes highly relevant as material off-balance sheet liabilities accumulate in response to climate change, threatening the long-term financial sustainability of the public sector (CIMA, 2014).

While NCA is a well-developed approach in Government Finance Statistics (GFS) – covering issues such as measurement, recognition, and disclosure of certain assets – the issue of accounting for natural resources has (with a few exceptions) not yet penetrated public sector accounting logic, and a public sector-specific, international accounting standard is still missing. IFRS 6 on the exploration and evaluation of mineral resources “provides guidance on the accounting of exploration and evaluation expenditures,” however, “it does not address the accounting for the natural resources themselves” (IPSASB, 2020b, p. 2).

Several professional bodies, such as the Chartered Institute of Management Accountants (CIMA, 2014), have pushed the subject and provided thought-provoking impulses. The IPSASB is now about to put theory into practice with the launch of its Natural Resource Project.

6.1. THE IPSASB NATURAL RESOURCE PROJECT

In its 2018 Fiscal Monitor on managing public wealth, the IMF highlights that natural resource assets account for 38 percent of GDP in the 31 economies examined in the report. The IPSASB (IPSASB, 2020b) acknowledges that natural resources make up the majority of public sector assets and that managing them sustainably has become a priority for many governments: “From a public interest perspective, the financial reporting of natural resources, which is referring to the accounting of the underlying resources themselves, is an important issue. In jurisdictions with resource-based and resource-rich economies, the identification and quantification of these resources prior to their extraction or other use should inform policy decisions about such potential use and impacts” (IPSASB, 2020b, p. 1).

However, accounting for the value of ecosystem services is not covered by IPSAS literature, and the term natural resources is not defined (IPSASB, 2020b). In 2019, the IPSASB initiated its Natural Resource Project to develop accounting standards for living resources, subsoil resources, and water. While the transparency of climate-related financial impacts on these assets was not the primary objective, certain environmental events, such as biodiversity collapse, will impair natural resources, resulting in a loss. In this regard, IPSASB constituents noted that “[...] the correct measurement of natural resources is an important input into environmental sustainability” (IPSASB, 2020b, p. 1).

Currently, a Consultation Paper (CP) is being developed, which will form the basis for one or more Exposure Drafts addressing issues relating to recognition, measurement, presentation, and disclosure of natural resources, whose common characteristic is that they “exist without human action, i.e., prior to extraction, cultivation or harvest” (IPSASB, 2020b, p. 2). In doing so, the IPSASB will draw on GFS definitions of natural resources provided by the System of National Accounts (2008) and the Government Finance Statistics Manual (2014), as well as the respective methodology regarding their measurement (ibid.). During the project, alignment with IFRS 6 (“Exploration for and Evaluation of Mineral Resources”) will also be addressed.

6.2. EXAMPLES OF COUNTRY INITIATIVES TO ACCOUNT FOR NATURAL RESOURCES

6.2.1. Colombia

Colombia implemented accrual-basis public sector accounting standards in line with IPSAS more than ten years ago. In some areas, such as natural resources and the environment, Colombian standards complement the IPSASs. Since respective international accounting guidance is lacking, the accounting standard for non-renewable natural resources in Chapter 13 is based on GFSM 2014 methodology. (IBRD, 2015)

6.2.2. South Africa

In 2017, the South African Accounting Standards Board issued a Standard of Generally Recognized Accounting Practice (GRAP) on natural resources. GRAP differentiates between living and non-living resources and sets out the criteria for those resources to be recognized as an asset. (IPSASB, 2020b)

7. Other Current Initiatives

7.1. UNITED NATIONS CLIMATE CHANGE CONFERENCE (COP26)

The United Nations 26th Climate Change Conference is scheduled to take place in November 2021 in Glasgow, UK, and will include discussions to refine, promote and implement TCFD recommendations (Mark, 2020):

- a. To enhance the quality and quantity of climate-related financial disclosures, deliverables include,
 - a TCFD status report and examination of compliances, the quality and quantity of disclosure, best practice examples, and guidance,
 - the voluntary disclosure of TCFD recommendations by companies, and
 - a comprehensive audit of climate risk and the suitability of climate-related financial disclosure.

- b. To promote the alignment and unification of disclosures globally around the TCFD framework, deliverables include
 - countries establishing a pathway for mandatory TCFD recommendations and climate financial reporting and
 - international standard setters to incorporate TCFD recommendations in accounting standards.

- c. For the establishment of guidelines for mandatory disclosure, deliverables include,
 - a stock exchange to establish TCFD compliance list guidance,
 - regulators and central banks to issue guidance on EFA, and
 - international standard setters to issue globally consistent mandatory EFA based on TCFD recommendations.

7.2. IFRS FOUNDATION TO ESTABLISH SUSTAINABILITY STANDARDS BOARD (SSB)

In March 2021, trustees of the IFRS Foundation announced plans to establish a new SSB under the governance structure of the IFRS Foundation. This initiative aims to achieve coherence and comparability in environmental financial accounting by developing global sustainability reporting standards. A consultation with stakeholders revealed the need for enhanced coordination of organizations providing a wide range of voluntary frameworks and standards, «in order to build a shared vision on which a coherent corporate reporting system can be based» (IFRS, 2020a, p. 7). Notably, the IPSASB has no plans to develop a public sector-specific approach; however, this initiative might provide momentum for a systematized approach that would be highly relevant for public sector organizations.

Official press release on Switzerland becoming a supporter of the TCFD

On 12 January 2021, Switzerland officially became a supporter of the Task Force on Climate-Related Financial Disclosures (TCFD). This move is in line with the country's policy on sustainable finance. At its meeting on 11 December 2020, the Federal Council presented concrete proposals on how to strengthen Switzerland's role as a global leader in sustainable financial services. In this context, the Federal Council called on Swiss companies from all sectors of the economy to implement these recommendations on a voluntary basis from now on. It also decided that a bill should be drafted to make the recommendations binding. The work will be carried out this year, with the private sector and associations being consulted.

Source: FDF, 2021

8. Conclusions

Failure to take action to combat climate change is the most critical worldwide risk, according to the WEF (2020). The gravity of this risk highlights the need for urgent measures in the face of global warming. Linking environmental data with accounting information systems is one way to make transparent the consequences on our society and enable governments to make climate-informed decisions. The following conclusions can be drawn based on the research presented in this working paper:

1. The multitude of initiatives and proactive stakeholders in this area underscores the need to systematize Environmental Financial Accounting by connecting and integrating current workstreams. Although much has been done in this regard, a comprehensive, synthesized, public sector-specific approach is needed. The pivotal questions in this respect are, how to develop public-sector EFA further, and who will lead the way in taking this to the next level.
2. Building on existing accounting standards is a pragmatic way forward since many generally accepted recognition and measurement principles could be applied in the context of environmental accounting. IPSAS is the primary reference framework in public sector accounting and provides a suitable starting point. The IPSASB Natural Resource Project will complete the repertoire of accounting standards relevant for EFA since it addresses accounting for ecosystem services, currently not covered by IPSAS literature. A separate EFA framework is likely to be counterproductive, as it could be associated with an overburdened reporting process and inflated compliance costs. However, efforts should be made to harmonize the IPSAS framework with well-established EFA relevant guidance, such as the recommendations of the Task Force on Climate-Related Disclosures (TCFD).
3. Disclosing high-level information on how entities are affected by climate change is increasingly accepted, while the measurement and recognition of climate-related financial impact is still rare. This could be explained by difficulties in obtaining reliable data and the challenges of measurement. Consequently, additional practice-oriented guidance is needed. When applying standards specifically, the preparers and auditors of financial statements may face highly technical decisions requiring specific skills when evaluating how to account for climate-change-related events, their underlying scenarios, and the ultimate consequences.
4. Efforts should not stop at disclosing climate-related risks along the lines of the TCFD recommendations. Climate change issues should be included in public-sector entities' General Purpose Financial Reports (GPFR), comprising material non-financial and financial information. Governments worldwide need to take immediate action, and comprehensively "greened" financial statements will serve as a robust management tool for ecologically informed decision making.

9. References

AASB- Australia Accounting Standards Board, April 2019: 'Climate-related and other emerging risks disclosures: assessing financial statement materiality using AASB/IASB Practice Statement 2' AASB_AUASB_Joint_Bulletin_May2019.pdf

Aggestam-Pontoppidan, C. and Andernack, I., 2016: Interpretation and Application of IPSAS (pp. 11-30). Chichester: Wiley.

AGL Annual Report 2020. Retrieved from: https://www.agl.com.au/-/media/aglmedia/documents/about-agl/asx-and-media-releases/2020/2097212_annualreport.pdf?f1a=en&hash=82E8FF1E819275718B654F-3B19C7862F

Auckland City Council (ACC) 2020: Annual Report 2020. Retrieved from: <https://www.aucklandcouncil.govt.nz/plans-projects-policies-reports-bylaws/our-annual-reports/Pages/current-annual-report.aspx>

Borges, L.F.X. and Bergamini, S., 2001: Stressing Environmental Financial Accounting Transparency for Decision Making in Brazil. Retrieved from: <file:///C:/Users/grfl/Downloads/SSRN-id272008.pdf>

C. Adams, P. Druckman and R. Picot, 2020: Sustainable Development Goals Disclosure (SDGD) Recommendations. Retrieved from: https://www.ifac.org/system/files/publications/files/Adams_Druckman_Picot_2020_Final_SDGD_Recommendations_updated.pdf

Climate Disclosure Standards Board (CDSB), December 2020: Accounting for climate Integrating climate-related matters into financial reporting. Retrieved from: https://www.cdsb.net/sites/default/files/cdsb_climateaccountingguidance_s_110121.pdf

Chartered Institute of Management Accountants (CIMA) 2014: ACCOUNTING FOR NATURAL CAPITAL. The elephant in the boardroom. Retrieved from: <https://www.cim-aglobal.com/Research-Insight/Accounting-for-natural-capital-the-elephant-in-the-boardroom/>

Commonwealth Bank CBA: Annual Report 2020. Retrieved from: <https://www.commbank.com.au/content/dam/commbank/about-us/shareholders/pdfs/results/fy20/cba-2020-annual-report.pdf>

Chartered Professional Accountants (CPA) Canada, 2019: Climate-related Issues: Questions to Ask Under Existing Public Sector Generally Accepted Accounting Principles (GAAP) and Statements of Recommended Practice (SORPs). Retrieved from: <https://www.cpacanada.ca/en/business-and-accounting-resources/financial-and-non-financial-reporting/sustainability-environmental-and-social-reporting/publications/climate-related-issues-questions-to-ask>

European Commission (EC): Natural Capital Accounting. https://ec.europa.eu/environment/nature/capital_accounting/index_en.htm

Federal Department of Finance (FDF) 2021: Switzerland promotes transparency on climate-related financial risks. Press release retrieved from: <https://assets.bbhub.io/company/sites/60/2021/01/Press-release-TCFD-SwitzerlandV3.pdf>

Financial Stability Board (FSB) 2020: Press release on the TCFD status report. Retrieved from: <https://assets.bbhub.io/company/sites/60/2020/10/FSB-TCFD-2020-Status-Report-Press-Release.pdf>

Government Accountability Office (GAO) 2020: Report to Congressional Requesters: A Climate Migration Pilot Program. Retrieved from: <https://www.gao.gov/assets/710/707961.pdf>

IFRS (a) Foundation, 2020: Consultation Paper on Sustainability Reporting. Retrieved from: <file:///C:/Users/grfl/OneDrive%20-%20ZHAW/Green%20PFM/Accounting/IFRS%20consultation-paper-on-sustainability-reporting.pdf>

IFRS (b) Foundation, 2020: Effects of climate-related matters on financial statements. Retrieved from: <https://www.ifrs.org/content/dam/ifrs/supporting-implementation/documents/effects-of-climate-related-matters-on-financial-statements.pdf>

International Monetary Fund (IMF), 2018: Fiscal Monitor Reports. Managing Public Wealth. Retrieved from <https://www.imf.org/en/Publications/FM/Issues/2018/10/04/fiscal-monitor-october-2018>

International Monetary Fund (IMF), 2021: The IMF is placing climate change at heart of its work. Remarks by IMF Managing Director at the Climate Adaptation Summit. Retrieved from: <https://www.imf.org/en/News/Articles/2021/01/25/sp012521-md-remarks-at-the-climate-adaptation-summit>

International Public Sector Accounting Standards Board, 2019: Natural Resources in the Public Sector. Retrieved from: <https://www.ipsasb.org/system/files/meetings/files/6-Agenda-Item-Natural-Resources-Final.pdf>

International Public Sector Accounting Standards Board (IPSASB) a, 2020: Climate Change: Relevant IPSASB Guidance. Retrieved from: <https://www.ipsasb.org/publications/climate-change-relevant-ipsasb-guidance>

International Public Sector Accounting Standards Board (IPSASB) b, 2020: Natural Resources Project Brief Final. Retrieved from: <https://www.ifac.org/system/files/uploads/IPSASB/Natural%20Resources%20Project%20Brief%20Final%20March%202027%2C%202020.pdf>

Mark C., 2020: Building a Private Finance System for Net Zero COP26. Retrieved from: COP26-Private-Finance-Hub-Strategy_Nov-2020v4.1.pdf

Moisescu, F. and Anghel, O., 2006. Environmental Financial Accounting. Economics and Applied Informatics, (1), pp.79-84.

Montesinos, V. and Brusca, I., 2019: Non-financial reporting in the public sector: alternatives, trends and opportunities: Non-financial information in the public sector: alternatives, trends and opportunities. Journal of Accounting-Spanish Accounting Review, 22(2), pp.122-128.

National Research Council Canada, 2020: Durability and Climate Change Implications for Service Life Prediction and the Maintainability of Building. Retrieved from: <file:///C:/Users/grfl/Downloads/buildings-10-00053.pdf>

NIC- National Intelligence Council, January 2017: 'Global Trends' GT-Main-Report.pdf (dni.gov)

PricewaterhouseCoopers (PwC) 2020: Klimawandel und seine Auswirkung auf das öffentliche Rechnungswesen. PwC Webcast - Public Sector Workshop, held in September 2020.

Task Force on Climate-related Financial Disclosures (TCFD), 2017: Recommendations of the Task Force on Climate-related Financial Disclosures. Retrieved from: <https://assets.bbhub.io/company/sites/60/2020/10/FINAL-2017-TCFD-Report-11052018.pdf>

Task Force on Climate-related Financial Disclosures (TCFD), 2020: Task Force on Climate-related Financial Disclosures Overview. Retrieved from: https://assets.bbhub.io/company/sites/60/2020/10/TCFD_Booklet_FNL_Digital_March-2020.pdf

The World Bank (IBRD) 2015: SAR – Reforma Contable del Sector Público: Política de Regulación Contable Pública de la Contaduría General de la Nación. Nota Técnica: Recursos Naturales no Renovables.

United Nations Conference on Trade and Development (UNCTAD), 2002: Guidance Manual Accounting and Financial Reporting for Environmental Costs and Liabilities. Retrieved from: https://unctad.org/system/files/official-document/iteeds4_en.pdf

UNEP, 2019: Global Environment Outlook 6. Retrieved from: <https://www.unep.org/resources/global-environment-outlook-6>

World Economic Forum (WEF), 2020: The Global Risks Report 2020. Retrieved from: <https://www.weforum.org/reports/the-global-risks-report-2020>

Zurich University
of Applied Sciences

School of Management and Law

Institute of Public
Management

Bahnhofplatz 12
P.O. Box
8401 Winterthur
Switzerland

www.zhaw.ch/sml



swissuniversities