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■ research article

Not a panacea: private-sector engagement in adaptation and adaptation finance in developing countries

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The role of the private sector in climate finance is increasingly emphasized in international political debates. Knowledge of private engagement in mitigating climate change and in more advanced economies is growing, but the evidence base for private-sector engagement in climate change adaptation in developing countries remains weak. Starting from the premise that the private sector's role in adaptation is often inevitable and potentially significant, this article first analyses the potential of private-sector engagement in adaptation and adaptation financing in developing countries by conceptualizing the private sector's roles and motivation therein. For further inquiry, and for a discussion based on a developing-country context, interviews were conducted with key stakeholders for adaptation of Zambia's agricultural sector, including on ways in which the government can incentivize private-sector engagement in adaptation.

How much private-sector adaptation and adaptation finance can be identified depends on the interpretation of the concept of adaptation. Under a broad interpretation, the domestic private sector in particular can contribute substantially to adaptation, both directly and indirectly, through its investments and activities. However, the international private sector's role in financing adaptation should be analysed under a strict interpretation of adaptation and appears limited.

Policy relevance

International political debates increasingly stress the importance of private climate finance, yet are constrained by vagueness around the private sector's role in adaptation finance. This article conceptualizes and scrutinizes private-sector engagement in adaptation and adaptation finance in developing countries. It concludes that the domestic private sector in particular can contribute substantially to adaptation in direct and indirect ways, and that domestic policies incentivize such contributions. However, international private financing of adaptation is more limited and its analysis requires a stricter interpretation of adaptation. Private-sector engagement in adaptation and adaptation finance can supplement, but not substitute for, public investments in adaptation. These limitations are particularly important when discussing private adaptation finance as part of the developed countries' pledge to mobilize US\$100 billion of climate finance per annum from 2020 onwards.

Keywords: adaptation; adaptation finance; agriculture; climate finance; private sector; Zambia

1. Introduction

At the UN Climate Negotiations in Cancun in 2010, developed countries committed to increase financial resources to assist developing countries with climate change adaptation (hereafter

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‘adaptation’) and mitigation to approximately US\$100 billion per year from 2020 onwards (UNFCCC, 2011). As a result of the persistence of developed countries, the private sector was included as one of the sources of finance. Yet, the evidence base for private-sector adaptation is very limited, and grounded on large international companies domiciled in developed markets (Surminski, 2013) rather than the activities of small- to medium-sized enterprises (SMEs) in developing countries. The literature is still very much about conceptualizing private-sector adaptation and adaptation finance (IFC, 2012). This article aims to theorize about the potential of private-sector engagement in adaptation and adaptation financing in a developing-country context. Zambia’s agricultural sector serves as a case study for further inquiry.

As the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) are countries, application of ‘the polluter pays’ principle in this regime implies that developed countries have a responsibility to provide public adaptation finance because their historical emissions largely caused climate change in the first place. Along these lines, developing-country Parties have repeatedly stressed their predisposition for public grants over private financing during UNFCCC negotiations. However, the private sector also has to be investigated. Private-sector investments constitute 86% of global investment and financial flows (UNFCCC, 2007), and 90% of the population in developing countries depends on the private sector for their income (SER, 2011), as small as it may be. Furthermore, public funding alone will not suffice to combat climate change (AGF, 2010; UNEP FI, 2009). Together, these facts demonstrate that engagement in adaptation of the domestic and international private sectors is ‘often inevitable and potentially significant’ (Pauw & Pegels, 2013).

But how are the potential and significance reflected on the ground in developing countries? Private investments might have adaptation benefits, but the main aim of private-sector activity and investment is to have reasonable, relatively quick and predictable returns at acceptable risk (Atteridge, 2011; Christiansen, Ray, Smith, & Haites, 2012). Least Developed Countries (LDCs), in particular, often do not offer enabling environments for these investments, as can be concluded from their systematic low scores on the ‘Doing Business’ ranking of the World Bank and the ‘Global Competitiveness Index’ of the World Economic Forum.

Private investments in adaptation are fundamentally different from and more complex than private investments in mitigation. In mitigation, the cost per ton of abated GHG emissions is a useful proxy to measure the effectiveness of a mitigation measure. Adaptation, however, remains an unclear concept, and is carried out amid uncertainty about actual climate change; furthermore, costs potentially remain with the investor, whereas benefits are often largely public (Abadie, Galarrage & Rübhelke, 2012; IFC, 2012).

Indeed the IPCC’s definition: ‘Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities’ (IPCC, 2007) leaves room for different interpretations on whether (private) investments and activities constitute adaptation. Buchner et al. (2013, p. 12) conclude that ‘there is little agreement on what qualifies as adaptation finance or, more narrowly, as an adaptation intervention’, and they point at the large knowledge gap about the private sector’s role in financing adaptation.

This article addresses this gap with the hypothesis that private-sector engagement in adaptation is inevitable and the role potentially significant, but dependent on the definition of adaptation that is being used. Private-sector engagement in adaptation is examined from a broader perspective than financing alone, for two reasons.

The first is the scale. There is a paradox between adaptation finance (as embedded in the UNFCCC negotiations) being discussed and focusing on international financing and investing, and the local level where adaptation needs to be implemented and managed (Abadie, Galarrage, & Rübhelke, 2012; Ayers, 2011). Both are likely to require the private sector, but in different ways.

The second reason is the close link between adaptation and development. Adaptation is described as development ‘under uncertainty’ (Denton, 2010) or ‘in a hostile climate’ (Romani & Stern, 2013). It goes beyond the scope of this article to analyse the differences and similarities between adaptation and development. However, as the success of adaptation in developing countries relies strongly on broader development (e.g. Ayers, 2011; Huq & Reid, 2004; Klein & Persson, 2008), a broad perspective is required to understand private-sector engagement in adaptation.

This article refers to the private sector as all non-state organizations and individuals, from multinational companies to smallholder farmers. Built on the premise that this wide variety of actors can all contribute to adaptation, this article also explores the ways in which governments – in this case the Zambian government – can incentivize private-sector engagement in adaptation.

Section 2 analyses the different approaches to private-sector engagement in adaptation and adaptation finance, considers the motivations for doing so, and describes how governments can create enabling environments. For consistency reasons, the section focuses on the agricultural sector. Section 3 explains why Zambia’s agricultural sector was selected as a case study and describes the interviewing method. Section 4 provides the results of domestic and international private-sector engagement in adaptation in Zambia, as well as ways to incentivize the private sector to engage more. The final section concludes.

2. Engaging the private sector in adaptation

2.1. Domestic and international private sector

To better understand the private sector’s role in adaptation in developing countries, lessons can be learned from development cooperation. In Zambia, for example, it is recognized that poverty reduction and sustainable development will not be achieved through government action alone (Kivuitu, Yambayamba, & Fox, 2005). However, the role of the private sector in development is complex. Byiers and Rosengren (2012) distinguish between ‘private sector development’ and engaging the ‘private sector *for* development’. The former focuses on domestic economies in developing countries, with their governments designing and implementing policies to encourage economic transformation through investment, productivity growth, business expansion, and employment. The latter is further divided into *activities* for development by encouraging productive investment and leveraging private-sector *finance*. Based on this differentiation, this article distinguishes between ‘domestic private sector adaptation’ and ‘international private sector *for* adaptation’.

‘Domestic private sector adaptation’ in this article relates to domestic-actor adaptation. In developing countries, the income of approximately 90% of the population depends on the private sector (SER, 2011). In Zambia and many other countries, the majority of the population rely on (rain-fed) agriculture; they are vulnerable to climate change but hardly have the means to invest in adaptation (Bryan, Deressa, Gbetibouo, & Ringler, 2009; Pauw, 2013). Many businesses, small enterprises in particular, also lack adequate resources for adaptation (PwC, 2010). To finance their adaptation activities, farmers and

small businesses in developing countries mostly depend on domestic sources (Christiansen, Ray, Smith, & Haites, 2012). Although the impacts of both climate change and adaptation have been studied extensively (IPCC, 2007; World Bank, 2010), domestic private-sector engagement in adaptation is not well documented from a business perspective. Among the few exceptions are Intellectap (2010), Trabacchi and Stadelmann (2013), and Begum and Pereira (2013). According to Intellectap's 2009 study in Asian cities, adaptation interventions such as (affordable) housing, micro-insurance, and water management are always context-specific. Accordingly, small and local businesses are important for adaptation and sometimes better able to respond to the needs of the poorest than government bodies or NGOs. Trabacchi and Stadelmann (2013) show that investments from agribusiness firms (e.g. to train farmers and to facilitate farmers' access to inputs) and local commercial banks (enabling access to finance) in improving resilience of Nepal's agricultural sector can increase farmers' production, but implementation is limited due to the many social and economic constraints and uncertainties. Similarly, in Malaysia, Begum and Pereira (2013) conclude that many businesses have started to recognize that climate change poses risks and opportunities, but there is often a lack of effective frameworks in place to understand and manage these long-term risks and opportunities.

'Private sector *for* adaptation' distinguishes between the international private sector's adaptation activities and adaptation finance. Whether international private-sector *activities* will be outreaching and inclusive is an issue of debate. On a country level, there is a likelihood that only the subset of developing countries with sufficiently low investment risks will be reached (Persson et al., 2009). In terms of sectors and the poor, Atteridge (2011) states that sectors such as water and agriculture have either been relatively unattractive to private investment, or have seen investment in large-scale export-oriented activities but not in the small-scale production that sustains local populations. Case studies of the Private Sector Initiative of the UNFCCC indicate that the private sector can reach poorer countries and people, including in the agricultural sector. For instance, Cafédirect trains thousands of coffee and tea farmers in Africa and Latin America to adapt, while Unilever Tea, at its growing farms in East Africa, responds to deforestation and changing rainfall patterns by investing in efficient irrigation equipment, drought-tolerant tea varieties, and reforestation (UNFCCC, 2014). In both cases, the benefits of companies' investments in their supply chains trickle down to (smallholder) farmers, which enables them to increase their agricultural outputs.

The second subcategory is international private-sector *financing* of adaptation. There is a large knowledge gap about the private sector's role in financing adaptation (Buchner et al., 2013). The financial sector has little experience in identifying and targeting climate adaptation (Persson et al., 2009). The UNFCCC (2007) expects private finance to partially cover adaptation costs, for instance in the sectors of agriculture and infrastructure, with privately owned physical assets. However, they also note that less developed and smaller developing countries still attract limited private investment.

Financing and *activities* (inherently including investment) are difficult to separate, but three broad types of financing can be distinguished (see also Atteridge, 2011; Buchner et al., 2013; Christiansen, Ray, Smith, & Haites, 2012; Intellectap, 2010; Pauw & Pegels, 2013). These types apply to both domestic and international financing, but in the context of international adaptation finance, the descriptions focus on the latter.

First, adaptation can be financed through capital contributions into shareholder ownership (equity and other assets), creditor claims that need to be repaid with interest (debt, loans, bonds, etc.), and hybrid capital instruments (Buchner, Falconer, Hervé-Mignucci, Trabacchi, & Brinkman, 2011).

Typical investors include banks, and pension and private equity funds (Christiansen, Ray, Smith, & Haites, 2012). Given the long-term and uncertain effects of climate change, and the capital markets' orientation towards short-term amortization and risk aversion (Pegels, 2014), it is unlikely that equity and loans will finance stand-alone adaptation projects that are not, simultaneously, attractive in economic terms.

Second, insurance encourages people and societies to reduce their vulnerability, distributes the risks and costs of weather-related events, and can provide relief during and after disaster (Brouwer & Aerts, 2006; CCCD, 2009). Increasing economic losses from extreme weather events can have considerable effects for the insurance sector. It also creates new business opportunities, especially in low-income countries where currently 99% of households and businesses have no disaster insurance (CCCD, 2009). BASIX and ICICI Lombard GIC started the first pilot project on rain-index insurance policies in India in 2003–2011, and years later there are approximately 12 million Indian farmers with weather index insurance (Kato, Ellis, Pauw, & Karuso, 2014). However, some elements can be difficult to implement on a micro-scale (CCCD, 2009) or are too expensive for many people in developing countries (Bouwer & Aerts, 2006).

A third type is philanthropy. The expenditure of foundations on development activities increased to \$4.5 billion in 2006, but flows mainly to health care (Edwards, 2009). Buchner, Falconer, Hervé-Mignucci, Trabacchi, and Brinkman (2011) have guesstimated the annual global adaptation-related philanthropy to be \$210 million. Financial resources from philanthropy can be used more flexibly than commercial investment, because no profitable returns are required (Persson et al., 2009). Governments could incentivize philanthropy for adaptation, but it would remain a modest flow and incentives might divert resources away from urgent development needs.

This article's modification of Byiers and Rosengren's (2012) framework allows for a distinction between (1) domestic private-sector adaptation and (2) international private-sector activities and finance *for* adaptation. Although not perfect, this differentiation is important to better understand the private sector's role in adaptation in developing countries, in particular in the context of international climate finance. The next section explains the motivation of the domestic and international private sector to engage in adaptation.

2.2. Motivation to engage in adaptation

Crosscutting through the three categories of the previous section, two broad categories of private-sector motivation for engagement in adaptation can be identified. The motivations are easily distinguishable, although in practice they might overlap. First, 'climate risk management' is understood as mainstreaming adaptation in business practice to protect revenues and to prevent future costs from changing climatic conditions. These costs derive from direct and indirect risks. Direct risks relate to a company's local exposure to climate impacts such as heat stress, water scarcity, and extreme weather events, causing damage for instance to physical assets, production or health. Indirect risks are based on both local and more distant exposure, as they include the broader effects of climate impacts, such as disruption of infrastructure or supply chains, and impacts on communities or workforce (PwC, 2010) (see Figure 1).

Significant private investments in mainstreaming of direct and indirect risks can be expected (c.f. Christiansen, Ray, Smith, & Haites, 2012). For example, among the 72 multinationals that responded

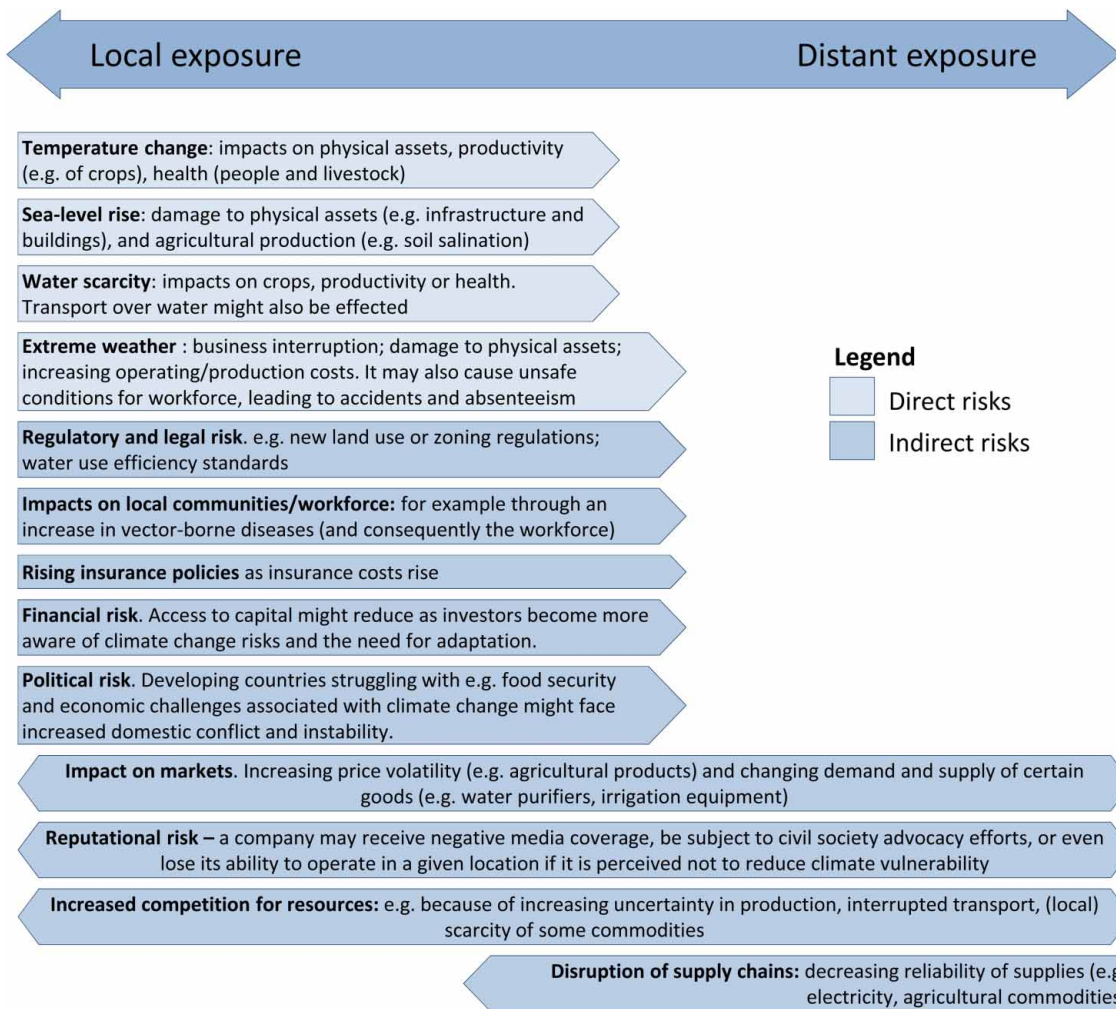


Figure 1 Direct and indirect climate risks for business. *Note:* In line with the case study (see Section 4) this table focuses on the agricultural sector. *Sources:* Updated from PwC (2010), based on e.g. UN Global Compact, UNEP, Oxfam, & WRI (2011)

to the ‘Caring for Climate’ survey, 83% believe that climate change impacts pose a risk to their products or services (UN Global Compact, UNEP, Oxfam, & WRI, 2011). On a national level, Begum and Pereira (2013) for example point out that in Malaysia, 70% of businesses perceive that climate change would affect their profits.

However, it is unlikely that climate risk management activities will be financed as stand-alone adaptation projects (cf. Christiansen, Ray, Smith, & Haites, 2012; Smit & Wandel, 2006). It will be hard to label the additional costs of rising insurance policies, disruption of supply chains, or regulatory risk (see Figure 1) as adaptation, and many investments might pass unnoticed. The visible level of clearly

identifiable adaptation activities and investments may thus understate the actual activity level (Agrawala et al., 2011). Businesses also often consider the academic or political concept of adaptation as a somewhat artificial concept (Berkhout, Hertin, & Gann, 2006); what counts is business continuity.

The second motivation is new markets and business opportunities. In the 'Caring for Climate' survey ($N = 72$), 86% of multinationals expect business opportunities from responding to climate change risks or investing in adaptation solutions (UN Global Compact et al., 2011). Two types of opportunity arise. First, demands are changing. This probably happens in every sector, including agriculture (e.g. pest control, drip-irrigation), communication (e.g. technology and information services), and water management (e.g. water saving and purification) (Intellectap, 2010; Oxfam America, 2009; Persson et al., 2009) (see Table 1). Second, publicly funded adaptation projects such as climate-resilient roads and flood protection barriers require implementation by the (domestic) private sector (cf. PwC, 2010). Such adaptation projects enlarge existing markets but also require specialized companies that understand climate risks and take these into account during project design and implementation.

Table 1 Business opportunities and new markets of adaptation related to agricultural production

Sector	Business opportunity and new markets
Agriculture	<ul style="list-style-type: none"> • Climate-resilient (e.g. drought-resistant) seeds • Pest and disease control products like technologies in seed treatment, food safety, post-harvest disease control, animal health and hygiene, human nutrition, structural pest control, and vector control • Water-saving irrigation systems • Expectation of growth of the biological and reduced chemical market • Weather risk insurance, crop insurance and other insurance products
Communication and information	<ul style="list-style-type: none"> • Advanced weather forecasting systems • Climate change information and consulting services: e.g. to provide climate change risk management strategies, adaptation options, economic, technical, and policy analysis, geographic information system mapping and modelling
Energy	<ul style="list-style-type: none"> • (Off-grid, rural) renewable energy production, using biomass, waste to energy and wind as inputs
Housing and construction	<ul style="list-style-type: none"> • Resilient construction material, e.g. for storage facilities • Resilient buildings, levees, etc., to prevent losses of lives, equipment, and livestock (e.g. from storms and flooding)
Insurance	<ul style="list-style-type: none"> • Direct insurance for agriculture, e.g. weather risk insurance, crop insurance • Indirect insurance for agriculture, e.g. flood insurance • Catastrophe bonds, reinsurance
Water management	<ul style="list-style-type: none"> • Advanced water management technologies: e.g. purification, desalination, and water filtration and reuse, pumps and filtration systems • Water-saving technologies for irrigation • Drainage systems that cope with weather extremes

Sources: Based on Oxfam America (2009), Persson et al. (2009), Intellectap (2010).

The public sector can incentivize both domestic private-sector adaptation and international private-sector adaptation activities and adaptation finance to mainstream climate risks and to capitalize on new business opportunities. On a general level, for instance, the development literature has identified low levels of bureaucracy, an independent judiciary, good roads, a functioning education system, a simplification of business registration procedures, as well as reforms of labour regulations and property titling as elements of a business enabling environment, although there is a lack of clarity about the relative importance of each of these elements (Byiers & Rosengren, 2012; UNIDO & GIZ, 2008).

The climate change literature mentions similar incentives in the context of climate (see, e.g., Kato, Ellis, Pauw, & Karuso, 2014; Sierra, 2011; UNEP, 2011). More specific tools are tax incentives, foreign exchange liquidity facilities, loan guarantees (Buchner, Falconer, Hervé-Mignucci, Trabacchi, & Brinkman 2011); subsidies (UNFCCC, 2007); establishing roadmaps for developing and disseminating key technologies and services; enhanced communication systems between public and private actors, and public–private partnerships (PPPs) through tools such as risk mitigation instruments, insurance, and equities (Kato, Ellis, Pauw, & Karuso, 2014). These take place in a domestic context, but they can also be organized or supported bilaterally or internationally. For instance, business networks and private-sector platforms such as the United Nations Office for Disaster Risk Reduction and the UNFCCC's Private Sector Initiative offer opportunities for information exchange and building partnerships.

The literature focuses mainly on multinationals, financing, and mitigation rather than adaptation and the domestic private sector. More specific examples of the latter include reducing climate risks through land-use regulation for real estate (Bouwer & Aerts, 2006) or water quality standards and temperature limits (Agrawala et al., 2011). The case study in Zambia focuses on domestic private-sector activities and adaptation in particular for the agricultural sector.

3. Case study and method

3.1. Case study: Zambia

Section 2 subdivided the role of the private sector in adaptation into the domestic and international private sectors, and explained the motivation of the private sector to engage in adaptation. Building on Section 2, this article further theorizes the potential of private-sector engagement in adaptation and adaptation finance and ways in which a government can incentivize more engagement. The Zambian agricultural sector was selected as the case study, for three reasons.

First, like many other African countries, Zambia is vulnerable to climate change as many livelihoods depend on rain-fed agriculture. Zambia's economy has grown steadily at 6.4% per year over the period 2006–2010 (MFNP, 2011), and the World Bank lifted Zambia's status to a 'middle-income country' in 2011. However, 72% of the population still has a livelihood in agriculture, most of which is rain-fed (World Bank, 2013). The Zambian government considers the development of agriculture as the engine of income expansion and livelihood improvement, and 'land use' as a priority sector to address climate change (GRZ, 2010). The annual costs of climate change on the agricultural sector are estimated at \$2.2–3.1 billion, or 41–72% of the estimated overall costs in Zambia (MTENR, 2011). The contribution of agriculture, forestry, and fishing to Zambia's gross domestic product (GDP) varies strongly, from 1.9% (2007) to 12% (2008), a difference that can partly be explained by weather

conditions (GRZ, 2010). Increasing dryness has, for example, negatively affected Zambia's soil conditions and caused poor growth of crops (Chaudhury, Ajayi, Hellin, & Neufeldt, 2011; MTENR, 2011). Indeed, since the 1960s, the mean annual temperature has increased by 1.3 °C, whereas rains have decreased by -2.3% per decade. Temperatures are projected to increase by another 1.2–3.4 °C by the 2060s (Mcsweeney, New, & Lizcano, 2008). Second, private-sector adaptation and adaptation finance are relatively new on political and academic agendas, so a frontrunner was selected as a case study. Zambia has established an Interim Climate Change Secretariat and a Disaster Management and Mitigation Unit. High-level climate change focal points are appointed in every ministry. Zambia published the study 'The Economics of Climate Change in Zambia', and formulated a National Climate Change Response Strategy and a National Adaptation Programme of Action (NAPA). In this NAPA, Zambia gives more attention to the private sector than most other NAPAs (Pauw & Pegels, 2013). Zambia has also been successful in attracting multilateral climate finance, for example from the Pilot Programme for Climate Resilience (PPCR), the Global Environment Facility, and UN-REDD (Reducing Emissions from Deforestation and forest Degradation; Watson, van Rooij, & Nakhoda, 2013).

Third, the role of the private sector in Zambia's economy has dramatically changed in recent decades. The private sector in Zambia ranges from large corporations, to SMEs, and to farmers (MFNP, 2011). In 1968, four years after independence, state intervention in the economy caused large-scale nationalization of privately owned companies. One year later, parastatal activities covered all aspects of business, including mining; agriculture; tourism; brewing; housing provision and construction; transportation; electricity and water; and timber and wood products (Fundanga & Mwaba, 1997). From the 1980s to the early 1990s, less than 20% of Zambia's economy was in private hands. Vigorous economic reforms then brought liberalization and rapid privatization; in 2002, 80% of production was in private hands (Fundanga & Mwaba, 1997; Kivuitu, Yambayamba, & Fox, 2005; NORAD, 2002). In combination with prudent macro-economic management and investments in infrastructure as well as services, this has spurred economic growth in Zambia (MFNP, 2011). Zambia is now one of the best scoring LDCs on the Ease of Doing Business Index (World Bank, 2013). It goes beyond the scope of this article to compare private-sector engagement in adaptation in Zambia with more state-dominated economies – but the dramatic changes in Zambia imply that there have been debates about the private sector's role in its economy, and make the country an interesting case study (as was reaffirmed by a respondent from government).

Altogether, from the inquiry in Zambia, lessons could be learned for the global debate on private-sector engagement in adaptation and adaptation finance.

3.2. Method

The groundwork of Section 2 formed the theoretical foundation for interviews in Lusaka in October 2012 ($N = 26$) and subsequent UNFCCC conferences and workshops. All interviews were written up (summary transcription) and analysed qualitatively. In the research design this limited interview sample among a diversity of key stakeholders was preferred over a larger set of empirical data, as it allowed for a more in-depth analysis to better understand causalities. As can be concluded from Pauw and Pegels (2013), private-sector engagement in adaptation in developing countries is relatively new on the political agenda in LDCs. This article did not consider the subsequent exploratory stage of knowledge development, compatible with impending generality, incomparability, and inferiority of

Table 2 Anonymized overview of interviewees

Stakeholder group	Symbol	No. of interviews	No. of interviewees
Government	Gov	10	12
Research	Res	4	3
Private sector	PS	5	7
Development organization	Dev	11	15

interviewing a larger set of less-experienced people in addition to the key stakeholders (c.f. Gschwend & Schimmelpfennig, 2007). In a few years, when the field is more established, a study with a larger sample could provide more conclusive insights. Unlike this article, such a study could also shed light on the effectiveness of private-sector engagement in adaptation, particularly in the wider context of markets and regulations, as well as uncertain climate change projections (c.f. Berkhout, Hertin, & Gann, 2006)

Semi-structured face-to-face interviews lasting 30–60 minutes took place with key informant stakeholders with government, research, private-sector, and development organization backgrounds (Gov, Res, PS, Dev; see Table 2). The latter included domestic NGOs, financing institutions, and bi- and multi-lateral development organizations. Interview questions were grouped according to (1) responsibilities for planning, financing, and implementing adaptation; (2) expectations concerning climate risk mainstreaming in business operations and capitalization on new business opportunities by the private sector; and (3) how to create enabling environments for private-sector engagement in adaptation and adaptation finance.

During the interviews, no definition of ‘private sector’ was given. This allowed respondents to prioritize those segments of the private sector they considered important and to provide the best examples according to their knowledge in the new field of private-sector engagement in adaptation.

To complement the interviews and to triangulate statements, Zambian climate change planning documents were also analysed. Finally, Zambia’s policy-prioritization of adaptation is inherently connected to the international debates on adaptation finance. Therefore, numerous UNFCCC conferences, meetings, and discussions were attended in recent years. These occasions were also used to interview a Zambian researcher, three policy makers, and a representative from civil society on adaptation of the private sector. The research results are tabulated but no statistical analysis is conducted given the limited sample and the diversity of respondents.

4. Results

This section first describes the results for domestic private-sector adaptation and international private-sector activities and finance for adaptation (see Section 2). Second, based on practical examples, it shows the results of how the government can incentivize private-sector adaptation. The private sector’s motivation to engage in adaptation is reflected upon, but the limited sample does not allow for general conclusions in a separate section.

4.1. Adaptation by the domestic and international private sector

Most respondents consider the domestic private sector to have an important role in adaptation in Zambia. Respondents of all stakeholder categories consider the agricultural sector as key in Zambia's adaptation. In line with the broad definition of adaptation of development 'under uncertainty' (Denton, 2010) or 'in a hostile climate' (Romani & Stern, 2013), many respondents consider development of the agricultural sector to lead to adaptation (Dev, Gov, PS, Res). One government official stated: 'If farmers have more income, they will adapt better'. Respondents also stated development can contribute to adaptation, even without the implementing actor knowing about it (Dev, Res).

The focus of private-sector engagement in adaptation has been to deal with climate risks, rather than on exploring business opportunities (Dev). Respondents explicitly stated that adaptation offers limited opportunities for short-term profit (Dev, PS) and that the private sector has to mainstream climate risks in their operation in order to stay in business (Gov, Res, Dev). Examples include direct contributions (e.g. investing in drip irrigation and conservation farming) and indirect contributions (e.g. large-scale farmers collecting rainfall data) (Dev, Gov, PS, Res) (see Table 3). These are not practised for adaptation purposes alone, but often have adaptation benefits.

In terms of new business opportunities, Zambia is quite successful in attracting international public climate finance for adaptation projects and programmes (Watson, van Rooij, & Nakhoda, 2013), and respondents clearly see the implementation of these projects as a new market for the

Table 3 Examples of private-sector engagement in adaptation

	Mainstream climate risks		Capitalize on business opportunities	
	Direct contributions	Indirect contributions	Direct contributions	Indirect contributions
Domestic private-sector adaptation	Drip irrigation; building small dams; conservation agriculture; use of improved seeds; diversifying livelihoods	Collect rainfall data; research; sensitizing	Implement publicly financed adaptation projects; developing improved seeds	Venture capital; marketing products; supply goods and equipment; transport facilities; extension services; research; sensitizing
International private sector for adaptation: activities	Sustainable water management	CSR; sensitizing	Developing improved seeds	CSR; sensitizing
International private sector for adaptation: financing		CSR; sensitizing		Microfinance; insurance; sensitizing

Note: These examples are not necessarily implemented or labelled as adaptation, but respondents mentioned they contribute to it.

domestic private sector (Gov, Res). However, respondents think it might be hard to create a business model for adaptation projects in the agricultural sector (Gov, PS, Res). Indeed, the significant delay of the PPCR project can partly be attributed to ‘challenges in identifying suitable adaptation investment opportunities as well as appropriate private sector clients’ (CIF, 2013). Only one clear example was identified: a seed company that continuously develops new seeds and was stated to ‘have been adapting all along’. More indirect contributions to farmers’ adaptation include, for instance, extension services and marketing of products, for example to diversify livelihoods (e.g. honey or fish) (Gov), the supply of equipment and drought-resistant seeds (Dev, Gov), and improved transport facilities (Dev) (see Table 3). In this context, the private sector was described as a ‘facilitator of adaptation’ (Gov). As discussed in the next section, the government can stimulate such activities.

For larger (domestic) companies, the Africa Carbon Credit Exchange has started a capacity-building project. It also considers venture capital for adaptation, as this could deepen the financial sector. For example, entrepreneurs could see opportunities in solar-powered irrigation systems, but, because of the lack of experience and the risks involved, entrepreneurs do not put their ideas into practice. With venture capital, one body could provide the solar, a second actor could provide the irrigation system, and a third could take care of maintenance. Venture capital can jumpstart growth and indirectly contribute to adaptation (PS).

Respondents also considered the role of the international private sector. International private-sector *activities* for adaptation are limited or not defined as such. For example, large mining companies undertake corporate social responsibility (CSR) activities. Although these are not labelled as adaptation and remain relatively small (Res), respondents mentioned the adaptation benefits of CSR in, for example, forestry (Dev) and bio-fuels (Res) through income diversification or prevention of soil erosion. Another example is SABMiller’s multimillion US dollar investment to ensure sustainable water availability for its brewery in Ndola. This has adaptation benefits, and in the end it is also in the interest of the city council as SABMiller pays taxes and creates many jobs (Dev).

Several respondents stated it to be particularly difficult for the international private sector to undertake adaptation activities in the agricultural sector in rural areas. The private sector might not be interested because many of the adaptation projects are *de facto* development projects with limited return on investment and high risks (Res). Other arguments are that local entrepreneurs need to take the lead as externals find it difficult to start in unknown areas (PS, Res), and that larger SMEs operate on a larger level and do not penetrate the rural areas where much of the adaptation is needed (Dev).

The government expects international private-sector *financing* for adaptation, for example, in the energy and forestry sectors (GRZ, 2010). At the same time, government officials stated that international adaptation finance should be public grants from developed countries rather than private loans or investments. Others stated that, in practice, participation of international financial institutions in adaptation is minimal (Dev) or basically non-existent, despite it being ‘crucial to move forward’ (PS). There are data available regarding the size and sector of foreign direct investment (FDI) inflows, but these data do not show whether FDI inflows are climate-relevant or have climate change objectives (Mulenga, 2013).

Zambia’s very low banking penetration was mentioned as a barrier (Dev). This might be related to Zambia’s past. For a long time, the Zambia Commercial National Bank had a monopoly on banking business from parastatal firms (Fundanga & Mwaba, 1997). In 2002, the market for

long-term lending was almost exclusively based on two parastatal banks, but international banks started operating and the microfinance sector was growing (NORAD, 2002). Respondents indeed reported that financial institutions are growing; that they have money available to invest, including for good adaptation projects; and that they are looking for new markets and new clients (PS, Res). However, many respondents again argue that most adaptation projects are not bankable (Gov, Res).

Insurance is the second category of *financing*. Insurance is still limited in the agricultural sector but increasing (Gov). The International Finance Corporation (IFC) plans to approach insurance companies to determine the feasibility of establishing a weather index-based insurance product (MFNP, 2011). Different opinions exist on the potential of micro-credit.

The third category of financing is philanthropy. Mulenga (2013) estimates that the total inflow of private philanthropic grants to 200 adaptation projects from 2009 to 2011 was around \$23 million. Also, after floods and other disasters, the private sector donates cash and equipment (Gov).

The debate on private-sector engagement in adaptation is still developing in Zambia (Res), but some conclusions can be drawn. The interviews show that there are various direct and indirect ways in which the private sector can mainstream climate risks in their operations. Furthermore, there are many business opportunities that could indirectly contribute to adaptation. However, seed development was identified as the only business opportunity in adaptation. Results, furthermore, seem to indicate that the role of the domestic private sector in adaptation is larger than the role of the international private sector. The discussion on private adaptation finance is in its infancy. The next section will elaborate on how respondents describe the way the government can create an enabling environment for more private-sector engagement in adaptation.

4.2. Incentivizing the private sector

In official documents, the Zambian government has repeatedly stressed the importance of an enabling policy framework for adaptation. Examples include further integration of agriculture and water management strategies; revision of building codes and safety standards in high-risk areas; energy diversification; and strengthening adaptation planning at all levels (e.g. GRZ, 2010; MTENR, 2011). This section analyses the respondents' views of how the government can create incentives for the domestic and international private sector to mainstream climate risks in their business operations and to capitalize on new business opportunities.

Respondents considered Zambia's national agricultural policy (2004–2015) important for adaptation, even though it does not refer to it. Key goals of the policy are income growth; poverty reduction; crop diversification; and improved food security. All of these could indeed contribute to adaptation (MACO, 2004). To achieve these goals, the government invests in infrastructural development and support services, while supporting private sector-led development (Govereh, Shawa, Malawo, & Jayne, 2006). Examples of the latter are policies to encourage private research, liberalization of agricultural markets by reducing trade barriers, and allowing local and foreign private firms to enter agribusiness (Pray, Gisselquest, & Nagarajan, 2011).¹ Respondents mentioned a number of other, more concrete ways, which are listed as four categories: infrastructure and trade, tax rebates, information and capacity building, and stimulating investment (see also Table 4).

Table 4 Possible incentives for private-sector engagement in adaptation, as mentioned by the respondents

Category	Measure	Potential adaptation benefits
Infrastructure	Improve roads, bridges, water availability, and energy access	For example, improved market accessibility and transport facilities; information exchanging; availability of water and electricity
	Establish storage facilities	Reduce loss of harvest; improved food security; increased income
	Build agricultural centres	Seeds, fertilizers, etc., more easily available; reduced transaction costs for farmer
Tax rebates	Tax rebates on seeds, fertilizers, irrigation equipment, construction material	Climate-proofing harvest; improve livelihoods; increase income
	Tax rebates on a wider variety of seeds	Ensure harvest under different weather patterns; increase resilience
Information and capacity building	(Electronic) vouchers for discounted fertilizers and seeds	Seeds, fertilizers, etc., more easily available; reduced transaction costs for farmer
	Documentation, workshops	Mainstream climate risks in private-sector activities and investments
Stimulate investment	Climate change focal points	Mainstream climate risk in consistent and integrated policies
	Improve weather forecasts; tax rebates on ICT equipment	Reduce crop losses; increase harvest
	Improve extension services	Improving farming techniques; increasing food security; increased income; disaster risk reduction
	Run pilot projects	Additional private investments in adaptation
Stimulate investment	Provide small grants and soft loans for start-up projects	Depending on initiative; e.g. weather information, commodity supply, market facilities, extension services, etc.
	Create land ownership	Improved food security; increased income
	Create farmer cooperatives	Improved food security; increased income
	Policy reform	Mainstream climate risk in plethora of investments and insurance
	PPPs, e.g. bonds	Increased private investments in adaptation

4.2.1. Infrastructure

The lack of road and electricity infrastructure was considered a barrier towards private-sector activities in rural areas, constraining both development and adaptation (Dev, Gov). Larger companies only operate in locations where there is infrastructure, and small companies cannot grow to create economies of scale without infrastructure (Dev).

Storage facilities also facilitate adaptation (PS, Res). Farmers can lose up to 50% of their harvest due to insects and disease (Res). Storage facilities would prevent harvest and seed losses and effectively increase food availability. The EU recently supported Zambia National Farmers Union (ZNFU) in

establishing two large 'agricultural centres' where storage and marketing come together. To minimize operation costs, these centres are managed by a consortium of seven companies, each of which offers different products (seeds, vaccines, fertilizers, etc.) and services. These centres help farmers to improve their livelihood, as they save time, money, and energy, and have better access to market their products.

4.2.2. Tax rebates

Respondents from all categories considered the existing tax rebates on seeds, fertilizers, and construction material (leading to more resilient housing and infrastructure) useful for adaptation. Additional rebates on irrigation equipment and information and communications technology (ICT) equipment were encouraged (Dev). The tax rebates through maize promotion programmes were, however, criticized. They help farmers to increase their income, but the focus on maize restrains crop rotation and conservation agriculture, counteracting other government attempts to promote these (Dev). Small-scale subsidies for other crops only started recently. It might enhance policy consistency if the climate change focal point in the Ministry of Agriculture and Livestock were involved in these maize programmes (Gov).

Four respondents (Dev, PS) proposed replacing the current system in which farmers buy subsidized goods in Lusaka with a system of (electronic) vouchers that allow farmers to buy agricultural inputs at reduced rates at local shops. Both storage facilities (see above) and vouchers were stated to increase local business activities, reduce farmers' transaction costs, and thus indirectly contribute to adaptation.

4.2.3. Information and capacity building

An important way to incentivize the private sector to engage in adaptation is to sensitize, provide information, and build capacity, both for the private sector and among different ministries to stimulate integrated policy making (Dev, Gov, PS, Res). One clear example is the workshop organized by the former Ministry of Tourism, Environment and Natural Resources on private finance for adaptation with domestic and international banks such as Barclays and Standard Chartered Bank. The government, aware of their own budget limitations, promised incentives (including tax waivers) if these banks would deliberately invest in environment and climate. This was considered a big step. However, financial institutions were sceptical and have not shown much movement so far. From the ministry's point of view it is 'a learning process' and there is ongoing exchange to explore options for private-sector support for government efforts (Gov).

Improved weather forecasting and weather information systems also stimulate the private sector, and farmers in particular, to adapt better (Dev, Gov). Tax rebates on ICT equipment could improve and broaden communication on weather-related disasters and early warning (Gov).

The important role of public and private extension officers in information provision and capacity building was highlighted by respondents from all categories. However, public extension officers cannot cover the areas they are supposed to as they lack transport facilities (PS, Res). One researcher complained that private extension officers are only interested in high-value crops or large-scale farmers. However, ZNFU does provide extension services to poor farmers in rural areas too.

Cooperation among different ministries is crucial for consistent policy making. The abovementioned focal points are considered important here (Gov).

Finally, one respondent stated that the government could run pilot projects to show the private sector the potential of particular investments (Res). Others were more sceptical and mentioned that even pilot projects can distort markets. For example, they stated that there would be more private-sector activities in irrigation and dam building if there were no subsidized pilot projects for irrigation (Dev). One NGO, however, stated that the problem is not the pilot projects, but a lack of land ownership, which prevents farmers from investing in irrigation (see next section).

4.2.4. Stimulate investment

The government needs the private sector for adaptation as its own budget is too small (Gov). Zambian financial institutions have money to invest (PS, Res), but adaptation projects are mostly not bankable (Gov, Res). Respondents thus identified several ways for the government to incentivize the domestic and international private sector to make investments that contribute to adaptation. First, land reform could increase investments in agriculture (Dev). Farmers often stay in the village where they were born and might cultivate the same land for decades without ever owning it. Smallholders are therefore hesitant to invest, and as they have no collateral (Dev, Gov), and SMEs and the financial sector are also hesitant to invest or provide loans (Dev). One way of addressing this is by giving or selling land to farmers. The government is now leasing out land to farmers that join a cooperative that is able to attract investors for land development (Gov).

Another initiative focused on small-scale adaptation provides grants or low-rent loans covering the start-up costs of private engagement in adaptation (Res). MFNP (2011) mentions the example of mobile phone platform providers that specialize on providing weather information to farmers. Respondents did not mention concrete examples.

On a larger scale, investment opportunities could also be created by issuing bonds, where the government takes the riskier parts of an investment (Res). The involvement of the private sector may be promoted through PPPs (Dev; GRZ, 2011). However, few PPPs have been developed so far, with the Disaster Management and Mitigation Unit a notable exception (Dev, Gov). The enacted legislation that facilitates PPPs seems to focus on attracting FDI for larger projects, rather than smaller 'pro-poor' PPPs between, for instance, subnational governments and NGOs or the domestic private sector (Watson, van Rooij, & Nakhouda, 2013; Res, Dev).

Finally, national policies can encourage adaptation benefits from investments and insurance. For example, financial institutions demand the application of certain conservation agriculture principles before they finance activities (Dev). The government could also formulate stricter regulations for FDI (Dev).

The interview results show that the Zambian government has many options to incentivize private-sector engagement in adaptation. This research design only allowed for a limited level of detail of individual incentives. Nevertheless, the maize promotion programme example highlights the complexity of incentivizing adaptation through policies, and that there is a risk of maladaptation. More detailed analysis of such a policy would be helpful in order to optimize its long-term adaptation benefits. Incentives such as agricultural centres and extension services incentivize adaptation of the domestic private sector only, but most of the other options listed in Table 4 could indirectly incentivize the international private sector too.

The incentives could both foster the private-sector mainstreaming of climate risks, and create new business opportunities, but it not always possible to draw a clear line between the two. It will be difficult to identify the 'climate finance' component of the investments potentially resulting from the incentives, in particular because most activities and investments are not stand-alone adaptation, but rather adaptation benefits of investments done for other reasons.

5. Conclusion and discussion

The case study in Zambia reiterates the frame from Section 2, where the private sector was found to adapt and contribute to adaptation in direct and indirect ways. Adaptation as such is indeed often not an aim of the private sector, and it might sometimes contribute to adaptation without being aware of it. The concept of adaptation is more important to policy makers than to businesses.

How much private-sector adaptation and adaptation finance can be identified depends on the interpretation of the concept of adaptation. The narrowest interpretation would include only private stand-alone activities, investment, and financing that specifically aim at adaptation. Under this interpretation, private-sector adaptation and adaptation finance is currently minimal or non-existent in Zambia.

The broadest interpretation, with adaptation being development 'under uncertainty' (Denton, 2010) or 'in a hostile climate' (Romani & Stern, 2013) would not only look at what constitutes adaptation, but also what directly and indirectly contributes to adaptation, for example by increasing resilience. In the context of Zambia's large agricultural sector and various development challenges, the adoption of this interpretation would result in significant domestic private-sector adaptation, both in mainstreaming climate risks in operations (e.g. conservation farming; irrigation) and in capitalizing on new opportunities (e.g. marketing of harvests and farming equipment; development of improved seeds). Through, for instance, corporate social responsibility and investments in sustainable water management, activities and financing from the international private sector would also contribute.

However, there is a risk that such a broad interpretation of adaptation might advance business-as-usual (BAU) activities rather than innovation. The examples mentioned by respondents to incentivize private-sector adaptation, such as improving infrastructure, investing in storage capacity and trade, and providing better weather forecasts, do reduce barriers for the private sector to do business and to contribute to adaptation. However, according to one respondent, a broad interpretation of adaptation and such policy responses encourages neither innovative value-chain approaches or partnerships, nor new approaches that bring together adaptation, mitigation, technology transfer, and international climate finance, in line with the need of developing countries.

Governments thus have to carefully design incentives for private-sector engagement in adaptation. This was outside the scope of this article, and private-sector awareness of adaptation might first need to grow further, but, in the future, a more extensive study on the impact and required policy framework for private-sector engagement in adaptation could really benefit adaptation processes in countries like Zambia.

A broad interpretation of adaptation helps to identify how private engagement in adaptation can be maximized at minimal cost. The frame, as provided in Section 2 (in particular the part on motivation) is quite helpful here. For adaptation finance, however, a stricter interpretation of adaptation is probably

more useful, also in the context of opposing visions on the accounting of private-sector financing for adaptation at United Nations Framework Convention on Climate Change (UNFCCC) negotiations. This interpretation could focus more on the incremental impacts of climate change, rather than dealing with difficult current climate conditions. The latter might be more important in developing countries, but developed countries committed climate finance for the former.

This more strict interpretation of adaptation should also prevent the manipulation of private-sector financing of adaptation. Actors in development have in the past used adaptation language to garner funding to suit their ends, even when they feel their work is unrelated to adaptation (Ireland, 2012). During a panel discussion in advance of a Board meeting of the Green Climate Fund, one investor indeed stated that business might misuse a broad definition of adaptation for greenwashing of BAU activities. The private sector should be prevented from attracting (international) climate finance for BAU activities, and developed-country governments from adding falsely flagged investments in adaptation of 'their' multinationals to their national contribution to international climate finance. This is critical for trust-building between developed and developing countries, as the latter generally prefer public grants over private finance, and are therefore often sceptical about increasing private engagement. Lessons on how to determine whether an investment is BAU or mobilized through a financial incentive could be learned from the 'additionality' debate in carbon markets (c.f. Hayashi & Michaelowa, 2013).

Finally, it should be noted that private-sector engagement in adaptation and in adaptation finance does not lead to adaptation in every sector, everywhere, and in a sufficient manner. Some sectors and locations might not be reached, and in others it might lead to maladaptation, for example, when too many farmers start irrigating, thereby depleting water resources. Despite the potential, private-sector engagement in adaptation and adaptation finance is no panacea and can only be supplementary to, and not substitute for, public financing of adaptation.

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Note

1. The draft of the new national agricultural policy does refer to climate change adaptation. In fact, mainstreaming climate change is one of the objectives (MAL, 2013).

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