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Unlocking the Potentials of Private Financing for Low-carbon Energy Transition: Ideas and Solutions from ASEAN Markets

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Abstract: Under the Paris Agreement in 2015, the opportunities for the ASEAN Member States (AMS) to maximise low-carbon energy sources to achieve the Nationally Determined Contributions (NDC) target in reducing carbon emission levels have expanded. In order to move towards a low-carbon energy transition, private sector actors must work together with governments to implement strategies to invest in the low-carbon economy. However, major barriers such as insufficient enabling policy environment, availability of technologies and access to funding somehow impede the implementation. It is believed that unlocking the potentials of private sector would accelerate the transition of low-carbon energy. This paper, based on a market survey, which aimed to identify barriers and risks that private sectors face in accelerating the low-carbon investments. The survey respondents are divided into two categories, Lenders and Borrowers. Analysing 110 total respondents helped to identify the perceived and actual barriers as well as risks underlying to the access to financing and generated potential solution for policymakers to overcome these barriers. The survey results indicate that the main obstacles faced by private sectors are incoherent policies that created a high-risk environment for investment, a lack of access to de-risking mechanisms, and insufficient capacity to communicate the opportunities amongst financial institutions and project developers. To bare these risks, this paper suggests four interdependent solutions – establishment of a low-carbon transition fund, government warranty programme, broadening of de-risking mechanisms, and capacity building programme to accelerate the low-carbon energy transition across ASEAN.

***Keywords*:** *Paris Agreement, low-carbon energy transition, private sector, regional cooperation, innovative financing*
***JEL Classification*:** *F36, E51, Q54*

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1. Introduction

Meeting energy needs by low carbon means will be one of the greatest global challenges in the coming decades. Up to the point when the Paris Agreement was signed to abate global warming, the relentless increase in the demand for energy to feed burgeoning regional economic growth was a top priority, especially for the Association of Southeast Asian Nations (ASEAN) Member States (AMS) governments. According to the Southeast Asia Energy Outlook (2017), the region's energy demand will grow by almost two-thirds by 2040 to meet the increased electricity demand. Currently, 80% of the energy supply is from fossil fuels to ensure an affordable energy supply and attain energy security. However, tackling climate change is to be a critical consideration amongst those objectives, as these countries are most vulnerable to the negative impacts of global warming and committed for carbon emission coming from fossil fuel burning. Following the 2015 Paris Agreement, each of the ASEAN countries agreed to take actions to limit temperature rise below 2 degrees centigrade (°C) through a pledge called Nationally Determined Contributions (NDCs) (Anbumozhi and Kaliappa, 2017). It shows the willingness of the region to utilise more renewable energy resources and improvement in energy efficiency. However, insufficient policy or regulation and lack of access to funding are main barriers that might hold back the ASEAN's transition to a low-carbon economy.

Nevertheless, businesses and the governments are committed to increasing their efforts to transition towards a low-carbon economy. This is exemplified by the increase of renewables in energy mix and the governments' effort to make energy efficiency improvement across the economy. The transition to low-carbon economy would also create new business opportunities for the private sector to invest and eventually lead the transition, especially with more synergy between the technology and finance subsectors. Private financial institutions are main facilitators of the low-carbon energy projects; meanwhile, local and international project developers can propose low-carbon projects to be incorporated into the governments' programme on climate change mitigation, creating an equilibrium condition for financial flow to occur.

Having a clear understanding of both the governments' and private sector's role in low-carbon energy transition is important to stimulating the necessary investments. The

relationship between the two sectors directly impacts the perceived and actual financing and development barriers. For the private sector to be profitable in this transition it is vital for them to have greater understanding of the market potential for low-carbon technology deployment and policy certainties to identify how they can make cost-effective investments. Therefore, coordinated efforts by multilevel governments, public financing institutions, as well as financial intermediaries are essential to move towards unlocking the potentials of the private sector.

ERIA conducted an online questionnaire survey to identify the needs, barriers, and risks that the private sector faced to finance low-carbon energy projects, and derived recommendations to support low-carbon energy development across ASEAN and East Asia. This paper firstly elaborates the background of the survey and research methodology. Then, the market survey results are elaborated in three parts: 1) Profiling the respondents (Lenders, Borrowers, and Influencers), 2) Identifying the barriers and risks for Lenders and Borrowers (including economic, financial, technical, and regulatory aspects) to scale up private investments, and 3) Identifying policy recommendations to unleash the potentials of private finance to support the transition pathway.

2. Survey Methodology

Over the period of December 2018 to April 2019, ERIA researchers designed and implemented a questionnaire through an online platform, targeting private financial institutions such as commercial banks, private equity, low-carbon energy project developers, business owners, academia, and the governments. This survey gathered more than 100 respondents across ASEAN and the East Asia region. Figure 1 elaborates the steps involved in conducting the survey.

Participants of the survey were also classified based on their functional role in financing the energy markets. Each participant was categorised as one of three groups. This category determined which combination of sections the respondent would answer depending on their background and industry characteristics. The three possible categories were:

1. Lenders: Institutions that provide energy financing or financing support (non-bank financial institutions [private equity and venture capital], commercial

banks/credit agencies, international financial institutions, and international investors)

2. Borrowers: Institutions that seek energy financing (energy corporations, renewable project developers, industry associations, and energy cooperatives).
3. Influencers: Institutions that provide research and market insights (government institutions, research/academic institutes, aid agencies, and consultant firms).

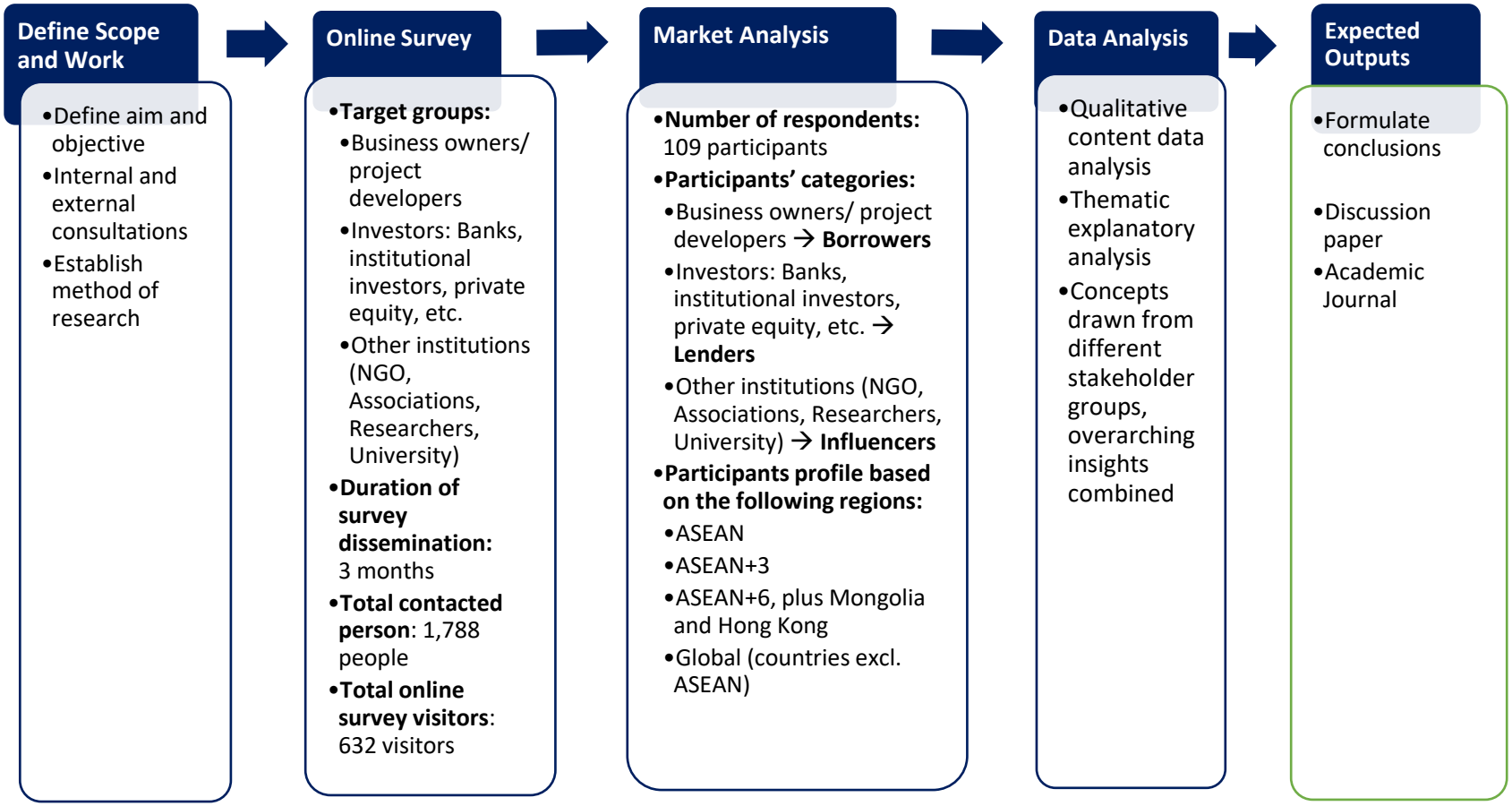
Within each section there was a range of question styles. The survey consisted of four types of questions, categorised as:

1. Matrix Multiple choice using the Likert scale (one answer): *(1) strongly disagree (2) disagree (3) neutral/moderate (4) agree and (5) strongly agree (Likert scale)*
2. Multiple choice (many answers): *Checkboxes*
3. Matrix ranking in the order of importance: *Dropdown*
4. Open-ended question seeking inputs from respondents: *Organisation Characteristics/comments/suggestions*

Each question style was designed to capture various elements of importance and preference for participants on a range of issues and solutions within their respective categories.

The questionnaire was divided into four sections: respondents background, Lenders' perspectives of key risks on LCET project investments, Borrowers' perspectives of significant limitations in accessing funds and investments to the low-carbon projects, and regulatory framework. Table 1 shows the structure of the survey and the proposed hypotheses. Section 1 aims to identify general characteristics of all participants to profiling the respondents. It contains general information, included information on industry, ownership, position of the respondent, sector focus, asset holdings, and firm size.

Figure 1. Steps in Designing and Implementing the Market Survey



ASEAN = Association of Southeast Asian Nations; NGO = non-governmental organisation.
Source: Authors.

Section 2 classified the respondents from non-bank financial institutions such as private equity and venture capital, commercial banks/credit agencies, international financial institutions, and international institutional investors, which for the remainder of this analysis will be categorised as Lenders. Questions in section 2 are aimed to determine the key risks that prevent the flow of financial resources to the institutions and borrowers in the low-carbon sector that require capital. The questions tried to address the hypothesis on the Lenders side that theorised that Lenders, with much of the technology and financing needed for a low-carbon transformation already in the global economy, would not be able to generate significant scale of investment in low-carbon projects, unless they were accompanied by improving the determinants of low-carbon investment, such as economic incentives, reducing risk perception, increasing capacity to assess environmental risks, and standardised national policy frameworks and regional drivers. This hypothesis was evaluated in two subsections: (i) Risk perception on low-carbon energy systems investments, and (ii) Capacity to assess low-carbon investment risk.

Section 3 identifies the significant barriers that firms face in accessing funds and investment for their low-carbon projects, and ways to further stimulate low-carbon investments. The section focuses only on respondents who are categorised as Borrowers, such as corporations, project developers, industry associations, and energy cooperatives. The hypothesis in section 3 evaluated the feasibility of acquiring low-carbon financing at a project's level of required financing and whether the current appropriate programme level is economically viable. Considering that business owners face multiple obstacles in undertaking low-carbon investments, project developers struggle to secure financing. This is due to the fact that developers are unable to fully utilise low-carbon financing within their projects due to high regulatory costs, inefficient subsidies, and technological and political risks. By eliminating or lessening the impact of these obstacles, finance will flow towards the low-carbon projects. These hypotheses were included in two subsections: (i) Demand for projects and awareness of low-carbon financing opportunities, and (ii) Access to finance.

The final section of the survey was designed for all participants to respond, including those that were excluded as Lenders and Borrowers, and categorised as Influencers namely intermediaries such as government institutions providing information services, research/academic institutes that share market data, aid agencies, and consultant firms.

The section identifies government and market failures in attracting private investments in low-carbon projects and identifies policies or instruments that could enhance low-carbon investments. All the questions tried to address the following hypothesis: If the public sector has the capacity to incentivise low-carbon investment through a range of instruments and mechanisms that could help to reduce capital cost and investment risks, these tools can be implemented on a national and regional scale. This section served as a source of insights into the conditions of the existing regulatory environment for low-carbon investments and technologies and helped to reinforce trends uncovered in the Lenders and Borrowers' only sections.

Table 1. Survey Sections and the Hypothesis

Section	Participants Category	Sub-sections	Hypothesis
Section 1: Respondents characteristics	• Lenders • Borrowers • Influencers	NA	NA
Section 2: Supply side	Lenders	• Risk perception of investments • Capacity to assess investment	Even when available, technology and financing needed for a low-carbon transformation require certain actions to enhance the ability to facilitate low-carbon investment. • *Economic incentives for low-carbon investment:* Banks do not regard low-carbon credit lines as an attractive business opportunity • *Risks perception on low-carbon investment:* Banks regard investment credit to renewable energy and energy efficiency projects as either less rewarding or too risky • *Capacity to assess environmental risks:* Banks lack the capacity to assess environmental risks and are particularly unaware or unable to assess risk in low-carbon related projects • *National policy framework:* Despite the existence of government and market failures in attracting low-carbon investments, the public sector plays a crucial role in catalysing low-carbon investments • *Regional policies:* Regional policies provide an overarching framework to enhance low-carbon investment as they provide regional solutions to tackle common challenges (i.e. climate change), which consequently would increase investor confidence
Section 3: Demand side	Borrowers	• Demand for projects • Access to finance	There are multiple obstacles business owners face in undertaking low-carbon investments and project developers are unable to fully utilise low-carbon finance, subsidies, and technologies. • *Awareness:* Companies are eager to find the available financing options • *Economic incentives:* Low energy prices and inadequate environmental regulation decrease economic incentives for investments • *Access to finance:* SMEs especially face problems in accessing finance due to high capital costs • *National policy framework:* Weak pressure on companies to comply with environmental standards demanded by either international clients or the government decreases the need to carry out low-carbon investment • *Regional policies:* Intervention at the macro-economic level will reinforce firms to increase investment in low-carbon projects to be more competitive
Section 4: Regulatory framework	• Lenders • Borrowers • Influencers	• Perception and commitment • Economic and financial barriers • Technical/infrastructure barriers • National regulatory barriers • Regional policies	If the public sector has the capacity to incentivise low-carbon investment through a range of instruments and mechanisms that could help to reduce capital cost and investment risks, these tools can be implemented on a national and regional scale.

SME = small and medium-sized enterprise.
Source: Authors.

3. Survey Results

Upon the initial distribution of this survey, 1,788 online questionnaires were distributed via electronic mail to stakeholders within the low-carbon energy community. The survey remained open for 3 months and had 182 responses (a rate of 10.1%). Out of 182 responses 110 were complete responses, meaning all questions were fully answered, and six responses were partially completed and included in the qualitative analysis, but not captured in the reported figures. Moreover, it is important to highlight that eight responses included in the Borrower analysis were derived from additional information provided by other sectors not captured in the previously mentioned definition of Borrower. By utilising the collected answers, this section elaborates on the respondents' profile and further identifies reported barriers and risk within the low-carbon technology financing market. Details of the survey results are summarised in Appendix A.

3.1. Participants Profile

In this survey, all respondents were further categorised based on the regional position of their institutions, falling into four categories as follows:

1. ASEAN: Countries that are members of ASEAN
2. ASEAN+3: ASEAN + China, Japan, and the Republic of Korea (CJK)
3. ASEAN+6+Mongolia and Hong Kong: ASEAN + CJK, India, New Zealand, Australia, Mongolia, and Hong Kong
4. Global (Non-Asia): Respondents are not based in Asia (US, UK, France, Austria, Germany, and Norway)

Most of the respondents were based in the ASEAN region (about 50%), followed by the respondents from the CJK (+3) group (31%), India, New Zealand, Australia (+6), Mongolia, and Hong Kong group (11%), and the Global group (8%) (see Figure 2). Figure 3 describes 62% of respondents categorised as influencers and the remaining 38% as Borrowers (23%) and Lenders (15%). In the Lenders categories, there was an insufficient number of respondents from the Global (Non-Asia) category as well as ASEAN+6+Mongolia and Hong Kong, which are elaborated in Table 2 and Figure 4.

Table 2. Respondents Categories

China, Japan, and Republic of Korea (CJK) (+3)	**Respondents: 34**
Borrower	12%
Influencer	76%
Lender	12%
India, New Zealand, Australia (+6), Mongolia, and Hong Kong	**Respondents: 13**
Borrower	15%
Influencer	85%
Lender	0%
ASEAN	**Respondents: 54**
Borrower	33%
Influencer	44%
Lender	22%
Global	**Respondents: 9**
Borrower	11%
Influencer	89%
Lender	0%
ASEAN +3	**Respondents: 88**
Borrower	25%
Influencer	57%
Lender	18%
ASEAN +6, Mongolia and Hong Kong	**Respondents: 101**
Borrower	24%
Influencer	60%
Lender	16%

Source: Authors.

Figure 2. Regional Breakdown of Survey

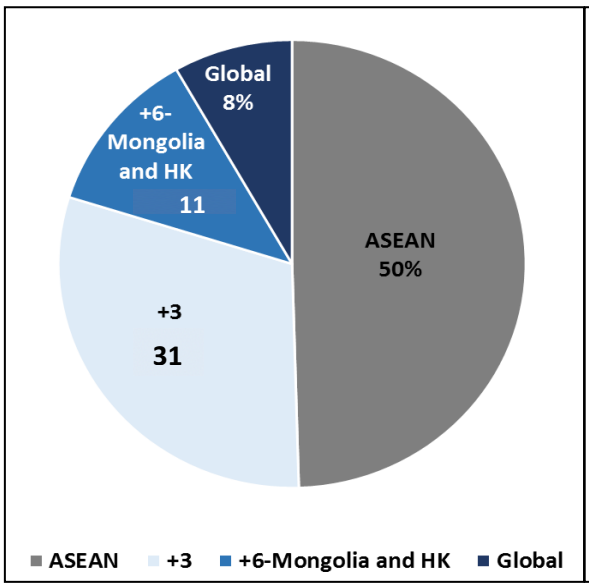
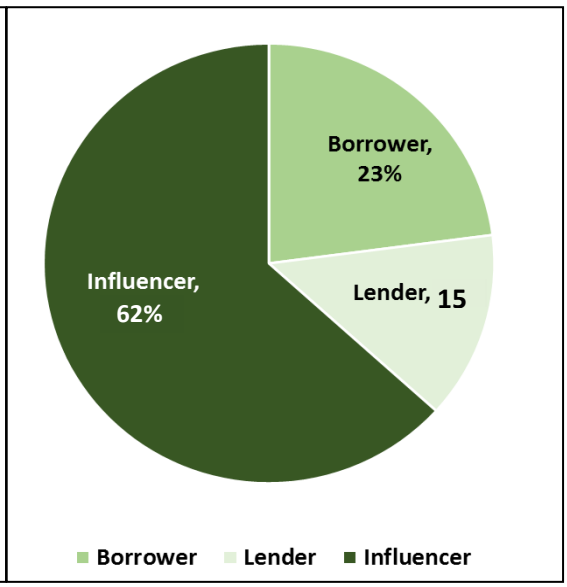


Figure 3. Categorical Breakdown of Survey

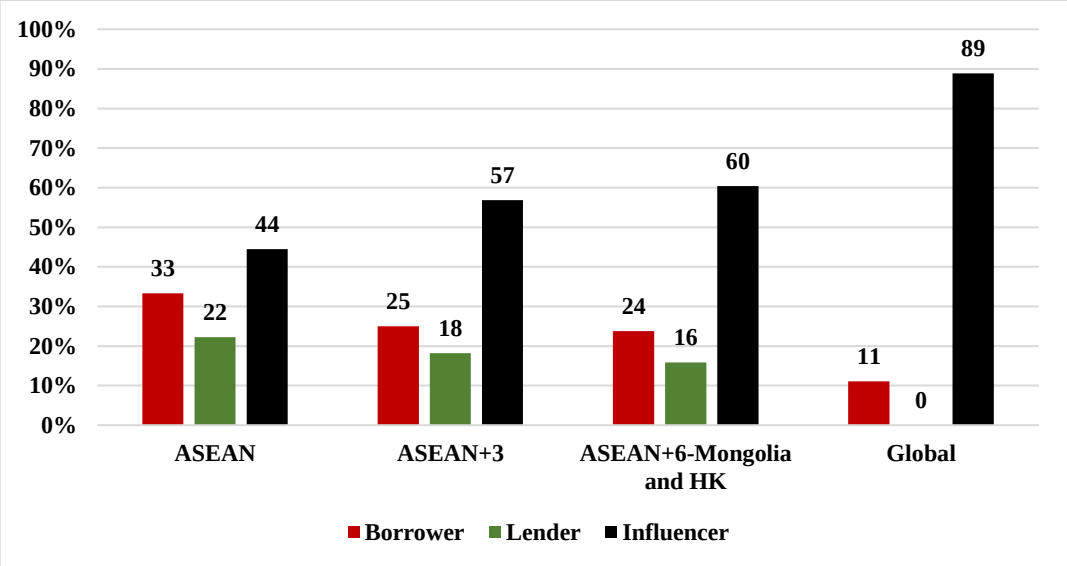


ASEAN = Association of Southeast Asian Nations.
Source: Authors.

The absence of Lender respondents from the Global category occurred because there are still only limited financial institutions that offer financial support for low-carbon energy projects.

Across the regional breakdown, Borrowers and Lenders were distributed in each group within a similar quantity, except the Global group. The predominant participants were in the Influencer category across all regions, contributing to at least 44% of answers within each region, which is illustrated in Figure 4.

Figure 4. Regional Composition by Participant Type



ASEAN = Association of Southeast Asian Nations.
Source: Authors.

3.2. Barriers and Risks to Low-carbon Energy Finance

Public finance is currently the main source for leveraging and scaling up private finance for infrastructure investments by most Asian governments (Climate Policy Initiative, 2018). This has become possible because institutional investors, such as pension, insurance, and mutual funds, have large pools of capital to deploy with a long-term investment outlook that is suited to low-carbon energy infrastructure financing. However, the progress in mobilising private capital to invest in low-carbon energy infrastructure is still insignificant due to existing barriers, for instance, inability to confidently invest in a project due to perceived and/or real risks or the inability to direct capital to projects due to regulatory and bureaucratic burdens.

Despite, regional investment in Asia in renewable energy steadily increasing (Jones and Johnson, 2016), the low-carbon transition is still lagging behind. This along with energy efficiency improvement represented a six-fold increase from 2005. On the other hand, GHG emissions from Asian countries have been increasingly rapidly as well, mainly due to industrialisation, urbanization, and population growth (Treco et al., 2018). For project developers and companies that focus on low-carbon technology development, it is vital to have reliable and committed financing to secure projects. Examples of policy and institutional barriers, a general unawareness of how to engage the financing market, weak institutional infrastructure, and a lack of effectively utilised corrective regulatory instruments, have led Borrowers to emphasise their inability to contribute to low-carbon energy transition. Lenders consider the policy and market risks of making an investment too high a potential cost to dedicate competitive financial resources towards low-carbon technology developers. This is because the priority of Lenders is risk of investments and returns on investments.

These conditions have led to insufficient funding for low-carbon technologies within the framework of meeting NDC goals. Identifying these barriers and risks will allow policymakers to craft solutions that utilise the proper type of incentives to provide additional financial and developmental support.

3.3. Borrowers Barriers to Access Low-carbon Financing

Borrowers were directly asked to identify what the biggest obstacles to receiving financing and bank loans were. The obstacles indicated three larger considerations within the realm of low-carbon financing that obstruct the optimal flow of investments: issues concerning policy, issues concerning institutional aversions, and issues concerning the current market structure. These three considerations are composed of a series of subsequent obstacles that construct a larger barrier to borrower's abilities to access finance and hinder the development of low-carbon technologies (Table 3). Results showed that most respondents agreed that access to finance is an obstacle to new low-carbon investments. Only 4%–6% of respondents disagreed with this proposition. These obstacles have a significant limiting impact on the financing market, and it is vital to seek solutions to mitigate and eliminate these obstacles. It is, thus, necessary to analyse what the obstacles are and what caused them to exist.

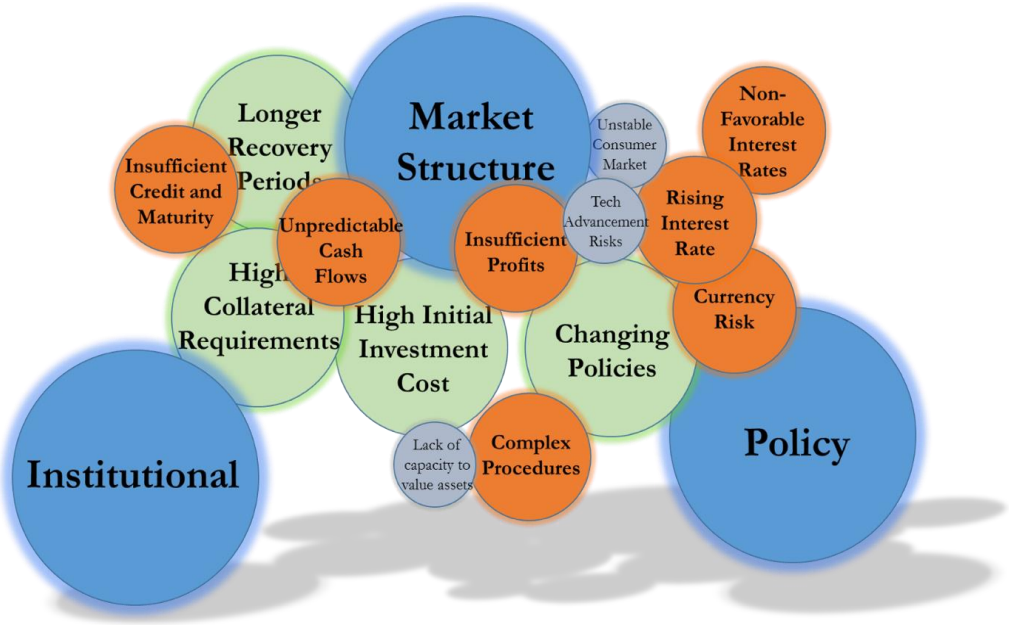
Table 2. Biggest Obstacles to Financing Low-carbon Projects

What do you perceive as the biggest obstacles to receiving finance and bank loans? (Respondents can choose multiple answers)				
Category	**Obstacles**	**ASEAN**	***ASEAN+3***	***ASEAN+6-Mongolia and HK***
Policy	Changing Policies	56%	45%	50%
	Complex Procedures	28%	27%	29%
Institutional	High Initial Investment Cost	50%	45%	50%
	Longer Recovery Periods	50%	45%	46%
	High Collateral Requirements	44%	45%	46%
	Insufficient Credit and Maturity	28%	27%	25%
	Lack of capacity to value assets	17%	14%	13%
Market	Currency Risk	33%	32%	29%
	Insufficient Profits	33%	32%	29%
	Unpredictable Cash Flows	28%	23%	25%
	Non-Favorable Interest Rates	28%	23%	25%
	Rising Interest Rate	28%	23%	21%
	Technology Advancement Risks	22%	18%	17%
	Unstable Consumer Market	11%	9%	13%

ASEAN = Association of Southeast Asian Nations; HK = Hong Kong.
Source: Authors.

Apart from determining the obstacles and how they affect Borrowers, it is important to also consider the overlapping impacts that each barrier has on other barriers. Issues of institutional concern can be driven by market concerns and policy concerns, which will be further discussed in the next section. The structure of capital markets is closely linked to market pressures, which are influenced by policies that affect market prices. Therefore, it is important to analyse the obstacles as prevailing turbulent winds preventing the maximum ignition of low-carbon financing rather than as individual walls standing solidly in the way. Table 3 has aligned these obstacles with their strongest categorical affiliations, but it is ideal to consider these barriers as an overlapping web, as visualised in Figure 5.

Figure 5. Intersectionality of Barriers



Source: Authors.

3.3.1. Policy Barriers

Frequent changes of government policies and its complex procedures in terms of seeking low-carbon financial support become main policy barriers, which are elaborated in Table 4. These policy changes and procedural complexities occurred due to overlapping and inconsistent policies. According to Anbumozhi et al. (2018a), across ASEAN member states, the jurisdictions of licensing often overlap leading to the number of permits required for a project being high with long processing times. Based on the survey results, more than 80% of Borrowers had this experience Furthermore, approximate 70%–90% of Borrowers stated that overlapping and inconsistent policies are part of a national regulatory barriers, and the regulatory framework for land procurement is complicated. Borrowers shared an equally strong sentiment that coordination amongst ministries and institutions is weak, supporting the conclusion that there is little coordination within energy project developers, government ministries, and between the two groups.

Table 3. Policy Barriers in Seeking Low-carbon Financing

Policy Barriers (Statement)	Borrower Location	1	2	3	4	5
Overlapping and inconsistent policies by governments	**ASEAN**	6%	6%	11%	17%	61%
	ASEAN+3	5%	5%	14%	14%	64%
	ASEAN+6-Mongolia and HK	4%	8%	13%	13%	63%
Coordination amongst ministries and institutions is weak.	**ASEAN**	0%	6%	17%	11%	67%
	ASEAN+3	0%	5%	14%	14%	68%
	ASEAN+6-Mongolia and HK	0%	8%	13%	13%	67%
Lack of concrete action plans by the government on the low-carbon transition leads to uncertainty in my organisation's business model and decisions.	**ASEAN**	0%	0%	22%	28%	50%
	ASEAN+3	0%	0%	23%	27%	50%
	ASEAN+6-Mongolia and HK	0%	4%	21%	25%	50%
The number of permits required for low-carbon energy projects is high and processing time is long.	**ASEAN**	0%	6%	6%	28%	61%
	ASEAN+3	0%	5%	5%	32%	59%
	ASEAN+6-Mongolia and HK	0%	4%	4%	33%	58%
The regulatory framework for land procurement is complicated and takes time.	**ASEAN**	0%	0%	22%	17%	61%
	ASEAN+3	0%	0%	23%	18%	59%
	ASEAN+6-Mongolia and HK	0%	4%	21%	17%	58%
Compared to other investment projects, low-carbon projects require more due diligence.	**ASEAN**	0%	6%	22%	28%	44%
	ASEAN+3	0%	5%	18%	41%	36%
	ASEAN+6-Mongolia and HK	0%	4%	21%	42%	33%
Foreign direct investment restrictions are currently limiting the amount of international funding available to my organisation.	**ASEAN**	11%	0%	22%	39%	28%
	ASEAN+3	9%	0%	23%	41%	27%
	ASEAN+6-Mongolia and HK	8%	0%	25%	42%	25%

ASEAN = Association of Southeast Asian Nations; HK = Hong Kong.
Source: Authors.

In other instances, there is an indication that there are policy uncertainties and inconsistencies. Over 75% of Borrowers argued that their governments lack concrete action plans on the low-carbon transition. This in effect takes a toll of formulating innovative business models, further hindering the ability to secure and identify innovative financing options. In Indonesia, PLN, the state-owned energy authority, has acted inconsistently in regard to its policies on gas supply. Furthermore, there have been several inconsistencies between the tendering process at the regional level and the subsequent price negotiations under Power Purchase Agreements (PPAs) with PLN (PWC, 2017).

These inconsistencies are further compounded by the constant leadership changes within Indonesia's energy ministry.

The Republic of Korea has also been plagued by inconsistent polices stemming from several leadership changes. Since 2008, in instances where there has been a change in the presidential office, there have also been changes in green finance of banks in the Republic of Korea. From 2008–2013, the government had a stated Green Growth Policy, which was forsaken for a larger focus on the country's creative and start-up economies. Then in 2017, the development of renewable energies became a major policy focus again (Kim, 2018).

An investment environment without a clear governing framework contributes to business uncertainty. This uncertainty leads 72% to 77% of Borrowers to identify low-carbon projects as requiring greater due diligence compared to other investments. An extra degree of required verification makes low-carbon investments undesirable due to a higher perceived risk from the difficulty of implementing such investment. These barriers expand to a regional level as Borrowers believe that current restrictions on foreign direct investment prevent optimal levels of international funding. Attempts to coordinate on energy policies, regulations, and funding mechanisms will promote low-carbon investment according to 83%–85% of Borrowers. These policies influence the institutional framework that shapes and influences how Borrowers identify and meet their business needs.

3.3.2. Institutional Barriers

Institutional barriers emerge due to information asymmetry. These barriers originate from the mismatched requirements Borrowers and Lenders face for developing a low-carbon project and maintaining its operations. Various barriers have been identified in the survey for Borrowers, including high initial investment cost, longer recovery periods, high collateral requirements, insufficient profits, insufficient credit and maturity, and a lack of capacity to value assets. The results showed that the most significant barriers are high initial investment costs, long recovery periods, and high collateral requirements, based on more than 50% of Borrowers' responses. These three major barriers become main obstacles to finance the project. Besides, around 15%–28% of Borrowers responded that insufficient credit and credit maturity structures are also institutional barriers.

In terms of obstacles related to access to finance, Borrowers responded that investment costs, recovery periods, and collateral requirements are the primary obstacles for institutional investors. As Borrowers begin sourcing financial capital for low-carbon investments, over 70% of respondents indicated difficulties in securing capital due to high perceived risks. These perceived institutional risks are derived from issues within technical infrastructure, including Borrower capacity and knowledge, and financing/capital markets maturity. By seeking to identify the issues within these components of the institutional barriers, lower investment costs, longer recovery periods, and reduce collateral requirements are identified as modifiers of risk.

Borrowers strongly indicated that underdevelopment of physical, logistical, and supply chain infrastructure become technical barriers within the low-carbon industry. Borrowers believe that a lack of grid connectivity, underdeveloped local supply chains, portfolio standards to accommodate low-carbon energy supply, and technical information and communication structures are currently obstacles to securing financing, which are described in Table 5.

Table 4. Technical and Infrastructure Barriers

Technical / Infrastructure Barriers (Statement)	Borrower Location	1	2	3	4	5	Total of 4+5
Lack of grid connectivity	ASEAN	0%	0%	17%	39%	44%	83%
	ASEAN+3	5%	0%	14%	36%	45%	82%
	ASEAN+6-Mongolia and HK	4%	0%	13%	38%	46%	83%
Local supply chains are underdeveloped	ASEAN	6%	0%	11%	44%	39%	83%
	ASEAN+3	5%	0%	9%	45%	41%	86%
	ASEAN+6-Mongolia and HK	4%	0%	13%	42%	42%	83%
The portfolio standards to accommodate low-carbon energy supply are inadequate	ASEAN	0%	0%	28%	44%	28%	72%
	ASEAN+3	0%	0%	23%	50%	27%	77%
	ASEAN+6-Mongolia and HK	0%	0%	21%	50%	29%	79%
A lack of available technical information on the net costs, benefits and risks	ASEAN	6%	0%	33%	39%	22%	61%
	ASEAN+3	5%	0%	27%	41%	27%	68%
	ASEAN+6-Mongolia and HK	4%	0%	25%	38%	33%	71%

ASEAN = Association of Southeast Asian Nations; HK = Hong Kong.
Source: Authors.

Investments in supply chain components such as transportation can have large and significant benefits. The Asian Development Bank (ADB) and ADB Institute (ADBI) have estimated potential benefits from transport investment improvements across Southern Asia and Southeast Asia. Their study found an increase in real income from a 5% reduction in transport costs between the two regions through 2030 could be 1% of gross domestic product (GDP) for Southeast Asia (roughly US$30 billion). If transport costs were reduced by 15%, net benefits would increase dramatically to 3.9% of GDP for Southeast Asia (roughly US$118 billion), much higher than the expected costs (Chotichanathawewong, 2018).

Borrowers also shared a common concern in that they lacked information on available grants, subsidies, incentives, and financial products as well as a lack of awareness of successful low-carbon investments. When these statements were put to them, an average of 86% of respondents indicated they experienced a lack of information on opportunities for support and de-risking tools such as subsidies, incentives, and financial products and an average of 84% stated that they lacked access to information on previously successful investments. Without proper knowledge of how to take advantage of government instruments and mechanism that provide financial credibility and de-risking, it becomes increasingly difficult for developers and borrowers to encourage private investment. Furthermore, without knowledge of successful investments, newer market participants will struggle to replicate best practices and gain an understanding of how to structure their project's finances. The lack of utilisation of proper de-risking mechanisms results in a lack of leveraging of private capital into low-carbon technologies.

Efforts to improve the process of communicating the benefits and risks of low-carbon financing can also be further elaborated to ensure a reduction in perceived risk. Governments would be able to more effectively craft policies that pertain to low-carbon technologies such as Power Purchase Agreements while developers would be able to receive more information on the industry from these initiatives. Green banks and green bonds have the potential to target clean energy financing. Green Investment Banks as public or semi-public entities are increasingly being used to facilitate private capital into domestic investments, mainly in low-carbon energy infrastructure that can help to meet NDC targets. These new institutions are publicly funded and offer preferential rate lending to finance renewable energy, energy efficiency, and other clean energy

infrastructure projects in partnership with private lenders (David and Venkatachalam, 2019). Green banks improve credit conditions, aggregate small projects to a commercially attractive scale, and expand the market by more widely and efficiently disseminating information about the benefits of clean energy (NRDC, 2016).

Green bonds are a mechanism that can help to alleviate the second institutional barrier of financing/capital markets. Many low-carbon financing projects struggle with maintaining and securing non-burdensome sources of finance. Green Bonds can provide long-term and reasonably priced capital to refinance a project once it has passed through the construction phase and is operating successfully (Yoshino and Taghizadeh-Hesary, 2018).

Long-term financing, five or more years, is often difficult or even impossible to obtain in many low-income countries of ASEAN, which may be in part due to regulatory or other restrictions on long-term bank lending. A lack of experience with low-carbon projects means many potential financiers will feel unable to assess the risks involved; there may also be a lack of matching funding sources. Long-term financing is heavily dependent on investors looking for long-term assets to match the profile of their liabilities – such as pension funds. In many ASEAN economies, such funds either do not exist or limit investment activities largely to the purchase of government debt owing to its low risk (Wolff, 2018).

Lending markets of most of the Asian economies such as China, India, Indonesia, Malaysia, and Thailand are dominated by bank lending and the share of the capital market in their financial systems is comparatively smaller. Hence, banks are the major source of financing for low-carbon energy projects, but the maturity mismatch between bank lending and long-term financing presents a barrier to investors decisions (Yoshino and Taghizadeh-Hesary, 2018). Survey respondents further echoed this sentiment. Respondents were asked, from a variety of choices, with the ability to choose multiple, what they currently considered the main financing mechanisms for low-carbon financing.

The survey responses can be considered in two categories: (i) economic/financial instruments such as bank loans, equity finance, and private investment or (ii) regulatory/policy instruments including feed-in-tariffs, government grants, government guarantees, and tax credits. Of the survey pool of respondents classified as borrowers, 41%–46% stated that they relied on bank loans as a means of financing. This surpassed

the usage indicated for all other economic and financial instruments included in the survey by 13%–42%. Within the regulatory/policy instrument category, feed-in-tariffs were indicated as a primary means of financing by 46%–50% of respondents, followed by government grants, which received the second lowest response rate at 33% (Table 6).

Table 5. Current Financing Mechanisms for Low-carbon Projects in ASEAN and East Asia

The main financing mechanisms used for low-carbon investments				
Instruments and Mechanisms		**ASEAN**	**ASEAN+3**	**ASEAN+6, plus Mongolia and HK**
Economic/Financial Instruments	Bank Loans	44%	41%	46%
	Equity Finance	33%	32%	33%
	Private Investment	6%	5%	4%
Regulatory Instruments	Feed-in Tariffs	50%	45%	46%
	Government Grants	28%	32%	33%
	Government Guarantees	28%	23%	21%
	Tax-Credits	17%	14%	17%

ASEAN = Association of Southeast Asian Nations; HK = Hong Kong.
Source: Authors.

Despite the lower response rates, government grants and government guarantees play a pivotal role in supporting the financial health (and therefore credibility) of low-carbon technology projects. Of all respondents, 58%–67% indicated that they received government support, without which their projects would be not be financially viable. Amongst those that responded to the same question regarding the importance of government support to project health, only 17%–18% indicated that this support was not important. Borrowers also indicated that out of five possible choices for who they considered to be the prime movers in making access to finance available, banks were ranked first followed by government, institutional investors, international assistance, and social enterprises, which were ranked last. This further bolsters the claim of the importance of banks in securing financing, and the potential to further buttress government participation in leveraging financing.

Borrowers rely on bank loans and feed-in tariffs for low-carbon financing, but lack access to equity finance and other means of private investment. Government grants and guarantees are only used to a limited extent. The strong reliance on feed-in-tariffs and bank borrowing and a lack of access to capital markets have resulted in respondents

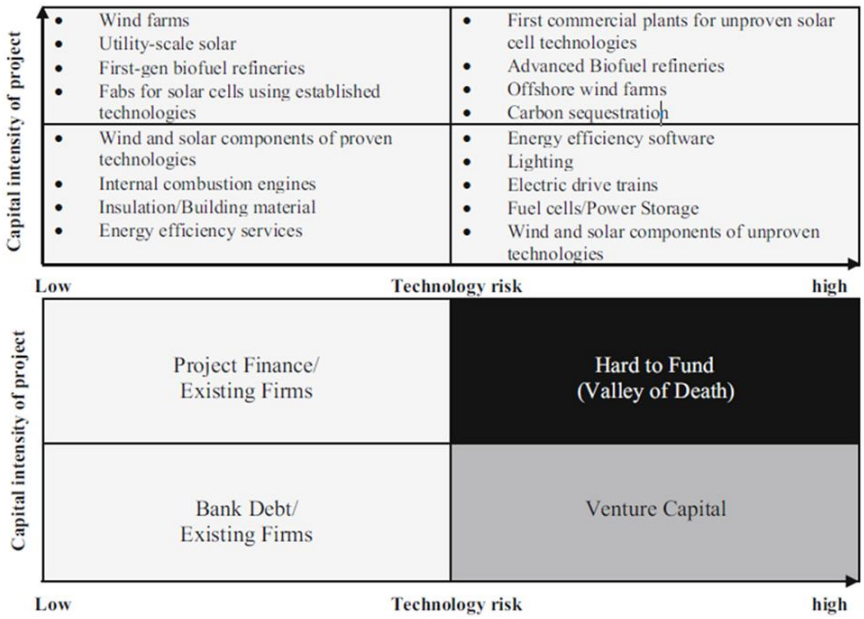
indicating that there are general limitations in accessing long-term financing.

Capital markets can be viewed as debt financing and equity financing. Debt financing includes debt instruments such as government bonds or corporate bonds. Equity financing is when a company can raise money through selling shares or equity in return for ownership of the company to investors such as individuals, corporations and other institutional investors.

When evaluating the potential access to capital markets for low-carbon projects, two variables could be taken into consideration: technology risk and capital intensity. By considering these two variables, a spectrum of financing is created in which projects that have a high technology risk and a high capital intensity will be difficult to fund. Projects in this category fall into a 'Valley of Death' scenario (Figure 6) in which commercialisation is unlikely because they are too capital intensive for venture capital investors, but have technology or execution risks that are too high for private equity and project finance investors.

This financing dynamic is a particular obstacle for low-carbon energy because of substantial capital requirements and perceived high-level risks for commercialisation of energy projects. Even after commercialisation, lack of access to risk capital, project scale, and gaps in business skills remain significant barriers to investment for widespread deployment. Many recent studies on energy efficiency also identified various barriers to financing of large-scale projects which includes policy and regulatory barriers. Financing barriers in energy efficiency improvement projects arise because energy users are unwilling to invest their own funds in energy efficiency projects. Most energy users, including large industrial firms, small and medium-sized enterprises (SMEs), commercial sector energy users, and public agencies, therefore, seek external funding for energy efficiency improvement projects. However, bank and financial institutions are generally reluctant to provide loans even for highly profitable energy efficiency projects because of their lack of knowledge and understanding, and their perception of high risk with respect to energy efficiency projects.

Figure 6. Technology and Capital Risks in the Context of Low-carbon Investments



Source: Ghosh and Nanda, 2010.

The difficulties in navigating institutional obstacles are further compounded by the limited opportunities to seek capital lending abroad and the limited size of secondary markets. Over 50% of Borrowers believe that capital lending has become further restricted with the implementation of international regulatory frameworks such as Basel III. Only 4%–6% of Borrowers believe the current regulatory framework does not limit international capital lending. This regulatory framework derived from policy actions has consequentially had an impact on the institutional structure and abilities of Borrowers. Furthermore, 59%–63% of Borrowers identify that the lack of secondary markets for low-carbon project finance debt limits capital provisions from private investors and institutions. No Borrowers indicated disagreement with this statement but 38%–41% were unsure.

There is a need to mobilise institutionally held capital in support of low-carbon energy transition. Institutional investors, such as pension, insurance, and mutual funds have large pools of capital to deploy with a long-term investment outlook that is suited to low-carbon energy infrastructure financing. These funds enable institutional investors to cover the long-term financing needs of projects that are not covered by commercial banks.

When considering the need to reduce the risks of low-carbon financing, an established system of infrastructure to connect new technologies is vital to the financial success of each project. Ensuring that project risks are properly evaluated and understood will also allow Borrowers to develop their projects in a manner that works with existing infrastructure. Concurrently, governments need to continue to leverage grants, tax incentives, and policy mechanisms to ensure that the surrounding infrastructure needs of low-carbon projects are met and that there is a path to access finance. The greater investment in infrastructure will help to reduce costs, operational and external, for project developers looking to sell onto the market. Infrastructure investment would also attract greater financing so long as these investments are made alongside capital market reforms.

3.3.3. Market Barriers

Concerns pertaining to structural market barriers were of the least concern to Borrowers. The two highest ranked concerns, insufficient profits and currency risks, were indicated as major obstacles by only 29%–33% of Borrowers. Concerns of unpredictable cash flows, non-favourable interest rates, technological advancement, and an unstable consumer market received no more than 28% of respondent support. The low levels of concern for market-based obstacles do not negate the fact that Borrowers believe they exist. Of all Borrowers, 71%–73% believe that energy prices are unstable with high-risk speculative pricing and fluctuations. An even greater share, 78%–83%, believe that initial investment costs for low-carbon investments are high with unpredictable cash flows. However, the low level of concern is an outcome that is vital to understand the needs of low-carbon technology developers seeking finance. These responses can be considered a sign that the market for financing is healthy but institutional and policy barriers prevent the optimal utilisation of financing opportunities.

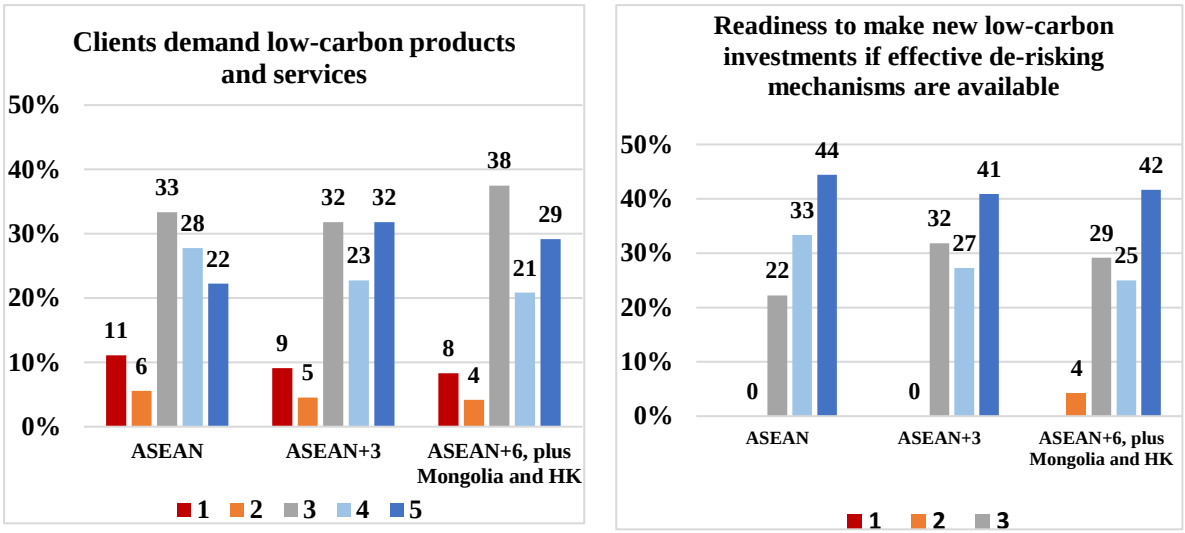
The obstacles that exist within the policy and institutional categories exist in spite of the overall market for low-carbon technology financing. Borrowers also believe that there is a strong demand for low-carbon investments. When questioned about the demand for low-carbon products and services, 50%–55% of borrowers estimated that there exists a strong or very strong demand with 32%–38% reporting a neutral/moderate level of interest. Despite the funding obstacles that might be market development related, borrowers remain positive and upbeat that there is growing demand for their product and

services. More needs to be done in setting up policies to support borrowers to get the credit they need and providing a stable financing policy environment.

These are risks that could potentially be addressed though the further development, articulation, and communication of de-risking instruments, public financial support, and public support mechanisms. The policy and institutional obstacles indicate that it is difficult to gather information, that governments are not doing enough to serve as a resource, and that these factors drive the growth of limited access to finance. Of all borrowers, 67%–77% agree or strongly agree that there is a readiness and willingness to make new low-carbon investments if effective de-risking mechanisms are available. Government support is important to the health of a project, but it is not currently readily available. Borrower dissatisfaction with financing opportunities stems from a lack of de-risking mechanisms, like government guarantees, or a lack of information/access to these instruments therefore leading to their underutilisation (Figure 7). This therefore requires more government commitment to the low-carbon transition that would then guarantee more funding to low-carbon project developers.

Despite the healthy state of the market and the low indication of obstacles, it is worth addressing the obstacles that contribute to unpredictable cash flows and insufficient profits. These market obstacles are connected to institutional obstacles and policy obstacles driving market disruptions that in their absence would further support the development of the low-carbon industry.

Figure 7. Demand and Readiness for Investment

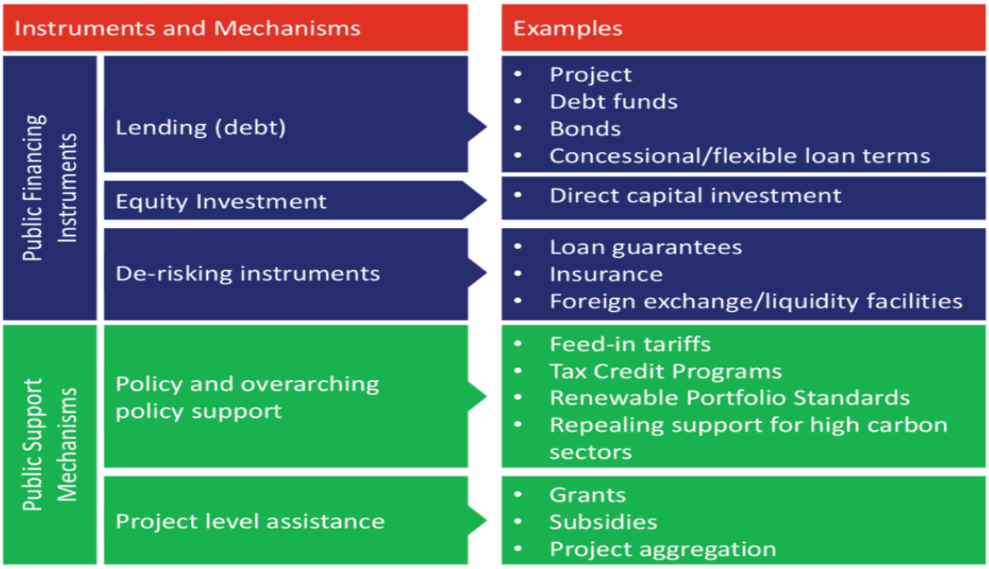


Source: Authors.

Indicating that access to finance is an obstacle, and that government support is important to the health of a project but not readily available are all indications that the current system of financing is weak and operating below optimal efficiency. This dissatisfaction with financing opportunities stems from a lack of de-risking mechanisms, like government guarantees, or a lack of information/access to these instruments therefore leading to their underutilisation.

Borrowers identified high market concentration and monopolisation of low-carbon financing, subsidies for conventional energy and the absence of a carbon price, and current PPAs structuring as problematic for the low-carbon financing market. Across all three issues areas, 60%–71% of Borrowers indicated that these barriers were related to a lack of access to finance.

Figure 8. De-Risking Policy Instruments in Asia



Source: WRI, 2012

These market issues are driven by policies that can change shareholder perception, leading to concerns about pricing and profit. Fossil fuel subsidies contribute to a limited ability of market participants to determine commodity prices and the lack of pricing for externalities puts further downward pressure on high-carbon technologies. The legacy and established infrastructure of high-carbon investments also attracts market investors who need to balance intense competing demand for capital within the firms. Fiscal and public finance subsidies to high-carbon investments also contribute to high barriers to entry to procure finance. These subsidies or incentives put low-carbon investors at a competitive disadvantage and subject them to unfair market conditions allowing for a low-carbon market to form where there is limited competition amongst low-carbon technology developers since so few can survive the inflated advantage bestowed upon high-carbon technologies (Anbumozhi et al., 2018a).

The significant reliance on government support and the lower usage of government guarantees, grants, and tax-credits suggests that there is an opportunity for policymakers to further develop the usage of de-risking mechanisms to further leverage private capital for low carbon financing. Such de-risking mechanisms are available in various forms throughout ASEAN and have been developed to different degrees. These often take the form of bonds, insurances, subsidies, and renewable portfolio standards (Figure 8).

3.4. Lenders Risks in Low-carbon Financing

Respondents labelled as Lenders were directly asked to complete a Lender section of the survey where they were asked to identify what they regarded as major risks in making new low-carbon investments. These risks have also been categorised into the same three categories used to identify Borrower barriers: issues concerning policy, issues concerning institutional aversions, and issues concerning the current market structure. These three considerations are also composed of a series of subsequent risks that overlap with the Borrower barriers and further develop the perception of risk amongst Lenders (Table 7).

Table 7. Biggest Lender Risks to Finance Low-carbon Projects

How do you regard major risks in making new low-carbon investments? (Respondents Rank the Options)

Category	Risks	Score (Out of 7)			Ranking (Out of 7)			*Average Rank*
		ASEAN	*ASEAN +3*	*ASEAN+6-Mongolia and HK*	ASEAN	*ASEAN +3*	*ASEAN+6-Mongolia and HK*	
Policy	Changing Regulations	3.33	2.93	2.93	2/3	1	1	0.9
	Inconsistent Policies	3.33	3.13	3.13	2/3	2	2	1.6
Market	Market Risks	3.17	3.47	3.47	1	3	3	2.3
	Tech Risks	4.25	4.20	4.20	6	4	4	4.7
	Currency Risks	4.17	4.27	4.27	5	5	5	5.0
Institutional	Rising Business Costs	4.08	4.53	4.53	4	6	6	5.3
Market	Rising Interest Rates	5.67	5.47	5.47	7	7	7	7.0

ASEAN = Association of Southeast Asian Nations; HK = Hong Kong.
Source: Authors.

Asian governments are currently using public finance to leverage, and thereby scale up, private finance for infrastructure investments. This has become possible because institutional investors, such as pension, insurance, and mutual funds, have large pools of capital to deploy with a long-term investment outlook that is suited to low-carbon energy infrastructure financing. In order to entice these investors to invest more in these projects, all that is needed is demonstrated policy stability in the direction of low-carbon development. The progress in mobilising private capital is inadequate as many suspected barriers exist. These barriers can consist of an inability to invest in a project of scale due

to perceived and/or real risks or the inability to direct capital to projects due to regulatory and bureaucratic failures. These barriers have led to insufficient funding for low-carbon technologies within the framework of meeting NDC targets. Further, there is insufficient evidence to show what types of incentives provide additional financial and developmental support. Despite the lack of information on barriers and solutions to leveraging financing, there are general trends that have been identified to help identify these unknown elements.

There has been an upward trend of domestically raised investment, indicating the importance of strong national policy and regulatory frameworks for climate-related projects. Over 2015–2016, 79% of finance was raised in the same country in which it was spent emphasising the importance of national markets, regulations, and reforms to unleash private financing (Buchner et al., 2017). In this same 2015–2016 period, commercial financial institutions and institutional investors contributed $64 billion, 15.6% (Buchner et al., 2017), of this low-carbon financing indicating that banks, which often operate domestically, play a pivotal role in ensuring projects receive support. Despite the importance of these lending institutions in supporting the low-carbon market, these institutions regard low-carbon credits lines as risky and unattractive investment opportunities. Survey respondents from the lending sector demonstrated agreement with the sentiment that low-carbon investments are risky emphasising that policy and market risks are their primary concerns. Within the three categories or risks the top 5 sub-risks of concern to Lenders were within the categories of policy and market risks.

As highlighted in section 3.3.2, the analysis of Borrower obstacles, the risks that Lenders face do not occur as isolated incidents. Policy risks can impact market risks which shape the functioning of institutions. As the three categories of risk are evaluated, this concept is important in understanding the dynamic of low-carbon financing markets.

3.4.1. Policy Risks

Lenders' perceived policy risks stem from an inadequate articulation, creation, or enactment of low-carbon/ energy related policies. Of all respondents, 80%–85% strongly or very strongly believe that their government implements inconsistent and overlapping policies and 69%–70% strongly or very strongly agree that there is weak coordination amongst ministries and agencies. Of respondents, 54%–60% agree or strongly agree that the absence of concrete action plans by the government on the low-carbon transition leads

to uncertainty in their organisations' business models and decisions. These policy risks prevent institutions with sufficient capacity from being able to accurately assess risks due to policy uncertainty.

Amongst the other national regulatory and policy concerns, Lenders shared strong agreement across all relevant questions in regards to risks and barriers with many also believing that the number of permits required for low-carbon energy projects are high and processing time is long, that the regulatory framework for land procurement is complicated and takes time, and that compared to other investment projects low-carbon projects require more due diligence (Table 8).

Amongst identified policy risks and barriers, Lenders do not believe that the current regulations on foreign direct investment (FDI) act as a restriction to international funding. This logically corresponds with the growing reliance on and strengthening of domestic markets. Considering financing is primarily driven by domestic actors, the need for FDI has lessened. Lenders also reiterated that issues of bureaucratic miscommunication, policy overlap, government inefficiency, and general regulatory barriers and red tape increase the risk of financing a low-carbon project.

Table 8. Lenders' Perceived Policy Risks

National Regulatory Barriers (Statement)	Lender Location	1	2	3	4	5	Total of 4+5
Overlapping and inconsistent policies by governments	ASEAN	0%	0%	20%	60%	20%	80%
	ASEAN+3	0%	0%	15%	62%	23%	85%
	ASEAN+6–Mongolia and HK	0%	0%	15%	62%	23%	85%
Coordination amongst ministries and institutions is weak	ASEAN	0%	0%	30%	40%	30%	70%
	ASEAN+3	0%	0%	31%	46%	23%	69%
	ASEAN+6–Mongolia and HK	0%	0%	31%	46%	23%	69%
Lack of concrete action plans by the government on the low-carbon transition leads to uncertainty in my organisation's business model and decisions	ASEAN	0%	10%	30%	30%	30%	60%
	ASEAN+3	0%	8%	38%	31%	23%	54%
	ASEAN+6–Mongolia and HK	0%	8%	38%	31%	23%	54%
	ASEAN	0%	0%	40%	40%	20%	60%

The number of permits required for low-carbon energy projects is high and processing time is long	ASEAN+3	0%	0%	38%	46%	15%	62%
	ASEAN+6–Mongolia and HK	0%	0%	38%	46%	15%	62%
The regulatory framework for land procurement is complicated and takes time	ASEAN	0%	0%	40%	30%	30%	60%
	ASEAN+3	0%	0%	31%	31%	38%	69%
	ASEAN+6–Mongolia and HK	0%	0%	31%	31%	38%	69%
Compared to other investment projects, low-carbon projects require more due diligence	ASEAN	0%	20%	30%	30%	20%	50%
	ASEAN+3	8%	15%	23%	38%	15%	54%
	ASEAN+6–Mongolia and HK	8%	15%	23%	38%	15%	54%
Foreign direct investment restrictions are currently limiting the amount of international funding available to my organisation	ASEAN	10%	30%	40%	20%	0%	20%
	ASEAN+3	8%	23%	38%	23%	8%	31%
	ASEAN+6–Mongolia and HK	8%	23%	38%	23%	8%	31%

ASEAN = Association of Southeast Asian Nations; HK = Hong Kong.
Source: Authors.

3.4.2. Institutional Risks

Lenders identified institutionally based risks as one of the least important risks in their determination for providing financing to low-carbon projects. Institutional concerns, which were a greater concern for Borrowers, are ranked the lowest, indicating that institutions for Lenders are stronger than the institutional needs of Borrowers. With the Bank driven financing system that is currently the dominant form of financing across Asia, Lenders do not believe that the institutional structure currently in place is a primary risk to low-carbon financing.

Even though institutional risks were ranked by Lenders as being amongst the lowest risks, concerns persist. Lenders indicated varying degrees of affirmative support that technical infrastructure barriers such as grid connectivity, local supply chains, portfolio standards, and availability of technical information create financing risk. The need to further develop long-term financing sources such as pension, insurance, and mutual funds that have large long-term capital supplies will be vital to Borrower success. Of all Lenders, 69%–70% consider the current lack of secondary markets for low-carbon project finance debt as a limiting institutional feature increasing the perceived risks of providing capital provision for private investors and institutions. Lenders are also still in the earlier stages

of developing their capacity frameworks for determining viable low-carbon investments.

Survey questions concerning capacity produced mixed results. When asked if low-carbon investments are complex, most respondents (47%–50%) were neutral or moderate. When asked if there were only a small number of risk-mitigating or risk-sharing facilities, uncertainty was expressed again with 58%–53% of respondents responding neutral or moderate. Lenders indicated, by a slim margin of just over 50%, that they have a specific team for low-carbon investments, but it was unclear whether lenders believed that they had adequate tools for evaluating low-carbon investments with 'no' being the most common response (Table 9).

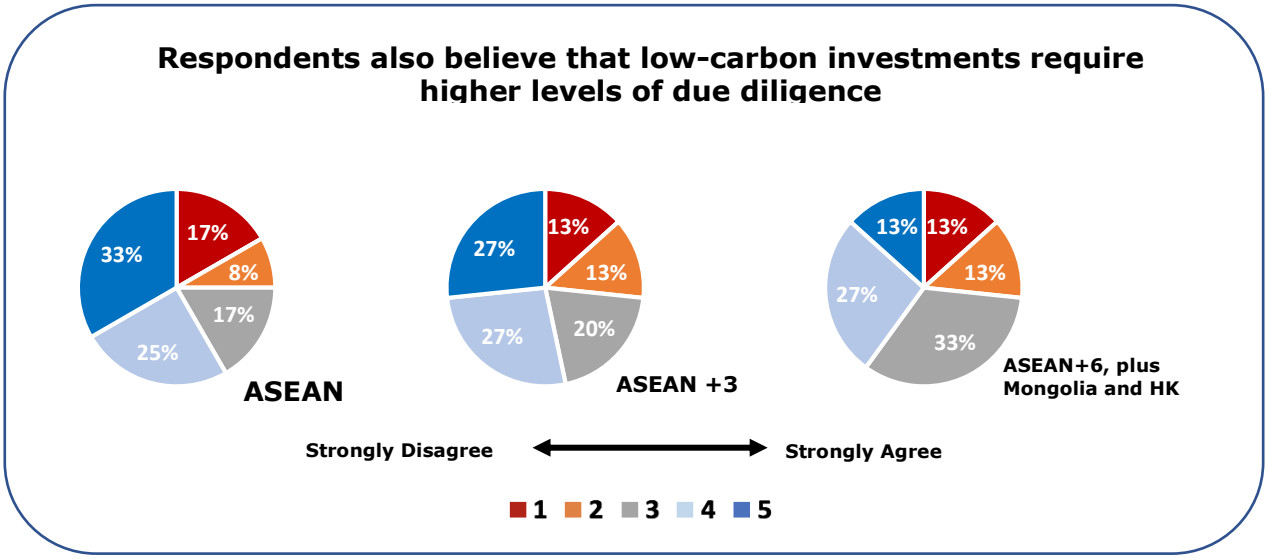
Lenders indicate that there is a stronger focus on low-carbon solutions after the Paris Agreement, but many still struggle with the higher levels of due diligence required to make investments in low-carbon solutions, with 40%–58% indicating low-carbon investments require a greater degree of due diligence (Figure 9). In facing these risks to market entry, over 77% of Lenders have continued to seek opportunities to understand the market as they begin to incorporate emissions reductions and environmental sustainability into their organisations' mission statements. As we have previously assessed, by their nature, low-carbon energy transition projects take longer to receive investor attention. Incumbent industries have an advantage with investors as the capacity of knowledge of these existing industries has been developed along with strong relationships. The lack of knowledge of the low-carbon market in combination with uncertainty in regulation and incentives further dampens the potential to mobilise capital for low-carbon resources (Anbumozhi et al., 2018a).

Table 9. Lenders' Institutional Capacity

Question	Lender Location	1	2	3	4	5	Total of 1+2	Total of 4+5
Low-carbon energy investments are complex and relatively immature	ASEAN	8%	25%	50%	17%	0%	33%	17%
	ASEAN+3	7%	27%	47%	20%	0%	33%	20%
	ASEAN+6–Mongolia and HK	7%	27%	47%	20%	0%	33%	20%
Very few risk mitigation or risk-sharing facilities are available	ASEAN	0%	8%	58%	17%	17%	8%	33%
	ASEAN+3	0%	7%	53%	27%	13%	7%	40%
	ASEAN+6–Mongolia and HK	0%	7%	53%	27%	13%	7%	40%
We have a specific team responsible for evaluating low-carbon investments risks.	ASEAN	17%	8%	25%	33%	17%	25%	50%
	ASEAN+3	20%	7%	20%	33%	20%	27%	53%
	ASEAN+6–Mongolia and HK	20%	7%	20%	33%	20%	27%	53%
We have adequate tools and best practices to evaluate the low-carbon investments risks.	ASEAN	8%	17%	33%	25%	17%	25%	42%
	ASEAN+3	13%	13%	33%	27%	13%	27%	40%
	ASEAN+6–Mongolia and HK	13%	13%	33%	27%	13%	27%	40%
Low-carbon investments require more due diligence compared to other projects	ASEAN	17%	8%	17%	25%	33%	25%	58%
	ASEAN+3	13%	13%	20%	27%	27%	27%	53%
	ASEAN+6–Mongolia and HK	13%	13%	33%	27%	13%	27%	40%

ASEAN = Association of Southeast Asian Nations; HK = Hong Kong.
Source: Authors.

Figure 9. Due Diligence Necessity for Low-carbon Investments



Source: Authors.

Many of these organisations are at the early stages of developing the capacity to engage with these investment opportunities. The capacity constraints of respondents were further highlighted by below 50% of respondents stating that they did have the adequate tools to evaluate low-carbon risks with the second largest response of approximately 33% of respondents indicating a neutral/moderate response. The lack of capacity and in-house knowledge of low-carbon investments will only further intensify the perceived risks to making low-carbon investments and further de-incentivise investments. Without the proper capacity to evaluate risk within projects that require a greater degree of due diligence all within an unstable policy environment, Lenders will require further assistance to reduce institutional risk.

In resolving these capacity issues, Lenders identified several actions that could reduce institutional risks. Almost all, 93% of all respondents indicated that the sharing of best practices would be beneficial in efforts to build capacity to increase low-carbon investment. Training opportunities and guidelines also received similar support with 47%–50% of respondents indicating the development of these tools would also be beneficial. The information that lenders hope to have conveyed through these tools would ideally pertain to the cost saving potential of low-carbon technologies, and how to measure technological and markets risks. These three topics were also indicated by

lenders as information of interest in making a low-carbon investment decision easier. 60% to 62% of Lenders consider sourcing financial capital for low-carbon investments difficult due to perceived risks. Institutional risk, though not the greatest source of risk, contributes to creating this perception which is primarily driven by policy and market risks. Policy and market risks can shape institutional risks and structures by limiting opportunities to build capacity and weakening institutional financing opportunities through government driven or naturally occurring market conditions driving interest away from low-carbon financing.

3.4.3. Market Risks

Market based risks rank as the second greatest concern for Lenders when considering low-carbon financing and investment options. This category of risk has been divided into two sub-categories: general market risks (currency/interest risks) and technological risks.

When considering how market risks are constructed and measured by Lenders, the influences of policy and institutional structures must be taken into consideration. Policy can affect market risk directly through economic market policies. These polices take form as direct rules regarding subsidies to certain industries or directly utilising commodity price setting tools, especially in the case of state-owned-enterprises. Financial market policies are indirect and address the structure of the overall market. The effects of financial market policies take form as regulations and assurances by policymakers to create access and affordability of financing through establishing appropriate financing vehicles and institutions, such as blended finance, green bonds and other renewable energy investment bonds. Regulations pertaining to who can seek and provide financing and from where as well as policies that change the markets entire cost structure such as a carbon tax.

It is difficult for respondents to identify low-carbon market risks because Lenders and Borrowers lack access to information, about carbon emission reduction potential of the projects and programmes as well as regulatory environment. This uncertainty is reflected in the responses of Lenders. For both general market-based risks and technological risks, Lenders tend more towards answers focusing on moderate/neutral responses or have provided responses indicating uncertainty of what the risks are within the market. Lenders are the most confident that subsidies for conventional energy and the

absence of carbon prices are distorting low-carbon investment. With less confidence, Lenders also indicate that energy prices are unstable with a high risk of speculative prices and fluctuation (Table 10).

Table 10. Lenders Perceived Market Risks

Economic and Financial Barriers (Statement)	Lender Location	1	2	3	4	5	Total of 4+5
Subsidies for conventional energy and the absence of carbon prices are distorting low-carbon investment	**ASEAN**	0%	0%	10%	60%	30%	90%
	ASEAN+3	0%	0%	8%	69%	23%	92%
	ASEAN+6–Mongolia and HK	0%	0%	8%	69%	23%	92%
Current Power Purchase Agreements (PPA) are not conducive for low-carbon investment	**ASEAN**	0%	0%	60%	30%	10%	40%
	ASEAN+3	8%	0%	54%	31%	8%	38%
	ASEAN+6–Mongolia and HK	8%	0%	54%	31%	8%	38%
Energy prices are unstable with a high risk of speculative prices and fluctuation	**ASEAN**	0%	0%	40%	60%	0%	60%
	ASEAN+3	0%	0%	38%	54%	8%	62%
	ASEAN+6–Mongolia and HK	0%	0%	38%	54%	8%	62%
Low-carbon investments suffer from high initial investment costs and unpredictable cash flows	**ASEAN**	0%	0%	50%	50%	0%	50%
	ASEAN+3	0%	0%	46%	46%	8%	54%
	ASEAN+6–Mongolia and HK	0%	0%	46%	46%	8%	54%
The potential cost savings from energy efficiency improvements are difficult to estimate, which makes calculating the payback period very challenging	**ASEAN**	0%	40%	20%	30%	10%	40%
	ASEAN+3	0%	38%	15%	38%	8%	46%
	ASEAN+6–Mongolia and HK	0%	38%	15%	38%	8%	46%

ASEAN = Association of Southeast Asian Nations; HK = Hong Kong.
Source: Authors.

Borrowers have issues with profitability and potential losses – possibly connected with the availability of PPAs and stable feed-in-tariffs, or the issues concerns unstable revenue coming from these projects, meaning cashflows are unpredictable. Given the intermittent nature of renewable energy resources such as solar and wind, generating stable and predictable revenues without storage is difficult. When storage is available, this adds as another upfront investment cost hurting the market cost competitiveness of low-carbon technologies. Unpredictable policies for clean energy introduce further risk since renewable energy projects are often subject to incentive policies. Uncertainty of incentive policies cannot provide predictable cash flows to investors over the long term (Mo, 2018).

3.5. Influencers Perspectives on Low-carbon Financing Barriers and Risks

When comparing the responses of Influencers, Borrowers, and Lenders in the final section of the survey, significant overlaps in responses could be identified. Influencers typically articulated the same trend to nearly the same degree as lenders and borrowers. Of the 30 total questions posed in the final section, 16 of those questions captured similar responses across regional and participant categories. These questions covered topics related to the perception and commitment to low-carbon investment, economic and financial barriers, and national regulatory barriers. In terms of perception and commitment, participants primarily supported the statements that low-carbon finance has become a promising business especially after the Paris Agreement, that there has been an increasing consumer awareness in low-carbon finance, and that emission reduction and environmental sustainability are included in their organisational mission statements and that they currently make considerable investments in low-carbon energy projects. In the economic and financial barriers category respondents articulated concerns over fossil fuel subsidies leading to volatile price distortions and that international regulatory frameworks, the lack of a strong secondary markets, and high perceived risks makes sourcing capital and investments difficult. Upon consideration of national regulatory barriers, respondents stated that the low-carbon financing is plagued by overlapping and inconsistent policies by governments, weak coordination amongst ministries and institutions and a lack of concrete action plans by the government on the low-carbon transition which leads to uncertainty organisational business models and decisions.

An additional eight questions showed very similar responses across the regional participant categories except for those in the global category. Global respondents in these questions tended to answer to the contrary of the answers of lenders and borrowers across all ASEAN and the extended Asian region. These questions pertained primarily to economic and financial barriers and questions of technical and infrastructure barriers. When considering questions of whether low-carbon investments suffer from high initial investment costs and unpredictable cash flows, global respondents did not provide a definitive response with an equal distribution concentrated between uncertain/moderate. To the contrary all other respondents indicated that they agreed or strongly agreed at a rate of 50% or greater. On the topic of infrastructure and technical barriers, global respondents' answers conflicted with all other respondents on three topics: lack of grid connectivity, local supply chain underdeveloped, and the adequacy of portfolio standards to accommodate low-carbon energy supply. Global respondents indicated that the lack of grid connectivity is not a barrier to investments with 62% of respondents indicating support for this sentiment. Other respondents agreed or strongly agreed at rates 60% or higher that this was an issue. For the final two questions, a majority of respondents agreed or strongly agreed to the posed questions but respondents from the global category provided inconclusive responses.

Two of the questions in the final section had different responses across all categories. The first question that showed various sentiments in responses was divided along categorical, not geographical lines. When asked what duration the financial incentives in the form of subsidies would be required to support new investment an average of 62% of lenders across all regions choose up to 5 Years, with 22% choosing up to 10 years, and the remaining 17% choosing more than 10 years. 20% of borrowers across all regions choose up to 5 Years, 52% choose up to 10 years, and 28% choose more than 10 years. Finally, influencers answered with an average 31% for 5 years, 31% for 10 years, and 38% for more than 10 years. These various answers amongst the participant categories are an indication of a possible miscommunication of borrower needs and lending capacity further extrapolated by the miscalculation of lender and borrower needs by influencers. Furthermore, this may be attributed to the limited ability of different groups to understand changing governments stances towards low-carbon policies and regulations. The second question with conflicting answers was whether foreign direct investment restrictions were

currently limiting the amount of international funding available to an organisation. Lenders indicated that they did not feel limited, while borrowers stated that they did see the limitations. Influencer's responses were unclear and provided no definitive answer.

The remaining four questions in the section were formatted as multiple choice checkbox question or as a matrix ranking scale dropdown question. These questions contained a variety of unique insights into best practices for crafting national and regional policy frameworks as well as potential financial incentives and tools that can be utilised to increase investment opportunities. Outlined in Table 11 are the questions asked and their reported results. Evaluating the responses across regional categorisations, there remains a consistency amongst the answers except in certain circumstances for global respondents.

Upon evaluation under the scope of participant categorisation there is a wider variation of answers between Lenders, Borrowers, and Influencers. As a means to increase investment opportunities, there is a general level of support amongst respondents towards establishment of low-carbon investment fund and a system of government guarantees. This support is slightly weaker amongst Borrowers but strong amongst lenders and influencers. Securitisation is also popular amongst borrowers and lenders, but influencers rank this tool poorly. In order to improve the low-carbon investment environment respondents reiterated their support for government guarantees with further requests for the harmonisation of existing policies, shortening the time to acquire licenses, and a lesser support for the implementation of an international regulatory framework. Borrowers were the only respondents seeking more aggressive competition policy, ease in procuring property, and the reduction of excessive credit support for fossil fuels. The lack of support amongst Lenders and Influencers for reducing excessive credit support does not equate a lack of support for the idea but a lower prioritisation of the initiative compared to other policy recommendations. In consideration of specific policy areas that the government should undertake, all participants except those labelled global believe that there should be a greater focus on the commercialisation of low-carbon technologies. Furthermore, all respondents consider the use of public funding to stimulate private investment a priority policy area for government to focus on. Energy taxation also demonstrates broad support from all respondents except those considered global or are Lenders. Carbon pricing also has similar results except that global participants also

support energy taxation. Research and development support were strong amongst the category of Influencers.

Finally, respondents were asked to rank possible regional cooperation structures and incentives that would unlock the potentials of low-carbon investment by the private sector. Respondents indicated that a regional carbon price and a regional low-carbon investment fund were the top two structures or incentives of choice. Influencers also ranked both options within their top two choices but preferred a regional low-carbon investment fund. Amongst all categories for all participants, regional regulations on goods and services and regional green bonds were ranked fifth and sixth (last), respectively, conflicting to an extent with earlier expressed responses to other questions. Taking this into consideration, the conclusion can be drawn that at a regional level, regulations and bond initiatives were not a priority to most respondents, but can be valuable at the national level and do not exclude the need for international assistance and cooperation.

Table 11. National and Regional Policy Frameworks

Which additional financial incentives would increase your investment opportunities?												
Listed Financial Incentives	ASEAN			ASEAN+3			ASEAN+6+ Mongolia/HK			Global		
	Lender (L)	Borrower (B)	Influencer (I)	L	B	I	L	B	I	L	B	I
Capacity Building For Assessing Climate-Related Risks	50%	39%	58%	38%	36%	46%	38%	42%	46%	N/A	N/A	25%
Dedicated Low-carbon Investment Funds	90%	50%	73%	77%	41%	56%	77%	42%	54%	N/A	N/A	50%
Government Guarantees for High-Risks (e.g. off-taker risk)	70%	61%	69%	77%	50%	69%	77%	46%	65%	N/A	N/A	63%
Improved Low-carbon Definitions and Standards	40%	33%	38%	31%	41%	35%	31%	42%	40%	N/A	N/A	25%
Incentives to Increase the Use of Equity Funding	40%	33%	35%	46%	32%	25%	46%	33%	29%	N/A	N/A	25%
Securitisation of Low-carbon Energy Projects into Asset-Backed Securities	60%	50%	35%	62%	45%	25%	62%	42%	29%	N/A	N/A	25%

What do you think the government should address to improve the environment for low-carbon investment?												
Listed Proposed Improvements	ASEAN			ASEAN+3			ASEAN+6+ Mongolia/HK			Global		
	L	B	I	L	B	I	L	B	I	L	B	I
Ease of procuring property	10%	56%	31%	15%	45%	21%	15%	46%	22%	N/A	N/A	13%
Financial market stabilisation	0%	22%	42%	8%	23%	35%	8%	25%	37%	N/A	N/A	13%
Government subsidies/guarantees for low-carbon projects	60%	100%	73%	62%	91%	60%	62%	83%	57%	N/A	N/A	63%
Implementation of international regulatory frameworks	50%	39%	38%	46%	36%	35%	46%	33%	40%	N/A	N/A	38%
Improving credit rating for private finance	10%	28%	38%	15%	23%	31%	15%	21%	32%	N/A	N/A	13%
Harmonisation of existing policies	70%	56%	62%	62%	50%	52%	62%	50%	57%	N/A	N/A	75%
More aggressive competition policy	0%	56%	23%	15%	50%	27%	15%	46%	30%	N/A	N/A	25%
Local-content requirement	10%	39%	27%	15%	32%	21%	15%	33%	25%	N/A	N/A	0%
More liberalised trade and investment policy	0%	50%	50%	15%	41%	42%	15%	38%	44%	N/A	N/A	38%
Reducing excessive credit support for fossil fuel	0%	44%	27%	0%	36%	13%	0%	33%	16%	N/A	N/A	0%
Resolving insolvency of banks	0%	11%	23%	8%	9%	12%	8%	13%	14%	N/A	N/A	13%
Shorten the time to get licences	50%	56%	42%	54%	55%	44%	54%	50%	46%	N/A	N/A	50%
Sharing start-up business costs	30%	39%	23%	31%	32%	31%	31%	29%	30%	N/A	N/A	13%
Reducing excessive credit support to state-owned enterprises	20%	44%	27%	31%	41%	17%	31%	42%	19%	N/A	N/A	0%

Which specific policy areas should governments undertake to substantially influence low-carbon investment decisions?												
Listed Proposed Focus	ASEAN			ASEAN+3			ASEAN+6+ Mongolia/HK			Global		
	L	B	I	L	B	I	L	B	I	L	B	I
Commercialization of low-carbon technology	50%	50%	69%	54%	50%	60%	54%	50%	60%	N/A	N/A	25%
Energy taxation	20%	56%	62%	31%	45%	52%	31%	42%	49%	N/A	N/A	25%
Carbon pricing	40%	67%	81%	31%	64%	73%	31%	63%	70%	N/A	N/A	75%
Fossil fuels support	30%	39%	15%	23%	36%	15%	23%	33%	16%	N/A	N/A	0%
Green bonds	30%	50%	46%	31%	45%	40%	31%	42%	40%	N/A	N/A	25%
Municipal tax-credit bonds	10%	22%	27%	8%	23%	19%	8%	21%	19%	N/A	N/A	0%
Research Development and Demonstration	30%	33%	81%	31%	32%	77%	31%	33%	78%	N/A	N/A	63%
Standards for asset-backed securities funding for low-carbon assets	10%	17%	42%	15%	14%	25%	15%	13%	27%	N/A	N/A	25%
Stimulate private sector investment through public funding	40%	39%	65%	46%	41%	58%	46%	46%	59%	N/A	N/A	38%
Targeted investment incentive schemes	30%	39%	31%	38%	32%	33%	38%	29%	35%	N/A	N/A	63%

Regional structures and incentives that could increase investment and development of low-carbon energy systems include: (Note – Rankings highlighted to indicate green as the value of highest selection)												
Regional Structure Ranks	ASEAN			ASEAN+3			ASEAN+6+ Mongolia/HK			Global		
	L	B	I	L	B	I	L	B	I	L	B	I
Regional Carbon Price	1	1	2	1	1	2	1	1	2	N/A	N/A	1
Regional Finance Warranty Program	4	3	4	4	3	4	4	3	4	N/A	N/A	3/4
Regional Fund for Investing in Low-carbon Energy Transition Projects	2	2	1	2	2	1	2	2	1	N/A	N/A	2
Regional Low-carbon Guarantee Fund	3	4	3	3	4	3	3	4	3	N/A	N/A	3/4

Regional Regulations on Goods and Services	5	5	5	5	5	5	5	5	5	N/A	N/A	5
Regional Green Bond	6	6	6	6	6	6	6	6	6	N/A	N/A	6

ASEAN = Association of Southeast Asian Nations; HK = Hong Kong.
Source: Authors.

3.6. Challenges on Borrowers and Lenders

In the evaluation of Borrower barriers and Lender risks, there are many areas of overlap and agreement in terms of the obstacles and needs within the low-carbon financial markets. There is a disconnect between Borrowers and Lenders in evaluating the complexities of the low-carbon financing market. Borrowers believe that there is a demand for low-carbon products and services and that they lack information on systems of financial support. Lenders seem to lack information on the complexity and risks of the market indicating that there is a greater sense of awareness of gaps that currently exist amongst the Borrowers than amongst the Lenders. Despite the disconnect in the degree of knowledge, Borrowers currently rely on government support to maintain the viability of projects while Lenders indicated that government and international organisations are the primary sources to share risks, increasing the potential for public sector reforms that can help to bridge these knowledge gaps. Borrowers may want more done for them by governments and a change in policy direction to a shift to a more low-carbon development orientation, vis-à-vis other energy sources. Lenders may want more players that they can share their risks with, and a stronger policy regime to know that they will reap more profits from their investments while also reducing the risks by spreading it across government and other institutions.

The most significant difference in the perceptions of the low-carbon market by Borrowers and Lenders is the respondents' views on the role of the international community. Borrowers consider the international financial institutions possess a major role in reducing financial risks. However, Borrowers also consider the current international regulatory framework as a limitation on capital lending within a highly concentrated monopolistic financing environment. Considering Borrowers rely heavily on banks for financing and find it a difficult source of capital to access these conclusions

fit within the crafted framework of obstacles that has been constructed.

Lenders were unable to provide a definitive answer as to whether the market is currently dominated by a few actors and are unable to state whether the current international regulatory framework has been restrictive for capital lending. In light of this uncertainty, Lenders prefer stringent regulations and government guarantees to reduce risk.

Even though Borrowers and Lenders have drawn slightly different conclusions regarding international financing, most of the other conclusions drawn are similar (Appendix A). Despite the differences in views on regional and international policies and barriers, both groups believe that increased regional coordination on policies, regulations, and funding mechanisms will promote and improve the low-carbon financing market (Table 12).

Table 12. Comparison between Borrowers' and Lenders' Perspective on Enabling Low-carbon Investments

Questionnaire Order	Borrowers Section		Lenders Section	
	A. Demand for projects and awareness of low-carbon financing opportunities	**Answer**	**C. Risk perception on low-carbon energy system investments**	**Answer**
1	Clients demand low-carbon products and services	Agree	Low-carbon energy investments are complex and relatively immature.	Unclear/ Unknown (greater share disagrees)
2	Lack information on available grants, subsidies, incentives and financial products.	Strongly Agree	Very few risk mitigation or risk-sharing facilities is available.	Unclear/Unknown (greater share agrees)
4	Currently, our projects are financially viable, through government support without which they are not profitable.	Agree	Who is willing to share your risks in low-carbon investments?	• Government • Development Banks/ Multilateral Agencies

	B. Access to finance	Answer	D. Capacity to assess low-carbon investment risks	Answer
4	International financial institution plays a major role in reducing financial risks.	Strongly Agree	4. Stringent regulation for carbon emissions and government guarantee schemes reduce the risks.	Strongly Agree
Questionnaire order	**General Section**			
	Questions		**Borrowers**	**Lenders**
	F. Economic and financial barriers		**Answer**	**Answer**
1	The current low-carbon investment is characterised by high market concentration and monopoly by a few players.		Agree	Unclear/ Unknown
8	Capital lending has been further restricted with the implementation of international regulatory framework for banks.		Agree	Unclear/ Unknown
11	Financial incentives in the form of subsidies would be required to support new investment:		Up to 10 Years	Up to 5 Years
	H. National regulatory barriers		**Answer**	**Answer**
7	Foreign direct investment restrictions are currently limiting the amount of international funding available to my organisation.		Agree	Unclear/ Unknown (greater share disagrees)
	I. Regional policies		**Answer**	**Answer**
1	Increased regional coordination on energy policies, regulations, and funding mechanisms will promote low-carbon investment.		Strongly Agree	Strongly Agree

Sources: Authors.

4. Implications for Policymaking

Finance is the key component of the low-carbon energy transition and any financial flow under the Sustainable Development Goals of the Paris Agreement and Financing for Development will need to consider the estimates of an additional US$600–US$800 billion annually (World Bank, 2016) for low-carbon energy investments. How to mobilise, manage, and channel the future private capital needed to support the low-carbon transition

is a major challenge. It is vital to focus on the key issues of establishing a system for nationally and internationally coordinated investments and markets, gain insight into the complex understanding of replacing socio-technical regimes across multiple sectors and economies, and support financial innovations to encourage leveraging of capital. These goals are further complicated by policy, operational, capacity, and political risks that are derived from changing policies, shifting geo-politics, and weak capital and capacity institutions.

Utilising the survey data to inform a pathway to encourage substantial low-carbon investment, the following regionally coordinated solutions could be considered for immediate action: the development of regionally orientated solutions and regulations including the establishment of a low-carbon transition fund and a government warranty programme, the broadening of national de-risking funding mechanisms, and finally, the implementation of capacity building programmes to narrow communication and knowledge gaps.

4.1. National Policy to Unleash Private Finance

Policy, institutional, and market risks that are derived from changing policies, shifting politics, and subsidised and volatile energy markets hinder the institutions supporting low-carbon technology. These perceived barriers and risks decrease the confidence of Borrowers and Lenders seeking financing opportunities. To mitigate these, government institutions and policymakers have to utilise de-risking financing and institutional support mechanisms. However, the second key finding of the survey shows that these approaches are weak, difficult to access, unknown or unavailable.

National policymakers can take several steps to reduce risk and support the low-carbon financing market. Lenders overwhelmingly indicate that governments should be the main source of providing action to mitigate risk, with development banks, multilateral institutions, and insurance companies as a distant second and third choice, respectively. Respondents showed little interest in relying upon banks or credit agencies as institutions that reduce or mitigate risks. Borrowers have also highlighted that the domestic financing market is dominated by banks, which also proves to be a barrier to access due to high collateral requirements. Such dynamics indicate the greater need for more liberalized FDI policy to expand access to funding. Most Lenders (80%–83%) believe that Power

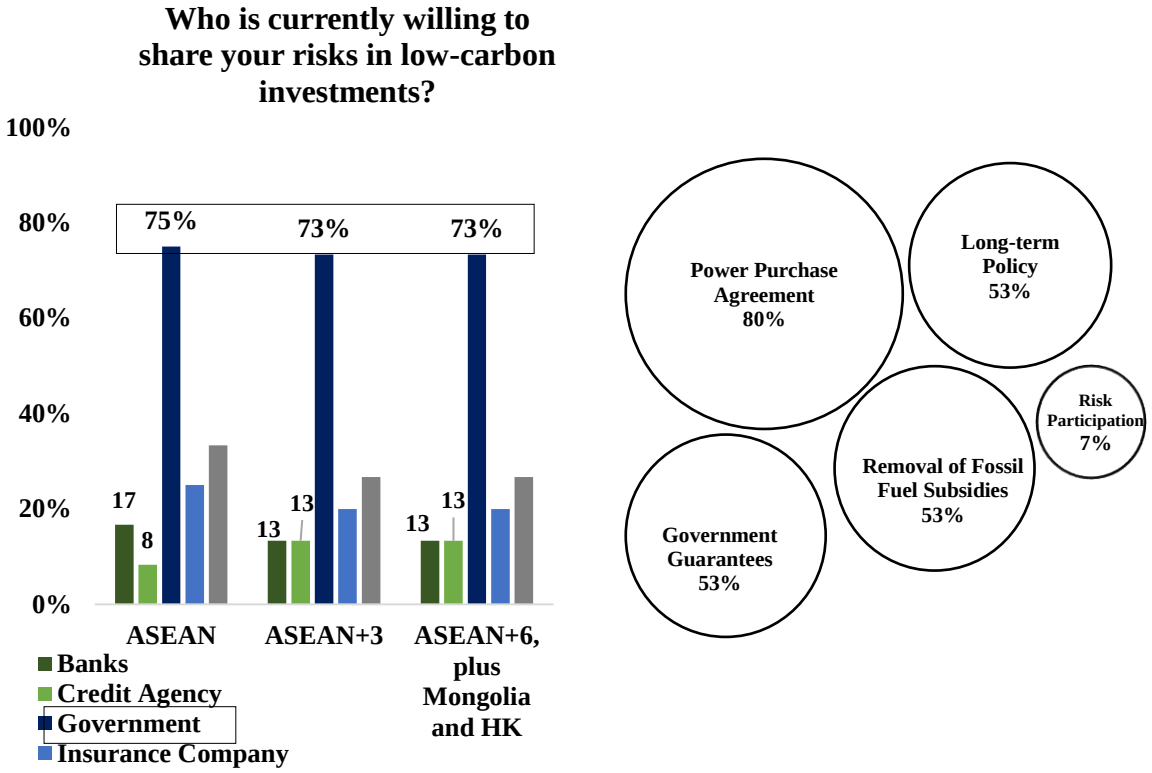
Purchase Agreements can act as the primary tool to mitigate risk. Government guarantees, long- term policy articulation, and the removal of fossil fuel subsidies are viewed as equally popular options, all favoured by over 50% of respondents (Figure 10). These tools and policies can act as valuable instruments and goals within the domestic market to encourage greater financing opportunities and a chance for the low-carbons sector to tap deeper into domestic financing markets.

In the 2015–2016 period, commercial financial institutions and institutional investors contributed US$64 billion, or 15.6% (Buchner et al., 2017), of this low-carbon financing support indicating that banks, which often operate domestically, play a pivotal role in ensuring that projects receive financial support. Despite the importance of these lending institutions in supporting the low-carbon market, it is believed that these institutions regard low-carbon credit lines as risky and unattractive investment opportunities.

Despite the lower response rates, government grants and government guarantees play a pivotal role in supporting the financial health (and therefore credibility) of low-carbon technology projects. Of all Borrowers, 58%–67% indicated that they depend on government support, without which their projects would not be financially viable (strongly agreeing or agreeing). Amongst those that responded to the same question regarding the importance of government support for project health, only 17%–18% indicated that such support was not important. Borrowers also indicated that out of five possible choices for who they considered to be the prime movers in making access to finance available, banks were ranked first followed by government, institutional investors, international assistance and social enterprises ranked last further bolstering the claim of the current importance of banks in securing financing, and the potential to further buttress government participation in leveraging financing in cooperation with banks.

The significant reliance on government support but the lower usage of government guarantees, grants, and tax-credits suggests that there is an opportunity for policymakers to further develop the usage of de-risking mechanisms to further leverage private capital finance. Such de-risking mechanisms are available in various forms throughout ASEAN and have been developed to different degrees. These often take the form of bonds, insurances, guarantees, subsidies, renewable portfolio standards and other instruments.

Figure 10. Willingness to Shares Risks and Ways to Mitigate the Risks



ASEAN = Association of Southeast Asian Nations; HK = Hong Kong.
Source: Authors.

To efficiently leverage private finance through public policy, several financing options that are considered beneficial in new low-carbon investment, as well as the corresponding institution that would be able to assist the low-carbon reforms, have been identified. The survey identified 12 possible choices and multiple options could be selected. The result showed three dominant options with an average 50% of responses – Green Bonds (50%), International Financing (57%), and Government Guarantee Scheme (58%). The least popular options, tax breaks and subsidies, received responses of 14% and 5%, respectively.

Borrowers earlier responded that international assistance was not a primary mover in accessing finance. However, this group pointed out that international financial institutions play a major role in reducing financial risks, as shown in 75%–78% of responses. This indicates that the emphasis on the importance of international financing in eliminating obstacles requires international financial institutions to become a more prominent policy

force in providing de-risking instruments along with policy support and financing mechanisms.

To further support the national policy framework for low-carbon investment, national and regional finance performance warranty programmes that could greatly reduce the effects of political, institutional, and market-based risks should be established. This programme would target manufacturers of low-carbon technology whose customers, such as engineering procurement and construction companies and public procurement actors, require insurance to warranty technology availability and performance. To improve project cash flows, a warranty programme would transfer investment risk to the insurance market, which has been indicated as a leader in potential de-risking initiatives alongside government guarantee programmes. Insurance markets would also be able to assess the risks of projects using newer or emerging technologies.The implementation of this programme would assist low-carbon technology manufactures to secure improved financing terms for capital and debt to support projects. This programme can be further expanded to provide a guarantee directly to customers of low-carbon technologies whose performance is dependent on manufactures of these technologies staying in business.

Setting up such a programme would help to structure the beginning of a regional underwriting market for low-carbon technologies. Beyond limiting the risk of investing in low-carbon technologies, a warranty programme would act as another market signal for investors to be used as an indicator for investment needs (Anbumozhi and Rakhmah, 2018b). Overall, such a programme will address the major concerns of risk that investors consider when investing in a low-carbon project. Easing the burden of having to wait a longer period for returns and making large upfront investments despites greater operational and pricing instability will become less of a concern when the investments have some form of protection. This is a policy that goes further than a traditional Power Purchase Agreement (PPA), which was indicated as a favoured tool by Lenders, in encouraging greater ongoing investment than what is outlined in a PPA agreement. A PPA encourages a limiting investment environment based on the availability of PPAs but guarantees and warranties allow a larger amount of risk to be mitigated. This increases confidence in investing in these projects as would an insurance coverage program.

Lenders also desire greater support to build their capacity instruments with 90%–100% of respondents requesting more opportunities for sharing of best practices amongst

lenders, and approximately 50% requesting either additional guidelines or training on how to identify low-carbon investment risks and make investments. These guidelines and this training and additional resources should highlight market risks, technology risks, and the cost saving potential of low-carbon technologies. Encouraging the adaptation of environmental, social, and governance considerations amongst private sector actors would ideally complement these capacity building programs. Respondents had a strong preference for this information but in most cases had less interest in receiving more information on government policy. Previously, it was highlighted that a large segment of respondents answered that government policies are inconsistent and coordination between agencies/ministries is weak and that governments should act as the primary stakeholder of risk, but this question seems to indicate lenders have little interest in learning more about said government policies. This may indicate that lenders have become disenfranchised by bureaucratic complexities and lack of reliability, requiring governments to make a concerted effort to simplify and clarify current and future policies before educating stakeholders.

4.2. Regional Risk Reducing Actions

The establishment of a regional low-carbon transition would occur under the purview of a regional cap and trade system. By creating this fund in collaboration with a system of cap and trade would enable investors to monetise carbon credits and thus increase their financial resilience. The funding for this initiative will be provided by redirecting current subsidies to fossil fuels towards qualifying low-carbon project developers that can apply for loans to finance low-carbon energy projects delivering carbon emission reductions that meet NDC targets. The loans will be converted into grants at a pre-established carbon price and when carbon reductions for projects proposed by emission reduction providers are realised as planned. Similar to availability payments made by governments to crowd in private capital into public infrastructure, the loans would be forgivable at a rate to be determined, if the planned reductions are achieved within 5 years.

By implementing a low-carbon transition fund, policymakers will ease the broadening and deep risk-bearing capacity of investors. Capital stocks amongst low-carbon project developers would be deepened and develop stronger policy ties between officials responsible for supporting the leveraging of private finance for low-carbon technology.

Regulators would be able to utilise the fund to gain insights into the market signals pertaining to the scale and nature of low-carbon innovation solutions and further develop and refine policy mechanisms to continuously improve the system of investment (Anbumozhi and Rakhmah, 2018b).

A cap-and-trade system has high indicated support from survey respondents that prefer carbon pricing over carbon taxation. A cap-and-trade programme sets the quantity of emissions during a fixed time period, letting the price of allowances be set in the marketplace. A carbon tax sets a price on emissions, which provides an incentive for emissions reductions, but allows the actual amount of reduction that occurs to vary. Both instruments can act as a source of revenue for public institutions, either by auctioning off emission vouchers or by collecting tax revenues. Both serve the function of placing a cost of carbon/GHG emissions, and both correct a market failure. The key difference between the two instruments is that one is a tax on carbon content of any specific fuel or energy technology, and the other a market in the rights to pollute. A tax fixes the price of carbon but allows emission levels to vary, while the cap imposes a limit on emissions and lets the price of tradable carbon allowances vary (Doshi, 2018). The cap-and-trade system working within the highly supported low-carbon transition fund can provide necessary reassurance and capital to low-carbon projects and therefore draw in more private capital.

The regional finance performance warranty programme would target manufacturers of low-carbon technology whose customers, such as engineering procurement and construction companies and public procurement actors, require insurance to warranty technology availability and performance. To improve project cash flows, a warranty programme would transfer investment risk to the insurance market which has been indicated as a leader in potential de-risking initiatives alongside government guarantee programmes. The implementation of this programme would assist low-carbon technology manufactures to secure improved financing terms for capital and debt to support projects.

This warranty programme can be further expanded to providing a guarantee directly to customers of low-carbon technologies whose performance is dependent on manufactures of these technologies staying in business. The foundation of this programme would help to structure the beginning of a regional underwriting market for low-carbon technologies. Beyond limiting risk of investing in low-carbon technologies, a warranty programme would act as another market signal for investors to use as an

indicator for investment needs (Anbumozhi and Rakhmah, 2018b). Overall, such a programme will address the major concerns of risk that investors consider when investing in a low-carbon project. Easing the burden of having to wait a longer period for returns and making large upfront investments despites greater operational and pricing instability will become less of a concern when the investments have some form of protection.

The best regional regulation programme would enable countries to request a third-party assessment of the potential within their country of international policies and regulations that have enabled commercial deployment of low-carbon technology investment. The programme would develop a knowledge base of expertise stemming from the academic, non-profit, and business community to assess current policy and regulation implications to prioritise reforms that would enable low-carbon investments. These reports and proposals would be made public and would be guided by NDC goals. Drawing on international best practices and experiences, this basic framework could include 15 specific regulations, clearly delineating the responsibilities of various government agencies and market entities under the four categories of institution building, policy support, financial infrastructure, and legal infrastructure.

Such a programme would assist in encouraging and developing the capacity building firms require to effectively participate in the market. Creating clear and consistent guidelines and standardising government and regional policies has been a major obstacle for respondents in participating and gaining knowledge within the low-carbon technology financing market. This would act as a first step in making it easier to build capacity. A low ranking given by respondents for regional regulations on goods and services was likely to be an indication, that greater regulations would not necessarily help to encourage greater financing.

Borrowers also indicated that the weakness of capital markets and over-reliance on domestic market financing (primarily through incompatible and uncompromising banks) has shifted the outlook on where investment and support should come from. Many respondents indicated the importance of regional and international assistance/institutions in encouraging financing. Looking to the international and regional community will require greater coordination of regulations and best practices to ensure the seamless movement of capital and investments between nations.

Table 13. Coverage of Best Regulation Programme

Specialised Investment Institutions	Fiscal and Financial Policy Support	Financial Infrastructure	Legal Infrastructure
(1) Low-carbon transition fund (2) Green banks (3) Greening development banks	(4) Discounted low-carbon loans (5) Green bonds (6) Green IPO (7) Pension funds	(8) Emission trading (9) Green ratings (10) Low-carbon stock indices (11) Low-carbon technology database (12) Low-carbon investor network	(13) Regional warranty/ insurance programme (14) Compulsory disclosure (15) Lender liability

Source: Anbumozhi and Rakhmah (2018b).

4.3. Technical, Infrastructure, and Institutional Capacity Building

Under the high-quality infrastructure procurement, an approach with three stages would be taken to evaluate new infrastructure programmes. Such a programme would prove vital to alleviating the concerns over the current incumbent advantage of high carbon-based technologies and investments. Respondents, except Global respondents, clearly and strongly indicated that infrastructure has proved to be a barrier in seeking or providing financing for low-carbon projects.

First, full economic life cycle cost assessments would be established, including operating costs, social benefits and the impact on NDC targets. Currently, a majority of cost assessments in Asia only take into account the upfront costs of project development.

Second, full carbon cost assessment, accounting for embodied, operational, end-of-life sequestered carbon emissions. The current system of project assessment fails to capture the effects of life-cycle emissions from upstream, midstream, and downstream sources. The carbon content of future infrastructure projects would be evaluated in at least four forms: (i) embodied – from material production, construction process, and waste; (ii) operational – from functional use of a project over its useful life; (iii) end of life – from decommissioning, reuse, recycling, and/or disposal; and (iv) sequestered. By accounting for these costs, carbon related savings can be fully embodied in the value investors and project developers receive from their projects.

Third, the best available low-carbon infrastructure solutions – assessments that require the project proponents and investors to undertake analysis of whether the needs associated with the infrastructure project can be met through cost innovative means or

conventional approaches.

By creating a uniform and systemically engrained accounting system for project developers to utilise, low-carbon technology manufactures will be able to clearly emphasise the cost-saving benefits of using their technology. This would widen the opportunity for low-carbon technologies to be incorporated into public infrastructure projects and provide another detailed source of information for investors that can act as a market signal (Anbumozhi and Rakhmah 2018b).

Lenders and borrowers share many of the same sentiments on the current state of the low-carbon financing market. Despite similar perceptions of risk and lack of ability to mitigate these risks, Lenders and Borrowers have limited abilities to cooperate amongst themselves and with policymakers to reduce these risks. Organising government sponsored workshops to facilitate the development of knowledge about the industry and the means to identify financing opportunities. Such workshops would include the sharing of best practices amongst lenders and borrowers, additional guidelines for making or soliciting low-carbon investments and financing, and finally training on how to identify low-carbon investment risks to make efficient and successful investments. These capacity building initiatives would correspond alongside the development of domestic and regionally orientated policies to support the development of capacity within the financial institutions of Borrowers and Lenders.

Considering that both Lenders and Borrowers believe that the current financing system, which relies primarily on banking, leads to sub-optimal results and does little to reduce risk perception, these capacity building workshops can help facilitate the development of other sources of financing. These other sources of financing can come from capital markets, direct equity investments, or venture capital. The remaining gaps in investment and capacity that exist will have to be filled by the international community and national government institutions. Lenders and Borrowers both believe that outside support and guidance is vital to the current and future health of low-carbon projects.

These capacity building initiatives can be led by public and private national and international organisations. The World Bank Institute has utilized the ability of individuals, organisations, state institutions, coalitions, the private sector and society itself to catalyse change to achieve their development objectives in a country-led and country-owned process of change (Otoo, Agapitova, and Behrens, 2009). To this end, they

have utilised a results-orientated road-mapping strategy in their efforts to assist in international capacity building. The determination of set expectations and outcomes is pivotal for obtaining the desired structural change needed to ensure lasting and successful development. Results orientated capacity building looks beyond technical training and assistance to strive for transformative change and connect private, public, academic, and non-profit leaders.

The Japan International Cooperation Agency (JICA) also attempts to incorporate into their capacity building efforts the targeting of three systemic capacity layers – individual, organisational, and institutional or societal levels. These layers are not mutually exclusive and are interconnected having effects on each other. Such a view of capacity building aims to communicate and bring about effective change throughout the breadth and depth of a country and of organisations (Sihag, Misra, and Sharma, 2004).

The Asian Development Bank (ADB) has already begun working on building capacity within the market and within low-carbon financing organisations. ADB currently provides direct finance for private clean energy projects (normally non-sovereign projects undertaken by private investors) using debt, equity, and credit enhancement/or de-risking instruments. ADB also creates public-private partnerships that can mobilise private finance. ADBs involvement creates a signalling effect to dedicate more resources to low-carbon investments and creates a framework through its own actions to craft a robust and sound due diligence process, a standardised system of standards, and system for good communication with governments to reduce some of policy risks and increase private sector's confidence. Multilateral organisations can act as advisers utilising their regionally based view and information resources to build industry capacity and financial market structures (Mo, 2018).

Multilateral organisations that assist in capacity building must ensure that there is a Cascading of knowledge across the organisation, that the right people attending trainings, and that there is an emphasis on transparency and an openness of agencies to change and to adapt new practices. Capacity building must be organised through a programmatic approach with various capacity building activities systematically planned to achieve organisational outcomes and to maximise impact across multiple years (AANZFTA, 2017).

In previous efforts to build capacity, ASEAN–Australia Development Corporation (ADC) has focused on consumer protection. By evaluating the framework of ADC's efforts to addressed gaps in both human and institutional capacities, lessons can be drawn as to how capacity should be built to support low-carbon financing. Development of policy briefs and case studies, which are summary documents that explore key issues and information gaps for low-carbon market participants across ASEAN would be a useful first step. Such documents and research would be used by and distributed to Borrowers and Lenders to build organisational knowledge of how to navigate the financing market. Such materials can also be aimed at government policymakers and others who are interested in formulating or influencing policy. Beyond policy briefs and case studies, the analysis of current and future trends, risks and opportunities that may influence regional and national capacity building needs are also vital to creating an informed market. Such research should be conducted on a regional and country based lens and ultimately identify effective and efficient interventions to address needs/gaps such as how best to meet the identified needs and what form of support required at what level: regional, sub-regional and/or national (Consumers International Kuala Lumpur Office, 2011).

The best regional regulation and capacity building programme would enable countries to request a third-party assessment of the potential within their country of international policies and regulations that have enabled commercial deployment of low-carbon technology investment. The programme would develop a knowledge base of expertise stemming from the academic, non-profit, and business community to assess current policy and regulation implications to prioritise reforms that would enable low-carbon investments. These reports and proposals would be made public and would be guided by NDC goals. Drawing on international best practices and experiences, this basic framework could include 15 specific regulations, clearly delineating the responsibilities of various government agencies and market entities under the four categories of institution building, policy support, financial infrastructure and legal infrastructure.

By providing academics, non-profit organisations, and civil society the opportunity to participate in the regulatory and permitting process, regulators would be better informed in creating a supportive environment for low-carbon stakeholders. The crafting of best practices would help to reduce costs, delays, and structural impediments to raising and soliciting investment (Anbumozhi and Rakhmah, 2018b). This kind of coordination and

capacity building permits the improved development of capital and financing markets by making it easier for Lenders to enter the market.

When addressing the direct needs of capital and financial markets, regional and national policymakers can approach the development and diversification of these markets through six solutions.

1. Gradually improving the building blocks for sustaining long-term capital market growth: Establish multi-layer capital market structures; establish a 'green channel' and lower barriers to entry of capital markets for SMEs; and flexible pricing mechanism and convenient refinancing channels.
2. Financial products and services innovations should be encouraged in capital markets: Risk reduction instruments and guarantee instruments can leverage public climate funds to attract private investment like green bonds; formation of a clean stock index; Debt-based instruments, such as on-lending and co-lending structures; and standardisation of project documents and aggregation.
3. Promoting market transparency and strengthening formal requirements to provide information on investments with effective regulation authority cooperation and standardised and unified information disclosure environment: Enhancing the cooperation of regulation authorities and other organisations; establish information sharing mechanism from both the market side and the cooperation side.
4. Setting up a 'guarantee mechanism' to reduce technology and investment risk: To reduce risk, government can provide supportive environments to create demand for new technology using technology push policy, also can influence the flow of later stage capital with a stable, predictable and long-term incentive programme, or create public–private partnership funds to cover start-up risk.
5. Improved ASEAN equity markets collaboration: Share experience from well-established financial supervisory infrastructure and capital market structures with less experienced ASEAN countries and officially introduce ASEAN Exchanges to provide greater access and exposure to companies operating in ASEAN.
6. International financial support plays a critical role in financing renewable deployment in ASEAN countries: ASEAN countries should use international community financial support to implement international loan projects and various forms of knowledge transfer and also to train professional and technical personnel.

This can also contribute to strengthening the capacity building of ASEAN public officials (Tian, 2018).

Such reforms would increase the availability and supply of capital within the market, reduce project-financing costs, reduce institutional barriers and risks, and reduce transaction costs for low-carbon investments.

5. Conclusion and Recommendations

A rather quiet transition is underway in ASEAN and East Asia in that financial systems and low-carbon energy systems are becoming aligned with the Paris Agreement. In general, there is a thrust towards integrating low-carbon considerations both by lenders and borrowers. This was a key finding of the survey. Increasing efforts are being made to integrate the low-carbon considerations between investors and project developers, with notable policy and regulatory leadership provided by major economies of the region. The experiences of the various market players suggest there is an emerging tool box of measures that can be implemented such as supporting capital reallocation, risk pricing, and market information sharing, across a range of low-carbon projects, such as renewable energy, energy efficiency improvement, and changes in resource use. There is a potential to systemise these early innovations, both nationally and regionally, to effect major deployment of private capital to finance low-carbon energy transition.

But this momentum is not enough to achieve the Paris Targets in 2030, which requires an unprecedented mobilisation of private finance. Several bankable projects in developing and emerging economies of ASEAN and East Asia are not being implemented due to a lack of financial resources at an affordable cost. To this end, it is critical that national and regional institutions take actions to create policy solutions that leverage a greater degree of low-carbon technology investment. As the survey results indicate, current efforts to align the financial systems with low-carbon energy development is still in progress, but is marred by several institutional, regulatory, and information barriers. Major ASEAN countries report that only 5%–10% of bank loans are low-carbon. Despite the rapid expansion in green bond markets, much less than 1% of total bond issuance is made up of labelled green bonds. Structural constraints continue to hold back market leadership, including perceived risks and misaligned incentives and short-termism of

policies. A failure to address these barriers has allowed continued investments in conventional energy resources and that means that the NDC targets for 2030 are likely to be missed.

Shifting from incremental change investments to transformation could be accelerated by regionally coordinated action. Four interrelated solutions could be considered: establishment of a low-carbon fund that can broaden and deepen the risk bearing capacity of the private sector; formulation of a financial warranty performance programme that would target low-carbon investors; the best regulations for low-carbon economy programmes through recruiting independent third parties to assess the effectiveness of new energy and investment policies that spur private finance actions domestically; and a quality infrastructure programme that evaluates new energy infrastructure in terms of their net carbon impact.

The barriers and risks identified in the survey also require further, deeper analysis so we can gain a better understanding of their impact on the size of private financial flows. This will require collecting a larger sample size from mature financial markets as well as conducting individual interviews with respondents and industry leaders. Such interviews would also help us to gain further insights into the specific financial aspects of the barriers and risks within the market and to identify possible obstacles pertaining to specific industries, sectors, countries, and/or stakeholders. Individual follow-up interviews with survey respondents and conducting case studies would also help to develop a framework of guidelines of best practices for policymakers and investors.

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APPENDIX A
Summary of Survey Responses

Lenders	
A. Risk perception on low-carbon energy system investments	**Responses**
1. Low-carbon energy investments are complex and relatively immature.	Unclear/Unknown (greater share disagrees)
2. Very few risk mitigation or risk-sharing facilities is available.	Unclear/Unknown (greater share agrees)
3. Climate change risks and the Paris Agreement have increased our focus.	Strongly Agree
4. Who is willing to share your risks in low-carbon investments?	- Government - Development Banks/Multilateral Agencies
5. How do you regard major risks in making new low-carbon investments?	- Changing Regulations - Inconsistent Policies - Market Risks
6. What are the main opportunities for mitigating financial risks?	- Power Purchase Agreements - Government Guarantees - Long-Term Government Policies - Removal of Fossil Fuel Subsidies
B. Capacity to assess low-carbon investment risks	**Responses**
1. We have a specific team responsible for evaluating low-carbon investments risks.	Agree
2. We have adequate tools and best practices to evaluate the low-carbon investments risks.	Unclear/Unknown (greater share agrees)
3. Low-carbon investments require more due diligence compared to other projects.	Agree
4. Stringent regulation for carbon emissions and government guarantee schemes reduce the risks.	Strongly Agree
5. Which capacity building opportunities would be beneficial to increase low-carbon energy investment?	- Sharing best practices on successful projects and investments - Guidelines - Training
6. What type of information would make your investment decision to invest in low-carbon energy easier?	- Cost Saving Potential of Technologies - Technology Risks - Market Risks
Borrowers	

A. Demand for projects and awareness of low-carbon financing opportunities	Responses
1. Clients demand low-carbon products and services	Agree
2. Lack information on available grants, subsidies, incentives and financial products.	Strongly Agree
3. Lack of dissemination and awareness of successful low-carbon investments.	Strongly Agree
4. Currently, our projects are financially viable, through government support without which they are not profitable.	Agree
5. The main financing mechanisms used for low-carbon energy investments are:	1. Feed-in Tariffs 2. Bank Loans 3. Equity Finance
B. Access to finance	**Responses**
1. Access to finance is generally an obstacle for new low-carbon investments.	Strongly Agree
2. Bank and lenders accept different forms of collateral.	Agree
3. Our organisation is ready to make new low-carbon investments if effective de-risking mechanisms are put in place.	Agree
4. International financial institution plays a major role in reducing financial risks.	Strongly Agree
5. What other financing options will benefit your company in new low-carbon investment?	- Government Guarantees Schemes - International Financing - Green Bonds
6. What do you perceive as the biggest obstacles to receiving finance and bank loans?	- Changing Policies - High Initial Investment Costs - Longer Recovery Periods - High Collateral Requirements
7. Who are the prime movers in making access to finance available?	- Banker or Lender - Government - Institution Investor - International Assistance - Social Enterprise
8. In percentage (%) terms, how much would cost of low-carbon technology have to decline (relative to costs of generating power using fossil fuel energy) for you to continue the existing investment or make new low-carbon investments without any government subsidies?	1–10%
9. At what rate can your organization borrow for low-carbon investments?	1–10% (Converging towards 5%)

10. At what rate can your organization borrow for other investments?	1–10% (Converging towards 5%)	
General section		
Questions	**Lenders**	**Borrowers**
E. Perception and commitment to low-carbon investment	**Responses**	
1. Low-carbon finance has become a promising business especially after the Paris Agreement and increasing consumer awareness.	Agree	Agree
2. Emission reduction and environmental sustainability are included in your organization's mission statements.	Strongly Agree	Agree
3. Your organization makes considerable investments in low-carbon energy projects.	Agree	Agree
F. Economic and financial barriers		
1. The current low-carbon investment is characterized by high market concentration and monopoly by a few players.	Unclear/ Unknown	Agree
2. Subsidies for conventional energy and the absence of carbon prices are distorting low-carbon investments.	Strongly Agree	Agree
3. Current Power Purchase Agreements (PPA) are not conducive for low-carbon investment.	Unclear/ Unknown (greater share agrees)	Agree
4. Energy prices are unstable with a high-risk speculative prices and fluctuations.	Agree	Agree
5. Low-carbon investments suffer from high initial investment costs and unpredictable cash flows.	Agree	Strongly Agree
6. The potential cost savings from energy efficiency improvements are difficult to estimate, which makes calculating the payback period very challenging.	Unclear/ Unknown	Unclear/ Unknown (greater share agrees)
7. Sourcing financial capital for low-carbon energy investments is difficult due to high-perceived risks.	Agree	Agree
8. Capital lending has been further restricted with the implementation of international regulatory framework for banks.	Unclear/Unknown	Agree
9. Lack of secondary markets for low-carbon project finance debt currently	Agree	Agree

limits capital provision from private investors and institutions.		
10. More innovative options for financing such as equipment leases, third party guarantors, and asset securitization would be helpful.	Agree	Strongly Agree
11. Financial incentives in the form of subsidies would be required to support new investment:	Up to 5 Years	Up to 10 Years
12. Which additional financial incentives would increase your investment opportunities?	- Dedicated Low-carbon Investment Funds - Government Guarantees for High-Risks (e.g. off-taker risk) - Securitisation of Low Carbon Energy Projects into Asset-Backed Securities - Capacity Building for Assessing Climate-Related Risks	- Government Guarantees for High-Risks (e.g. off-taker risk) - Securitisation of Low Carbon Energy Projects into Asset-Backed Securities - Dedicated Low-carbon Investment Funds
G. Technical/infrastructure barriers		
1. Lack of grid connectivity.	Agree	Strongly Agree
2. Local supply chains are underdeveloped	Agree	Strongly Agree
3. The portfolio standards to accommodate low-carbon energy supply are inadequate	Agree	Strongly Agree
4. A lack of available technical information on the net costs, benefits and risks.	Strongly Agree	Agree
H. National regulatory barriers		
1. Overlapping and inconsistent policies by governments.	Strongly Agree	Strongly Agree
2. Coordination amongst ministries and institutions are weak.	Agree	Strongly Agree
3. Lack of concrete action plans by the government on the low-carbon transition leads to uncertainty in my organisation's business model and decisions.	Agree	Strongly Agree

4. The number of permits required for low-carbon energy projects are high and processing time is long.	Agree	Strongly Agree
5. The regulatory framework for land procurement is complicated and takes times.	Agree	Strongly Agree
6. Compared to other investment projects, low-carbon projects require more due diligence.	Agree	Strongly Agree
7. Foreign direct investment restrictions are currently limiting the amount of international funding available to my organisation.	Unclear/Unknown (greater share disagrees)	Agree
8. Other regulatory barriers to low-carbon energy investment and/or project development include:	Unclear/Unknown	Unclear/Unknown
9. What do you think the government should address to improve the environment for low-carbon investment?	- Harmonisation of existing policies - Government subsidies/guarantees for low-carbon projects - Implementation of international regulatory frameworks - Shorten the time to get licenses	- Government subsidies/guarantees for low-carbon projects - Shorten time to get licenses - Harmonisation of existing policies - More aggressive competition policy - Ease procuring property - Liberalised trade/investment
10. Which specific policy areas should governments undertake to substantially influence low-carbon investment decisions?	- Commercialisation of low-carbon technology - Stimulate private sector investment with public funding	- Carbon pricing - Energy taxation - Commercialisation of low-carbon technology - Green bonds
I. Regional policies		

1. Increased regional coordination on energy policies, regulations and funding mechanisms will promote low-carbon investment.	Strongly Agree	Strongly Agree
2. Regional structures and incentives that could enhance investment and development of low-carbon energy system, include:	1. Regional Carbon Price 2. Regional Fund for Investing in Low-carbon Energy Transition Projects 3. Regional low-carbon guarantee fund 4. Regional Finance Warranty Program 5. Regional Reg. on Goods and Services 6. Regional Green Bond	1. Regional Carbon Price 2. Regional Fund for Investing in Low-carbon Energy Transition Projects 3. Regional Finance Warranty Program 4. Regional low-carbon guarantee fund 5. Regional Reg. on Goods and Services 6. Regional Green Bond

Source: Authors.

Non-Liker Scale Questions: Answers chosen by approx. 50%. Of surveyed respondents or were amongst the top three ranked options were included in the answers guide.

Liker Scale Questions: If the cumulative agreement, disagreement, or neutral/moderate options for a question were greater or equal to 51% the results were classified as agree or disagree. If the cumulative agreement, disagreement, or neutral/moderate options for a question were greater or equal to 75% the results were classified as strongly agree or strongly disagree. If the cumulative agreement, disagreement, or neutral/moderate options for a question were less than or equal to 50% the results were classified as unclear/unknown.

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